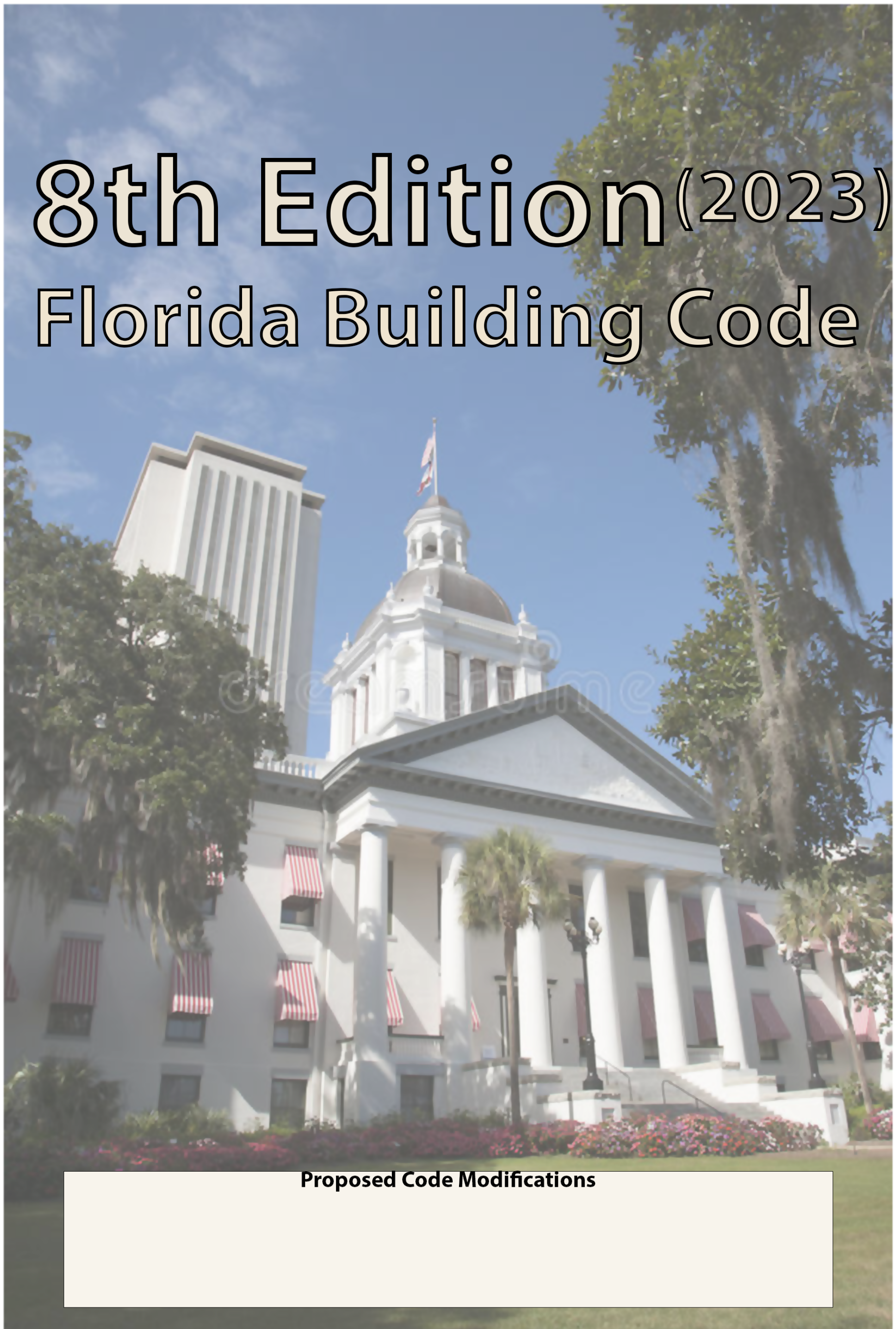

This document created by the Florida Department of Business and Professional Regulation -

850-487-1824

TAC: Structural

Total Mods for **Structural** in **Approved as Modified : 1**

Total Mods for report: 58

Sub Code: Residential

S9958

1

Date Submitted	01/25/2022	**Section**	46	**Proponent**	T Stafford
Chapter	2712	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Approved as Modified				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

Summary of Modification

This proposal updates ASCE 7 from the 2016 edition to the 2022 edition (ASCE 7-22)

Rationale

This proposal updates ASCE 7 from the 2016 edition to the 2022 edition (ASCE 7-22). See uploaded support for additional rationale for the proposed change.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposal will impact local entities relative to enforcement of the code. Pressure coefficients for roofs have been simplified and roof design pressures are lower in some cases. Local code officials will have to become familiar with the changes to the wind load provisions.

Impact to building and property owners relative to cost of compliance with code

This proposal will impact building and property owners relative to cost of compliance with the code. Pressure coefficients for roofs have been simplified and roof design pressures are lower in some cases. Changes in ASCE 7-22 will affect the design of some buildings.

Impact to industry relative to the cost of compliance with code

This proposal will impact industry relative to cost of compliance with the code. Pressure coefficients for roofs have been simplified and roof design pressures are lower in some cases. Changes in ASCE 7-22 will affect the design of some buildings.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification incorporates the latest knowledge and research on the determination of design wind loads on buildings and structures through the update to the 2022 Edition of ASCE 7.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification strengthens the code by updating to the latest edition of the standard that has been the basis for the determination of wind loads on buildings and structures since the inception of the Florida Building Code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against any other material, product, method, or system of construction.

Does not degrade the effectiveness of the code

The modification does not degrade the effectiveness of the code. The effectiveness of the code is enhanced by adopting the latest methods and design procedures for designing buildings for wind loads.

Alternate Language

2nd Comment Period

9958-A2

Proponent Gaspar Rodriguez **Submitted** 8/23/2022 9:15:31 AM **Attachments** Yes

Rationale:

This mod corelates Test Protocols for High-Velocity Hurricane Zone RAS 127 Prescriptive Pressures with the values indicated using ASCE7-22.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Simpler way of verifying design pressure requirements.

Impact to building and property owners relative to cost of compliance with code

Eliminates the need for Design Professional Calculations.

Impact to industry relative to the cost of compliance with code

Eliminates the need for Design Professional Calculations.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Corelates codes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Corelates codes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Corelates codes.

Does not degrade the effectiveness of the code

Corelates codes.

1st Comment Period History

9958-A1

Proponent T Stafford **Submitted** 4/12/2022 2:26:37 PM **Attachments** Yes

Rationale:

Modification 9957 was the original modification that updated ASCE 7 to the 2022 edition in the FBCB. However, a glitch in the system combined parts of my original Mod 9957 with another modification. At the direction of staff, this alternate language comment to Mod 9958 updates ASCE 7 to the 2022 edition in the FBCB.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification will impact local entities relative to enforcement of the code as they will be required to become familiar with the updated wind load requirements in ASCE 7-22.

Impact to building and property owners relative to cost of compliance with code

This modification will impact building and property owners relative to cost of compliance with the code. The update to ASCE 7-22 includes increases in wind loading requirements for some situations and decreases in wind loading requirements for others.

Impact to industry relative to the cost of compliance with code

This modification will impact industry relative to cost of compliance with the code. The update to ASCE 7-22 includes increases in wind loading requirements for some situations and decreases in wind loading requirements for others.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification updates the wind load requirements in the Florida Building Code to ASCE 7-22. The wind load provisions in ASCE 7 are based on the latest science and research and has been the basis for wind loading requirements in the Florida Building Code since its inception.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification strengthens and improves the code by updating the wind loading requirements to be consistent with the most current science and research.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This modification does not degrade the effectiveness of the code.

S9958 (Original plus A1)

Original

Include the following change to Chapter 46 in the Florida Building Code, Residential:

ASCE/SEI American Society of Civil Engineers
Structural Engineering Institute
1801 Alexander Bell Drive
Reston, VA 20191-4400

Standard reference number Title

7-~~16~~ 22 Minimum Design Loads and Associated Criteria for Buildings and Other Structures ~~with Supplement No. 1~~

A1

Include the following change to Chapter 35 in the Florida Building Code, Building:

Text of Modification

FLORIDA BUILDING CODE, BUILDING

CHAPTER 35

REFERENCED STANDARDS

ASCE/SEI American Society of Civil Engineers

Structural Engineering Institute

1801 Alexander Bell Drive

Reston, VA 20191-4400

Standard reference number Title

S9958-A1Revision

7-~~16~~ 22 Minimum Design Loads and Associated Criteria for Buildings and Other Structures ~~with Supplement No. 1~~

S9958 (Original plus A1)

Original

Include the following change to Chapter 46 in the Florida Building Code, Residential:

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Standard reference number Title

7-~~16~~ 22 Minimum Design Loads and Associated Criteria for Buildings and Other Structures ~~with Supplement No. 1~~

Test Protocols for High-Velocity Hurricanes Zones RAS 127

1.Scope

This standard covers the procedure for determining the Moment of Resistance (M_r) and Minimum Characteristic Resistance Load (F') to install a tile system on buildings of a specified roof slope and height. Compliance with the requirements and procedures herein specified, where the design wind uplift pressures (P_{asd}) have been determined based on Tables 1-3 or Tables 4-6, Tables 7-9 or Tables 10-12 of this standard, as applicable, do not require additional signed and sealed engineering design calculation. All other calculations must be prepared, signed and sealed by a professional engineer or registered architect. Tables 1-3 are applicable to a wind speed of 175 mph, risk category II buildings with gable roofs ~~with overhangs~~, and Exposure Category C. Tables 4-6 are applicable to a wind speed of 175 mph, risk category II buildings with gable roofs ~~with overhangs~~, and Exposure Category D. Tables 7-9 are applicable to a wind speed of 175 mph, for Risk Category II buildings with hip roofs ~~and overhangs~~, and Exposure Category C. Tables 10-12 are applicable to a wind speed of 175 mph, for Risk Category II buildings with hip roofs ~~and overhangs~~, and Exposure Category D.

For steep slope roof systems other than tile, Tables 1-3, Tables 4-6, Tables 7-9 or Tables 10-12 of this standard, as applicable, do not require additional signed and sealed engineering design calculation when determining the use of a specific Product Approval. All other calculations must be prepared, signed and sealed by a Professional Engineer or Registered Architect.

All calculations must be submitted to the building official at time of permitting.

2.How to determine the Moment Resistance (M_r) (Moment Based Systems)

1.2.1 Determine the minimum design wind pressures for each roof pressure zone using the values given in Tables 1-3, or Tables 4-6, Tables 7-9 or Tables 10-12, as applicable, or those obtained by engineering analysis prepared, signed and sealed by a professional engineer or registered architect based on ASCE 7.

2.2.2 Locate the aerodynamic multiplier (?) in tile Product Approval.

3.2.3 Determine the restoring moment due to gravity (M_g) per Product Approval.

4.2.4 Determine the attachment resistance (M_f) per Product Approval.

5.2.5 Determine the Moment of Resistance (M_r) per following formula:

6.2.6 Compare the values for M_r, with the values for M_f, noted in the Product Approval. If the M_f values are greater than or equal to the M_r values, for each area of the roof then the tile attachment method is acceptable.

3.How to determine the Minimum Characteristic Resistance Load (F') (Uplift Based System)

1.3.1 Determine the minimum design pressures for each roof pressure zone using the values given in Table 1-3, Tables 4-6, Tables 7-9 or Tables 10-12 as applicable, or those obtained by engineering analysis prepared, signed and sealed by a professional engineer or registered architect based on the criteria set forth in ASCE 7.

2.3.2 Determine the angle (?) of roof slope, from Tables 1-3, Tables 4-6, Tables 7-9 or Tables 10-12, as applicable.

3.3.3 Determine the length (l), width (w) and average tile weight (W) of tile, per Product Approval.

4.3.4 Determine the required uplift resistance (F_r) per following formula:

5.3.5 Compare the values for F_r with the values for F' noted in the Product Approval. If the F' values are greater than or equal to the F_r values, for each area of roof, then the tile attachment method is acceptable

TABLE 1 — GABLE ROOFS

MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~= 2:12 to = 4:12~~ 1.5:12 TO LESS THAN 4.5:12

RISK CATEGORY II EXPOSURE CATEGORY "C"

Roof Mean Height	Roof Pressure Zones

S9958-A2Text Modification

	See Figure 1		
	1 ~~and 2e~~	2~~n, 2r and 3e~~	3~~r~~
= 15'	-74	~~-108~~ -98	-128
> 15' to = 20'	-78	~~-114~~ -104	-136
> 20' to = 25'	-82	~~-120~~ -108	-142
> 25' to = 30'	-85	~~-125~~ -113	-148
> 30' to = 35'	-88	~~-129~~ -116	-153
> 35' to = 40'	-91	~~-132~~ -120	-157
> 40' to = 45'	-93	~~-136~~ -123	-162
> 45' to = 50'	-95	~~-139~~ -126	-165
> 50' to = 55'	-97	~~-142~~ -128	-169
> 55' to = 60'	-98	~~-144~~ -130	-171

TABLE 2 — GABLE ROOFS

MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~> 4:12 to = 6:12~~4.5:12 TO LESS THAN 6:12

RISK CATEGORY II EXPOSURE CATEGORY "C"

Roof Mean Height	Roof Pressure Zones See Figure 1		
	1 ~~and 2e~~	2~~n, 2r and 3e~~	3~~r~~
= 15'	-57	-91	~~-128~~ -108
> 15' to = 20'	-60	-96	~~-136~~ -114
> 20' to = 25'	-63	-101	~~-142~~ -120
> 25' to = 30'	-66	-105	~~-148~~ -125
> 30' to = 35'	-68	-109	~~-153~~ -128
> 35' to = 40'	-70	-111	~~-157~~ -132
> 40' to = 45'	-72	-115	~~-162~~ -135
> 45' to = 50'	-73	-117	~~-165~~ -139
> 50' to = 55'	-75	-120	~~-169~~ -141
> 55' to = 60'	-76	-121	~~-171~~ -144

-

TABLE 3 — GABLE ROOFS

MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~>~~ 6:12 to ~~=~~ 12:12 RISK CATEGORY II EXPOSURE CATEGORY "C"

Roof Mean Height	Roof Pressure Zones

	See Figure 2		
	1~~, 2e and 2r~~	2~~n and 2r~~	3~~e~~
= 15'	-67	-74	~~-115~~ -91
> 15' to = 20'	-71	-78	~~-122~~ -99
> 20' to = 25'	-74	-82	~~-127~~ -101
> 25' to = 30'	-78	-85	~~-132~~ -105
> 30' to = 35'	-80	-88	~~-137~~ -108
> 35' to = 40'	-82	-91	~~-141~~ -111
> 40' to = 45'	-85	-93	~~-146~~ -114
> 45' to = 50'	-86	-95	~~-147~~ -117
> 50' to = 55'	-88	-97	~~-151~~ -119
> 55' to = 60'	-89	-98	~~-153~~ -121

TABLE 4 — GABLE ROOFS

MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~-■ 2:12 to ■ 4:12~~ 1.5:12 TO LESS THAN 4.5:12 RISK CATEGORY II EXPOSURE CATEGORY “D”

Roof Mean Height	Roof Pressure Zones See Figure 1		
	1 ~~and 2e~~	2~~n, 2r and 3e~~	3~~r~~
= 15'	-90	~~-131~~ -119	-156
> 15' to = 20'	-94	~~-137~~ -124	-163
> 20' to = 25'	-98	~~-142~~ -129	-169
> 25' to = 30'	-101	~~-148~~ -134	-175
> 30' to = 35'	-104	~~-152~~ -137	-180
> 35' to = 40'	-106	~~-155~~ -140	-184
> 40' to = 45'	-109	~~-157~~ -143	-189
> 45' to = 50'	-111	~~-161~~ -146	-192
> 50' to = 55'	-113	~~-164~~ -149	-195
> 55' to = 60'	-114	~~-167~~ -151	-198

TABLE 5 — GABLE ROOFS

MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~-> 4:12 to ■ 6:12~~4.5:12 TO LESS THAN 6:12 RISK CATEGORY II EXPOSURE CATEGORY “D”

Roof Mean Height	Roof Pressure Zones

	See Figure 1		
	1 ~~and 2e~~	2~~n, 2r and 3e~~	3~~r~~
= 15'	-69	-110	~~-156~~ -131
> 15' to = 20'	-73	-116	~~-163~~ -137
> 20' to = 25'	-75	-120	~~-169~~ -142
> 25' to = 30'	-78	-124	~~-175~~ -147
> 30' to = 35'	-80	-128	~~-180~~ -151
> 35' to = 40'	-82	-131	~~-184~~ -155
> 40' to = 45'	-84	-134	~~-189~~ -158
> 45' to = 50'	-85	-136	~~-192~~ -161
> 50' to = 55'	-87	-138	~~-195~~ -164
> 55' to = 60'	-88	-140	~~-198~~ -167

TABLE 6 — GABLE ROOFS MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~>~~ 6:12 to ~~=~~ 12:12 RISK CATEGORY II EXPOSURE CATEGORY "D"			
Roof Mean Height	Roof Pressure Zones See Figure 2		
	1~~, 2e and 2r~~	2~~n and 2r~~	3~~e~~
= 15'	-82	-90	~~-140~~ -110
> 15' to = 20'	-86	-94	~~-146~~ -116
> 20' to = 25'	~~-87~~ -89	-98	~~-151~~ -120
> 25' to = 30'	-92	-101	~~-157~~ -124
> 30' to = 35'	-94	-103	~~-161~~ -128
> 35' to = 40'	-97	-106	~~-165~~ -131
> 40' to = 45'	-99	-109	~~-168~~ -133
> 45' to = 50'	-101	-111	~~-172~~ -136
> 50' to = 55'	-102	-112	~~-174~~ -138
> 55' to = 60'	-104	-114	~~-177~~ -140

(See image below)

Figure 1 Figure 2

TABLE 7 — HIP ROOFS MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~≥ 2:12 to ≤ 4:12~~1.5:12 TO LESS THAN 4.5:12 RISK CATEGORY II EXPOSURE CATEGORY "C"			
Roof Mean Height	Roof Pressure Zones See Figure 3		
	1	2~~r~~	~~2e and~~ 3
≤ 15'	-67	-88	-94
> 15' to ≤ 20'	-71	-93	-100
> 20' to ≤ 25'	-75	-97	-104
> 25' to ≤ 30'	-78	-101	-109
> 30' to ≤ 35'	-80	-105	-113
> 35' to ≤ 40'	-82	-107	-115
> 40' to ≤ 45'	-85	-110	-119
> 45' to ≤ 50'	-86	-112	-121
> 50' to ≤ 55'	-88	-115	-124
> 55' to ≤ 60'	-89	-117	-125

TABLE 8 — HIP ROOFS MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~> 4:12 to ≤ 6:12~~4.5:12 TO LESS THAN 6:12 RISK CATEGORY II EXPOSURE CATEGORY "C"			
Roof Mean Height	Roof Pressure Zones See Figure 3		
	1	~~2r and 2e~~	2 and 3
≤ 15'	~~-71~~ -54	~~-91~~	~~-111~~ -74
> 15' to ≤ 20'	~~-75~~ -57	~~-97~~	~~-118~~ -78
> 20' to ≤ 25'	~~-79~~ -59	~~-101~~	~~-124~~ -82
> 25' to ≤ 30'	~~-82~~ -62	~~-105~~	~~-129~~ -85
> 30' to ≤ 35'	~~-84~~ -64	~~-109~~	~~-133~~ -88
> 35' to ≤ 40'	~~-87~~ -66	~~-112~~	~~-137~~ -91
> 40' to ≤ 45'	~~-89~~ -67	~~-114~~	~~-140~~ -93
> 45' to ≤ 50'	~~-91~~ -69	~~-117~~	~~-143~~ -95
> 50' to ≤ 55'	~~-93~~ -70	~~-120~~	~~-146~~ -97
> 55' to ≤ 60'	~~-94~~ -72	~~-122~~	~~-149~~ -98

TABLE 9 — HIP ROOFS **MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~>~~ 6:12 to ~~=~~ 12:12 RISK CATEGORY II EXPOSURE CATEGORY "C"**				
Roof Mean Height	**Roof Pressure Zones** **See Figure 3**			
	1	~~2r~~	2e	3
= 15'	-57	~~-98~~	~~-101~~ -67	~~-128~~ -88
> 15' to = 20'	-60	~~-104~~	~~-108~~ -71	~~-136~~ -93
> 20' to = 25'	-63	~~-109~~	~~-113~~ -74	~~-143~~ -97
> 25' to = 30'	-66	~~-113~~	~~-117~~ -78	~~-149~~ -101
> 30' to = 35'	-67	~~-117~~	~~-121~~ -80	~~-153~~ -104
> 35' to = 40'	-70	~~-120~~	~~-124~~ -82	~~-158~~ -107
> 40' to = 45'	-71	~~-123~~	~~-128~~ -84	~~-162~~ -110
> 45' to = 50'	-73	~~-126~~	~~-130~~ -86	~~-165~~ -112
> 50' to = 55'	-75	~~-129~~	~~-133~~ -88	~~-169~~ -115
> 55' to = 60'	-76	~~-131~~	~~-135~~ -89	~~-172~~ -117

TABLE 10 — HIP ROOFS **MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~= 2:12 to = 4:12~~1.5:12 TO LESS THAN 4.5:12** **RISK CATEGORY II EXPOSURE CATEGORY "D"**			
Roof Mean Height	**Roof Pressure Zones** **See Figure 3**		
	1	2~~r~~	~~2e and~~ 3
= 15'	-82	-106	-114
> 15' to = 20'	-86	-111	-120
> 20' to = 25'	-89	-116	-124
> 25' to = 30'	-91	-120	-129
> 30' to = 35'	-94	-123	-132
> 35' to = 40'	-97	-126	-136
> 40' to = 45'	-99	-128	-138
> 45' to = 50'	-101	-131	-141

> 50' to = 55'	-102	-133	-143
> 55' to = 60'	-104	-135	-146

TABLE 11 — HIP ROOFS

MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~-> 4:12 to = 6:12~~4.5 TO LESS THAN 6:12

RISK CATEGORY II EXPOSURE CATEGORY "D"

Roof Mean Height	Roof Pressure Zones See Figure 3	
	1	2~~e, 2r~~ and 3
= 15'	-65	-90
> 15' to = 20'	-68	-94
> 20' to = 25'	-71	-98
> 25' to = 30'	-73	-101
> 30' to = 35'	-75	-104
> 35' to = 40'	-77	-106
> 40' to = 45'	-79	-109
> 45' to = 50'	-80	-111
> 50' to = 55'	-82	-112
> 55' to = 60'	-83	-114

TABLE 12 — HIP ROOFS

MINIMUM ASD DESIGN WIND UPLIFT PRESSURES IN PSF FOR ROOF SLOPE ~~->~~ 6:12 to ~~=~~ 12:12 RISK CATEGORY II EXPOSURE CATEGORY "D"

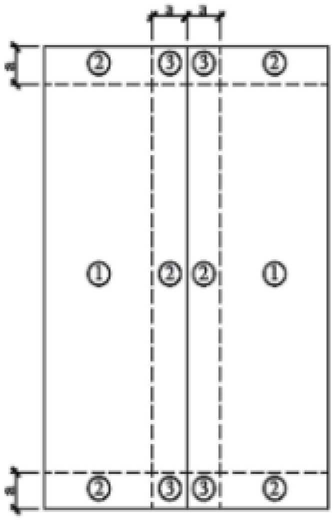
Roof Mean Height	Roof Pressure Zones			
	1	~~2e~~	2~~r~~	3
= 15'	-69	~~-119~~	~~-123~~ -82	~~-156~~ -106
> 15' to = 20'	-73	~~-124~~	~~-129~~ -86	~~-163~~ -111
> 20' to = 25'	-75	~~-129~~	~~-133~~ -89	~~-169~~ -116

> 25' to = 30'	-78	~~-134~~	~~-138~~ -92	~~-175~~ -120
> 30' to = 35'	-80	~~-137~~	~~-142~~ -94	~~-180~~ -123
> 35' to = 40'	-82	~~-141~~	~~-145~~ -97	~~-184~~ -126
> 40' to = 45'	-84	~~-143~~	~~-148~~ -99	~~-188~~ -128
> 45' to = 50'	-85	~~-146~~	~~-151~~ -101	~~-192~~ -131
> 50' to = 55'	-87	~~-149~~	~~-154~~ -102	~~-195~~ -133
> 55' to = 60'	-88	~~-151~~	~~-156~~ -104	~~-198~~ -135

(See below for image)

Figure 3

Image for Mod 9958-A2



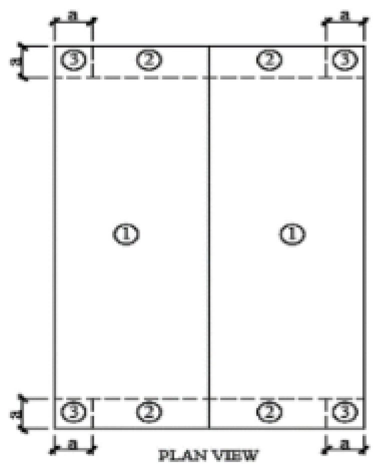
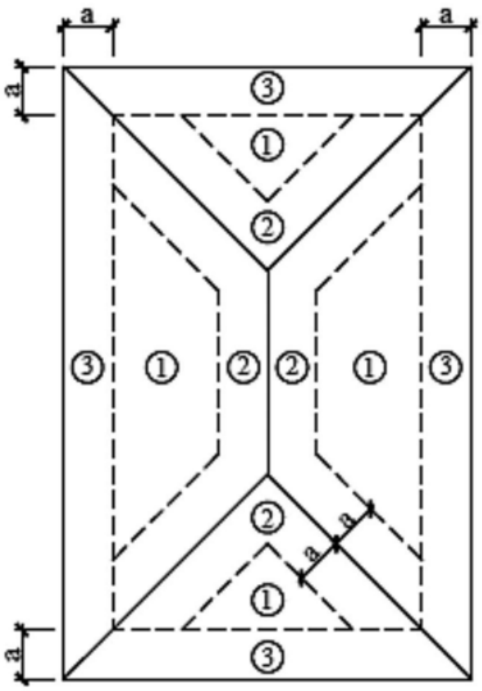


Figure 1 Figure 2

9958-A2 Image Figure 3



Include the following change to Chapter 35 in the Florida Building Code, Building:

Text of Modification

FLORIDA BUILDING CODE, BUILDING
CHAPTER 35
REFERENCED STANDARDS

ASCE/SEI American Society of Civil Engineers
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Standard reference number Title

7-~~16~~ 22 Minimum Design Loads and Associated Criteria for Buildings and Other Structures ~~with Supplement No. 1~~

S9958Text Modification

ASCE/SEI American Society of Civil Engineers
Structural Engineering Institute
1801 Alexander Bell Drive
Reston, VA 20191-4400

Standard reference number	Title
7-~~16~~ 22 ~~with Supplement No. 1~~	Minimum Design Loads and Associated Criteria for Buildings and Other Structures

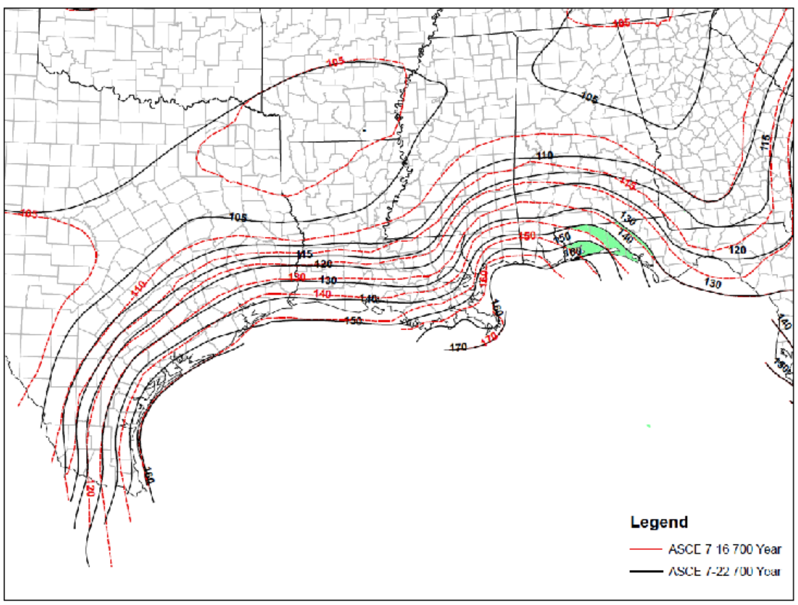
Page: 1

Mod_9958_TextOfModification.pdf

This is one of several proposals that updates the ASCE 7 standard from the 2016 edition to the 2022 edition (ASCE 7-22). The wind load provisions of ASCE 7-22 have been revised and refined in several key areas. The following is a summary of some of the key changes to the wind load provisions applicable to the State of Florida:

- Slight increases in design wind speeds for the western Panhandle.
- Revised the determination of applicability of the Wind-borne Debris Region in areas where the design wind speed is greater than or equal to 130 mph and less than 140 mph.
- Changes to roof pressure coefficients for mean roof heights less than or equal to 60 ft.
- New provisions for roof pavers
- New provisions for ground-mounted fixed-tilt solar panel systems.
- New provisions for wind loads on elevated buildings (MWFRS and C&C).
- New provisions for tornado loads.

For most of Florida, wind speeds have not changed. However, for the western part of the Panhandle, wind speeds have slightly increased. The following figure shows the impact of these increases for Risk Category II. The 130 mph contour has shifted very slightly northward and eastward. The 140 mph contour and the 150 mph contour have shifted moderately northward and eastward.



Where wind speeds are equal to or greater than 130 mph but less than 140 mph, the Wind-borne Debris region now applies within one mile of the mean high water line where an Exposure D condition exists upwind of the water line. The term “coastal” has been deleted. This change provides a more consistent method for determining the Wind-borne Debris Region in these areas.

One of the more significant changes in ASCE 7-22 is related to the roof design pressures for buildings with mean roof heights less than or equal to 60 ft. In particular, the pressure coefficient graphs and equations have become simpler. For gable and hipped roofs with slopes between 7 and 45 degree, the number of zones has been reduced to 3 consistent with editions of ASCE 7 prior to the 2016 edition. Additionally, all zones have been truncated at effective wind areas 10 square feet and less, also consistent with editions of ASCE 7 prior to the 2016 edition. This truncation has resulted in reduced pressure coefficients for some zones and effective wind areas, and subsequent reduced design pressures on the roof in some areas.

Another significant change in ASCE 7-22 is the introduction of tornado wind speed maps and design requirements. New Chapter 32 has been added that specifically addresses the design of buildings for tornadoes. The tornado provisions only apply to certain Risk Category III and IV buildings. Risk Categories I and II are exempt from the tornado provisions. Where the tornado wind speed, V_T, is less than 60 mph, design for tornadoes is not required. Additionally, the design for tornadoes is not required for the following wind speeds:

For Exposure B: $V_T \geq 0.5V$

For Exposure C: $V_T \geq 0.6V$

For Exposure D: $V_T \geq 0.67V$

The applicable tornado wind speed for a building is based on the Risk Category and the effective plan area of the building. For Risk Category III buildings, tornado wind speeds are based on a 700-year MRI. For Risk Category IV buildings, tornado wind speeds are based on a 3000-year MRI. Based on the wind speed limitations, Risk Category III buildings in Florida with an effective plan area of 100,000 square feet and less are not required to be designed for tornado loads. For all effective plan areas, the tornado wind speeds in Florida are less than the corresponding hurricane wind speeds. While the tornado provisions are not anticipated to significantly affect the design of Risk Category III and IV buildings for wind loads in Florida, there are situations, particularly for large buildings in Northwest Florida where the tornado provisions may govern over the hurricane provisions.

TAC: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Building

S10164

2

Date Submitted	02/11/2022	**Section**	202	**Proponent**	Robert Koning
Chapter	2	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

Add: Decorative Cementitious Finish. A skim coat, as defined in ASTM C926, of Portland cement-based plaster applied to concrete or masonry surfaces intended for cosmetic purposes.

Rationale

Always defined the FBC (Building and Residential) until the definition was removed from the Building Code starting with the 2014 edition, yet rightfully remains in the Florida Residential Code to this day. Concrete or masonry surfaces are most often fully code compliant by and of themselves – application of a stucco coat is not required by code, so normally, stucco’s only purpose is cosmetic on these surfaces. The ASTM C926 require stucco to be 1/2” in total thickness – applied by a 3/8” “base coat”, then once cured, followed by an 1/8” finish (colored) coat. The purpose of the 3/8” cured base coat is so the 1/8” colored coat (brown, tan, cream, white, etc.) will dry uniformly by even suction and not dry “blotchy” by uneven curing. If you are not using an 1/8” colored cementitious finish coat, i.e., you are using a coating (paint) or other synthetic coating – there is NO need for the 3/8” base coat – just apply a “Skim coat of stucco” as defined in the ASTM provisions. This process has performed perfectly since the inception of stucco without fault. It was originally included as the Decorative Cementitious Finish due to the inordinate amount of industry members who did not understand the complexities of the ASTM C926. The ASTM C926 standard’s provisions provide for the deduction of the 1/8” cementitious coating thickness requirements when other acrylic coating is to be used. This yields a 3/8” thickness requirement or allows a skim coat for cosmetic reasons – it’s a choice allowed – not a “code required ½” thickness". Yet, since this provisional definition was removed from the Building Code, its omission has been misinterpreted as to require ½” stucco over concrete or masonry surfaces and failure to do so a violation of the Florida Building Code. This is pled erroneously in many complaints and claims. We need to reinstate the necessary and needed definition in the Building Code as we have rightfully kept in the Residential Code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10164-G1

Proponent Michael Fox Submitted 8/16/2022 4:23:25 PM Attachments No

Comment:

Request attachment of ASTM C926 sections in support of this proposal. In my copy of ASTM C926 there is no exception for the "finish coat" using "acrylic coatings". The definitions include "basecoat", "finish coat" & "skim coat". The "skim coat" is decorative, but not the "finish coat" (second coat), thus the two coats are always required up to the 1/2" required thickness. Recommend denial of this proposal pending further supporting documentation from ASTM C926.

Decorative Cementitious Finish. A skim coat, as defined in ASTM C926, of Portland cement-based plaster applied to concrete or masonry surfaces intended for cosmetic purposes.

TAC: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Building

S10427

3

Date Submitted	02/15/2022	**Section**	1010.1.7	**Proponent**	Jennifer Hatfield
Chapter	10	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

Modifies Exception 2 in Section 1010.1.7 to clarify that a higher door threshold height may be allowed in order to meet the water testing requirements of Section 1709.5.

Rationale

This proposal is being submitted on behalf of the Fenestration & Glazing Industry Alliance (formerly AAMA). This code modification is intended to clear up only Exception 2 to Section 1010.1.7. Exception 2 in Section 1010.1.7 as currently written is confusing and this proposal is intended to clarify that a higher door threshold may be allowed as required to meet the water testing requirements in Section 1709.5 of the code. Exception 2 indicates a higher door threshold height is allowed in order to meet "water resistance testing" of NAFS or TAS 202 or "the maximum allowable height difference between interior floors". It is not clear what exactly the second option means and why only interior floor levels are being referenced and not exterior floor or surface levels. The intent of a higher threshold is to meet the water testing requirements of Section 1709.5 in the code, yet that seems to be negated by other language in the exception, particularly where "exterior floor levels shall comply with Table 1010.1.7". Three of the four exterior floor levels in the table are ½" which negates the intent of allowing a higher door threshold height in order to meet with water testing requirements in the code. The modification to Exception 2 in Section 1010.1.7 will clarify that a higher door threshold height may be allowed in order to meet the water testing requirements of Section 1709.5.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Could lessen costs associated with misinterpretations and confusion around the existing code language.

Impact to building and property owners relative to cost of compliance with code

Could lessen costs associated with misinterpretations and confusion around the existing code language.

Impact to industry relative to the cost of compliance with code

Could lessen costs associated with misinterpretations and confusion around the existing code language.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Will provide for less confusion and misinterpretation of what the code intended, providing better end results for the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by addressing language that currently is confusing and misinterpreted.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It does not.

Does not degrade the effectiveness of the code

It does not.

2nd Comment Period

S10427-G1

Proponent Scott McAdam Submitted 8/26/2022 7:25:43 PM Attachments No

Comment:

removal of exception number 2 would remove addressing exterior dwelling unit exit door which is the primary door. An exit door needs to comply with Table 1010.1.7. Accessible doors would still need to comply with the FBC, Accessibility. This MOD indicates it does not affect HVHZ but the exception specifically includes HVHZ which would now be removed. MOD remove requirements for exit doors and directly lessens the code and allows raised thresholds at exterior exits doors

1010.1.7 Thresholds.
Thresholds at doorways shall not exceed $^{3}/_{4}$ inch (19.1 mm) in height above the finished floor or landing for sliding doors serving *dwelling units* or $^{1}/_{2}$ inch (12.7 mm) above the finished floor or landing for other doors. Raised thresholds and floor level changes greater than $^{1}/_{4}$ inch (6.4 mm) at doorways shall be beveled with a slope not greater than one unit vertical in two units horizontal (50-percent slope).

Exceptions:

1. In occupancy Group R-2 or R-3, threshold heights for sliding and side-hinged exterior doors shall be permitted to be up to $7^{3}/_{4}$ inches (197 mm) in height if all of the following apply:
   1.1. The door is not part of the required *means of egress*.
   1.2. The door is not part of an *accessible route* as required by Chapter 11.
2. For exterior doors serving dwelling units, or sleeping units, thresholds at doorways shall be allowed at a height necessary to comply with the water resistance requirements of Section 1709.5. ~~not exceed the height required to pass the water resistance test of AAMA/WDMA/CSA 101/I.S.2/ A440, or TAS 202 for high-velocity hurricane zones, or the maximum allowable height difference between interior floor levels. Exterior floor level shall comply with Table 1010.1.7.~~

~~TABLE 1010.1.7 EXTERIOR FLOOR LEVEL DIFFERENCE~~

(*Delete table without substitution)*

<u>TAC</u>: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Building

S10435

4

Date Submitted	02/14/2022	**Section**	35	**Proponent**	Jennifer Hatfield
Chapter	35	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

<u>Comments</u>

General Comments No

Alternate Language Yes

Related Modifications

Chapter 46 - Referenced Standards to FBC-R.

Summary of Modification

Updates AAMA (FGIA) and ASTM Standards with appropriate names and editions.

Rationale

These are standard updates of existing AAMA and ASTM Standards utilized in the FBC-B. Edits to add a new edition and in some cases clarify the correct name of the standard are being provided. Also in some cases older ASTM editions are being removed. It is important to note that AAMA Standards are being published by the Fenestration & Glazing Industry Alliance (FGIA), which was the result of the American Architectural Manufacturers Association (AAMA) and the Insulating Glass Manufacturers Alliance (IGMA) unifying as one combined organization as of January 1, 2020.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No expected impact.

Impact to building and property owners relative to cost of compliance with code

No expected impact.

Impact to industry relative to the cost of compliance with code

No expected impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Provides for the latest editions of standards and accurate names to ensure Florida Codes are utilizing the most up to date standards.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by providing most recent standard editions.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It does not.

Does not degrade the effectiveness of the code

It does not.

Alternate Language

2nd Comment Period

S10435-A2

Proponent Jennifer Hatfield **Submitted** 8/25/2022 11:42:25 AM **Attachments** Yes

Rationale:

This alternative language comment, submitted on behalf of the Fenestration & Glazing Industry (FGIA), is simply to a) separate the two AAMA 450 editions as they have slightly different titles (the TAC already recommended adding the 2020 edition in June), and b) address an error brought to our attention under AAMA 711. A 2016 edition of the AAMA 711 standard does not exist, there are 2013, 2020 and now 2022 editions. Therefore, this comment simply eliminates the 2016 edition, continues to add the 2020 edition as was approved by the TAC in June, but also now adds a 2022 edition that exists. We believe this alternative comment will provide needed clarity as to the standards listed. Note there were no changes to the ASTM standards that were approved in June.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Provides for the accurate and latest editions of standards to ensure Florida Codes has the correct standards.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by providing the most recent editions and corrections.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It does not.

Does not degrade the effectiveness of the code

It does not.

AAMA Standards by FGIA

~~American Architectural Manufacturers Association~~
Fenestration & Glazing Industry Alliance
~~1827 Walden Office Square, Suite 550~~
1900 E Gold Rd., Suite 1250
Schaumburg, IL 60173

Update the following, all other existing AAMA Standards remain the same:

450—10 Voluntary Performance Rating Method for Mulled Fenestration Assemblies 1709.8

or

450-20 Performance Rating Method for Mulled Combination Assemblies, Composite Units, and Other Mulled Fenestration Systems 1709.8

711— 13 ~~or 16~~, 20 or 22 Voluntary Specification for Self-~~A~~adhering Flashing Used for Installation of Exterior Wall Fenestration Products 1405.4, Table 1507.1.1.1, 1507.1.1.2, 1507.1.1.3

714—15 or 19 Voluntary Specification for Liquid Applied Flashing Used to Create Water-resistive Seal around Exterior Wall Openings in Buildings 1405.4

ASTM

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Update the following, all other existing AAMA Standards remain the same:

E283—04(2012) or E283/283M-19
Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen 202

E330/E330M—~~02 or~~ 14 or 14 (21)
Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
1709.5.2, 1709.5.2.1, 1709.8, 2415.4, 2415.7.1

E331-00 (2009 or 2016)
Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference
1403.2, 2415.4

E1886-~~-12 or~~ 2013a or 2019
Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials 1609.1.2, 1709.5.1

E1996-~~-17 or 2012a or~~ 2014a, 2017 or 2020
Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes 449.4.2.5.1, 450.4.2.5.1, 1609.1.2, 1609.1.2.2, 1709.5.1

F2006~~—10 or~~ 17 or 2021
Standard/Safety Specification for Window Fall Prevention Devices for Nonemergency Escape (Egress) and Rescue (Ingress) Windows
1015.8

F2090--17 or 2021
Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms
1015.8, 1015.8.1

AAMA ~~Standards by FGIA~~

~~American Architectural Manufacturers Association~~
Fenestration & Glazing Industry Alliance
~~1827 Walden Office Square, Suite 550~~
1900 E Gold Rd., Suite 1250
Schaumburg, IL 60173

Update the following, all other existing AAMA Standards remain the same:

450—10 or 20 Voluntary Performance Rating Method for Mulled Fenestration Assemblies, Composite Units, and Other Mulled Fenestration Systems 1709.8

711— ~~13 or~~ 16 or 20 Voluntary Specification for Self-~~A~~adhering Flashing Used for Installation of Exterior Wall Fenestration Products 1405.4, Table 1507.1.1.1, 1507.1.1.2, 1507.1.1.3

714—15 or 19 Voluntary Specification for Liquid Applied Flashing Used to Create Water-resistive Seal around Exterior Wall Openings in Buildings 1405.4

ASTM

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Update the following, all other existing AAMA Standards remain the same:

E283—04(2012) or E283/283M-19
Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen 202

E330/E330M—~~02 or~~ 14 or 14 (21)
Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
1709.5.2, 1709.5.2.1, 1709.8, 2415.4, 2415.7.1

E331-00 (2009 or 2016)
Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference
1403.2, 2415.4

E1886--~~12 or~~ 2013a or 2019

Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials 1609.1.2, 1709.5.1

E1996~~--17 or 2012a or~~ 2014a, 2017 or 2020
Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes 449.4.2.5.1, 450.4.2.5.1, 1609.1.2, 1609.1.2.2, 1709.5.1

F2006—~~10 or~~ 17 or 2021
Standard/Safety Specification for Window Fall Prevention Devices for Nonemergency Escape (Egress) and Rescue (Ingress) Windows
1015.8

F2090--17 or 2021
Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms
1015.8, 1015.8.1

TAC: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Residential

S9971

5

Date Submitted	01/27/2022	**Section**	301.2	**Proponent**	T Stafford
Chapter	3	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

9958 and 9960

Summary of Modification

This proposal updates the simplified component cladding loads in the Florida Building Code, Residential for correlation with the proposed update to ASCE 7-22.

Rationale

This proposal updates the simplified component and cladding loads in the Florida Building Code, Residential for correlation with the proposed update to ASCE 7-22. Mod number 9958 proposes to update the edition of ASCE 7 from the 2016 edition to the 2022 edition. In ASCE 7-22, component and cladding loads on roofs of buildings with mean roof heights less than or equal to 60 feet have been revised. The attached support file provides a more detailed analysis of these changes in addition to supporting information on additional changes to the wind loading provisions in ASCE 7-22 that will impact the State of Florida.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposal will impact local entities relative to enforcement of the code. Roof component and cladding loads have changed for some roof slopes and zones.

Impact to building and property owners relative to cost of compliance with code

This proposal will impact building and property owners relative to cost of compliance with the code. Roof component and cladding loads have changed for some roof slopes and zones.

Impact to industry relative to the cost of compliance with code

This proposal will impact industry relative to cost of compliance with the code. Roof component and cladding loads have changed for some roof slopes and zones.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification incorporates the latest knowledge and research on the determination of design wind loads on buildings and structures through the update to the 2022 Edition of ASCE 7.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification strengthens the code by updating to the latest edition of the standard that has been the basis for the determination of wind loads on buildings and structures since the inception of the Florida Building Code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against any other material, product, method, or system of construction.

Does not degrade the effectiveness of the code

The modification does not degrade the effectiveness of the code. The effectiveness of the code is enhanced by adopting the latest methods and design procedures for designing buildings for wind loads.

Alternate Language

2nd Comment Period

S9971-A1

Proponent T Stafford **Submitted** 8/8/2022 12:29:37 PM **Attachments** Yes

Rationale:

This alternate language comment simply replaces Table R301.2(2) with a revised version. A small error was discovered in the equation for roof slopes ~ 7 degrees for effective wind areas of 20 and 50 square feet. This revised table corrects that error and also adds the design pressures Zone 1' for roof slopes less than 7 degrees. In the original modification, the user was directed to use Zone 1 pressures in Zone 1' or determine Zone 1' from ASCE 7.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to cost of compliance with the code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to cost of compliance with the code.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This public comment corrects the simplified design pressures for low slope roofs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by correcting the simplified design pressures for low slope roofs.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This public comment does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This public comment does not degrade the effectiveness of the code.

Replace Table R301.2(2) in the original modification with the following table:

(See image below)

Image for Table R301.2(2)

Replace Table R301.2(2) in the original modification with the following table:

TABLE R301.2(2)

COMPONENT AND CLADDING LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B (ASD) (psf)[a, b, c, d, e, f, g]

	Zone	Effective Wind Area	90		95		100		105		110		115		120		130		140		150		160		170		180	
			POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG
Gable Roof < 7 degrees	1'	10	3.6	-8.0	4.0	-8.9	4.4	-9.9	4.8	-10.9	5.3	-12.0	5.8	-13.1	6.3	-14.2	7.4	-16.7	8.6	-19.4	9.9	-22.2	11.2	-25.3	12.7	-28.5	14.2	-32.0
	1'	20	3.3	-8.0	3.7	-8.9	4.1	-9.9	4.5	-10.9	5.0	-12.0	5.4	-13.1	5.9	-14.2	7.0	-16.7	8.1	-19.4	9.3	-22.2	10.5	-25.3	11.9	-28.5	13.3	-32.0
	1'	50	3.0	-8.0	3.4	-8.9	3.8	-9.9	4.1	-10.9	4.5	-12.0	5.0	-13.1	5.4	-14.2	6.3	-16.7	7.4	-19.4	8.4	-22.2	9.6	-25.3	10.8	-28.5	12.2	-32.0
	1'	100	2.8	-8.0	3.1	-8.9	3.5	-9.9	3.8	-10.9	4.2	-12.0	4.6	-13.1	5.0	-14.2	5.9	-16.7	6.8	-19.4	7.8	-22.2	8.9	-25.3	10.0	-28.5	11.3	-32.0
	1	10	3.6	-13.9	4.0	-15.5	4.4	-17.2	4.8	-19.0	5.3	-20.8	5.8	-22.7	6.3	-24.8	7.4	-29.1	8.6	-33.7	9.9	-38.7	11.2	-44.0	12.7	-49.7	14.2	-55.7
	1	20	3.3	-13.0	3.7	-14.5	4.1	-16.1	4.5	-17.7	5.0	-19.4	5.4	-21.2	5.9	-23.1	7.0	-27.1	8.1	-31.5	9.3	-36.1	10.5	-41.1	11.9	-46.4	13.3	-52.0
	1	50	3.0	-11.8	3.4	-13.1	3.8	-14.6	4.1	-16.1	4.5	-17.6	5.0	-19.3	5.4	-21.0	6.3	-24.6	7.4	-28.5	8.4	-32.8	9.6	-37.3	10.8	-42.1	12.2	-47.2
	1	100	2.8	-10.9	3.1	-12.1	3.5	-13.4	3.8	-14.8	4.2	-16.2	4.6	-17.8	5.0	-19.3	5.9	-22.7	6.8	-26.3	7.8	-30.2	8.9	-34.4	10.0	-38.8	11.3	-43.5
	2	10	3.6	-18.4	4.0	-20.5	4.4	-22.7	4.8	-25.0	5.3	-27.4	5.8	-30.0	6.3	-32.7	7.4	-38.3	8.6	-44.5	9.9	-51.0	11.2	-58.1	12.7	-65.6	14.2	-73.5
	2	20	3.3	-16.4	3.7	-18.2	4.1	-20.2	4.5	-22.3	5.0	-24.5	5.4	-26.7	5.9	-29.1	7.0	-34.2	8.1	-39.6	9.3	-45.5	10.5	-51.8	11.9	-58.4	13.3	-65.5
	2	50	3.0	-13.7	3.4	-15.3	3.8	-16.9	4.1	-18.7	4.5	-20.5	5.0	-22.4	5.4	-24.4	6.3	-28.6	7.4	-33.2	8.4	-38.1	9.6	-43.3	10.8	-48.9	12.2	-54.8
	2	100	2.8	-11.7	3.1	-13.0	3.5	-14.5	3.8	-15.9	4.2	-17.5	4.6	-19.1	5.0	-20.8	5.9	-24.4	6.8	-28.3	7.8	-32.5	8.9	-37.0	10.0	-41.8	11.3	-46.8
	3	10	3.6	-25.0	4.0	-27.9	4.4	-30.9	4.8	-34.1	5.3	-37.4	5.8	-40.9	6.3	-44.5	7.4	-52.2	8.6	-60.6	9.9	-69.6	11.2	-79.1	12.7	-89.4	14.2	-100.2
	3	20	3.3	-21.0	3.7	-23.4	4.1	-26.0	4.5	-28.6	5.0	-31.4	5.4	-34.4	5.9	-37.4	7.0	-43.9	8.1	-50.9	9.3	-58.4	10.5	-66.5	11.9	-75.1	13.3	-84.2
	3	50	3.0	-15.7	3.4	-17.5	3.8	-19.4	4.1	-21.4	4.5	-23.5	5.0	-25.6	5.4	-27.9	6.3	-32.8	7.4	-38.0	8.4	-43.6	9.6	-49.6	10.8	-56.0	12.2	-62.8
	3	100	2.8	-11.7	3.1	-13.0	3.5	-14.5	3.8	-15.9	4.2	-17.5	4.6	-19.1	5.0	-20.8	5.9	-24.4	6.8	-28.3	7.8	-32.5	8.9	-37.0	10.0	-41.8	11.3	-46.8
Gable Roof > 7 to 20 degrees	1	10	5.8	-16.2	6.4	-18.0	7.1	-19.9	7.9	-22.0	8.6	-24.1	9.4	-26.4	10.3	-28.7	12.1	-33.7	14.0	-39.1	16.1	-44.9	18.3	-51.0	20.6	-57.6	23.1	-64.6
	1	20	5.3	-13.9	5.9	-15.5	6.5	-17.1	7.2	-18.9	7.9	-20.7	8.6	-22.7	9.4	-24.7	11.0	-29.0	12.7	-33.6	14.6	-38.6	16.6	-43.9	18.8	-49.5	21.1	-55.5
	1	50	4.6	-10.9	5.1	-12.1	5.7	-13.4	6.2	-14.8	6.8	-16.3	7.5	-17.8	8.2	-19.4	9.6	-22.7	11.1	-26.4	12.7	-30.3	14.5	-34.4	16.4	-38.9	18.3	-43.6
	1	100	4.1	-8.6	4.5	-9.6	5.0	-10.7	5.5	-11.7	6.1	-12.9	6.6	-14.1	7.2	-15.3	8.5	-18.0	9.8	-20.9	11.3	-24.0	12.9	-27.3	14.5	-30.8	16.3	-34.5
	2	10	5.8	-21.3	6.4	-23.8	7.1	-26.3	7.9	-29.0	8.6	-31.9	9.4	-34.8	10.3	-37.9	12.1	-44.5	14.0	-51.6	16.1	-59.3	18.3	-67.4	20.6	-76.1	23.1	-85.4
	2	20	5.3	-18.4	5.9	-20.5	6.5	-22.7	7.2	-25.1	7.9	-27.5	8.6	-30.1	9.4	-32.8	11.0	-38.4	12.7	-44.6	14.6	-51.2	16.6	-58.2	18.8	-65.7	21.1	-73.7
	2	50	4.6	-14.6	5.1	-16.2	5.7	-18.0	6.2	-19.8	6.8	-21.8	7.5	-23.8	8.2	-25.9	9.6	-30.4	11.1	-35.3	12.7	-40.5	14.5	-46.1	16.4	-52.0	18.3	-58.3
	2	100	4.1	-11.7	4.5	-13.0	5.0	-14.4	5.5	-15.9	6.1	-17.4	6.6	-19.0	7.2	-20.7	8.5	-24.3	9.8	-28.2	11.3	-32.4	12.9	-36.8	14.5	-41.6	16.3	-46.6
	3	10	5.8	-28.0	6.4	-31.2	7.1	-34.6	7.9	-38.1	8.6	-41.8	9.4	-45.7	10.3	-49.8	12.1	-58.4	14.0	-67.8	16.1	-77.8	18.3	-88.5	20.6	-99.9	23.1	-112.0
	3	20	5.3	-24.0	5.9	-26.7	6.5	-29.6	7.2	-32.7	7.9	-35.8	8.6	-39.2	9.4	-42.7	11.0	-50.1	12.7	-58.1	14.6	-66.6	16.6	-75.8	18.8	-85.6	21.1	-96.0
	3	50	4.6	-18.7	5.1	-20.8	5.7	-23.1	6.2	-25.4	6.8	-27.9	7.5	-30.5	8.2	-33.2	9.6	-39.0	11.1	-45.2	12.7	-51.9	14.5	-59.1	16.4	-66.7	18.3	-74.7
	3	100	4.1	-14.7	4.5	-16.3	5.0	-18.1	5.5	-20.0	6.1	-21.9	6.6	-24.0	7.2	-26.1	8.5	-30.6	9.8	-35.5	11.3	-40.8	12.9	-46.4	14.5	-52.3	16.3	-58.7
Gable Roof > 20 to 27 degrees	1	10	5.8	-12.4	6.4	-13.9	7.1	-15.4	7.9	-16.9	8.6	-18.6	9.4	-20.3	10.3	-22.1	12.1	-26.0	14.0	-30.1	16.1	-34.6	18.3	-39.3	20.6	-44.4	23.1	-49.8
	1	20	5.3	-11.2	5.9	-12.5	6.5	-13.9	7.2	-15.3	7.9	-16.8	8.6	-18.4	9.4	-20.0	11.0	-23.5	12.7	-27.2	14.6	-31.2	16.6	-35.5	18.8	-40.1	21.1	-45.0
	1	50	4.6	-9.7	5.1	-10.8	5.7	-11.9	6.2	-13.1	6.8	-14.4	7.5	-15.8	8.2	-17.2	9.6	-20.2	11.1	-23.4	12.7	-26.8	14.5	-30.5	16.4	-34.5	18.3	-38.6
	1	100	4.1	-8.5	4.5	-9.4	5.0	-10.4	5.5	-11.5	6.1	-12.6	6.6	-13.8	7.2	-15.0	8.5	-17.7	9.8	-20.5	11.3	-23.5	12.9	-26.7	14.5	-30.2	16.3	-33.8
	2	10	5.8	-19.9	6.4	-22.1	7.1	-24.5	7.9	-27.0	8.6	-29.7	9.4	-32.4	10.3	-35.3	12.1	-41.4	14.0	-48.0	16.1	-55.2	18.3	-62.8	20.6	-70.8	23.1	-79.4
	2	20	5.3	-17.0	5.9	-18.9	6.5	-20.9	7.2	-23.1	7.9	-25.3	8.6	-27.7	9.4	-30.1	11.0	-35.4	12.7	-41.0	14.6	-47.1	16.6	-53.6	18.8	-60.5	21.1	-67.8
	2	50	4.6	-13.1	5.1	-14.6	5.7	-16.2	6.2	-17.9	6.8	-19.6	7.5	-21.4	8.2	-23.3	9.6	-27.4	11.1	-31.8	12.7	-36.5	14.5	-41.5	16.4	-46.8	18.3	-52.5
	2	100	4.1	-10.2	4.5	-11.4	5.0	-12.6	5.5	-13.9	6.1	-15.3	6.6	-16.7	7.2	-18.2	8.5	-21.3	9.8	-24.7	11.3	-28.4	12.9	-32.3	14.5	-36.5	16.3	-40.9
	3	10	5.8	-23.6	6.4	-26.3	7.1	-29.1	7.9	-32.1	8.6	-35.2	9.4	-38.5	10.3	-41.9	12.1	-49.2	14.0	-57.0	16.1	-65.4	18.3	-74.5	20.6	-84.1	23.1	-94.2
	3	20	5.3	-20.0	5.9	-22.3	6.5	-24.7	7.2	-27.2	7.9	-29.9	8.6	-32.6	9.4	-35.5	11.0	-41.7	12.7	-48.4	14.6	-55.5	16.6	-63.2	18.8	-71.3	21.1	-80.0
	3	50	4.6	-15.3	5.1	-17.0	5.7	-18.9	6.2	-20.8	6.8	-22.8	7.5	-24.9	8.2	-27.2	9.6	-31.9	11.1	-37.0	12.7	-42.4	14.5	-48.3	16.4	-54.5	18.3	-61.1
	3	100	4.1	-11.7	4.5	-13.0	5.0	-14.5	5.5	-15.9	6.1	-17.5	6.6	-19.1	7.2	-20.8	8.5	-24.4	9.8	-28.3	11.3	-32.5	12.9	-37.0	14.5	-41.8	16.3	-46.8
Gable Roof > 27 to 45 degrees	1	10	8.0	-14.7	8.9	-16.3	9.9	-18.1	10.9	-20.0	12.0	-21.9	13.1	-24.0	14.2	-26.1	16.7	-30.6	19.4	-35.5	22.2	-40.8	25.3	-46.4	28.5	-52.3	32.0	-58.7
	1	20	7.3	-12.4	8.2	-13.9	9.0	-15.4	10.0	-16.9	10.9	-18.6	11.9	-20.3	13.0	-22.1	15.3	-26.0	17.7	-30.1	20.3	-34.6	23.1	-39.3	26.1	-44.4	29.3	-49.8
	1	50	6.4	-9.5	7.1	-10.6	7.9	-11.7	8.7	-12.9	9.6	-14.2	10.5	-15.5	11.4	-16.9	13.4	-19.8	15.5	-23.0	17.8	-26.4	20.3	-30.0	22.9	-33.9	25.6	-38.0
	1	100	5.7	-7.3	6.4	-8.1	7.1	-9.0	7.8	-9.9	8.6	-10.8	9.3	-11.9	10.2	-12.9	11.9	-15.1	13.9	-17.6	15.9	-20.2	18.1	-22.9	20.4	-25.9	22.9	-29.0
	2	10	8.0	-16.2	8.9	-18.0	9.9	-19.9	10.9	-22.0	12.0	-24.1	13.1	-26.4	14.2	-28.7	16.7	-33.7	19.4	-39.1	22.2	-44.9	25.3	-51.0	28.5	-57.6	32.0	-64.6
	2	20	7.3	-14.4	8.2	-16.1	9.0	-17.8	10.0	-19.7	10.9	-21.6	11.9	-23.6	13.0	-25.7	15.3	-30.1	17.7	-34.9	20.3	-40.1	23.1	-45.6	26.1	-51.5	29.3	-57.7
	2	50	6.4	-12.2	7.1	-13.6	7.9	-15.0	8.7	-16.6	9.6	-18.2	10.5	-19.9	11.4	-21.6	13.4	-25.4	15.5	-29.5	17.8	-33.8	20.3	-38.5	22.9	-43.4	25.6	-48.7
	2	100	5.7	-10.5	6.4	-11.7	7.1	-12.9	7.8	-14.2	8.6	-15.6	9.3	-17.1	10.2	-18.6	11.9	-21.8	13.9	-25.3	15.9	-29.0	18.1	-33.0	20.4	-37.3	22.9	-41.8
	3	10	8.0	-19.9	8.9	-22.1	9.9	-24.5	10.9	-27.0	12.0	-29.7	13.1	-32.4	14.2	-35.3	16.7	-41.4	19.4	-48.0	22.2	-55.2	25.3	-62.8	28.5	-70.8	32.0	-79.4
	3	20	7.3	-17.3	8.2	-19.3	9.0	-21.3	10.0	-23.5	10.9	-25.8	11.9	-28.2	13.0	-30.7	15.3	-36.1	0.0	-41.8	20.3	-48.0	23.1	-54.6	26.1	-61.7	29.3	-69.1
	3	50	6.4	-13.9	7.1	-15.5	7.9	-17.1	8.7	-18.9	9.6	-20.7	10.5	-22.7	11.4	-24.7	13.4	-29.0	15.5	-33.6	17.8	-38.6	20.3	-43.9	22.9	-49.5	25.6	-55.5
	3	100	5.7	-11.3	6.4	-12.6	7.1	-14.0	7.8	-15.4	8.6	-16.9	9.3	-18.5	10.2	-20.1	11.9	-23.6	13.9	-27.4	15.9	-31.4	18.1	-35.8	20.4	-40.4	22.9	-45.3
Hip Roof > 7 to 20 degrees	1	10	6.5	-14.7	7.3	-16.3	8.0	-18.1	8.9	-20.0	9.7	-21.9	10.6	-24.0	11.6	-26.1	13.6	-30.6	15.8	-35.5	18.1	-40.8	20.6	-46.4	23.3	-52.3	26.1	-58.7
	1	20	5.6	-13.0	6.3	-14.4	6.9	-16.0	7.7	-17.6	8.4	-19.4	9.2	-21.2	10.0	-23.0	11.7	-27.0	13.6	-31.3	15.6	-36.0	17.8	-40.9	20.1	-46.2	22.5	-51.8
	1	50	4.4	-10.7	5.0	-11.9	5.5	-13.2	6.1	-14.5	6.6	-16.0	7.3	-17.5	7.9	-19.0	9.3	-22.3	10.8	-25.9	12.4	-29.7	14.1	-33.8	15.9	-38.1	17.8	-42.8
	1	100	3.6	-9.0	4.0	-10.0	4.4	-11.1	4.8	-12.2	5.3	-13.4	5.8	-14.7	6.3	-16.0	7.4	-18.7	8.6	-21.7	9.9	-24.9	11.2	-28.4	12.7	-32.0	14.2	-35.9
	2	10	6.5	-19.1	7.3	-21.3	8.0	-23.6	8.9	-26.0	9.7	-28.6	10.6	-31.2	11.6	-34.0	13.6	-39.9	15.8	-46.3	18.1	-53.1	20.6	-60.4	23.3	-68.2	26.1	-76.5
	2	20	5.6	-17.2	6.3	-19.2	6.9	-21.3	7.7	-23.5	8.4	-25.7	9.2	-28.1	10.0	-30.6	11.7	-35.9	13.6	-41.7	15.6	-47.9	17.8	-54.5	20.1	-61.5	22.5	-68.9
	2	50	4.4	-14.7	5.0	-16.4	5.5	-18.2	6.1	-20.1	6.6	-22.0	7.3	-24.1	7.9	-26.2	9.3	-30.7	10.8	-35.7	12.4	-40.9	14.1	-46.6	15.9	-52.6	17.8	-58.9
	2	100	3.6	-12.9	4.0	-14.3	4.4	-15.9	4.8	-17.5	5.3	-19.2	5.8	-21.0	6.3	-22.8	7.4	-26.8	8.6	-31.1	9.9	-35.7	11.2	-40.6	12.7	-45.9	14.2	-51.4
	3	10	6.5	-20.6	7.3	-22.9	8.0	-25.4	8.9	-28.0	9.7	-30.8	10.6	-33.6	11.6	-36.6	13.6	-43.0	15.8	-49.8	18.1	-57.2	20.6	-65.1	23.3	-73.5	26.1	-82.4
	3	20	5.6	-18.5	6.3	-20.7	6.9	-22.9	7.7	-25.2	8.4	-27.7	9.2	-30.3	10.0	-33.0	11.7	-38.7	13.6	-44.9	15.6	-51.5	17.8	-58.6	20.1	-66.2	22.5	-74.2
	3	50	4.4	-15.8	5.0	-17.6	5.5	-19.5	6.1	-21.5	6.6	-23.6	7.3	-25.8	7.9	-28.1	9.3	-33.0	10.8	-38.3	12.4	-43.9	14.1	-50.0	15.9	-56.5	17.8	-63.3
	3	100	3.6	-13.8	4.0	-15.3	4.4	-17.0	4.8	-18.7	5.3	-20.6	5.8	-22.5	6.3	-24.5	7.4	-28.7	8.6	-33.3	9.9	-38.2	11.2	-43.5	12.7	-49.1	14.2	-55.1
Hip Roof > 20 to 27 degrees	1	10	6.5	-11.7	7.3	-13.0	8.0	-14.5	8.9	-15.9	9.7	-17.5	10.6	-19.1	11.6	-20.8	13.6	-24.4	15.8	-28.3	18.1	-32.5	20.6	-37.0	23.3	-41.8	26.1	-46.8
	1	20	5.6	-10.4	6.3	-11.6	6.9	-12.8	7.7	-14.1	8.4	-15.5	9.2	-16.9	10.0	-18.4	11.7	-21.6	13.6	-25.1	15.6	-28.8	17.8	-32.8	20.1	-37.0	22.5	-41.5
	1	50	4.4	-8.6	5.0	-9.6	5.5	-10.6	6.1	-11.7	6.6	-12.8	7.3	-14.0	7.9	-15.3	9.3	-17.9	10.8	-20.8	12.4	-23.9	14.1	-27.2	15.9	-30.7	17.8	-34.4
	1	100	3.6	-7.3	4.0	-8.1	4.4	-9.0	4.8	-9.9	5.3	-10.8	5.8	-11.9	6.3	-12.9	7.4	-15.1	8.6	-17.6	9.9	-20.2	11.2	-22.9	12.7	-25.9	14.2	-29.0
	2	10	6.5	-16.2	7.3	-18.0	8.0	-19.9	8.9	-22.0	9.7	-24.1	10.6	-26.4	11.6	-28.7	13.6	-33.7	15.8	-39.1	18.1	-44.9	20.6	-51.0	23.3	-57.6	26.1	-64.6
	2	20	5.6	-13.9	6.3	-15.5	6.9	-17.2	7.7	-18.9	8.4	-20.8	9.2	-22.7	10.0	-24.7	11.7	-29.0	13.6	-33.7	15.6	-38.7	17.8	-44.0	20.1	-49.7	22.5	-55.7
	2	50	4.4	-11.0	5.0	-12.2	5.5	-13.5	6.1	-14.9	6.6	-16.4	7.3	-17.9	7.9	-19.5	9.3	-22.9	10.8	-26.6	12.4	-30.5	14.1	-34.7	15.9	-39.2	17.8	-43.9
	2	100	3.6	-8.7	4.0	-9.7	4.4	-10.8	4.8	-11.9	5.3	-13.1	5.8	-14.3	6.3	-15.5	7.4	-18.2	8.6	-21.2	9.9	-24.3	11.2	-27.6	12.7	-31.2	14.2	-35.0
	3	10	6.5	-16.2	7.3	-18.0	8.0	-19.9	8.9	-22.0	9.7	-24.1	10.6	-26.4	11.6	-28.7	13.6	-33.7	15.8	-39.1	18.1	-44.9	20.6	-51.0	23.3	-57.6	26.1	-64.6
	3	20	5.6	-13.9	6.3	-15.5	6.9	-17.2	7.7	-18.9	8.4	-20.8	9.2	-22.7	10.0	-24.7	11.7	-29.0	13.6	-33.7	15.6	-38.7	17.8	-44.0	20.1	-49.7	22.5	-55.7
	3	50	4.4	-11.0	5.0	-12.2	5.5	-13.5	6.1	-14.9	6.6	-16.4	7.3	-17.9	7.9	-19.5	9.3	-22.9	10.8	-26.6	12.4	-30.5	14.1	-34.7	15.9	-39.2	17.8	-43.9
	3	100	3.6	-8.7	4.0	-9.7	4.4	-10.8	4.8	-11.9	5.3	-13.1	5.8	-14.3	6.3	-15.5	7.4	-18.2	8.6	-21.2	9.9	-24.3	11.2	-27.6	12.7	-31.2	14.2	-35.0
Hip Roof = 45 degrees	1	10	6.5	-12.4	7.3	-13.9	8.0	-15.4	8.9	-16.9	9.7	-18.6	10.6	-20.3	11.6	-22.1	13.6	-26.0	15.8	-30.1	18.1	-34.6	20.6	-39.3	23.3	-44.4	26.1	-49.8
	1	20	5.6	-10.7	6.3	-11.9	6.9	-13.2	7.7	-14.5	8.4	-15.9	9.2	-17.4	10.0	-19.0	11.7	-22.2	13.6	-25.8	15.6	-29.6	17.8	-33.7	20.1	-38.0	22.5	-42.7
	1	50	4.4	-8.3	5.0	-9.3	5.5	-10.3	6.1	-11.3	6.6	-12.4	7.3	-13.6	7.9	-14.8	9.3	-17.3	10.8	-20.1	12.4	-23.1	14.1	-26.2	15.9	-29.6	17.8	-33.2
	1	100	3.6	-6.5	4.0	-7.3	4.4	-8.0	4.8	-8.9	5.3	-9.7	5.8	-10.6	6.3	-11.6	7.4	-13.6	8.6	-15.8	9.9	-18.1	11.2	-20.6	12.7	-23.3	14.2	-26.1
	2	10	6.5	-14.7	7.3	-16.3	8.0	-18.1	8.9	-20.0	9.7	-21.9	10.6	-24.0	11.6	-26.1	13.6	-30.6	15.8	-35.5	18.1	-40.8	20.6	-46.4	23.3	-52.3	26.1	-58.7
	2	20	5.6	-12.4	6.3	-13.9	6.9	-15.4	7.7	-16.9	8.4	-18.6	9.2	-20.3	10.0	-22.1	11.7	-26.0	13.6	-30.1	15.6	-34.6	17.8	-39.3	20.1	-44.4	22.5	-49.8
	2	50	4.4	-9.5	5.0	-10.6	5.5	-11.7	6.1	-12.9	6.6	-14.2	7.3	-15.5	7.9	-16.9	9.3	-19.8	10.8	-23.0	12.4	-26.4	14.1	-30.0	15.9	-33.9	17.8	-38.0
	2	100	3.6	-7.3	4.0	-8.1	4.4	-9.0	4.8	-9.9	5.3	-10.8	5.8	-11.9	6.3	-12.9	7.4	-15.1	8.6	-17.6	9.9	-20.2	11.2	-22.9	12.7	-25.9	14.2	-29.0
	3	10	6.5	-19.1	7.3	-21.3	8.0	-23.6	8.9	-26.0	9.7	-28.6	10.6	-31.2	11.6	-34.0	13.6	-39.9	15.8	-46.3	18.1	-53.1	20.6	-60.4	23.3	-68.2	26.1	-76.5
	3	20	5.6	-16.0	6.3	-17.8	6.9	-19.7	7.7	-21.8	8.4	-23.9	9.2	-26.1	10.0	-28.4	11.7	-33.4	13.6	-38.7	15.6	-44.4	17.8	-50.5	20.1	-57.1	22.5	-64.0
	3	50	4.4	-11.9	5.0	-13.2	5.5	-14.6	6.1	-16.1	6.6	-17.7	7.3	-19.4	7.9	-21.1	9.3	-24.8	10.8	-28.7	12.4	-33.0	14.1	-37.5	15.9	-42.3	17.8	-47.5
	3	100	3.6	-8.7	4.0	-9.7	4.4	-10.8	4.8	-11.9	5.3	-13.1	5.8	-14.3	6.3	-15.5	7.4	-18.2	8.6	-21.2	9.9	-24.3	11.2	-27.6	12.7	-31.2	14.2	-35.0
Walls	4	10	8.7	-9.5	9.7	-10.6	10.8	-11.7	11.9	-12.9	13.1	-14.2	14.3	-15.5	15.5	-16.9	18.2	-19.8	21.2	-22.9	24.3	-26.3	27.6	-30.0	31.2	-33.8	35.0	-37.9
	4	20	8.3	-9.1	9.3	-10.1	10.3	-11.2	11.4	-12.4	12.5	-13.6	13.6	-14.8	14.8	-16.2	17.4	-19.0	20.2	-22.0	23.2	-25.2	26.4	-28.7	29.8	-32.4	33.4	-36.4
	4	50	7.8	-8.6	8.7	-9.5	9.7	-10.6	10.7	-11.7	11.7	-12.8	12.8	-14.0	13.9	-15.2	16.3	-17.9	18.9	-20.7	21.7	-23.8	24.7	-27.1	27.9	-30.6	31.3	-34.3
	4	100	7.4	-8.2	8.3	-9.1	9.2	-10.1	10.1	-11.1	11.1	-12.2	12.1	-13.3	13.2	-14.5	15.5	-17.1	18.0	-19.8	20.7	-22.7	23.5	-25.8	26.5	-29.2	29.7	-32.7
	5	10	8.7	-11.7	9.7	-13.0	10.8	-14.5	11.9	-15.9	13.1	-17.5	14.3	-19.1	15.5	-20.8	18.2	-24.4	21.2	-28.3	24.3	-32.5	27.6	-37.0	31.2	-41.8	35.0	-46.8
	5	20	8.3	-10.9	9.3	-12.2	10.3	-13.5	11.4	-14.9	12.5	-16.3	13.6	-17.8	14.8	-19.4	17.4	-22.8	20.2	-26.4	23.2	-30.3	26.4	-34.5	29.8	-39.0	33.4	-43.7
	5	50	7.8	-9.9	8.7	-11.0	9.7	-12.2	10.7	-13.4	11.7	-14.8	12.8	-16.1	13.9	-17.6	16.3	-20.6	18.9	-23.9	21.7	-27.4	24.7	-31.2	27.9	-35.2	31.3	-39.5
	5	100	7.4	-9.1	8.3	-10.1	9.2	-11.2	10.1	-12.4	11.1	-13.6	12.1	-14.8	13.2	-16.2	15.5	-19.0	18.0	-22.0	20.7	-25.2	23.5	-28.7	26.5	-32.4	29.7	-36.4

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m2, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.

a. The effective wind area shall be equal to the span length multiplied by an effective width. This width shall be not less than one-third the span length. For cladding fasteners, the effective wind areas shall not be greater than the area that is tributary to an individual fastener.

b. For effective areas between those given, the load shall be interpolated or the load associated with the lower effective areas shall be used.

c. Table values shall be adjusted for height and exposure by multiplying by the adjustment coefficient in Table R301.2(3).

d. See Figure R301.2(7) for locations of zones.

e. Plus and minus signs signify pressures acting toward and away from the building surfaces.

f. Positive and negative design wind pressures shall not be less than 10 psf.

g. Roof overhang loads shall be determined by summing the aplicable roof zone pressure with the adjacent wall zone pressure.

Delete Table R301.2(2) and replace with the following:

(See Table R301.2(2) below)

Revise Table R301.2(3) as follows:

TABLE R301.2(3)

HEIGHT AND EXPOSURE ADJUSTMENT COEFICIENTS FOR TABLE R301.2(2)

MEAN ROOF HEIGHT (ft)	EXPOSURE CATEGORY		
	B	C	D
15	0.82	1.21	1.47
20	0.89	1.29	1.55
25	0.94	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70
40	~~1.09~~ 1.06	1.49	1.74
45	~~1.12~~ 1.10	1.53	1.78
50	~~1.16~~ 1.13	1.56	1.81
55	~~1.19~~ 1.16	1.59	1.84
60	~~1.22~~ 1.19	1.62	1.87

Delete Figure R301.2(7) and replace with the following:

(See image below)

Table R301.2(2) for S9971

TABLE R301.2(2)

COMPONENT AND CLADDING LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B (ASD) (psf)[a, b, c, d, e, f, g]

	Zone	Effective Wind Area	90		95		100		105		110		115		120		130		140		150		160		170		180	
			POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG	POS	NEG
Gable Roof < 7	1,1'[h]	10	3.6	-13.9	4.0	-15.5	4.4	-17.2	4.8	-19.0	5.3	-20.8	5.8	-22.7	6.3	-24.8	7.4	-29.1	8.6	-33.7	9.9	-38.7	11.2	-44.0	12.7	-49.7	14.2	-55.7
	1,1'[h]	20	3.3	-12.4	3.7	-13.8	4.1	-15.3	4.5	-16.8	5.0	-18.5	5.4	-20.2	5.9	-22.0	7.0	-25.8	8.1	-29.9	9.3	-34.4	10.5	-39.1	11.9	-44.1	13.3	-49.5
	1,1'[h]	50	3.0	-10.3	3.4	-11.5	3.8	-12.7	4.1	-14.0	4.5	-15.4	5.0	-16.8	5.4	-18.3	6.3	-21.5	7.4	-24.9	8.4	-28.6	9.6	-32.5	10.8	-36.7	12.2	-41.2
	1,1'[h]	100	2.8	-8.7	3.1	-9.7	3.5	-10.8	3.8	-11.9	4.2	-13.1	4.6	-14.3	5.0	-15.5	5.9	-18.2	6.8	-21.2	7.8	-24.3	8.9	-27.6	10.0	-31.2	11.3	-35.0
	2	10	3.6	-18.4	4.0	-20.5	4.4	-22.7	4.8	-25.0	5.3	-27.4	5.8	-30.0	6.3	-32.7	7.4	-38.3	8.6	-44.5	9.9	-51.0	11.2	-58.1	12.7	-65.6	14.2	-73.5
	2	20	3.3	-16.4	3.7	-18.2	4.1	-20.2	4.5	-22.3	5.0	-24.5	5.4	-26.7	5.9	-29.1	7.0	-34.2	8.1	-39.6	9.3	-45.5	10.5	-51.8	11.9	-58.4	13.3	-65.5
	2	50	3.0	-13.7	3.4	-15.3	3.8	-16.9	4.1	-18.7	4.5	-20.5	5.0	-22.4	5.4	-24.4	6.3	-28.6	7.4	-33.2	8.4	-38.1	9.6	-43.3	10.8	-48.9	12.2	-54.8
	2	100	2.8	-11.7	3.1	-13.0	3.5	-14.5	3.8	-15.9	4.2	-17.5	4.6	-19.1	5.0	-20.8	5.9	-24.4	6.8	-28.3	7.8	-32.5	8.9	-37.0	10.0	-41.8	11.3	-46.8
	3	10	3.6	-25.0	4.0	-27.9	4.4	-30.9	4.8	-34.1	5.3	-37.4	5.8	-40.9	6.3	-44.5	7.4	-52.2	8.6	-60.6	9.9	-69.6	11.2	-79.1	12.7	-89.4	14.2	-100.2
	3	20	3.3	-21.0	3.7	-23.4	4.1	-26.0	4.5	-28.6	5.0	-31.4	5.4	-34.4	5.9	-37.4	7.0	-43.9	8.1	-50.9	9.3	-58.4	10.5	-66.5	11.9	-75.1	13.3	-84.2
	3	50	3.0	-15.7	3.4	-17.5	3.8	-19.4	4.1	-21.4	4.5	-23.5	5.0	-25.6	5.4	-27.9	6.3	-32.8	7.4	-38.0	8.4	-43.6	9.6	-49.6	10.8	-56.0	12.2	-62.8
	3	100	2.8	-11.7	3.1	-13.0	3.5	-14.5	3.8	-15.9	4.2	-17.5	4.6	-19.1	5.0	-20.8	5.9	-24.4	6.8	-28.3	7.8	-32.5	8.9	-37.0	10.0	-41.8	11.3	-46.8
Gable Roof > 7 to 20 degrees	1	10	5.8	-16.2	6.4	-18.0	7.1	-19.9	7.9	-22.0	8.6	-24.1	9.4	-26.4	10.3	-28.7	12.1	-33.7	14.0	-39.1	16.1	-44.9	18.3	-51.0	20.6	-57.6	23.1	-64.6
	1	20	5.3	-13.9	5.9	-15.5	6.5	-17.1	7.2	-18.9	7.9	-20.7	8.6	-22.7	9.4	-24.7	11.0	-29.0	12.7	-33.6	14.6	-38.6	16.6	-43.9	18.8	-49.5	21.1	-55.5
	1	50	4.6	-10.9	5.1	-12.1	5.7	-13.4	6.2	-14.8	6.8	-16.3	7.5	-17.8	8.2	-19.4	9.6	-22.7	11.1	-26.4	12.7	-30.3	14.5	-34.4	16.4	-38.9	18.3	-43.6
	1	100	4.1	-8.6	4.5	-9.6	5.0	-10.7	5.5	-11.7	6.1	-12.9	6.6	-14.1	7.2	-15.3	8.5	-18.0	9.8	-20.9	11.3	-24.0	12.9	-27.3	14.5	-30.8	16.3	-34.5
	2	10	5.8	-21.3	6.4	-23.8	7.1	-26.3	7.9	-29.0	8.6	-31.9	9.4	-34.8	10.3	-37.9	12.1	-44.5	14.0	-51.6	16.1	-59.3	18.3	-67.4	20.6	-76.1	23.1	-85.4
	2	20	5.3	-18.4	5.9	-20.5	6.5	-22.7	7.2	-25.1	7.9	-27.5	8.6	-30.1	9.4	-32.8	11.0	-38.4	12.7	-44.6	14.6	-51.2	16.6	-58.2	18.8	-65.7	21.1	-73.7
	2	50	4.6	-14.6	5.1	-16.2	5.7	-18.0	6.2	-19.8	6.8	-21.8	7.5	-23.8	8.2	-25.9	9.6	-30.4	11.1	-35.3	12.7	-40.5	14.5	-46.1	16.4	-52.0	18.3	-58.3
	2	100	4.1	-11.7	4.5	-13.0	5.0	-14.4	5.5	-15.9	6.1	-17.4	6.6	-19.0	7.2	-20.7	8.5	-24.3	9.8	-28.2	11.3	-32.4	12.9	-36.8	14.5	-41.6	16.3	-46.6
	3	10	5.8	-28.0	6.4	-31.2	7.1	-34.6	7.9	-38.1	8.6	-41.8	9.4	-45.7	10.3	-49.8	12.1	-58.4	14.0	-67.8	16.1	-77.8	18.3	-88.5	20.6	-99.9	23.1	-112.0
	3	20	5.3	-24.0	5.9	-26.7	6.5	-29.6	7.2	-32.7	7.9	-35.8	8.6	-39.2	9.4	-42.7	11.0	-50.1	12.7	-58.1	14.6	-66.6	16.6	-75.8	18.8	-85.6	21.1	-96.0
	3	50	4.6	-18.7	5.1	-20.8	5.7	-23.1	6.2	-25.4	6.8	-27.9	7.5	-30.5	8.2	-33.2	9.6	-39.0	11.1	-45.2	12.7	-51.9	14.5	-59.1	16.4	-66.7	18.3	-74.7
	3	100	4.1	-14.7	4.5	-16.3	5.0	-18.1	5.5	-20.0	6.1	-21.9	6.6	-24.0	7.2	-26.1	8.5	-30.6	9.8	-35.5	11.3	-40.8	12.9	-46.4	14.5	-52.3	16.3	-58.7
Gable Roof > 20 to 27 degrees	1	10	5.8	-12.4	6.4	-13.9	7.1	-15.4	7.9	-16.9	8.6	-18.6	9.4	-20.3	10.3	-22.1	12.1	-26.0	14.0	-30.1	16.1	-34.6	18.3	-39.3	20.6	-44.4	23.1	-49.8
	1	20	5.3	-11.2	5.9	-12.5	6.5	-13.9	7.2	-15.3	7.9	-16.8	8.6	-18.4	9.4	-20.0	11.0	-23.5	12.7	-27.2	14.6	-31.2	16.6	-35.5	18.8	-40.1	21.1	-45.0
	1	50	4.6	-9.7	5.1	-10.8	5.7	-11.9	6.2	-13.1	6.8	-14.4	7.5	-15.8	8.2	-17.2	9.6	-20.2	11.1	-23.4	12.7	-26.8	14.5	-30.5	16.4	-34.5	18.3	-38.6
	1	100	4.1	-8.5	4.5	-9.4	5.0	-10.4	5.5	-11.5	6.1	-12.6	6.6	-13.8	7.2	-15.0	8.5	-17.7	9.8	-20.5	11.3	-23.5	12.9	-26.7	14.5	-30.2	16.3	-33.8
	2	10	5.8	-19.9	6.4	-22.1	7.1	-24.5	7.9	-27.0	8.6	-29.7	9.4	-32.4	10.3	-35.3	12.1	-41.4	14.0	-48.0	16.1	-55.2	18.3	-62.8	20.6	-70.8	23.1	-79.4
	2	20	5.3	-17.0	5.9	-18.9	6.5	-20.9	7.2	-23.1	7.9	-25.3	8.6	-27.7	9.4	-30.1	11.0	-35.4	12.7	-41.0	14.6	-47.1	16.6	-53.6	18.8	-60.5	21.1	-67.8
	2	50	4.6	-13.1	5.1	-14.6	5.7	-16.2	6.2	-17.9	6.8	-19.6	7.5	-21.4	8.2	-23.3	9.6	-27.4	11.1	-31.8	12.7	-36.5	14.5	-41.5	16.4	-46.8	18.3	-52.5
	2	100	4.1	-10.2	4.5	-11.4	5.0	-12.6	5.5	-13.9	6.1	-15.3	6.6	-16.7	7.2	-18.2	8.5	-21.3	9.8	-24.7	11.3	-28.4	12.9	-32.3	14.5	-36.5	16.3	-40.9
	3	10	5.8	-23.6	6.4	-26.3	7.1	-29.1	7.9	-32.1	8.6	-35.2	9.4	-38.5	10.3	-41.9	12.1	-49.2	14.0	-57.0	16.1	-65.4	18.3	-74.5	20.6	-84.1	23.1	-94.2
	3	20	5.3	-20.0	5.9	-22.3	6.5	-24.7	7.2	-27.2	7.9	-29.9	8.6	-32.6	9.4	-35.5	11.0	-41.7	12.7	-48.4	14.6	-55.5	16.6	-63.2	18.8	-71.3	21.1	-80.0
	3	50	4.6	-15.3	5.1	-17.0	5.7	-18.9	6.2	-20.8	6.8	-22.8	7.5	-24.9	8.2	-27.2	9.6	-31.9	11.1	-37.0	12.7	-42.4	14.5	-48.3	16.4	-54.5	18.3	-61.1
	3	100	4.1	-11.7	4.5	-13.0	5.0	-14.5	5.5	-15.9	6.1	-17.5	6.6	-19.1	7.2	-20.8	8.5	-24.4	9.8	-28.3	11.3	-32.5	12.9	-37.0	14.5	-41.8	16.3	-46.8
Gable Roof > 27 to 45 degrees	1	10	8.0	-14.7	8.9	-16.3	9.9	-18.1	10.9	-20.0	12.0	-21.9	13.1	-24.0	14.2	-26.1	16.7	-30.6	19.4	-35.5	22.2	-40.8	25.3	-46.4	28.5	-52.3	32.0	-58.7
	1	20	7.3	-12.4	8.2	-13.9	9.0	-15.4	10.0	-16.9	10.9	-18.6	11.9	-20.3	13.0	-22.1	15.3	-26.0	17.7	-30.1	20.3	-34.6	23.1	-39.3	26.1	-44.4	29.3	-49.8
	1	50	6.4	-9.5	7.1	-10.6	7.9	-11.7	8.7	-12.9	9.6	-14.2	10.5	-15.5	11.4	-16.9	13.4	-19.8	15.5	-23.0	17.8	-26.4	20.3	-30.0	22.9	-33.9	25.6	-38.0
	1	100	5.7	-7.3	6.4	-8.1	7.1	-9.0	7.8	-9.9	8.6	-10.8	9.3	-11.9	10.2	-12.9	11.9	-15.1	13.9	-17.6	15.9	-20.2	18.1	-22.9	20.4	-25.9	22.9	-29.0
	2	10	8.0	-16.2	8.9	-18.0	9.9	-19.9	10.9	-22.0	12.0	-24.1	13.1	-26.4	14.2	-28.7	16.7	-33.7	19.4	-39.1	22.2	-44.9	25.3	-51.0	28.5	-57.6	32.0	-64.6
	2	20	7.3	-14.4	8.2	-16.1	9.0	-17.8	10.0	-19.7	10.9	-21.6	11.9	-23.6	13.0	-25.7	15.3	-30.1	17.7	-34.9	20.3	-40.1	23.1	-45.6	26.1	-51.5	29.3	-57.7
	2	50	6.4	-12.2	7.1	-13.6	7.9	-15.0	8.7	-16.6	9.6	-18.2	10.5	-19.9	11.4	-21.6	13.4	-25.4	15.5	-29.5	17.8	-33.8	20.3	-38.5	22.9	-43.4	25.6	-48.7
	2	100	5.7	-10.5	6.4	-11.7	7.1	-12.9	7.8	-14.2	8.6	-15.6	9.3	-17.1	10.2	-18.6	11.9	-21.8	13.9	-25.3	15.9	-29.0	18.1	-33.0	20.4	-37.3	22.9	-41.8
	3	10	8.0	-19.9	8.9	-22.1	9.9	-24.5	10.9	-27.0	12.0	-29.7	13.1	-32.4	14.2	-35.3	16.7	-41.4	19.4	-48.0	22.2	-55.2	25.3	-62.8	28.5	-70.8	32.0	-79.4
	3	20	7.3	-17.3	8.2	-19.3	9.0	-21.3	10.0	-23.5	10.9	-25.8	11.9	-28.2	13.0	-30.7	15.3	-36.1	0.0	-41.8	20.3	-48.0	23.1	-54.6	26.1	-61.7	29.3	-69.1
	3	50	6.4	-13.9	7.1	-15.5	7.9	-17.1	8.7	-18.9	9.6	-20.7	10.5	-22.7	11.4	-24.7	13.4	-29.0	15.5	-33.6	17.8	-38.6	20.3	-43.9	22.9	-49.5	25.6	-55.5
	3	100	5.7	-11.3	6.4	-12.6	7.1	-14.0	7.8	-15.4	8.6	-16.9	9.3	-18.5	10.2	-20.1	11.9	-23.6	13.9	-27.4	15.9	-31.4	18.1	-35.8	20.4	-40.4	22.9	-45.3
Hip Roof > 7 to 20 degrees	1	10	6.5	-14.7	7.3	-16.3	8.0	-18.1	8.9	-20.0	9.7	-21.9	10.6	-24.0	11.6	-26.1	13.6	-30.6	15.8	-35.5	18.1	-40.8	20.6	-46.4	23.3	-52.3	26.1	-58.7
	1	20	5.6	-13.0	6.3	-14.4	6.9	-16.0	7.7	-17.6	8.4	-19.4	9.2	-21.2	10.0	-23.0	11.7	-27.0	13.6	-31.3	15.6	-36.0	17.8	-40.9	20.1	-46.2	22.5	-51.8
	1	50	4.4	-10.7	5.0	-11.9	5.5	-13.2	6.1	-14.5	6.6	-16.0	7.3	-17.5	7.9	-19.0	9.3	-22.3	10.8	-25.9	12.4	-29.7	14.1	-33.8	15.9	-38.1	17.8	-42.8
	1	100	3.6	-9.0	4.0	-10.0	4.4	-11.1	4.8	-12.2	5.3	-13.4	5.8	-14.7	6.3	-16.0	7.4	-18.7	8.6	-21.7	9.9	-24.9	11.2	-28.4	12.7	-32.0	14.2	-35.9
	2	10	6.5	-19.1	7.3	-21.3	8.0	-23.6	8.9	-26.0	9.7	-28.6	10.6	-31.2	11.6	-34.0	13.6	-39.9	15.8	-46.3	18.1	-53.1	20.6	-60.4	23.3	-68.2	26.1	-76.5
	2	20	5.6	-17.2	6.3	-19.2	6.9	-21.3	7.7	-23.5	8.4	-25.7	9.2	-28.1	10.0	-30.6	11.7	-35.9	13.6	-41.7	15.6	-47.9	17.8	-54.5	20.1	-61.5	22.5	-68.9
	2	50	4.4	-14.7	5.0	-16.4	5.5	-18.2	6.1	-20.1	6.6	-22.0	7.3	-24.1	7.9	-26.2	9.3	-30.7	10.8	-35.7	12.4	-40.9	14.1	-46.6	15.9	-52.6	17.8	-58.9
	2	100	3.6	-12.9	4.0	-14.3	4.4	-15.9	4.8	-17.5	5.3	-19.2	5.8	-21.0	6.3	-22.8	7.4	-26.8	8.6	-31.1	9.9	-35.7	11.2	-40.6	12.7	-45.9	14.2	-51.4
	3	10	6.5	-20.6	7.3	-22.9	8.0	-25.4	8.9	-28.0	9.7	-30.8	10.6	-33.6	11.6	-36.6	13.6	-43.0	15.8	-49.8	18.1	-57.2	20.6	-65.1	23.3	-73.5	26.1	-82.4
	3	20	5.6	-18.5	6.3	-20.7	6.9	-22.9	7.7	-25.2	8.4	-27.7	9.2	-30.3	10.0	-33.0	11.7	-38.7	13.6	-44.9	15.6	-51.5	17.8	-58.6	20.1	-66.2	22.5	-74.2
	3	50	4.4	-15.8	5.0	-17.6	5.5	-19.5	6.1	-21.5	6.6	-23.6	7.3	-25.8	7.9	-28.1	9.3	-33.0	10.8	-38.3	12.4	-43.9	14.1	-50.0	15.9	-56.5	17.8	-63.3
	3	100	3.6	-13.8	4.0	-15.3	4.4	-17.0	4.8	-18.7	5.3	-20.6	5.8	-22.5	6.3	-24.5	7.4	-28.7	8.6	-33.3	9.9	-38.2	11.2	-43.5	12.7	-49.1	14.2	-55.1
Hip Roof > 20 to 27 degrees	1	10	6.5	-11.7	7.3	-13.0	8.0	-14.5	8.9	-15.9	9.7	-17.5	10.6	-19.1	11.6	-20.8	13.6	-24.4	15.8	-28.3	18.1	-32.5	20.6	-37.0	23.3	-41.8	26.1	-46.8
	1	20	5.6	-10.4	6.3	-11.6	6.9	-12.8	7.7	-14.1	8.4	-15.5	9.2	-16.9	10.0	-18.4	11.7	-21.6	13.6	-25.1	15.6	-28.8	17.8	-32.8	20.1	-37.0	22.5	-41.5
	1	50	4.4	-8.6	5.0	-9.6	5.5	-10.6	6.1	-11.7	6.6	-12.8	7.3	-14.0	7.9	-15.3	9.3	-17.9	10.8	-20.8	12.4	-23.9	14.1	-27.2	15.9	-30.7	17.8	-34.4
	1	100	3.6	-7.3	4.0	-8.1	4.4	-9.0	4.8	-9.9	5.3	-10.8	5.8	-11.9	6.3	-12.9	7.4	-15.1	8.6	-17.6	9.9	-20.2	11.2	-22.9	12.7	-25.9	14.2	-29.0
	2	10	6.5	-16.2	7.3	-18.0	8.0	-19.9	8.9	-22.0	9.7	-24.1	10.6	-26.4	11.6	-28.7	13.6	-33.7	15.8	-39.1	18.1	-44.9	20.6	-51.0	23.3	-57.6	26.1	-64.6
	2	20	5.6	-13.9	6.3	-15.5	6.9	-17.2	7.7	-18.9	8.4	-20.8	9.2	-22.7	10.0	-24.7	11.7	-29.0	13.6	-33.7	15.6	-38.7	17.8	-44.0	20.1	-49.7	22.5	-55.7
	2	50	4.4	-11.0	5.0	-12.2	5.5	-13.5	6.1	-14.9	6.6	-16.4	7.3	-17.9	7.9	-19.5	9.3	-22.9	10.8	-26.6	12.4	-30.5	14.1	-34.7	15.9	-39.2	17.8	-43.9
	2	100	3.6	-8.7	4.0	-9.7	4.4	-10.8	4.8	-11.9	5.3	-13.1	5.8	-14.3	6.3	-15.5	7.4	-18.2	8.6	-21.2	9.9	-24.3	11.2	-27.6	12.7	-31.2	14.2	-35.0
	3	10	6.5	-16.2	7.3	-18.0	8.0	-19.9	8.9	-22.0	9.7	-24.1	10.6	-26.4	11.6	-28.7	13.6	-33.7	15.8	-39.1	18.1	-44.9	20.6	-51.0	23.3	-57.6	26.1	-64.6
	3	20	5.6	-13.9	6.3	-15.5	6.9	-17.2	7.7	-18.9	8.4	-20.8	9.2	-22.7	10.0	-24.7	11.7	-29.0	13.6	-33.7	15.6	-38.7	17.8	-44.0	20.1	-49.7	22.5	-55.7
	3	50	4.4	-11.0	5.0	-12.2	5.5	-13.5	6.1	-14.9	6.6	-16.4	7.3	-17.9	7.9	-19.5	9.3	-22.9	10.8	-26.6	12.4	-30.5	14.1	-34.7	15.9	-39.2	17.8	-43.9
	3	100	3.6	-8.7	4.0	-9.7	4.4	-10.8	4.8	-11.9	5.3	-13.1	5.8	-14.3	6.3	-15.5	7.4	-18.2	8.6	-21.2	9.9	-24.3	11.2	-27.6	12.7	-31.2	14.2	-35.0
Hip Roof = 45 degrees	1	10	6.5	-12.4	7.3	-13.9	8.0	-15.4	8.9	-16.9	9.7	-18.6	10.6	-20.3	11.6	-22.1	13.6	-26.0	15.8	-30.1	18.1	-34.6	20.6	-39.3	23.3	-44.4	26.1	-49.8
	1	20	5.6	-10.7	6.3	-11.9	6.9	-13.2	7.7	-14.5	8.4	-15.9	9.2	-17.4	10.0	-19.0	11.7	-22.2	13.6	-25.8	15.6	-29.6	17.8	-33.7	20.1	-38.0	22.5	-42.7
	1	50	4.4	-8.3	5.0	-9.3	5.5	-10.3	6.1	-11.3	6.6	-12.4	7.3	-13.6	7.9	-14.8	9.3	-17.3	10.8	-20.1	12.4	-23.1	14.1	-26.2	15.9	-29.6	17.8	-33.2
	1	100	3.6	-6.5	4.0	-7.3	4.4	-8.0	4.8	-8.9	5.3	-9.7	5.8	-10.6	6.3	-11.6	7.4	-13.6	8.6	-15.8	9.9	-18.1	11.2	-20.6	12.7	-23.3	14.2	-26.1
	2	10	6.5	-14.7	7.3	-16.3	8.0	-18.1	8.9	-20.0	9.7	-21.9	10.6	-24.0	11.6	-26.1	13.6	-30.6	15.8	-35.5	18.1	-40.8	20.6	-46.4	23.3	-52.3	26.1	-58.7
	2	20	5.6	-12.4	6.3	-13.9	6.9	-15.4	7.7	-16.9	8.4	-18.6	9.2	-20.3	10.0	-22.1	11.7	-26.0	13.6	-30.1	15.6	-34.6	17.8	-39.3	20.1	-44.4	22.5	-49.8
	2	50	4.4	-9.5	5.0	-10.6	5.5	-11.7	6.1	-12.9	6.6	-14.2	7.3	-15.5	7.9	-16.9	9.3	-19.8	10.8	-23.0	12.4	-26.4	14.1	-30.0	15.9	-33.9	17.8	-38.0
	2	100	3.6	-7.3	4.0	-8.1	4.4	-9.0	4.8	-9.9	5.3	-10.8	5.8	-11.9	6.3	-12.9	7.4	-15.1	8.6	-17.6	9.9	-20.2	11.2	-22.9	12.7	-25.9	14.2	-29.0
	3	10	6.5	-19.1	7.3	-21.3	8.0	-23.6	8.9	-26.0	9.7	-28.6	10.6	-31.2	11.6	-34.0	13.6	-39.9	15.8	-46.3	18.1	-53.1	20.6	-60.4	23.3	-68.2	26.1	-76.5
	3	20	5.6	-16.0	6.3	-17.8	6.9	-19.7	7.7	-21.8	8.4	-23.9	9.2	-26.1	10.0	-28.4	11.7	-33.4	13.6	-38.7	15.6	-44.4	17.8	-50.5	20.1	-57.1	22.5	-64.0
	3	50	4.4	-11.9	5.0	-13.2	5.5	-14.6	6.1	-16.1	6.6	-17.7	7.3	-19.4	7.9	-21.1	9.3	-24.8	10.8	-28.7	12.4	-33.0	14.1	-37.5	15.9	-42.3	17.8	-47.5
	3	100	3.6	-8.7	4.0	-9.7	4.4	-10.8	4.8	-11.9	5.3	-13.1	5.8	-14.3	6.3	-15.5	7.4	-18.2	8.6	-21.2	9.9	-24.3	11.2	-27.6	12.7	-31.2	14.2	-35.0
Walls	4	10	8.7	-9.5	9.7	-10.6	10.8	-11.7	11.9	-12.9	13.1	-14.2	14.3	-15.5	15.5	-16.9	18.2	-19.8	21.2	-22.9	24.3	-26.3	27.6	-30.0	31.2	-33.8	35.0	-37.9
	4	20	8.3	-9.1	9.3	-10.1	10.3	-11.2	11.4	-12.4	12.5	-13.6	13.6	-14.8	14.8	-16.2	17.4	-19.0	20.2	-22.0	23.2	-25.2	26.4	-28.7	29.8	-32.4	33.4	-36.4
	4	50	7.8	-8.6	8.7	-9.5	9.7	-10.6	10.7	-11.7	11.7	-12.8	12.8	-14.0	13.9	-15.2	16.3	-17.9	18.9	-20.7	21.7	-23.8	24.7	-27.1	27.9	-30.6	31.3	-34.3
	4	100	7.4	-8.2	8.3	-9.1	9.2	-10.1	10.1	-11.1	11.1	-12.2	12.1	-13.3	13.2	-14.5	15.5	-17.1	18.0	-19.8	20.7	-22.7	23.5	-25.8	26.5	-29.2	29.7	-32.7
	5	10	8.7	-11.7	9.7	-13.0	10.8	-14.5	11.9	-15.9	13.1	-17.5	14.3	-19.1	15.5	-20.8	18.2	-24.4	21.2	-28.3	24.3	-32.5	27.6	-37.0	31.2	-41.8	35.0	-46.8
	5	20	8.3	-10.9	9.3	-12.2	10.3	-13.5	11.4	-14.9	12.5	-16.3	13.6	-17.8	14.8	-19.4	17.4	-22.8	20.2	-26.4	23.2	-30.3	26.4	-34.5	29.8	-39.0	33.4	-43.7
	5	50	7.8	-9.9	8.7	-11.0	9.7	-12.2	10.7	-13.4	11.7	-14.8	12.8	-16.1	13.9	-17.6	16.3	-20.6	18.9	-23.9	21.7	-27.4	24.7	-31.2	27.9	-35.2	31.3	-39.5
	5	100	7.4	-9.1	8.3	-10.1	9.2	-11.2	10.1	-12.4	11.1	-13.6	12.1	-14.8	13.2	-16.2	15.5	-19.0	18.0	-22.0	20.7	-25.2	23.5	-28.7	26.5	-32.4	29.7	-36.4

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m2, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.

a. The effective wind area shall be equal to the span length multiplied by an effective width. This width shall be not less than one-third the span length. For cladding fasteners, the effective wind areas shall not be greater than the area that is tributary to an individual fastener.

b. For effective areas between those given, the load shall be interpolated or the load associated with the lower effective areas shall be used.

c. Table values shall be adjusted for height and exposure by multiplying by the adjustment coefficient in Table R301.2(3).

d. See Figure R301.2(7) for locations of zones.

e. Plus and minus signs signify pressures acting toward and away from the building surfaces.

f. Positive and negative design wind pressures shall not be less than 10 psf.

g. Roof overhang loads shall be determined by summing the aplicable roof zone pressure with the adjacent wall zone pressure.

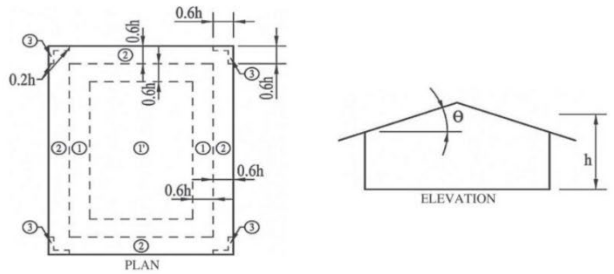
h. Loads in Zone 1' are permitted to be determined in accordance with ASCE 7.

Delete TABLE R301.2(3) and replace with the following:

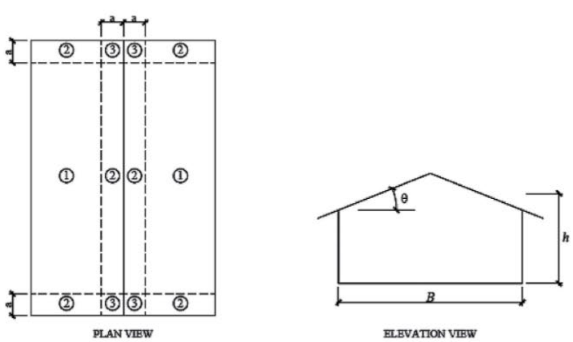
HEIGHT AND EXPOSURE ADJUSTMENT COEFICIENTS FOR TABLE R301.2(2)

MEAN ROOF HEIGHT (ft)	EXPOSURE CATEGORY		
	B	C	D
15	0.82	1.21	1.47
20	0.89	1.29	1.55
25	0.94	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70
40	~~1.09~~ 1.06	1.49	1.74
45	~~1.12~~ 1.10	1.53	1.78
50	~~1.16~~ 1.13	1.56	1.81
55	~~1.19~~ 1.16	1.59	1.84
60	~~1.22~~ 1.19	1.62	1.87

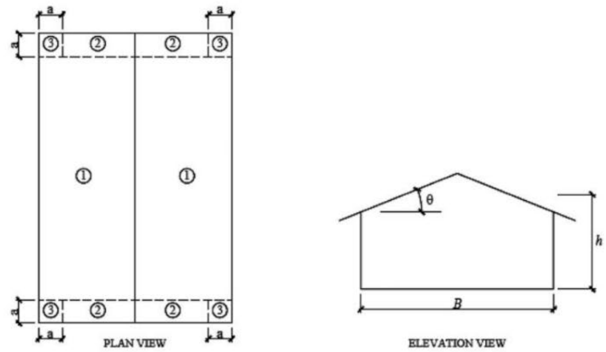
Delete Figure R301.2(7) and replace with the following:



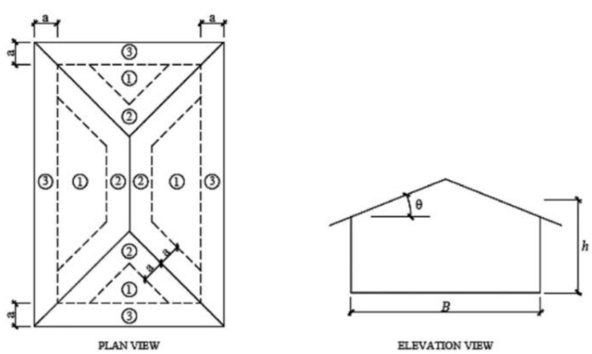
Gable and Flat Roofs θ ≤ 7°



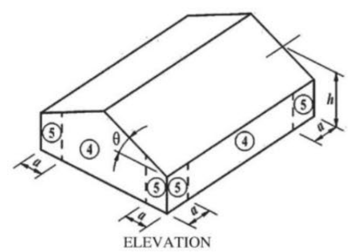
Gable Roofs 7° < θ ≤ 27°



Gable Roofs 27° < θ ≤ 45°



Hip Roofs 7° < θ ≤ 45°



Walls

For SI: 1 foot = 304.8mm, 1 degree = 0.0175 rad

Note: a = 4 feet in all cases

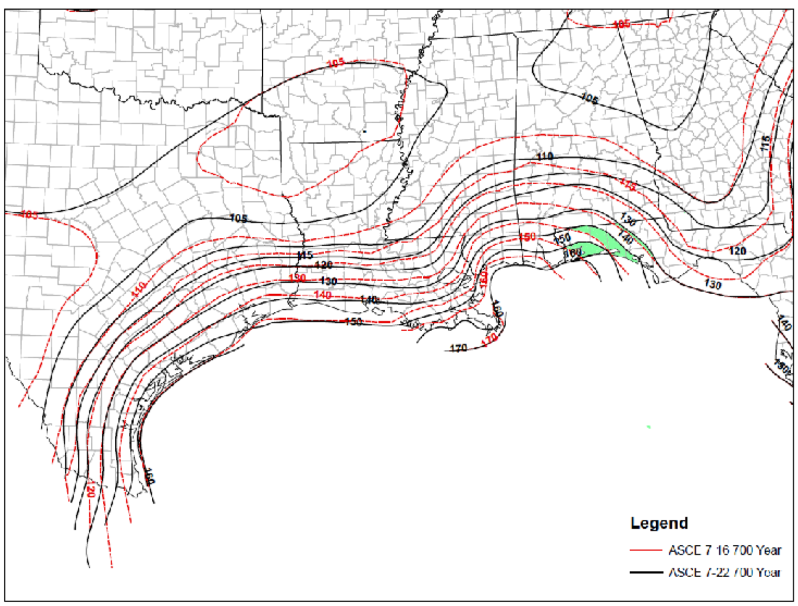
FIGURE R301.2(7)

COMPONENT CLADDING PRESSURE ZONES

This is one of several proposals that updates the ASCE 7 standard from the 2016 edition to the 2022 edition (ASCE 7-22). The wind load provisions of ASCE 7-22 have been revised and refined in several key areas. The following is a summary of some of the key changes to the wind load provisions applicable to the State of Florida:

- Slight increases in design wind speeds for the western Panhandle.
- Revised the determination of applicability of the Wind-borne Debris Region in areas where the design wind speed is greater than or equal to 130 mph and less than 140 mph.
- Changes to roof pressure coefficients for mean roof heights less than or equal to 60 ft.
- New provisions for roof pavers
- New provisions for ground-mounted fixed-tilt solar panel systems.
- New provisions for wind loads on elevated buildings (MWFRS and C&C).
- New provisions for tornado loads.

For most of Florida, wind speeds have not changed. However, for the western part of the Panhandle, wind speeds have slightly increased. The following figure shows the impact of these increases for Risk Category II. The 130 mph contour has shifted very slightly northward and eastward. The 140 mph contour and the 150 mph contour have shifted moderately northward and eastward.



Where wind speeds are equal to or greater than 130 mph but less than 140 mph, the Wind-borne Debris region now applies within one mile of the mean high water line where an Exposure D condition exists upwind of the water line. The term “coastal” has been deleted. This change provides a more consistent method for determining the Wind-borne Debris Region in these areas.

One of the more significant changes in ASCE 7-22 is related to the roof design pressures for buildings with mean roof heights less than or equal to 60 ft. In particular, the pressure coefficient graphs and equations have become simpler. For gable and hipped roofs with slopes between 7 and 45 degree, the number of zones has been reduced to 3 consistent with editions of ASCE 7 prior to the 2016 edition. Additionally, all zones have been truncated at effective wind areas 10 square feet and less, also consistent with editions of ASCE 7 prior to the 2016 edition. This truncation has resulted in reduced pressure coefficients for some zones and effective wind areas, and subsequent reduced design pressures on the roof in some areas.

Another significant change in ASCE 7-22 is the introduction of tornado wind speed maps and design requirements. New Chapter 32 has been added that specifically addresses the design of buildings for tornadoes. The tornado provisions only apply to certain Risk Category III and IV buildings. Risk Categories I and II are exempt from the tornado provisions. Where the tornado wind speed, V_T, is less than 60 mph, design for tornadoes is not required. Additionally, the design for tornadoes is not required for the following wind speeds:

For Exposure B: $V_T \geq 0.5V$

For Exposure C: $V_T \geq 0.6V$

For Exposure D: $V_T \geq 0.67V$

The applicable tornado wind speed for a building is based on the Risk Category and the effective plan area of the building. For Risk Category III buildings, tornado wind speeds are based on a 700-year MRI. For Risk Category IV buildings, tornado wind speeds are based on a 3000-year MRI. Based on the wind speed limitations, Risk Category III buildings in Florida with an effective plan area of 100,000 square feet and less are not required to be designed for tornado loads. For all effective plan areas, the tornado wind speeds in Florida are less than the corresponding hurricane wind speeds. While the tornado provisions are not anticipated to significantly affect the design of Risk Category III and IV buildings for wind loads in Florida, there are situations, particularly for large buildings in Northwest Florida where the tornado provisions may govern over the hurricane provisions.

TAC: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Residential

S10116

6

Date Submitted	02/08/2022	**Section**	317	**Proponent**	Greg Johnson
Chapter	3	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

F8693

Summary of Modification

This proposal incorporates wood columns in the general "location" items of R317.1 to eliminate the separate confusing columns section.

Rationale

See uploaded rationale.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None; no additional plan review or inspections required.

Impact to building and property owners relative to cost of compliance with code

None; the modification aligns the code with current construction practices and the commercial code.

Impact to industry relative to the cost of compliance with code

None; the modification aligns the code with current construction practices and the commercial code

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The modification provides clarity for the protection of wood structural components from decay.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The modification provides clarity for the protection of wood structural components from decay.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No materials are required or prohibited by this modification.

Does not degrade the effectiveness of the code

The modification provides clarity for the protection of wood structural components from decay.

Alternate Language

2nd Comment Period

S10116-A1

Proponent Greg Johnson **Submitted** 8/11/2022 12:47:57 PM **Attachments** Yes

Rationale:

The Structural TAC approved S10116 at its June meeting, but requested a comment to help clarify the application of the section. The proposed alternate title of Section R317.1 better reflects that the requirements of the section apply to wood members, while the charging language of the section connects the requirements for protection to specific locations as specified in the text.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

none - change is essentially editorial

Impact to building and property owners relative to cost of compliance with code

none - change is essentially editorial

Impact to industry relative to the cost of compliance with code

none - change is essentially editorial

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Protection of framing members against decay.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Clarifies

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Section is specific to wood regulation

Does not degrade the effectiveness of the code

Clarifies

R317.1~~Locationrequired~~ Protection of wood members from decay.

Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1.

1. ~~Wood joists or the bottom of a woodstructuralfloorwhencloserthan18inches(457mm)or wood girders when closer than 12 inches(305 mm) to the exposed ground in~~ In crawl spaces or unexcavated area located within the periphery of the building foundation., wood joists or the bottom of a wood structural floor where closer than18inches(457 mm)to exposed ground, wood girders where closer than 12 inches(305 mm) to exposed ground, and wood columns where closer than8 inches (204 mm) to exposed ground.

2.Woodframingmembers,includingcolumns,thatrestdirectlyonconcreteormasonryexteriorfoundationwalls and are less than 8 inches(203 mm) from the exposed ground.

3.Sillsandsleepersonaconcreteor masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.

4.Theendsofwoodgirdersenteringexteriormasonryorconcretewallshavingclearancesoflessthan1/2inch(12.7 mm) on tops, sides and ends.

5.Wood siding, sheathing and wall framing on the exterior of a building having a clearance oflessthan6 inches (152mm) fromthegroundorlessthan2inches(51mm)measured vertically from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather.

6.Woodstructuralmemberssupportingmoisture-permeablefloorsorroofsthatareexposedtotheweather,suchas concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.

7.Woodfurringstripsorotherwoodframingmembersattacheddirectlytotheinteriorofexteriormasonrywallsor concrete walls below grade except where an approved vapor retarder is applied between the wall and the furring strips or framing members.

8. Portions of wood structural members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members.

9. Wood columns in contact with basement floor slabs unless supported by concrete piers or metal pedestalsprojectingatleast1inch(25 mm)above the concrete floor and separated from the concrete pier by an impervious moisture barrier.

R317.1.1Field treatment. Unchanged.

R317.1.2 Ground contact. Unchanged.

~~R317.1.4Woodcolumns.~~
~~Woodcolumnsshallbeapprovedwoodofnaturaldecayresistanceorapprovedpressure-preservative-treatedwood.~~

~~**Exceptions:**~~

~~1.Columnsexposedtotheweatherorinbasementswheresupportedbyconcretepiersormetalpedestalsprojecting1inch (25 mm) above a concrete floor or6 inches(152 mm)above exposed earthand the earth is covered by anapproved impervious moisture barrier.~~

~~2.Columnsin enclosed crawl spacesor unexcavated areas located within the periphery ofthe building whensupportedbya concretepierormetalpedestalataheightmorethan8inches(203mm)fromexposedearthandtheearth is covered by an impervious moisture barrier.~~

~~3.Deckpostssupportedbyconcretepiersormetalpedestalsprojectingnotlessthan1inch(25mm)aboveaconcrete floor or 6 inches(152 mm) above exposed earth.~~

R317.1 Location required.
Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1.

1.~~Wood joists or the bottom of a wood structural floor when closer than 18 inches (457 mm) or wood girders when closer than 12 inches (305 mm) to the exposed ground in~~ In crawl spaces or unexcavated area located within the periphery of the building foundation~~.~~, wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) to exposed ground, wood girders where closer than 12 inches (305 mm) to exposed ground, and wood columns where closer than 8 inches (204 mm) to exposed ground.

2.Wood framing members, including columns, that rest directly on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground.

3.Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.

4.The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 1/2 inch (12.7 mm) on tops, sides and ends.

5.Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather.

6.Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.

7.Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below grade except where an approved vapor retarder is applied between the wall and the furring strips or framing members.

8. Portions of wood structural members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members.

9. Wood columns in contact with basement floor slabs unless supported by concrete piers or metal pedestals projecting at least 1 inch (25 mm) above the concrete floor and separated from the concrete pier by an impervious moisture barrier.

R317.1.1Field treatment.
Field-cut ends, notches and drilled holes of preservative-treated wood shall be treated in the field in accordance with AWPA M4.

R317.1.2 Ground contact.
All wood in contact with the ground, embedded in concrete in direct contact with the ground or embedded in concrete exposed to the weather that supports permanent structures intended for human occupancy shall be approved pressure-preservative-treated wood suitable for ground contact use, except that untreated wood used entirely below groundwater level or continuously submerged in fresh water shall not be required to be pressure-preservative treated.

~~**R317.1.4 Wood columns.**~~
~~Wood columns shall be approved wood of natural decay resistance or approved pressure-preservative-treated wood.~~

~~**Exceptions:**~~

~~1.Columns exposed to the weather or in basements where supported by concrete piers or metal pedestals projecting 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth and the earth is covered by an approved impervious moisture barrier.~~

~~2.Columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building when supported by a concrete pier or metal pedestal at a height more than 8 inches (203 mm) from exposed earth and the earth is covered by an impervious moisture barrier.~~

~~3.Deck posts supported by concrete piers or metal pedestals projecting not less than 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth.~~

Rationale for modification of residential code Section 317.1

Current Section R317.1.4 on wood column protection is unnecessarily confusing and contains errors in syntax, making it difficult to apply.

Current Exceptions 1 and 2: Current Exception 1 seems to exempt all columns exposed to the weather, which is not the intent. The rest of Exception 1 has criteria which conflicts with the current IBC and also seems to conflict with Exception 2—does the elevation of concrete piers and metal pedestals need to be 6 inches or 8 inches? It may be confusing when comparing the exceptions. In addition, the parallel section in the FBC, Section 2304.12.2.2, says nothing about covering the exposed ground in the crawl space with an impervious moisture barrier as a criterium for column protection, and sets the clearance for the bottom of the column at 8 inches above exposed earth, the same as is required for framing on exterior walls.

Current Exception 3: Current Exception 3 seems to exempt any deck posts that are supported by piers or pedestals extending 1 inch above concrete or 6 inches above exposed earth. But it would seem good policy that any deck post exposed to the weather should be treated regardless of clearance to a slab or ground.

Current charging language: The charging language in R317.1.4 requires all columns, regardless of location, to be treated unless they fit into an exception. Interior columns completely protected from the weather, such as heavy timber columns in the interior of the building or built-up columns in walls, are technically required to be treated since they don't fit into any exception. This is not the intent of the code.

This proposal attempts to incorporate wood columns in the general "location" items of R317.1 and eliminate the separate confusing columns section altogether:

Revisions to R317.1 item 1: Similar to floor framing and girders, columns are given a required clearance from exposed earth in crawl spaces, a clearance which is generally consistent with current Exception 2 except the requirement to cover the exposed ground with an impervious moisture barrier is dropped. The reason this requirement was dropped is because there is no such requirement in the parallel sections of the FBC (2304.12.2.2), and it seems that as long as a conservative clearance is required, provisions for moisture barriers over exposed earth in a crawl space should be governed by the crawl space section of the code (R408 Under-Floor Spaces, which has provisions for moisture barriers). The wording of item 1 is rearranged to retain readability with the addition of the new provision for columns.

Revision to R317.1 item 2: Including columns here specifically with other "wood framing members" seems prudent since the columns section is proposed for deletion. However, it may not be necessary since wood columns would normally be considered a wood framing member.

New item 9 to R317.1: This new item is necessary to preserve the reduced clearance for columns above basement floor slabs. It provides for as little as 1 inch of clearance if on a metal pedestal (consistent with current Exception 1 to R317.1.4), and 1 inch of clearance on a concrete pier if it is separated from the pier by an impervious moisture barrier, since concrete is porous and will allow wicking of moisture more readily (this consistent with current Exception 1 of R317.1.4 and also with FBC Section 2304.12.2.2 Exception 2).

This code change (RB137-19) was passed 10-0 by the ICC hearing committee with no public comments in opposition.

TAC: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Residential

S10256

7

Date Submitted	02/12/2022	**Section**	322.2.1	**Proponent**	Conn Cole FDEM SFMO
Chapter	3	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

Specifics for accessory structures in flood hazard areas in accordance with FEMA policy issued 2020.

Rationale

Based on FEMA 2024 IRC proposal RB137-22. Subject to 553.73(7)(a) as flood requirement for inclusion in 9th Edition. NFIP regulations do not explicitly address accessory structures & detached garages, thus they have to be elevated or dry floodproofed. NFIP Technical Bulletin 7 (1993) outlines wet floodproofing requirements, but states that communities must grant variances before authorizing wet floodproofing. Proposal is based on the 2020 FEMA Policy and 2021 Bulletin (FEMA P-214). It provides relief to elevation or dry floodproofing by allowing wet floodproofed accessory structures & detached garages with floors below required elevations based on size and flood zone. Also modifies for attached garages, with no size limits. When included in FBCR, hundreds of communities will not have to adopt local amended flood regulations. It does not conflict with those that have adopted similar requirements over the last year. Note that Section R403.1.4.1 does not require footings for “free-standing accessory structures with an area of 600 square feet or less, of light-frame construction” to extend meet the frost protection requirements. And in Zone V & CAZ, breakaway walls and flood openings are not required. FEMA Policy & Bulletin https://www.fema.gov/media-collection/floodplain-management-requirementsagricultural-and-accessory-structures

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Local cost savings: One, straightforward to enforce clear requirements rather than meet FEMA expectations that to conform to the Policy even if the specifics are not adopted; and Two, having requirements in the code eliminates the administrative burden of amending floodplain management regulations.

Impact to building and property owners relative to cost of compliance with code

Lower cost of construction for many detached accessory structures smaller than the size limits established by FEMA because they can be wet floodproofed instead of elevated or dry floodproofed.

Impact to industry relative to the cost of compliance with code

Facilitates compliance to have clear requirements.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, it provides requirements for flood resistance and facilitates meeting FEMA expectations which preserves access to federal flood insurance and disaster assistance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, it improves by stating specific requirements and limitations.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No, the use of flood damage resistant materials is already required.

Does not degrade the effectiveness of the code

No, it improves enforcement by having clear requirements.

2nd Comment Period

S10256-G2

Proponent	Brian Walsh - RCCIW	Submitted	8/5/2022 11:21:09 AM	Attachments	No

Comment:

No cost impact, but I do not understand why R322.2.1 modification would limit a property owner on the size of detached garages when there is no limit on size of attached garages.

1st Comment Period History

S10256-G1

Proponent	Rebecca Quinn obo FL Div Emerg Mgnt	Submitted	4/16/2022 11:29:12 AM	Attachments	No

Comment:

Submitted on behalf of the FDEM State Floodplain Manager, we recommend approval by the TAC and Commission because it not only implements FEMA's policy on accessory structures in floodplains, but having it in the FBC, Residential, would mean hundreds of Florida communities would not have to adopt separate local regulations. FEMA submitted this language for the International Residential Code as proposal RB137-22, which was Disapproved at the Committee Action Hearing. It's likely FEMA will submit public comment requesting approval by the ICC government voting members. We note that some Florida communities have size limits less than 600 sq ft, and those communities would either enforce that the size limit in zoning governs or they could adopt a local technical amendments to modify the size in this section.

R322.2.1 Elevation requirements.

1. Buildings and structures in flood hazard areas not including flood hazard areas designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.

2. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including basement) elevated to a height above the highest adjacent grade of not less than the depth number specified in feet (mm) on the FIRM plus 1 foot (305 mm), or not less than 3 feet (915 mm) if a depth number is not specified.

3. Basement floors that are below grade on all sides shall be elevated to or above base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.

4. Attached garages and carports ~~Garage and carport floors~~ shall comply with one of the following:

4.1. ~~They~~ The floors shall be elevated to or above the elevations required in Item 1 or Item 2, as applicable.

4.2. ~~They~~ The floors shall be at or above grade on not less than one side. Where ~~a~~ an attached garage or carport is enclosed by walls , the walls shall have flood openings that comply with Section R322.2.2 and the attached garage or carport shall be used solely for parking, building access or storage.

-

5. Detached accessory structures and detached garages shall comply with either of the following:

5.1. The floors shall be elevated to or above the elevations required in Item 1 or Item 2, as applicable.

5.2. The floors are permitted below the elevations required in Item 1 or Item 2, as applicable, provided such detached structures comply with

all of the following:

5.2.1. Are used solely for parking or storage.

5.2.2. Are one story and not larger than 600 square feet (55.75 m).

5.2.3. Are anchored to resist flotation, collapse or lateral movement resulting from design flood loads.

5.2.4. Have flood openings that comply with Section R322.2.2.

5.2.5. Are constructed of flood damage-resistant materials that comply with Section R322.1.8.

5.2.6. Have mechanical, plumbing and electrical systems, if applicable, that comply with Section R322.1.6.

Exception: Enclosed areas below the elevation required in this section, including basements with floors that are not below grade on all sides, shall meet the requirements of Section 322.2.2.

R322.3.2 Elevation requirements.

1. Buildings and structures erected within coastal high-hazard areas and Coastal A Zones, shall be elevated so that the bottom of the lowest horizontal structure members supporting the lowest floor, with the exception of pilings, pile caps, columns, grade beams and bracing, is elevated to or above the base flood elevation plus 1 foot (305 mm) or the design flood elevation, whichever is higher.

2. Basement floors that are below grade on all sides are prohibited.

3. Attached garages ~~Garages~~ used solely for parking, building access or storage, and carports shall comply with Item 1 or shall be at or above grade on not less than one side and, if enclosed with walls, such walls shall comply with Item ~~6~~ 7.

4. Detached accessory structures and detached garages shall comply with either of the following:

4.1. The bottom of the lowest horizontal structural member supporting the floors shall be elevated to or above the elevation required in

Item 1.

4.2. The floors are permitted below the elevations required in Item 1, provided such detached structures comply with all of the following:

4.2.1. Are used solely for parking or storage.

4.2.2. Are one story and not larger than 100 square feet (9.29 m).

4.2.3. Are anchored to resist flotation, collapse or lateral movement resulting from design flood loads.

5 4. The use of fill for structural support is prohibited.

6 ~~5~~. Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.

7 ~~6~~. Walls and partitions enclosing areas below the elevation required in this section shall meet the requirements of Sections R322.3.5 and R322.3.6.

TAC: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Residential

S9848

8

Date Submitted	01/05/2022	**Section**	703.3.4	**Proponent**	Fernando Pages
Chapter	7	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

Adds required clearance between grade and siding.

Rationale

The residential code contains various clearance between grades, slabs, and other horizontal surfaces relating to wood structural elements. With siding, there are several reasons to require this spacing including heat building up on horizontal surfaces, expansion and contraction issues that come along with certain sidings like polymeric siding, and moisture management issues. A 1/2” clearance will provide a good distance between materials and intersection surfaces/planes and 6” is consistent with specific codes requirements in R317.1, protection of wood products including wood siding.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Improves building performance, which supports the welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the code by expanding clearance requirements often ignored in practice.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change is comprehensive and does not discriminate.

Does not degrade the effectiveness of the code

Improves and does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

9848-A2

Proponent Fernando Pages **Submitted** 8/19/2022 9:51:44 AM **Attachments** Yes

Rationale:

This responds to GC G2. We agree with this comment and have revised our alternate language proposal to reflect the change.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clarifies ground to siding clearances to benefit the consumer.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Clarifies ground to siding clearances to avoid trade installation confusion.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Applies to all siding unless the manufacturer waves requirment.

Does not degrade the effectiveness of the code

Strengthens and does not degrade the code.

1st Comment Period History

9848-A1

Proponent Fernando Pages **Submitted** 4/11/2022 2:02:07 PM **Attachments** Yes

Rationale:

Adds precision

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not

Does not degrade the effectiveness of the code

Does not

2nd Comment Period

S9848-G2

Proponent	Michael Fox	Submitted	8/18/2022 9:58:07 AM	Attachments	No

Comment:

Recommend Denial pending further work on the language to eliminate possible confusion. The Mod proposes a new section for "Siding clearances", but uses the term "Cladding" in the section. This is confusing because Cladding by definition is "The exterior materials that cover the surface of the building envelope that is directly loaded by the wind." Thus the section is specific to "Siding" but references "Cladding" which generally applies to any exterior wall covering (ie: Siding is a type of Cladding, but not all Cladding is Siding). The proposed Alternate Text attempts to provide more specificity to Siding, but still uses the term Cladding which opens the door for confusion and the possible use of the requirements of this section for materials other than those intended.

R703.3.4 Siding clearance at wall and adjacent surfaces.

Unless otherwise specified by the material manufacturer, or this code, siding shall have a clearance of at least 6 inches (152 mm) from grade and at least 1/2 inch (13 mm) from other adjacent surfaces (decks, roofs, slabs).

R703.3.4 Siding clearance at the wall and adjacent surfaces. Unless otherwise specified by the cladding manufacturer or this code, polypropylene, insulated vinyl, and vinyl claddings shall have clearance of at least 6 inches (152 mm) from ~~grade~~ ground and at least 1/2 inch (13 mm) from other adjacent surfaces (decks, roofs, slabs).

Add new text as follows:

R703.3.4 Siding clearance at wall and adjacent surfaces.

Unless otherwise specified by the cladding manufacturer or this code, cladding shall have clearance of at least 6 inches (152 mm) from grade and at least 1/2 inch (13 mm) from other adjacent surfaces (decks, roofs, slabs).

TAC: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Residential

S10434

9

Date Submitted	02/14/2022	**Section**	46	**Proponent**	Jennifer Hatfield
Chapter	2712	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

Chapter 35 - Referenced Standards to FBC-B.

Summary of Modification

Updates AAMA (FGIA) and ASTM Standards with appropriate names and editions.

Rationale

These are standard updates of existing AAMA and ASTM Standards utilized in the FBC-R. Edits to add a new edition and in some cases clarify the correct name of the standard are being provided. Also in some cases older ASTM editions are being removed. It is important to note that AAMA Standards are being published by the Fenestration & Glazing Industry Alliance (FGIA), which was the result of the American Architectural Manufacturers Association (AAMA) and the Insulating Glass Manufacturers Alliance (IGMA) unifying as one combined organization as of January 1, 2020.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No expected impact.

Impact to building and property owners relative to cost of compliance with code

No expected impact.

Impact to industry relative to the cost of compliance with code

No expected impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Provides for the latest editions of standards and accurate names to ensure Florida Codes are utilizing the most up to date standards.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by providing most recent standard editions.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It does not.

Does not degrade the effectiveness of the code

It does not.

Alternate Language

2nd Comment Period

S10434-A1

Proponent Jennifer Hatfield **Submitted** 8/25/2022 11:52:09 AM **Attachments** Yes

Rationale:

This alternative language comment, submitted on behalf of the Fenestration & Glazing Industry (FGIA), is simply to a) separate the two AAMA 450 editions as they have slightly different titles (the TAC already recommended adding the 2020 edition in June), and b) address an error brought to our attention under AAMA 711. A 2016 edition of the AAMA 711 standard does not exist, there are 2013, 2020 and now 2022 editions. Therefore, this comment simply eliminates the 2016 edition, continues to add the 2020 edition as was approved by the TAC in June, but also now adds both 2013 and 2022 editions that exist. This aligns with the corresponding Building Code Standard update proposal. We believe this alternative comment will provide needed clarity as to the standards listed. Note there were no changes to the ASTM standards that were approved in June.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Provides for the accurate and latest editions of standards to ensure Florida Codes has the correct standards.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by providing the most recent editions and corrections.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It does not.

Does not degrade the effectiveness of the code

It does not.

S10434-A1Text Modification

AAMA Standards by FGIA

~~American Architectural Manufacturers Association~~
Fenestration & Glazing Industry Alliance
~~1827 Walden Office Square, Suite 550~~
1900 E Gold Rd., Suite 1250
Schaumburg, IL 60173

Update the following, all other existing AAMA Standards remain the same:

450—10 Voluntary Performance Rating Method for Mulled Fenestration Assemblies R609.8

or

450-20 Performance Rating Method for Mulled Combination Assemblies, Composite Units, and Other Mulled Fenestration Systems R609.8

711— ~~16~~ 13, 20 or 22 Voluntary Specification for Self-~~A~~adhering Flashing Used for Installation of Exterior Wall Fenestration Products R703.4, R905.1.1.1, R905.1.1.2, R905.1.1.3

714—15 or 19 Voluntary Specification for Liquid Applied Flashing Used to Create Water-resistive Seal around Exterior Wall Openings in Buildings R703.4

812—04(2010) or 19 Voluntary Practice for Assessment of Frame Deflection When Using One ~~Single~~ Component ~~Aerosol Expanding~~ Polyurethane Foams for Air-Sealing Rough Openings of Fenestration Installations R703.4

ASTM

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Update the following, all other existing AAMA Standards remain the same:

E283—04(2012) or E283/283M-19
Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen R202

E330/E330M—14 or 14 (21)
Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
R609.4, R609.5, R703.1.2

Page: 1

Mod_10434_A1_TextOfModification.pdf

E331-00 (2009 or 2016)
Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference
R703.1.1

E1886--~~12 or~~ 2013a or 2019
Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials R301.2.1.2, R609.3.1, R609.6.1, Table R703.11.2

E1996-~~02, 2012a, or~~ 2014a, 17, or 2020
Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes R301.2.1.2, R301.2.1.2.1, R609.3.1, R609.6.1

F2090--17 or 2021
Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms
R310.1.1, R312.2.1, R312.2.2, AJ102.4.3, AJ102.4.4

S10434Text Modification

AAMA ~~Standards by FGIA~~

~~American Architectural Manufacturers Association~~
Fenestration & Glazing Industry Alliance
~~1827 Walden Office Square, Suite 550~~
1900 E Gold Rd., Suite 1250
Schaumburg, IL 60173

Update the following, all other existing AAMA Standards remain the same:

450—10 or 20 Voluntary Performance Rating Method for Mulled Fenestration Assemblies, Composite Units, and Other Mulled Fenestration Systems R609.8

711—16 or 20 Voluntary Specification for Self-Aadhering Flashing Used for Installation of Exterior Wall Fenestration Products R703.4, R905.1.1.1, R905.1.1.2, R905.1.1.3

714—15 or 19 Voluntary Specification for Liquid Applied Flashing Used to Create Water-resistive Seal around Exterior Wall Openings in Buildings R703.4

812—04(2010) or 19 Voluntary Practice for Assessment of Frame Deflection When Using One ~~Single~~ Component ~~Aerosol Expanding~~ Polyurethane Foams for Air-Sealing Rough Openings of Fenestration Installations R703.4

ASTM

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Update the following, all other existing AAMA Standards remain the same:

E283—04(2012) or E283/283M-19
Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen R202

E330/E330M—14 or 14 (21)
Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
R609.4, R609.5, R703.1.2

Page: 1

Mod_10434_TextOfModification.pdf

E331-00 (2009 or 2016)
Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference
R703.1.1

E1886--~~12 or~~ 2013a or 2019
Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials R301.2.1.2, R609.3.1, R609.6.1, Table R703.11.2

E1996-~~02, 2012a, or~~ 2014a, 17, or 2020
Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes R301.2.1.2, R301.2.1.2.1, R609.3.1, R609.6.1

F2090--17 or 2021
Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms
R310.1.1, R312.2.1, R312.2.2, AJ102.4.3, AJ102.4.4

TAC: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Test Protocols

S10175

10

Date Submitted	02/14/2022	**Section**	103	**Proponent**	Michael Silvers (FRSA)
Chapter	1	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

10176, 10179, 10180 and 10238

Summary of Modification

Changes the test methods used to establish resistance to uplift pressure for tile underlayments to methods described in the code. The underlayment is part of the load path for most tile roof systems and product approval should demonstrate an expected resistance to negative pressure.

Rationale

The modification changes the test methods used to establish resistance to uplift pressure for tile underlayments to current methods described in the code for the testing of other non-air permeable membrane assemblies. The underlayment is part of the load path for most tile roof systems and product approval should demonstrate an expected resistance to negative pressure. Prescriptive methods described in the tile related RAS and TAS standards have been called into question. Underlayment applications described in the standards when tested using current performance testing standards indicate that some of the underlayment material and the fastener placement and density may not meet the current wind uplift resistance requirements based on ASCE-7. Test results from testing commissioned by FRSA using proposed test standards are attached and indicate very low resistance to uplift pressures for systems described in the RAS and TAS. The numbers shown are before applying the safety factor of two that further reduces the listed resistance of the underlayment. Independent testing by manufacturers of underlayment components produced similar results. The uplift resistance shown in many product approvals also confirms the need for these changes.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate.

Does not degrade the effectiveness of the code

Does not degrade.

Alternate Language

2nd Comment Period

S10175-A1

Proponent Zachary Priest **Submitted** 8/26/2022 9:47:34 AM **Attachments** Yes

Rationale:

UL 1897 and FM 4474 were added, so I am proposing these should be added to the Referenced Document section as this was not included in the original proposed change. Additionally, the wind uplift section has been clarified further. Neither FM 4474 nor UL 1897 provide details for the construction of a wood test deck, so this has been conserved to ensure uniformity in testing. TAS 103 does not currently address approval of multi-ply underlayment systems. Mulit-ply underlayment systems require additional considerations beyond uplift, so the scope of change has been pared back to only require a direct-to-deck test (this is consistent with the original language in TAS 103). The minimum acceptance and reporting requirements have been conserved. The minimum acceptance should be conserved for the test reporting purposes as the testing lab provides a statement of compliance for the underlayment tested to the standard. Without this, a lab could report a product complies with TAS 103 even though the uplift does not meet a 90psf minimum.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact

Impact to building and property owners relative to cost of compliance with code

No impact

Impact to industry relative to the cost of compliance with code

No impact

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Ensures consistency in testing and proper representation of the results

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Consistent with proposed code change, just further clarifies the details

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Consistent with proposed code change

Does not degrade the effectiveness of the code

Improves the effectiveness (and non-bias between labs) of testing and reporting

1. Scope

1.1 This Protocol covers procedures for testing self-adhering, ~~prefabricated~~, polymer modified bituminous, and solid thermoplastic sheet roofing materials intended for use as underlayment in Tile Roof Systems to assist in the waterproofing to function in combination with a Prepared Roof Covering. These products may employ granular or particulate surfacing materials on one side. The Granule Adhesion test shall be required for all granular surfaced materials used as a bonding surface for mortar or adhesive set tile systems.

1.2 The test procedures outlined in this Protocol cover the determination of the Wind Uplift Resistance; the Thickness; the Dimensional Stability; the Tear Resistance; the Breaking Strength; the Elongation; the Low Temperature Flexibility; the Ultraviolet Resistance; the Accelerated Aging Performance; the Cyclic Elongation Performance; the Water Vapor Transmission; the Compound Stability; the Puncture Resistance; the Tile Slip-page Resistance; the Peel Resistance; the Accelerated Weathering Performance of an underlayment material; the Tensile Adhesion properties of the exposed surface of the underlayment; and Granular Adhesion for granular surfaced underlayment.

Note: 1.3 remains unchanged

2.Referenced Documents

2.1 *ASTM Test Standards:*

D1079	Standard Definitions and Terms Relating to Roofing, Waterproofing and Bituminous Materials
D1623	Standard Test Method For Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
D1970	Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection (Low Temperature Flexibility)
D2523	Testing Load-Strain Properties of Roofing Membranes
D4073	Standard Test Method For Tensile Tear Strength of Bituminous Roofing Membranes
D5147	Sampling and Testing Modified Bituminous Sheet Materials
E96	Water Vapor Transmission of Materials
E380	Excerpts from the Standard Practice for Use of the International System of Units (SI) (the Modernized Metric System)

2.2 *ANSI Test Standards:*

FM 4474	American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static

	Positive and/or Negative Differential Pressures, Appendix D: 12x24 Simulated Wind Uplift Pressure Test Procedure
UL 1897	Uplift Tests for Roof Covering Systems

7. Wind Uplift

7. ~~Adhered or mechanically attached t~~The underlayment ~~or underlayment assemblies~~ shall be tested in accordance with ANSI/FM 4474 or UL 1897.

~~7.1 This test covers the determination of the wind uplift resistance of materials specified in Section 1 of this Protocol in accordance with TAS 124 except as noted below.~~

7.1~~.1~~ Test Deck Construction

~~7.1.1.1 Test is being conducted on materials noted in Section 1 of this Protocol; therefore, any reference to "roof membrane" in TAS 124 shall be regarded as 'underlayment.'~~

7.2~~1.1.2 Four (4) 8' × 8' t~~Test decks shall be constructed of minimum 40/20 1~~9~~5/32 in. APA Rated Plywood Sheathing attached to wood joists spaced 24 o.c. ~~Each ~~T~~test deck shall consist of four (4) panels of said sheathing, the corners of which shall meet at the center of each test deck~~, leaving a 1/8 in. gap between panels.

7.~~1.1.~~3 Adhere one (1) layer of underlayment to ~~each~~the test deck.

~~7.1.2 Procedure~~

~~7.1.2.1 Test shall be a laboratory test not a field test; therefore, any instruction in TAS 124 which references "building or outdoor conditions" shall be regarded as "laboratory conditions."~~

~~7.1.2.2 Regulate the negative pressure in the chamber. Begin by raising the negative pressure in the chamber to 30 lbf/ft2 and holding this pressure for one (1) minute. Thereafter, raise the negative pressure in increments of 15 lbf/ft2, holding each incremented pressure for one (1) minute, until the ~~7.4 The specimen shall be considered passing test when the maximum passing ~~negative ~~pressure ~~has been held at~~ is equal to or greater than 90 lbf/ft2~~ for one (1) minute.~~

7.~~1.3~~5 Report

~~7.1.3.1 Any test specimen which exhibits any significant separation between the membrane and tested substrate shall be considered as failing the wind uplift.~~

1. Scope

1.1 This Protocol covers procedures for testing self-adhering, ~~prefabricated~~, polymer modified bituminous, and solid thermoplastic sheet roofing materials intended for use as underlayment in Tile Roof Systems to assist in the waterproofing to function in combination with a Prepared Roof Covering. These products may employ granular or particulate surfacing materials on one side. The Granule Adhesion test shall be required for all granular surfaced materials used as a bonding surface for mortar or adhesive set tile systems.

1.2 The test procedures outlined in this Protocol cover the determination of the Wind Uplift Resistance; the Thickness; the Dimensional Stability; the Tear Resistance; the Breaking Strength; the Elongation; the Low Temperature Flexibility; the Ultraviolet Resistance; the Accelerated Aging Performance; the Cyclic Elongation Performance; the Water Vapor Transmission; the Compound Stability; the Puncture Resistance; the Tile Slip-page Resistance; the Peel Resistance; the Accelerated Weathering Performance of an underlayment material; the Tensile Adhesion properties of the exposed surface of the underlayment; and Granular Adhesion for granular surfaced underlayment.

Note: 1.3 remains unchanged

2.Referenced Documents

2.1 *ASTM Test Standards:*

D1079	Standard Definitions and Terms Relating to Roofing, Waterproofing and Bituminous Materials
D1623	Standard Test Method For Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
D1970	Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection (Low Temperature Flexibility)
D2523	Testing Load-Strain Properties of Roofing Membranes
D4073	Standard Test Method For Tensile Tear Strength of Bituminous Roofing Membranes
D5147	Sampling and Testing Modified Bituminous Sheet Materials
E96	Water Vapor Transmission of Materials
E380	Excerpts from the Standard Practice for Use of the International System of Units (SI) (the Modernized Metric System)

2.3 Reserved

2.4 The Florida Building Code, Building.

2.5 ~~*Application Standards*~~ Reserved

~~TAS 124~~	~~Test Procedure for Field Uplift Testing of Existing Membrane Roof Systems~~

Note: 3., 4., 5., and 6. Remain unchanged.

7. Wind Uplift

7. Adhered or mechanically attached tile underlayment or underlayment assemblies shall be tested in accordance with FM 4474 or UL 1897.

-

~~7.1 This test covers the determination of the wind uplift resistance of materials specified in Section 1 of this Protocol in accordance with TAS 124 except as noted below.~~

~~7.1.1 Test Deck Construction~~

~~7.1.1.1 Test is being conducted on materials noted in Section 1 of this Protocol; therefore, any reference to "roof membrane" in TAS 124 shall be regarded as 'underlayment.'~~

~~7.1.1.2 Four (4) 8' × 8' test decks shall be constructed of 40/20 19/32 in. APA Rated Plywood Sheathing attached to wood joists spaced 24 o.c. Each test deck shall consist of four (4) panels of said sheathing, the corners of which shall meet at the center of each test deck, leaving a 1/8 in. gap between panels.~~

~~7.1.1.3 Adhere one (1) layer of underlayment to each test deck.~~

~~7.1.2 Procedure~~

~~7.1.2.1 Test shall be a laboratory test not a field test; therefore, any instruction in TAS 124 which references "building or outdoor conditions" shall be regarded as "laboratory conditions."~~

~~7.1.2.2 Regulate the negative pressure in the chamber. Begin by raising the negative pressure in the chamber to 30 lbf/ft2 and holding this pressure for one (1) minute. Thereafter, raise the negative pressure in increments of 15 lbf/ft2, holding each incremented pressure for one (1) minute, until the negative pressure has been held at 90 lbf/ft2 for one (1) minute.~~

~~7.1.3 Report~~

~~7.1.3.1 Any test specimen which exhibits any significant separation between the membrane and tested substrate shall be considered as failing the wind uplift.~~

PRI Construction Materials Technologies LLC
6412 Badger Drive
Tampa, FL 33610
813.621.5777
https://www.pri-group.com/

Laboratory Test Report

Report for:	Mike Silvers FRSA 3855 N. Econlockhatchee Trail Orlando, FL 32817
Product Name:	Self-adhered underlayment applied to ASTM D226 anchor sheet
Project No.:	2368T0002
Dates Tested:	May 10, 2021
Test Methods:	UL 1897-12

Purpose: Determine uplift resistance in accordance with **UL 1897-12 *Uplift Tests for Roof Covering* Systems.**

Test Methods: Testing was completed as described in UL 1897-12 *Uplift Tests for Roof Covering* Systems. Specimens were incrementally loaded in accordance with UL 1897 until failure.

Deck Description:

Framing: 2x10 No. 2 SYP lumber installed 24” o.c.

Deck: 15/32 APA rated plywood sheathing installed over No. 2 lumber supports spaced 24” on center. Decking was attached with 2-3/8 inch x 0.113 inch ring shank nails spaced 6” o.c. along the perimeter and intermediate supports.

Underlayment: An anchor sheet of ASTM D226 type II material was mechanically attached to sheathed specimen with 12ga, 1-1/4 inch long, galvanized, ring shank, roofing nails placed through 32ga, 1-5/8 inch diameter tin caps (see Results Table for spacing details). A self-adhering underlayment was applied atop the mechanically attached anchor sheet in accordance with manufacturer’s installation instructions. The laps of the self-adhered underlayment were backnailed with 12ga, 1-1/4 inch long, galvanized, ring shank, roofing nails placed through 32ga, 1-5/8 inch diameter tin caps and spaced 12 inches on center along the lap.

Results:

Table 1. Summary of Test Results

Specimen No.	Underlayment	Attachment	Passing Uplift Pressure (psf)	Failure Mode
1	2 / A	Fastened in lap 6 in o.c. 2 rows in the field @ 12 in o.c.	30	Fastener Pull-through
2	2 / A	Fastened in lap 6 in o.c. 3 rows in the field @ 8 in o.c.	45	Fastener Pull-through
3	2 / A	Plywood joints taped[1] Fastened in lap 6 in o.c. 3 rows in the field @ 8 in o.c.	60	Fastener Pull-through
4	2 / D	Fastened in lap 6 in o.c. 2 rows in the field @ 12 in o.c.	30	Fastener Pull-through
5	2 / D	Fastened in lap 6 in o.c. 3 rows in the field @ 8 in o.c.	60	Fastener Pull-through

Notes: 1 - Specimen #3 construction details included taping of the plywood joints with AAMA 711 compliant seam tape.

Statement of Attestation:

Testing was conducted in accordance with **UL 1897-12 *Uplift Tests for Roof Covering* Systems.** The test results and interpretations presented herein are representative of the materials supplied by the client.

Signed:

Jason Simmons
Director

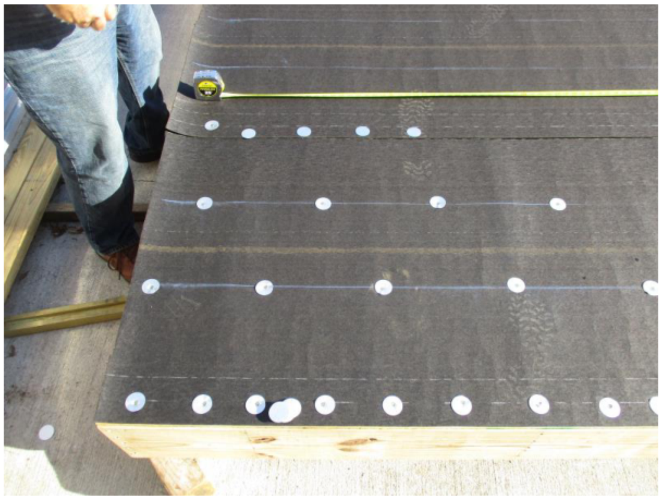
Report Issue History:

Issue #	Date	Pages	Revision Description (if applicable)
Original	07/07/2021	8	NA
Revision	07/14/2021	7	Remove product identification

APPENDIX ATTACHED

Appendix A: Representative Photographs

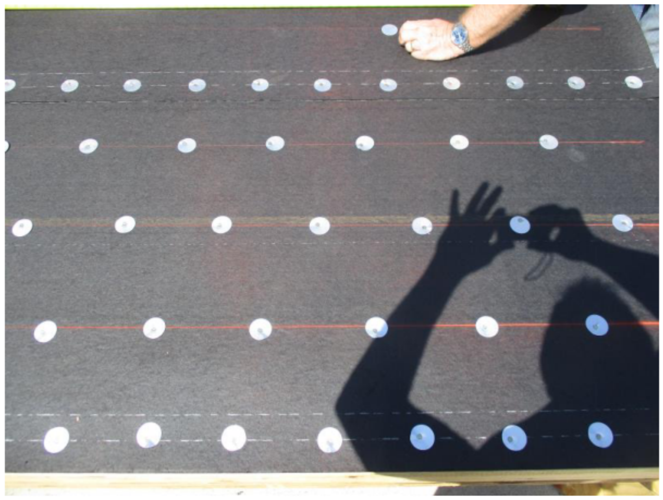
PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pri-group.com



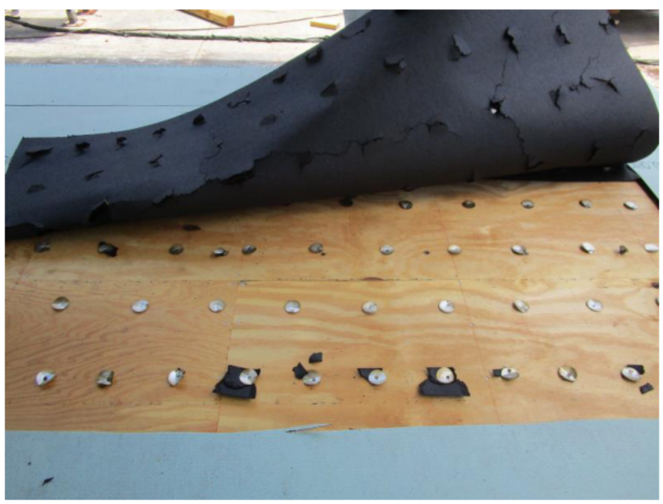
Specimen #1 (typ.): Layout 6" OC in Lap and 2 rows at 12" OC in the field

Specimen #1 failure – fastener pull-through

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pri-group.com

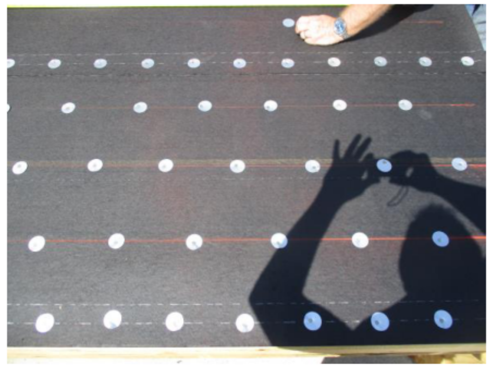


Specimen #2 (typ.): Layout 6" OC in Lap and 3 rows at 8" OC in the field

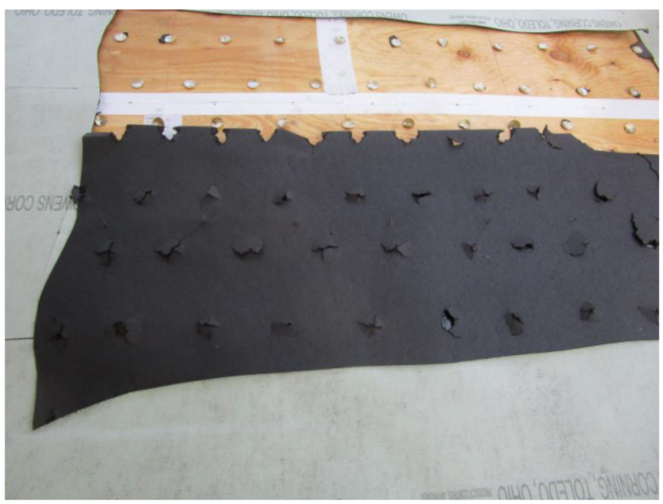


Specimen #2 failure – fastener pull-through

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pri-group.com

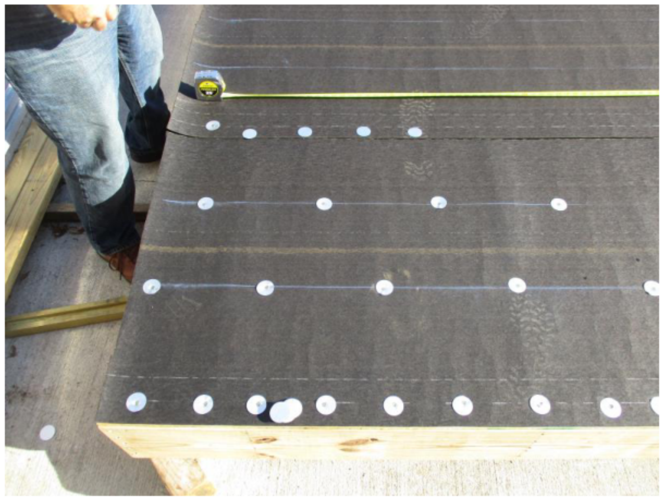


Specimen #3 (typ.): Layout 6" OC in Lap and 3 rows at 8" OC in the field over taped plywood joints



Specimen #3 failure – fastener pull-through

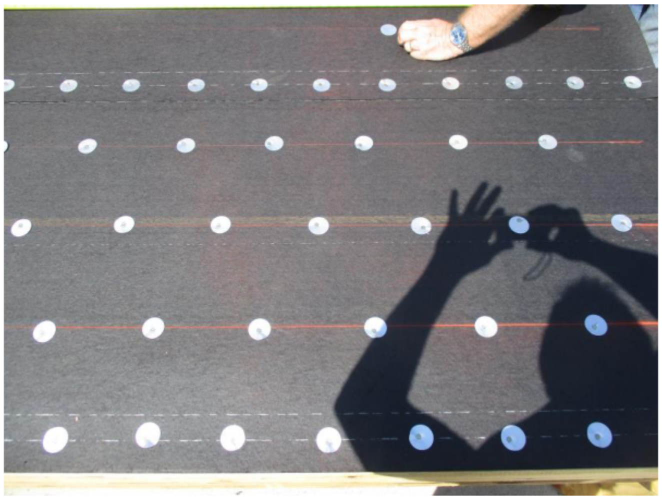
PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pri-group.com



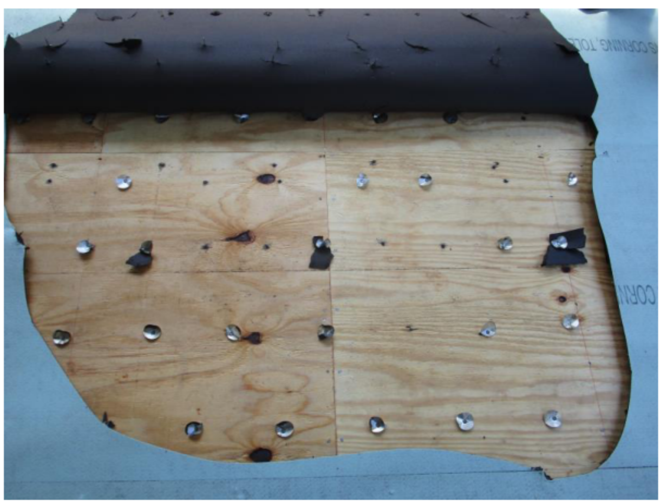
Specimen #4 (typ.): Layout 6" OC in Lap and 2 rows at 12" OC in the field

Specimen #4 failure – fastener pull-through

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pri-group.com



Specimen #5 (typ.): Layout 6" OC in Lap and 3 rows at 8" OC in the field



Specimen #5 failure – fastener pull-through

END OF REPORT

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pri-group.com

PRI Construction Materials Technologies LLC

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Tampa, FL 33610
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https://www.pri-group.com/

Test Status Email

Report for:	Mike Sivers FRSA 3855 N. Econlockhatchee Trail Orlando, FL
Product Name:	Various D226 30# underlayments and various self-adhering underlayments
Project No.:	2368T0001
Dates Tested:	April 1, 2021 – April 2, 2021
Test Methods:	ASTM D1876 T-peel TAS 117 (B) fastener pull-through
Results Summary:	*See Results table herein*

Mike,

Per your request, PRI completed resistance to T-peel between PSU30 and four (4) different ASTM D226, 30# underlayments. Identifying the 30# with which the PSU30 adhered the best, we completed testing for adhesion between that underlayment and the other three (3) self adhered products.

Additionally, we completed fastener pull-through testing in accordance with TAS 117 (B) for the four 30# underlayments.

The results of testing can be found herein in the following two results tables.

Please pass this on to your counterparts in preparation for the assembly work next week.

Feel free to call or email with any questions:

-Jason

ASTM D1876 T-Peel

Sample	Test Method	Results						
T-Peel Strength (lbf/in); 10 specimens; 1in x 12in; Test Rate @ 10in/min; Self adhered to anchor sheet	ASTM D1876							
1 / A		1	2	3	4	5	**Avg.**	St. Dev
		1.18	1.01	1.01	1.46	0.88		
		6	7	8	9	10		
		0.93	0.86	0.70	0.83	0.74	0.96	0.22
1 / B		1	2	3	4	5	**Avg.**	St. Dev
		0.54	0.42	0.49	0.39	0.46		
		6	7	8	9	10		
		0.73	0.40	0.41	0.49	0.50	0.48	0.10
1 / C		1	2	3	4	5	**Avg.**	St. Dev
		0.36	0.26	0.37	0.35	0.35		
		6	7	8	9	10		
		0.36	0.32	0.45	0.35	0.48	0.37	0.06
1 / D		1	2	3	4	5	**Avg.**	St. Dev
		0.53	0.57	0.59	0.62	0.53		
		6	7	8	9	10		
		0.58	0.47	0.56	0.53	0.45	0.54	0.05
2 / A		1	2	3	4	5	**Avg.**	St. Dev
		1.00	1.10	1.06	1.26	1.16		
		6	7	8	9	10		
		1.22	0.94	0.96	0.83	1.16	1.07	0.14
3 / A		1	2	3	4	5	**Avg.**	St. Dev
		0.19	1.23	1.34	0.95	1.12		
		6	7	8	9	10		
		0.92	0.82	0.88	0.80	1.32	1.05	0.20
4 / A		1	2	3	4	5	**Avg.**	St. Dev
		0.40	0.35	0.45	0.41	0.55		
		6	7	8	9	10		
		0.41	0.41	0.47	0.52	0.40	0.44	0.06

Notes: None

PRI Construction Materials Technologies LLC 6408 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

TAS 117 (B) Fastener Pull-Through Resistance

Sample	Test Method	Results Maximum Load (lbf)								
Fastener Pull-Through Resistance (lbf) 14 specimens; 18" by 18"; Test Rate @ 2in/min	TAS 117 Appendix B									
A		1	2	3	4	5	6	7	Avg.	St. Dev
		61.7	59.0	64.7	64.4	64.3	55.5	56.4		
		8	9	10	11	12	13	14		
		62.4	66.8	61.1	56.3	56.2	57.8	60.5	60.5	3.7
B		1	2	3	4	5	6	7	Avg.	St. Dev
		41.0	51.0	56.0	49.1	49.6	46.8	53.7		
		8	9	10	11	12	13	14		
		40.9	52.6	36.2	44.8	44.5	45.9	44.7	46.9	5.5
C		1	2	3	4	5	6	7	Avg.	St. Dev
		42.4	41.2	52.0	48.0	45.8	52.5	48.4		
		8	9	10	11	12	13	14		
		49.3	47.6	52.0	43.2	44.7	50.2	44.3	47.2	3.7
D		1	2	3	4	5	6	7	Avg.	St. Dev
		81.9	84.9	91.9	86.8	83.9	83.7	80.9		
		8	9	10	11	12	13	14		
		82.9	78.6	83.5	82.4	89.7	86.8	83.9	84.4	3.5

Notes: None

PRI Construction Materials Technologies LLC 6408 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

FRSA Tile Underlayment Testing Confirms Concerns

Mike Silvers, CPRC, Silvers Systems Inc. and FRSA Director of Technical Services

In the May 2021 edition of Florida Roofing magazine, I wrote an article titled *Florida May Have a Flaw in Our Roofing Code Armor*. The article went into some detail about a possible problem with tile underlayment consisting of a nailed D226 #30 with a self-adhering underlayment applied to it. Self-adhering manufacturer's product approvals showed relatively low uplift resistance for these underlayment systems. The highest of those we found provided resistance of 45 psf with the safety factor of 2 accounted for. This means the product should have resistance of 90 psf during testing. The resistance stated in these product approvals would not meet the American Society of Civil Engineers (ASCE) 7-16 requirements in many areas of Florida.

FRSA was concerned that this prescriptive application was being used to circumvent the more restrictive ASCE 7-16 compliant requirements of the 6th Edition FRSA-TRI Florida High Wind Concrete and Clay Tile Installation Manual. The manual has prescriptive methods for two ply hot mopped systems that include greatly enhanced fastening for the #30. For all other underlayments you need a product approval that meets the resistance values for your specific job based on the tables in the manual or engineering calculations that are based on ASCE 7-16.

In order to validate our concerns, the FRSA Education and Research Foundation provided funding, donated through an endowment by Bob Ferrante, that allowed us to conduct testing to verify the actual uplift resistance of this system. We began testing at the PRI facility in Tampa in April. Four different Miami-Dade approved ASTM D226 felts and four different self-adhering membranes were tested using TAS 117B

Table 1 – TAS 117 (B) Fastener Pull-Through Resistance

Sample	Test Method	Results – Maximum Load (lbf)								
Fastener Pull-Through Resistance (lbf) 14 Specimens; 18" by 18" Test Rate @ 2in/min	TAS 117 Appendix B									
A		1	2	3	4	5	6	7	Avg.	St. Dev.
		61.7	59.0	64.7	64.4	64.3	55.5	56.4		
		8	9	10	11	12	13	14		
		62.4	66.8	61.1	56.3	56.2	57.8	60.5	60.5	3.7
B		1	2	3	4	5	6	7	Avg.	St. Dev.
		41.0	51.0	56.0	49.1	49.6	46.8	53.7		
		8	9	10	11	12	13	14		
		40.9	52.6	36.2	44.8	44.5	45.9	44.7	46.9	5.5
C		1	2	3	4	5	6	7	Avg.	St. Dev.
		42.4	41.2	52.0	48.0	45.8	52.5	48.4		
		8	9	10	11	12	13	14		
		49.3	47.6	52.0	43.2	44.7	50.2	44.3	47.2	3.7
D		1	2	3	4	5	6	7	Avg.	St. Dev.
		81.9	84.9	91.9	86.8	83.9	83.7	80.9		
		8	9	10	11	12	13	14		
		82.9	78.6	83.5	82.4	89.7	86.8	83.9	84.4	3.5

for pull-through and ASTM D1876 adhesion peel test. The best performing of each were installed on five test decks. The #30 with best pull-through resistance (Product D in Table 1) and the one offering the best surface for adhesion (Product A in Table 1) were nailed using tin tabs/caps and ring shank nails into two decks using the standard pattern of 6" o.c. at the laps and two rows at 12" o.c. staggered in the field (per RAS), with three others using 6" o.c. at the laps and three rows at 8" o.c. staggered in the field. The best performing self-adhering membrane for adhesion (Product 2 in Table 2) was then applied to the two different #30 on all five decks. Approximately thirty days later, we tested them to failure in a bell chamber. The results were even lower than we had anticipated and very concerning. Tables 1-3 will show the test results.

You can see in Table 3 (page 18), that the Passing Uplift Pressure (psf) column in yellow shows for Specimen No. 1 and 4, which have the prescriptive nailing patterns, the passing pressures are 30 psf. When you apply the required safety factor of 2, it results in a final resistance pressure of 15 psf. This is very low and confirmed our previous concerns. You can also see that with minimally enhanced fastening and, in one specimen, by taping the joints of the plywood, it doubled the resistance. But when the safety factor of 2 is applied, the 60 psf becomes 30 psf. This is still very low. These values were much lower than known values for two-ply hot mopped systems, so the next question is why?

Table 2 – ASTM D1876 T-Peel

Sample	Test Method	Results											
T-Peel Strength (lbf/in); 10 specimens; 1in x 12in; Test Rate @ 10in/min; Self adhered to anchor sheet	ASTM D1876	1	2	3	4	5	6	7	8	9	10	Avg.	St. Dev.
1 / A		1.18	1.01	1.01	1.46	0.88	0.93	0.86	0.70	0.83	0.74	0.96	0.22
1 / B		0.54	0.42	0.49	0.39	0.46	0.73	0.40	0.41	0.49	0.50	0.48	0.10
1 / C		0.36	0.26	0.37	0.35	0.35	0.36	0.32	0.45	0.35	0.48	0.37	0.06
1 / D		0.53	0.57	0.59	0.62	0.53	0.58	0.47	0.56	0.53	0.45	0.54	0.05
2 / A		1.00	1.10	1.06	1.26	1.16	1.22	0.94	0.96	0.83	1.16	1.07	0.14
3 / A		0.19	1.23	1.34	0.95	1.12	0.92	0.82	0.88	0.80	1.32	1.05	0.20
4 / A		0.40	0.35	0.45	0.41	0.55	0.41	0.41	0.47	0.52	0.40	0.44	0.06

The failure mode shown in the green column in Table 3 were fastener pull-through. The only place we experienced fastener pull out was in the backnailing where the self-adhering membrane being nailed

Table 3 – Summary of Test Results (UL 1897-12)

Specimen No.	Underlayment	Attachment	Passing Uplift Pressure	Failure Mode
1	2/A	Fastened in lap 6 in o.c. 2 rows in the field @ 12 in o.c.	30	Fastener Pull-through
2	2/A	Fastened in lap 6 in o.c. 3 rows in the field @ 8 in o.c.	45	Fastener Pull-through
3	2/A	Plywood joints taped[1] Fastened in lap 6 in o.c. 3 rows in the field @ 8 in o.c.	60	Fastener Pull-through
4	2/D	Fastened in lap 6 in o.c. 2 rows in the field @ 12 in o.c.	30	Fastener Pull-through
5	2/D	Fastened in lap 6 in o.c. 3 rows in the field @ 8 in o.c.	60	Fastener Pull-through

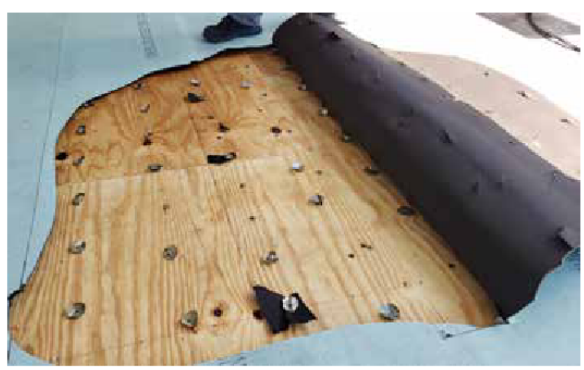
Note: 1 – Specimen #3 construction details including taping of the plywood joints with AAMA 711 compliant seam tape.

through added to the pull-through resistance. The pictures below show the bottom or underside of a tested underlayment and the fasteners that remain in the deck. Notice how the #30 felt is ripped and the tin tabs are deformed. Previously tested two-ply hot mopped underlayment failures were typically fastener pull out. So, there is clearly a difference in how the felt and tin tab interact with self-adhered versus hot mopped systems.

After a great deal of contemplation and discussion, we formed a hypothesis which I will attempt to explain. A mop is used to apply hot asphalt over a #30 and a nail/tin tag combination asphalt runs under and is applied over the tin tag. Then a second layer of compatible asphalt membrane is immediately applied. When the asphalt cools, the tin tag is sandwiched between these two asphaltic membranes creating a surrounding bond and, due to the rigidity achieved, helps to spread the fastener loading into the membranes. This bond locks the tin tag in and reinforces its resistance to tin tag deformation, as well as adding pull-through resistance to the interface. When using a self-adhering membrane, the adhesive does not solidify like asphalt, thereby leaving the tin tag #30 interface much weaker and, due to the flexible nature of the completed membranes, susceptible to single fastener loading and pull-through failure mode (see photos below).

Having a better understanding of the low resistance to uplift pressure that these prescriptive #30 and self-adhering membrane underlayments provide and why, we noted that almost all testing was done exclusively with nail/tin tag fastening. This may be one area where a stiffer cap nail may increase performance. Base sheets with better pull-through resistance and surface for better adhesion is another possibility. The vacuum chamber testing performed did not achieve high enough pressures to evaluate the adhesion properties of the self-adhering membranes. The information available leads one to believe that a D226 #30 will not achieve adequate uplift resistance to be used as the base sheet in a two-ply self-adhered system. There is evidence that with the right base sheet and fastening – a two-ply system that includes a self-adhering top layer – a compliant underlayment system can be achieved. One important concern is the relatively high cost that will come with this option.

Regardless of why these underlayments don't provide better overall resistance values, it is clear that we need to rectify the problem so that future editions of



the Florida Building Code can address the issue. The 6th Edition FRSA-TRI tile manual deals with this issue but unfortunately the Miami-Dade Roofing Application Standards (RAS) do not. The RAS are referenced in the code for use outside of the High Velocity Hurricane Zone (HVHZ Miami-Dade and Broward counties). If we can address the prescriptive underlayment methods included in the RAS, we can rectify this problem. Many contractors, when working outside of the HVHZ, use underlayment applied direct to deck. These systems provide the highest uplift resistance at a cost that is less than the prescriptive option and even more cost effective when compared to conforming two-ply systems. As many of you know, direct to deck applications and fasteners without tin caps are not permitted for use in the HVHZ. The stance on the direct to deck application exists in conflict with *RAS No. 118-20, 119-20 and 120-20 Underlayment Applications, E. Self-Adhered Underlayment (Single Ply). A single-ply underlayment system utilizing any Product approved self-adhered underlayment. The roof cover is terminated at approved metal flashings. Apply one layer of any self-adhered underlayment in compliance with the underlayment manufacturers approved/requirements.* As stated earlier, this is a cost effective way to meet the uplift resistance required by the code and should be acceptable in the HVHZ as well.

With all of this in mind, the FRSA Codes Subcommittee allowed the research project task group, which includes Manny Oyola, Eagle Roofing Products, Greg Keeler, Owens Corning and me to arrange a meeting with officials at Miami-Dade to discuss our test results and look for ways to deal with the problem. I am very happy to report that our task group met with Jorge Acebo, Jamie Gascon, Alex Tigera and Gaspar Rodriquez of Miami-Dade County in early September. FRSA appreciates their willingness to openly exchange points of view, concerns and possible solutions. It was a very productive meeting. The Miami-Dade group are currently discussing their options and we agreed to try and work together to find a good resolution. I will report on our progress in future articles. Keeping the dialogue open, building consensus and forming coalitions with other industry groups is of the upmost importance when proposing and making code changes. We will attempt to do so whenever our interests align.

FRM

Mike Silvers, CPRC is owner of Silvers Systems Inc. and is consulting with FRSA as Director of Technical Services. Mike is an FRSA Past President, Life Member and Campanella Award recipient and brings over 45 years of industry knowledge and experience to FRSA's team.

TAC: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Test Protocols

11

S10273

Date Submitted	02/12/2022	**Section**	15	**Proponent**	Gaspar Rodriguez
Chapter	1	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

On Table 15, replace FM 4471 with TAS 114, as an alternate test standard.

Rationale

Replace discontinued FM 4471 standard with equivalent TAS 114 standard.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None.
Impact to building and property owners relative to cost of compliance with code
None.
Impact to industry relative to the cost of compliance with code
Allows manufacturers to continue to use recently performed testing.
Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
Maintains current code.
Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Maintains current code.
Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities
Does not discriminate.
Does not degrade the effectiveness of the code
Maintains current code.

2nd Comment Period

S10273-G1

Proponent	Gaspar Rodriguez	Submitted	8/23/2022 8:31:19 AM	Attachments	No

Comment:

I would like to withdraw this mod, the proposed TAS substitute is hardly ever used. Therefore, to not clutter up the code we would ask it be withdrawn.

TABLE 15

TABLE 15

Product	Test	Test Standard
Structural, Nonstructural Metal Panels and Metal Shingle Roof Assemblies	Uplift Resistance	TAS 125
Structural, Nonstructural Metal Panels and Metal Shingle Roof Assemblies	Wind and Wind Driven Rain Resistance	TAS 100
Structural, Nonstructural Metal Panels and Metal Shingle Roof Assemblies	Fire Resistance	E108 (min. Class "B")
Structural, Nonstructural Metal Panels and Metal Shingle Roof Assemblies	Accelerated Weathering	G152 or G155 (2000 hours)
Structural, Nonstructural Metal Panels and Metal Shingle Roof Assemblies	Salt Spray	B117 (1000 hours)
Insulated Metal Panels	Thermal Value	C518 (report)
Nonstructural Standing SeamMetal Panels	Static Water Leakage Test[1]	~~FM 4471~~ TAS 114 Appendix G or ASTM E2140-01[2]

1.Optional test to allow minimum slope of 1:12.
2.Standing seam metal roof panel systems that pass the requirements of ~~FM 4471~~TAS 114, Appendix G or ASTM E2140-01, shall be permitted to be installed to a minimum slope of 1:12.

TAC: Structural

Total Mods for **Structural** in **Approved as Submitted : 11**

Total Mods for report: 58

Sub Code: Test Protocols

12

S9922

Date Submitted	01/18/2022	**Section**	6	**Proponent**	Aaron Phillips
Chapter	1	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

Summary of Modification

Uplift tests clarifications.

Rationale

This MOD offers several clarifications to TAS 124. Section 4.3 is changed to clarify that it provides guidance for dealing with roof replacements, not for new construction. The new subsection added to Section 6.2 clarifies the limitations associated with the Bell Chamber test, in accordance with the Section 6 title—Test Limitations and Precautions. Systems that are Approved by tests per TAS 114 Appendix D should be tested via the bonded pull test, which uses a 2’ x 2’ sample side (i.e., total of 4 square feet). The Bell Chamber test uses a 25 square foot sample size. There is no correlation in performance between the bonded pull test of TAS 114 Appendix D and the pressure chamber tests of TAS 114 Appendices C and J. The additional information added to Section 6.3.1 clarifies the limitations associated with the bonded pull test, in accordance with the Section 6 title. Specifically, it clarifies that the bonded pull test is used when all components of the roofing system are fully or partially bonded, not when only the roof covering is bonded. The roof covering may be fully adhered, but if the underlying insulation or base sheets are mechanically attached the Bell Chamber test should be used rather than the bonded pull test. Finally, deflection is neither measured nor a condition of failure in TAS 114 Appendices C and J. The addition to Section 10.1.2 and the associated new Table 3 establish specific deflection limits when conducting the Bell Chamber test. These limits are consistent with those of FM Global Property Loss Prevention Data Sheet 1-52, from which TAS 124 was derived.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Improves understanding of uplift test provisions, which should positively affect local enforcement of code.

Impact to building and property owners relative to cost of compliance with code

No cost of compliance impact is expected because the changes are simply to clarify requirements.

Impact to industry relative to the cost of compliance with code

No cost of compliance impact is expected because the changes are simply to clarify requirements.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
Improves understanding and applicability of uplift tests.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Improves understanding and applicability of uplift tests.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities
Does not discriminate. Clarifies applicability of tests.

Does not degrade the effectiveness of the code
Improves effectiveness of the code by providing better guidance for uplift tests applicability.

Alternate Language

2nd Comment Period

39922-A1

Proponent Aaron Phillips **Submitted** 7/20/2022 4:53:08 PM **Attachments** Yes

Rationale:

The original MOD did not include the units associated with the column headings in Table 3. This comment corrects that oversight. Changes from the original MOD are shown in underlined red text with yellow highlights.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The additional modification in this comment is a clarification with no impact.

Impact to building and property owners relative to cost of compliance with code

The additional modification in this comment is a clarification with no impact.

Impact to industry relative to the cost of compliance with code

The additional modification in this comment is a clarification with no impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clarifying the units will ensure evaluations in accordance with TAS 124 are interpreted correctly.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Clarifying the units will ensure evaluations in accordance with TAS 124 are interpreted correctly.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The addition of units is not discriminatory.

Does not degrade the effectiveness of the code

Associating units with the proposed test pressures and maximum deflections ensures correct interpretation of test results.

S9922-A1Text Modification

[See attached file for Text of Modification]

Mod_9922_A1_TextOfModification.pdf Page: 1

R9922

Revise TAS 124 as shown below:

Revise 4.3 to clarify it does not address new construction.

4.3 When ~~new construction will require~~ a tear off of the existing roof system assembly is required, areas of existing roofing shall be removed to deck level. Sample assemblies shall be applied including a lifting panel, as detailed in Section 5.2 when the bonded pull test procedure is utilized. Sample panels shall be covered and waterproofed with a membrane roof covering to return the existing assembly to a waterproof condition.

Add new subsection within section 6.2 (Bell chamber tests) to clarify when the bell chamber protocol is to be used. Renumber subsequent sections.

6.2.1 The Bell chamber test is appropriate when the selected roofing system has been tested in accordance with TAS 114 Appendix C or Appendix J. The Bell Chamber test is not appropriate for systems tested in accordance with TAS 114 Appendix D.

6.2.~~1~~2

6.2.~~2~~3

6.2.~~3~~4

6.2.~~4~~5

Clarify the limitations for use of the bonded pull test.

6.3.1 Testing shall only be conducted on fully adhered roof coverings and when all other roofing system components are adhered and or partially adhered. This test is not appropriate when any of the roofing system components are mechanically attached.

Provide additional guidance for deflection limits for the Bell Chamber test.

10.1.2 Any roof system assembly which exhibits an upward deflection greater than ~~or equal to~~ 1 inch (25 mm) during any of the tests shall be considered as failing at the point where 1 inch (25 mm) of deflection is recorded. Refer to Table 3 for deflection limitations.

Insert new Table 3.

Table 3 Maximum Recommended Deflection for Adhered Covers on Steel Deck Roofs Before the Sample is Considered Suspect

Test Pressure (PSF)	Maximum Deflection (in.)
60 < P < 120	½ or 0.50
120 < P < 180	¾ or 0.75
180 < P < 225	15/16 or 0.94

Note: For roof assemblies in which thin topping boards or the roof cover are adhered to a substrate immediately below using ribbons of adhesive, use a maximum deflection of 1 in. (25 mm) to determine suspect test samples.

Revise TAS 124 as shown below:

Revise 4.3 to clarify it does not address new construction.

4.3 When ~~new construction will require~~ a tear off of the existing roof system assembly is required, areas of existing roofing shall be removed to deck level. Sample assemblies shall be applied including a lifting panel, as detailed in Section 5.2 when the bonded pull test procedure is utilized. Sample panels shall be covered and waterproofed with a membrane roof covering to return the existing assembly to a waterproof condition.

Add new subsection within section 6.2 (Bell chamber tests) to clarify when the bell chamber protocol is to be used. Renumber subsequent sections.

6.2.1 The Bell chamber test is appropriate when the selected roofing system has been tested in accordance with TAS 114 Appendix C or Appendix J. The Bell Chamber test is not appropriate for systems tested in accordance with TAS 114 Appendix D.

6.2.~~1~~2

6.2.~~2~~3

6.2.~~3~~4

6.2.~~4~~5

Clarify the limitations for use of the bonded pull test.

6.3.1 Testing shall only be conducted on fully adhered roof coverings and when all other roofing system components are adhered and or partially adhered. This test is not appropriate when any of the roofing system components are mechanically attached.

Provide additional guidance for deflection limits for the Bell Chamber test.

10.1.2 Any roof system assembly which exhibits an upward deflection greater than ~~or equal to~~ 1 inch (25 mm) during any of the tests shall be considered as failing at the point where 1 inch (25 mm) of deflection is recorded. Refer to Table 3 for deflection limitations.

Insert new Table 3.

Table 3 Maximum Recommended Deflection for Adhered Covers on Steel Deck Roofs Before the Sample is Considered Suspect

Test Pressure	Maximum Deflection
60 < P < 120	½ or 0.50
120 < P < 180	¾ or 0.75
180 < P < 225	15/16 or 0.94

Note: For roof assemblies in which thin topping boards or the roof cover are adhered to a substrate immediately below using ribbons of adhesive, use a maximum deflection of 1 in. (25 mm) to determine suspect test samples.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

13

S10172

Date Submitted	02/11/2022	**Section**	202	**Proponent**	Robert Koning
Chapter	2	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

Add: Definition of Exterior Wall Covering Assembly System Methods

Rationale

These definitions and systems are historic and well established. The verbiage is derived from, Durability by Design 2nd Edition, U.S. Department of Housing and Urban Development, ASTM E 2128 Standard Guide for Evaluating Water Leakage of Building Walls, ASTM E 2266 Standard Guide for Design and Construction of Low-Rise Frame Building Wall Systems to Resist Water Intrusion, Architectural Graphical Standards, and other industry publications. Currently the code only addresses the application of Weather Resistant Barriers and ASTM C926 and 1063 (Application of Cement Based Plaster and Metal Lath respectively) which are intended for use with a concealed barrier system with a colored cementitious finish without paints or coatings (even though the ASTM documents contain an “unless otherwise specified” provision to accommodate all the other systems), accordingly, thousands of jobs are being affected by consultants and code officials who cite them as “code deficient” for cement cladding because there is only one system mentioned in the code text – and therefore only one wall method that is code compliant. This will clear up the ambiguity and provide clarity of design intent.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10172-G3

Proponent	Robert Koning	Submitted	8/26/2022 2:21:54 PM	Attachments	No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application wall covering systems and their lack of recognition in the code definitions.

1st Comment Period History

S10172-G1

Proponent	Sam Francis	Submitted	4/9/2022 11:03:46 AM	Attachments	No

Comment:

The American Wood Council submits the following comment: As written, this proposal includes extensive requirements in a definition. These requirements need to be located in Chapter 14. Requirements should never be located in a definition.

1st Comment Period History

S10172-G2

Proponent	Danko Davidovic	Submitted	4/14/2022 5:18:12 PM	Attachments	No

Comment:

I strongly approve and support the general intent to introduce the definitions of various wall assemblies and moisture management strategies into the code for various reasons (educate the audience, define and clarify various concepts for moisture management in wall assemblies). However, the proposed version is not complete and does not include some other very important water resistance strategies such as rainscreen and pressure equalization methods. Suggest to review the body of the text and include other relevant moisture control methods and ensure the terminology and definitions are consistent and in agreement with other industry standards.

Exterior Wall Covering Assembly System Methods. The design of a wall system can be described in two broad categories: barrier walls and water managed walls. A wall system may have characteristics of both a barrier wall and a drainage wall in various combinations. Every wall must have an identifiable mechanism to resist leakage, whether it is a distinct barrier material whose only function is to resist the movement of water toward the interior, or a combination of several wall elements intended to function together to provide leakage resistance. The anticipated volume of rain penetration, the method of controlling rain that penetrates, the location of a barrier within the wall assembly, the interaction of the wall components, the materials used, and the exposure of the barrier to environmental wind pressure and rain, determine how a wall is intended to function and how it is categorized. Systems are categorized as follows:

1. Drainage Wall Systems. The mechanism intended to prevent leakage in this type of wall is the control and discharge of anticipated and accepted amounts of water that penetrates the exterior surfaces.

a. Drained Cavity System. The drained cavity method relies on deflection, drainage, and drying to protect the wall from moisture damage. There are many possible variations. In general, a cavity exists to separate the cladding material from the surface of the underlying water-resistive barrier. The depth of the cavity, however, may vary. For example, siding may be placed directly on the WRB layer and still provide a cavity only restricted at points of contact (e.g., nail flanges). A minimum cavity depth of 3/8” is sometimes recommended, but often a depth of ¾” or 1 ½” is used based on the standard thickness of wood furring materials. For anchored masonry (brick) veneer, a minimum cavity depth is recommended to allow space for brick placement and mortar excesses. The drained cavity approach also can be applied to Portland cement stucco with use of a drainage mat or other appropriate means of creating a drainage cavity.

b. Concealed Barrier Drain System. The concealed barrier method relies on porous cladding material adhered to or placed directly on an internal (concealed) water barrier or drainage plane. A common example is conventional stucco applied on two layers of Grade D building paper attached to a wood-frame wall. This method also relies primarily on deflection of rainwater (like the face-sealed system) but also has limited capability to absorb moisture to later dry and to drain moisture through weeps (e.g., weep screed) at the base of the wall. However, there is no open drainage pathway to allow water to freely drain from the concealed moisture barrier.

2. Barrier Wall System. The mechanism intended to prevent leakage in this type of wall is blocking or interrupting the movement of water to the interior and are broken into two subcategories:

a. Face Sealed System. The exterior surfaces are relied upon as the only barrier. All surfaces, joints and interfaces must be sealed to provide a continuous exterior barrier, and the absorption properties of the materials must also be controlled. The materials within the wall assembly must be able to sustain occasional short-term wetting as might occur between maintenance cycles of the exterior seals or from unintended incidental water infiltration. The system can also incorporate a secondary water-resistant system in selected areas where incidental infiltration is anticipated.

b. Mass Barrier System. The thickness and properties of wall materials are relied upon to provide a barrier. The wall mass itself may absorb water, but permeation to the interior is prevented by sufficient thickness and absorption capacity, or a layer with low permeability within the wall. Examples: solid multi-wythe masonry and stone walls; masonry walls with filled collar joints.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10272

14

Date Submitted	02/12/2022	**Section**	202	**Proponent**	Robert Koning
Chapter	2	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

Add Definition Of Veranda and synonyms of same so professionals can differentiate between a roofing deck for slope, covering and other roofing system requirements.

Rationale

Rationale: Consultants, Inspectors and Plan Reviewers sometimes get confused regarding the applicable code provisions of a roof deck versus a veranda or balcony regarding roofing system applications and slope requirements. The roofing requirements for system design and slope may or may not be required for a veranda. Veranda's are frequently waterproofed with a waterproofing membrane or system and slope may or may not be required. Placing a 1/4" per foot slope (as required for a roof deck) will provide a 1" fall across a table and chairs will not seat properly. Therefore these are waterproofed using lower slope per foot requirements. Per the ACI 318 definitions: Waterproofing: Above grade, waterproofing is found wherever protection is required against the passage of liquid water from leakage, washing down or other sources. Examples are swimming pools, fountains, decks and plazas above portions of buildings, balconies, air-conditioning ponds, parking garages, malls, kitchens, showers and wet rooms of any kind. Occupied space beneath the deck must be protected from entrance of moisture.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10272-G1

Proponent Robert Koning Submitted 8/26/2022 4:04:46 PM Attachments No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application of cement plaster – both in current and historical provisions and referenced documents. I would like to impart the importance of the modification.

Veranda, or Verandah: A covered, partially covered or open deck, porch or balcony, usually extending along the outside of a building, or cantilevered floor section enclosed with a railing or balustrade when required. Entirely, or in part, open to the outdoors, unconditioned space, or atrium. Primarily planned for leisure enjoyment with minimal deck slope requirements . Common synonyms are terrace; lanai, plaza, balcony, or porch.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

15

S10388

Date Submitted	02/14/2022	**Section**	202	**Proponent**	Joseph Belcher
Chapter	2	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

2002.8 and 2003.10

Summary of Modification

Adds definitions for accessory structures and sun control structures to correlate with new provisions proposed for the design of sun control structures.

Rationale

The FBC-B does not define accessory structures that are often found in the field. The definition is the same as in the FBC-R with the addition of the word "buildings" and will allow for small accessory structures. The definition for Sun Control Structures is provided to correlate with the proposed provisions for the design of such structures.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No Impact.

Impact to building and property owners relative to cost of compliance with code

No Impact.

Impact to industry relative to the cost of compliance with code

No Impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal has a reasonable and positive impact on the health, safety, and welfare of the general public by providing a definition to correlate with proposed design criteria for sun control structures allowing for safe designs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by providing missing definitions to correlate with the proposed design criteria for sun control structures.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code and improves the effectiveness of the code.

Alternate Language

2nd Comment Period

S10388-A2

Proponent Joseph Belcher **Submitted** 8/24/2022 1:15:00 PM **Attachments** Yes

Rationale:

This alternate language proposal is to incorporate comments by the Structural TAC. Sun control structures with or without motorized louvers are becoming increasingly popular throughout the state. The lack of criteria in the code has resulted in widely varying requirements for the design of such structures. The original intent of the Mod was to provide a definition to correlate with a Mod to provide design criteria (Mod 10390). This proposed definition eliminates unnecessary language as identified by the TAC (Mr. Lavrich., P.E.) The proposal also includes the definition of Accessory Structure from the FBC-R because such structures are not defined in the FBC-B.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No fiscal impact. Jurisdictions are already reviewing plans and doing inspections. The change will provide a definition, and a correlating change will provide design criteria

Impact to building and property owners relative to cost of compliance with code

No fiscal impact. Approval could result in reduced costs where excessive provisions were applied due to the lack of definition and design criteria.

Impact to industry relative to the cost of compliance with code

No fiscal impact. Approval could result in reduced costs where designers or jurisdictions applied excessive provisions due to the lack of definition and design criteria.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal has a reasonable and positive impact on the health, safety, and welfare of the general public by providing definitions for sun control structures and accessory structures to correlate with the proposed design criteria allowing for safe designs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by providing definitions for sun control structures and accessory structures to correlate with the proposed design criteria allowing for safe designs.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the code's effectiveness and improves the code effectiveness.

1st Comment Period History

S10388-A1

Proponent Joseph Belcher **Submitted** 4/15/2022 9:42:08 PM **Attachments** Yes

Rationale:

Discussion with builders revealed that classifying Sun Control Structures relying on a host structure for support as accessory structures was problematic. The proposed alternate language clearly states that such structures relying on a host building for support are classified the same as the host.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No fiscal impact. Jurisdictions are already reviewing plans and doing inspections. The change will provide a definition and a correlating change provides design criteria. (Mod 10390)

Impact to building and property owners relative to cost of compliance with code

No fiscal impact. Approval could result in reduced costs where excessive provisions were applied due to a lack of definition and design criteria in the code.

Impact to industry relative to the cost of compliance with code

No fiscal impact. Approval could result in reduced costs where excessive provisions were applied due to a lack of definition and design criteria in the code.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal improves public safety by providing a definition for an increasingly popular structure. The definition along with design criteria provided in another proposed Mod will assure adequate design to resist wind and other loads. (Mod 10390)

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by providing a definition for an increasingly popular structure. The definition along with design criteria provided in another proposed Mod will assure adequate design to resist wind and other loads. (Mod 10390)

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposal does not discriminate.

Does not degrade the effectiveness of the code

The proposal does not degrade the code but increases its effectiveness.

2nd Comment Period

S10388-G1

Proponent	Scott McAdam	Submitted	8/24/2022 7:10:20 PM	Attachments	No

Comment:

BOAF CDC committee supports this MOD alternate language A2

202 ACCESSORY STRUCTURE. A structure that is accessory to and incidental to that of a building or *dwelling(s)* and that is located on the same *lot.*

202 Sun Control Structure. An independently supported accessory structure consisting of columns or posts supporting an open roof of girders, beams, or cross rafters with or without fixed or operational louvers serving to direct sunlight. Sun Control Structures attached to and depending on a building for support are considered the same occupancy class as the supporting building.

202 Sun Control Structure. An independently supported accessory structure consisting of parallel columns or posts supporting an open roof of girders and cross rafters with or without louvers serving to direct sunlight. Louvers may be fixed or operational. Sun Control Structures attached to and depending on a building for support are considered the same occupancy class as the supporting building.

202 ACCESSORY STRUCTURE. A structure that is accessory to and incidental to that of a building or *dwelling*(*s*) and that is located on the same *lot*.

202 Sun Control Structure. An accessory structure consisting of parallel columns or posts supporting an open roof of girders and cross rafters with louvers serving to direct sunlight. Louvers may be fixed or operational.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S9881

16

Date Submitted	01/12/2022	**Section**	1404.14	**Proponent**	Fernando Pages
Chapter	14	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

S9330

Summary of Modification

This change compliments FS134 which was been adopted through the consent agenda, with the introduction of ASTM D7793, and insulated vinyl siding into the Florida Building Code.

Rationale

This change compliments FS134 which was been adopted under the consent agenda with the introduction of ASTM D7793 and insulated vinyl siding into the IBC. The installation of vinyl siding and insulated vinyl siding are identical relative to code requirements. This proposal brings in a simple change to require insulated vinyl siding to be installed in the same manner as vinyl siding.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification has a reasonable connection with the health and welfare of the general public

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification strengthens, and provides equivalent or better products, methods, or systems of construction

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not degrade the effectiveness of the code

This modification does not degrade the effectiveness of the code

Alternate Language

2nd Comment Period

S9881-A2

Proponent Fernando Pages **Submitted** 7/28/2022 1:44:38 PM **Attachments** Yes

Rationale:

ASTM D7793 exists in the residential code under section R703.13. This modification harmonizes the building code with the residential code. The committee asked about aligning the standard with ASCE 7, which the standard will do over the next year. It should be noted that the changes to ASCE 7 do not have any direct impact on this product. There was also a question about the pressure equalization factor for insulated vinyl siding vs. vinyl siding. They are the same and the products are installed the same which is why we have asked they be referenced together in this section.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

NOne

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Adds needed refrences for insualted vinyl siding.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Adds needed refrences for insualted vinyl siding.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

DOes not discriminate.

Does not degrade the effectiveness of the code

Adds needed refrences for insualted vinyl siding.

Text of Modification, Add:

1404.14.1 Insulated Vinyl Siding.

Insulated vinyl siding conforming to the requirements of this section and complying with ASTM D7793-21 shall be permitted on *exterior walls* where the design wind pressure determined in accordance with Section 1609 does not exceed 30 pounds per square foot (1.44 kN/m^2). Where the design wind pressure exceeds 30 pounds per square foot (1.44 kN/m^2), tests or calculations indicating compliance with Chapter 16 shall be submitted. Insulated vinyl siding shall be secured to the building so as to provide weather protection for the *exterior walls* of the building.

Add:

Chapter 35 Refrenced Standards

ASTM D7793-21 Standard Specification for Insulated Vinyl Siding

1404.14Vinyl siding and Insulated Vinyl Siding.

Vinyl siding and *insulated vinyl siding* conforming to the requirements of this section and complying with ASTM D3679 and ASTM D7793, respectively, shall be permitted on *exterior walls* where the design wind pressure determined in accordance with Section 1609 does not exceed 30 pounds per square foot (1.44 kN/m^2). Where the design wind pressure exceeds 30 pounds per square foot (1.44 kN/m^2), tests or calculations indicating compliance with Chapter 16 shall be submitted. Vinyl siding and insulated vinyl siding shall be secured to the building so as to provide weather protection for the *exterior walls* of the building.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

17

S9900

Date Submitted	01/13/2022	**Section**	1405.18	**Proponent**	Fernando Pages
Chapter	14	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

Summary of Modification

This addition brings in critical installation elements for polypropylene siding.

Rationale

This addition brings in critical installation elements for polypropylene siding. Two critical applications are starter strip and utility trim, which are important to highlight as they are part of the wind performance system. In some instances, systems have been installed in high wind events incorrectly resulting in product performance failure. These are standard installation procedures for horizontal polymeric cladding. In addition, this proposal highlights the need for proper nail size, spacing uniqueness, and the need to for the installation over a proper nailable substrate.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact

Impact to building and property owners relative to cost of compliance with code

May add cost

Impact to industry relative to the cost of compliance with code

No impact

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification supports public welfare.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification strengthens the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification remains brand agnostic.

Does not degrade the effectiveness of the code

This modification does not degrade the code.

Alternate Language

2nd Comment Period

9900-A2

Proponent Fernando Pages **Submitted** 7/27/2022 12:37:20 PM **Attachments** Yes

Rationale:

Revised wording regarding fastener spacing language per TAC recommendation 27 June 2020.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

NOne

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clarifies instalation requirments for improved wind performance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the code for improved wind performance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

DOes not discriminate aaginst products or materials.

Does not degrade the effectiveness of the code

Improves the code.

2nd Comment Period

9900-A1

Proponent Fernando Pages **Submitted** 7/27/2022 7:16:13 AM **Attachments** Yes

Rationale:

Minor language change. Per TAC request on 21 June 2022, corrected language to avoid concept error implied by "install spacing of fasteners" to simply "spacing of fasteners."

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

Improve performance durring wind storm

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Improve performance durring wind storm

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improve performance durring wind storm

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No discrimination, material category no braning

Does not degrade the effectiveness of the code

Improves code

Add new text as follows:

[BS]1404.18.1Installation.

Unless otherwise specified in the approved manufacturer's instructions, *Polypropylene siding* and accessories shall be installed over and attached to wood structural panel sheathing with a minimum thickness of 7/16 inch (11.1 mm), or another nailable substrate.

[BS]1404.18.1.1Accessories.

Accessories shall be installed in accordance with the approved manufacturer's instructions.

[BS]1404.18.1.1.1Starter Strip.

Horizontal siding shall be installed with a starter strip at the initial course at any location.

[BS]1404.18.1.1.2Under Windows and Top of Walls.

Where nail hem is removed such as under windows and at top of walls, nail slot punch or predrilled holes shall be constructed.

[BS]1404.18.2Fastener requirements.
Unless otherwise specified in the approved manufacturer's instructions, nails shall be corrosion resistant, with a minimum 0.120-inch (3 mm) shank and minimum 0.313-inch (8 mm) head diameter. Nails shall be a minimum of 1 1/4 inches (32 mm) long or as necessary to penetrate sheathing or nailable substrate not less than 3/4 inch (19.1 mm). Where the nail fully penetrates the sheathing or nailable substrate, the end of the fastener shall extend not less than 1/4 inch (6.4 mm) beyond the opposite face of the sheathing or nailable substrate. The spacing of fasteners shall conform to the approved manufacturer's instructions.

Revise as follows:

[BS]1405.18Polypropylene siding.

Polypropylene siding conforming to the requirements of this section and complying with Section 1404.12 shall be limited to exterior walls of Type VB construction located in areas where the wind speed specified in Chapter 16 does not exceed 100 miles per hour (45 m/s) and the building height is less than or equal to 40 feet (12 192 mm) in Exposure C. Where construction is located in areas where the basic wind speed exceeds 100 miles per hour (45 m/s), or building heights are in excess of 40 feet (12 192 mm), tests or calculations indicating compliance with Chapter 16 shall be submitted. ~~Polypropylene siding shall be installed in accordance with the manufacturer's instructions.~~ Polypropylene siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

Add new text as follows:

[BS]1404.18.1Installation.

Unless otherwise specified in the approved manufacturer's instructions, *Polypropylene siding* and accessories shall be installed over and attached to wood structural panel sheathing with a minimum thickness of 7/16 inch (11.1 mm), or another nailable substrate.

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[BS]1404.18.1Installation.

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TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10090

18

Date Submitted	02/04/2022	**Section**	1410	**Proponent**	T Stafford
Chapter	14	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

A new stand-alone section is proposed for soffits with new language addressing common soffit materials, a prescriptive option for wood structural soffits, and fascia installation.

Rationale

The purpose of this code change proposal is to improve the high wind performance of soffits by clarifying FBCB installation requirements for the most common types of manufactured soffits and by providing a prescriptive alternative for wood structural panel soffits that comply with design wind pressures specified in the Florida Building Code and ASCE 7. This proposal is consistent with a very similar proposal that was approved for the 2020 Florida Building Code, Residential (See Section R704). One notable addition is new requirements for the installation of fascias. Currently the code does not provide specific instructions for the installation of fascia at the eaves and rakes. This is an area the code needs to address, as it has been identified as a point of weakness for failure during wind events. Examples from FEMA MAT reports include: Hurricane Harvey: See Section 4.1.4: “Being the leading edge of the roof system, soffits and fascia are particularly vulnerable to high winds.” Hurricane Irma: Multiple observations of fascia failure that appeared to initiate soffit and roof covering damage. The requirements are based on results of recent testing by the Vinyl Siding Institute (VSI). For lower design wind pressures, aluminum fascia can be installed with one fastener at the leg with a 1” or more coverage at the drip edge. For higher design wind pressures, fascia will be required to have two fasteners, at the face and leg, or the use of utility trim and punch locks at drip edge is permitted. The following is a link to the report from VSI: https://www.vinylsiding.org/wp-content/uploads/2022/01/m9254.01-109-40-r0.pdf The same requirements for fascias are being proposed for the FBCR. Additionally, similar code changes are being proposed for the IBC and IRC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposal will impact local entities relative to enforcement of the code. New requirements for fascias are being proposed.

Impact to building and property owners relative to cost of compliance with code

This proposal will impact to building and property owners relative to the cost of compliance with the code. New requirements are being proposed for fascias which will result in an increase in cost.

Impact to industry relative to the cost of compliance with code

This proposal will impact to industry relative to the cost of compliance with the code. New requirements are being proposed for fascias which will result in an increase in cost.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal clarifies wind requirements for soffits and adds new requirements for fascias which should result in improved performance and reduced water infiltration during design wind events.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal strengthens the code by clarifying wind requirements for soffits and adding new requirements for fascias which should result in improved performance and reduced water infiltration during design wind events.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This proposal does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

S10090-A1

Proponent	T Stafford	**Submitted**	8/24/2022 7:03:56 PM	**Attachments**	Yes

Rationale:

This public comment corrects several errors in the original proposal and revises the fascia installation requirements based on a new analysis. The types of fasteners specified for the various soffit panel materials in the original proposal have been. This public comment primarily refers to the manufacturer's product approval for fastener types. Additionally, the language has been revised to more closely match the provisions in the FBCR for soffits that was approved last code cycle. The representative figures have been replaced with new figures that also more closely match the figures in the FBCR. Lastly, the fascia installation requirements have been revised based on a new analysis by Tim Reinhold. Industry was concerned that the fastener schedule required in the face of the fascia in the original modification would have resulted in significant "oil-canning" due to thermal expansion and contraction. The proposed criteria in this public comment are the result of this new engineering analysis. This public comment included input and support from VSI, AAF, and FHBA. FHBA is submitting an alternate language public comment to Modification 9851 that is consistent with this public comment for fascia installation.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to the cost of compliance with code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to the cost of compliance with code.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This intent of this public comment is to improve the performance of soffits during high wind events.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This public comment strengthens the code improving the wind and water intrusion resistance of soffits.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This public comment does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This public comment does not degrade the effectiveness of the code.

1st Comment Period History

S10090-G1

Proponent	Sam Francis	Submitted	4/9/2022 10:43:23 AM	Attachments	No

Comment:

The American Wood Council submits the following comment: It seems the proponent’s intent is to require design for all soffit material by reference to 1410.2, which describes the design criteria. The subsequent sections list minimum prescriptive requirements for various materials, even though 1410.2 requires design. Why require minimum thicknesses if the soffit is to be designed? Also, why permit the use of T-nails because head pull through is usually very low and unclear if there is a design procedure to check. The new language should state to check head pull through for fasteners.

Replace Mod 10090 with the following:

Revise as follows:

1401.1 Scope. The provisions of this chapter shall establish the minimum requirements for exterior walls; *exterior wall* coverings; *exterior wall* openings; exterior windows and doors; exterior soffits and fascias; architectural *trim*; balconies and similar projections; and bay and oriel windows.

1403.3 ~~Structural~~ Wind resistance. *Exterior walls*, exterior wall coverings, exterior soffits and fascias, and the associated openings, shall be designed and constructed to resist safely the superimposed loads required by Chapter 16.

Add new text as follows:

1405.1.1 Soffits and fascias. Soffits and fascias installed at roof overhangs shall comply with Section 1410.

Add new text as follows:

SECTION 1410

SOFFITS AND FASCIAS AT ROOF OVERHANGS.

1410.1 General. Soffits and fascias at roof overhangs shall be designed and constructed in accordance with the applicable provisions of this section.

1410.2 General wind requirements. Soffits and fascias shall be capable of resisting the component and cladding loads for walls determined in accordance with Chapter 16 using an effective wind area of 10 square feet (0.93 m^2).

1410.3 Vinyl and aluminum soffit panels. Vinyl and aluminum soffit panels shall comply with Section 1410.2 and shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component in accordance with Figure 1410.3.1(1). Where the unsupported span of soffit panels is greater than 12 inches (406 mm), intermediate nailing strips shall be provided in accordance with Figure 1410.3.1(2) unless a larger span is permitted in accordance with the manufacturer's product approval specification and limitations of use.Vinyl andaluminum soffit panels shall be installedinaccordance withthe manufacturer'sproduct approval specification and limitations of use. Fastenersshall becorrosion resistant. Fascias shall comply with Section 1410.7 and the manufacturer'sproduct approval specification and limitations of use.

(See below for image)

FIGURE 1410.3(1)

TYPICAL SINGLE-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

(See below for image)

FIGURE 1410.3(2)

TYPICAL MULTI-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

1410.4 Fiber-cement soffit panels. Fiber-cement soffit panels shall comply with Section 1410.2 and shall be a minimum of 1/4 inch (6.4 mm) in thickness and comply with the requirements of ASTM C1186, Type A, minimum Grade II, or ISO 8336, Category A, minimum Class 2. Panel joints shall occur over framing or over wood structural panel sheathing. Soffit panels shall be installed with spans and fasteners in accordance with the manufacturer's product approval specification and limitations of use. Fasteners shall be corrosion resistant.

1410.5 Hardboard soffit panels. Hardboard soffit panels shall comply with Section 1410.2 and shall be not less than 7/16 inch (11.11 mm) in thickness and fastened to framing or nailing strips to meet the required design wind pressures. Where the design wind pressure is 30 and less, hardboard soffit panels are permitted to be attached to wood framing with 2 1/2-inch by 0.113-inch (64 mm by 2.9 mm) siding nails spaced not more than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports. Where the design wind pressure is greater than 30 psf, hardboard soffit panels shall be installed in accordance with the manufacturer's product approval specification and limitations of use. Fasteners shall be corrosion resistant.

1410.6 Wood structural panel soffit. Wood structural panel soffits shall comply with Section 1410.2 and shall have a minimum panel performance category of 3/8. Fasteners shall be corrosion resistant. Alternatively, wood structural panel soffits are permitted to attached to wood framing in accordance with Table 1410.6.

TABLE 1410.6

PRESCRIPTIVE ALTERNATE FOR WOOD STRUCTURAL PANEL SOFFIT[b,c,d,e]

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MAXIMUM DESIGN PRESSURE (- or + psf)	MINIMUM PANEL SPAN RATING	MINIMUM PANEL PERFORMANCE CATEGORY	NAIL TYPE AND SIZE (inches)	FASTENER[a] SPACING ALONG EDGES AND INTERMEDIATE SUPPORTS (inches	
				GALVANIZED STEEL	STAINLESS STEEL
30	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	6[f]	4
40	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	6	4
50	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	4	4
			8d common (2 ½ x 0.131 x 0.281 head diameter)	6	6
60	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	4	3
			8d common (2 ½ x 0.131 x 0.281 head diameter)	6	4
70	24/16	7/16	8d common (2 ½ x 0.131 x 0.281 head diameter)	4	4
			10d box (3 x 0.128 x 0.312 head diameter)	6	4
80	24/16	7/16	8d common (2 ½ x 0.131 x 0.281 head diameter)	4	4
			10d box (3 x 0.128 x 0.312 head diameter)	6	4
90	32/16	15/32	8d common (2 ½ x 0.131 x 0.281 head diameter)	4	3
			10d box (3 x 0.128 x 0.312 head diameter)	6	4

a. Fasteners shall comply with Section 1410.6.

b. Maximum spacing of soffit framing members shall not exceed 24 inches.

c. Wood structural panels shall be of an exterior exposure grade.

d. Wood structural panels shall be installed with strength axis perpendicular to supports with a minimum of two continuous spans.

e. Wood structural panels shall be attached to soffit framing members with specific gravity of at least 0.42. Framing members shall be minimum 2x3 nominal with the larger dimension in the cross section aligning with the length of fasteners to provide sufficient embedment depths.

f. Spacing at intermediate supports is permitted to be 12 inches on center.

1410.7 Aluminum Fascia. Aluminum fascia shall have a minimum thickness of 0.019 inches and be installed per the manufacturer's instructions and this code. Fasteners shall be aluminum or stainless steel. Aluminum fascia shall be attached in accordance with Section 1410.7.1, 1410.7.2 or 1410.7.3. The drip edge shall comply with 1507.2.9.3, and the thickness of the drip edge shall be in accordance with Table 1503.2.

1410.7.1 Fascia installation where the design wind pressure is 30 psf or less. Where the design wind pressure is 30 pounds per square foot (1.44kPA) or less, aluminum fascia shall be attached as follows:

1. Finish nails shall be provided in the return leg (1 ¼" x 0.057" x 0.177" head diameter) spaced a maximum of 24 inches (610 mm) on center, and

2. The fascia shall be inserted under the drip edge with not less than half the height of the drip edge or 1.0 inch (25 mm), whichever is greater, of the fascia material covered by the drip edge. One finish nail shall be centered in the face of the fascia from each end of the fascia material section located no more than 1 inch below the drip edge.

1410.7.2 Fascia installation where the design wind pressure exceeds 30 psf but is 60 psf or less. Where the design wind pressure exceeds 30 pounds per square foot but is 60 pounds per square foot (2.88kPA) or less, aluminum fascia shall be attached in accordance with Section 1410.7.2.1 or Section 1410.7.2.2.

1410.7.2.1. Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is less than or equal to 6.5 inches (165 mm) or less, aluminum fascia shall be attached as follows:

1. Finish nails shall be provided in the return leg (1 ¼" x 0.057" x 0.177" head diameter) spaced a maximum of 24 inches (610 mm) on center.

2. The fascia shall be inserted under the drip edge with not less than half the height of the drip edge or 1.0 inch (25 mm), whichever is greater, of the fascia material covered by the drip edge. One finish nail shall be centered in the face of the fascia from each end of the fascia material section located no more than 1 inch below the drip edge.

1410.7.2.2 Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is greater than 6.5 inches (165 mm), the top edge of the fascia shall be secured using utility trim installed beneath the drip edge with snap locks punched into the fascia spaced no more than 6 inches on center.

1410.7.3 Fascia installation where the design wind pressure exceeds 60 psf. Where the design wind pressure is greater than 60 pounds per square foot (2.88kPA), aluminum fascia shall be attached in accordance with Section 1410.7.3.1 or Section 1410.7.3.2.

1410.7.3.1. Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is less than or equal to 4.5 inches (114 mm) or less aluminum fascia shall be attached as follows:

1. Finish nails shall be provided in the return leg (1 ¼" x 0.057" x 0.177" head diameter) spaced a maximum of 16 inches on center, and

2. The fascia shall be inserted under the drip edge with not less than half the height of the drip edge or 1.0 inch (25 mm), whichever is greater, of the fascia material covered by the drip edge. One finish nail shall be centered in the face of the fascia from each end of the fascia material section located no more than 1 inch below the drip edge.

1410.7.3.2 Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is greater than 4.5 inches (114 mm), the top edge of the fascia shall be secured using utility trim installed beneath the drip edge with snap locks punched into the fascia spaced no more than 6 inches on center.

1410.7.4 Corners on Hip Roofs. Fascia shall be bent around corners and extend at least 12 inches beyond the corner. The next fascia material section shall overlap the extension a minimum of 3” and be fastened through the return leg at the overlap.

1410.7.5 Corners on Gable Roofs. Fascia shall be wrapped (tabbed) around and extend at least 1 inch beyond the corner. The gable fascia material section shall overlap the tab and be fastened through the fascia cover and the tab at the end with two face nails (1 ¼" x 0.057" x 0.177" head diameter) for a 2x4-inch sub fascia and three face nails for 2x6-inch and greater sub fascia.

(renumber existing Section 1410 as Section 1411)

Text of Mod 10090-A1

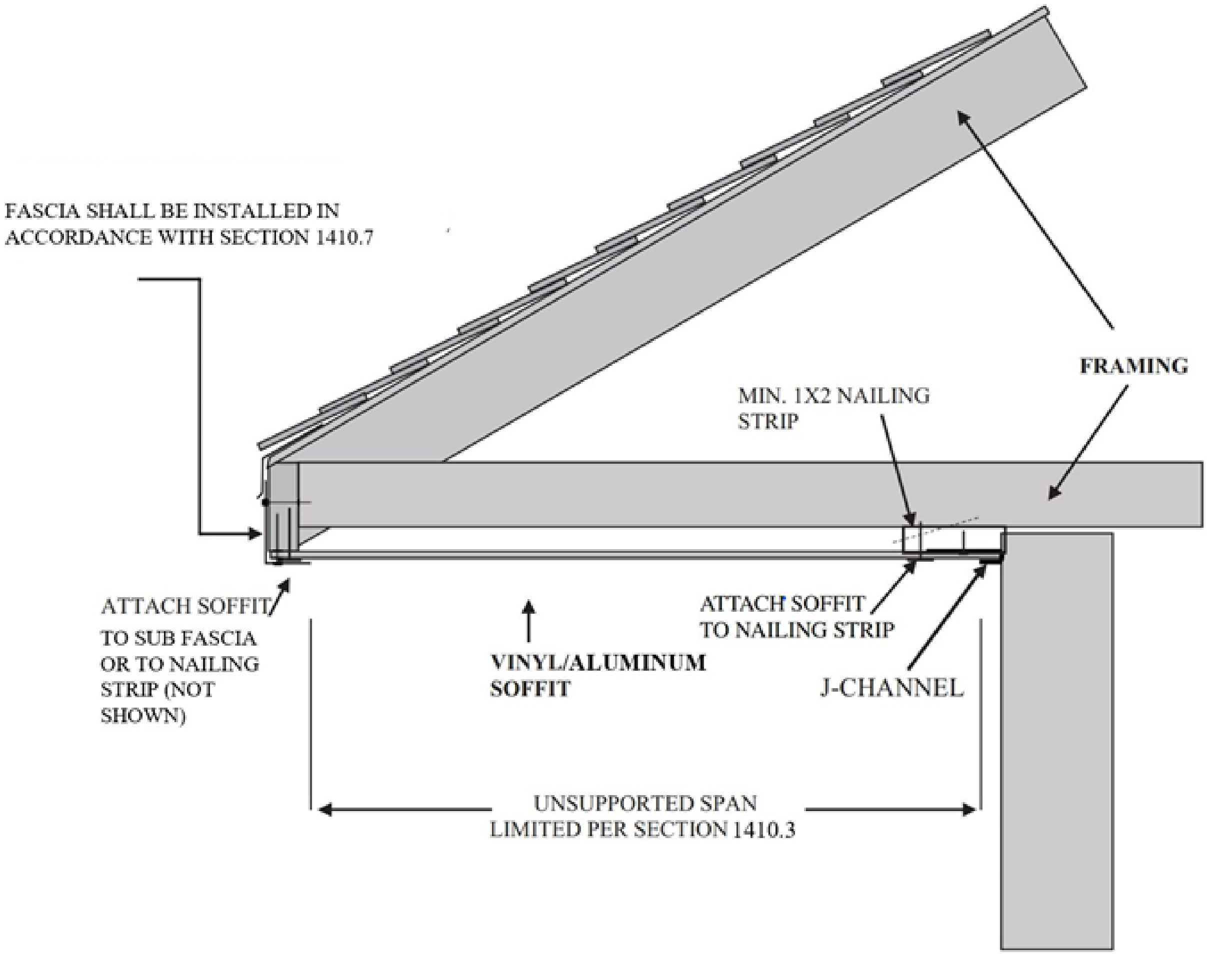

Figure 1410.3(1)

Typical Single-Span Vinyl or Aluminum Soffit Panel Support

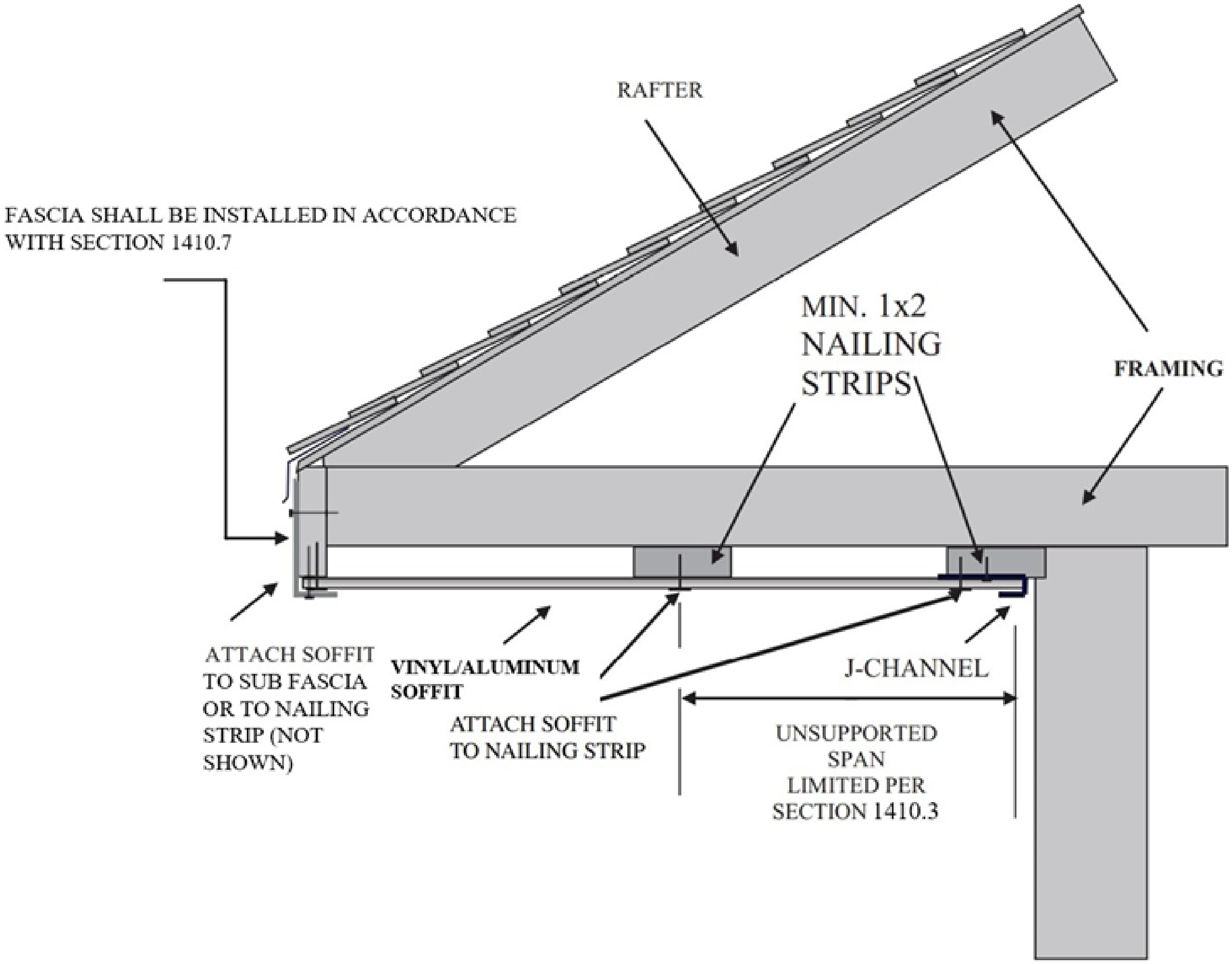

Figure 1410.3(2)

Typical Multi-Span Vinyl or Aluminum Soffit Panel Support

Text of Mod S10090

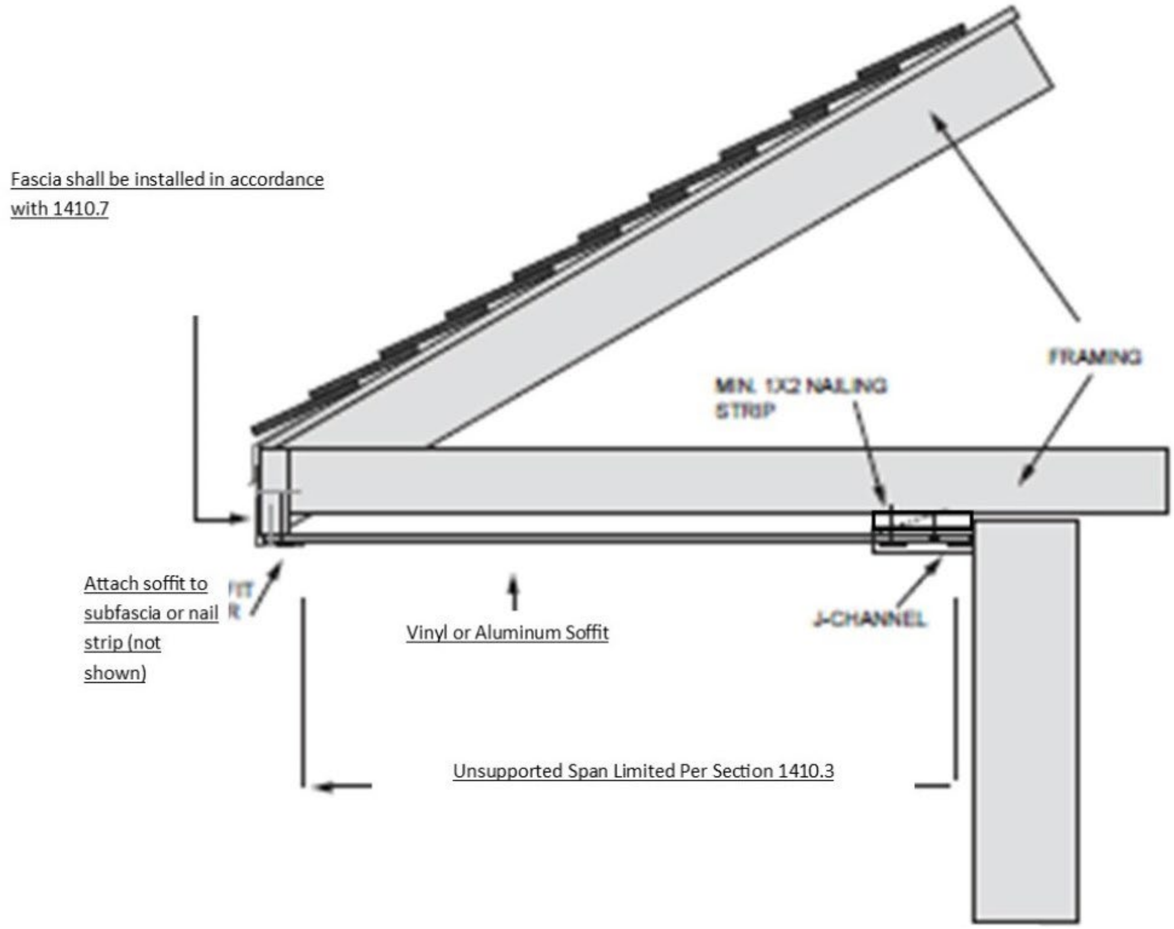

Figure 1410.3(1)

Single-Span Vinyl or Aluminum Soffit Panel Support

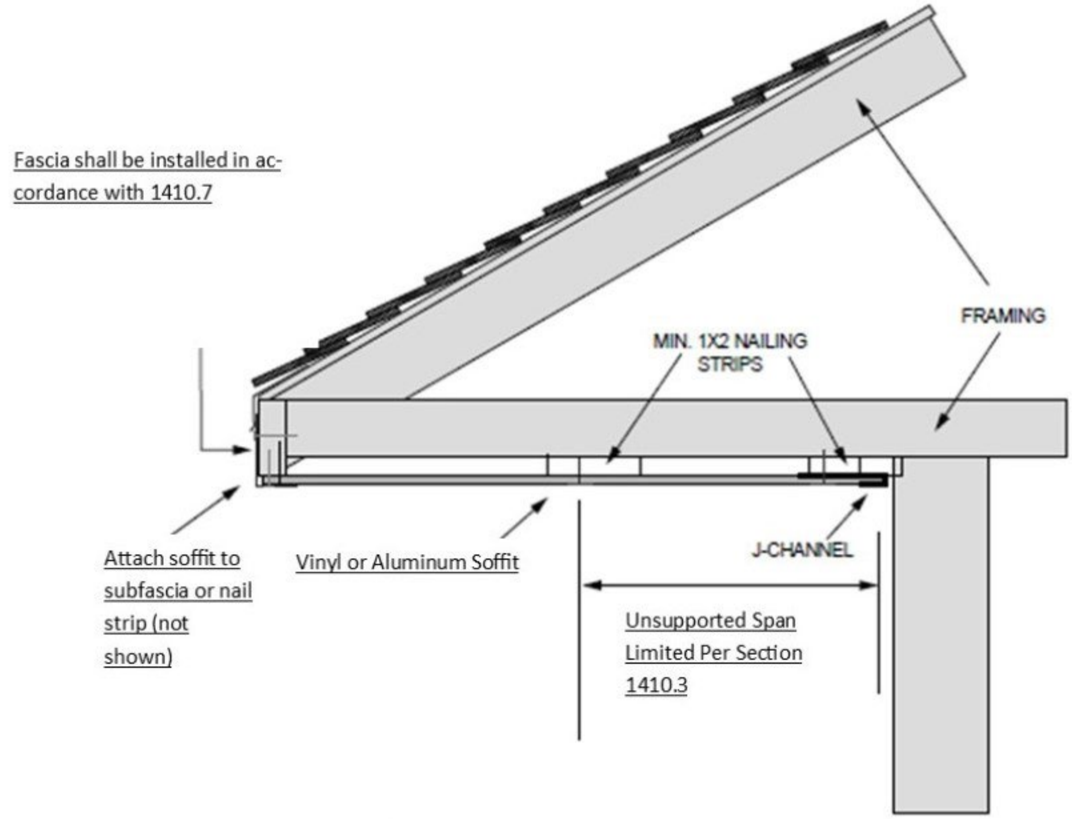

Figure 1410.3(2)

Double-Span Vinyl or Aluminum Soffit Panel Support

Revise as follows:

1401.1 Scope. The provisions of this chapter shall establish the minimum requirements for exterior walls; *exterior wall* coverings; *exterior wall* openings; exterior windows and doors; exterior soffits and fascias; architectural *trim*; balconies and similar projections; and bay and oriel windows.

1403.3 ~~Structural~~ Wind resistance. *Exterior walls*, exterior wall coverings, exterior soffits and fascias, and the associated openings, shall be designed and constructed to resist safely the superimposed loads required by Chapter 16.

Add new text as follows:

1405.1.1 Soffits and fascias. Soffits and fascias installed at roof overhangs shall comply with Section 1410.

Add new text as follows:

SECTION 1410

SOFFITS AND FASCIAS AT ROOF OVERHANGS.

-

1410.1 General. Soffits and fascias at roof overhangs shall be designed and constructed in accordance with the applicable provisions of this section.

-

1410.2 General wind requirements. Soffits and fascias shall be capable of resisting the component and cladding loads for walls determined in accordance with Chapter 16 using an effective wind area of 10 square feet (0.93 m^2).

1410.3 Vinyl and aluminum soffit panels. Vinyl and aluminum soffit panels shall comply with Section 1410.2 and shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component in accordance with Figure 1410.3.1(1). Where the unsupported span of soffit panels is greater than 12 inches (406 mm), intermediate nailing strips shall be provided in accordance with Figure 1410.3.1(2). Vinyl and aluminum soffit panels shall be installed in accordance with the manufacturer's installation instructions. Fasteners shall be aluminum, galvanized, stainless steel or rust preventative coated nails or staples or other approved corrosion-resistant fasteners. Nails shall be T-head, modified round head, or round head with smooth or deformed shanks. Staples, where permitted, shall have a minimum crown width of 7/16 inch (11.1 mm) outside diameter and be manufactured of minimum 16-gage wire.

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FIGURE 1410.3(1)

SINGLE-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

FIGURE 1410.3(2)

DOUBLE-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

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1410.4 Fiber-cement soffit panels. Fiber-cement soffit panels shall comply with Section 1410.2 and shall be a minimum of 1/4 inch (6.4 mm) in thickness and comply with the requirements of ASTM C1186, Type A, minimum Grade II, or ISO 8336, Category A, minimum Class 2. Panel joints shall occur over framing or over wood structural panel sheathing. Soffit panels shall be installed with spans and fasteners in accordance with the manufacturer's installation instructions. Fasteners shall be aluminum, galvanized, stainless steel or rust preventative coated nails or other approved corrosion-resistant fasteners. Nails shall be T-head, modifiedround head, or round head with smooth or deformed shanks.

-

1410.5 Hardboard soffit panels. Hardboard soffit panels shall comply with Section 1410.2 and shall be not less than 7/16 inch (11.11 mm) in thickness and fastened to framing or nailing strips to meet the required design wind pressures. Where the design wind pressure is 30 and less, hardboard soffit panels are permitted to be attached to wood framing with 2 1/2-inch by 0.113-inch (64 mm by 2.9 mm) siding nails spaced not more than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports. Fasteners shall be aluminum, galvanized, stainless steel or rust preventative coated nails or other approved corrosion-resistant fasteners. Nails shall be T-head, modified round head, or round head with smooth or deformed shanks.

-

1410.6 Wood structural panel soffit. Wood structural panel soffits shall comply with Section 1410.2 and shall have minimum panel performance category of 3/8. Fasteners shall be aluminum, galvanized, stainless steel or rust preventative coated nails or other approved corrosion-resistant fasteners. Nails shall be T-head, modified round head, or round head with smooth or deformed shanks. Alternatively, wood structural panel soffits are permitted to attached to wood framing in accordance with Table 1410.6.

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TABLE 1410.6

PRESCRIPTIVE ALTERNATE FOR WOOD STRUCTURAL PANEL SOFFIT[b,c,d,e]

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MAXIMUM DESIGN PRESSURE (- or + psf)	MINIMUM PANEL SPAN RATING	MINIMUM PANEL PERFORMANCE CATEGORY	NAIL TYPE AND SIZE (inches)	FASTENER[a] SPACING ALONG EDGES AND INTERMEDIATE SUPPORTS (inches	
				GALVANIZED STEEL	STAINLESS STEEL
30	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	6[f]	4
40	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	6	4
50	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	4	4
			8d common (2 ½ x 0.131 x 0.281 head diameter)	6	6
60	24/0	3/8	6d box (2 x 0.099 x 0.266 head diameter)	4	3
			8d common (2 ½ x 0.131 x 0.281 head diameter)	6	4
70	24/16	7/16	8d common (2 ½ x 0.131 x 0.281 head diameter)	4	4
			10d box (3 x 0.128 x 0.312 head diameter)	6	4
80	24/16	7/16	8d common (2 ½ x 0.131 x 0.281 head diameter)	4	4
			10d box (3 x 0.128 x 0.312 head diameter)	6	4
90	32/16	15/32	8d common (2 ½ x 0.131 x 0.281 head diameter)	4	3
			10d box (3 x 0.128 x 0.312 head diameter)	6	4

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a. Fasteners shall comply with Section 1410.6.

b. Maximum spacing of soffit framing members shall not exceed 24 inches.

c. Wood structural panels shall be of an exterior exposure grade.

d. Wood structural panels shall be installed with strength axis perpendicular to supports with a minimum of two continuous spans.

e. Wood structural panels shall be attached to soffit framing members with specific gravity of at least 0.42. Framing members shall be minimum 2x3 nominal with the larger dimension in the cross section aligning with the length of fasteners to provide sufficient embedment depths.

f. Spacing at intermediate supports is permitted to be 12 inches on center.

-

1410.7 Aluminum Fascia. Aluminum fascia shall comply with Section 1410.2 and shall be a minimum of 0.019 inches and installed in accordance with manufacturer's installation instructions. Fasteners shall be aluminum, galvanized, stainless steel or rust preventative coated nails or other approved corrosion-resistant fasteners. Aluminum fascia shall be attached to wood frame construction in accordance with Section 1410.7.1 or 1410.7.2.

-

1410.7.1 Fascia installation where the design wind pressure is 30 psf or less. Where the design wind pressure is 30 pounds per square foot (1.44kPA) or less, aluminum fascia shall be attached with one finish nail (1 ¼ x 0.057 x 0.177 head diameter) in the return leg spaced a maximum of 24 inches (610 mm) on center, and the fascia shall be inserted under the drip edge with at least 1 inch (305 mm) of fascia material covered by the drip edge. Where the fascia cannot be inserted under the drip edge, the top edge of the fascia shall be secured using one finish nail (1 ¼ x 0.057 x 0.177 head diameter) located not more than 1 inch below the drip edge and spaced a maximum of 24 inches on center.

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1410.7.2 Fascia installation where the design wind pressure exceeds 30 psf. Where the design wind pressure is greater than 30 pounds per square foot (1.44kPA), aluminum fascia shall be attached with one finish nail (1 ¼ x 0.057 x 0.177 head diameter) in the return leg spaced a maximum of 16 inches on center and one finish nail located no more than 1 inch below the drip edge spaced a maximum of 16 inches on center. As an alternative, the top edge of the fascia is permitted to be secured using utility trim installed beneath the drip edge with snap locks punched into the fascia spaced no more than 6 inches on center.

(renumber existing Section 1410 as Section 1411)

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10280

19

Date Submitted	02/12/2022	**Section**	1405.2	**Proponent**	Robert Koning
Chapter	14	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

Adds text to convey the existing limitations of Table 1405.2

Rationale

Rationale: Table 1405.2 is for a complete prescriptive wall covering without engineering and was not intended for higher wind regions. Stucco listed at 0.875" is for a stuccoed wall over open framing without any backing – a common practice for lower wind regions. Likewise, Vinyl siding at 0.035 is allowed as a complete wall covering in lower wind regions, etc. This additional text will clear up the need for required engineering or testing for all wall coverings in high wind regions and be in conformance with required load compliance provisions of Chapter 16.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

Alternate Language

2nd Comment Period

S10280-A1

Proponent Robert Koning **Submitted** 8/25/2022 3:43:55 PM **Attachments** Yes

Rationale:

Rationale: Table 1405.2 is for a complete prescriptive wall covering without engineering and was not intended for higher wind regions. Stucco listed at 0.875” is for a stuccoed wall over open framing without any backing – a common practice for lower wind regions. Likewise, Vinyl siding at 0.035 is allowed as a complete wall covering in lower wind regions, etc. This additional text will clear up the need for required engineering or testing for all wall coverings in high wind regions and be in conformance with required load compliance provisions of Chapter 16. Alternate text of "claddings" was inserted and "assemblies" was deleted after comment which found the word assemblies too broad.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, improves understanding

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No

Does not degrade the effectiveness of the code

No

1st Comment Period History

S10280-G1

Proponent Sam Francis Submitted 4/9/2022 10:40:37 AM Attachments No

Comment:

The American Wood Council offers this comment: The section pertains to weather protection, but the new language relates to the exterior wall assembly. Intent is unclear whether the wall covering is to be designed or whether the exterior wall assembly is to be designed. We believe it is the former, but use of "assembly" in the new language is confusing.

Add to 1405.2 Weather Protection:
1405.2Weather protection.
Exterior walls shall provide weather protection for the building. The materials of the minimum nominal thickness specified in Table 1405.2 shall be acceptable as approved weather coverings. Where the windspeed is greater than 115 Vult, ~~assemblies~~ claddings listed in Table 1405.2 must be of adequate strength to resist the wind loads for cladding specified in Chapter 16.

1405.2Weather protection.

Exterior walls shall provide weather protection for the building. The materials of the minimum nominal thickness specified in Table 1405.2 shall be acceptable as approved weather coverings. <u>Where the windspeed is greater than 115 Vult, assemblies listed in Table 1405.2 must be of adequate strength to resist the wind loads for cladding specified in Chapter 16.</u>

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10065

20

Date Submitted	02/14/2022	**Section**	1609	**Proponent**	T Stafford
Chapter	16	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

This proposal updates the code for correlation with the new tornado design requirements in ASCE 7-16

Rationale

This proposal is a coordination proposal with Modification 9957 that updates ASCE 7 from the 2016 edition to the 2022 edition (ASCE 7-22). This proposal updates the code for consistency with the new tornado design requirements in ASCE 7-22. See uploaded rationale. Also see the concurrent proposal submitted to ICC with additional background on the development of tornado loads in ASCE 7 and impacts to the design of buildings and other structures.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposal will impact local entities relative to enforcement of the code. Local entities will have to become familiar with tornado design requirements in ASCE 7-22.

Impact to building and property owners relative to cost of compliance with code

This proposal will impact building and property owners relative to cost of compliance with the code. Tornado design may control for some buildings in some parts of Florida.

Impact to industry relative to the cost of compliance with code

This proposal will impact industry relative to cost of compliance with the code. Tornado design may control for some buildings in some parts of Florida.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification incorporates the latest knowledge and research on the determination of design wind loads on buildings and structures through the update to the 2022 Edition of ASCE 7.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification strengthens the code by updating to the latest edition of the standard that has been the basis for the determination of wind loads on buildings and structures since the inception of the Florida Building Code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against any other material, product, method, or system of construction.

Does not degrade the effectiveness of the code

The modification does not degrade the effectiveness of the code. The effectiveness of the code is enhanced by adopting the latest methods and design procedures for designing buildings for wind loads.

Alternate Language

2nd Comment Period

S10065-A1

Proponent T Stafford **Submitted** 7/25/2022 8:12:10 AM **Attachments** Yes

Rationale:

This alternate language comment responds to a request by the TAC to incorporate the wording recommended in General Comment G1. It does not change any of the technical requirements of the original modification. This comment simply changes the phrase "Where tornado loads are required" to "Where design for tornado loads is required" in Sections 1609.6.1, 1609.6.3.1, and 1605.1.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entity relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to cost of compliance with the code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to cost of compliance with the code.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This alternate language modification makes the code more clear.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by making the language more clear.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This alternate language modification does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities .

Does not degrade the effectiveness of the code

This alternate language modification does not degrade the effectiveness of the code.

2nd Comment Period

S10065-G2

Proponent Michael Fox Submitted 8/16/2022 4:07:37 PM Attachments No

Comment:

Recommend Denial. 1) ASCE 7-22 is proposed to have Tornado Wind Speed Maps that can be referenced IF necessary 2) Risk Category III & IV Wind Speed Maps should suffice 3) ?? Remove Seismic & Snow Loads, but then, Add Tornado Loads ??

1st Comment Period History

S10065-G1

Proponent Sam Francis Submitted 4/14/2022 1:42:29 PM Attachments No

Comment:

The American Wood Council makes the following comment to this proposal: Three occurrences which read: "Where tornado loads are required…" should say "Where design for tornado loads is required…." Otherwise, we have no problems with this proposal.

Replace the original Mod in its entirety with the following:

Add new text as follows:

1609.5 Tornado Loads. The design and construction of Risk Category III and IV buildings and other structures shall be in accordance with Chapter 32 of ASCE 7, except as modified by this code.

(renumber remaining sections)

Revise as follows:

1609.~~5~~6.1 Roof deck. The roof deck shall be designed to withstand the wind pressures determined in accordance with ASCE 7. Where design for tornado loads is required, the roof deck shall be designed to withstand the greater of wind pressures or tornado pressures determined in accordance with ASCE 7.

1609.6.3.1 Tornado loads. Where design for tornado loads is required, tornado loads on rigid tile roof coverings shall be determined in accordance with Section 1609.6.3.1, replacing q_h with q_{hT} and (GC_p) with $K_{vT}(GC_p)$ in Equation 16-18, where:

q_{hT} = tornado velocity pressure, psf (kN/m) determined in accordance with Section 32.10 of ASCE 7.

K_{vT} = tornado pressure coefficient adjustment factor for vertical winds, determined in accordance with Section 32.14 of ASCE 7.

Add new text as follows:

1620.7 Tornado Loads. The design and construction of Risk Category III and IV buildings and other structures shall be in accordance with Chapter 32 of ASCE 7.

Add new notation as follows:

SECTION 1602

NOTATIONS

V_T = Tornado speed, miles per hour (mph) (m/s) determined from Chapter 32 of ASCE 7.

(no change to remaining notations)

Revise as follows:

1603.1.4 Wind design data. The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force-resisting system of the structure:

1. Ultimate design wind speed, V_{ult}, (3-second gust), miles per hour (km/hr), tornado speed, V_T (mph) and nominal design wind speed, V_{asd}, (mph) as determined in accordance with Section 1609.3.1.

2. *Risk category*.

3. Effective plan area, A_e, for tornado design in accordance with Chapter 32 of ASCE 7.

4 ~~3~~. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.

5 ~~4~~. Applicable internal pressure coefficients and applicable tornado internal pressure coefficients.

6 ~~5~~. Design wind pressures and their applicable zones with dimensions to be used for exterior component and cladding materials not specifically designed by the *registered design professional* responsible for the design of the structure, psf (kN/m^2). Where design for tornado loads is required, the design pressures shown shall be the maximum of wind or tornado pressures.

Revise as follows:

1605.1 General. Buildings and other structures and portions thereof shall be designed to resist the Strength Load Combinations specified in ASCE 7 Section 2.3, the Allowable Stress Design Load Combinations specified in ASCE 7 Section 2.4, or the Alternative Allowable Stress Design Load Combinations of Section 1605.2.

Exceptions:

1. The modifications to Load Combinations of ASCE 7 Section 2.3, ASCE 7 Section 2.4, and Section 1605.2 specified in ASCE 7 Chapter 18 and 19 shall apply.

2. When the Allowable Stress Design Load Combinations of ASCE 7 Section 2.4 are used, flat roof snow loads of 30 psf (1.44kN/m^2) and roof live loads of 30 psf (1.44 kN/m^2) or less need not be combined with seismic load. Where flat roof snow loads exceed 30 psf (1.44kN/m^2), 20 percent shall be combined with seismic loads.

3. Where Allowable Stress Design Load Combinations of ASCE 7 Section 2.4 are used, crane hook loads need not be combined with roof live loads or with more than three-fourths of the snow load or one-half of the wind loads.

4. Where design for tornado loads is required, the alternative allowable stress design load combinations of Section 1605.2 shall not apply where tornado loads govern the design.

Revise as follows:

1607.12 Roof loads. The structural supports of roofs and marquees shall be designed to resist wind and, where applicable, tornado, snow and earthquake loads, in addition to the dead load of construction and the appropriate live loads as prescribed in this section, or as set forth in Table 1607.1. The live loads acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

1607.12.4 Awnings and canopies. Awnings and canopies shall be designed for uniform live loads as required in Table 1607.1 as well as for snow loads and wind and tornado loads as specified in Sections 1608 and 1609.

Revise as follows:

SECTION 202

DEFINITIONS

ESSENTIAL FACILITIES. Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from *flood*, wind, tornado, snow or earthquakes.

NOMINAL LOADS. The magnitudes of the *loads* specified in Chapter 16 (dead, live, soil, wind, tornadoes, snow, rain, *flood* and earthquake).

RISK CATEGORY. A categorization of buildings and other structures for determination of *flood*, wind, tornado, snow, ice and earthquake *loads* based on the risk associated with unacceptable performance.

Add new text as follows:

1609.5 Tornado Loads. The design and construction of Risk Category III and IV buildings and other structures shall be in accordance with Chapter 32 of ASCE 7, except as modified by this code.

(renumber remaining sections)

Revise as follows:

1609.~~5~~6.1 Roof deck. The roof deck shall be designed to withstand the wind pressures determined in accordance with ASCE 7. Where tornado loads are required, the roof deck shall be designed to withstand the greater of wind pressures or tornado pressures determined in accordance with ASCE 7.

1609.6.3.1 Tornado loads. Where tornado loads are required, tornado loads on rigid tile roof coverings shall be determined in accordance with Section 1609.6.3.1, replacing q_h with q_{hT} and (GC_p) with $K_{vT}(GC_p)$ in Equation 16-18, where:

q_{hT} = tornado velocity pressure, psf (kN/m) determined in accordance with Section 32.10 of ASCE 7.

K_{vT} = tornado pressure coefficient adjustment factor for vertical winds, determined in accordance with Section 32.14 of ASCE 7.

Add new text as follows:

1620.7 Tornado Loads. The design and construction of Risk Category III and IV buildings and other structures shall be in accordance with Chapter 32 of ASCE 7.

Add new notation as follows:

SECTION 1602

NOTATIONS

V_T = Tornado speed, miles per hour (mph) (m/s) determined from Chapter 32 of ASCE 7.

(no change to remaining notations)

Revise as follows:

1603.1.4 Wind design data. The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force-resisting system of the structure:

1. Ultimate design wind speed, V_{ult}, (3-second gust), miles per hour (km/hr), tornado speed, V_T (mph) and nominal design wind speed, V_{asd}, (mph) as determined in accordance with Section 1609.3.1.

2. *Risk category*.

3. Effective plan area, A_e, for tornado design in accordance with Chapter 32 of ASCE 7.

4 ~~3~~. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.

5 ~~4~~. Applicable internal pressure coefficients and applicable tornado internal pressure coefficients.

6 ~~5~~. Design wind pressures and their applicable zones with dimensions to be used for exterior component and cladding materials not specifically designed by the *registered design professional* responsible for the design of the structure, psf (kN/m^2). Where design for tornado loads is required, the design pressures shown shall be the maximum of wind or tornado pressures.

Revise as follows:

1605.1 General. Buildings and other structures and portions thereof shall be designed to resist the Strength Load Combinations specified in ASCE 7 Section 2.3, the Allowable Stress Design Load Combinations specified in ASCE 7 Section 2.4, or the Alternative Allowable Stress Design Load Combinations of Section 1605.2.

Exceptions:

1. The modifications to Load Combinations of ASCE 7 Section 2.3, ASCE 7 Section 2.4, and Section 1605.2 specified in ASCE 7 Chapter 18 and 19 shall apply.

2. When the Allowable Stress Design Load Combinations of ASCE 7 Section 2.4 are used, flat roof snow loads of 30 psf (1.44kN/m^2) and roof live loads of 30 psf (1.44 kN/m^2) or less need not be combined with seismic load. Where flat roof snow loads exceed 30 psf (1.44kN/m^2), 20 percent shall be combined with seismic loads.

3. Where Allowable Stress Design Load Combinations of ASCE 7 Section 2.4 are used, crane hook loads need not be combined with roof live loads or with more than three-fourths of the snow load or one-half of the wind loads.

4. Where tornado loads are required, the alternative allowable stress design load combinations of Section 1605.2 shall not apply where tornado loads govern the design.

Revise as follows:

1607.12 Roof loads. The structural supports of roofs and marquees shall be designed to resist wind and, where applicable, tornado, snow and earthquake loads, in addition to the dead load of construction and the appropriate live loads as prescribed in this section, or as set forth in Table 1607.1. The live loads acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

1607.12.4 Awnings and canopies. Awnings and canopies shall be designed for uniform live loads as required in Table 1607.1 as well as for snow loads and wind and tornado loads as specified in Sections 1608 and 1609.

Revise as follows:

SECTION 202

DEFINITIONS

ESSENTIAL FACILITIES. Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from *flood*, wind, tornado, snow or earthquakes.

NOMINAL LOADS. The magnitudes of the *loads* specified in Chapter 16 (dead, live, soil, wind, tornadoes, snow, rain, *flood* and earthquake).

RISK CATEGORY. A categorization of buildings and other structures for determination of *flood*, wind, tornado, snow, ice and earthquake *loads* based on the risk associated with unacceptable performance.

Wind-2 (8176)

IBC: CHAPTER 2, SECTION 202, CHAPTER 16, SECTION 1602, 1602.1, SECTION 1603, 1603.1.4, SECTION 1605, 1605.1, SECTION 1607, 1607.14, 1607.14.3, SECTION 1609, 1609.5 (New), 1609.5, 1609.5.1, 1609.5.2, 1609.6.3 (New), 1609.5.3, 1609.6.3.2 (New), CHAPTER 23, SECTION 2308, 2308.2.3

Proponents: Jennifer Goupil, representing Structural Engineering Institute of ASCE (jgoupil@asce.org); Marc Levitan, National Institute of Standards and Technology, representing NIST (marc.levitan@nist.gov); Pataya Scott, representing Federal Emergency Management Agency (pataya.scott@fema.dhs.gov)

2021 International Building Code

CHAPTER 2
DEFINITIONS

SECTION 202
DEFINITIONS

Revise as follows:

[BS] NOMINAL LOADS. The magnitudes of the *loads* specified in Chapter 16 (dead, live, soil, wind, tornado, snow, rain, *flood* and earthquake).

[BS] ESSENTIAL FACILITIES. Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from *flood*, wind, tornadoes, snow or earthquakes.

[BS] RISK CATEGORY. A categorization of buildings and *other structures* for determination of *flood*, wind, tornado, snow, ice and earthquake *loads* based on the risk associated with unacceptable performance.

CHAPTER 16
STRUCTURAL DESIGN

SECTION 1602
NOTATIONS

Revise as follows:

1602.1 Notations. The following notations are used in this chapter:

D	=	Dead load.
D_i	=	Weight of ice in accordance with Chapter 10 of ASCE 7.
E	=	Combined effect of horizontal and vertical earthquake induced forces as defined in Section 12.4 of ASCE 7.
F	=	Load due to fluids with well-defined pressures and maximum heights.
F_a	=	Flood load in accordance with Chapter 5 of ASCE 7.
H	=	Load due to lateral earth pressures, ground water pressure or pressure of bulk materials.
L	=	Live load.
L_r	=	Roof live load.
R	=	Rain load.
S	=	Snow load.
T	=	Cumulative effects of self-straining load forces and effects.
V_{asd}	=	Allowable stress design wind speed, miles per hour (mph) (km/hr) where applicable.
V	=	Basic design wind speeds, miles per hour (mph) (km/hr) determined from Figures 1609.3(1) through 1609.3(12) or ASCE 7.
V_T	=	Tornado speed, miles per hour (mph) (m/s) determined from Chapter 32 of ASCE 7.
W	=	Load due to wind pressure.
W_i	=	Wind-on-ice in accordance with Chapter 10 of ASCE 7.

SECTION 1603

CONSTRUCTION DOCUMENTS

Revise as follows:

1603.1.4 Wind and tornado design data. The following information related to wind and tornado *loads* shall be shown, regardless of whether wind or tornado *loads* govern the design of the lateral force-resisting system of the structure:

1. Basic ~~design~~ *wind speed*, *V* (mph), tornado speed, V_T (mph), ~~miles per hour~~ and *allowable stress design wind speed*, V_{asd} (mph), as determined in accordance with Section 1609.3.1.
2. *Risk category*.
3. Effective plan area, A_e, for tornado design in accordance with Chapter 32 of ASCE 7.
4. ~~3.~~ 4. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
5. ~~4.~~ 5. Applicable internal pressure coefficients, and applicable tornado internal pressure coefficients.
6. ~~5.~~ 6. Design wind pressures and their applicable zones with dimensions to be used for exterior component and cladding materials not specifically designed by the *registered design professional* responsible for the design of the structure, pounds per square foot (kN/m^2). Where design for tornado loads is required, the design pressures shown shall be the maximum of wind or tornado pressures.

SECTION 1605
LOAD COMBINATIONS

Revise as follows:

1605.1 General. Buildings and *other structures* and portions thereof shall be designed to resist the strength load combinations specified in ASCE 7, Section 2.3, the *allowable stress design* load combinations specified in ASCE 7, Section 2.4, or the alternative *allowable stress design* load combinations of Section 1605.2.

Exceptions:

1. The modifications to load combinations of ASCE 7 Section 2.3, ASCE 7 Section 2.4, and Section 1605.2 specified in ASCE 7 Chapters 18 and 19 shall apply.
2. Where the allowable stress design load combinations of ASCE 7 Section 2.4 are used, flat roof snow *loads* of 30 pounds per square foot (1.44 kN/m^2) and *roof live loads* of 30 pounds per square foot (1.44 kN/m^2) or less need not be combined with seismic load. Where flat roof snow *loads* exceed 30 pounds per square foot (1.44 kN/m^2), 20 percent shall be combined with seismic loads.
3. Where the allowable stress design load combinations of ASCE 7 Section 2.4 are used, crane hook loads need not be combined with *roof live loads* or with more than three-fourths of the snow load or one-half of the wind loads.
4. Where tornado loads are required, the alternative *allowable stress design* load combinations of Section 1605.2 shall not apply when tornado loads govern the design.

SECTION 1607
LIVE LOADS

Revise as follows:

1607.14 Roof loads. The structural supports of roofs and *marquees* shall be designed to resist wind and, where applicable, tornado and snow and earthquake *loads*, in addition to the *dead load* of construction and the appropriate *live loads* as prescribed in this section, or as set forth in Table 1607.1. The *live loads* acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

1607.14.3 Awnings and canopies. *Awnings* and canopies shall be designed for uniform *live loads* as required in Table 1607.1 as well as for snow *loads* and wind and tornado *loads* as specified in Sections 1608 and 1609.

SECTION 1609
WIND LOADS

Add new text as follows:

1609.5 Tornado Loads. The design and construction of *Risk Category* III and IV buildings and *other structures* located in the tornado-prone region as shown in Figure 1609.5 shall be in accordance with Chapter 32 of ASCE 7, except as modified by this code.

FIGURE 1609.5 TORNADO-PRONE REGION

Revise as follows:

1609.~~5~~ 6 Roof systems. Roof systems shall be designed and constructed in accordance with Sections 1609.~~5~~ 6.1 through 1609.~~5~~ 6.3, as applicable.

1609.~~5~~ 6.1 Roof deck. The *roof deck* shall be designed to withstand the greater of wind pressures or tornado pressures determined in accordance with ASCE 7.

1609.~~5~~ 6.2 Roof coverings. *Roof coverings* shall comply with Section 1609.~~5~~ 6.1.

> **Exception:** Rigid tile *roof coverings* that are air permeable and installed over a *roof deck* complying with Section 1609.~~5~~ 6.1 are permitted to be designed in accordance with Section 1609.~~5~~ 6.3.

Asphalt shingles installed over a *roof deck* complying with Section 1609.~~5~~ 6.1 shall comply with the wind-resistance requirements of Section 1504.2 .

1609.~~5~~ 6.3 Rigid Tile . Wind and tornado loads on rigid tiles shall comply with Sections 1609.6.3.1 or 1609.6.3.2, as applicable.

1609.6.3.1 Wind Loads.

1609.5.3 Rigid tile. Wind *loads* on rigid tile *roof coverings* shall be determined in accordance with the following equation:

$$M_a = q_h C_L b L L_a [1.0 - GC_p]$$ **(Equation 16-18**

For SI:

where:

b = Exposed width, feet (mm) of the roof tile.

C_L = Lift coefficient. The lift coefficient for concrete and clay tile shall be 0.2 or shall be determined by test in accordance with Section 1504.3.1.

GC_p = Roof pressure coefficient for each applicable roof zone determined from Chapter 30 of ASCE 7. Roof coefficients shall not be adjusted for internal pressure.

L = Length, feet (mm) of the roof tile.

L_a = Moment arm, feet (mm) from the axis of rotation to the point of uplift on the roof tile. The point of uplift shall be taken at 0.76L from the head of the tile and the middle of the exposed width. For roof tiles with nails or screws (with or without a tail clip), the axis of rotation shall be taken as the head of the tile for direct deck application or as the top edge of the batten for battened applications. For roof tiles fastened only by a nail or screw along the side of the tile, the axis of rotation shall be determined by testing. For roof tiles installed with battens and fastened only by a clip near the tail of the tile, the moment arm shall be determined about the top edge of the batten with consideration given for the point of rotation of the tiles based on straight bond or broken bond and the tile profile.

M_a = Aerodynamic uplift moment, feet-pounds (N-mm) acting to raise the tail of the tile.

q_h = Wind velocity pressure, psf (kN/m^2) determined from Section 26.10.2 of ASCE 7.

Concrete and clay roof tiles complying with the following limitations shall be designed to withstand the aerodynamic uplift moment as determined by this section.

1. The roof tiles shall be either loose laid on battens, mechanically fastened, *mortar* set or adhesive set.
2. The roof tiles shall be installed on solid sheathing that has been designed as components and cladding.
3. An *underlayment* shall be installed in accordance with Chapter 15.
4. The tile shall be single lapped interlocking with a minimum head lap of not less than 2 inches (51 mm).
5. The length of the tile shall be between 1.0 and 1.75 feet (305 mm and 533 mm).
6. The exposed width of the tile shall be between 0.67 and 1.25 feet (204 mm and 381 mm).
7. The maximum thickness of the tail of the tile shall not exceed 1.3 inches (33 mm).
8. Roof tiles using *mortar* set or adhesive set systems shall have not less than two-thirds of the tile's area free of *mortar* or adhesive contact.

Add new text as follows:

1609.6.3.2 Tornado Loads. Tornado loads on rigid tile roof coverings shall be determined in accordance with Section 1609.6.3.1, replacing q_h with q_{hT} and (GC_p) with $K_{vT}(GC_p)$ in Equation 16-18, where:
q_{hT} = tornado velocity pressure, psf (kN/m^2) determined in accordance with Section 32.10 of ASCE 7.

K_{vT} = tornado pressure coefficient adjustment factor for vertical winds, determined in accordance with Section 32.14 of ASCE 7.

CHAPTER 23
WOOD

SECTION 2308
CONVENTIONAL LIGHT-FRAME CONSTRUCTION

Revise as follows:

2308.2.3 Allowable loads. *Loads* shall be in accordance with Chapter 16 and shall not exceed the following:

1. Average *dead loads* shall not exceed 15 psf (718 N/m^2) for combined roof and ceiling, *exterior walls*, floors and partitions.

   Exceptions:

   1. Subject to the limitations of Section 2308.6.10, stone or masonry *veneer* up to the less of 5 inches (127 mm) thick or 50 pounds per square foot (2395 N/m^2) and installed in accordance with Chapter 14 is permitted to a height of 30 feet (9144 mm) above a noncombustible foundation, with an additional 8 feet (2439) permitted for *gable* ends.
   2. Concrete or masonry fireplaces, heaters and chimneys shall be permitted in accordance with the provisions of this code.

2. *Live loads* shall not exceed 40 psf (1916 N/m^2) for floors.

   Exception: *Live loads* for concrete slab-on-ground floors in *Risk Categories* I and II shall be not more than 125 psf.

3. Ground snow *loads* shall not exceed 50 psf (2395 N/m^2).
4. Tornado loads on the main wind force resisting system and all components and cladding shall not exceed the corresponding wind loads on these same elements

Reason: This proposal is a coordination proposal to bring the 2024 IBC up to date with the provisions of the 2022 edition of ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7-22). ASCE 7 will be updated to the 2022 edition from the 2016 edition as an Administrative update in the 2024 I-Codes.
This proposal includes technical updates as well as editorial coordination. The specific changes to each section included in this proposal is outlined below, and a detailed summary of the technical updates are explained below that:

Section 202 Definitions: Updates to **Nominal Loads**, **Essential Facilities**, and **Risk Category** to include tornadoes.

Section 1602.1 Notations: Add new term V_T for tornado speeds.

Section 1603.1.4 Wind design data: Modifies section to include tornado speed and applicable internal pressures to be included on the construction drawings.

Section 1605.1 General: Adds new Exception 4 to exclude the use of the Alternative allowable stress design load combinations in Section 1605.2 when tornado loads govern the design.

Section 1607.14 Roof loads; Section 1607.14.3 Awnings and canopies: Modifies section to include tornado.

Section 1609.5 Tornado Loads: Added new section for charging language for tornado loads as well as a new **Figure 1609.5 Tornado Prone Region** to determine where tornado loads must be considered, per ASCE 7-22 Chapter 32.

Section 1609.5 Roof systems: This is to update the section number to 1609.6 after adding the new section 1609.5 for Tornado loads.

Section 1609.5.1 Roof deck: This updates to the new section number of 1609.6.1 and clarifies the requirement to be the greater of wind or tornado pressures for roof deck design.

Section 1609.5.2 Roof coverings: This updates the new section number 1609.6.2 as well as updates the pointers to the new section numbers.

Section 1609.5.3 Rigid Tile: This updates to the new section number of 1609.6.3 as well as adds new section **1609.6.3.1 Wind loads** and **1609.6.3.2 Tornado loads** to differentiate the requirements for wind and tornado. Also the new section 1609.6.3.2 for tornado loads clarifies the terms to be used in Equation 16-18 as well as adds pointers to ASCE 7 Chapter 32. [NOTE TO EVERYONE: cdpAccess would not permit me to strikeout the redundant "Section 1609.5.3 Rigid Tile" following the new section "Section 1609.6.3.1 Wind Loads" shown in the PDF of this proposal. My intention is to strike out "~~Section 1609.5.3 Rigid Tile~~" but cannot in cdpAccess at the time of this submittal.]

Section 2308.2.3 Allowable loads: This adds a requirement that allowable loads for conventional light-frame construction shall not be used on any portion of the design where tornado loads govern. This is written to specifically address only the portions of the design - specific to each element - where the loads are governed by tornado loads and does not intend to exclude the rest of the project that is not governed by tornado loads.

TECHNCIAL REASON STATEMENT:

Overview

Tornado hazards have not previously been considered in the design of conventional buildings, despite the fact that tornadoes and tornadic storms cause more fatalities than hurricanes and earthquakes combined (NIST 2014) and more catastrophe insured losses than hurricanes and tropical storms combined (Insurance Information Institute 2021). This gap is addressed for the first time in ASCE 7-22, which now includes requirements for tornado loads. The tornado hazard maps and load methodology are based on a decade of research and development led by the National Institute of Standards and Technology (NIST), in collaboration with ASCE, following the record 2011 tornado season (1,691 tornadoes causing 553 fatalities). ASCE 7-22 requirements for tornado loads apply to Risk Category III and IV buildings and other structures sited in the tornado-prone region, which is approximately equal to the area of the U.S. east of the Continental Divide.

The tornado loads specified in the new Chapter 32 provide reasonable consistency with the reliability delivered by the existing criteria in ASCE 7 Chapters 26 and 27 for the Main Wind Force Resisting System (MWFRS), using the same return periods as the basic wind speed maps in Chapter 26 for Risk Category III and IV facilities (1,700 and 3,000 years, respectively). At return periods of 300 and 700 years (used for wind speeds with Risk Category I and II structures), tornado speeds are generally so low that tornado loads will not control over Chapter 26 wind loads. Therefore, design for tornadoes is not required for Risk Category I and II buildings and other structures.

ASCE 7-22 tornado design speeds for Risk Category III and IV structures range from 60 to 138 mph, depending on geographic location, Risk Category, and effective plan area (which is a function of the building footprint size and shape). This approximately corresponds to the speeds for Enhanced Fujita Scale EF0- EF2 tornadoes, which are not the most intense tornadoes but they are the most common. During the period from 1995 to 2016, over 89% of all reported tornadoes were EF0-EF1, and 97% were in the range of EF0-EF2. Furthermore, most of the area impacted by a tornado does not experience the maximum winds speeds on which the tornado is rated. For example, in the 2011 EF-5 tornado that damaged or destroyed approximately 8,000 buildings in Joplin, Missouri, an estimated 72% of the area swept by the tornado experienced EF0-EF2 winds, while just 28% experienced EF3 and greater winds (NIST 2014). It should also be noted that while property losses per individual tornado increase dramatically with increasing EF number, the aggregate losses caused by all EF1 tornadoes are very similar in magnitude to aggregate losses for all EF2s, for all EF3s, for all EF4s, and for all EF5s (NIST 2014). This is due to the fact that there are so many more lower-intensity tornadoes; e.g., only 59 of the nearly 66,000 recorded tornadoes since 1950 have been rated as EF-5.

To make it very clear that the ASCE 7 tornado provisions are not intended to provide protection from the most violent tornadoes, a large User Note on the first page of the Tornado Load chapter advises readers as follows:

Options for protection of life and property from more intense tornadoes include construction of a storm shelter and/or design for longer-return-period tornado speeds as provided in Appendix G, including performance-based design. A building or other structure designed for tornado loads determined exclusively in accordance with Chapter 32 cannot be designated as a storm shelter without meeting additional critical requirements provided in the applicable building code and ICC 500, the ICC/NSSA Standard for the Design and Construction of Storm Shelters. See Commentary

Section C32.1.1 for an in-depth discussion on storm shelters. (ASCE 7-22 Section 32.1.1)

The referenced commentary section explains that life safety protection against the most violent tornadoes requires a tornado shelter that meets the *ICC 500 Standard for Design and Construction of Storm Shelters* (ICC 2020), or a tornado safe room meeting FEMA P-361 guidelines (FEMA 2021; note that Safe Rooms must meet all ICC 500 requirements plus additional FEMA Funding Criteria). Tornado hazard criteria for ICC 500 and FEMA P-361 are much more stringent than ASCE 7, reflecting the purpose to provide 'near-absolute life safety protection' as described by FEMA (2021). For example, the tornado shelter design speed in the central US is 250 mph. This compares to ASCE 7 speeds of 78-124 mph for Risk Category III and 95-138 mph for Risk Category IV, where the lower and upper values in the ranges correspond to 1 ft^2 and 4 million ft^2 effective plan areas, respectively.

Tornado Hazards

Among the many reasons that building codes and standards have not previously required design for tornado hazards is the misperception that tornadoes are too rare. As seen in Figure 1, in recent decades there have been an average of 1,251 *reported* tornadoes per year. The apparent smaller numbers of tornadoes from the 1950s through the early 1990s is primarily due to reporting issues, before there were doppler radar networks, cell phones, and trained spotter networks. Even today, many tornadoes in areas of low population density go unreported, in a well-known effect called *population bias*. There are less tornadoes per square mile per year recorded in very rural areas compared to suburban and urban areas in the same region of the country. The average annual frequency of tornadoes per state is shown in Figure 2, with the majority of tornadoes occurring in the Central and Southeast states.

Although the peak months for tornado activity in the US are in the spring, tornadoes can and do occur year-round. The end of 2021 yielded a record-setting December. The "Quad-State Tornado Outbreak" on December 10-11 spawned 68 tornadoes across 10 states, including two that tracked for more than 100 miles. This outbreak caused 90 confirmed fatalities. "The total damages and economic losses resulting from the historic tornado outbreak that impacted multiple states from the South to the Midwest could amount to $18 billion, which would make it the costliest tornado outbreak in U.S. history," (AccuWeather 2021). The day after AccuWeather published that loss estimate, a derecho over the upper Midwest on December 15-16 caused another outbreak of 94 tornadoes. December yielded a total of 193 tornadoes across the Midwest and Southeast, including 42 EF-0, 96 EF-1, 42 EF-2, 6 EF-3, and 2 EF-4 tornadoes, with 5 more rated as unknown intensity (Figure 3).

While tornadoes have been recorded in all 50 states, the overwhelming majority occur east of the Continental Divide as seen in Figure 4. Even from this raw data, it is apparent why the tornado prone-region is east of the Rocky Mountains. The most intense tornadoes, shown in the darker colors, generally occur in the Central US, except near the Gulf Coast. Similarly, there are fewer intense tornadoes along the Atlantic Coast states. The coastal states have a large number of lower intensity tornadoes, many of them generated by hurricanes. In comparison, the Mountain and Western States experience relatively few tornadoes, and almost no strong (EF2-EF3) or violent (EF4-EF5) tornadoes.

Tornadoes can vary significantly in size. Path lengths range from as short as tens of yards to over a hundred miles. December's Quad-State Tornado tracked 166 miles across Arkansas, Missouri, Tennessee and Kentucky over the span of 4 hours. It was the 9th longest tornado on record (the longest being 219 miles). Path widths vary from around 10 yards to over a mile. The widest tornado on record occurred in El Reno, Oklahoma in 2013, with a maximum path width of 2.6 miles. The average path length for the December 2021 tornadoes was 8.8 miles, while the average maximum path width was 184 yards (Figure 3).

It is clear from the climatology that tornadoes are not rare events. For example, Oklahoma City has been struck by at least 141 tornadoes since 1940, for an average of nearly 2 per year (NWS 2022a). Another way to understand how frequent tornadoes actually are is to consider them from a building impacts perspective. Mining of event and episode narratives from NOAA's National Centers for Environmental Information (NCEI) Storm Events Database from 1993-2020 indicated at least 647 reports of schools being struck by tornadoes. Figure 5 shows the number of preK-12 schools per state that were struck by tornadoes. This average of more than 23 schools per year is a lower bound. The purpose of the Storm Events Database narratives is not to document school impacts per se, but rather summarize key features of storm and its overall impacts. Schools are often mentioned, but this is by no means a complete data source for school strikes. Review of other databases, post-storm reports, news searches, and other sources of information revealed many additional schools that were struck by tornadoes during this time period.

One recent example school impact: in a terrible way to ring in the new year, Veterans Memorial Middle School in Covington, Georgia was struck by an EF-1 tornado on December 31, 2021 (Figure 6). According to the National Weather Service, which conducted its assessment on New Year's Day, structural damage was observed at the school (NWS 2022b). "The tornado reached peak intensity of 90 mph as it hit Veterans Middle School removing significant amounts of siding and roofing from the gymnasium and sections of roof."

Tornado Load Provisions

The commentary chapter C32 of ASCE 7-22 provides descriptions and references supporting the development and application of the tornado load provisions. A brief summary is provided below.

Introduction. The tornado hazard maps and load methodology were developed over the course of a decade of R&D by the National Institute of

Standards and Technology, working closely with Applied Research Associates, Inc. and ASCE. The ASCE 7 tornado load provisions were developed by the ASCE 7 Tornado Task Committee in cooperation with the ASCE 7 Wind Load and Load Combinations Subcommittees. Three workshops were held (two at ASCE headquarters, in September 2015 and May 2019) in support of the tornado hazard map development. A broad range of stakeholders were informed about the detailed plans for map development at the first two workshops and advised on the details of the final methodology and draft maps at the last workshop. Stakeholder feedback from all workshops was incorporated into the final tornado hazard maps and load methodology.

Incorporation of Tornado Loads in ASCE 7. Tornado load are treated completely separately from wind loads, hence their inclusion in a new chapter. While tornadoes are a type of windstorm, there are significantly different characteristics between tornadoes and other windstorms. For instance, tornadic winds have significant updrafts near the core; rapid atmospheric pressure changes can induce loads; and load combinations including tornado loads are not always the same as those including other wind loads (e.g., tornadoes are warm weather phenomena, so snow loads would not be included in combination with tornado loads). As a result of these considerations, tornado loads are treated separately from wind loads, not as a subset of wind loads. This is analogous to the separate treatment of flood loads and tsunami loads; both are hydrodynamic loads on buildings, but the nature of the hazard and the hazard-structure interaction is different enough that they are considered as completely separate loads.

Tornado Load Procedures. The tornado load procedures are based on the overall framework of the ASCE 7 wind load procedures. Tornado velocity pressure and design pressure/design load equations are similar to those found in Chapters 26-31 (exclusive of Chapter 28 Envelope Procedure, where the underlying methodology is incompatible with the tornado load approach). However, most of the terms used in the tornado load equations have some differences compared to their wind load counterparts, reflecting the unique characteristics of tornadic winds and wind-structure interaction in contrast to straight-line winds. Several wind load parameters are not used in the tornado load chapter, while Chapter 32 also introduces a few new and significantly revised parameters.

Tornado Hazard Maps. Critical to development of the entire tornado load methodology was creation of a new generation of tornado hazard maps. The R&D needed to create these maps broke new ground in a number of areas. For example, novel approaches to quantify the well-known problems of population bias (where more tornadoes are reported in areas having greater population) and to capture regional variation in tornado climate were developed and applied. Tornado wind speeds associated with the Enhanced Fujita (EF) Scale intensity ratings were derived through engineering analysis instead of relying on the original EF Scale methodology, which was based on expert elicitation. The tornado hazard maps take spatial effects into account (since larger buildings are more likely to be struck by a tornado, tornado wind speeds increase with increasing plan (i.e., footprint) area of the building). These efforts resulted in a set of state-of-the-art probabilistic tornado hazard maps prescribing tornado design wind speeds for a wide range of return periods and target building plan area sizes, enabling tornado-resistant design of conventional buildings and infrastructure, including essential facilities.

The mapped tornado speeds represent the maximum 3-s gust produced by the translating tornado at a height of 33 ft anywhere within the plan area of the target building. The design tornado speeds for Risk Category III and IV buildings (for 1,700- and 3,000-year return periods, respectively) typically range from EF0-EF2 intensity, depending on geographic location, Risk Category, and plan size and shape. For protection from more violent tornadoes, performance-based design is explicitly allowed, and commentary on additional design requirements for storm shelters is provided. An appendix is included with tornado speeds for longer return periods. At return periods of 300 and 700 years, tornado speeds are generally so low that tornado loads will not control over Ch. 26 wind loads, hence design for tornadoes is not required for Risk Category I and II buildings and other structures.

Tornado Velocity Pressure. While the effects of terrain and topography on tornado wind speed profiles are not yet well understood, a review of near-surface tornadic wind measurements from mobile research radar platforms plus numerical and experimental simulations consistently showed wind speed profiles with greater horizontal wind speeds closer to the ground than aloft. The tornado velocity pressure profile (K_{zTor}) used has a uniform value of 1.0 from the ground up to a height of 200 ft, with a slightly smaller value at greater heights. In comparison, wind loads are based on an assumed boundary layer profile, where wind speeds are slower near the ground due to the effects of surface roughness.

Tornado Design Pressures. Atmospheric pressure change (APC) was found to have significant contributions to the tornado loads, particularly for large buildings with low permeability. The internal pressure coefficient was modified to also include the effects of APC. Since APC-related loads are not directionally dependent, the directionality factor was removed from the velocity pressure equation and added to the external pressure term (only) in the design pressure/load equations. The directionality factor K_d was modified through analysis of tornado load simulations on building MWFRS and components and cladding (C&C) systems. The resulting tornado directionality factor K_{dT} has values slightly less than the corresponding wind K_d values, with the exception of roof zone 1' (in the field of the roof), which increased. External pressure and force coefficients for both the MWFRS and C&C remain unchanged, but a modifier (K_{vT}) was added to account for experimentally determinized increases to uplift loads on roofs caused by updrafts in the core of the tornado.

Reliability. A reliability analysis was conducted to evaluate the tornado load provisions for the purpose of identifying appropriate return periods for the tornado hazard maps. This effort was conducted by a working group composed of members from both the ASCE 7-22 Load Combinations and Wind Load Subcommittees. Monte Carlo analyses (adapted from the ASCE 7-16 wind speed map return period analysis) were used, in which significant uncertainties for system demands and capacity were identified and quantified in the form of random variables with defined probability distributions. The results of this series of risk-informed analyses showed that the tornadic load criteria of Chapter 32 provided reasonable consistency with the reliability delivered by the existing criteria in Chapters 26 and 27 for MWFRS; therefore confirming that the 1,700- and 3,000-year return periods used for Risk Category III and IV wind hazard maps (respectively) in Chapter 26 were also suitable return periods to use for the tornado hazard maps.

Load Combinations. In both the Strength and Allowable Stress Design (ASD) load combinations that maximize wind load effects, the wind load term W is replaced by the term (W or W_T), where W_T is the tornado load. Tornado loads do not appear in combinations that maximize other loads where wind is an arbitrary point-in-time load.

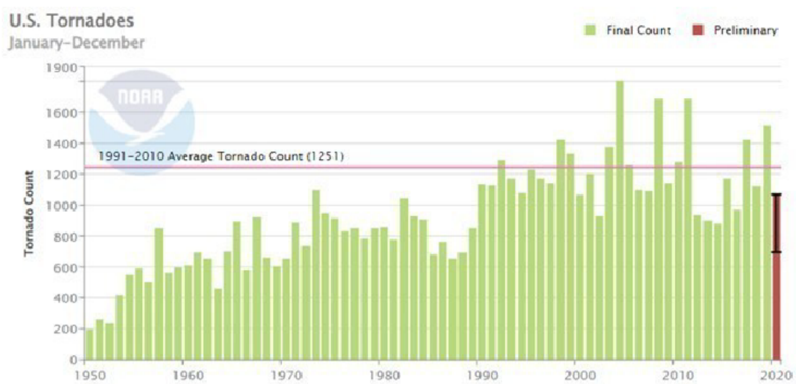

Figure 1. Number of *reported* tornadoes per year from 1950-2020 (NCEI 2022).

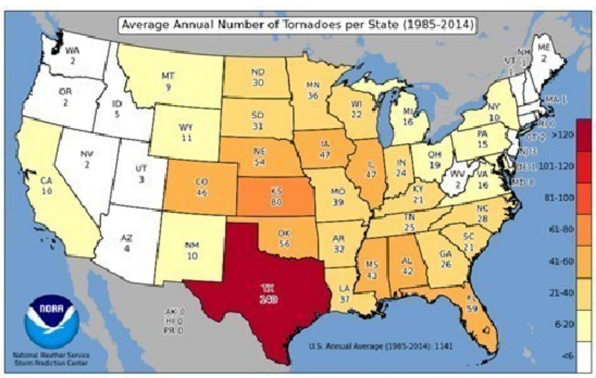

Figure 2. Average annual number of tornadoes per state (SPC 2022).

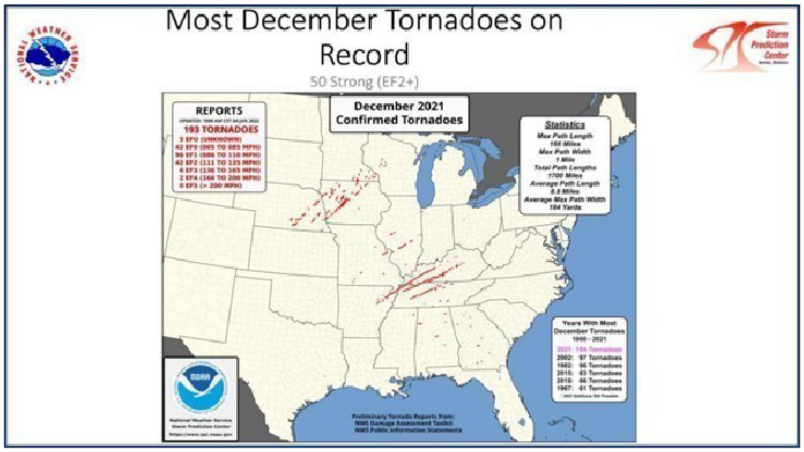

Figure 3. December 2021 produced a record 193 tornadoes across 17 states. (source: NOAA/NWS/Storm Prediction Center)

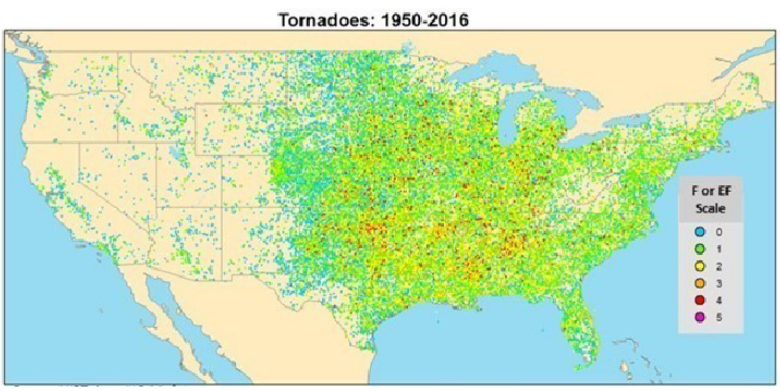

Figure 4. Map of tornado locations from 1950-2016 (source: NIST, using NOAA data).

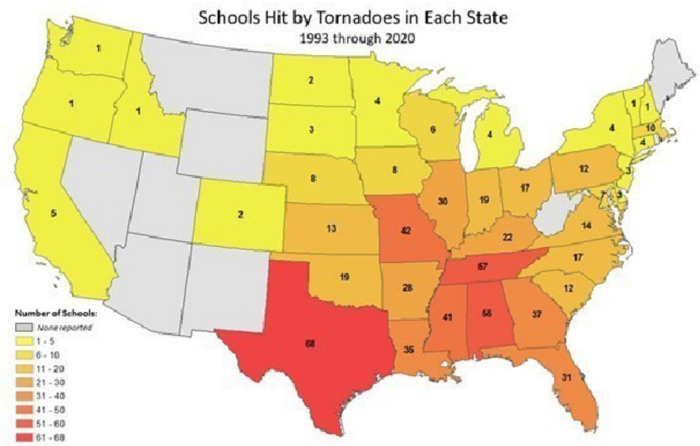

Figure 5. Lower bound for the number of schools struck by tornadoes, per state, for the 28-year period of 1993-2020 (source: NIST, using NOAA data).

Figure 6. EF-1 tornado in Covington, Georgia on New Year's Eve, 2021 (left); resulting damage to Veterans Memorial Middle School (right). (source: NWS)

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NWS. 2022b. NWSChat - PUBLIC INFORMATION STATEMENT, NATIONAL WEATHER SERVICE PEACHTREE CITY GA, 258 PM EST SAT JAN 1. https://nwschat.weather.gov/p.php?pid=202201011958-KFFC-NOUS42-PNSFFC

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Cost Impact: The code change proposal will increase the cost of construction
This proposal may increase the cost of construction for Risk Category III and IV buildings and other structures located in the tornado-prone region where tornado loads govern the design.

The ASCE 7-22 tornado load provisions in Section 32.5.2 include provisions to help identify many of the situations where tornado loads will not control any aspects of the wind load design. If the tornado speed V_T < 60 mph, tornado loads will not control over wind loads, so design for tornado loads is not required. Additionally, if the tornado speed is less than a certain percentage of the basic (non-tornado) wind speed, V, tornado loads will not control. For structures located in wind Exposure Category B or C, design for tornado loads is not required where $V_T < 0.5V$ or $V_T < 0.6V$, respectively (in this context, Exposure B means that the structure is surrounded on all sides by urban, suburban or wooded terrain, otherwise it would be considered Exposure C). The exposure category does not change the tornado loads, while wind loads in Exposure B are less than in Exposure C. Therefore, a building located in Exposure B is more likely to have tornado loads control over wind loads compared to the same building in Exposure C.

Whether or not tornado loads will ultimately control any aspects of the wind load design for a particular structure is dependent on a large number of factors, including but not limited to:

1. tornado speed, which is a function of
   - geographic location
   - Risk Category
   - effective plan area, which depends on footprint size and shape
2. basic wind speed, which is a function of
   - geographic location
   - Risk Category
3. wind exposure category
4. building shape
5. roof geometry
6. roof height
7. enclosure classification
8. designation as an essential facility or not

Maps were created to show where design for tornado loads is not required, based on the tornado speed criteria in the previous paragraph. Examples for a medium size Risk Category III facility and a very large Risk Category IV facility are shown in Figures 7 and 8, for both Exposures B and C. At locations where the tornado speed is greater than the specified percentage of the basic wind speed, design for tornado loads is required but may still not control. This is because the net pressure loading patterns on a building are different for tornadic versus non-tornadic winds, due to the differences in wind and wind-structure interaction characteristics which are reflected by factors 4 through 8 above.

For a medium-sized Risk Category III building, the tornado speeds are less than 60 mph across much of the tornado prone region (Figure 7). Tornado loads are required only in the areas shaded with the warm colors, which spans roughly between north Texas, central Minnesota, and the central Carolinas. In contrast, tornado loads are required across most of the tornado-prone region for very large Risk Category IV facilities, except New England and small areas of south Florida and south Louisiana for Exposure C (Figure 8). In both figures, the darker reds indicate areas that tornado loads are more likely to exceed wind loads. In general, tornado loads are more likely to control at least some element(s) of the wind load design for buildings and other structures that have one or more of the following characteristics:

- are located in the central or southeast US, except near the coast (where hurricanes can dominate the extreme wind climate),
- are Risk Category IV,
- have large effective plan areas,
- are designated as Essential Facilities,
- are located in Exposure B,
- have low mean roof heights, and
- are classified as enclosed buildings for purposes of determining internal pressures.

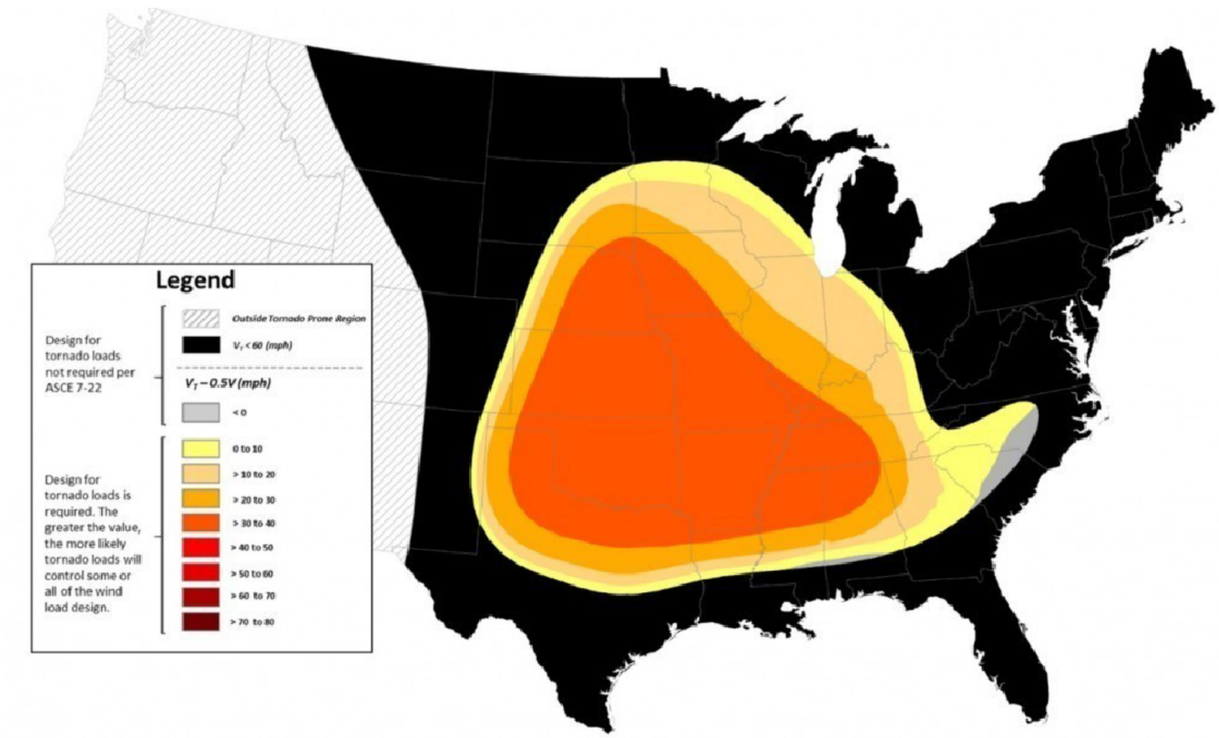
A case study was conducted to compare MWFRS and C&C pressures between ASCE 7-16 (non-tornado) and ASCE 7-22 tornado provisions in the Dallas / Fort Worth area of Texas, and also consider the cost impacts. The case study considered four building types, an elementary school, a high school, a fire station, and a large hospital facility. The schools were Risk Category III, while the fire station and hospital were Risk Category IV essential facilities. All were new construction (no additions or renovations).

The elementary school was assumed to have an effective plan area of 100,000 ft^2 while the high school was 500,000 ft^2. For the two-story schools, the basic wind speed V = 112 mph, while the tornado speeds for the elementary and high school were V_T = 90 and 102 mph, respectively. Even though the tornado speeds were less than the basic wind speeds, tornado loads exceeded wind loads for many elements of the design. The high school experienced greater increases in design pressures compared to the elementary school, given its greater tornado speed. The tornado loads were generally larger than the corresponding wind loads, with the most significant impacts occurring where the magnitude of MWFRS and C&C pressure coefficients are relatively small. Tornado suction pressures on the leeward wall and uplift pressures in the field of the roof were more than double the corresponding wind loads in some instances. This was primarily due to the increased tornado internal pressure coefficient and the new pressure coefficient adjustment factor for vertical winds, which increases the uplift on the roof. These surfaces have the smallest magnitude pressures to begin with, so increases of internal pressure and other coefficients have more relative effect. MWFRS loads on the windward walls of all schools also increased (again, due to internal pressures), but less than on the leeward walls. The net lateral loads on the buildings were not significantly impacted (internal pressure cancels out). MWFRS and C&C tornado pressures on roof edges and corners generally increased for the Exposure B cases, but were similar to or smaller than the corresponding wind design pressures when the schools were in Exposure C.

Although specific percentage changes to design pressures are dependent on many factors as discussed previously, the trend for the greatest relative impacts to occur on parts of the building or structure that have the smallest absolute values of wind loads holds true, as was the case for the fire station and hospital examples. The fire station and hospital were designed with effective plan areas of 15,000 ft^2 and 4 million ft^2 and heights of 20 ft and 80 ft (5-stories), respectively. The basic wind speed for Risk Category IV facilities in the DFW area is V = 115 mph. Tornado speeds for the fire station and hospital were V_T = 97 and 123 mph, respectively. The relative impacts on the fire station were generally somewhere between those for the elementary and high schools. The hospital, with its much greater tornado speed due to the large effective plan area, experienced greater relative pressure differences. For example, C&C tornado pressures (for effective wind area of 200 ft^2) exceeded corresponding wind pressures across the four different flat roof pressure zones by 81 to 126% for Exposure B, and 39 to 73% for Exposure C. The tornado design pressures for the hospital were similar in magnitude to wind pressures for a comparable facility located in the hurricane-prone region along the Texas coast.

A study of the cost impacts for the schools showed that the structural cost increases were very modest. On the elementary school with a building cost of $20M, the estimated cost increases were 0.24% and 0.14% for wind Exposure B and C, respectively. For the $200M high school, the cost increases were 0.13% and 0.08% for Exposures B and C. The study did not include cladding and appurtenance costs. It should be noted that Dallas-Ft. Worth location of this case study is part of the most highly impacted area of the country (as seen in Figures 7 and 8 below), having a combination of comparatively high tornado speeds and low basic wind speeds. The increases in design pressures and costs diminish rapidly outside of the parts of the central and southeast US that experience the most frequent and intense tornadoes and have the greatest tornado speeds, roughly approximated as the area between north Texas, west Iowa, and north Alabama.

Therefore, while tornado load design could increase loads and pressures for Risk Category III and IV structures in the tornado prone area, the impacts on cost of construction resulting in increases will most likely be small when compared to the overall project costs.



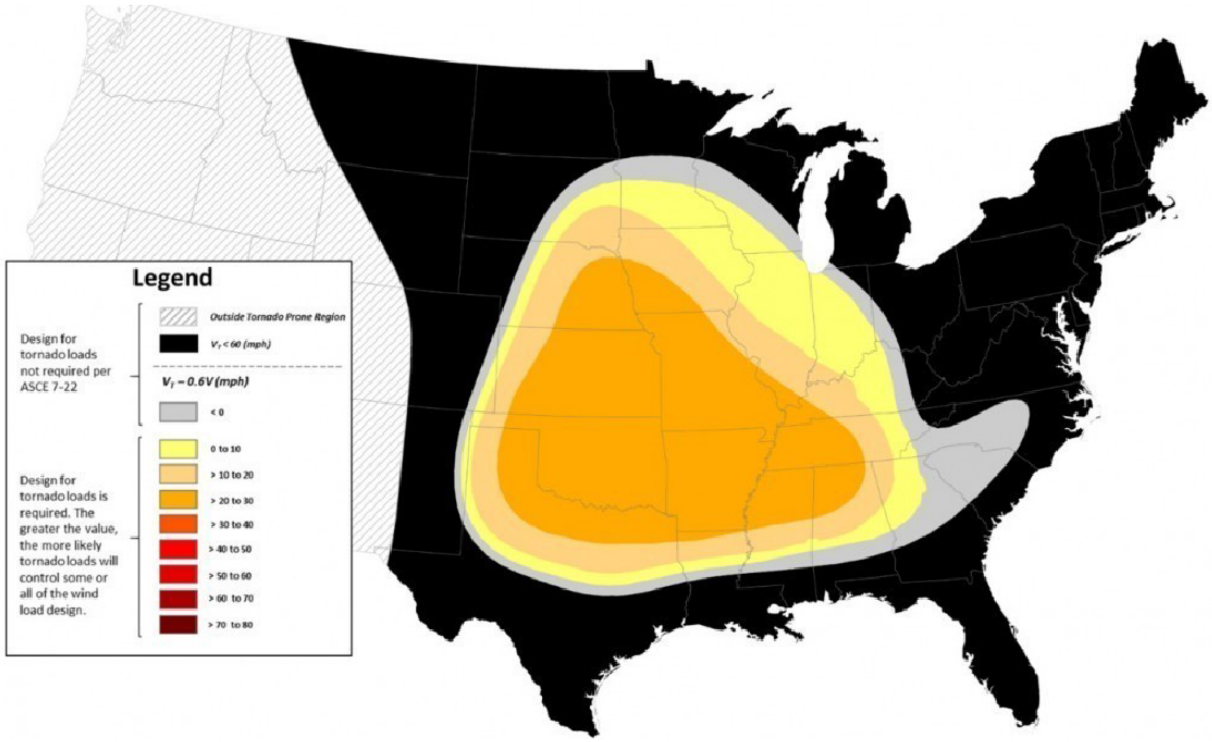
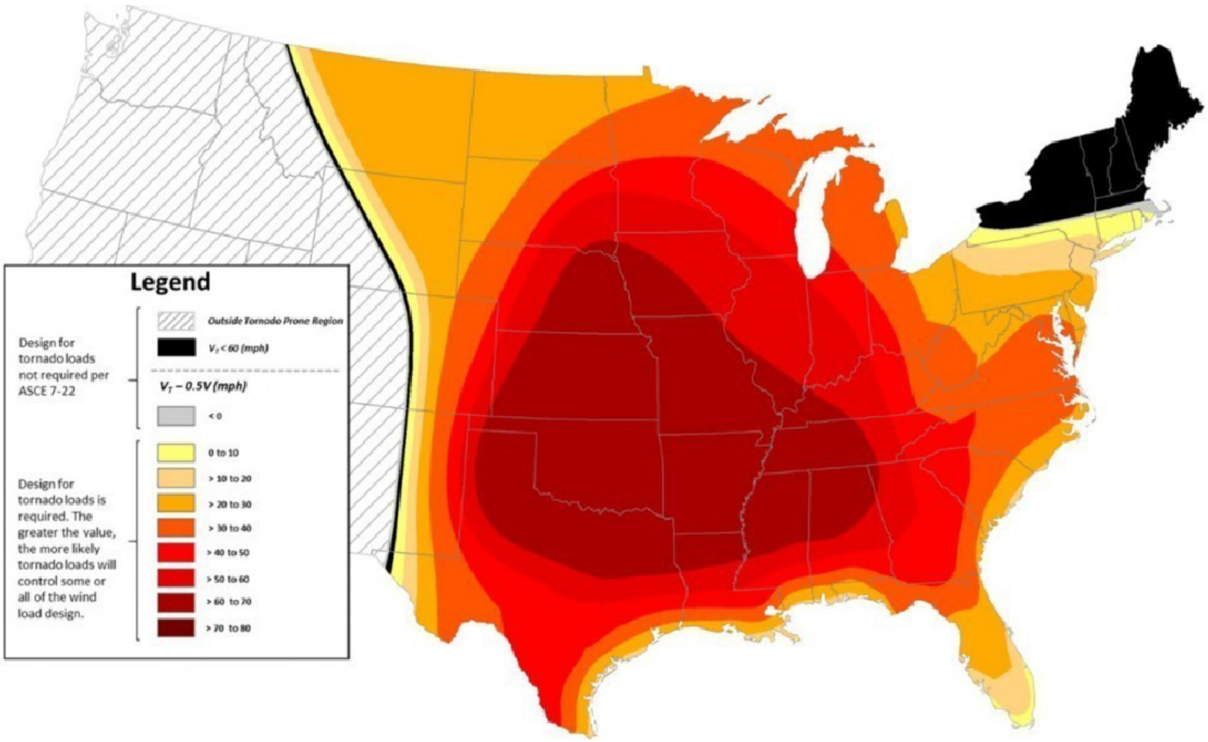


Figure 7. Locations where design for tornado loads is not required for a Risk Category III building or other structure having an effective plan area A_e = 100,000 ft^2, located in Exposure B (top) and Exposure C (bottom).


Legend
Design for tornado loads not required per ASCE 7-22
Outside Tornado Prone Region
$V_T < 60$ (mph)
$V_T - 0.5V$ (mph)
< 0
Design for tornado loads is required. The greater the value, the more likely tornado loads will control some or all of the wind load design.
0 to 10
> 10 to 20
> 20 to 30
> 30 to 40
> 40 to 50
> 50 to 60
> 60 to 70
> 70 to 80

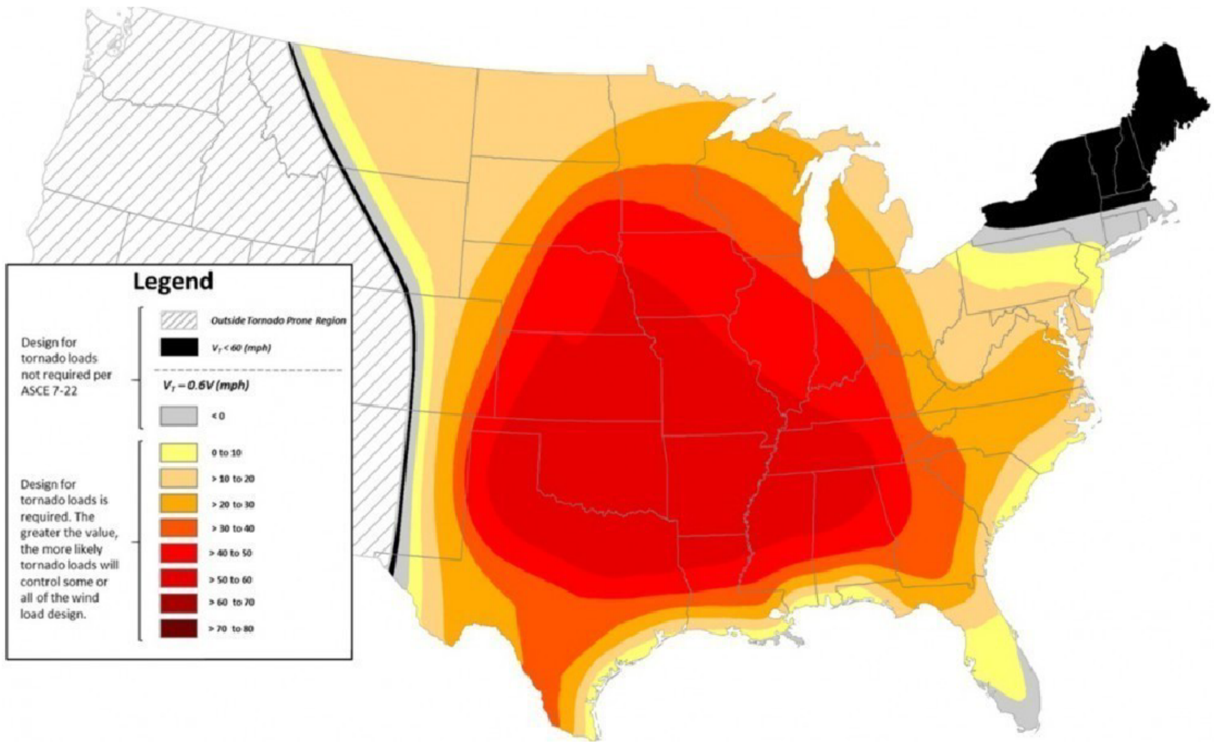


Figure 8. Locations where design for tornado loads is not required for a Risk Category IV building or other structure having an effective plan area A_e = 1,000,000 ft^2, located in Exposure B (top) and Exposure C (bottom).

Rationale: This proposal is a coordination proposal with Modification 9957 that updates ASCE 7 from the 2016 edition to the 2022 edition (ASCE 7-22). This proposal updates the code for consistency with the new tornado design requirements in ASCE 7-22.

A significant change in ASCE 7-22 is the introduction of tornado wind speed maps and design requirements. New Chapter 32 has been added that specifically addresses the design of buildings for tornadoes. The tornado provisions only apply to certain Risk Category III and IV buildings. Risk Categories I and II are exempt from the tornado provisions. Where the tornado wind speed, V_T, is less than 60 mph, design for tornadoes is not required. Additionally, design for tornadoes is not required for the following relationship between the tornado speed and the basic wind speed for the site:

For Exposure B: $V_T < 0.5V$

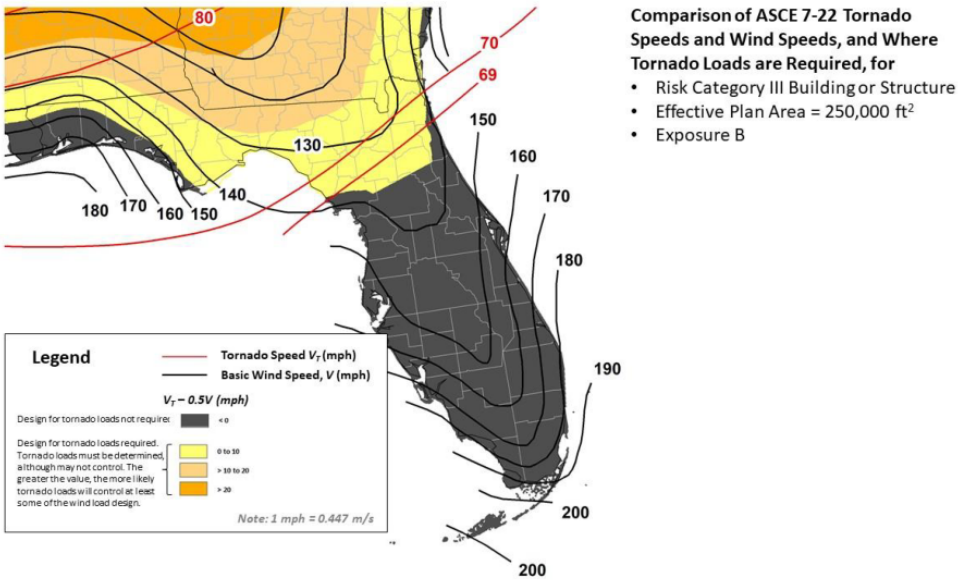
For Exposure C: $V_T < 0.6V$

For Exposure D: $V_T < 0.67V$

The applicable tornado speed for a building is based on the Risk Category and the effective plan area of the building. For Risk Category III buildings, tornado speeds are based on a 1,700-year MRI. For Risk Category IV buildings, tornado speeds are based on a 3,000-year MRI. Eight tornado speed maps are provided for Risk Category III buildings for effective plan areas ranging from 1 square feet to 4,000,000 square feet and eight tornado speed maps are provided for Risk Category IV buildings also for effective plan areas ranging from 1 square feet to 4,000,000 square feet.

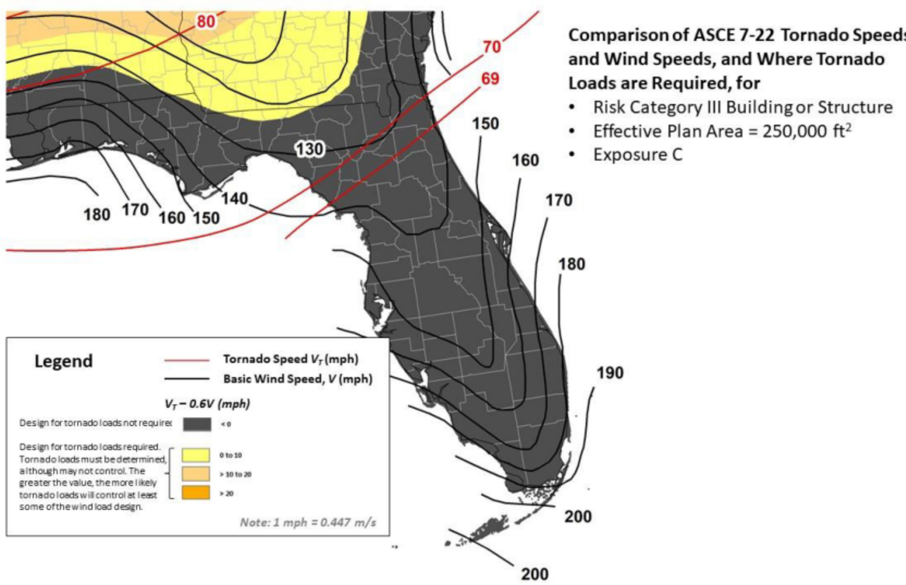
Based on the tornado speed limitations, Risk Category III buildings in Florida with an effective plan area of 100,000 square feet and less are not required to be designed for tornado loads. For Risk Category IV buildings, tornado design is not required unless the effective plan area is nearly 10,00 square feet. The following 2 figures show the potential impact of the new tornado design requirements for Risk Category III buildings with a plan area of 250,000 square feet. Figure 1 identifies the areas that are exempt from tornado design for Risk Category III buildings located Exposure Category B with an effective plan area of 250,000 square feet. It also overlays the applicable tornado speed over the required basic wind speed. The gray shaded areas on the figure are exempt from tornado design. The other yellow/orange shaded areas indicate that tornado design is required. While tornado loads have to be checked, they may not control over the loads determined for typical hurricane design loads.

Figure 2 provides a similar depiction for Risk Category III buildings located in Exposure Category C with an effective plan area of 250,000 square feet. For this condition, nearly all buildings are exempt from tornado design.



Courtesy National Institute of Standards and Technology (NIST) and Federal Emergency Management Agency (FEMA)

Figure 1



Courtesy National Institute of Standards and Technology (NIST) and Federal Emergency Management Agency (FEMA)

Figure 2

For all effective plan areas, the tornado wind speeds in Florida are less than the corresponding hurricane wind speeds. While the tornado provisions are not anticipated to significantly affect the design of Risk Category III and IV buildings for wind loads in Florida, there are situations, particularly for large buildings in Northern Florida where the tornado provisions may govern over the hurricane provisions.

A similar proposal is being submitted concurrently to the International Building Code. The complete ICC proposal and full reason statement has been uploaded with this proposal as a support file.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

21

S10120

Date Submitted	02/08/2022	**Section**	1703.6.2	**Proponent**	Joseph Belcher
Chapter	17	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

Summary of Modification

The modification will require tests of materials to be submitted to the material supplier to the registered design professional of record and the material supplier.

Rationale

The purpose of the change is to improve the quality control of concrete performance. While the producer typically would perform internal quality control testing, the magnitude of their testing is insignificant compared to the much larger volume of testing being done by the project laboratory. There exists an inherent difference in strength level between laboratories and it is crucial to evaluate the data from the laboratory which is performing the acceptance testing. The data produced by the project laboratory is preferred, due both to quantity of the data and independence of the project laboratory. For more information justifying this change, please review the uploaded document. The code change will allow better and earlier monitoring of the performance of the concrete. This proposal will provide for a timelier response for: • Detecting changes in concrete performance • Recognizing testing variables which affect the test results • Continuous application of code required acceptance calculations • Critical adjustments to the mixtures before a potential issue • Assessing the contractor’s level of control • Making code required revisions to the overdesign values For more information justifying this change, please review the uploaded document.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Approval of the change has a connection with the health, safety, and welfare of the public because it will allow quick action by the producer/supplier in the event of problems with the mix that would otherwise not be detected by project personnel or the engineer of record.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Approval of the change will result in better concrete on affected jobsites.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code and improves the effectiveness of the code.

Alternate Language

2nd Comment Period

S10120-A1

Proponent Joseph Belcher **Submitted** 8/24/2022 12:42:13 AM **Attachments** Yes

Rationale:

The Structural TAC stated several concerns when recommending denial of this code change. 1. The provision could be applied to any material. The change is intended to address test reports for concrete only. Creating a new section limiting the provisions to concrete addresses the concern. 2. The timing of the submission of the test reports was mentioned as a concern. The inclusion of language calling for the report submission to be concurrent with the report of results to the client will address this concern. 3. Concern was expressed about creating conflicts with contracts. The code requires test reports to be submitted in numerous sections, and conflicts with contracts have not been reported. i.e. FBC-B §1703.6.2, §1703.2, §1703.4, §804.3, §1404.12.1, §1523.6.5.2, §2203.1, §2319.17.2.3.8; FBC-EC §R403.10.5, Table C404.2 Note h, Table C403.2.3(8), Form 402, §C104.2.6, §C408.2.4.1, §C408.2.4.2, §C408.2.5.4, and §C408.2.5.4 to name a few. The code change will allow better and earlier monitoring of the performance of the concrete. This proposal will provide for a timelier response for: • Detecting changes in concrete performance • Recognizing testing variables that affect the test results • Continuous application of code required acceptance calculations • Critical adjustments to the mixtures before a potential issue • Assessing the contractor’s level of control • Making code required revisions to the overdesign values

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact. The code, in some cases, requires test reports to be submitted to the building official and others.

Impact to building and property owners relative to cost of compliance with code

No impact. The change will merely add persons to receive test reports for the required testing of concrete. The change does not require testing.

Impact to industry relative to the cost of compliance with code

No impact. The change will merely add persons to receive test reports for the required testing of concrete. The change does not require testing.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Approval of the change has a connection with the health, safety, and welfare of the public because it will allow the involved parties to take quick action in the event of problems with the mix that would otherwise not be detected.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Approval of the change will result in better concrete on affected job sites.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the code's effectiveness and improves the code effectiveness.

1703.6.2 Test and inspection records. Copies of necessary tests and special inspection records shall be filed with the building official.

Add a new section as follows:

1703.6.2.1 Concrete Testing Reports. Where this code, a referenced standard, a building official or inspection agency requires testing of concrete on a project, test reports shall be provided to the building official or inspection agency, the registered design professional of record, and the material supplier concurrent with reporting results to the client.

1703.6.2 Test and inspection records. Copies of necessary tests and special inspection records shall be filed with the building official. Any agency conducting tests on materials supplied for the project shall provide copies of test reports to both the registered design professional of record and the material supplier when reporting results to their client.

Rationale: The purpose of the change is to improve the quality control of concrete performance. While the producer typically would perform internal quality control testing, the magnitude of their testing is insignificant compared to the much larger volume of testing being done by the project laboratory. There exists an inherent difference in strength level between laboratories, and it is crucial to evaluate the data from the laboratory which is performing the acceptance testing. The data produced by the project laboratory is preferred due to the quantity of the data and the independence of the project laboratory. For more information justifying this change, please review the uploaded document.

The code change will allow better and earlier monitoring of the performance of the concrete. This proposal will provide for a timelier response for:

- Detecting changes in concrete performance
- Recognizing testing variables that affect the test results
- Continuous application of code required acceptance calculations
- Critical adjustments to the mixtures before a potential issue
- Assessing the contractor's level of control
- Making code required revisions to the overdesign values

The impact of test reports is many and affect various aspects of the project:

- Proportioning mixtures and submittal
    - Field data is used to establish variability and subsequent over-design
        - If field data is not available, significantly higher default over-design values are used
            - Higher over-design would require greater cement content & higher cost
                - Higher cement content yields greater CO_2 emission
    - Field data is used to validate the ability of the proposed mixture to meet over-design
        - If field data is not available, multiple tests by a laboratory required
            - Laboratory testing adds additional time and cost
    - Field data used to rate the anticipated variability of the concrete
        - Level of control provides standardized ratings from poor to excellent
- Project control
    - Receipt of test reports during construction provides for continuous evaluation of the concrete and the testing
    - Formulas/calculations are used to determine holistic compliance after every test
    - Adjustments to the mixture during construction are made based on the projects test results
        - Increase or decrease the strength level due to many variables which affect the concrete
            - Variability of raw materials, weather changes, placement/use changes, etc.

- Assist with formulating an appropriate response to changes in strength level
- Determine the level of control during construction

Before construction, mixture designs are submitted for review and approval. The industry outlines the parameters by which concrete mixtures are proportioned. While there are many requirements for durability concerns, the primary criterion is meeting the specified strength (f_c). Proportioning for strength is addressed in two steps:

- The variability of concrete production is first evaluated and added as over-design to the specified strength to create a required strength (f'_{cr}).
- The ability of the mixture to meet the higher f_{cr} value.

The determination of overdesign includes two methods. First, if there are test reports available, the standard deviation is calculated (ACI 301, 4.2.3.2) and used in a formula to determine the required strength (f'cr) [ACI 301, 4.2.3.3]. This method usually produces an overdesign of about 700 psi. If there are no test reports available, then a default overdesign must be used, typically 1200 psi. The 500 psi increase in the overdesign equates to a significantly higher cement content – simply because project test data was not distributed to the producer promptly.

In large part, the strength level of the mixture is affected by the cement or cementitious proportions. While more cement essentially yields higher strength, there are critical concerns that must be addressed:

- Greater cement content equates to more CO_2 in the environment since CO_2 is created in the production of cement
- More cement can be detrimental to the concrete with higher heat generation and greater cracking potential

The verification that the mix will meet the f'_{cr} also includes two methods. The preferred and most expeditious method is the use of test reports to show actual strength capability (ACI 301, 4.2.3.4(a)(b)). If there are no field test reports, then a laboratory must perform multiple trial batches in the lab to produce data to use as proof of strength capability, which is undoubtedly more time-consuming and costly (ACI 301, 4.2.3.4(c)).

Rating of concrete performance is a valuable tool for those specifiers who prefer a simple evaluation instead of digesting raw statistical values. The rating system, found in ACI 214, relies on statistical methods but provides five levels of control from “poor” to “excellent.” The producer can submit the rating to indicate the anticipated performance and monitor the current performance during construction.

During construction, the strength tests shall meet both the following criteria:

- the average of 3 consecutive strength test results should equal or exceed the specified strength $f'c$, and
- each strength test result should not be less than (f'_c – 500) psi; or (0.90f'_c) if f'_c exceeds 5000 psi

Delays in receipt of test data would make this requirement useless.

ACI calls for continuous monitoring of the strength of the concrete during construction. The monitoring allows adjustment of the strength level, either up or down, as needed. Thie monitoring cannot be done adequately without continued distribution of the test results to the concrete producer.

To fully understand why there are such extensive evaluations of the strength results, one must understand that concrete mixtures are not designed to meet/exceed the specified strength 100% of the time [ACI 318, Sec. 19.2, ACI 301, Sec. 4.2.3 and ACI 214R-11, Sec. 6.1]. In fact, the overdesign calculations allow for about 9% of tests to fall below the specified strength. However, this 9% is expected to fall within the normal distribution of test data, typically all being within about 500 psi of f'_c and would be considered acceptable.

There is an expected 1% which may fall below the critical threshold (about 500 psi below f'_c), which is also dealt with in the standards. In short, since concrete cannot be tested until after it is placed, it is impossible to require the concrete to meet the specified strength 100% of the time. Because of this, monitoring the testing as the project progresses is critical. This monitoring can only be done by the entity that knows the concrete mixtures better than anyone, the producer. This is especially true with the early age (3-7 days) testing, which is done on almost all projects. Only the producer knows how to interpret these results concerning the expected 28-day strength. The producer is best suited by far to evaluate individual results or trends

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

22

S10139

Date Submitted	02/10/2022	**Section**	1809.4	**Proponent**	Jeanne Clarke
Chapter	18	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

This modification is intended to clarify the point at which the depth of the footing is to be measured.

Rationale

Previous versions of the code included the information that the top of footings shall be 12 inches below grade. This modification restores that requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

It protects the foundation of a structure

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

It clarifies the point of measurement and unifies application of the code

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification is applicable to all shallow foundations supporting structures of any type

Does not degrade the effectiveness of the code

It is a clarification for measurement purposes and does not degrade the code

2nd Comment Period

S10139-G1

Proponent	Jeanne Clarke	Submitted	8/25/2022 8:52:31 AM	Attachments	No

Comment:

This modification only applies to isolated or strip footings, not to monolithic footings. Due to the granular nature and possible lack of proper compaction, installation of footings at this depth with provide a more stable base for the structure and may avert settlement problems. Setting them at this depth allows for the installation concrete slabs or pavers while maintaining a buffer of soil on top of the concrete foundation. This soil buffer serves to distribute the loads across the top of the footing. If properly designed, the additional depth can also reduce the size of the foundation due to the added load from the soil above. The soil depth also allows aids in draining water away from the structure.

The minimum depth of footings below the undisturbed ground surface shall be 12 inches (305 mm) measured to the top of footing. Where applicable, the requirements of Section 1809.5 shall also be satisfied. The minimum width of footings shall be 12 inches (305 mm).

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10390

23

Date Submitted	02/14/2022	Section	2002	Proponent	Joseph Belcher
Chapter	20	Affects HVHZ	No	Attachments	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

202 Definitions for Accessory Structure and Sun Control Structure

Summary of Modification

The proposed modification adds design criteria for sun control structures.

Rationale

Sun control structures with operable louvers to direct sunlight are becoming increasingly popular as they allow enjoyment of the outdoors without direct sunlight. All jurisdictions currently require the engineered design of such structures, but the code does not provide guidance to the engineer or jurisdiction for the design parameters. This code change proposal is intended to provide the needed design criteria.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No Impact.

Impact to building and property owners relative to cost of compliance with code

: No impact or a reduction in cost in areas with a lower wind speed.

Impact to industry relative to the cost of compliance with code

No impact or a reduction in cost in areas with a lower wind speed.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal has a reasonable and positive impact on the health, safety, and welfare of the general public by providing design criteria for sun control structures allowing for safe designs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by providing missing design criteria for sun control structures.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code and improves the effectiveness of the code

Alternate Language

2nd Comment Period

S10390-A1

Proponent Joseph Belcher **Submitted** 8/24/2022 1:23:54 PM **Attachments** Yes

Rationale:

This alternate language proposal is to incorporate comments by members of the Structural TAC. 1. The TAC expressed concern that the locking of the louvers in the open position is necessary to prevent the wind from closing them (Mr. Gascon, P.E.). The change clearly states operable louvers are to be locked in the open position to prevent the wind from blowing them closed. 2. The TAC suggested changing the wind speeds to 75 mph for consistency with other code provisions (Mr. Gascon, P.E.). 3. The U.S. Weather Bureau was corrected to the National Weather Service to reflect the current name of the agency. 4. The language related to the locking of operable louvers in the warning label was modified to be more precise. Sun control structures with operable louvers to direct sunlight are becoming increasingly popular as they allow enjoyment of the outdoors without direct sunlight. All jurisdictions currently require the engineered design of such structures, but the code does not provide guidance to the engineer or jurisdiction for the design parameters. This code change proposal is intended to provide the needed design criteria.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No Impact.

Impact to building and property owners relative to cost of compliance with code

No impact or a reduction in cost in some areas.

Impact to industry relative to the cost of compliance with code

No impact or a reduction in cost in some areas.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal has a reasonable and positive impact on the health, safety, and welfare of the general public by providing design criteria for sun control structures allowing for safe designs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by providing missing design criteria for sun control structures.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the code's effectiveness and improves the code effectiveness.

2nd Comment Period

S10390-G1

Proponent Scott McAdam Submitted 8/24/2022 7:08:16 PM Attachments No

Comment:

BOAF CDC committee supports this MOD alternate language A1

2002.8 Sun Control Structure Design. A registered design professional shall design sun control structures.

2002.8.1 Free-standing sun control structures shall be permitted to be designed to resist wind speeds for Risk Category I of Figure 1609.3(4) of the *Florida Building Code-Building*. Sun control structures relying on a host structure for support shall be designed for the Risk Category of the host structure.

2002.8.2 Operable louvers shall be repositioned and locked in the vertical open position when wind speeds are predicted to be 75 mph or greater. The contractor shall post a legible and readily visible permanent decal or sign stating words to the effect that the operable louvers are to be locked in the vertically open position when wind speeds are predicted to be 75 mph and during a hurricane warning or alert as designated by the National Weather Service. The warning label should essentially read:

-

THIS SUN CONTROL STRUCTURE SHALL HAVE LOUVERED BLADES LOCKED IN THE VERTICAL POSITION DURING A HURRICANE WARNING OR ALERT AS DESIGNATED BY THE NATIONAL WEATHER SERVICE OR WHEN WIND SPEEDS ARE PREDICTED TO BE 75 MPH.

-

2002.8.3 Electrical Installations. All electrical components and installations shall comply with Chapter 27 of this Code.

2002.8 Sun Control Structure Design. A registered design professional shall design sun control structures.

2002.8.1 Free standing sun control structures shall be permitted to be designed to resist wind speeds for Risk Category I of Figure 1609.3(4) of the *Florida Building Code-Building*. Sun control structures relying on a host structure for support shall be designed for the Risk Category of the host structure.

2002.8.2 Operable louvers shall be repositioned in the vertical open position when wind speeds are predicted to be 60 mph or greater. Operable louvers shall be repositioned in the vertical open position when wind speeds are predicted to be 45 mph or greater In the High Velocity Hurricane Zone. The contractor shall post a legible and readily visible permanent decal or sign stating words to the effect that the operable louvers are to be moved to the vertically open position when such wind speeds are predicted and during such periods of time as designated by the Us weather bureau as being a hurricane warning or alert. The warning label should essentially read:

-

THIS SUN CONTROL STRUCTURE SHALL HAVE LOUVERED BLADES POSITIONED TO THE VERTICAL POSITION DURING A HURRICANE WARNING OR ALERT AS DESIGNATED BY THE U.S. WEATHER BUREA OR WHEN WIND SPEEDS ARE PREDICTED TO BE 60 MPH OR 45 MPH IN HVHZ.

-

2002.8.3 Electrical Installations. All electrical components and installations shall comply with Chapter 27 of this Code.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10393

24

Date Submitted	02/14/2022	**Section**	2003	**Proponent**	Joseph Belcher
Chapter	20	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

202 Definition of Accessory Structure and Sun Control Structure to correlate with the design criteria being added.

Summary of Modification

The proposal adds design criteria for sun control structures.

Rationale

Sun control structures with operable louvers to direct sunlight are becoming increasingly popular as they allow enjoyment of the outdoors without direct sunlight. All jurisdictions currently require the engineered design of such structures, but the code does not provide guidance to the engineer or jurisdiction for the design parameters. This code change proposal is intended to provide the needed design criteria.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
No Impact.
Impact to building and property owners relative to cost of compliance with code
No Impact.
Impact to industry relative to the cost of compliance with code
No Impact.
Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
The proposal has a reasonable and positive impact on the health, safety, and welfare of the general public by providing design criteria for sun control structures allowing for safe designs.
Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by providing missing design criteria for sun control structures.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code and improves the effectiveness of the code.

Alternate Language

2nd Comment Period

S10393-A1

Proponent Joseph Belcher **Submitted** 8/24/2022 1:29:43 PM **Attachments** Yes

Rationale:

This alternate language proposal is to incorporate comments by members of the Structural TAC. 1. The change clearly states operable louvers are to be locked in the open position to prevent the wind from blowing them closed. 2. The wind speeds are changed to 75 mph for consistency with other code provisions per Mr. Gascon, P.E. 3. The U.S. Weather Bureau was corrected to the National Weather Service to reflect the current name of the agency. 4. The language related to the locking of operable louvers was modified to be more precise. Sun control structures with operable louvers to direct sunlight are becoming increasingly popular as they allow enjoyment of the outdoors without direct sunlight. All jurisdictions currently require the engineered design of such structures, but the code does not provide guidance to the engineer or jurisdiction for the design parameters. This code change proposal is intended to provide the needed design criteria.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal has a reasonable and positive impact on the health, safety, and welfare of the general public by providing design criteria for sun control structures allowing for safe designs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by providing missing design criteria for sun control structures.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code and improves the effectiveness of the code.

2nd Comment Period

S10393-G1

Proponent Scott McAdam Submitted 8/24/2022 7:12:03 PM Attachments No

Comment:

BOAF CDC committee supports this MOD alternate language A1

2003.10 Sun Control Structure Design. A registered design professional shall design sun control structures.

2002.10.1 Wind Loads. Basic wind speed in miles per hour (mph) shall be determined in accordance with Section 1620. Sun control structures, including exposed structures, components, and cladding, shall be designed to resist the wind loads as established in Section 1620.2.

2002.10.2 Operable louvers shall be repositioned and locked in the vertical open position when wind speeds are predicted to be 75 mph or greater. The contractor shall post a legible and readily visible permanent decal or sign stating words to the effect that the operable louvers are to be locked in the vertically open position when wind speeds are predicted to be 75 mph and during a hurricane warning or alert as designated by the National Weather Service. The warning label should essentially read:

-

THIS SUN CONTROL STRUCTURE SHALL HAVE LOUVERED BLADES LOCKED IN THE VERTICAL POSITION DURING A HURRICANE WARNING OR ALERT AS DESIGNATED BY THE NATIONAL WEATHER SERVICE OR WHEN WIND SPEEDS ARE PREDICTED TO BE 75 MPH.

-

2002.10.3 Electrical Installations. All electrical components and installations shall comply with Chapter 27 of this Code.

2003.10 Sun Control Structure Design. A registered design professional shall design sun control structures.

2002.10.1 Wind Loads. Basic wind speed in miles per hour (mph) shall be determined in accordance with Section 1620. Sun control structures including exposed structures, components ,and cladding, shall be designed to resist the wind loads as established in Section 1620.2.

2002.10.2 Operable louvers shall be repositioned in the vertical open position when wind speeds are predicted to be 45 mph or greater.The contractor shall post a legible and readily visible permanent decal or sign stating words to the effect that the operable louvers are to be moved to the vertically open position when such wind speeds are predicted and during such periods of time as designated by the Us weather bureau as being a hurricane warning or alert. The warning label should essentially read:

-

THIS SUN CONTROL STRUCTURE SHALL HAVE LOUVERED BLADES POSITIONED TO THE VERTICAL POSITION DURING A HURRICANE WARNING OR ALERT AS DESIGNATED BY THE U.S. WEATHER BUREA OR WHEN WIND SPEEDS ARE PREDICTED TO BE 45 MPH.

-

2002.10.3 Electrical Installations. All electrical components and installations shall comply with Chapter 27 of this Code.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10128

25

Date Submitted	02/15/2022	**Section**	2201.1	**Proponent**	Bonnie Manley
Chapter	22	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

10129

Summary of Modification

This clarifies the relationship between the main body of Chapter 22 and the HVHZ provisions of Chapter 22.

Rationale

As currently written, the HVHZ provisions of Chapter 22 exclude three base chapter sections -- 2210 (cold-formed steel), 2211 (cold-formed steel light-frame construction), and 2212 (gable end walls). Because of successful changes made in previous cycles for the FBC, the standards adopted in Sections 2210 and 2211 now match those standards adopted in Section 2214 for HVHZ. Therefore, it does not make sense to continue to exclude these sections in the charging language for the chapter.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact is anticipated.

Impact to building and property owners relative to cost of compliance with code

No change in cost is anticipated.

Impact to industry relative to the cost of compliance with code

No change in cost is anticipated.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, it does.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, it does
Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities
No, it does not.
Does not degrade the effectiveness of the code
No, it does not.

Alternate Language

2nd Comment Period

S10128-A1

Proponent Bonnie Manley **Submitted** 8/4/2022 4:53:51 PM **Attachments** Yes

Rationale:

As currently written, the scope of Chapter 22 inadvertently excludes the last three base chapter sections -- 2210 (cold-formed steel), 2211 (cold-formed steel light-frame construction) and 2212 (gable end walls) -- from the HVHZ provisions. This modification simply corrects the reference to include all of the base chapter sections.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No change in cost is anticipated.

Impact to building and property owners relative to cost of compliance with code

No change in cost is anticipated.

Impact to industry relative to the cost of compliance with code

No change in cost is anticipated.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, it does.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, it does.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No, it does not.

Does not degrade the effectiveness of the code

No, it does not.

2201.1 Scope. The provisions of this chapter govern the quality, design, fabrication and erection of steel used structurally in buildings or structures.

Exception: Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Sections 2204 through 2212~~2209~~ and 2214 through 2224.

2201.1 Scope.
The provisions of this chapter govern the quality, design, fabrication and erection of steel used structurally in buildings or structures.
~~Exception:~~ Buildings and structures located within the high-velocity hurricane zone shall comply with the additional provisions of Sections ~~2204 through 2209 and~~ 2214 through 2224.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10248

26

Date Submitted	02/11/2022	**Section**	2304.10	**Proponent**	Greg Johnson
Chapter	23	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Type IV mass timber modifications including mods# 10098, 10099, 10161, 10162, 10163, 10167, 10169, 10174, and more

Summary of Modification

This modification provides two options for demonstrating compliance with thee requirement for the protection of connections in Types IV-A, IV-B and IV-C construction.

Rationale

see uploaded rationale

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None; these are typical design and plan review requirements.

Impact to building and property owners relative to cost of compliance with code

None; this is an optional building method. The owner can choose another method of construction to avoid costs.

Impact to industry relative to the cost of compliance with code

None; this is an optional building method. The owner can choose another method of construction to avoid costs

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This is a fire resistant construction provision.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This improves the code by supporting a new optional construction method.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No materials are required or prohibited by this change.

Does not degrade the effectiveness of the code

This improves the code by supporting a new optional construction method.

2nd Comment Period

S10248-G1

Proponent	Greg Johnson	Submitted	8/22/2022 4:28:00 PM	Attachments	No

Comment:

Nothing in the current FL Building Code prohibits construction using mass timber material. Nothing in the FL Building Code currently prevents a building official from approving a mass timber building without fire-resistance requirements determined by the nation's leading experts in these matters in the IBC development process. 10248 should be passed so that local building officials have the tools to appropriately regulate mass timber construction.

2nd Comment Period

S10248-G2

Proponent	Sam Francis	Submitted	8/26/2022 11:42:58 AM	Attachments	No

Comment:

AWC discussed the issues with interested parties and found that this change is appropriate as written and adds to the context of the regulation of mass timber buildings.

2nd Comment Period

S10248-G3

Proponent	ashley ong	Submitted	8/26/2022 4:04:39 PM	Attachments	No

Comment:

Building Officials Association of Florida (BOAF) supports this modification.

2304.10.8 Connection fire resistance rating. Fire resistance ratings for connections in Type IV-A, IV-B, or IV-C construction shall be determined by one of the following:

1. Testing in accordance with Section 703.2 where the connection is part of the fire resistance test.
2. Engineering analysis that demonstrates that the temperature rise at any portion of the connection is limited to an average temperature rise of 250°F (139°C), and a maximum temperature rise of 325°F (181°C), for a time corresponding to the required fire resistance rating of the structural element being connected. For the purposes of this analysis, the connection includes connectors, fasteners, and portions of wood members included in the structural design of the connection.

Section 2304.10.8 connection fire resistance rating rationale

AWC proposes this code change as part of a package which, when taken together, as a group, creates the safety and reliability requirements necessary for the regulation of large mass timber (MT) buildings by the Florida Building Code. The following statement was offered by the Ad Hoc Committee on Tall Wood Buildings (TWB) for this proposal (IBC-S170-19) in the ICC Code Development monograph 2018 Group A:

The Ad Hoc Committee on Tall Wood Buildings (TWB) was created by the ICC Board to explore the science of tall wood buildings and take action on developing code changes for tall wood buildings. The TWB has created several code change proposals with respect to the concept of tall buildings of mass timber and the background information is at the end of this Statement. Within the statement are important links to information, including documents and videos, used in the deliberations which resulted in these proposals.

BC Sections 704.2 and 704.3 require connections of columns and other primary structural members to be protected with materials that have the required fire-resistance rating. This proposed change provides two options for demonstrating compliance with this requirement for connections in Types IV-A, IV-B and IV-C construction: a testing option and a calculation option. Types IV-A, IV-B and IV-C construction utilize mass timber elements that have inherent fire resistance. The new provisions which added these construction types have explicit fire-resistance ratings and protection requirements. Option 1 allows connections that are part of a successful ASTM E119 fire resistance test to be considered acceptable evidence of meeting the requirements of Sections 704.2 and 704.3.

Some connections used in Types IV-A, IV-B and IV-C construction are not part of the mass timber element or assembly testing. For those connections, an engineering analysis is required. Analysis procedures have been developed that allow the protection of these connections to be designed based on test results of E119 fire tests from protection configurations using the wood member outside of the connection, additional wood cover, and/or gypsum board. The analysis procedures must demonstrate that the protection will limit the temperature rise at any portion of the

connection, including the metal connector, the connection fasteners, and portions of the wood member that are necessary for the structural design of the connection. The average temperature rise limit of 250°F (139°C) and maximum temperature rise limit of 325°F (181°C) represent the fire separation and thermal protection requirements for wall and floor assemblies tested per ASTM E119 and ensure that the connection retains most of its initial strength throughout the fire-resistance rating time. Please note the Celsius values in parentheses are for temperature rise calculated as the difference between the final temperature and the initial temperature, not a direct conversion of a Fahrenheit temperature.

IBC 722 permits structural fire-resistance ratings of wood members to be determined using Chapter 16 of the National Design Specification® (NDS®) for Wood Construction. Where a wood connection is required to be fire-resistance rated, NDS Section 16.3 requires all components of the wood connection, including the steel connector, the connection fasteners, and the wood needed in the structural design of the connection, to be protected for the required fire-resistance rating time. NDS permits the connection to be protected by wood, gypsum board or other approved materials. AWC publication *Technical Report 10: Calculating the Fire Resistance of Wood Members and Assemblies* (https://www.awc.org/codesstandards/publications/tr10) , which is referenced in the NDS Commentary to Chapter 16, has been specifically updated to provide guidance on and examples of connection designs meeting the requirements of IBC 704 and NDS 16.3.

The Ad Hoc Committee for Tall Wood Buildings (AHC-TWB) was created by the ICC Board of Directors to explore the building science of tall wood buildings with the scope to investigate the feasibility of and take action on developing code changes for these buildings. Members of the AHC-TWB were appointed by the ICC Board of Directors. Since its creation in January 2016, the AHC-TWB has held 8 open meetings and numerous Work Group conference calls. Four Work Groups were established to address over 80 issues and concerns and review over 60 code proposals for consideration by the AHC-TWB. Members of the Work Groups included AHC-TWB members and other interested parties. Related documentation and reports are posted on the AHC-TWB website at

https://www.iccsafe.org/codes-tech-support/cs/icc-ad-hoc-committee-on-tall-wood-buildings/.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10278

27

Date Submitted	02/12/2022	**Section**	2502.1	**Proponent**	Robert Koning
Chapter	25	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes

Alternate Language No

Related Modifications

Summary of Modification

Add definitions of Exterior Wall Covering Assembly Methods and Decorative Cement Finish

Rationale

Rationale: Required Definitions

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier
Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work
Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work
Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
No change to health safety and welfare
Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Yes - reinstates needed provisions
Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities
No - same products as alwayas - no change
Does not degrade the effectiveness of the code
No, improves understanding

2nd Comment Period

S10278-G1

Proponent Robert Koning Submitted 8/26/2022 4:01:52 PM Attachments No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application of cement plaster – both in current and historical provisions and referenced documents. I would like to impart the importance of the modification.

Exterior Wall Covering Assembly System Methods
Decorative Cementitious Finish

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10281

28

Date Submitted	02/12/2022	**Section**	2510.6.2	**Proponent**	Robert Koning
Chapter	25	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

New Section 2510.6.2 This adds the needed exceptions to this newly created provision in order to perform in Florida's high wind region and provides needed exceptions for other wall covering systems.

Rationale

Rationale: 1. Face sealed systems do not rely on or use a drainage mat. The requirements require sealing any vapor inlet/outlet is imperative for their success. All bulk water and vapor must be rejected at the outer surface of the wall face. 2. The current prescriptive attachment methods for claddings found in the ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. This is due to the vast increase in wall pressure fluctuations imposed in high wind regions. The now proposed inclusion of air cavities or spaces will allow introduction of pressure differentials that will exacerbate the effect upon the cladding, especially along wall corners. These cavities or channeled surface openings terminate at the top and bottom of wall to ambient atmosphere inlet/outlet receivers. In high wind regions, this can affect the performance of the cladding attachment by imposing significant flexure and withdrawal stresses to brittle claddings such as cement plaster. Testing will assure compliance with Chapter 16.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier
Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work
Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work
Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10281-G3

Proponent	Robert Koning	Submitted	8/26/2022 3:59:41 PM	Attachments	No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application of cement plaster – both in current and historical provisions and referenced documents. I would like to impart the importance of the modification.

1st Comment Period History

S10281-G1

Proponent	Sam Francis	Submitted	4/9/2022 11:40:09 AM	Attachments	No

Comment:

The American Wood Council submits the following comment: It is difficult to follow the proponent's INTENT statement accompanying this proposal. Therefore it is difficult to understand is meaning/impact.

1st Comment Period History

S10281-G2

Proponent	Danko Davidovic	Submitted	4/15/2022 1:10:29 PM	Attachments	No

Comment:

I have the following concerns with proposed code change: 1) My first comment would be that referenced section does not exist in the current code. 2) The face sealed stucco cladding system relies solely on the exterior surface of the stucco and sealants used to control the water intrusion into the whole system. In other words, there is no mechanism to manage the moisture once it penetrates the exterior seal. It might be proponent's experience that these systems work in practice, however, there is no good track record about performance of these systems and what is rate of failure due to poor installation and lack of maintenance. 3) It is inappropriate to place structural requirements for these cladding systems into the section of the code which addresses only the water management of the stucco cladding system. 4) The current code does not define and recognize the face sealed stucco systems, and introducing partial provisions for performance of these systems would create more confusion to the industry and society than providing ultimate benefit. In particular reference to ASTM E331 for testing water resistance does not proide detailed specs what tested wall assembly should include (opaque wall only, any control/expansion joints, penetrations, transitions, etc.). 5) It might be helpful to strategically develope other code sections defining the scope, description, structural performance of these face sealed stucco systems, before addressing the water integrity aspect as proposed here. 6) Even ASTM E2128-17: "Standard Guide for Evaluating Water Leakage of Building Walls" in Appendix X5: Cement Stucco and Tile Systems, Appendix X5.3.2 acknowledges that "stucco alone should not be considered a permanent barrier to water penetration".

2510.6.2

Exceptions:

1.Where the Exterior Wall Covering Assembly System Method is a Face Sealed System approved in accordance with ASTM E300 for required wind loads of Chapter 16 and accordance with the ASTM E331 weather protection requirements of 1403.2.

2.Where the windspeed is greater than 115 Vult, cladding attachment through water resistive materials with cavity created spaces 3/16” or greater, or created cavities using furring or similar strips 3/16” or greater, must be engineered to ensure the superimposed wind load requirements for withdrawal and flexure according to Chapter 16 are satisfied or tested in accordance with ASTM E330 for required wind load attachment using the Factor of Safety of 2.5 pursuant to 1709.3

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

29

S10282

Date Submitted	02/12/2022	**Section**	2510.3	**Proponent**	Robert Koning
Chapter	25	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

Text exceptions state the already existing requirement for wind loading requirements in high wind regions and state the exceptions for Florida's time tested Face Sealed Systems

Rationale

Rationale: 1. Face Barrier Systems have been the predominant application process in Florida since the inception of applied exterior stucco systems. The ASTM C926 is for a concealed drainage system with the application of an 1/8” colored cementitious finish coat installed in lower windspeed regions. It does not address the application processes for other systems, rather contains an "unless otherwise specified" provision for partial or whole modification. The requirement for the ASTM E300 and ASTM E331 assures attachment and weather protection requirements pursuant to 1403.2 2. The current prescriptive attachment methods for claddings found in the ASTM C 926 and ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The South Florida Building code and subsequent editions of the Florida Building Code HVHZ addressed attachment in these regions as 2 fasteners per square foot. This was eliminated in the 2010 leaving designers to use the “unless otherwise specified” provision of the ASM C926 and 1063 to modify attachment spacing configuration. This will codify the needed requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities
No - same products as alwayas - no change

Does not degrade the effectiveness of the code
No, improves understanding

Alternate Language

2nd Comment Period

S10282-A1

Proponent Robert Koning **Submitted** 8/25/2022 5:31:47 PM **Attachments** Yes

Rationale:

Rationale: 1. Face Barrier Systems have been the predominant application process in Florida since the inception of applied exterior stucco systems. The ASTM C926 is for a concealed drainage system with the application of an 1/8" colored cementitious finish coat installed in lower windspeed regions. It does not address the application processes for other systems, rather contains an "unless otherwise specified" provision for partial or whole modification. The requirement for the ASTM 300 and ASTM 331 assures attachment and weather protection requirements pursuant to 1403.2 2. The current prescriptive attachment methods for claddings found in the ASTM C 926 and ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The South Florida Building code and subsequent editions of the Florida Building Code HVHZ addressed attachment in these regions as 2 fasteners per square foot. This was eliminated in the 2010 leaving designers to use the "unless otherwise specified" provision of the ASM C926 and 1063 to modify attachment spacing configuration. This will codify the needed requirement. This will greatly improve current failures that happen due to improper attachment.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No

Does not degrade the effectiveness of the code

No

1st Comment Period History

S10282-G1

Proponent Danko Davidovic Submitted 4/15/2022 1:27:18 PM Attachments No

Comment:

I have the following concerns with proposed code change: 1) It appears that referenced Section 2510.3 is not the most appropriate location for these modifications (Section 2510.5.1 seems more appropriate for the second proposal). 2) Proposed modifications do not have anything in common with installation practices and do not propose suggestions to improve the current installation practices.

Add to 2510.3
Exceptions
1. Face Sealed Systems approved in accordance with ASTM 300 for required wind loads of Chapter 16 and accordance with ASTM 331 weather protection requirements of 1403.2.
2. Where the windspeed is greater than 115 Vult, metal, wire, plastic, fiberglass or other lathing attachment for cement claddings or systems must be engineered for fastener withdrawal and cladding flexure to ensure the superimposed wind load requirements of Chapter 16 are satisfied or tested in accordance with ASTM 330 for required wind load attachment using the Factor of Safety of 2.5 pursuant to 1709.3.

2510.3
Exceptions
1. Face Sealed Systems approved in accordance with ASTM E300 for required wind loads of Chapter 16 and accordance with ASTM E331 weather protection requirements of 1403.2.
2. Where the windspeed is greater than 115 Vult, metal, wire, plastic, fiberglass or other lathing attachment for cement claddings or systems must be engineered for fastener withdrawal and cladding flexure to ensure the superimposed wind load requirements of Chapter 16 are satisfied or tested in accordance with ASTM E330 for required wind load attachment using the Factor of Safety of 2.5 pursuant to 1709.3.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10283

30

Date Submitted	02/12/2022	**Section**	2510.3.1	**Proponent**	Robert Koning
Chapter	25	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

Summary of Modification

Adds new paragraph for laboratory tested and code approved attachment tables available without charge to the public

Rationale

Rationale: The current prescriptive attachment methods for claddings found in the ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The Safe Attachment Tables with PRI Reports contain published attachment patterns and fastener specifications for common applications including their allowable loads tabulated in in Tables with graphical representations of all requirements for each specimen. All data tested according to the requirements of ASTM 330 with accredited laboratory reports.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

Alternate Language

2nd Comment Period

S10283-A1

Proponent Robert Koning **Submitted** 8/26/2022 11:39:02 AM **Attachments** Yes

Rationale:

Rationale: The current prescriptive attachment methods for claddings found in the ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The Safe Attachment Tables with PRI Reports contain published attachment patterns and fastener specifications for common applications including their allowable loads tabulated in in Tables with graphical representations of all requirements for each specimen. All data tested according to the requirements of ASTM 330 with accredited laboratory reports.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No

Does not degrade the effectiveness of the code

No

Add new 2510.3.1

2510.3.1. The Safe Attachment Tables for Metal with PRI Reports as published separately by the Stucco Institute or contained within the Stucco Design Manual shall be accepted as conforming to accepted engineering practices for attachment of metal or wire lath.

Alternatively:
Add new 2510.3.1

2510.3.1. Metal lath attachments shall be according to the following tables using a factor of safety of 2.5 unless specifically engineered otherwise.

Proposer has attached the full publication and will edit to show just the tables if that is desired.

STUCCO INSTITUTE TECHNICAL BULLETIN
Stucco Information by and for Stucco Applicators
Robert Koning - Director
robertk@stuccoinstitute.com

Safe Attachment Tables For Metal Lath and Wire to Plywood, OSB and other Structural Panels for Code Compliance

Technical Bulletin TB 107.2

Based Upon the Florida Building Codes 7th Edition

and ASCE 7 - Wind Loading Provisions

Test Methodology ASTM E330

and the provisions of ASTM C926 and C1063

Referenced Tabulated Fastening Tables

Testing Data Included

For Designers, Contractors, Inspectors, Plans Examiners and Plastering Professionals

INTRODUCTION:

The fastening of metal lath seems like a simple enough task; the ICC and Florida Building and Residential codes state that the installation of metal lath conform to the requirements of **ASTM C-1063-19a "Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster"**

Section 7.3.3.1 of that standard states:

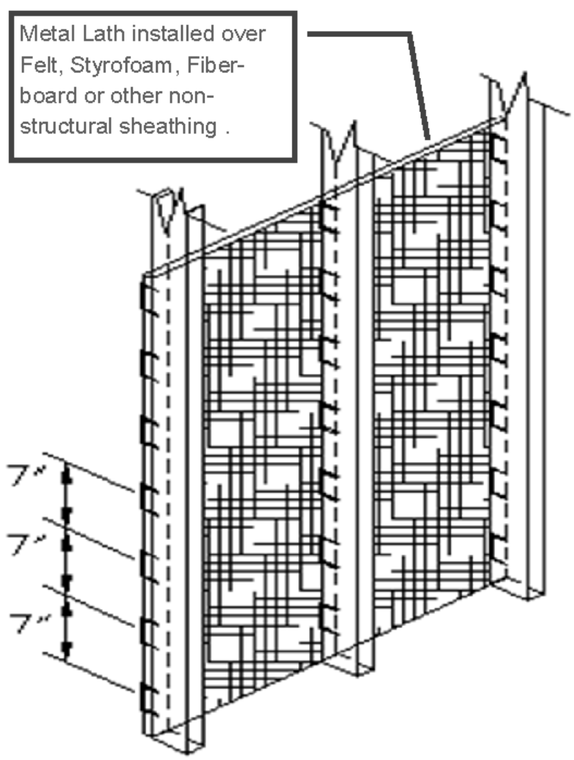


Figure 1 - ASTM C 1063-19a; 7.3.3.1

"…. Metal plaster bases shall be attached to framing members at not more than 7 in. (178 mm) on center, along framing members …." See Figure 1 below.

ASTM C-1063 is simply requiring that the metal lath be attached to the studs (horizontally spaced 16" on center) at intervals of 7 inches vertically.

Seems simple enough, but we will soon learn otherwise. First is the failure to understand that the ASTM C-1063 standard was (and is) written for installations without a substrate covering (open framing) or where the studs are covered with non-structural sheathing such as Styrofoam boards, Asphalt Impregnated sheathing, Thermo-ply sheathing, etc… So where else would the nails be placed? Into air between the studs? or into the non structural sheathing? The provision makes sense now, doesn't it.

These substrates are generally not acceptable for design in areas of high wind regions which require the appropriate wind loading requirements be determined and the attachment be specific for the applied loads. The standard does not factor placement over "Structural Rated Panels" (OSB or Plywood, etc...). The standard's attachment provision was neither developed for use in high wind areas nor by approved testing or engineering data. The 7" on center requirement evolved from field applied line wire spacing (single metal wires were pulled taught for support and attachment - See Figure 1A). This application method was common in mid-western regions with a lower windspeed and humidity level than the climatic conditions such as those found in the southeast United States. Additionally, these ASTM standards (C926 Cement Plaster and C1063 Installation of Metal Lath) were developed for plastering contractors to be used by fellow plastering contractors in "real application time". They were (and are) application standards - not design standards.

Accordingly, specific provisions were placed within these standards to permit the plastering specifier (design professional, plasterer or contractor) the ability to modify those provisions to accommodate proper application within differing regions.

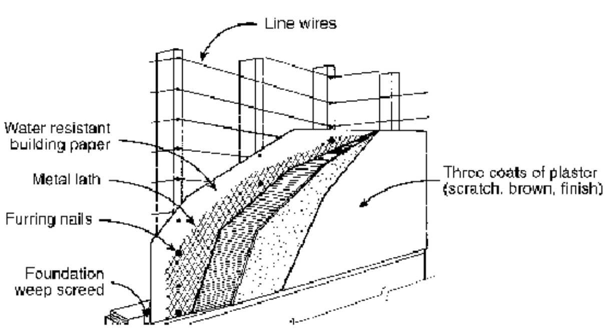


Figure 1A - Wire Line Application

Other specific adopted code provisions and requirements must always be evaluated for compliance in other regions. And, as we all know, when faced with conflicting provisions; the most restrictive provision applies.

It is herein that we will discover a major discrepancy that was always known to "old plasterers" and seasoned professionals - but relatively unknown to newer generations of design professionals, inspectors and contractors.

CODE PROVISIONS:
Provisions codified within the Building Codes and Standards are either written on a "prescriptive" basis or on a "performance" basis. The 7" fastener spacing provision (as previously stated) is an example of a simple "prescriptive" requirement.

A "performance" basis would state the requirement more simply such as; "Comply with Chapter 16, Structural" or "Design to limit the wall deflection to L/360 according to the wind provisions of ASCE 7" or similar language....

When performance specifications are required, calculations must be performed to determine the metal lath fastener and fastener spacing needed to prevent withdrawal and prevent cladding flexural failure based upon the aerodynamic forces (both positive and negative) that will be imposed upon the building's exterior by the wind loading provisions of Chapter 3 (residential code), Chapter 16 (building code), or the referenced ASCE-7. These forces vary by defined zones (areas) of the building's exterior.

Application of prescriptive provisions can be applied only in areas that do not exceed their stated design pressure maximums. If the wind load is higher than the prescriptive design or allowable code provision, the attachment of the wall covering must be determined using performance methodology.

(Authors note; the Residential Code publishes these pressures in a Table with adjusting factors in Chapter 3. The Building code requires computation based upon varying spatial configurations)

To assure this compliant attachment is achieved, the code contains a separate performance compliance provision which overrides the prescriptive provision as stated in ASTM 1063. Refer to Florida Building Code, Residential:

(Authors note; The provisions of the Residential code are being cited for brevity. The Building Code contains similar provisions)

R301.2.1 Wind design criteria. Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in Table R301.2(1) as determined from Figure R301.2(4). Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) **shall be used to determine design load performance requirements for wall coverings,** curtain walls, roof coverings, exterior windows, skylights, and exterior doors (other than garage doors)…..

R301.2.1.1 Wind limitations and wind design required.
The prescriptive provisions of this code for wood construction, cold-formed steel light-frame construction, and masonry construction **shall not apply** to the design of buildings where the ultimate design wind speed, V_{ult}, from Figure R301.2(4) equals or exceeds 115 miles per hour (51 m/s)….

R601.2 Requirements.
Wall construction shall be capable of accommodating all loads imposed in accordance with Section R301 and of transmitting the resulting loads to the supporting structural elements.

R703.1.2 Wind resistance.
Wall coverings, backing materials and their attachments shall be capable of resisting wind loads in accordance with Tables R301.2(2) and R301.2(3) for walls using an effective wind area of 10 square feet. Wind-pressure resistance of the siding and backing materials shall be determined by **ASTM E330** or other applicable standard test methods where wind-pressure resistance is determined by design analysis,….. *(remaining text eliminated for brevity)*

R703.3.1 Wind limitations.
Where the design wind pressure exceeds **30 psf** or where the limits of Table R703.3.1 are exceeded, the attachment of wall coverings shall be designed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). For the determination of wall covering attachment, component and cladding loads shall be determined using an effective wind area of 10 square feet (0.93 m2).

R703.7 Exterior plaster.
Installation of these materials shall be in compliance with ASTM C926, ASTM C1063... and the provisions of this code.

R703.7.1 Lath.
Lath and lath attachments shall be of corrosion-resistant materials. Expanded metal or woven wire lath shall be attached with 1-1/2-inch-long (38 mm), 11 gage nails having a 7/16-inch (11.1 mm) head, or 7/8-inch long (22.2 mm), 16 gage staples, spaced not more than 6 inches (152 mm), **or as otherwise approved.**

(Authors note: the standard does not say 6 inches on center vertically at each stud or 6 inches on-center each way)

Now, the questions at hand are; Will the prescriptive fastening requirements of the ASTM standard comply with the wind design performance criteria of the code? And, if they conflict, which provision prevails?

The latter question can be answered by referencing the following two code provisions:

102.4.1 Conflicts.
Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

102.4.2 Provisions in referenced codes and standards.
Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code or the Florida Codes listed in Section 101.4, the provisions of this code or the Florida Codes listed in Section 101.4, as applicable, shall take precedence over the provisions in the referenced code or standard.

So, we have learned that the code provisions apply over the standards for both content and conflict.

Since the current code does not provide a prescriptive fastener spacing requirement for metal lath for wind regions in excess of 115 mph V_{ult}, the performance requirement of the code defers determination of the fastener spacing, type and penetration points to the designer or specifier.

How did we comply in the past? Former codes contained a high wind attachment provision in the HVHZ section. Although restricted to mandatory application area of Miami -Dade and Broward, any locale in Florida could electively apply or use these provisions as well as product approvals.

This provision came from the South Florida Building Code and remained in the Florida Building Codes through the 2010 edition. Advocated by persons ignorant of its application necessity, it was deleted from the 5th edition for the sake of provision "unification". The provisions are still be applied today since they were based off a higher wind speed than the remainder of the peninsula. I have included the fastening provision for your perusal:
HVHZ Section 4411.3 (residential code with a mirror provision in the building code):
"Fastenings into wood sheathing or wood framing shall be by galvanized nails, with heads not less than 3/8 inch (9.5 mm) in diameter, driven to full penetration. using a minimum of two nails per square foot (0.093 m2), or by approved staples having equal resistance to withdrawal."

These modified high wind attachment provisions served south Florida flawlessly for decades. Knowledgeable stucco designers and installers simply applied them as a minimum provision - regardless of where the building was sited within Florida.

Whether in the code today or not, they are still being used since the code requires compliance with high wind provisions and the ASTM documents contain an "Unless otherwise specified" provision for necessary regional modifications such as this.

So, back to the Florida Building Codes, 7th. Edition. If your residential home is located in a region with wind speeds in excess of 115 mph V_{ult}, (most all of Florida) then you must verify the fastener resistance for its design pressures (negative and positive). Fastener spacing, length and pattern **must** be determined.

We will see that this is where "the devil is in the details". Except for a few rare instances, most all other products have their design pressure rating published or known—stucco lath attachment is one of these rare exceptions. Accordingly, the Attachment Tables published herein were developed by the code approved testing methodology (**ASTM E300**) in order to determine allowable fastener loading depending upon common fasteners, placement and substrates.

To understand why this and other (stucco and lath) related issues in the standards seem simple but in fact are complicated, one needs to remember that the ASTM C-926 (stucco) and C-1063 (metal lath) standards were never developed as a design code document, but rather as a plaster's installation standard based upon a specific installation criteria and method. Later on, they were referenced into the code, but were not modified for regional or other design code application—that would make the standard too voluminous - they simply included language such as "unless other specified" to accommodate regional or needed modifications.

Simply put, they were developed (and internationally still are used today) as an installation standard for plasterers when application is over open framing or non-structural sheathing using a 3 coat cement plaster application when installed over a metal or wire lath and 2 coat when installed over block or similar substrate where the final coat is a **colored cementitious** finish coat (no paint).

In both cases the final coat is an 1/8" "colored" coat of cement - painting the surface is **not** contemplated whatsoever.

Painting the system when installed over wood framing changes the dynamics, accessories, detailing and curing properties of the system requiring major application adjustments by way of the "unless otherwise specified" provisions of the standards. Refer to other Stucco Institute newsletters for expanded discussions on other aspects of design and installation of stucco systems.

Summary

As developed and written for frame construction, the standard's application methodology was for developed for application over "open" stud framing (no exterior wall sheathing at all) or over non-structural sheathing such as foam boards, thermo-ply, asphalt impregnated sheathing, or other non-structural sheathing panels or heavy ply felts.

Originally, horizontal rows of wires were pulled taut and the wire lath was tied to them. With the development of more rigid laths that would span between studs, wire rows were eliminated. Since the wires had been commonly spaced 7" on center, the nailing spacing was continued.

Regardless of the origin - no testing, evaluation, or other factual basis for the fastening pattern in these ASTM documents has been codified. Until Now - See Attachment Tables contained herein.

Understanding that the standard contemplates "open framing" or "non-structural" sheathing, the ASTM provision requiring the metal lath fasteners be embedded 3/4 inch (standard minimum withdrawal depth) into "the vertical framing members" becomes self-evident.

And the requirement that the sheathing thickness be added to the fastener length? If the foam board sheathing was 3/4" thick, and the fasteners were 3/4" long, there would be no structural attachment whatsoever. So these provisions become self explanatory when you understand the basis, concept and application of the ASTM standards.

As of 2022, the ASTM documents do not address structural panels or their applications. That is up to the designer or specifier. The ASTM provisions assumes open framing or non-structural sheathing in regions where the wind speed is less than115 mph V_{ult} or where aerodynamically applied wall pressures are ≤ 30 psf.

So why doesn't the standard provide for a higher wind speed installation method? First of all, the use of full structural sheathed walls is only applicable in a miniscule area of the globe—we just happen to live in this tiny slice. So, although of great importance to us, it is of little importance to the international arena.

Secondly, it does address it indirectly. The standard has always contained a statement to follow its provisions "Unless Otherwise Specified". The standard, since its inception, knew its few pages of text could not possibly cover every application, on every building, in every climatic region, in every windspeed, in every seismic zone on planet earth— remember it is an International standard.

So the "except as otherwise specified" provisions are used to allow the necessary regional modifications for successful installation of stucco assemblies and applications globally.

ASTM C1063 WITHDRAWAL TESTS:

So, back to the ASTM prescribed fasteners installed 3/4" into the vertical framing members spaced 7 inches on-center. Exactly what withdrawal value can be used when lath is installed as prescribed?

Two identical full size (4' x 8' each) wall specimens were prepared (one with a control joint and one without). 2.5 lb. expanded metal lath sheets were attached per the ASTM C-926 and ASTM C-1063 requirements; fasteners penetrating 3/4 inch into studs at 7 inch on-center vertically. Studs spaced 16 inch horizontally. The specimens were properly plastered, (2 - 3/8" coats with a finish coat) cured (21 days) and tested in an accredited laboratory for static and cyclic loading. Testing was performed on 10/16/2016.

The test protocol was performed according to the code requirement of **ASTM E330.** (attached) The report was titled:

WIND RESISTANCE EVALUATION OF STUCCO FINISH APPLIED TO PAPER-BACKED STUCCO LATH ON A WOOD FRAMED WALL

Once cured, the specimens were attached to a wall that applies static pressure in both positive and negative modes with recovery times between each repetitive increased pressure cycle. The specimen is cycled through these pulses until failure.

The ASTM 330 states that all loads must be proofed to 1-1/2 times the published rating. This factor takes into account the variables of ideal assemblage in a controlled testing environment that rarely happens in real world installations (Refer to Fastening Tables for application of safety factors (FoS).

Testing was taken to failure on both specimens. Both held for a 50 psf rating (proofed at 75 psf but the 75 psf failed to proof at the next increment. This leaves the available rating at 50 psf using the test factor of 1.5.

See Stucco Institute **Figures 2, 3, 4 and 5.** Does the crack pattern in 4 and 5 look familiar? Have you seen these failures?

Note that failure of both specimens was from negative pressure between the studs. In other words, the 7 inch on center fasteners held, but the horizontal interval of 16 inches was too great a span to keep the system from failing - it simply flexed ("cupped") and fractured.

Authors Note; There was some discussion if mass rupturing represented an absolute failure of the system since it did not detach from the wall altogether and might be subject to repair. Besides the testing classification of a failure - failure is certain for the following other reasons; (1) If applied over open framing or non-structural sheathing, repair would be impossible - if over structural panels, random screws might be installed at 6 inches on-center each way securing the ruptured system to its substrate. However if the wall has been painted, the application of new coat of stucco using a bonding agent over the repair would be problematic and attaching new metal lath at that point would represent more effort than removal and replacement. (2) the test was stopped at rupture - in a high wind event, the continued cycling would inevitably lead to detachment of cladding sections.

So, to adequately attach the lath there would need to be an intermediate vertical column of fasteners in between the stud spacing fastened into a structural panel (or a random pattern of placed fasteners) in order to resist higher withdrawal values. See Stucco Institute **Figures 6 and 7.**

You might say, "Well wouldn't the 50 psf be ample since most wind loads are 30 - 50 psf?"

No. The answer lies in the fact that this is testing to failure data. We need appropriate safety factors. We look to the code for the appropriate factor. Although many designers use a factor of 3 for cladding attachment. However the code states at:

1709.3.1 Test procedure.
….. the test specimen shall be subjected to an increasing superimposed load until structural failure occurs or the load is equal to **two and one-half times** the desired superimposed design load. The allowable superimposed design load shall be taken as the lesser of:

1. The load at the deflection limitation given in Section 1709.3.2.

2. The failure load divided by 2.5.

3. The maximum load applied divided by 2.5.

So, adjusting for failure; 50 psf x 1.5 / 2.5 equals **30 psf** allowable load using the code prescribed safety factor.

Hey! Wait! isn't that same maximum psf found in the code at **R703.3.1 Wind limitations?** Yes.

For a design pressure over 30 psf, prescriptive provisions of the standard are

Figure 2

Figure 3

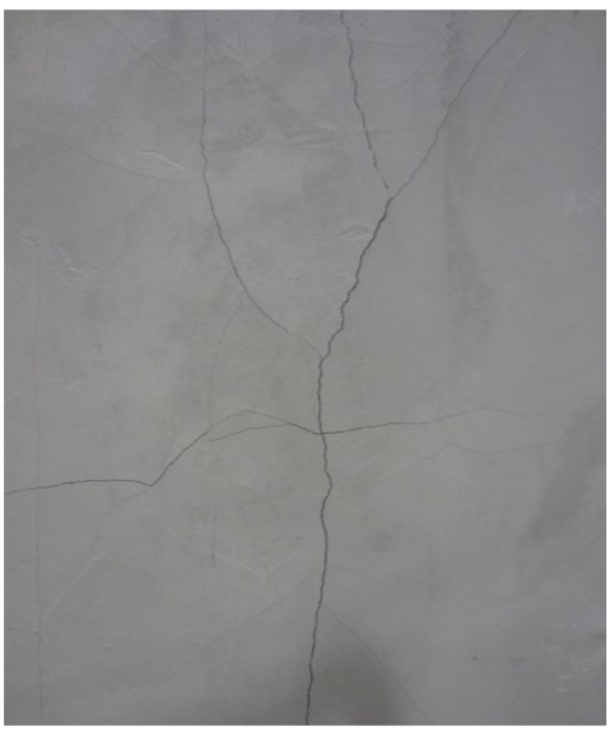


Figure 4

Figure 5

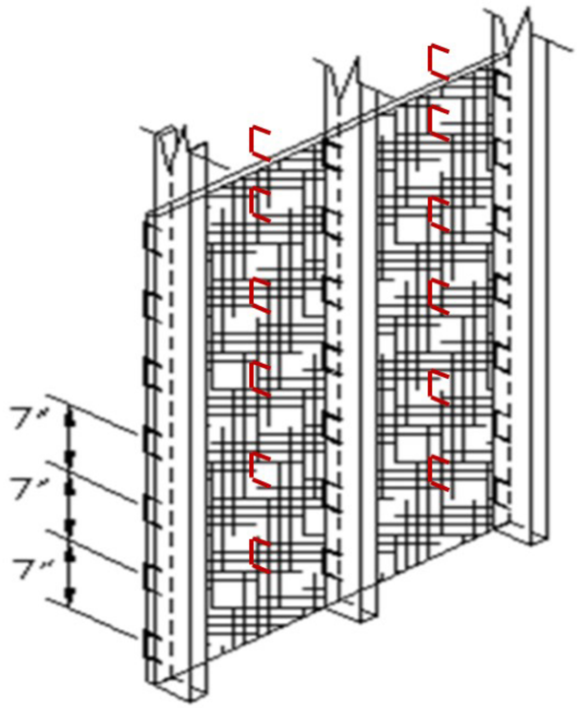


Figure 6

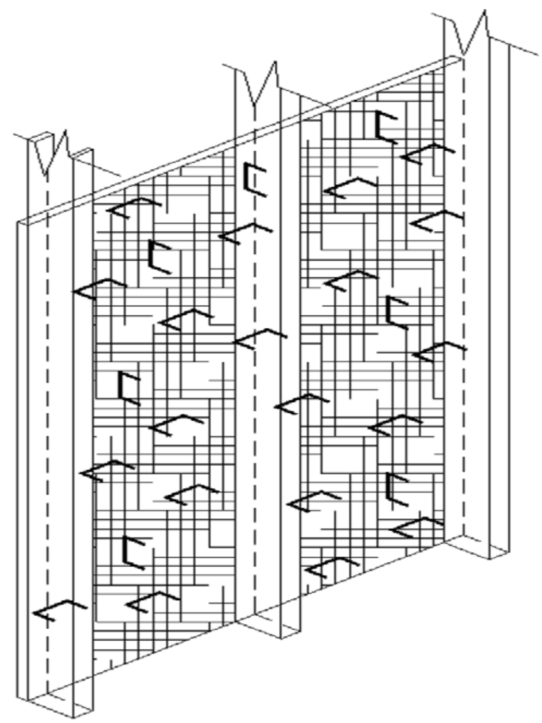


Figure 7

negated (unless prescriptively tested and approved for higher pressures). The designer is required to determine and design according to the applicable wind forces. Yep, now you're getting it.

In most national regions the 30 psf value is sufficient and prescriptive methods can be used since the windspeed is lower than high wind regions such as Florida.

Although structural components oftentimes have safety factors of 2 or in some cases 1.5, these items are interconnected in the Main Wind Force Resisting System (MWFRS) or are assembled in repetitive use combinations. Components and claddings are "stand alone" items and do not have interconnective or repetitive advantages and therefore are not subject to these more lenient factors.

So where does this knowledge leave us? How do we comply? The answer in the past was simple: If any portion of your wall area is subject to design pressures in excess of 30 psf, then you needed to add a row of intermediate fasteners in between the stud spacing to resist the cupping factor (See Figure 6) or do as we were taught 40 years ago by those "old trained" professionals and scatter your fasteners across the panel (≈ 6" o.c. each way) to ensure anchorage and to create a system wide monolithic force distribution panel (See Figure 7).

Although some "new" consultants say the "old-timers" were incorrect, the old method of attachment did not fail. As the old saying goes, "the proof is in the pudding". This pattern is shown in Figure 7.

Although the old method performed, there was still not full scale wall testing data to rely upon - Until Now. The **Safe Attachment Tables** that follow can be used for design data and all tests were performed using the code prescribed **ASTM E330** in an accredited facility.

Now, when required spacing requires attachments between the studs, there will be those that say; "the fasteners must only be placed in the studs due to the sealing of the fastener legs into the wood". They contend that this method will keep water that is migrating downward behind the stucco façade (towards the weep screed) from entering the wall cavity during its migration.

First, Note the word "weep screed" as the discharge mechanism and exit point. It is not called a "drain" screed. The water migrating down the wall is miniscule. If you have quantities of water so vast that they are migrating horizontally around fastener legs through the water resistant barrier, then you have a serious bulk water intrusion problem in need of immediate repair.

Second, assuming water was actually draining down the water resistant barrier, in a high wind region, the last place you would want that water absorbing and creating fungal growth would be at the stud line. In our high wind regions, these vertical framing members serve not only to support the gravitational (dead) loads—but also resist and transfer wall shear, uplift and other horizontal (live) loads.

Accordingly, these structural panels have an increased nailing pattern with 8d common or other approved nails at the stud line. The last thing we need is an additional line of fasteners driven into these already stressed locations.

Third, the argument fails to adjust for using a paint (coating) in lieu of a colored coat of 1/8” cement plaster. This process creates a face barrier system. Florida has used the face barrier system rather than the drain plane concept since the stuccoing of exteriors began. Notwithstanding the fact that when you paint the surface - you seal the weep screed interface preventing its functionality unless special accessories are employed. (see face barrier vs drain plane at the www.stuccoinstitute.com)

In our Florida region we usually use a face barrier system. Using a drain plane is much more difficult due to the amount of annual rainfall and average relative humidity. Not to mention the salt depositing itself on the wall surface and migrating behind the system.

Accordingly, long ago, our plasterers knew that we needed to seal the face of our stucco systems to prevent water intrusion and seal all penetrations to prevent the accumulation of salt laden vapor behind the stucco cladding. The face barrier system was employed and has successfully performed throughout the years.

The face barrier system depends upon proper details, sealants and proper application (especially regarding coating thickness) in order to perform successfully.

The face barrier system is a recognized ASTM protocol—but it is not mentioned in the ASTM stucco document. Why? Because the ASTM C-926 was developed for application of colored stucco finish that uses a required drain plane to manage infiltrating moisture. Simple as that.

With a proper face barrier system, the drain plane (underlayment) is necessary to provide protection of the wood during construction and to control initial hydration (curing) of the wet cement.

After that, its function is similar to shingle underlayment - to protect the substrate (structural wood panels) in the event of an emergency situation. If the shingles develop a leak or are partially blown off, the underlayment provides temporary or partial protection until necessary repairs can be made.

Can you install both? Yes, but the weep screed will be covered with the paint (coating) and that will render the drain plane useless unless a two piece flashing is used.

So, we return to the required fastening pattern and the "unless specified otherwise" provisions of the ASTM C-926 and C-1063.

WHO CAN "SPECIFY OTHERWISE?
Who is the intended authority? The architect, the engineer, the contractor, the stucco contractor, or the waterproofing contractor?

The answer is any or all of these professionals. Remember the standards are International standards so the "specifier" is intended to be the professional that was given the authority by the owner or a professional required by local regulations, if applicable. Originally, it was referring to the trained Plasterer.

Therefore the fastening pattern may be specified as prescribed by the code referenced standard, or if in excess of 30 psf, the attachment can be determined by the following **Safe Attachment Tables**.

Does the code require metal lath inspection?

Refer to the Florida Building Code:

110.3.5 - Lath, gypsum board and gypsum panel product inspection.
Lath, gypsum board and gypsum panel product inspections shall be made after lathing, gypsum board and gypsum panel products, interior and exterior, are in place, but before any plastering is applied or gypsum board and gypsum panel product joints and fasteners are taped and finished.

Exception: Gypsum board and gypsum panel products that are <u>not part of a fire-resistance-rated assembly or a shear assembly.</u>

Note; this requirement was always intended to be for rock (gypsum) lath (base for gypsum plaster) and gypsum boards.

These are common components for interior fire partitions. The term lath (by uninformed practice) was extended to include "metal lath" which was not the intent of the provision without including the preface of "Metal or Wire".

So regardless of how you interpret the foregoing, the exception is clear. So, is the lath or gypsum part of a fire rated or shear assembly? If yes, then it needs to be inspected to ensure that the fire or shear requirements and components are properly placed and assembled in accordance with the compliance documents. If no, then no inspection is required by code.

Since local ordinances can amend the inspection list found in Chapter 1 of the Florida Building Code at will, inspection of the metal lath may have been included in the local code officials checklist.

If the fastening pattern is not specified on the approved plans, I would ask the builder to submit a fastening pattern diagram or statement of spacing intervals or simply reference the appropriate **Safe Attachment Table** contained herein.

Conclusion:

So, we see that simple attachment of metal lath is not simple at all. The issues are quite complex and interdependent upon other interfaces in order to perform to Florida's high wind regions. Accordingly, most provisions are under the auspices of the contractor of record or the Plastering Contractor - not the Building Official, unless local amendments require the code official to inspect or monitor for code compliance.

True, Building Officials have governance over the code and plan review, but that does not mean they are responsible for quality control, or responsible to inspect and ensure all the provisions of all codes and standards are met, especially regarding waterproofing of building envelopes. That is the responsibility of the contractor of record. Building Officials are given a prescribed list of components that they are to review for code compliance at time of plan review and a separate list of components they are to inspect - both lists contained in Chapter 1 of the Code (Administration). Therein is drawn the framework of their purview and responsibility.

Imagine if building inspectors were responsible for application of all of the codes, standards, publications and documents of the code, the requirements would fill a room with data. They would need a superhuman knowledgebase and an intimate understanding of thousands of technical documents in order to perform an inspection. Fortunately they have no such mandate.

So, the quality is up the Plastering / Lathing contractor and the Contractor of Record to maintain these installation standards - its our profession to keep…

Other bulletins, newsletters, articles and manuals are posted online at www.stuccoinstitute.com . Additional articles such as "The Truth about Florida Stucco" and "Moisture Effects Behind Florida Stuccoed Walls", "Drain Plane vs Face Barrier Systems", "Inspecting Stucco Applications for Code Compliance" along with other articles including full scale testing building modeling, are posted at the same site.

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Hudson, FL 34667

Safe Attachment Tables Begin on Next Page.

Safe Attachment Tables

The following **Safe Attachment Tables** and their associated diagrammatic **Fastening Placement Tables** have been prepared according to testing results derived from **ASTM 330** testing data as required (and prescribed) by the ICC and Florida Building Codes.

Each Table represents a specifically prepared full wall specimen that was prepared and tested in an accredited testing facility. Although the testing specimens were largely constructed using StructaLath, Standard 2.5 expanded metal lath was also tested as an initial control. Differences were not significant.

The **ASTM 330** states that all loads must be proofed to 1-1/2 times the published rating. This factor takes into account the variables of ideal assemblage in a controlled testing environment that rarely happens in real world installations (Refer to Fastening Tables for application of code prescribed safety factors (FoS).

Many designers use as Factor of Safety (Fos) of 3 for all claddings. The code requires a Fos of 2.5 for untested specific product. Accordingly we have included all 3 values for the users consideration. We suggest that, unless a degreed design professional, all plasters and contractors use the 2.5 or 3 Fos values.

Safe Attachment Table T-1

Refer to Fastener Placement Table F-1

Staple Attachment into 16” o.c. vertical wood framing members at 7” maximum vertical intervals (or steel[1])framing members with screw attachment

ASTM 330 TEST METHODOLOGY RESULTS

2.5 Expanded Metal Lath Installed over Wood Studs Spaced 16” on center. Lath Attached with Staple or Screw[1] Fasteners Vertically Spaced 7” on center

Attachment according to the ASTM C-1063

Attachment Data and Spacing	Listed Load Proofed for FoS of 1.5 per ASTM 330 Test Requirement	Allowable Load in psf Using Code Applied Load FoS of 2.5 per	Allowable Load in psf Using Code Applied Load FoS of 3.0 per ASCE 7	Tributary Area in2	Fas-teners p/s/f
16 ga.1” crown x 1” leg galvanized staples spaced 7” on center into vertical framing members spaced 16” horizontally on center	50	30	25	112	1.28

Frequently fails for Higher Wind Areas or where modifiers adjust basic wind speed

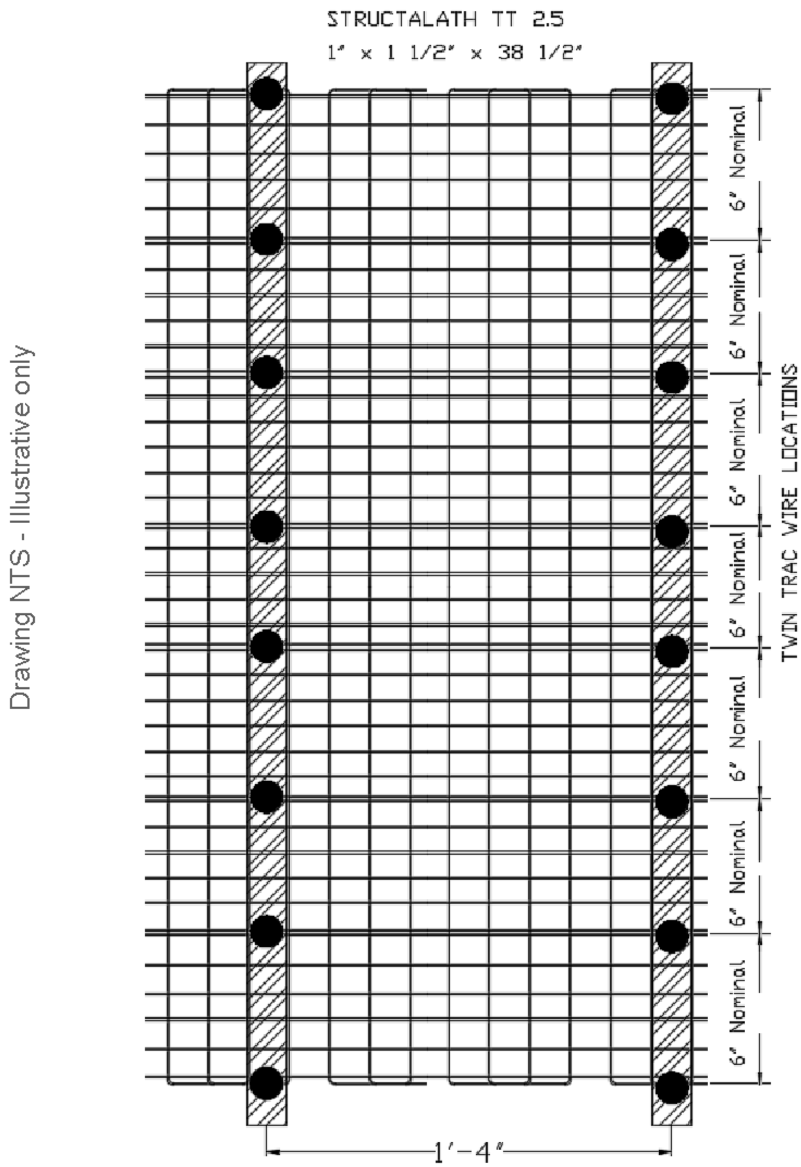
ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows - FoS = Factor of Safety - Allowable Loads are obtained by multiplying the laboratory published proofed load by 1.5 and dividing by FoS - Designers often require a FoS of 3 for claddings and may be required when designing buildings of higher importance as defined in ASCE 7*

Author Note : Most ASTM installations are installed wholly or partially over open framing as tested in this specimen. Although there was no sheathing installed over the studs the results would have been the same since failure was in the negative direction. In other words , even if sheathing were to have been used, if the nails were placed in the same vertical stud lines, the effects would be the same since failing force was initiated on the negative pressure cycle.

[1] A 16” o.c. steel stud frame assembly was covered with 5/8” DensGlass sheathing. #8 x 1-1/4” Lath screws were used to attach the Metal Lath to the studs 6” o.c. vertically. 1 - “C” track was place horizontally at the 4’ (midwall) point with screws attaching the lath to the midwall strap (track) 6” horizontally o.c. The wall failed to proof at a higher value than those listed above. See Table T-5 for Steel Framing configurations requiring higher values.

Fastening Placement Table F-1

See Table T-1 for Fasteners Specifications
Wood Studs with Staple Attachment at Vertical Studline
Steel Studs with Screws Placed in the Vertical Studline
Studs may be Covered with Wood, Gypsum, Foam, Fiberboard or Other Sheathing
If Expanded Metal Lath is Used, Fasteners May be vertically Spaced at 7" o.c.



Safe Attachment Table T-2
Refer to Fastener Placement Table F-2

Staple Attachment to Structural Wood Panels ≈ 6” o.c. each way

ASTM 330 TEST METHODOLOGY RESULTS

StructaLath No. 17 SFRC Twin Trac 2.5 installed over 1/2 nominal (7/16 minimum) structural panel sheathing attached to studs or sub-framing per design using 1” leg x 1” crown, 16ga. galvanized steel staples spaced maximum 6” o.c. along the horizontal dimension on the twin track. The rows were spaced vertically a maximum 6” o.c. and offset 3” o.c. from the preceding row.

Attachment Data and Spacing	Listed Load Proofed for FoS of 1.5 per ASTM 330 Test Requirement	Allowable Load in psf Using Code Applied Load FoS of 2.5 per 1709.3	Allowable Load in psf Using Code Applied Load FoS of 3.0 per ASCE 7	Tributary Area in2	Fasteners p/s/f
16 ga.1” crown x 1” leg galvanized staples spaced 6” vertically into structural wood sheathing panel and fastener pacing of 6” horizontally on center with each row placement offset 3” to achieve a staggered pattern	60	36 May meet basic load requirement for buildings sited in a “B” exposure classification where modifiers do not raise design pressures	30	36	4

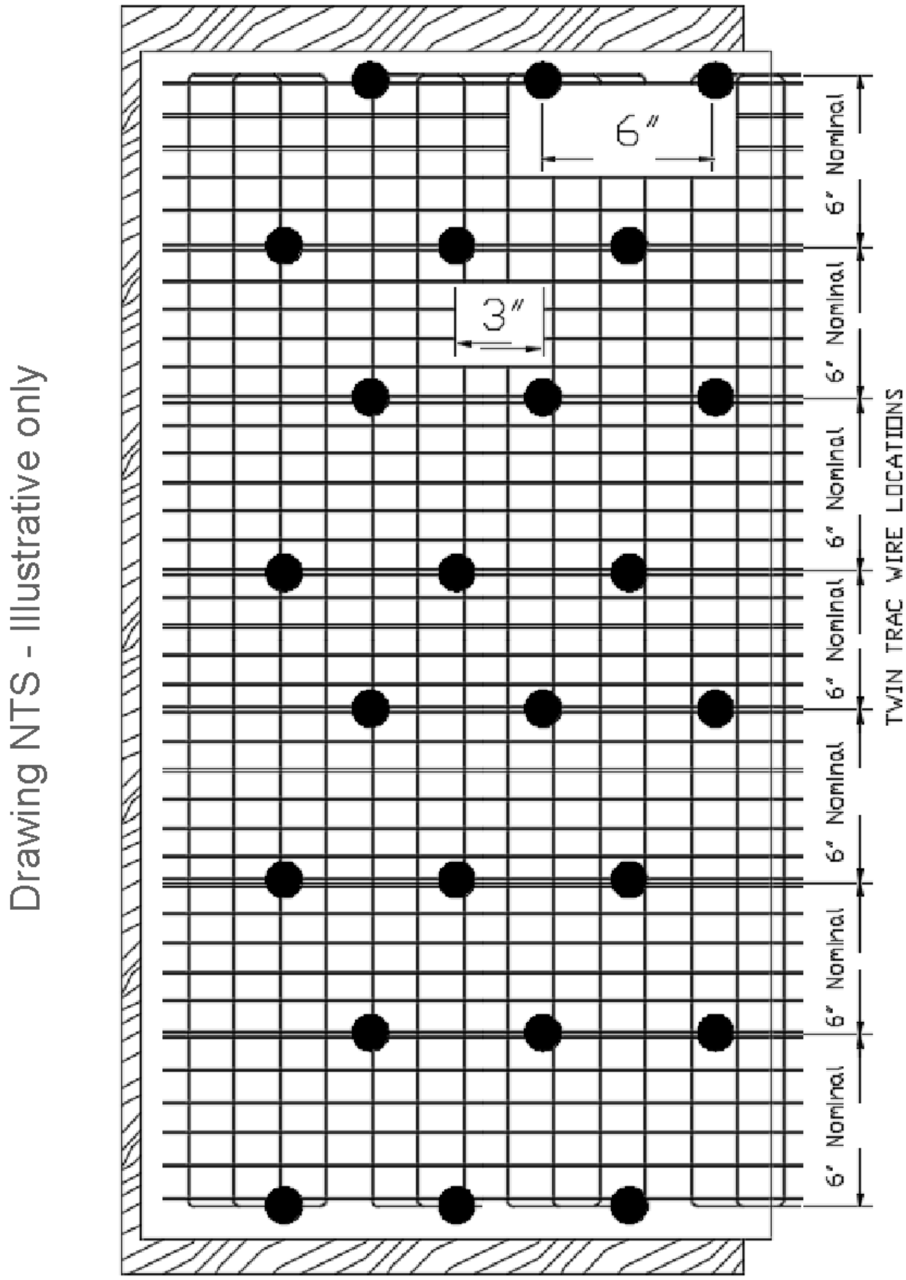
ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows - FoS = Factor of Safety - o.c. = on center - Allowable Loads are obtained by multiplying the laboratory published proofed load by 1.5 and dividing by FoS - Designers often require a FoS of 3 for claddings and may be required when designing buildings of higher importance as defined in ASCE 7.*

Fastening Placement Table F-2

See Table T-2 for Fasteners Specifications

Studs Covered with Structural Panel Sheathing; 1/2" Nominal Thickness

Staples Placed 6" O.C. Each Way - Fasteners Offset Every Other Row



Safe Attachment Table T-3
Refer to Fastener Placement Table F-3

Screw Attachment to Structural Wood Panels ≈ 6” Vertical and 16” Horizontal

ASTM 330 TEST METHODOLOGY RESULTS

StructaLath No. 17 SFRC Twin Trac installed with screws spaced maximum 16” o.c. along the horizontal dimension. Attachment rows spaced vertically 6” o.c. and offset 8” o.c. from the preceding row.

Attachment Data and Spacing	Listed Load Proofed for FoS of 1.5 per ASTM 330 Test Requirement	Allowable Load in psf Using Code Applied Load FoS of 2.5 per 1709.3	Allowable Load in psf Using Code Applied Load FoS of 3.0 per ASCE 7	Tributary Area In2	Fasteners p/s/f
StructaLath No. 17 SFRC Twin Trac 2.5 was installed with #8 x 1” truss-head, K-lath screws spaced maximum 16” o.c. along the horizontal dimension on the twin track. The attachment rows were spaced vertically a maximum 6” o.c. and offset 8” o.c. from the preceding row.	100	60 Frequently meets design attachment requirements	50	96	1.5

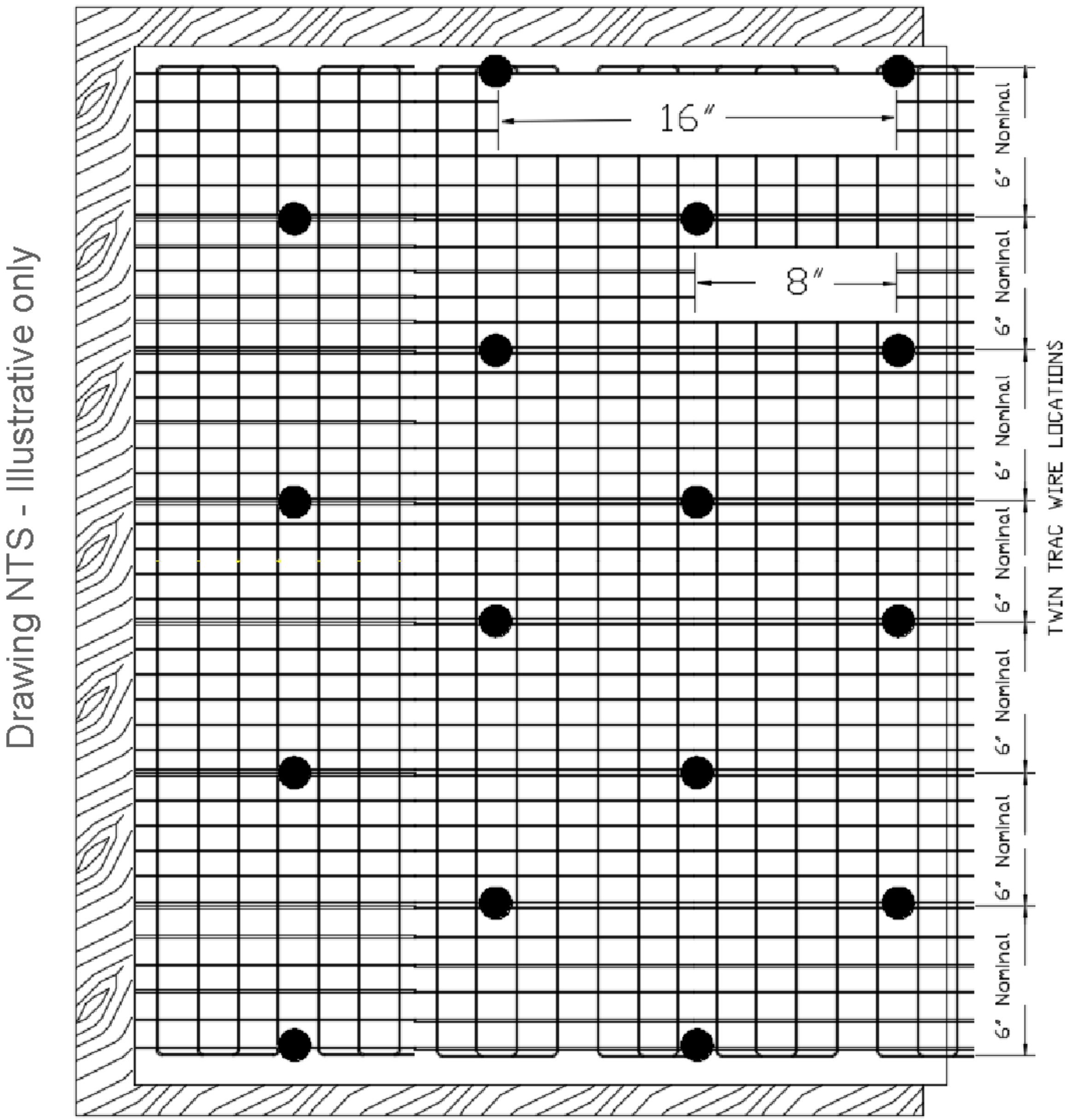
ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows - FoS = Factor of Safety - o.c. = on center - Allowable Loads are obtained by multiplying the laboratory published proofed load by 1.5 and dividing by FoS - Designers often require a FoS of 3 for claddings and may be required when designing buildings of higher importance as defined in ASCE 7*

Fastening Placement Table F-3

See Table T-3 for Fasteners Specifications

Studs Covered with Structural Panel Sheathing; 1/2” Nominal Thickness

Screws Placed 16” O.C. Horizontally - 6” Vertically - Fasteners Offset 8” Every Other Row



Safe Attachment Table T-4
Refer to Fastener Placement Table F-4

Screw Attachment to Structural Wood Panels ≈ 6" Vertical and 12" Horizontal

ASTM 330 TEST METHODOLOGY RESULTS

StructaLath No. 17 SFRC Twin Trac installed with screws spaced maximum 12" o.c. along the horizontal dimension. Attachment rows spaced vertically 6" o.c. and offset 6" o.c. from the preceding row.

Attachment Data and Spacing	Listed Load Proofed for FoS of 1.5 per ASTM 330 Test Requirement	Allowable Load in psf Using Code Applied Load FoS of 2.5 per 1709.3	Allowable Load in psf Using Code Applied Load FoS of 3.0 per ASCE 7	Tributary Area In2	Fasteners p/s/f
StructaLath No. 17 SFRC Twin Trac 2.5 was installed with #8 x 1" truss-head, K-lath screws spaced maximum 12" o.c. along the horizontal dimension on the twin track. The attachment rows were spaced vertically a maximum 6" o.c. and offset 6" o.c. from the preceding row.	150	90 Should meet any design attachment requirement	75	72	2

ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows - FoS = Factor of Safety - o.c. = on center - Allowable Loads are obtained by multiplying the laboratory published proofed load by 1.5 and dividing by FoS - Designers often require a FoS of 3 for claddings and may be required when designing buildings of higher importance as defined in ASCE 7*

The requirement for 2 fasteners p/s/f was a South Florida Building Code requirement for over 50 years. Unknowledgeable professionals lobbied for consolidation of text and it was eliminated by the Florida Code Commission in the 2010 Florida Building Code. That has proven to be a serious unintended error in Florida.

S10283-A1Text Modification

Fastening Placement Table F-4

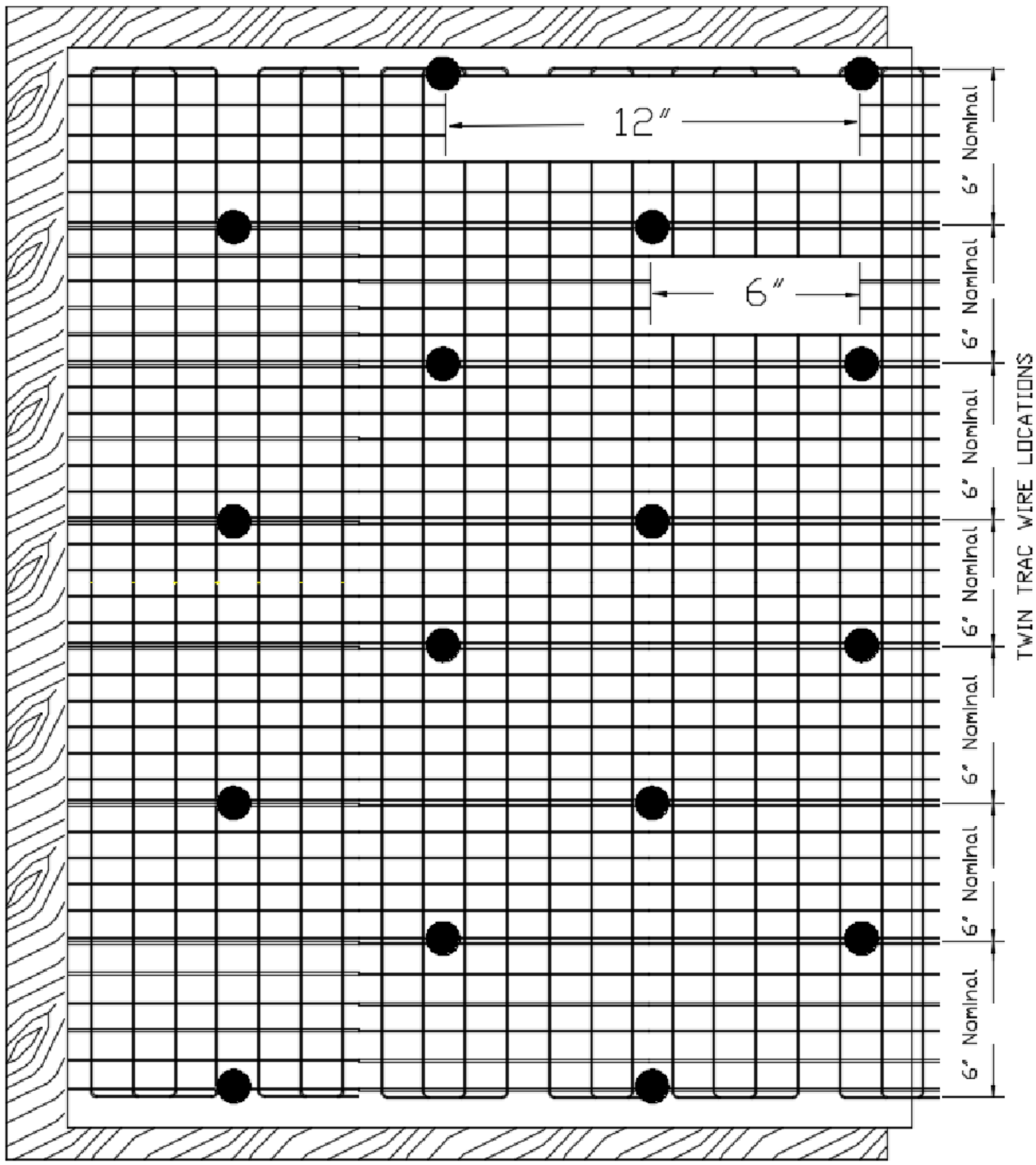
See Table T-4 for Fasteners Specifications

Studs Covered with Structural Panel Sheathing; 1/2” Nominal Thickness

Screws Placed 12” Horizontally - 6” Vertically . Fasteners Offset 6” Every Other Row

South Florida Building Code Pattern

Drawing NTS - Illustrative only



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Safe Attachment Table T-5
Refer to Fastener Placement Table F-5

Screw Attachment to Steel Studs Covered with fiberglass mat gypsum sheathing (DensGlass®)

ASTM 330 TEST METHODOLOGY RESULTS

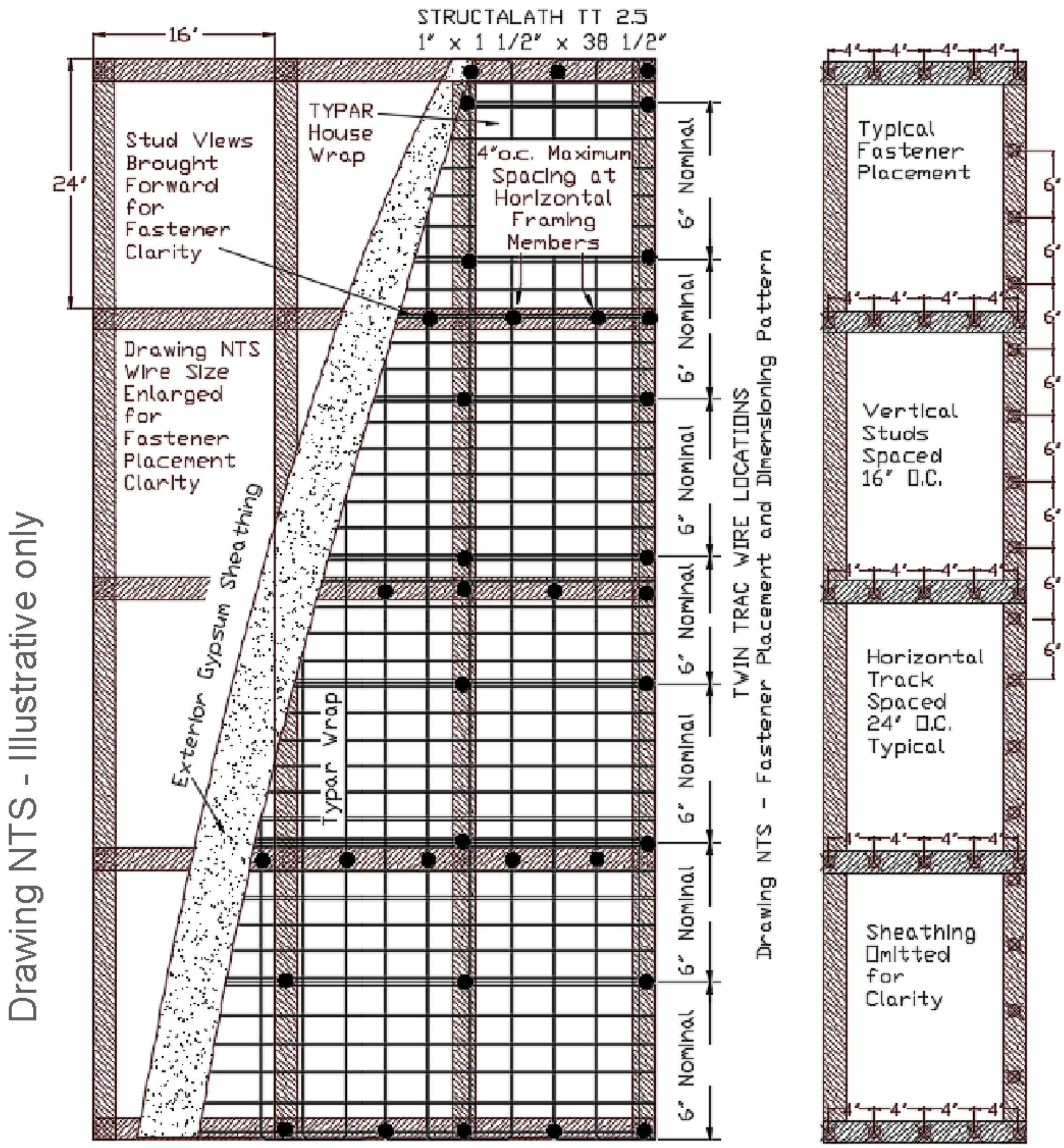
StructaLath No. 17 SFRC Twin Trac 2.5 installed with K-lath screws (3 threads minimum penetrating through stud flange) spaced a maximum 6" o.c. along Vertical Studs spaced 16" o.c., and 4" o.c. spacing at Horizontal Rows spaced 24" o.c.

Attachment Data and Spacing	Listed Load Proofed for FoS of 1.5 per ASTM 330 Test Requirement	Allowable Load in psf Using Code Applied Load FoS of 2.5 per 1709.3	Allowable Load in psf Using Code Applied Load FoS of 3.0 per ASCE 7	Tributary Area In2 / Fasteners p/s/f
StructaLath No. 17 SFRC Twin Trac 2.5 was installed with #8 x 1" (minimum) truss-head K-lath screws installed into vertical steel studs spaced 16" o.c. Vertical attachment was 6" into the stud at each twin track (approximately 6" o.c.). In addition, the lath was attached at each c-stud strap placed horizontally 2' o.c. at 4" o.c. spacing between studs along the twin track.	120	72 Should meet most any design attachment requirement	60	**96** / 1.5 Does not include the horizontal fasteners placed 4" o.c. at each horizontal strap placed 2' o.c.
ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows - FoS = Factor of Safety - o.c. = on center - Allowable Loads are obtained by multiplying the laboratory published proofed load by 1.5 and dividing by FoS - Designers often require a FoS of 3 for claddings and may be required when designing buildings of higher importance as defined in ASCE 7*				

Fastening Placement Table F-5

See Table T-5 for Fasteners Specifications

Studs Covered with Exterior Gypsum Panel Sheathing (DensGlass); 1/2” Nominal Thickness, Screws Placed 6” o.c. At Vertical Studs Spaced 16” o.c. and 4” o.c. at Horizontal Framing Spaced 24” o.c.



Note: If 3/4” Structural rated wood panels are used, horizontal mid framing members may be eliminated provided fastener pattern remains as diagrammed and #8 - 3/4” pointed Tek Screws are used for attachment of the lath.

ASTM E330 Testing and PRI Report Data Follow

CONSTRUCTION MATERIALS
TECHNOLOGIES

Table T-1

WIND RESISTANCE EVALUATION OF STUCCO FINISH APPLIED TO PAPERBACKED STUCCO LATH ON A WOOD FRAMED WALL

(PROJECT NO. KCCI-005-02-01)

For

KONING CONSTRUCTION CONSULTANTS
8301 JOLIET STREET
HUDSON, FL 34667

OCTOBER 20, 2016
REVISED JANUARY 14, 2019

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

Purpose: Evaluate the exterior finish assembly described herein for wind resistance in accordance with **ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference***.

Test Methods: Testing was conducted in accordance with ASTM E 330-02(2010): *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*. Specimens were tested in accordance with Procedure A. The selected test load was ±50 psf, which equates to a ±75 psf proof load when the typical 1.5 factor of safety is applied to the test result. The following sequence was used to evaluate the specimen:

1. +25 psf was applied for 10 seconds
2. Specimen was recovered for 1-5 minutes
3. +50 psf was applied for 10 seconds
4. Specimen was recovered for 1-5 minutes
5. -25 psf was applied for 10 seconds
6. Specimen was recovered for 1-5 minutes
7. -50 psf was applied for 10 seconds
8. Specimen was recovered for 1-5 minutes
9. +37.5 psf was applied for 10 seconds
10. Specimen was recovered for 1-5 minutes
11. +75 psf was applied for 10 seconds
12. Specimen was recovered for 1-5 minutes
13. -37.5 psf was applied for 10 seconds
14. Specimen was recovered for 1-5 minutes
15. -75 psf was applied for 10 seconds
16. Specimen was recovered for 1-5 minutes

Steps 17-23 were used to take the specimens to failure.

17. +56 psf was applied for 10 seconds
18. Specimen was recovered for 1-5 minutes
19. +112.5 psf was applied for 10 seconds
20. Specimen was recovered for 1-5 minutes
21. -56 psf was applied for 10 seconds
22. Specimen was recovered for 1-5 minutes
23. -112.5 psf was applied for 10 seconds

Sampling: All products applied to the wood studs were provided by Koning Construction Consultants. Below is an itemized list of products that are used in the Koning Exterior Finish Assembly.

Product Identification	Manufacturer
ClarkDietrich™ Expanded Diamond Mesh Metal Lath with Grade-D, Style 2 paper-backing water resistive barrier	ClarkDietrich™ Building Systems
Vinyl control joint	Not provided
Florida Super Stucco	Argos Cement LLC

Specimen: Specimen #1: A 4-ft x 8-ft mock-up was constructed from No.2 2x6 dimensional lumber with studs located 16-inch o.c. ClarkDietrich™ Expanded Diamond Mesh Metal Lath with Grade-D, Style 2 paper-backing water resistive barrier was installed over the studs with 16 ga., 1" crown x 1" leg galvanized staples spaced

7-inch o.c. The stucco finish was prepared by mixing Florida Super Stucco and sand at a 1:3 to 1:4 ratio and applied in a scratch coat, brown coat, and finish coat to a total thickness of 7/8-inch.

Specimen #2: A 4-ft x 8-ft mock-up was constructed from No.2 2x6 dimensional lumber with studs located 16-inch o.c. ClarkDietrich™ Expanded Diamond Mesh Metal Lath with Grade-D, Style 2 paper-backing water resistive barrier was installed over the studs with 16 ga., 1" crown x 1" leg galvanized staples spaced 7-inch o.c. A 5/8" vinyl control joint was secured to the lath by wire tying each flange 6-inch o.c. The stucco finish was prepared by mixing Florida Super Stucco and sand at a 1:3 to 1:4 ratio and applied in a scratch coat, brown coat, and finish coat to a total thickness of 7/8-inch.

Results: The specimen was tested October 18, 2016. Results of testing are shown below.

Table 1. Results from ASTM E 330, Procedure A for ±50 psf Test Load & ± 75 psf (1.5 Factor of Safety)

Pressure (psf)	Duration (s)	Result (Pass/Fail)	
		Specimen #1	Specimen #2
+25	10	Pass	Pass
0	60	Pass	Pass
+50	10	Pass	Pass
0	60	Pass	Pass
-25	10	Pass	Pass
0	60	Pass	Pass
-50	10	Pass	Pass
0	60	Pass	Pass
+37.5	10	Pass	Pass
0	60	Pass	Pass
+75	10	Pass	Pass
0	60	Pass	Pass
-37.5	10	Pass	Pass
0	60	Pass	Pass
-75	10	Pass	Pass
0	60	Pass	Pass

Note(s): Deflection measurements were not evaluated.

Table 2. Results from ASTM E 330, Procedure A – Loading to Failure

Pressure (psf)	Duration (s)	Result (Pass/Fail)	
		Specimen #1	Specimen #2
+56	10	Pass	Pass
0	60	Pass	Pass
+112.5	10	Pass	Pass
0	60	Pass	Pass
-56	10	Pass	Pass
0	60	Pass	Pass
-112.5	0	Fail	Fail

Note(s): Deflection measurements were not evaluated.

Specimen failure was determined by the presence of visible cracks in the stucco finish.

Statement of Attestation:

The performance evaluation of Koning Exterior Finish Assembly was conducted in accordance with ASTM E 330-02(2010): *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference* as described herein. The laboratory test results presented in this report are representative of the material supplied.

Signed: ______________________
Zachary Priest, P.E.
Director

Report Issue History:

Issue #	Date	Pages	Revision Description (if applicable)
Original	10/20/2016	10	NA
Rev 1	01/14/2019	10	Updated specimen description at client request

APPENDIX FOLLOWS

PRI-CMT Accreditations: IAS TL-189; Miami-Dade 14-1215.01; State of Florida TST5878; CRRC

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

Specimen #1 Construction Photos

 PRI-CMT Accreditations: IAS TL-189; Miami-Dade 14-1215.01; State of Florida TST5878; CRRC

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

Specimen #2 Construction Photos

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

Product Submittal Sheet

ClarkDietrich BUILDING SYSTEMS

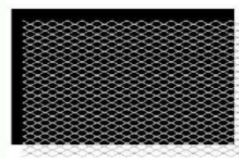
Tech Support: 888-437-3244
Engineering Services: 877-832-3206

Sales: 800-543-7140
clarkdietrich.com

09.22.36 (Metal Lath)

Paper-Backed Diamond Mesh Lath

A Galvanized Expanded Steel Plaster/Stucco Base



A superior diamond mesh multi-purpose expanded steel base with an approved Grade-D Breather sheet spot attached. Application of asphalt paper-backed (APB) metal lath is used behind stone, traditional stucco and tile installations as a certified breather sheet and also aids in preventing loss of plaster when applying. It is an excellent base for spray on structural fireproofing, ornamental work, and under ceramic tile. It provides protection against wet areas during stucco curing. The asphalt paper-backed breather sheet meets Federal Specification UUB790A; Type 1, Grade D, Style 2 and is printed on the face of the paper for easy identification. APB is also available with Dimple and V-Groove self furring metal lath.

- **Grade D paper available on Flat, Dimple & V-Groove Lath**

Product Data & Ordering Information:

Material: G-60 Galvanized Steel
Packaged: 25 bundles or 250 pieces per pallet

Finish	Wt. per Sq Yd.	Sheet Size	Pcs./Bdl.	Yds./Bdl.	Yds./Pallet
Galv.	2.5 lbs.	27" x 97"	10	20	500
Galv.	3.4 lbs.	27" x 97"	10	20	500

ASTM & Code Standards:

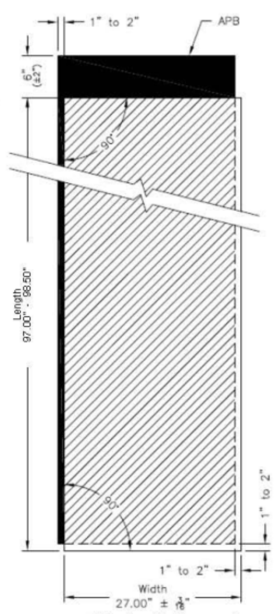
- ASTM C1063, C841, C847, CE 240.01 and ML/SFA-920
- All Expanded Metal Lath is fabricated from prime galvanized steel, G60 zinc coating by the hot dipped method, conforming to Specification ASTM A-653/A-653M.
- Asphalt paper-backed breather sheet meets Federal Specification UUB790A; Type 1, Grade D, Style 2.
- MSDS & Product Certification Information is available @ clarkdietrich.com
- For installation and placement instructions refer to ASTM C1063, C841 and C926.

Storage:

All stored materials shall be kept dry. Materials shall be stacked off the ground, supported on a level platform, and protected from the weather and surface contamination. Per ASTM C-1063

Limitations:

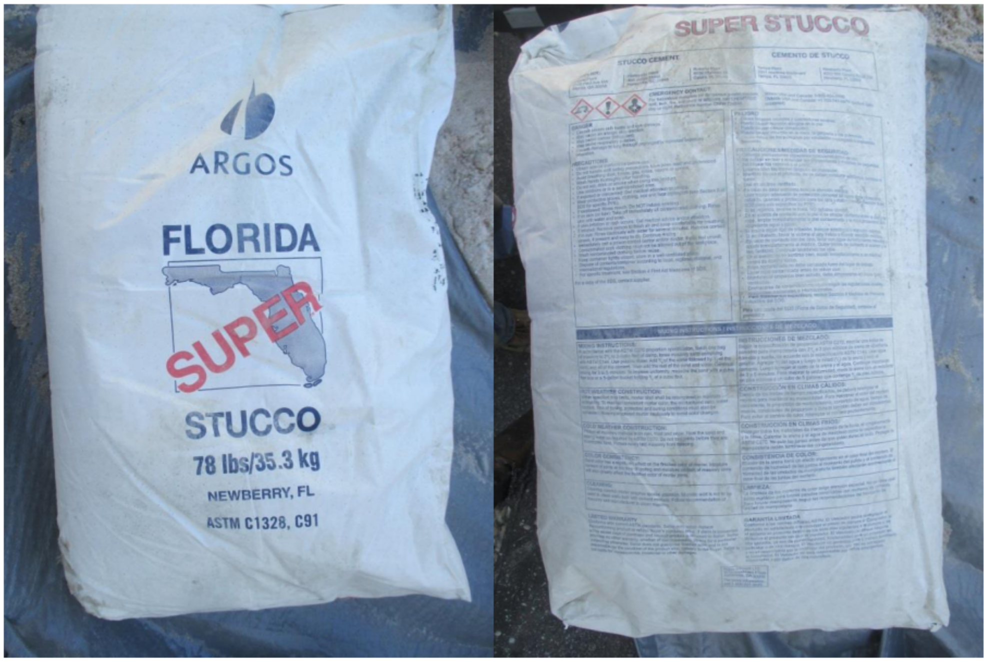
Galvanized steel products should not be used with magnesium oxychloride cement stucco or Portland cement stucco containing calcium chloride additives.



Full sized lath panel

Sustainability Credits:
For more details and LEED letters contact Technical Services at 888-437-3244 or visit www.clarkdietrich.com/LEED
LEED v4 MR Credit -- Building Product Disclosure and Optimization: EPD (up to 2 points) - Sourcing of Raw Materials (1 point) - Material Ingredients (1 point) - Construction and Demolition Waste Management (up to 2 points) - Innovation Credit (up to 2 points).
LEED 2009 Credit MR 2 & MR 4 -- ClarkDietrich's steel products are 100% recyclable and have a minimum recycled content of 34.2% (19.8% post-consumer and 14.4% pre-consumer). If seeking a higher number to meet Credit MR 5, please contact us at (info@clarkdietrich.com / 888-437-3244)

Project Information	Contractor Information	Architect Information
Name:	Name:	Name:
Address:	Contact:	Contact:
	Phone:	Phone:
	Fax:	Fax:



PRI-CMT Accreditations: IAS TL-189; Miami-Dade 14-1215.01; State of Florida TST5878; CRRC

Specimen #1 Failure Photo

Specimen #2 Failure Photo

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Laboratory Test Report

Table T-2

ASTM E 330 WIND RESISTANCE EVALUATION OF SEALED CLADDING SYSTEM ON A WOOD FRAMED WALL WITH LATH ATTACHED WITH STAPLES

(PROJECT NO. 1809T0003)

For

KONING CONSTRUCTION CONSULTANTS
8301 JOLIET STREET
HUDSON, FL 34667

DECEMBER 5, 2019

Purpose: Evaluate the exterior finish assembly described herein for wind resistance in accordance with **ASTM E 330:** ***Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference***.

Test Methods: Testing was conducted in accordance with ASTM E330-02(2010): *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.* Specimens were tested in accordance with Procedure A. The selected test load was ±60 psf, which equates to a ±90 psf proof load when the typical 1.5 factor of safety is applied to the test result. The following sequence was used to evaluate the specimen:

1. +30 psf was applied for 10 seconds
2. Specimen was recovered for 1-5 minutes
3. +60 psf was applied for 10 seconds
4. Specimen was recovered for 1-5 minutes
5. -30 psf was applied for 10 seconds
6. Specimen was recovered for 1-5 minutes
7. -60 psf was applied for 10 seconds
8. Specimen was recovered for 1-5 minutes
9. +90 psf was applied for 10 seconds
10. Specimen was recovered for 1-5 minutes
11. -90 psf was applied for 10 seconds
12. Specimen was recovered for 1-5 minutes

Sampling: All products applied to the assembly were provided by Koning Construction Consultants. Below is an itemized list of products that are used in the Sealed Cladding System.

Product Identification	Manufacturer
TYPAR® BuildingWrap	Fiberweb, Inc.
TYPAR®Construction Tape	Fiberweb, Inc.
StructaLath No. 17 SFRC Twin Trac 2.5	Structa Wire Corp.
DRYLOK®Extreme Masonry Waterproofer	United Gilsonite Laboratories
Vinyl Corp E-Flange Casing Beads	ClarkDietrich
MasterSeal NP150	BASF
Florida Super Stucco	Argos Cement LLC

Specimen: A 4-ft x 8-ft mock-up was constructed from No.2 2x6 dimensional lumber with studs located 16-inch o.c. and sheathed with CAT 7/16 PS 2-10 OSB sheathing attached 6" o.c. with #8 x 2" bugle head wood screws. The OSB was installed with a single horizontal and single vertical joint. TYPAR® BuildingWrap was installed with a T-Joint, having a minimum 6" overlap. All joints were taped with 1-7/8" wide TYPAR®Construction Tape. The building wrap was tacked in place with 3/8" crown x 1/4" leg staple placed randomly to hold in place. Vinyl Corp 3/4" E-Flange Casing Beads was attached along the perimeter of the water with #8 x 1" lath screws spaced 24" o.c. The casing was sealed on the exterior to the wall with MasterSeal NP150. StructaLath No. 17 SFRC Twin Trac 2.5 was installed with 1" leg x 1" crown, 16ga. galvanized steel staples spaced maximum 6" o.c. along the horizontal dimension on the twin track. The rows were spaced vertically a maximum 6" o.c. and offset 3" o.c. from the preceding row. The stucco finish was prepared by mixing Florida Super Stucco and sand at a 1:4 ratio and applied in two (2) 3/8" coats for a total thickness of 3/4". The final coat was densified with a green wet float. The walls were coated with DRYLOK® Extreme Masonry Waterproofer at a rate of 100 ft^2/gal applied in two coats (13-21 wet mils per coat).

Results: The specimen was tested December 5, 2019. Results of testing are shown below.

Table 1. Results from ASTM E330, Procedure A for ±60 psf Test Load

Pressure (psf)	Duration (s)	Result (Pass/Fail)
+30	10	Pass
0	60	Pass
+60	10	Pass
0	60	Pass
-30	10	Pass
0	60	Pass
-60	10	Pass
0	60	Pass
+90	10	Pass
0	60	Pass
-90	10	Pass
0	60	Pass

Note(s): Deflection measurements were not evaluated.

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Statement of Attestation:

The performance evaluation of the Sealed Cladding System was conducted in accordance with ASTM E 330-02(2010): *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference* as described herein. The laboratory test results presented in this report are representative of the material supplied.

Signed:

Zachary Priest, P.E.
Director

Report Issue History:

Issue #	Date	Pages	Revision Description (if applicable)
Original	12/05/2019	8	NA

APPENDIX FOLLOWS

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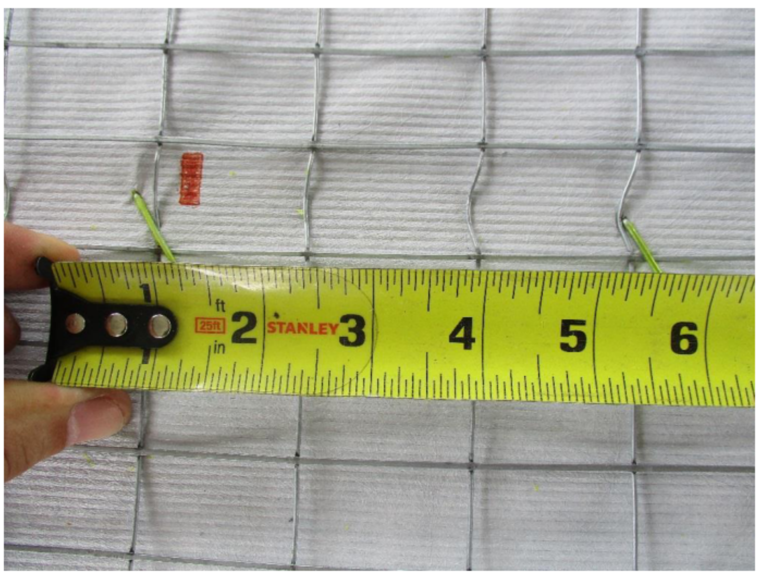
Specimen #1 Construction Photos



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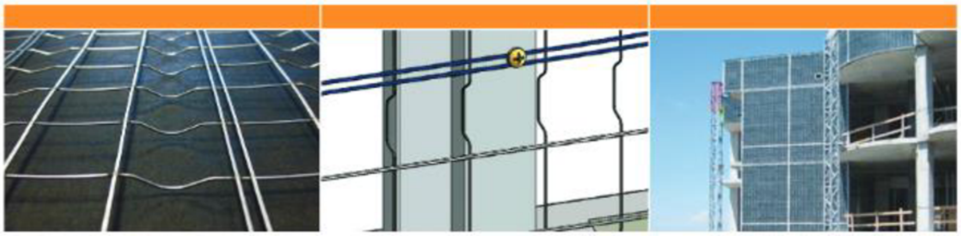
STRUCTA WIRE CORP

STRUCTALATH **TWIN TRAC**

SPECIFICATION SHEET

IAPMO UES 2017 US Patent # 6,305,424, B1 7,287,356, B2



Structalath Twin is a self furring welded wire lath for use as an alternative to the 2.5 lb/yd² diamond mesh metal lath as specified in ASTM C 847 and for use as an alternative to the 1.14 lb/yd² welded wire lath specified in ASTM C 933. Structalath Twin Trac is similar to Structalath No. 17 ga. with an addition of eight secondary cold–rolled longitudinal wires. Excellent for commercial construction, Twin Trac has been designed to simplify the attachment of wire lath to wood and steel studs.

FEATURES

- Designed to simplify attachment for both steel and wood stud construction
- 17 ga. galvanized steel wire is precision welded to form 1 ½" x 1 ½" openings
- Eight additional secondary cold rolled longitudinal wires form a twin trac that simplifies attachment
- The 3/16" Twin Trac spacing allows the easy penetration of screws, nails, and a wide base for automatic staples
- Rolls are 38 3/8" wide by 150 ft. long (50 square yards)
- Weight of roll is 1.14 lb/yd2
- Design promotes uniform plaster thickness
- Provides superior reinforcement and crack resistance
- Each and every cross wire is securely furred
- Hat channel furr provides for superior stucco embedment
- Longitudinal wires are cold rolled (flattened) to eliminate curvature memory
- Cold rolled (CR) process increases tensile and breaking load of wire
- Rolls out flat and stays flat
- Easy to fold around corners with clean bending lines

DETAILS

A. Width of furring leg 3/8"
B. Furring height 1/4" to the underside of the cross wire
C. Furring rows every 3" on centre
D. Every cross wire is furred
E. Tabs are aligned with edge wire and extend 1/4" beyond edge wires
F. Overall width is 38 3/8". Designed for full coverage of 9' - 3" wall heights including code required overlaps
G. Twin Trac for ease of attachment

PACKAGING

- 32 rolls per pallet
- Each rolls is banded with poly strapping indicating manufacturer and IAPMO UES 2017
- English/Spanish installation instructions available

GREEN ATTRIBUTES

- Made from 80% recycled steel – recycling conserves natural and energy resources
- Conservation of steel without reducing strength
- Less metal with no loss of performance
- Compact packaging means further reduction in total carbon footprint

ALSO AVAILABLE:

- Twin Trac - Stainless Steel T- 304/ANSI *Special Order Only*

Fully conforms to the requirements for stucco reinforcing as defined in UBC, IBC and IRC building codes

STRUCTA WIRE CORP. 1395 NORTH GRANDVIEW HWY, VANCOUVER, BC V5N 1N2 T 604-254-9868 E INFO@STRUCTAWIRE.COM

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Tampa, FL 33610
813.621.5777
https://www.pri-group.com/

Laboratory Test Report

Table T-3

ASTM E 330 WIND RESISTANCE EVALUATION OF SEALED CLADDING SYSTEM ON A WOOD FRAMED WALL WITH LATH ATTACHED WITH SCREWS

(PROJECT NO. 1809T0001)

For

KONING CONSTRUCTION CONSULTANTS
8301 JOLIET STREET
HUDSON, FL 34667

OCTOBER 8, 2019

Purpose: Evaluate the exterior finish assembly described herein for wind resistance in accordance with **ASTM E 330:** ***Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference***.

Test Methods: Testing was conducted in accordance with ASTM E 330-02(2010): *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.* Specimens were tested in accordance with Procedure A. The selected test load was ±50 psf, which equates to a ±75 psf proof load when the typical 1.5 factor of safety is applied to the test result. The following sequence was used to evaluate the specimen:

1. +75 psf was applied for 10 seconds
2. Specimen was recovered for 1-5 minutes
3. +150 psf was applied for 10 seconds
4. Specimen was recovered for 1-5 minutes
5. -75 psf was applied for 10 seconds
6. Specimen was recovered for 1-5 minutes
7. -150 psf was applied for 10 seconds
8. Specimen was recovered for 1-5 minutes

Sampling: All products applied to the wood studs were provided by Koning Construction Consultants. Below is an itemized list of products that are used in the Sealed Cladding System.

Product Identification	Manufacturer
TYPAR® BuildingWrap	Fiberweb, Inc.
TYPAR®Construction Tape	Fiberweb, Inc.
StructaLath No. 17 SFRC Twin Trac 2.5	Structa Wire Corp.
DRYLOK®Extreme Masonry Waterproofer	United Gilsonite Laboratories
Vinyl Corp E-Flange Casing Beads	ClarkDietrich
MasterSeal NP150	BASF
Florida Super Stucco	Argos Cement LLC

Specimen: A 4-ft x 8-ft mock-up was constructed from No.2 2x6 dimensional lumber with studs located 16-inch o.c. and sheathed with CAT 7/16 PS 2-10 OSB sheathing attached 6" o.c. with #8 x 2" bugle head wood screws. The OSB was installed with a single horizontal and single vertical joint. TYPAR® BuildingWrap was installed with a T-Joint, having a minimum 6" overlap. All joints were taped with 1-7/8" wide TYPAR®Construction Tape. The building wrap was tacked in place with 3/8" crown x 1/4" leg staple placed randomly to hold in place. Vinyl Corp 3/4" E-Flange Casing Beads was attached along the perimeter of the water with #8 x 1" lath screws spaced 24" o.c. The casing was sealed on the exterior to the wall with MasterSeal NP150. StructaLath No. 17 SFRC Twin Trac 2.5 was installed with #8 x 1" truss-head, K-lath screws spaced maximum 16" o.c. along the horizontal dimension on the twin track. The attachment rows were spaced vertically a maximum 6" o.c. and offset 8" o.c. from the preceding row. The stucco finish was prepared by mixing Florida Super Stucco and sand at a 1:4 ratio and applied in two (2) 3/8" coats for a total thickness of 3/4". The final coat was densified with a green

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

wet float. The walls were coated with DRYLOK® Extreme Masonry Waterproofer at a rate of 100 ft^2/gal applied in two coats (13-21 wet mils per coat).

Results: The specimen was tested September 11, 2019. Results of testing are shown below.

Table 1. Results from ASTM E330, Procedure A for ±75 psf Test Load

Pressure (psf)	Duration (s)	Result (Pass/Fail)
+75	10	Pass
0	60	Pass
+150	10	Pass
0	60	Pass
-75	10	Pass
0	60	Pass
-150	10	Pass
0	60	Pass

Note(s): Deflection measurements were not evaluated.

Specimen failure was determined by the presence of visible cracks in the stucco finish.

Statement of Attestation:

The performance evaluation of the Sealed Cladding System was conducted in accordance with ASTM E 330-02(2010): *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference* as described herein. The laboratory test results presented in this report are representative of the material supplied.

Signed:

Zachary Priest, P.E.
Director

Report Issue History:

Issue #	Date	Pages	Revision Description (if applicable)
Original	10/08/2019	8	NA
Rev 1	10/28/2019	8	Editorially revised

APPENDIX FOLLOWS

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Specimen #1 Construction Photos

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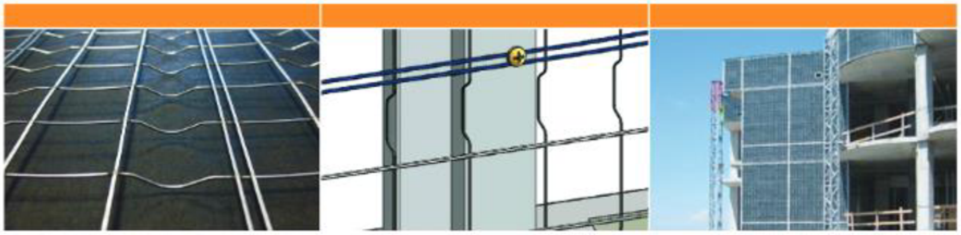
STRUCTA WIRE CORP

STRUCTALATH **TWIN TRAC**

SPECIFICATION SHEET

IAPMO UES 2017 US Patent # 6,305,424, B1 7,287,356, B2



Structalath Twin is a self furring welded wire lath for use as an alternative to the 2.5 lb/yd² diamond mesh metal lath as specified in ASTM C 847 and for use as an alternative to the 1.14 lb/yd² welded wire lath specified in ASTM C 933. Structalath Twin Trac is similar to Structalath No. 17 ga. with an addition of eight secondary cold–rolled longitudinal wires. Excellent for commercial construction, Twin Trac has been designed to simplify the attachment of wire lath to wood and steel studs.

FEATURES

- Designed to simplify attachment for both steel and wood stud construction
- 17 ga. galvanized steel wire is precision welded to form 1 ½" x 1 ½" openings
- Eight additional secondary cold rolled longitudinal wires form a twin trac that simplifies attachment
- The 3/16" Twin Trac spacing allows the easy penetration of screws, nails, and a wide base for automatic staples
- Rolls are 38 3/8" wide by 150 ft. long (50 square yards)
- Weight of roll is 1.14 lb/yd2
- Design promotes uniform plaster thickness
- Provides superior reinforcement and crack resistance
- Each and every cross wire is securely furred
- Hat channel furr provides for superior stucco embedment
- Longitudinal wires are cold rolled (flattened) to eliminate curvature memory
- Cold rolled (CR) process increases tensile and breaking load of wire
- Rolls out flat and stays flat
- Easy to fold around corners with clean bending lines

DETAILS

A. Width of furring leg 3/8"
B. Furring height 1/4" to the underside of the cross wire
C. Furring rows every 3" on centre
D. Every cross wire is furred
E. Tabs are aligned with edge wire and extend 1/4" beyond edge wires
F. Overall width is 38 3/8". Designed for full coverage of 9' - 3" wall heights including code required overlaps
G. Twin Trac for ease of attachment

PACKAGING

- 32 rolls per pallet
- Each rolls is banded with poly strapping indicating manufacturer and IAPMO UES 2017
- English/Spanish installation instructions available

GREEN ATTRIBUTES

- Made from 80% recycled steel – recycling conserves natural and energy resources
- Conservation of steel without reducing strength
- Less metal with no loss of performance
- Compact packaging means further reduction in total carbon footprint

ALSO AVAILABLE:

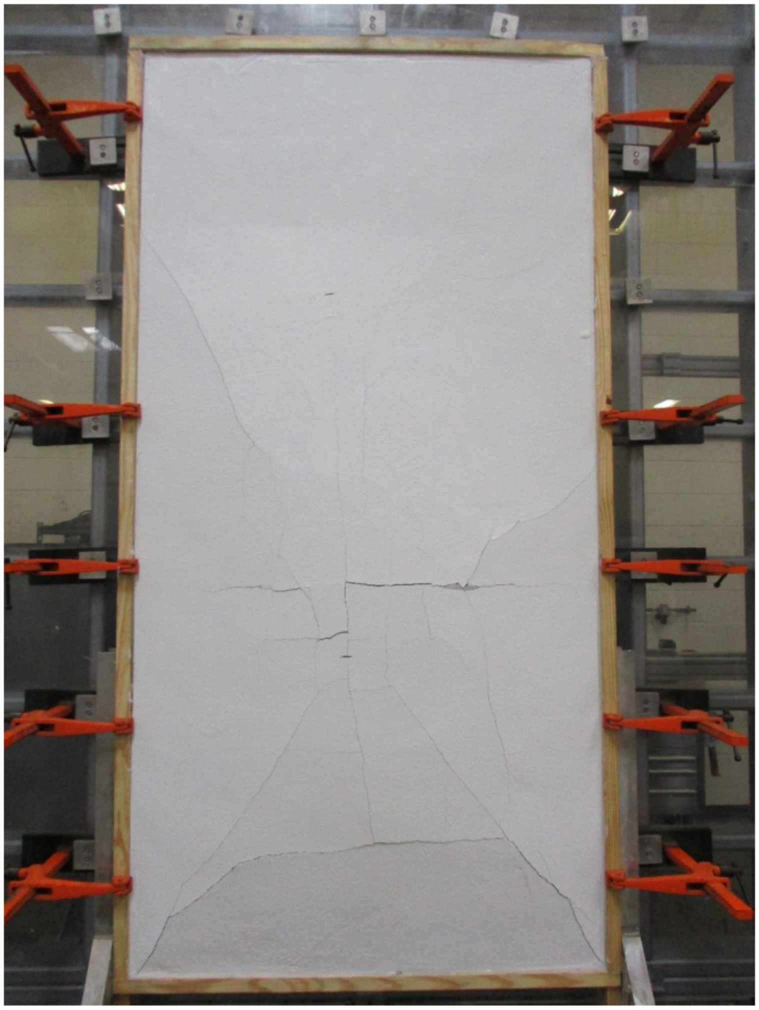
- Twin Trac - Stainless Steel T- 304/ANSI *Special Order Only*

Fully conforms to the requirements for stucco reinforcing as defined in UBC, IBC and IRC building codes

STRUCTA WIRE CORP. 1395 NORTH GRANDVIEW HWY, VANCOUVER, BC V5N 1N2 T 604-254-9868 E INFO@STRUCTAWIRE.COM

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

Specimen #1 Failure Photo



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CONSTRUCTION MATERIALS
TECHNOLOGIES

Table T-4

WIND RESISTANCE EVALUATION OF THE KONING EXTERIOR FINISH ASSEMBLY IN ACCORDANCE WITH ASTM E 330

(PROJECT NO. KCCI-002-02-03)

For

KONING CONSTRUCTION CONSULTANTS
8301 JOLIET STREET
HUDSON, FL 34667

APRIL 4, 2016

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

Purpose: Evaluate the Koning Exterior Finish Assembly for wind resistance in accordance with **ASTM E 330: *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference***.

Test Methods: Testing was conducted in accordance with ASTM E 330-02(2010): *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*. Specimens were tested in accordance with Procedure A. The selected test load was ±150 psf, which equates to a ±225 psf proof load when the typical 1.5 factor of safety is applied to the test result. The following sequence was used to evaluate the specimen:

1. -75 psf was applied for 10 seconds
2. Specimen was recovered for 1-5 minutes
3. -150 psf was applied for 10 seconds
4. Specimen was recovered for 1-5 minutes
5. +75 psf was applied for 10 seconds
6. Specimen was recovered for 1-5 minutes
7. +50 psf was applied for 10 seconds
8. Specimen was recovered for 1-5 minutes
9. -112.5 psf was applied for 10 seconds
10. Specimen was recovered for 1-5 minutes
11. -225 psf was applied for 10 seconds
12. Specimen was recovered for 1-5 minutes
13. +112.5 psf was applied for 10 seconds
14. Specimen was recovered for 1-5 minutes
15. +225 psf was applied for 10 seconds
16. Specimen was recovered for 1-5 minutes

Sampling: All products applied to the exterior sheathing were provided by Koning Construction Consultants. Below is an itemized list of products that are used in the Koning Exterior Finish Assembly.

Product Identification	Manufacturer
Tyvek® HomeWrap	DuPont
Vinyl Casing Bead	Not provided
Structalath Twin Trac	Structa Wire Corporation
Florida Super Stucco	Argos Cement LLC
MasterSeal NP 150	BASF Corp.

Specimen: A 4-ft x 8-ft mock-up was constructed from No.2 2x6 dimensional lumber and sheathed with 7/16" OSB. The OSB sheathing was installed with two (2) offset vertical joints and one horizontal joint and was fastened to the framing with #8 x 2 wood screws spaced 6" o.c. along the edges and intermediate supports. DuPont Tyvek® HomeWrap was placed over the OSB using 1-1/2" plastic cap nails spaced 24" o.c. 5/8" ground x 1-3/4" flange, vinyl casing beads were located around perimeter of the specimen and attached 24" o.c with #8 x 1" PH wood screws. Structalath Twin Trac was secured through to the sheathing with #8 x 1" PH screws spaced 12" o.c. horizontally and 6 " o.c vertically in a staggered pattern. The stucco finish was prepared by mixing Florida Super Stucco and

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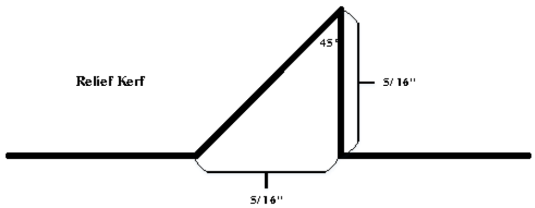
sand at a 1:3 to 1:4 ratio and applied flush with the casing bead. A relief kerf, as shows below, was cut into the wet stucco at the casing bead. MasterSeal NP 150 was applied in the kerf to seal to the trim.



Results: The specimen was tested January 29, 2016. Results of testing are shown below.

Table 1. Results from ASTM E 330, Procedure A

Pressure (psf)	Duration (s)	Result (Pass/Fail)
-75	10	Pass
0	60	Pass
-150	10	Pass
0	60	Pass
+75	10	Pass
0	60	Pass
+150	10	Pass
0	60	Pass
-112.5	10	Pass
0	60	Pass
-225	10	Pass
0	60	Pass
+112.5	10	Pass
0	60	Pass
+225	10	Pass
0	60	Pass

Note(s): Deflection measurements were not evaluated.

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Statement of Attestation:

The performance evaluation of Koning Exterior Finish Assembly was conducted in accordance with ASTM E 330-02(2010): *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference* as described herein. The laboratory test results presented in this report are representative of the material supplied.

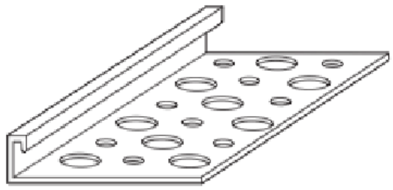
Signed: ______________________

Zachary Priest, P.E.
Director

Report Issue History:

Issue #	Date	Pages	Revision Description (if applicable)
Original	04/04/2016	13	NA

APPENDIX FOLLOWS



Vinyl Casing Bead

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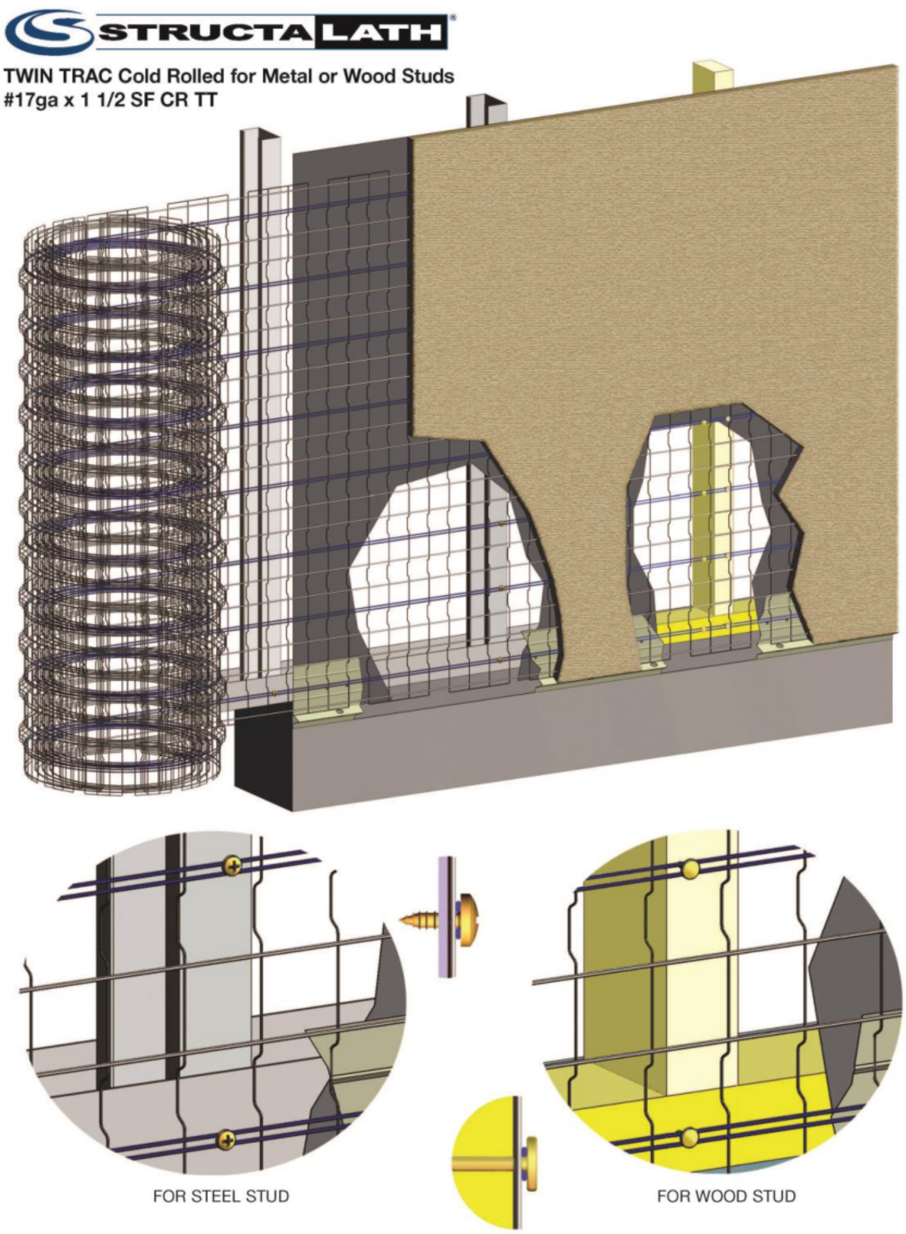
INTRODUCING
STRUCTA LATH®
1 1/2" SF CR TWIN TRAC
Another natural innovation from Structa Wire Corp.
We've made our product even better!
▶ Twin Trac simplifies the attachment of wire lath to wood and steel studs for residential and commercial construction.
▶ Twin Trac provides convenient options for attachment of the lath that exceed all building code requirements.
Features
▶ Twin Trac in rolls (compared to sheet) provides the most economical and cost effective metal base (wire lath) for 3 coat stucco on commerical buildings.
▶ Twin Trac creates a series of (8)-3/16" spacing bands which act as a continuous washer. This allows the easy penetration of self-tapping screws or hand nails, providing a wide flat base for automatic staples.
▶ Twin Trac flat wires provide a pressure seal at the fastener penetration point that serves to inhibit water leakage.
▶ Twin Trac secures and protects asphalt building paper from punctures.
▶ Twin Trac at a 38 3/8" width and 150' length requires 50% less side and end laps on average (compared to 27" x 101" metal lath sheets). This reduces overlaps which create weak points and are a significant source of shrinkage cracking.
▶ Twin Trac utilizes our cold rolled flat wire exclusively for longitudinal wires which provides greater tensile strength and additional surface area for keying purposes.
▶ Worker friendly Twin Trac unwinds from roll into the flat without curvature memory.
StructaLath provides a minimum of 28 (rugged) furring points per square foot that ensure superior embedment and crack resistance.
STRUCTA WIRE CORP.
Structa Wire Corp., Vancouver, BC Canada 1.800.887.4708
www.structawire.com


STRUCTA LATH
TWIN TRAC Cold Rolled for Metal or Wood Studs
#17ga x 1 1/2 SF CR TT
FOR STEEL STUD
FOR WOOD STUD

BASF
We create chemistry

Technical Data Guide

7 | 07 92 00
Joint
Sealants

MasterSeal® NP 150

Low-modulus, non-sag, elastomeric, hybrid sealant

FORMERLY SONOLASTIC® 150 VLM

PACKAGING
- 300 ml (10.1 fl oz) cartridges, 30 cartridges per carton
- 20 oz (590 ml) ProPaks, 20 per carton

COLORS
White, Stone, Limestone, Black, Medium Bronze, Aluminum Gray, Tan, Off-White, Special Bronze, Precast White, Champagne

YIELD
See page 3 for charts

STORAGE
Store in original, unopened containers in a cool, dry area. Protect unopened containers from heat and direct sunlight. Storing at elevated temperatures will reduce shelf life.

SHELF LIFE
15 months when properly stored

VOC CONTENT
13.6 g/L
less water and exempt solvents

DESCRIPTION
MasterSeal NP 150 is a high performance, very low-modulus, high-movement, non-sag, fast-curing, hybrid sealant.

PRODUCT HIGHLIGHTS
- Superior adhesion results in a long-lasting bond, helping to reduce call backs
- Low modulus to accommodate for joint movement (100% extension in EIFS joints with little stress on bond line)
- Can be painted with elastomeric coatings soon after installation
- Easy to gun and tool, speeding up application
- Wide temperature application range
- Weather resistant for long-lasting weathertight seals
- Fast curing helps to speed up jobsite production
- Non-staining formula for use on stone and other sensitive substrates
- Available in ProPaks to reduce jobsite waste and lower disposal costs
- Meets all state and federal VOC regulations

SUBSTRATES
- EIFS
- Stucco
- Aluminum
- Concrete
- Masonry
- Wood
- Stone
- Metal
- Vinyl
- Fiber cement siding

APPLICATIONS
- Vertical or horizontal
- Exterior or interior
- Above grade
- Joints with high movement
- In place of silicone sealants
- Store front systems
- Expansion joints
- Panel walls
- Precast units
- Aluminum, vinyl and wood window frames
- Fascia
- Parapets
- Sanitary applications

HOW TO APPLY
JOINT PREPARATION
1. The product may be used in sealant joints designed in accordance with SWR Institute's Sealants - The Professional's Guide.
2. In optimal conditions, the depth of the sealant should be ½ the width of the joint. The sealant joint depth (measured at the center) should always fall between the maximum depth of ½" and the minimum depth of ¼". Refer to Table 1.

Master Builders Solutions by BASF
www.buildingsystems.basf.com

MASTER® BUILDERS SOLUTIONS

Technical Data

Composition

MasterSeal NP 150 is a formulation based on hybrid polymer.

Compliances

- ASTM C 920, Type S, Grade NS, Class 50, Use NT, M, A, and O*
  -capable of +100/-50% movement under typical field conditions.
- ASTM C 1382 for use with EIFS wall systems at 100% Extension
- Federal Specification TT-S-001543A, Type II, Class A, Type Nonsag
- Federal Specification TT-S-00230C, Type II,Class A
- Corps of Engineers CRD-C-541, Type II, Class A
- CFI accepted
- USDA compliant for use in areas that handle meat and poultry

*Refer to substrates in Where to Use.

Typical Properties

PROPERTY	VALUE
Service temperature range, ° F (° C)	-40 to 180 (-40 to 82)
Shrinkage	None

SEALANT • WATERPROOFING & RESTORATION INSTITUTE

Issued to: **BASF Corporation**
Product: **Sonolastic 150 W/VLM**
C719: Pass ✓ Ext:+50% Comp:-50%
Substrate: Primed Mortar, Unprimed Aluminum and Glass
[mortar substrates were primed with Sonneborn Primer 2000]
C661: Rating 17
Validation Date: 10/12/13 – 10/11/17
No. 1013-VLM1017 *Copyright © 2013*
SEALANT VALIDATION
www.swrionline.org

TABLE 1
Joint Width and Sealant Depth

JOINT WIDTH, IN (MM)	SEALANT DEPTH AT MIDPOINT, IN (MM)
½–¾ (13–19)	¼–⅜ (6–10)
¾–1 (19–25)	⅜–½ (10–13)
1–1½ (25–38)	½ (13)

Test Data

PROPERTY	RESULTS	TEST METHOD
Movement capability, %	±50	ASTM C 719
Extention	100%	ASTM C 1382
100% modulus, psi (MPa)	35 (0.24)	ASTM C 412
Tensile strength, psi (MPa)	140–180	ASTM D 412
Tear strength, lb/in (kg/cm)	40 (7.1)	ASTM D 1004
Ultimate elongation at break, %	800–1,000	ASTM D 412
Rheological, (sag in vertical displacement), at 120° F (49° C)	No sag	ASTM C 639
Extrudability, sec	2 – 3	ASTM C 1183
Hardness, Shore A, at standard conditions	17	ASTM C 661
Weight loss, after heat aging, %	< 10	ASTM C 1246
Tack-free time, min (maximum 72 hours)	90	ASTM C 1246
Stain and color change	Passes (no visible stain)	ASTM C 510
Bond durability,* pli on aluminum and concrete, +/– 50% movement	Passes	ASTM C 719
Adhesion* in peel, pli (kg/cm), (minimum 5 pli [0.89 kg/cm])		ASTM C 794
Aluminum	35 (6.2)	
Concrete	36 (6.4)	
Artificial weathering, Xenon arc, 2,000 hrs	No Cracking	ASTM G 155

*Concrete primed with MasterSeal P 179 for water immersion as indicated in ASTM C 920.
Test results are averages obtained under laboratory conditions. Reasonable variations can be expected.

Yield

LINEAR FEET PER GALLON*

JOINT DEPTH, (INCHES)	⅜	½	JOINT WIDTH (INCHES) ⅝
¼	205	154	122
⅜	–	–	82
½	–	–	–

3. In deep joints, the sealant depth must be controlled by closed cell backer rod or soft backer rod. Where the joint depth does not permit the use of backer rod, a bond breaker (polyethylene strip) must be used to prevent three-point bonding.
4. To maintain the recommended sealant depth, install backer rod by compressing and rolling it into the joint channel without stretching it lengthwise. Closed cell backer rod should be about ⅛" (3 mm) larger in diameter than the width of the joint to allow for compression. Soft backer rod should be approximately 25% larger in diameter than the joint width. The sealant does not adhere to it, and no separate bond breaker is required. Do not prime or puncture the backer rod.

SURFACE PREPARATION

Substrates must be structurally sound, fully cured, dry and clean. Substrates should always be free of the following: dirt, loose particles, oil, grease, asphalt, tar, paint, wax, rust, waterproofing or curing and parting compounds, membrane materials and sealant residue

EIFS

1. MasterSeal NP 150 should be applied to the system base coat for best adhesion and to avoid delamination of EIFS finish applied in the joint.
2. Base coat must be sound, well bonded, properly cured and of sufficient depth to comply with manufacturer's specifications.
3. Certain EIFS systems require the use of a primer. Refer to the EIFS manufacturer for recommendations.

CONCRETE, STONE, AND OTHER MASONRY

Clean by grinding, sandblasting or wire brushing to expose a sound surface free of contamination and laitance.

WOOD

New and weathered wood must be clean, dry and sound. Scrape away loose paint to bare wood. Any coatings on wood must be tested to verify adhesion of sealant or to determine an appropriate primer.

METAL

Remove scale, rust and loose coatings from metal to expose a bright white surface. Any coatings on metal must be tested to verify adhesion of sealant or to determine an appropriate primer.

PRIMING

1. MasterSeal NP 150 is generally a non-priming sealant, but special circumstances or substrates may require a primer.
   - Porous materials subject to intermittent water immersion require priming. Use MasterSeal P 179.
   - Certain architectural metal finishes may require priming with MasterSeal P 173.
   - It is the user's responsibility to check the adhesion of the cured sealant on typical test joints at the project site before and during application. Refer to the technical data guides for MasterSeal P 179 and MasterSeal P 173.
2. Apply primer full strength with a brush or clean cloth. A light, uniform coating is sufficient for most surfaces. Very porous surfaces may require a second coat of MasterSeal P 179; however, do not over apply
3. Allow primer to dry before applying MasterSeal NP 150. Depending on temperature and humidity, primer will be tack-free in 15–30 minutes. Priming and sealing must be done on the same day.

APPLICATION

1. MasterSeal NP 150 comes ready to use. Apply using professional grade caulking gun. Do not open cartridges, ProPaks or pails until preparatory work has been completed.
2. Fill joints from the deepest point to the surface by holding an appropriately sized nozzle against the back of the joint.
3. Dry tooling is recommended. Proper tooling results in the correct bead shape, neat joints, and optimal adhesion.

CLEAN UP

1. Immediately after use, clean equipment with MasterSeal 990 or xylene. Use proper precautions when handling solvents.
2. Remove cured sealant by cutting with a sharp-edged tool.
3. Remove thin films by abrading

FOR BEST PERFORMANCE

- In cold weather, store container at room temperature for at least 24 hours before using.
- Not for use in glazing applications. Do not apply on glass and plastic glazing panels.
- For proper sealing of joint edges, all window covers must be removed prior to application of sealant.
- Do not allow uncured MasterSeal NP 150 to come into contact with alcohol-based materials or solvents.
- MasterSeal NP 150 should not be applied adjacent to other uncured sealants and certain petroleum based products.
- MasterSeal NP 150 can adhere to other residual sealants in restoration applications. For best results, always clean the joint as advised in the Surface Preparation section of this data guide. A product field adhesion test for MasterSeal NP 150 within the specific application is always recommended to confirm adhesion and suitability of the application.
- MasterSeal NP 150 should not be used for continuous immersion in water. Contact Technical Service for recommendations.
- Do not apply over freshly treated wood. Allow six months for weathering
- Do not use MasterSeal P 179 on nonporous surfaces such as aluminum, steel, vinyl or Kynar 500 based paints. Use MasterSeal P 173 on coated metals when testing dictates.
- Lower temperatures and humidity will extend curing times.
- MasterSeal NP 150 can be painted over after a thin film or skin forms on the surface.
- Pursuant to accepted industry standards and practices, using rigid paints and/or coatings over flexible sealants can result in a loss of adhesion of the applied paint and/or coating, due to the potential movement of the sealant. However, should painting and/or coating be desired it is required that the applicator of the paint and/or coating conduct on-site testing to determine compatibility and adhesion.
- Proper application is the responsibility of the user. Field visits by BASF personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.

HEALTH, SAFETY AND ENVIRONMENTAL

Read, understand and follow all Safety Data Sheets and product label information for this product prior to use. The SDS can be obtained by visiting www.master-builders-solutions.basf.us, e-mailing your request to basfbscst@basf.com or calling 1(800)433-9517. Use only as directed. **For medical emergencies only, call ChemTrec® 1(800) 424-9300.**

LIMITED WARRANTY NOTICE

BASF warrants this product to be free from manufacturing defects and to meet the technical properties on the current Technical Data Guide, if used as directed within shelf life. Satisfactory results depend not only on quality products but also upon many factors beyond our control. BASF MAKES NO OTHER WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ITS PRODUCTS. The sole and exclusive remedy of Purchaser for any claim concerning this product, including but not limited to, claims alleging breach of warranty, negligence, strict liability or otherwise, is the replacement of product or refund of the purchase price, at the sole option of BASF. Any claims concerning this product must be received in writing within one (1) year from the date of shipment and any claims not presented within that period are waived by Purchaser. BASF WILL NOT BE RESPONSIBLE FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFITS) OR PUNITIVE DAMAGES OF ANY KIND.

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Construction Systems
889 Valley Park Drive, Shakopee, MN 55379
www.master-builders-solutions.basf.us
Customer Service 1(800)433.9517
Technical Service 1(800)243.6739

DuPont™ Tyvek® HomeWrap®

PHYSICAL PROPERTIES DATA SHEET

PROPERTIES	METHOD	DUPONT™ TYVEK® HOMEWRAP®
Air Penetration Resistance	ASTM E2178 (cfm/ft²@1.57 psf)	< .004
	Gurley Hill (TAPPI T-460) (sec/100cc)	1200
	ASTM E1677	Type 1
Water Vapor Transmission	ASTM E96-05 Method A (g/m²-24 hrs) (perms)	400 56
	Method B (g/m²-24 hrs) (perms)	370 54
Water Penetration Resistance	ATTCC 127 (cm)	250
Basis Weight	TAPPI T-410 (oz/yd²)	1.8
Breaking Strength	ASTM D882 (lbs/in)	30/30
Tear Resistance (Trapezoid)	ASTM D1117 (lbs)	8/6
Surface Burning Characteristics	ASTM E84 Flame Spread Index	15 Class A
	Smoke Developed Index	15 Class A
Ultra Violet Light Exposure (UV)		120 days (4 months)

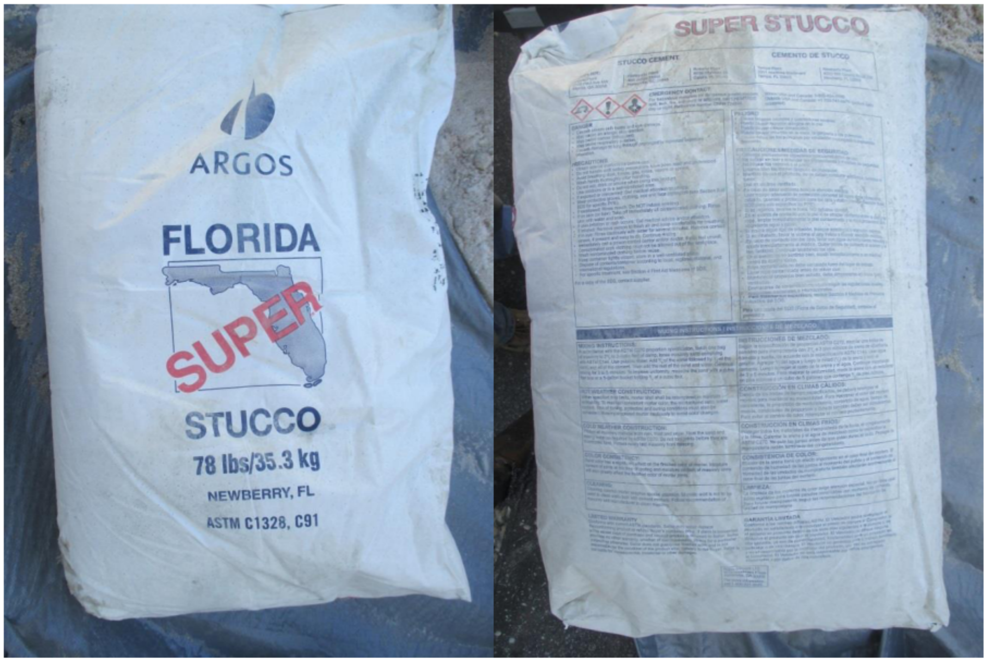
Test results shown represent roll averages. Individual results may vary either above or below averages due to normal manufacturing variations, while continuing to meet product specifications.

For more information about DuPont™ Tyvek® Weatherization Systems, please call 1-800-44-Tyvek or visit us at www.Construction.Tyvek.com

WARNING: DuPont™ Tyvek® is combustible and should be protected from an open flame and other high heat sources. If the temperature of DuPont™ Tyvek® reaches 750 °F (400 °C), it will burn and the fire may spread and fall away from the point of ignition.

The miracles of science™

DuPont™ Tyvek® HomeWrap®



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PRI Construction Materials Technologies LLC
6412 Badger Drive
Tampa, FL 33610
813.621.5777
https://www.pri-group.com/

Laboratory Test Report

Table T-5

ASTM E 330 WIND RESISTANCE EVALUATION OF SEALED CLADDING SYSTEM OVER DENSGLASS® SHEATHING

(PROJECT NO. 1809T0003)

For

KONING CONSTRUCTION CONSULTANTS
8301 JOLIET STREET
HUDSON, FL 34667

DECEMBER 5, 2019

Purpose: Evaluate the exterior finish assembly described herein for wind resistance in accordance with **ASTM E 330:** ***Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference***.

Test Methods: Testing was conducted in accordance with ASTM E330-02(2010): *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.* Specimens were tested in accordance with Procedure A. The selected test load was ±120 psf, which equates to a ±180 psf proof load when the typical 1.5 factor of safety is applied to the test result. The following sequence was used to evaluate the specimen:

1. +60 psf was applied for 10 seconds
2. Specimen was recovered for 1-5 minutes
3. +120 psf was applied for 10 seconds
4. Specimen was recovered for 1-5 minutes
5. -60 psf was applied for 10 seconds
6. Specimen was recovered for 1-5 minutes
7. -120 psf was applied for 10 seconds
8. Specimen was recovered for 1-5 minutes
9. +180 psf was applied for 10 seconds
10. Specimen was recovered for 1-5 minutes
11. -180 psf was applied for 10 seconds
12. Specimen was recovered for 1-5 minutes

Sampling: All products applied to the assembly were provided by Koning Construction Consultants. Below is an itemized list of products that are used in the Sealed Cladding System.

Product Identification	Manufacturer
TYPAR® BuildingWrap	Fiberweb, Inc.
TYPAR® Construction Tape	Fiberweb, Inc.
StructaLath No. 17 SFRC Twin Trac 2.5	Structa Wire Corp.
DRYLOK® Extreme Masonry Waterproofer	United Gilsonite Laboratories
Vinyl Corp E-Flange Casing Beads	ClarkDietrich
MasterSeal NP150	BASF
Florida Super Stucco	Argos Cement LLC

Specimen: A 4-ft x 8-ft mock-up was constructed from 18 ga. galvanized steel, 2x6 c-stud with studs located 16-inch o.c. and sheathed with 5/8" thick DensGlass® Sheathing attached 6" o.c. with #8 x 1.25" wafer head screws. C-stud straps were placed 24" o.c. between each stud and the DensGlass® Sheathing was attached 6" o.c. into each strap. TYPAR® BuildingWrap was installed with a T-Joint, having a minimum 6" overlap. All joints were taped with 1-7/8" wide TYPAR® Construction Tape. The building wrap was tacked in place with 3/8" crown x 1/4" leg staple placed randomly to hold in place. Vinyl Corp 3/4" E-Flange Casing Beads was attached along the perimeter of the wall with #8 x 1" lath screws spaced 24" o.c. The casing was sealed on the exterior to the wall with MasterSeal NP150. StructaLath No. 17 SFRC Twin Trac 2.5 was installed with #8 x 1" truss-head K-lath screws spaced a maximum 16" o.c. into each stud along the twin track. The attachment rows were spaced vertically into the stud at each twin track

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(approximately 6" o.c.). In addition, the lath was attached at each c-stud strap 4" o.c. and along the twin track. The stucco finish was prepared by mixing Florida Super Stucco and sand at a 1:4 ratio and applied in two (2) 3/8" coats for a total thickness of 3/4". The final coat was densified with a green wet float. The walls were coated with DRYLOK® Extreme Masonry Waterproofer at a rate of 100 ft^2/gal applied in two coats (13-21 wet mils per coat).

Results: The specimen was tested December 5, 2019. Results of testing are shown below.

Table 1. Results from ASTM E330, Procedure A for ±120 psf Test Load

Pressure (psf)	Duration (s)	Result (Pass/Fail)
+60	10	Pass
0	60	Pass
+120	10	Pass
0	60	Pass
-60	10	Pass
0	60	Pass
-120	10	Pass
0	60	Pass
+180	10	Pass
0	60	Pass
-180	10	Pass
0	60	Pass

Note(s): Deflection measurements were not evaluated.

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

Statement of Attestation:

The performance evaluation of the Sealed Cladding System was conducted in accordance with ASTM E 330-02(2010): *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference* as described herein. The laboratory test results presented in this report are representative of the material supplied.

Signed:

Zachary Priest, P.E.
Director

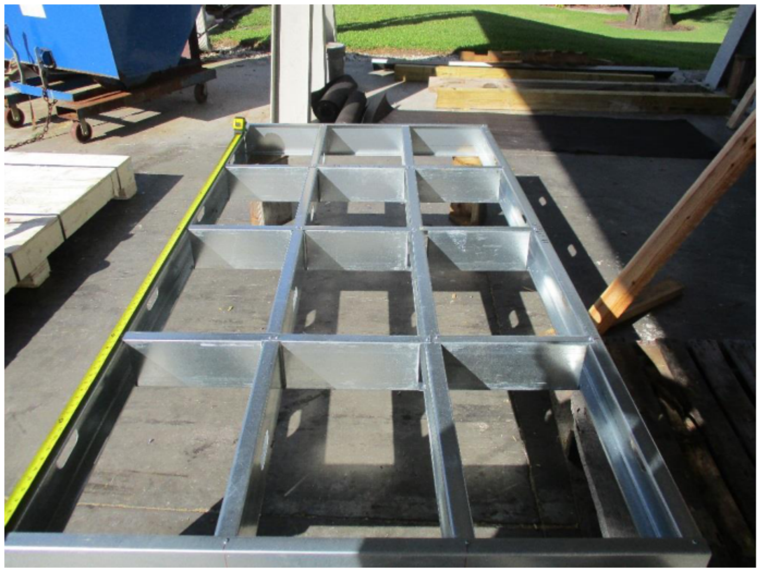
Report Issue History:

Issue #	Date	Pages	Revision Description (if applicable)
Original	12/05/2019	8	NA

PPENDIX FOLLOWS

PRI Construction Materials Technologies LLC 6412 Badger Drive Tampa, FL 33610 Tel: 813-621-5777 Fax: 813-621-5840 e-mail: materialstesting@pricmt.com WebSite: http://www.pricmt.com

Specimen #1 Construction Photos



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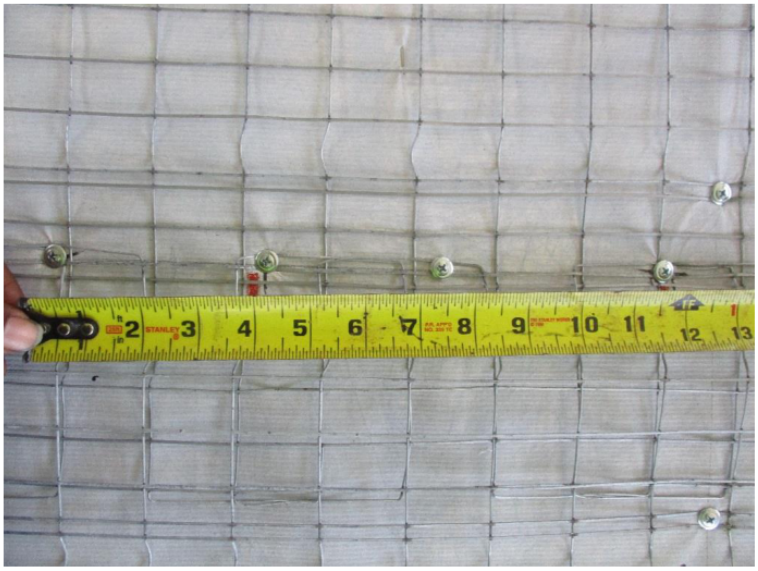

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Add new

2510.3.1. The Safe Attachment Tables for Metal with PRI Reports as published separately by the Stucco Institute or contained within the Stucco Design Manual shall be accepted as conforming to accepted engineering practices for attachment of metal or wire lath.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10284

31

Date Submitted	02/12/2022	**Section**	2510.3.2	**Proponent**	Robert Koning
Chapter	25	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

Summary of Modification

Adds new paragraph for laboratory tested and code approved application manual available to the public free of charge

Rationale

Rationale: The current prescriptive attachment methods for claddings found in the ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The Safe Attachment Tables with PRI Reports contain published attachment patterns and fastener specifications for common applications including their allowable loads tabulated in in Tables with graphical representations of all requirements for each specimen. All data tested according to the requirements of ASTM 330 with accredited laboratory reports and Florida Product Approval

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

Alternate Language

2nd Comment Period

S10284-A1

Proponent Robert Koning **Submitted** 8/26/2022 11:58:45 AM **Attachments** Yes

Rationale:

Rationale: The current prescriptive attachment methods for claddings found in the ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The Safe Attachment Tables with PRI Reports contain published attachment patterns and fastener specifications for common applications including their allowable loads tabulated in in Tables with graphical representations of all requirements for each specimen. Stucco over solid backing (CMU a/k/a Block) is not detailed in the ASTM C926 unless colored cementitious finish is applied - which is rarely done in Florida. This manual prescribes the time tested Florida method. All data tested according to the requirements of ASTM 330 with accredited laboratory reports and Florida Product Approval.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No

Does not degrade the effectiveness of the code

No

Add new 2510.3.2

2510.3.2. The Add new 2510.3.2

2510.3.2. The Stucco Design and Installation Technical Manual TM 201.2 with Florida Product Approval #Fl30710-R1 shall be accepted as conforming to accepted engineering practices for application of Face Sealed Systems.

2510.3.2

<u>2510.3.2. The Sealed Stucco Cladding System as published within the Stucco Design Manual shall be accepted as conforming to accepted engineering practices for application of Face Sealed Systems.</u>

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10285

32

Date Submitted	02/12/2022	**Section**	2512.1	**Proponent**	Robert Koning
Chapter	25	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

Summary of Modification

Adds needed exception for other code allowed installations and systems

Rationale

Rationale: 1. The ASTM C926 defines at 3.2.11.9 “skim coat, n—a thin finish coat applied to an existing plaster surface or other substrate to improve appearance.” This application does not require a defined thickness nor more than one coat. Neither does a Decorative Cementitious Finish. Cement plaster can be applied cosmetically to mimic faux finishes on both wet and dry locations. Section 2510.5 does not segregate locations or application purposes. 2. Face Barrier Systems have been the predominant application process in Florida since the inception of applied exterior stucco systems. The ASTM C926 is for a concealed drainage system with the application of an 1/8” colored cementitious finish coat in low wind regions over open framing or non-structural sheathing. It does not address the application processes for other systems. The requirement for the ASTM E300 and ASTM E331 assures attachment according to Chapter 16 and weather protection requirements pursuant to 1403.2

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

Alternate Language

2nd Comment Period

S10285-A1

Proponent Robert Koning **Submitted** 8/26/2022 12:07:23 PM **Attachments** Yes

Rationale:

Rationale: 1. The ASTM C926 defines at 3.2.11.9 “skim coat, n—a thin finish coat applied to an existing plaster surface or other substrate to improve appearance.” This application does not require a defined thickness nor more than one coat. Neither does a Decorative Cementitious Finish. Cement plaster can be applied cosmetically to mimic faux finishes on both wet and dry locations. Section 2510.5 does not segregate locations or application purposes. 2. Face Barrier Systems have been the predominant application process in Florida since the inception of applied exterior stucco systems. The ASTM C926 / C1063 is for a concealed drainage system with the application of an 1/8” colored cementitious finish coat in low wind regions over open framing or non-structural sheathing. It does not address the application processes for other systems. The requirement for the ASTM 300 and ASTM 331 assures attachment according to Chapter 16 and weather protection requirements pursuant to 1403.2

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No

Does not degrade the effectiveness of the code

No

Add Exceptions to 2512.1 General
Exceptions:
1. Systems Applied as ASTM C926 Skim Coats, Face Sealed Systems, Decorative Cementitious Finishes or specialty cosmetic applications of cement plaster.
2. Where the Exterior Wall Covering Assembly System Method is a Face Sealed System approved in accordance with ASTM 300 for required wind loads of Chapter 16 and accordance with the ASTM 331 weather protection requirements of 1403.2.
3. Systems designed by a licensed architect or engineer

Exceptions:
1. Systems Applied as ASTM C926 Skim Coats, Face Sealed Systems, Decorative Cementitious Finishes or specialty cosmetic applications of cement plaster.
2. Where the Exterior Wall Covering Assembly System Method is a Face Sealed System approved in accordance with ASTM E300 for required wind loads of Chapter 16 and accordance with the ASTM E331 weather protection requirements of 1403.2.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10301

33

Date Submitted	02/12/2022	**Section**	2510.6.2	**Proponent**	Robert Koning
Chapter	25	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

This is based upon S196-19 as approved by the Commission

Summary of Modification

Add Exceptions

Rationale

Rationale: 1. No definition is provided for "ventilated space" and no direction on how to provide such. Without a definition of the required minimum dimensions, how can this be properly regulated or inspected? Ventilation requiring entry and exit points creates a chimney effect within the wall cavity formed by combustible materials. Though rainscreen proponents typically have tested to NFPA 285, this is a 2-story test. Consider wood framed apartment buildings of more than two floors. Will there be a requirement for firestopping between floors? A ventilated space here provides continual, 24/7, exposure to hot , humid, and highly salt-laden air (from 30-60 miles inland of the coast) on the back side of the lath. Lath is not required to be nor is it possible to fully encapsulate lath. Open ventilation gaps leave an open "bug run" in the wall. Insect infestation is likely. Bear in mind that a termite needs only 1/64th to pass through. This exception restores all other installation assemblies that have proven histories for performance. The Florida Lath & Plaster Bureau strongly supports the removal of this exception until such time as these issues are addressed. Placing the exception will allow the continuance of the proven methodology. 2. The current prescriptive attachment methods for claddings found in the ASTM C 926 and ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult 3. Face Barrier Systems have been the predominant application process in Florida since the inception of applied exterior stucco systems.. It does not address the application processes for other systems, rather contains an "unless otherwise specified" provision for partial or whole modification. The requirement for the ASTM E300 and ASTM E331 assures attachment and weather protection requirements pursuant to 1403.2

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

None

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

None

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

None

Does not degrade the effectiveness of the code

None

2nd Comment Period

S10301-G2

Proponent	Robert Koning	Submitted	8/26/2022 2:16:08 PM	Attachments	No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application of cement plaster – both in current and historical provisions and referenced documents.

1st Comment Period History

S10301-G1

Proponent	Danko Davidovic	Submitted	4/15/2022 1:36:44 PM	Attachments	No

Comment:

I have the following concerns with proposed code change: 1) My first comment would be that referenced section does not exist in the current code. 2) The face sealed stucco cladding system relies solely on the exterior surface of the stucco and sealants used to control the water intrusion into the whole system. In other words, there is no mechanism to manage the moisture once it penetrates the exterior seal. It might be proponent's experience that these systems work in practice, however, there is no good track record about performance of these systems and what is rate of failure due to poor installation and lack of maintenance. 3) It is inappropriate to place structural requirements for these cladding systems into the section of the code which addresses only the water management of the stucco cladding system. 4) The current code does not define and recognize the face sealed stucco systems, and introducing partial provisions for performance of these systems would create more confusion to the industry and society than providing ultimate benefit. In particular reference to ASTM E331 for testing water resistance does not proide detailed specs what tested wall assembly should include (opaque wall only, any control/expansion joints, penetrations, transitions, etc.). 5) It might be helpful to strategically develope other code sections defining the scope, description, structural performance of these face sealed stucco systems, before addressing the water integrity aspect as proposed here. 6) Even ASTM E2128-17: "Standard Guide for Evaluating Water Leakage of Building Walls" in Appendix X5: Cement Stucco and Tile Systems, Appendix X5.3.2 acknowledges that "stucco alone should not be considered a permanent barrier to water penetration".

Exceptions:

1. Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of a water-resistive barrier complying with ASTM E2556, Type II and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or drainage space.

2. Where the windspeed is equal to or greater than 115 Vult, metal, wire, plastic, fiberglass or other lathing attachment for cement claddings or systems are through vented channel bases, furring strips or similar drainage spaces the assemblage must be engineered for fastener withdrawal and cladding flexure to ensure the superimposed wind load requirements of chapter 16 Wind Design Requirements are satisfied or tested in accordance with ASTM E330 for required wind load attachment using the Factor of Safety of 2.5 pursuant to Florida Building Code 1709.3.

3. Where the Exterior Wall Covering Assembly System Method is a Face Sealed System approved in accordance with ASTM E300 for required wind loads of of Chapter 16 are met and in accordance with the ASTM E331 weather protection requirements.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

S10286

34

Date Submitted	02/12/2022	**Section**	35	**Proponent**	Robert Koning
Chapter	35	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

Adds Referenced Publication

Rationale

Rationale: References

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities
No - same products as alwayas - no change

Does not degrade the effectiveness of the code
No, improves understanding

2nd Comment Period

S10286-G1

Proponent	Robert Koning	Submitted	8/26/2022 2:32:34 PM	Attachments	No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The listing of a published technical design document with the code authorized ASTM E330, ASTM E331 and ASTM E74 testing approval and Florida Product Approval Number #FL30710-R1 seems to be without objection.

Add to Chapter 35
SI - Stucco Institute
Stucco Design Manual
SI-SDM-20
Title:
Stucco Design Manual
Sealed Stucco Cladding System
Referenced Sections:
2510.3.1
2510.3.2

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Building

35

S10353

Date Submitted	02/13/2022	**Section**	35	**Proponent**	Greg Johnson
Chapter	35	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Type IV Mass timber proposed mods: 10099; 10162; 10163; 10167; 10168; 10174

Summary of Modification

Identifies referenced standards related to new Type IV construction classifications

Rationale

This modification provides section and edition details for standards referenced as part of the Type IV mass timber construction modifications. These standards were all updated or added as part of Mod#9124 (ADM47-16) so staff and TAC members should already have copies. APA 320-19 is provided as it is not referenced in the current FBC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None; reference standards update.

Impact to building and property owners relative to cost of compliance with code

None; reference standards update.

Impact to industry relative to the cost of compliance with code

None; reference standards update.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Reference standards update.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by updating to current referenced standards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No materials are required of prohibited by this modification.

Does not degrade the effectiveness of the code

Improves the code by updating to current referenced standards.

2nd Comment Period

S10353-G1

Proponent	Greg Johnson	Submitted	8/11/2022 5:57:11 PM	Attachments	No

Comment:

All of the proposed referenced standards are already accepted for reference in the FL Building Code (S10106 provided some updates approved by the structural TAC). This modification identifies the applicability of the referenced standard to specific sections related to mass timber.

2nd Comment Period

S10353-G2

Proponent	ashley ong	Submitted	8/26/2022 4:05:08 PM	Attachments	No

Comment:

Building Officials Association of Florida (BOAF) supports this modification.

AISI S220—~~15~~20 North American Standard for Cold-formed Steel Framing-Nonstructural Members, ~~2015~~
722.7.2.1, 2203.1, 2203.2, 2211.1, 2211.2, 2214.3, Table 2506.2, Table 2507.2

ANSI/APA PRG 320-19 Standard for Performance-Rated Cross-Laminated Timber
602.4

ASTM C920—~~14~~18 A Standard for Specification for Elastomeric Joint Sealants
1711.2.1, 2415.4, Table 2506.2, B303.6, E303.3.1

ASTM C1002-18 Specification for Steel Self-piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
722.7.2.2

ASTM D3498—03 (2011) Standard Specifications for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
1711.2.1, 2314.4.4, 2322.1.5

ASTM E84—2016 Test Methods for Surface Burning Characteristics of Building Materials
202, 402.6.4.4, 406.7.2, 452.2.16.3, 602.4.1.1, 602.4.2.1, 602.4.3.1, 1703.5.2, 720.1, 720.4, 803.1.1, 803.1.4, 803.10, 803.11, 806.7, 1403.5, 1404.12.1, 1407.9, 1407.10.1, 1409.9, 1409.10.1, 1510.6.2, 1510.6.3, 2303.2, 2314.4.4, 2603.3, 2603.4.1.13, 2603.5.5, 2604.2.4, 2606.4, 2612.3, 2614.3, 3105.6

NFPA 275—17 Standard Method of Fire Tests for the Evaluation of Thermal Barriers
508.4.4.1, 509.4.1, 1407.10.2, 1409.10.2, 2603.4

UL 723—~~2008~~2018 Standard for Test for Surface Burning Characteristics of Building Materials—with Revisions through August 2013
202, 402.6.4.4, 406.7.2, 602.4.1.1, 602.4.2.1, 602.4.3.1, 703.5.2, 720.1, 720.4, 803.1.1, 803.1.4, 803.10, 803.11, 806.7, 1403.5, 1404.12.1, 1407.9, 1407.10.1,1409.9, 1409.10.1, 1510.6.2, 1510.6.3, 2303.2, 2603.3, 2603.4.1.13, 2603.5.4, 2603.5.5, 2604.2.4, 2606.4, 2612.3, 2614.3, 3105.3.4.1, D102.2.8, D106

S10353Text Modification

ANSI/APA PRG 320-2019

AMERICAN NATIONAL STANDARD

Standard for Performance-Rated Cross-Laminated Timber

Approved American National Standard

ANSI

APA

Mod_10353_Text_ANSI-APA PRG-320-2019.pdf Page: 1

AMERICAN NATIONAL STANDARD

Approval of an American National Standard requires review by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made towards their resolution. The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

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www.ansi.org

Published by
APA – The Engineered Wood Association
7011 South 19th Street
Tacoma, WA 98466

Cover photo courtesy of Nordic Structures.

ANSI/APA PRG 320-2019

AMERICAN NATIONAL STANDARD

Standard for Performance-Rated Cross-Laminated Timber

APA – The Engineered Wood Association

Approved January 6, 2020
American National Standards Institute

FOREWORD (This Foreword is not a part of American National Standard ANSI/APA PRG 320-2019)

This standard provides requirements and test methods for qualification and quality assurance for performance-rated cross-laminated timber (CLT), which is manufactured from solid-sawn lumber or structural composite lumber (SCL) intended for use in construction applications. Product performance classes are also specified.

The development of this consensus American National Standard was achieved by following the *Operating Procedures for Development of Consensus Standards* of *APA – The Engineered Wood Association*, approved by the American National Standards Institute (ANSI).

Inquiries or suggestions for improvement of this Standard should be directed to *APA – The Engineered Wood Association* at 7011 South 19th Street, Tacoma, WA 98466, www.apawood.org.

CONTENTS

Continued next page

CONTENTS (continued)

1 SCOPE

Cross-laminated timber (CLT) panels referenced in this standard are defined in 3.2 and shall be qualified and marked in accordance with this standard. This standard provides requirements for dimensions and tolerances, performance, test methods, quality assurance, and marking for CLT panels.

CLT panels shall be used in dry service conditions, such as in most covered structures, where the average equilibrium moisture content of solid wood is less than 16 percent in the U.S. and is 15 percent or less over a year without exceeding 19 percent in Canada. CLT panels qualified in accordance with the provisions of this standard are intended to resist the effects of moisture on structural performance as may occur due to construction delays or other conditions of similar severity. Products marked in accordance with this standard shall be used in accordance with the installation requirements prescribed in the recommendations provided by the CLT manufacturer, an *approved agency*, and/or its trade association. Finger joining, edge gluing, and face gluing between CLT panels, and camber of CLT panels are beyond the scope of this standard.

The annex contained in this standard is mandatory, while notes and appendices are non-mandatory. This standard incorporates the U.S. customary units as well as the International System of Units (SI). The values given in the U.S. customary units are the standard in the U.S. and the SI values given in parentheses are the standard in Canada.

2 REFERENCED DOCUMENTS

This standard incorporates dated references. Subsequent amendments or revisions to these references apply to this standard only when incorporated into this standard by amendments or revisions.

2.1 ASTM Standards

ASTM D9-12 Standard Terminology Relating to Wood and Wood-Based Products

ASTM D198-15 Standard Test Methods of Static Tests of Lumber in Structural Sizes

ASTM D905-08 (2013) Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading

ASTM D907-15 Standard Terminology of Adhesives

ASTM D1037-12 Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials

ASTM D2395-17 Standard Test Methods for Specific Gravity of Wood and Wood-Base Materials

ASTM D2559-12a (2018) Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions

ASTM D2915-17 Standard Practice for Sampling and Data-Analysis for Structural Wood and Wood-Based Products

ASTM D3737-18e1 Standard Practice for Establishing Stresses for Structural Glued Laminated Timber (Glulam)

ASTM D4761-19 Standard Test Methods for Mechanical Properties of Lumber and Wood-Based Structural Material

ASTM D5055-19 Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists

ASTM D5456-19 Standard Specification for Evaluation of Structural Composite Lumber Products

ASTM D6815-09 (2015) Standard Specification for Evaluation of Duration of Load and Creep Effects of Wood and Wood-Based Products

ASTM D7247-17 Standard Test Method for Evaluating the Shear Strength of Adhesive Bonds in Laminated Wood Products at Elevated Temperatures

ASTM D7374-08 (2015) Standard Practice for Evaluating Elevated Temperature Performance of Adhesives Used in End-Jointed Lumber

2.2 CSA Standards

CAN/CSA O86-14 (Reprint 2016) Engineering Design in Wood

CAN/ULC S101-14 Standard Methods of Fire Endurance Tests of Building Construction and Materials

CSA O112.10-08 (R2013) Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure)

CSA O122-16 Structural Glued-Laminated Timber

CSA O141-05 (R2014) Softwood Lumber

CSA O177-06 (R2015) Qualification Code for the Manufacturers of Structural Glued-Laminated Timber

2.3 Other Standards

AITC Test T107-2007 Shear Test

ANSI 405-2018 Standard for Adhesives for Use in Structural Glued Laminated Timber

ANSI A190.1-2017 Structural Glued Laminated Timber

ANSI/AWC NDS-2018 National Design Specification for Wood Construction

ISO/IEC 17011-2017 Conformity Assessment—General Requirements for Accreditation Bodies Accrediting Conformity Assessment Bodies

ISO/IEC 17020-2012 Conformity Assessment—Requirements for Operation of Various Types of Bodies Performing Inspection

ISO/IEC 17025-2017 General Requirements for the Competence of Testing and Calibration Laboratories

ISO/IEC 17065-2012 Conformity Assessment—Requirements for Bodies Certifying Products, Processes, and Services

NLGA Standard Grading Rules for Canadian Lumber (2017)

NLGA SPS 1-2017 Special Products Standard for Fingerjoined Structural Lumber

NLGA SPS 2-2019 Special Products Standard for Machine Graded Lumber

NLGA SPS 4-2014 Special Products Standard for Fingerjoined Machine Graded Lumber

NLGA SPS 6-2015 Special Products Standard for Structural Face-Glued Lumber

U.S. Product Standard PS 1-09 Structural Plywood

U.S. Product Standard PS 20-15 American Softwood Lumber Standard

3 TERMINOLOGY

3.1 Definitions

See the referenced documents for definitions of terms used in this standard.

3.2 Terms Specific to This Standard

ASD Reference Design Value—design value used in the U.S. based on normal duration of load, dry service conditions, and reference temperatures up to 100°F (38°C) for Allowable Stress Design (ASD)

Adhesive—a chemical substance capable of bonding materials together (aka Glue)

Adherend—a material held to another material by an adhesive

Approved Agency (Canada)—an established and recognized agency regularly engaged in conducting certification services, when such agency has been approved by regulatory bodies (see *Qualified Certification Agency*)

Approved Agency (U.S.)—an established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by regulatory bodies (see *Qualified Inspection Agency* and *Qualified Testing Agency*)

Billet— an unfinished CLT panel formed by a single pressing operation

Note 1: *One or several finished CLT panels may be produced from a billet*

Bond—the attachment at an interface between adhesive and adherends or the act of attaching adherends together by adhesive

Bondline—the layer of adhesive that attaches two adherends

- **Face bondline**—the bondline joining the wide faces of laminations in adjacent layers
- **Bondline**—the optional bondline joining the narrow faces of adjacent laminations within one layer

Characteristic Values—the structural property estimate, typically a population mean for stiffness properties or a tolerance limit (5th percentile with 75% confidence) for strength properties, as estimated from the test data that is representative of the population being sampled

Certificate of Conformance—a certificate issued by an approved agency certifying the product as in conformance to a standard or standards

Cross-Laminated Timber (CLT)—a prefabricated engineered wood product made of at least three orthogonal layers of graded sawn lumber or structural composite lumber (SCL) that are laminated by gluing with structural adhesives

CLT Grade—a class of CLT determined by the combination of grades of laminations in the longitudinal and transverse layers

Note 2: *Basic CLT grades and layups in this standard are listed in Annex A. Custom CLT grades and layups may be established in accordance with 7.1.2 (see Layup).*

CLT Length—dimension of the CLT panel measured parallel to the major strength direction

Note 3: *The length and width of CLT defined in this standard are based on the CLT panel face layer orientation and may not be related to the end-use applications, such as wall, roof, and floor.*

CLT Panel—a single piece of CLT

CLT Thickness—dimension of the CLT panel measured perpendicular to the plane of the panel

CLT Width—dimension of the CLT panel measured perpendicular to the major strength direction

Cure—the process of converting an adhesive into a fixed or hardened state by chemical and/or physical action

Delamination—the separation of layers in a laminate due to failure of the adhesive either in the adhesive itself or at the interface between the adhesive and the adherend

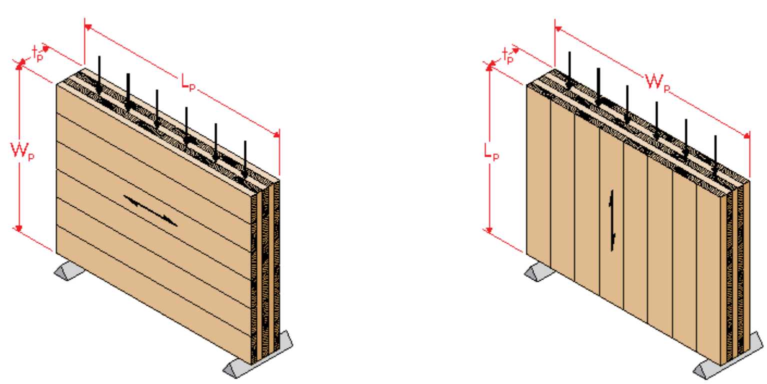
Note 4: *For a specimen, the average delamination is calculated as the ratio of the total length of delamination on all exposed bond lines divided by the total length of all exposed bond lines, in percentage.*

Edge (Panel Edge)—the narrow face of a panel that exposes the ends or narrow faces of the laminations

Edgewise Bending—bending of CLT under loads applied to the panel edge (see Figure 1) creating in-plane bending and edgewise shear, also known as in-plane shear or shear through-the-thickness

FIGURE 1

EDGEWISE BENDING IN THE MAJOR (LEFT) AND MINOR (RIGHT) CLT STRENGTH DIRECTIONS



Edge Joint—a joint of the narrow faces of adjacent laminations within a CLT layer with or without gluing

Effective Bonding Area—proportion of the lamination wide face averaged over its length that is able to form a close contact bond upon application of pressure

End Joint—a joint made by gluing the ends of two pieces of laminations within a CLT layer

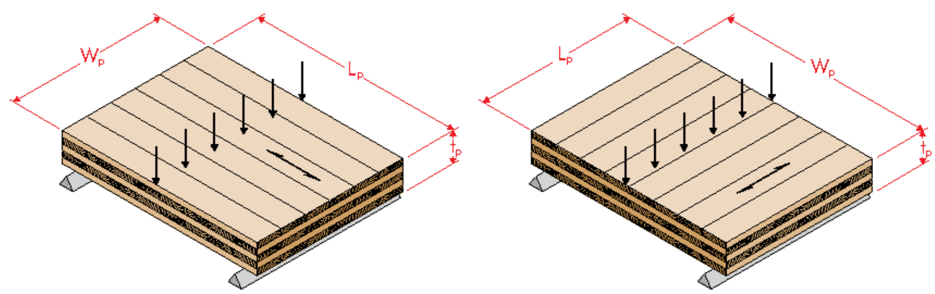
Face—one of the four longitudinal surfaces of a piece or panel

- **Lamination narrow face**—the face with the least dimension perpendicular to the lamination length
- **Lamination wide face**—the face with the largest dimension perpendicular to the lamination length
- **Panel face**—the face of the CLT length-width plane

Flatwise Bending—bending of CLT under transverse loads applied to the panel face (see Figure 2) creating out-of-plane bending and flatwise shear, also known as planar or rolling shear

FIGURE 2

FLATWISE BENDING IN THE MAJOR (LEFT) AND MINOR (RIGHT) CLT STRENGTH DIRECTIONS



Lamination—a piece of sawn lumber or structural composite lumber, including stress rated boards, remanufactured lumber, or end-joined lumber, which has been prepared and qualified for laminating

Layer—an arrangement of laminations laid out parallel to each other in one plane

- **Longitudinal layer**—a layer with the laminations oriented parallel to the major strength direction
- **Transverse layer**—a layer with the laminations oriented perpendicular to the major strength direction, also referred to as cross layer

Layup—an arrangement of layers in a CLT panel determined by the grade(s), number, orientations, and thickness(es) of layers

LSD Design Value—design value used in Canada based on standard-term duration of load, dry service conditions, and temperatures up to 122°F (50°C) except for occasional exposures to 150°F (65°C) for Limit States Design (LSD)

Major Strength Direction—direction parallel to strength direction of the laminations in the outer layers of the CLT panel

Manufacturing Standard—a document that establishes the minimum requirements for manufacturing practices, staff, facilities, equipment, and specific quality assurance processes, including inspection (in the U.S.) and/or certification (in Canada), by which the product is manufactured

Mill Specification—a manufacturing specification based on product evaluation to be used for quality assurance purposes by the manufacturer and the *approved agency*

Minor Strength Direction—direction of the grain of the inner layers perpendicular to the major strength direction of the CLT panel

Qualified Certification Agency (Canada)—an agency meeting the following requirements:

a. has trained personnel to perform product certification in compliance with all applicable requirements specified in this standard,

b. has procedures to be followed by its personnel in performance of the certification,

c. has no financial interest in, or is not financially dependent upon, any single company manufacturing the product being certified,

d. is not owned, operated, or controlled by any such company, and

e. is accredited by a recognized accreditation body under ISO/IEC 17065

Qualified Inspection Agency (U.S.)—an agency meeting the following requirements:

a. has trained personnel to verify that the grading, measuring, species, construction, bonding, workmanship, and other characteristics of the products as determined by inspection in compliance with all applicable requirements specified in this standard,

b. has procedures to be followed by its personnel in performance of the inspection,

c. has no financial interest in, or is not financially dependent upon, any single company manufacturing the product being inspected,

d. is not owned, operated, or controlled by any such company, and

e. is accredited by a recognized accreditation body under ISO/IEC 17020

Qualified Testing Agency—an agency meeting the following requirements:

a. has access to the facilities and trained technical personnel to conduct testing on the characteristics of the products by sampling and testing in compliance with all applicable requirements specified in this standard,

b. has procedures to be followed by its personnel in performance of the testing,

c. has no financial interest in, or is not financially dependent upon, any single company manufacturing the product being tested,

d. is not owned, operated, or controlled by any such company, and

e. is accredited by a recognized accreditation body under ISO/IEC 17025

Recognized Accreditation Body—an organization complying with ISO/IEC 17011 and recognized by the regulatory body having jurisdiction as qualified to evaluate and accredit certification agencies, inspection agencies and/or testing agencies

Remanufactured Lumber—lumber that meets the requirements of Section 5.4 of ANSI A190.1 in the U.S., or NLGA SPS 1, 2, 4, or 6 in Canada

Sample—one or more items taken as representative of a population or portion of material taken without bias from a bulk of material for assessment

Specimen—an individual piece of material or product selected for testing

Structural Composite Lumber (SCL)—an engineered wood product that is intended for structural use and bonded with adhesives, and meeting the definition and requirements of ASTM D5456

Wood Failure—the rupturing of wood fibers from the specified block shear test on bonded specimens, measured as the area of wood fiber remaining at the bondline and expressed as a percentage of total area involved in such failure

4 SYMBOLS

4.1 CLT Section and Mechanical Properties

Symbol	Definition	Reference(s)
$E_{e,0}$	Effective edgewise bending modulus of elasticity of CLT, in psi (MPa), in the major strength direction, used with $I_{e,0}$ when calculating edgewise bending stiffness	8.5.5.2
$E_{e,90}$	Effective edgewise bending modulus of elasticity of CLT, in psi (MPa), in the minor strength direction, used with $I_{e,90}$ when calculating edgewise bending stiffness	8.5.5.2
$(EI)_{eff,f,0}$	Effective flatwise bending stiffness of CLT, in lbf-in²/ft (N-mm²/m) of width, in the major strength direction	8.5.3.2 and Tables A2 and A4
$(EI)_{eff,f,90}$	Effective flatwise bending stiffness of CLT, in lbf-in²/ft (N-mm²/m) of width, in the minor strength direction	8.5.3.2 and Tables A2 and A4
$f_{b,e,0}$	Effective LSD specified edgewise bending strength of CLT, in MPa, in the major strength direction, used with $S_{e,0}$ when calculating LSD edgewise bending moment resistance.	8.5.5.2
$F_{b,e,0}$	Effective ASD reference edgewise bending stress of CLT, in psi, in the major strength direction, used with $S_{e,0}$ when calculating ASD reference edgewise bending moment.	8.5.5.2
$f_{b,e,90}$	Effective LSD specified edgewise bending strength of CLT, in MPa, in the minor strength direction, used with $S_{e,90}$ when calculating LSD edgewise bending moment resistance.	8.5.5.2
$F_{b,e,90}$	Effective ASD reference edgewise bending stress of CLT, in psi, in the minor strength direction, used with $S_{e,90}$ when calculating ASD reference edgewise bending moment.	8.5.5.2
$(f_bS)_{eff,f,0}$	Effective LSD flatwise bending moment resistance of CLT, in N-mm/m of width, in the major strength direction	8.5.3.2 and Table A4
$(F_bS)_{eff,f,0}$	Effective ASD reference flatwise bending moment of CLT, in lbf-ft/ft of width, in the major strength direction	8.5.3.2 and Table A2
$(f_bS)_{eff,f,90}$	Effective LSD flatwise bending moment resistance of CLT, in N-mm/m of width, in the minor strength direction	8.5.3.2 and Table A4
$(F_bS)_{eff,f,90}$	Effective ASD reference flatwise bending moment of CLT, in lbf-ft/ft of width, in the minor strength direction	8.5.3.2 and Table A2
$f_{v,e,0}$	LSD specified edgewise shear strength of CLT, in MPa, in the major strength direction, used with t_p when calculating LSD edgewise shear resistance.	8.5.6.2
$F_{v,e,0}$	ASD reference edgewise shear stress of CLT, in psi, in the major strength direction, used with t_p when calculating ASD reference edgewise shear capacity.	8.5.6.2
$f_{v,e,90}$	LSD specified edgewise shear strength of CLT, in MPa, in the minor strength direction, used with t_p when calculating LSD edgewise shear resistance.	8.5.6.2
$F_{v,e,90}$	ASD reference edgewise shear stress of CLT, in psi, in the minor strength direction, used with t_p when calculating ASD reference edgewise shear capacity	8.5.6.2
$G_{e,0}$	Effective modulus of rigidity (shear modulus) in edgewise bending of CLT, in psi (MPa), in the major strength direction, used with t_p when calculating edgewise shear stiffness	8.5.6.2
$G_{e,90}$	Effective modulus of rigidity (shear modulus) in edgewise bending of CLT, in psi (MPa), in the minor strength direction, used with t_p when calculating edgewise shear stiffness	8.5.6.2
$(GA)_{eff,f,0}$	Effective shear stiffness in flatwise bending of CLT in lbf/ft (N/m) of width in the major strength direction	8.5.4.2, and Tables A2 and A4
$(GA)_{eff,f,90}$	Effective shear stiffness in flatwise bending of CLT in lbf/ft (N/m) of width in the minor strength direction	8.5.4.2, and Tables A2 and A4
$I_{e,0}$	Gross moment of inertia of CLT in edgewise bending in the major strength direction, in in.⁴ (mm⁴), for a specific panel width (beam depth), calculated as $\frac{W_p^3 t_p}{12}$	8.5.5.2

Symbol	Definition	Reference(s)
$I_{e,90}$	Gross moment of inertia of CLT in edgewise bending in the minor strength direction, in in.[4] (mm[4]), for a specific panel length (beam depth), calculated as $\frac{L_p^3 t_p}{12}$	8.5.5.2
L_p	Length of CLT panel in ft (m), measured in the major strength direction	Figures 1 and 2
$S_{e,0}$	Gross section modulus of CLT in edgewise bending in the major strength direction, in in.[3] (mm[3]) for a specific CLT width (beam depth), calculated as $\frac{W_p^2 t_p}{6}$	8.5.5.2
$S_{e,90}$	Gross section modulus of CLT in edgewise bending in the minor strength direction, in in.[3] (mm[3]) for a specific CLT length (beam depth), calculated as $\frac{L_p^2 t_p}{6}$	8.5.5.2
t_p	Gross thickness of CLT panel, in in. (mm)	Figures 1 and 2, Tables A2 and A4, and 8.5.6.2
$v_{s,0}$	LSD flatwise shear resistance, in N/m of width, in the major strength direction	8.5.4.2 and Table A4
$V_{s,0}$	ASD reference flatwise shear capacity, in lbf/ft of width, in the major strength direction	8.5.4.2 and Table A2
$v_{s,90}$	LSD flatwise shear strength, in N/m of width, in the minor strength direction	8.5.4.2 and Table A4
$V_{s,90}$	ASD reference flatwise shear capacity, in lbf/ft of width, in the minor strength direction	8.5.4.2 and Table A2
W_p	Width of CLT panel in ft (m), measured in the minor strength direction	Figures 1 and 2

4.2 Lamination Mechanical Properties

Symbol	Definition	Reference(s)
E	Modulus of elasticity of a lamination, in psi (MPa)	Tables A1 and A3
f_b	Characteristic bending strength or LSD specified bending strength of a lamination, in psi (MPa)	Table A3
F_b	ASD reference bending stress of a lamination, in psi	Table A1
f_c	Characteristic axial compressive strength or LSD specified axial compressive strength of a lamination, in psi (MPa)	Table A3
F_c	ASD reference axial compressive stress of a lamination, in psi	Table A1
f_s	Characteristic planar (rolling) shear strength or LSD specified planar (rolling) shear strength of a lamination, in psi (MPa)	Table A3
F_s	ASD reference planar (rolling) shear stress of a lamination, in psi	Table A1
f_t	Characteristic axial tensile strength or LSD specified axial tensile strength of a lamination, in psi (MPa)	Table A3
F_t	ASD reference axial tensile stress of a lamination, in psi	Table A1
f_v	Characteristic shear strength or LSD specified shear strength of a lamination, in psi (MPa)	Table A3
F_v	ASD reference shear stress of a lamination, in psi	Table A1
G	Modulus of rigidity (shear modulus) of a lamination, in psi (MPa)	Tables A1 and A3

5 PANEL DIMENSIONS AND DIMENSIONAL TOLERANCES

5.1 CLT Thickness

The CLT thickness shall not exceed 20 inches (508 mm).

5.2 CLT Dimensional Tolerances

Dimension tolerances permitted at the time of manufacturing shall be as follows:

- CLT Thickness: ± 1/16 inch (1.6 mm) or 2% of the CLT thickness, whichever is greater
- CLT Width: ± 1/8 inch (3.2 mm)
- CLT Length: ± 1/4 inch (6.4 mm)

Textured or other face or edge finishes are permitted to alter the tolerances specified in this section. The designer shall compensate for any loss in cross-section and/or specified strength of such alterations.

Note 5: *The manufacturer may be contacted for recommendations.*

5.3 Squareness

Unless specified otherwise, the length of the two panel face diagonals measured between panel corners shall not differ by more than 1/8 inch (3.2 mm).

5.4 Straightness

Unless specified otherwise, deviation of edges from a straight line between adjacent panel corners shall not exceed 1/16 inch (1.6 mm).

6 COMPONENT REQUIREMENTS

6.1 Laminations

6.1.1 General

Lumber meeting the requirements of 6.1.2 and structural composite lumber meeting the requirements of 6.1.3 shall be permitted for use as laminations in CLT manufacturing and shall meet the requirements specified in 6.1.4 through 6.1.8. Laminations within the same layer shall be of the same thickness, type, grade, and species or species combination.

Note 6: *Laminations in different layers may be of different thicknesses, types, grades, and species or species combinations.*

6.1.2 Sawn lumber laminations

a. Lumber species – Lumber of any softwood species or species combinations recognized by American Lumber Standards Committee (ALSC) under PS 20 or Canadian Lumber Standards Accreditation Board (CLSAB) under CSA O141 with a minimum published specific gravity of 0.35, as published in the National Design Specification for Wood Construction (NDS) in the U.S. and CSA O86 in Canada, shall be permitted.

b. Lumber grades – The minimum grade of lumber in the longitudinal layers of CLT shall be 1200f-1.2E MSR or visual grade No. 2. The minimum grade of lumber in the transverse layers of CLT shall be visual grade No. 3. Remanufactured lumber shall be considered as equivalent to solid-sawn lumber when qualified in accordance with Section 5.4 of ANSI A190.1 in the U.S. or SPS 1, 2, 4, or 6 in Canada. Proprietary lumber grades meeting or exceeding the mechanical properties of the lumber grades specified above shall be permitted for use provided that they are qualified in accordance with the requirements of an *approved agency.*

Note 7: *ASTM D5055 provides guidance for proprietary lumber grades used specifically in I-joist applications.*

6.1.3 Structural composite lumber (SCL) laminations

Laminated Strand Lumber (LSL), Laminated Veneer Lumber (LVL), Oriented Strand Lumber (OSL), and Parallel Strand Lumber (PSL) meeting the requirements of ASTM D5456 and with a minimum published equivalent specific gravity of 0.35 shall be permitted.

6.1.4 Lamination sizes

a. Width – For longitudinal layers (major strength direction), the net lamination width shall not be less than 1.75 times the net lamination thickness. For transverse layers (minor strength direction), the net width of a lamination, or the combined width of an edge-bonded lamination or remanufactured lumber shall not be less than 3.5 times the net lamination thickness unless the interlaminar shear strength and creep are evaluated by testing in accordance with Section 8.5.5 and the principles of ASTM D6815, respectively. Laminations made of SCL shall be permitted to be full CLT width.

b. Thickness – The net lamination thickness in any layer at the time of gluing shall not be less than 5/8 inch (16 mm) or more than 2 inches (51 mm). The lamination thickness shall not vary within the same CLT layer subject to the tolerances specified in 6.1.7.

Note 8: *The CLT manufacturer should contact the SCL manufacturer to ensure that protective coatings have not been applied to the surface of the SCL that may hamper the face bonding of the SCL laminations.*

6.1.5 Moisture content

The moisture content of the laminations at the time of CLT manufacturing shall be typically 12 ± 3% and 8 ± 3%, for lumber and SCL laminations, respectively. Lower lamination moisture contents shall be permitted if the adhesive bond performance is qualified at the lower moisture content in accordance with 6.3.3, 8.2.5, and 8.2.6, and meets the recommendations provided by the adhesive manufacturer. When a lower moisture content is used, the as-manufactured moisture content of the laminations shall be within ± 3% of the average moisture content from the qualification.

6.1.6 Face–bonding surface

a. General – Laminations shall be prepared to provide bonding surfaces for adhesive bond performance required by this standard and to meet the recommendations provided by the adhesive manufacturer.

Note 9: *Satisfactory face-bonding surfaces are typically free from dust, foreign matter, and exudation that are detrimental to adhesive bond performance.*

b. Lumber – All face-bonding surfaces shall be planed or sanded prior to face bonding. The process used to prepare bonding surfaces shall be approved by the *approved agency.*

Note 10: *Satisfactory face-bonding surfaces are typically free of raised grain, torn grain, skip, burns, glazing or other deviations from the plane of the surface that might interfere with the contact of sound wood fibers in the bonding surfaces, except for minor local variations. It may be necessary to plane or sand the lumber lamination surfaces within 48 hours of face bonding for some wood species.*

c. SCL – Planing or sanding of face-bonding surfaces prior to face bonding shall not be required unless indicated otherwise by the adhesive bond qualification or required to meet lamination thickness tolerances.

6.1.7 Face–bonding dimensional tolerances

At the time of face bonding, the thickness variation across the width of a lumber lamination shall not exceed ±0.008 inch (0.20 mm) and the thickness variation across the width of a SCL lamination shall not exceed ±0.008 inch (0.20 mm) in every 12-inch (30.5-mm) width. The thickness variation along the length of a lumber or SCL lamination shall not exceed ±0.012 inch (0.30 mm).

Note 11: *Cup and twist, if present, should be small enough to be flattened out by pressure in bonding.*

6.1.8 Gaps between adjacent lamination edges

At the time of CLT manufacturing, laminations in the CLT layers shall be tightly fit. Gaps between adjacent lamination edges (edge joint gaps) are permitted as follows: Edge joint gaps in face layers shall not exceed 1/4 inch (6.4 mm) and edge joint gaps between adjacent lamination edges in other layers shall not exceed 3/8 inch (9.5 mm).

Note 12: *Edge joint gaps are typically caused by imperfections such as crook or twist in individual laminations, which prevent contact along the full length of edges. Consequently, small gaps may occur in a layer at the time of manufacturing. These gaps are not typically present between all laminations in the layer or along the full length of individual edges. Small natural growth characteristics of lumber, such as knots and wane, are not considered as part of an edge joint gap and should not be included in the measurements. The intent of this standard is for the laminations to be tightly fit with no individual gap exceeding the prescribed limits.*

Note 13: *This provision applies at the time when the CLT billet exits the press and the quality assurance measures are implemented at the plant. Gaps in face layers may increase slightly as CLT billets or panels season.*

Note 14: *When edge joints of laminations are not bonded with an adhesive or not filled with a filler, small air gaps are common for CLT (see Note 12). These gaps will affect the air tightness through the CLT thickness, and the effect will depend on the number of CLT layers and actual gap size as manufactured. If air tightness is an important requirement, such as in fire containment, thermal resistance, or sound attenuation, additional measures should be incorporated in the assembly design, such as the use of an air-tight membrane (e.g. concrete floor topping or finished gypsum wallboard ceiling for floor-ceiling assemblies or finished gypsum wallboard or plaster for wall assemblies).*

6.2 Adhesives

Adhesives used for CLT manufacturing shall meet the requirements specified in this section.

6.2.1 Requirements in the U.S.

Adhesives used in CLT shall meet the requirements of ANSI 405 with the following exceptions:

a. Section 2.1.6 of ANSI 405 is not required, and

b. The CSA O177 small-scale flame test (Sections 2.1.7 and 3.7 of ANSI 405) shall be conducted using CLT specimens of the same size and geometry as the structural glued laminated timber specimens.

6.2.2 Requirements in Canada

Adhesives used in CLT shall meet the requirements of CSA O112.10, and Sections 2.1.3, 2.1.7, 3.3, and 3.7 of ANSI 405 with the following exception:

a. The CSA O177 small-scale flame test (Sections 2.1.7 and 3.7 of ANSI 405) shall be conducted using CLT specimens of the same size and geometry as the structural glued laminated timber specimens.

Note 15: *The CSA O177 small-scale flame test specimens should be made with orthogonal 0.78-inch (20-mm) laminations to replicate a CLT configuration, resulting in 8 laminations (6.3 inches or 160 mm) in height, and approximately 6 inches (150 mm) in width and 1.6 inches (40 mm) in thickness. There should be no edge joints within the inner 6 laminations. Whenever possible, the pith should be centered along the lamination.*

6.2.3 Elevated temperature performance requirements in the U.S. and Canada

Adhesives shall be evaluated and comply with the requirements for elevated temperature performance in accordance with Annex B.

Note 16: *The intent of the elevated temperature performance evaluation is to identify and exclude use of adhesives that permit CLT char layer fall-off resulting in fire regrowth during the cooling phase of a fully developed fire.*

6.3 Lamination Joints

6.3.1 General

The lamination joints of CLT shall meet the requirements specified in this section.

6.3.2 End joints in laminations

End joints in each lamination shall be either finger-jointed or scarf-jointed. Butt joints shall not be permitted. The manufacturing of end joints shall follow ANSI A190.1 in the U.S. or CSA O122 in Canada. The strength, wood failure, and bond durability of lamination end joints shall be qualified in accordance with the requirements specified herein.

a. Full-size end-joint specimens shall be prepared from lumber or SCL selected at random from stock meeting the requirements of 6.1.1 to 6.1.5. Additional requirements specified in the CLT plant manual procedures and quality manuals shall be followed.

b. A minimum of 30 full-size end-joint specimens shall be tested in tension. The specimens shall be centered between the grips of the testing machine, which are spaced at minimum 24 inches (610 mm) apart and tested to failure in approximately 3 to 5 minutes at a constant rate of loading. The accuracy of the load measurements shall be within ±1%. Average wood failure of all end-joint specimens tested shall be equal to or greater than 80%. The characteristic tensile strength of the end joints (5th percentile with 75% confidence) shall be equal to or greater than 2.1 times the ASD tension design value in the U.S. or 1.1 times the LSD specified tensile strength in Canada of the laminating lumber or SCL.

c. A minimum of 5 individual end-joint specimens shall be selected and tested for bond durability. Each specimen shall have a length of approximately 6 inches (152 mm) with the end joint located approximately in the center of the specimen. The specimen shall be crosscut through the center of the joint with a saw kerf of 1/8 inch (3.2 mm) or less to create two specimens with a length of approximately 3 inches (76 mm) and each having at least 1/4 inch (6.4 mm) of the end joint remaining after crosscutting. The specimens shall be tested for bond durability in accordance with the method in 8.2.6(b) and shall meet the delamination requirements specified in 6.3.3(b).

6.3.3 Edge and face joints between laminations

a. The wood failure of the edge (when required for structural performance) and face joints in the block shear specimens (see Figure 4) prepared in accordance to 8.2.4 and tested in accordance to 8.2.5 shall meet the following requirements:

1. The average wood failure of all specimens combined shall equal to or greater than 80%,
2. At least 95% of all specimens shall have a wood failure of minimum 60%, and
3. For specimens with wood failure below 50%, a second block shear specimen shall be permitted to be prepared from the same bond line and tested in accordance with 8.2.5. Wood failure of the second specimen shall be 80% minimum.

b. The delamination for the edge (when required for structural performance) and face joints in the delamination specimens (see Figure 5) prepared in accordance with 8.2.4 and tested in accordance with 8.2.6 shall meet the following requirements:

1. The average delamination of all bond lines in each specimen shall not exceed 5%, and
2. If the average delamination of all bond lines in a specimen exceeds 5% but is not more than 10%, a second delamination specimen shall be permitted to be prepared from the same CLT panel and tested in accordance with 8.2.6. The average delamination of all bond lines in the second specimen shall be no more than 5%.

For CLT products using SCL laminations, the SCL-to-lumber and SCL-to-SCL face bonds shall be permitted to be evaluated in accordance with the short-span flatwise bending tests specified in Section A4.2 of ASTM D5456 except that a single vacuum-pressure-soak cycle shall be permitted, and the average strength retention shall be at least 75%.

7 CLT PERFORMANCE CRITERIA

CLT shall meet the performance requirements established in this section.

7.1 CLT Grade and Layup Requirements

CLT grades and layups shall be specified in the manufacturing standard of each CLT plant when qualified in accordance with the requirements specified in this section and by an *approved agency*. Each custom CLT grade shall have unique designation assigned by the *approved agency*.

7.1.1 Basic CLT Grades and Layups

Basic CLT grades and layups are those provided in Annex A.

Note 17: *As illustrated in Tables A2 and A4, the basic CLT grades and layups are balanced and symmetrical about the neutral axis, with alternating layers of the same lamination thickness.*

7.1.2 Custom CLT Grades and Layups

CLT grades and layups that are not listed in Annex A shall be considered as custom grades and layups. Custom CLT grades and layups shall be permitted when approved by an *approved agency* in accordance with the qualification and mechanical test requirements specified in 8.4 and 8.5.

Note 18: *Custom CLT grades and layups may be asymmetric, contain different lamination thicknesses, and have adjacent layers oriented in the same direction.*

7.2 Structural Performance Requirements

Design values for each CLT grade and layup shall be developed using an engineering model recognized by an *approved agency* and shall be evaluated and confirmed by test results in accordance with 8.4 and 8.5.

Note 19: *Design values for basic CLT grades and layups are provided in Table A2 for use in the U.S. and Table A4 for use in Canada based on the engineering model shown in Appendix X3.*

7.3 Appearance Classifications

CLT panel appearance shall be as agreed upon between the end-user and the CLT manufacturer.

Note 20: *Appendix X1 contains examples of CLT appearance classifications for reference.*

8 QUALIFICATION AND PRODUCT MARKING

8.1 Qualification Requirements

Required qualification tests for CLT components, such as lumber, SCL, adhesives, and end, face, and edge joints are provided in Section 6 and summarized in Table 1. This section provides requirements for plant qualification and CLT qualification tests to meet the structural performance levels specified in Tables A2 and A4.

TABLE 1

SUMMARY OF QUALIFICATION REQUIREMENTS

Qualification for	Standard(s)	Referenced Section(s) in This Standard
Lumber	Grading Rules/Manufacturing Standard	6.1.1, 6.1.2, 6.1.4 through 6.1.7
SCL	ASTM D5456	6.13
Adhesives	This standard	6.2
End Joints	This standard	6.3.2 and 8.2.6(b)
Face Joints	This standard	6.1.6, 6.1.7, 6.3.3, 8.2, and 8.3
Edge Joints (if applicable)	This standard	6.1.8, 6.3.3, and 8.2
CLT Panel Dimensions	This standard	5
CLT Panel Structural Performance	ASTM D198 or ASTM D4761	7.2 and 8.5

8.2 Plant Pre-Qualification

8.2.1 General

The CLT plant shall be pre-qualified for the manufacturing factors considered (see 8.2.2) using full-thickness qualification panels of 24 inches (610 mm) or more in the major strength direction and 18 inches (457 mm) or more in the minor strength direction (hereafter referred to as "pre-qualification panels"). A minimum of two replicate CLT pre-qualification panels shall be manufactured for pre-qualification for each combination of factors considered in 8.2.2. The two replicate CLT pre-qualification panels shall not be extracted from a single billet.

Note 21: *A pre-qualification panel of 24 inches (610 mm) or more in the minor strength direction is recommended, particularly for thicker CLT products.*

Pre-qualification panels shall be prepared at the facility or at an alternative facility acceptable to the *approved agency*. All pre-qualification panels shall be:

a. Of the same approximate length and width at the time of pressing;

b. Pressed individually; and

c. Taken from approximately the geometric center of the larger panel, if applicable.

8.2.2 Fabrication of pre–qualification panels

Application of pressure to manufacture pre-qualification panels shall reflect the key characteristics of the manufacturing equipment, including the platen and glue spreader (as applicable) that is or will be used in the facility to be qualified. The applicability of the results shall be documented by the *approved agency*.

Note 22: For example, pre-qualification panels for facilities using a vacuum press or an air bag should be clamped using a vacuum press or an air bag inserted between the specimen and the rigid platen. In addition, the specimen preparation facility should distinguish between, for example, roller versus curtain coating and single spread versus double spread, which varies in the uniformity of the adhesive spread.

Factors considered for pre-qualification evaluation shall include assembly time, lamination moisture content, adhesive spread rate, clamping pressure, and wood surface temperature, as specified in the manufacturing standard of the plant and accepted by the *approved agency*.

8.2.3 Conditioning of pre–qualification panels

Pre-qualification panels shall be stored in an indoor environment for a minimum of 24 hours or until the adhesive has cured sufficiently to permit evaluation, whichever is longer.

Note 23: For panels larger than the specified pre-qualification panel size, the panels may be trimmed to the specified size to facilitate conditioning.

8.2.4 Specimens

A minimum of six square/rectangular specimens (three for block shear tests, i.e., "B" specimens and three for delamination tests, i.e., "D" specimens) shall be extracted from each pre-qualification panel at the locations shown in Figure 3 and labeled to indicate the panel number and the specimen position within the panel. The block shear "B" specimens and delamination "D" specimens shall be prepared in such a way that all laminations in the major strength direction are continuous (i.e. do not include an edge joint between laminations). In the minor strength direction, a maximum of one edge joint between laminations shall be allowed in each specimen. To meet this specimen requirement, additional "B" and "D" specimens shall be considered in the specimen preparation.

The "B" and "D" specimens shall be prepared in accordance with the test specimen configuration shown in Figures 4 and 5, respectively. If the pre-qualification panel is larger than the specified pre-qualification panel size, the pre-qualification sampling area shall be 24 inches (610 mm) to 36 inches (910 mm) square located at the geometric center of the panel.

FIGURE 3

BLOCK SHEAR ("B") AND DELAMINATION ("D") SPECIMEN LOCATIONS
a = 4 ± 1 inches, L_1 = 24 to 36 inches, and L_2 = 24 to 36 inches (1 inch = 25.4 mm)

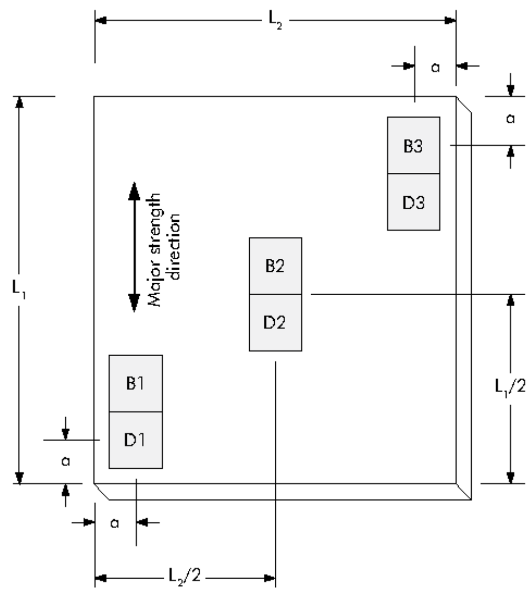
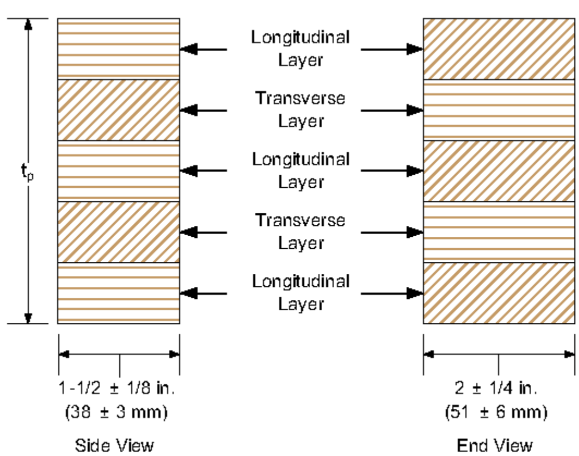


FIGURE 4

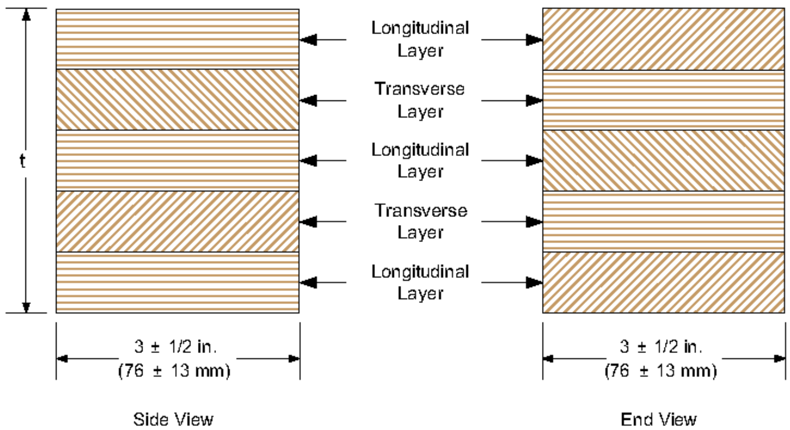
STRAIGHT-BLOCK SHEAR SPECIMEN CONFIGURATION (5-PLY CLT SHOWN)



Shear specimen configurations conforming to Figure A, B, or D of AITC Test T107 or Figure 1 of CSA 0177 are deemed to comply

FIGURE 5

DELAMINATION SPECIMEN CONFIGURATION (5-PLY CLT SHOWN)



See 8.2.4 for permissible edge joints in the minor strength direction

8.2.5 Shear tests

a. The block shear specimens obtained in accordance with 8.2.4 shall be subjected to the shear test specified herein and meet the wood failure requirements specified in 6.3.3.

b. The block shear specimens shall be placed in a standard shearing tool and tested in shear by compression loading at a uniform rate of loading of 0.50 ± 0.05 inch/min (12.7 ± 1 mm/min). The specimen shall be positioned in the shearing tool with the bond line in the shearing plane.

Note 24: A shearing tool for testing block shear specimens in shear by compression loading is described in ASTM D905. The ASTM D905 shear block test is intended for the assessment of adhesive bonds in wood products with bonded layers parallel to each other and with the grain oriented in the same direction, such as glulam. In the case of CLT, one half of the specimen is compressed parallel to the grain, which may produce longitudinal shear along the bond line, while the other half is compressed perpendicular to the grain, which may produce rolling shear along the shear plane. It is likely that the half of the specimen loaded perpendicular to the grain undergoes substantial deformation during the test, which may lead to crushing or tensile rupture perpendicular to the grain (peeling). These complications make interpretation of the shear block test on CLT specimens challenging and are likely to increase uncertainties related to the determination of wood failure fraction values. Therefore, it is important to include the description of the failure mode(s) in the test report.

8.2.6 Cyclic Delamination Test

a. The delamination specimens obtained in accordance with 8.2.4 shall be subjected to the cyclic delamination test specified herein and meet the delamination requirements specified in 6.3.3(b).

b. The initial weight of the delamination specimens shall be measured to the nearest gram and recorded prior to placing the specimens in an autoclave or similar pressure vessel that can safely withstand a minimum of 75 psi (517 kPa) of pressure. The specimens shall be weighted down and covered with water at a temperature of 65 to 85 °F (18 to 29 °C). A vacuum of 10 to 12 psi (69 to 85 kPa, which is equivalent to 20 to 25 inches or 510 to 640 mm Hg) shall be drawn and held for 30 minutes. The vacuum shall then be released and a pressure of 75 ± 5 psi (517 ± 34 kPa) shall be applied for 2 hours. The specimens shall be removed from the autoclave and dried in a drying oven with forced air circulation at a temperature of approximately 160°F (71°C) until their weight is approximately between 110% and 115% of their original weight. During drying, the specimens shall be spaced at approximately 2 inches (50 mm) apart and with their end-grain surfaces parallel to the direction of the air flow. After drying to 110% to 115% of their initial weight, the specimens shall be removed from the oven, and delamination measured immediately and recorded.

8.3 Qualification of Effective Bond Area

8.3.1 General

The manufacturer shall establish visual grading rules for the bonded faces and limit the average glue skip to maintain an average effective bond area of 80% or more. The manufacturer's visual grading rules established to achieve the effective bond area shall include major visual characteristics, such as wane, knots, decay, pitch pockets, torn grain, and raised grain, based on characteristic measurements consistent with standard lumber grading rules.

8.3.2 Sample selection and inspection

Samples shall be drawn from representative production of laminations meeting the manufacturer's visual grading rules and positioned in accordance with the in-plant manufacturing standard. The layer formed by the laminations shall be verified by the *approved agency* to provide an effective bond area of 80% or more over any randomly selected area not less than 48 inches (1,220 mm) by 48 inches (1,220 mm).

Note 25: *A template with a square opening, i.e., 48 inches (1,220 mm) by 48 inches (1,220 mm), may be used to facilitate inspection.*

8.4 Qualification for Structural Performance

Following plant pre-qualification, a representative sample of CLT panels shall be manufactured for qualification tests in accordance with 8.4.1 and 8.4.2. Depending on the number of CLT grades and layups intended for qualification, a qualification plan shall be developed and accepted by an *approved agency* in accordance with the requirements prescribed in this section.

8.4.1 Required mechanical property qualification

The flatwise bending and flatwise shear properties of CLT grades at extreme depths in both major and minor strength directions shall be tested in accordance with 8.5.3 and 8.5.4 to confirm the design values shown in Table A2 for use in the U.S. or Table A4 for use in Canada, or the design values approved by an *approved agency*.

8.4.2 Optional mechanical property qualification

When edgewise bending and edgewise shear properties are to be approved by an *approved agency*, qualification tests shall be conducted in accordance with 8.5.5 and 8.5.6, respectively.

8.5 Mechanical Property Qualification

The design values from required mechanical property qualification (8.4.1) and optional mechanical property qualification (8.4.2) shall be approved by an *approved agency* in accordance with this section.

8.5.1 Sampling

Test specimens, including the width of laminations, shall be representative of typical production and shall be sampled at the manufacturing facility by an *approved agency* using the layup intended for qualification. The sample size required for stiffness capacities shall be sufficient for estimating the population mean within 5% precision with 75% confidence, or 10 specimens, whichever is greater. In general, a sample size larger than 10 is needed when the coefficient of variation is greater than 13%. The sample size required for strength capacities shall be sufficient for estimating the characteristic value with 75% confidence in accordance with ASTM D2915.

Note 26: *Both flatwise and edgewise bending moment, and shear capacities in the U.S. and both flatwise and edgewise bending moment, and shear resistances in Canada may be affected by the lamination width used in the CLT manufacturing. A significant change in the lamination width from original qualification will require subsequent requalification in accordance with 8.6 and Table 2.*

8.5.2 Moisture conditioning

CLT specimens shall be stored in an indoor environment for a minimum of 24 hours or until the adhesive has cured sufficiently to permit evaluation, whichever is longer. The CLT specimens at the time of mechanical tests shall have an average moisture content of not less than 8%.

8.5.3 Flatwise bending properties

Flatwise bending stiffness and bending moment capacity (resistance) shall be evaluated in accordance with 8.5.3.1 and 8.5.3.2.

8.5.3.1 Flatwise bending test methods

Flatwise bending tests shall be conducted in both major and minor strength directions in accordance with the third-point load method of Sections 4 through 12 of ASTM D198 or Section 8 of ASTM D4761 using the specimen width of not less than 12 inches (305 mm) and the on-center span equal to approximately 30 times the specimen depth for the tests in the major strength direction and approximately 18 times the specimen depth for the tests in the minor strength direction. The weight of the CLT panel is permitted to be included in the determination of the flatwise bending moment capacity (resistance).

8.5.3.2 Flatwise bending qualification requirements

In the U.S. and Canada, the average flatwise bending stiffness determined from qualification tests shall equal or exceed the published flatwise bending stiffness [$(EI)_{eff,f,0}$ or $(EI)_{eff,f,90}$]. In the U.S., the characteristic flatwise bending moment capacity determined from qualification tests shall equal or exceed the published ASD reference flatwise bending moment capacity [$(F_bS)_{eff,f,0}$ or $(F_bS)_{eff,f,90}$] times 2.1. In Canada, the characteristic flatwise bending moment resistance determined from qualification tests shall equal or exceed the published LSD flatwise bending resistance [$(f_bS)_{eff,f,0}$ or $(f_bS)_{eff,f,90}$] divided by 0.96.

8.5.4 Flatwise shear properties

Flatwise shear stiffness and capacity (resistance) shall be evaluated in accordance with 8.5.4.1 and 8.5.4.2.

8.5.4.1 Flatwise shear test methods

Flatwise shear stiffness tests shall be conducted in both major and minor strength directions in accordance with Sections 45 through 52 of ASTM D198. Flatwise shear tests shall be conducted in both major and minor strength directions in accordance with the center-point load method of Sections 4 through 12 of ASTM D198 or Section 7 of ASTM D4761 using the specimen width of not less than 12 inches (305 mm) and the on-center span equal to 5 to 6 times the specimen depth. The bearing length shall be sufficient to avoid bearing failure, but not greater than the specimen depth. All specimens are to be cut to length with no overhangs allowed.

8.5.4.2 Flatwise shear qualification requirements

In the U.S. and Canada, the average flatwise shear stiffness determined from qualification tests shall equal or exceed the published shear stiffness in flatwise bending [$(GA)_{eff,f,0}$ or $(GA)_{eff,f,90}$]. In the U.S., the characteristic flatwise shear capacity determined from qualification tests shall equal or exceed the published ASD reference flatwise shear capacity ($V_{s,0}$ or $V_{s,90}$) times 2.1. In Canada, the characteristic flatwise shear resistance determined from qualification tests shall equal or exceed the published LSD flatwise shear resistance ($v_{s,0}$ or $v_{s,90}$) divided by 0.96.

8.5.5 Edgewise bending properties

If the manufacturer intends to publish edgewise bending properties, edgewise bending stiffness and bending moment capacity (resistance) shall be evaluated in accordance with 8.5.5.1 and 8.5.5.2. If the specimens are not pre-conditioned to a standard moisture content level prior to testing, which may not be feasible depending on the size of the test specimens, the calculated bending strength and stiffness shall be adjusted to the standard moisture content using the procedures given in ASTM D2915 for CLT made of lumber laminations or ASTM D5456 made of SCL laminations. The volume, creep and load duration effects of edgewise bending capacity (resistance) shall be evaluated in accordance with the principles of Sections 7.4.1 and 7.4.2 of ASTM D5456.

8.5.5.1 Edgewise bending test methods

Bending tests shall be conducted edgewise in both major and minor strength directions in accordance with the third-point load method of Sections 4 through 12 of ASTM D198 or Section 6 of ASTM D4761 using the specimen depth of not less than 12 inches (305 mm) and the on-center span equal to approximately 18 times the specimen depth. The weight of the CLT panel is permitted to be included in the determination of the edgewise bending moment capacity (resistance).

8.5.5.2 Edgewise bending qualification requirements

Separate qualification shall be conducted for each layup. In the U.S. and Canada, the average edgewise bending stiffness determined from qualification tests divided by the calculated gross moment of inertia ($I_{e,0}$ or $I_{e,90}$) shall equal or exceed the published edgewise bending modulus of elasticity ($E_{e,0}$ or $E_{e,90}$). In the U.S., the characteristic edgewise bending moment capacity determined from qualification tests shall equal or exceed the published ASD reference edgewise bending stress ($F_{b,e,0}$ or $F_{b,e,90}$) multiplied by the calculated gross edgewise section modulus ($S_{e,0}$ or $S_{e,90}$) and an adjustment factor of 2.1. In Canada, the characteristic edgewise bending moment resistance determined from qualification tests shall equal or exceed the published LSD specified edgewise bending strength ($f_{b,e,0}$ or $f_{b,e,90}$) multiplied by the calculated gross edgewise section modulus ($S_{e,0}$ or $S_{e,90}$) and divided by an adjustment factor of 0.96.

8.5.6 Edgewise shear properties

If the manufacturer intends to publish edgewise shear properties, edgewise shear stiffness and capacity (resistance) shall be evaluated in accordance with 8.5.6.1 and 8.5.6.2.

8.5.6.1 Edgewise shear test methods

Edgewise shear stiffness tests shall be conducted in both major and minor strength directions in accordance with Sections 45 through 52 of ASTM D198. Edgewise shear capacity (resistance) tests shall be conducted in both major and minor strength directions in accordance with the full-scale test method specified in Annex A3 of ASTM D5456. The web thickness of the I-shaped cross section shall be the CLT thickness. The specimen shall contain at least one edge joint, as applicable, in the middle 1/3 of the specimen depth.

Note 27: *Tests have demonstrated that reinforcing the specimens with flanges (creating I-shaped beams) is necessary for development of the shear failure mode. Conducting preliminary tests to confirm the failure mode is recommended prior to producing the entire batch of I-shaped test specimens. Tests have also demonstrated that it may not be possible to fail the 7-ply or thicker CLT beams in shear in both minor and major strength directions. High-capacity testing apparatus is needed in all cases.*

8.5.6.2 Edgewise shear qualification requirements

Separate qualification shall be conducted for each layup. For use in the U.S. or Canada, the average edgewise shear stiffness determined from qualification tests divided by the CLT thickness (t_p) shall equal or exceed the published modulus of rigidity (shear modulus) in edgewise bending ($G_{e,0}$ or $G_{e,90}$). In the U.S., the characteristic edgewise shear capacity determined from qualification tests shall equal or exceed the published ASD reference edgewise shear capacity ($F_{v,e,0}\, t_p$ or $F_{v,e,90}\, t_p$) multiplied by an adjustment factor of 2.1. In Canada, the characteristic edgewise shear resistance determined from qualification tests shall equal or exceed the published LSD edgewise shear resistance ($f_{v,e,0}\, t_p$ or $f_{v,e,90}\, t_p$) divided by an adjustment factor of 0.96.

8.6 Process Changes Qualification

Significant changes to the manufacturing process or facilities shall be subjected to subsequent qualification testing. The requirements of 8.2 through 8.5 shall be reapplied for significant changes listed or equivalent to that listed in Table 2.

TABLE 2

SUBSEQUENT QUALIFICATION IN RESPONSE TO SIGNIFICANT CHANGES

Category	Applicable Sections	Material Change (examples)	Notes
A	8.2 through 8.5	▪ Press equipment ▪ Adhesive formulation class ▪ Addition or substitution of species from a different species group ▪ Changes to the visual grading rules that reduce the effective bond area or the effectiveness of the applied pressure (e.g., warp permitted)	
B	8.2, 8.3	▪ Other changes to the manufacturing process or component quality not listed above ▪ Adhesive composition (e.g., fillers and extenders)	Additional evaluation in accordance with 8.4 and 8.5 is at the discretion of the approved agency[a]
C	8.4, 8.5	▪ Increase in billet width or length of more than 20%	
D	8.5.3 and 8.5.5 as applicable	▪ Increase in the net lamination width of more than 2 inches (51 mm) from the lamination width used in the product qualification in either major or minor CLT strength direction[b]	
E	8.5.4 and 8.5.6 as applicable	▪ Decrease in the net lamination width of more than 2 inches (51 mm) from the lamination width used in the product qualification in either major or minor CLT strength direction[b]	

a. Changes involving two or more manufacturing parameters shall be considered for reevaluation in accordance with 8.4 and 8.5.
b. Lamination width shall comply with 6.1.4.

8.7 Mill Specification

Upon conformance with the requirements specified in this standard, a manufacturing specification or documentation unique to the product and mill shall be written based on product evaluation. This specification shall be used for quality assurance purposes by the manufacturer and the *approved agency*. Control values for quality assurance shall be established during product evaluation to ensure conformance to performance requirements in this standard.

8.8 Certification and Marking

8.8.1 Certification

CLT products represented as conforming to this standard shall bear the stamp or certificate of conformance of an *approved agency* which (1) either inspects the manufacturer or (2) has tested a random sampling of the finished products in the shipment being certified for conformance with this standard.

8.8.2 Product marking

CLT products represented as conforming to this standard shall be identified with marks containing the following information:

a. CLT grade qualified in accordance with this standard;

b. The CLT thickness or identification;

c. The mill name or identification number;

d. The *approved agency* name or logo;

e. The symbol of “ANSI PRG 320” signifying conformance to this standard;

f. Any manufacturer’s designations which shall be separated from the grade-marks or trademarks of the *approved agency* by not less than 6 inches (152 mm);

g. “Top” stamp on the top face of custom CLT panels used for roof or floor if manufactured with an unbalanced layup; and

h. A production lot number or job identification number as a means to trace the CLT product back to the production and quality control records at the manufacturing facility.

8.8.3 Frequency of marking

Non-custom and other required marks in this section shall be placed on standard products at intervals of 8 feet (2.4 m) or less along the longest dimension of the CLT panel in order that each piece cut from a longer piece will have at least one of each of the required marks.

8.8.4 Custom products

For products manufactured to meet specific job specifications (custom products), the marking shall be permitted to contain information less than that specified in 8.8.2. However, custom products shall bear at least one mark containing the information specified in 8.8.2(c), (d), (e), and (h). In addition, custom products shall be accompanied by a certificate of conformance to this standard including all of the information listed in 8.8.2. When CLT products shipped to a job are to be cut later into several members for use in the structure, the frequency of marking required in 8.8.3 shall be followed.

8.8.5 Voiding marks

CLT products originally marked as conforming to this standard but subsequently rejected as not conforming thereto shall have any reference to the standard obliterated or voided by the manufacturer.

Note 28: *This can be performed by blocking out the stamp with permanent black ink or light sanding.*

9 QUALITY ASSURANCE

9.1 Objectives

This section is intended for use with CLT products that have been qualified under this standard. The purpose of this section is to assure product quality by detecting changes in properties that may adversely affect the CLT performance. In all cases, the criteria to which the CLT products are tested shall be provided in the Mill Specification or equivalent document.

9.2 Process Control

On-going evaluation of the process properties listed in this section shall be performed to confirm that the CLT quality remains in satisfactory compliance to the product specification requirements. Sampling methods and quality assurance testing shall be documented in an in-plant manufacturing standard and approved by the *approved agency*. All processes and test records relevant to the production shall be retained based on the manufacturer's record retention policy and are subject to audit by the *approved agency*. Production shall be held pending results of the quality assurance testing on representative samples.

9.3 End, Face, and Edge Joints in Laminations

The lamination end joints, face joints, and edge joints (when applicable) shall be sampled and tested for ongoing quality assurance in accordance with Table 3 and meet the strength (required for end joints only), wood failure, and durability requirements specified herein. The sampling shall be well-spaced in each production shift to avoid sampling concentration in the production time. Special considerations for face bonding of the CLT panel as a whole are provided in 9.3.1 through 9.3.4.

TABLE 3

SUMMARY OF OFFLINE TESTS – FOR DAILY REQUIREMENTS

Test	Minimum Number of Specimens	Requirements	Referenced Section(s) in This Standard
Face and Edge Joints[a,b,c]	1 specimen per billet up to 4 specimens per production shift	Wood Failure	6.3.3(a) and 8.2.5
	1 specimen per billet up to 2 specimens per production shift	Delamination	6.3.3(b) and 8.2.6
End Joints[a,c,d]	1 specimen per 5,000 joints produced up to 8 specimens per production shift	Tensile Strength	6.3.2(b)
	1 specimen per production shift	Delamination	6.3.2(c)

a. For each adhesive, lamination type, and species combination used.

b. Edge joint daily tests are required only when the edge joint is a structural requirement.

c. For each production line.

d. All grades and widths shall be tested over time. In each shift, at least one specimen shall represent the highest grade and widest width produced during the shift.

9.3.1 Effective bonding area

Laminations shall be laid up to maintain an effective bonding area of not less than 80% on surfaces to be bonded for each bondline.

Note 29: *To maintain an effective bond area, lumber laminations in adjacent layers may need to be oriented such that the bark and pith faces of adjacent pieces are generally alternated.*

9.3.2 Lumber lamination grade limits

Grade limits intended to limit the amount of lumber lamination warp that will not be corrected upon application of pressure shall be qualified in accordance with 8.3.

9.3.3 Glue skip in the face bondline

The average glue skip in a face bondline shall not exceed the level established to maintain the effective bonding area specified in 9.3.1.

9.3.4 Additional consideration for face joints

Sampling of face joints for quality assurance shall consider the large bonding area for a typical CLT panel and avoid a constant location at all times. Core shear specimens based on AITC Test T107 shall be permitted to be used in place of the block shear specimens specified in 8.2.4 and 8.2.5 for the quality assurance of face joints provided that a correlation factor between core shear and block shear specimens are evaluated in accordance with AITC Test T107 except that a minimum of 40 block shear specimens and an equal number of core shear specimens shall be tested. The correlation shall be documented and included in the in-plant manufacturing standard after the approval by the *approved agency*. The correlation factor shall be reevaluated at least annually.

9.3.5 Additional consideration for end joints

For each production line, sampling of end joints shall include all grades and widths of laminations over time for each adhesive, lamination type, and species combination used. Each combination of grade, width, adhesive, lamination type, and species combination shall be tracked separately for quality assurance. For each production line, at least one end joint tested for each shift shall represent the highest grade and widest width for each adhesive, lamination type, and species combination produced during the shift.

9.4 Finished Production Inspection

All production shall be inspected visually, and/or by measurements or testing for conformance to this standard with the following attributes:

a. Dimensions (width, depth and length);

b. Shape, including straightness and squareness;

c. Type, quality and location of structural bond lines;

d. Appearance classification;

e. Layup, including lumber species and grades, placement, and orientation;

f. Moisture content; and

g. Application of the appropriate marks.

9.5 Minor Variations

A product is considered conforming to this standard when minor variations of a limited extent in non-critical locations exist, or when structural damage or defects have been repaired and, in the judgment of a qualified person, the product is structurally adequate for the use intended. The identity of the product and the nature of the minor variation shall be documented and provided to the engineer of record upon request. A qualified person is one who is familiar with the job specifications and applicable design requirements and has first-hand knowledge of the manufacturing process.

ANNEX A. Design Properties for PRG-320 CLT (Mandatory)

This Annex provides the design properties for basic CLT grades and layups listed in Table A2 using the lamination design values provided in Table A1. The CLT grades and layups represent the CLT production intended for use by the CLT manufacturers in North America and are based on the following:

- E1: 1950f-1.7E Spruce-pine-fir MSR lumber in all longitudinal layers and No. 3 Spruce-pine-fir lumber in all transverse layers
- E2: 1650f-1.5E Douglas fir-Larch MSR lumber in all longitudinal layers and No. 3 Douglas fir-Larch lumber in all transverse layers
- E3: 1200f-1.2E Eastern Softwoods, Northern Species, or Western Woods MSR lumber in all longitudinal layers and No. 3 Eastern Softwoods, Northern Species, or Western Woods lumber in all transverse layers
- E4: 1950f-1.7E Southern pine MSR lumber in all longitudinal layers and No. 3 Southern pine lumber in all transverse layers
- E5: 1650f-1.5E Hem-fir MSR umber in all longitudinal layers and No. 3 Hem-fir lumber in all transverse layers
- V1: No. 2 Douglas fir-Larch lumber in all longitudinal layers and No. 3 Douglas fir-Larch lumber in all transverse layers
- V1(N): No. 2 Douglas fir-Larch (North) lumber in all longitudinal layers and No. 3 Douglas fir-Larch (North) lumber in all transverse layers
- V2: No. 1/No. 2 Spruce-pine-fir lumber in all longitudinal layers and No. 3 Spruce-pine-fir lumber in all transverse layers
- V3: No. 2 Southern pine lumber in all longitudinal layers and No. 3 Southern pine lumber in all transverse layers
- V4: No. 2 Spruce-pine-fir South lumber in all longitudinal layers and No. 3 Spruce-pine-fir South lumber in all transverse layers
- V5: No. 2 Hem-fir lumber in all longitudinal layers and No. 3 Hem-fir lumber in all transverse layers
- S1: 2250f-1.5E Laminated Veneer Lumber (LVL) in all longitudinal and transverse layers
- S2: 1900f-1.3E Laminated Strand Lumber (LSL) in all longitudinal and transverse layers
- S3: 1750f-1.3E Oriented Strand Lumber (OSL) in all longitudinal and transverse layers

TABLE A1

ASD REFERENCE DESIGN VALUES[a] FOR LAMINATIONS USED IN BASIC CLT GRADES (FOR USE IN THE U.S.)

	Laminations Used in Major Strength Direction						Laminations Used in Minor Strength Direction					
CLT Grade	F_b (psi)	E [b] (10^6 psi)	F_t (psi)	F_c (psi)	F_v (psi)	F_s (psi)	F_b (psi)	E [b] (10^6 psi)	F_t (psi)	F_c (psi)	F_v (psi)	F_s (psi)
E1	1,950	1.7	1,375	1,800	135	45	500	1.2	250	650	135	45
E2	1,650	1.5	1,020	1,700	180	60	525	1.4	325	775	180	60
E3	1,200	1.2	600	1,400	110	35	350	0.9	150	475	110	35
E4	1,950	1.7	1,375	1,800	175	55	450	1.3	250	725	175	55
E5	1,650	1.5	1,020	1,700	150	50	500	1.2	300	725	150	50
V1	900	1.6	575	1,350	180	60	525	1.4	325	775	180	60
V1(N)	850	1.6	500	1,400	180	60	475	1.4	300	825	180	60
V2	875	1.4	450	1,150	135	45	500	1.2	250	650	135	45
V3	750	1.4	450	1,250	175	55	450	1.3	250	725	175	55
V4	775	1.1	350	1,000	135	45	450	1.0	200	575	135	45
V5	850	1.3	525	1,300	150	50	500	1.2	300	725	150	50
S1	2,250	1.5	1,500	1,950	130	40	2,250	1.5	1,500	1,950	130	40
S2	1,900	1.3	1,300	1,650	150	50	1,900	1.3	1,300	1,650	150	50
S3	1,750	1.3	1,200	1,500	115	35	1,750	1.3	1,200	1,500	115	35

For SI: 1 psi = 0.006895 MPa

a. The ASD reference design values for laminations in the basic CLT grades made of visually graded lumber are based on 2x12 lumber. Because the basic CLT grades do not limit the lamination sizes used, the ASD reference design values for laminations in basic CLT grades are not increased for the lamination size, repetitive member, and flat use adjustment factors when calculating the ASD reference design properties for basic CLT grades provided in Table A2.

b. The tabulated E values are published E for lumber and flatwise (plank) apparent E for SCL.

The ASD reference design capacities for the basic CLT grades with 3, 5, and 7 layers are provided in Table A2. These capacities were derived analytically using the Shear Analogy Model[1] (the calculated moment capacities in the major strength direction were further multiplied by a factor of 0.85 for conservatism) and validated by testing. The lamination thicknesses are as tabulated. The ASD reference tensile and compressive capacities will be developed and added to future editions of this standard.

1. Gagnon, S. and M. Popovski. 2011. *Structural Design of Cross-Laminated Timber Elements*. In: Chapter 3, *CLT Handbook*. FPInnovations, Canada

TABLE A2

ASD REFERENCE DESIGN VALUES[a] FOR BASIC CLT GRADES AND LAYUPS (FOR USE IN THE U.S.)

CLT Grade	t_p (in.)	Lamination Thickness (in.) in CLT Layup =	⊥	=	⊥	=	⊥	=	Major Strength Direction $(F_bS)_{eff,f,0}$ (lbf-ft/ft of width)	$(EI)_{eff,f,0}$ (10^6 lbf-in.^{2}/ft of width)	$(GA)_{eff,f,0}$ (10^6 lbf/ft of width)	$V_{s,0}$ (lbf/ft of width)	Minor Strength Direction $(F_bS)_{eff,f,90}$ (lbf-ft/ft of width)	$(EI)_{eff,f,90}$ (10^6 lbf-in.^{2}/ft of width)	$(GA)_{eff,f,90}$ (10^6 lbf/ft of width)	$V_{s,90}$ (lbf/ft of width)
E1	4 1/8	1 3/8	1 3/8	1 3/8					4,525	115	0.46	1,490	160	3.1	0.61	495
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			10,400	440	0.92	2,480	1,370	81	1.2	1,490
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	18,375	1,089	1.4	3,475	3,150	313	1.8	2,480
E2	4 1/8	1 3/8	1 3/8	1 3/8					3,825	102	0.53	1,980	165	3.6	0.56	660
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			8,825	389	1.1	3,300	1,440	95	1.1	1,980
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	15,600	963	1.6	4,625	3,300	364	1.7	3,300
E3	4 1/8	1 3/8	1 3/8	1 3/8					2,800	81	0.35	1,160	110	2.3	0.44	385
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			6,400	311	0.69	1,930	955	61	0.87	1,160
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	11,325	769	1.0	2,700	2,210	234	1.3	1,930
E4	4 1/8	1 3/8	1 3/8	1 3/8					4,525	115	0.50	1,820	140	3.4	0.62	605
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			10,400	440	1.0	3,025	1,230	88	1.2	1,820
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	18,400	1,089	1.5	4,225	2,850	338	1.9	3,025
E5	4 1/8	1 3/8	1 3/8	1 3/8					3,825	101	0.46	1,650	160	3.1	0.55	550
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			8,800	389	0.92	2,750	1,370	81	1.1	1,650
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	15,575	962	1.4	3,850	3,150	312	1.7	2,750
V1	4 1/8	1 3/8	1 3/8	1 3/8					2,090	108	0.53	1,980	165	3.6	0.59	660
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			4,800	415	1.1	3,300	1,440	95	1.2	1,980
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	8,500	1,027	1.6	4,625	3,300	364	1.8	3,300
V1(N)	4 1/8	1 3/8	1 3/8	1 3/8					1,980	108	0.53	1,980	150	3.6	0.59	660
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			4,550	415	1.1	3,300	1,300	95	1.2	1,980
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	8,025	1,027	1.6	4,625	3,000	364	1.8	3,300
V2	4 1/8	1 3/8	1 3/8	1 3/8					2,030	95	0.46	1,490	160	3.1	0.52	495
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			4,675	363	0.91	2,480	1,370	81	1.0	1,490
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	8,275	898	1.4	3,475	3,150	312	1.6	2,480

Table continued on next page.

TABLE A2 (continued)

ASD REFERENCE DESIGN VALUES[a] FOR BASIC CLT GRADES AND LAYUPS (FOR USE IN THE U.S.)

CLT Grade	t_p (in.)	Lamination Thickness (in.) in CLT Layup: =	⊥	=	⊥	=	⊥	=	Major Strength Direction: $(F_bS)_{eff,f,0}$ (lbf-ft/ft of width)	$(EI)_{eff,f,0}$ (10^6 lbf-in.^{2}/ft of width)	$(GA)_{eff,f,0}$ (10^6 lbf/ft of width)	$V_{s,0}$ (lbf/ft of width)	Minor Strength Direction: $(F_bS)_{eff,f,90}$ (lbf-ft/ft of width)	$(EI)_{eff,f,90}$ (10^6 lbf-in.^{2}/ft of width)	$(GA)_{eff,f,90}$ (10^6 lbf/ft of width)	$V_{s,90}$ (lbf/ft of width)
V3	4 1/8	1 3/8	1 3/8	1 3/8					1,740	95	0.49	1,820	140	3.4	0.52	605
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			4,000	363	0.98	3,025	1,230	88	1.0	1,820
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	7,100	899	1.5	4,225	2,825	338	1.6	3,025
V4	4 1/8	1 3/8	1 3/8	1 3/8					1,800	74	0.38	1,490	140	2.6	0.41	495
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			4,150	285	0.76	2,480	1,230	68	0.82	1,490
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	7,325	706	1.1	3,475	2,825	260	1.2	2,480
V5	4 1/8	1 3/8	1 3/8	1 3/8					1,980	88	0.45	1,650	160	3.1	0.48	550
	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			4,550	337	0.91	2,750	1,370	81	0.97	1,650
	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	8,025	835	1.4	3,850	3,150	312	1.5	2,750
S1	4 1/2	1 1/2	1 1/2	1 1/2					6,225	132	0.61	1,440	845	5.1	0.61	480
	7 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2			14,325	506	1.2	2,400	7,325	132	1.2	1,440
	10 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	25,325	1,252	1.8	3,350	16,850	506	1.8	2,400
S2	4 1/2	1 1/2	1 1/2	1 1/2					5,250	114	0.53	1,800	715	4.4	0.53	600
	7 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2			12,100	438	1.1	3,000	6,175	114	1.1	1,800
	10 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	21,400	1,085	1.6	4,200	14,225	438	1.6	3,000
S3	4 1/2	1 1/2	1 1/2	1 1/2					4,850	114	0.53	1,260	655	4.4	0.53	420
	7 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2			11,150	438	1.1	2,100	5,700	114	1.1	1,260
	10 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	19,700	1,085	1.6	2,950	13,000	438	1.6	2,100

For SI: 1 in. = 25.4 mm; 1 ft = 304.8 mm; 1 lbf = 4.448 N

a. This table represents the basic CLT grades and layups. Custom CLT grades and layups that are not listed in this table shall be permitted in accordance with 7.1.2.

Note A1: *The rounding rules in Table A2 are as follows:*

F_bS (lbf-ft/ft) and Vs (lbf/ft)—Nearest 25 for values greater than 2,500, nearest 10 for values between 1,000 and 2,500, or nearest 5 otherwise.

EI (lbf-in.^{2}/ft) and GA (lbf/ft)—Nearest 10^6 for values greater than 10^7, nearest 10^5 for values between 10^6 and 10^7, or nearest 10^4 otherwise.

TABLE A3

LSD SPECIFIED STRENGTH AND MODULUS OF ELASTICITY[a,b] FOR LAMINATIONS USED IN BASIC CLT GRADES (FOR USE IN CANADA)

	Laminations Used in Major Strength Direction						Laminations Used in Minor Strength Direction					
CLT Grade	f_b (MPa)	$E^{(d)}$ (MPa)	f_t (MPa)	f_c (MPa)	f_v (MPa)	f_s (MPa)	f_b (MPa)	$E^{(d)}$ (MPa)	f_t (MPa)	f_c (MPa)	f_v (MPa)	f_s (MPa)
E1	28.2	11,700	15.4	19.3	1.5	0.50	7.0	9,000	3.2	9.0	1.5	0.50
E2	23.9	10,300	11.4	18.1	1.9	0.63	4.6	10,000	2.1	7.3	1.9	0.63
E3	17.4	8,300	6.7	15.1	1.3	0.43	4.5	6,500	2.0	5.2	1.3	0.43
E5	23.9	10,300	11.4	18.1	1.6	0.53	7.0	10,000	3.2	9.2	1.6	0.53
V1(N)	10.0	11,000	5.8	14.0	1.9	0.63	4.6	10,000	2.1	7.3	1.9	0.63
V2	11.8	9,500	5.5	11.5	1.5	0.50	7.0	9,000	3.2	9.0	1.5	0.50
V5	11.0	11,000	6.2	14.8	1.6	0.53	7.0	10,000	3.2	9.2	1.6	0.53
S1	28.7	10,300	19.1	21.5	1.7	0.56	28.7	10,300	19.1	21.5	1.7	0.56
S2	24.2	8,900	16.6	18.2	1.9	0.64	24.2	9,300	16.6	18.2	1.9	0.64
S3	22.3	8,900	15.3	16.5	1.5	0.49	22.3	8,900	15.3	16.5	1.5	0.49

For SI: 1 MPa = 145 psi

a. The LSD design values for laminations in the basic CLT grades made of visually graded and MSR lumber are based on 2x12 lumber except for the specified tensile strength made of MSR lumber. Because the basic CLT grades do not limit the lamination sizes used, the LSD design values for laminations in basic CLT grades are not increased for the lamination size and system factors in accordance with CSA O86 when calculating the LSD design properties for basic CLT grades provided in Table A4. The LSD specified tensile strength values for MSR lumber are based on 2x8 lumber and not permitted to be increased for the system factor in accordance with CSA O86 when calculating the LSD design properties for basic CLT grades provided in Table A4.

b. The tabulated E values are published E for lumber and flatwise (plank) apparent E for SCL.

For use in Canada, the LSD design resistances for basic CLT grades and layups are listed in Table A4 using the LSD design values for the laminations provided in Table A3. The LSD design resistances are not compatible with the ASD reference design capacities used in the U.S. Since there are no published LSD specified strength and modulus of elasticity for Southern pine and Spruce-pine-fir South lumber in Canada, the CLT Grades E4, V1, V3, and V4 are not listed in Tables A3 and A4.

TABLE A4

LSD STIFFNESS AND UNFACTORED RESISTANCE VALUES[a] FOR BASIC CLT GRADES AND LAYUPS (FOR USE IN CANADA)

CLT Grade	t_p (mm)	Lamination Thickness (mm) in CLT Layup =	⊥	=	⊥	=	⊥	=	Major Strength Direction $(f_bS)_{eff,f,0}$ (10^6 N-mm/m of width)	$(EI)_{eff,f,0}$ (10^9 N-mm²/m of width)	$(GA)_{eff,f,0}$ (10^6 N/m of width)	$V_{s,0}$ (kN/m of width)	Minor Strength Direction $(f_bS)_{eff,f,90}$ (10^6 N-mm/m of width)	$(EI)_{eff,f,90}$ (10^9 N-mm²/m of width)	$(GA)_{eff,f,90}$ (10^6 N/m of width)	$V_{s,90}$ (kN/m of width)
	105	35	35	35					42	1,088	7.3	35	1.40	32	9.1	12
E1	175	35	35	35	35	35			98	4,166	15	58	12	837	18	~~35~~
	245	35	35	35	35	35	35	35	172	10,306	22	82	29	3,220	27	58
	105	35	35	35					36	958	8.0	44	0.94	36	8.2	15
E2	175	35	35	35	35	35			83	3,674	16	74	8.2	930	16	44
	245	35	35	35	35	35	35	35	146	9,097	24	103	19	3,569	25	74
	105	35	35	35					26	772	5.3	30	0.92	23	6.4	10
E3	175	35	35	35	35	35			60	2,956	11	50	8.0	605	13	30
	245	35	35	35	35	35	35	35	106	7,313	16	70	18	2,325	19	50
	105	35	35	35					36	958	8.0	37	1.40	36	8.2	12
E5	175	35	35	35	35	35			83	3,674	16	62	12	930	16	37
	245	35	35	35	35	35	35	35	146	9,097	24	87	29	3,569	25	62
	105	35	35	35					15	1,023	8.0	44	0.94	36	8.7	15
V1(N)	175	35	35	35	35	35			35	3,922	16	74	8.2	930	17	44
	245	35	35	35	35	35	35	35	61	9,708	24	103	19	3,571	26	74
	105	35	35	35					18	884	7.2	35	1.4	32	7.5	12
V2	175	35	35	35	35	35			41	3,388	14	58	12	837	15	~~35~~
	245	35	35	35	35	35	35	35	72	8,388	22	82	29	3,213	23	58
	105	35	35	35					17	1,023	8.0	37	1.40	36	8.7	12
V5	175	35	35	35	35	35			38	3,922	16	62	12	930	17	37
	245	35	35	35	35	35	35	35	67	9,708	24	87	29	3,571	26	62
	114	38	38	38					51	1,226	8.9	43	6.90	47	8.9	14
S1	190	38	38	38	38	38			117	4,704	18	71	60	1,226	18	43
	266	38	38	38	38	38	38	38	207	11,647	27	99	138	4,704	27	71

Table continued on next page.

TABLE A4 (continued)

LSD STIFFNESS AND UNFACTORED RESISTANCE VALUES[a] FOR BASIC CLT GRADES AND LAYUPS (FOR USE IN CANADA)

		Lamination Thickness (mm) in CLT Layup							Major Strength Direction				Minor Strength Direction			
CLT Grade	t_p (mm)	=	⊥	=	⊥	=	⊥	=	$(f_bS)_{eff,f,0}$ (10^6 N-mm/m of width)	$(EI)_{eff,f,0}$ (10^9 N-mm²/m of width)	$(GA)_{eff,f,0}$ (10^6 N/m of width)	$v_{s,0}$ (kN/m of width)	$(f_bS)_{eff,f,90}$ (10^6 N-mm/m of width)	$(EI)_{eff,f,90}$ (10^9 N-mm²/m of width)	$(GA)_{eff,f,90}$ (10^6 N/m of width)	$v_{s,90}$ (kN/m of width)
	114	38	38	38					43	1,059	7.7	49	5.80	41	7.7	16
S2	190	38	38	38	38	38			99	4,064	15	81	51	1,059	15	49
	266	38	38	38	38	38	38	38	175	10,064	23	113	116	4,064	23	81
	114	38	38	38					40	1,059	7.7	37	5.40	41	7.7	12
S3	190	38	38	38	38	38			91	4,064	15	62	47	1,059	15	37
	266	38	38	38	38	38	38	38	161	10,064	23	87	107	4,064	23	62

For SI: 1 mm = 0.03937 in.; 1 m = 3.28 ft; 1 N = 0.2248 lbf

a. This table represents the basic CLT grades and layups.Custom CLT grades and layups that are not listed in this table shall be permitted in accordance with 7.1.2.

Note A2. *The rounding rules in Table A4 are as follows:*

f_bS (N-mm/m) and GA (N/m)—Nearest 10^6 for values greater than 10^7, nearest 10^5 for values between 10^6 and 10^7, or nearest 10^4 otherwise.

v_s (kN/m)—Nearest 1 for values greater than 10, nearest 0.1 for values between 10 and 1, or nearest 0.01 otherwise.

EI (N-mm²/m)—Nearest 10^9 for values greater than 10^{10}, nearest 10^8 for values between 10^9 and 10^{10}, or nearest 10^7 otherwise.

ANNEX B. Practice for Evaluating Elevated Temperature Performance of Adhesives Used in Cross-Laminated Timber Using the Compartment Fire Test (CFT) Method (Mandatory)

B1 Scope

B1.1 This annex is to be used to evaluate the elevated temperature performance of adhesives used in cross-laminated timber (CLT).

B1.2 An unprotected CLT floor-ceiling slab is exposed to specified fire conditions representative of a real fire scenario.

B1.3 The unprotected CLT floor-ceiling slab shall sustain the applied load during the specified fire exposure for a period of 240 minutes without char layer fall-off resulting in fire regrowth during the cooling phase of a fully developed fire.

B1.4 This annex is used to evaluate the performance of adhesives used in CLT to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment under actual fire conditions

B1.5 This annex does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this annex to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

B2 Referenced Documents

See Section 2 of the standard for referenced documents. Referenced standards specific to this annex are listed below.

ASTM C1396/C1396M-17 Standard Specification for Gypsum Board

ASTM E176-15ae1 Standard Terminology of Fire Standards

B3 Terminology

B3.1 Definition

Definitions used in this annex are in accordance with Section 3 of the standard, and the terminology standards ASTM D9 and ASTM E176, unless otherwise indicated.

B3.2 Superimposed Load

The additional external load needed to be applied to the slab to result in the specified calculated stresses within the slab when any dead load of the assembly itself is accounted for in the calculations.

B4 Summary of Practice

B4.1 This annex shall be used to evaluate adhesives intended for use in CLT by fire testing a floor-ceiling slab under a vertical load associated with 25% of the effective ASD reference flatwise bending moment of the CLT. The unprotected CLT floor-ceiling slab shall sustain the applied load during the specified fire exposure for a period of 240 minutes without char layer fall-off resulting in a significant temperature increase at the compartment ceiling during the cooling phase of a fully developed fire. The temperature increase is considered significant if, after 150 minutes, any room interior thermocouple at the compartment ceiling exceeds 950 °F (510 °C) at any time before termination of the test.

B5 Significance and Use

B5.1 CLT used in fire-resistance-rated assemblies shall be able to support the superimposed design load for the specified time under the specified fire exposure without char layer fall-off resulting in fire regrowth during the cooling phase of a fully developed fire.

B6 Sample Description

B6.1 Dimensions

CLT floor-ceiling sample shall be approximately 8 feet by 16 feet (2438 mm by 4877 mm), with the long dimension spanning in the major strength direction. Clear distance between the supports shall be at least 15 feet (4572 mm).

B6.2 Fabrication

CLT floor-ceiling test sample shall be at least 5-ply CLT with maximum lamination thickness of 1-3/8 inches (35 mm) and maximum lamination widths of 7-1/4 inches (184 mm). The edge joints in the laminations shall be tight, but shall not be edge-glued.

B6.3 Adhesive

CLT floor-ceiling test sample shall be fabricated using the adhesive being evaluated.

B6.4 Moisture Content

The moisture content of the CLT floor-ceiling test sample shall be not greater than the moisture content specified in Section 6.1.4 of this standard at the time of the fire test.

B7 Test Room Description

B7.1 Test Room Dimensions

A test room shall have interior dimensions of 9 feet ± 4 inches (2743 mm ± 102 mm) in width by 19 feet ± 4 inches (5791 mm ± 102 mm) in depth by 8 feet ± 2 inches (2438 mm ± 51 mm) in height. The test room shall consist of two sections separated by a protected beam across the width of the room, located at approximately 15 feet (4572 mm) from the interior of the front wall. The CLT floor-ceiling sample shall be located in the front section of the room. A propane or natural gas diffusion burner shall be used to create the exposing fire. The burner shall be located in the back section of the test room (referred to hereafter as the burner compartment).

***Note B1:** A steel frame structure protected with three layers of 5/8-inch (15.9-mm) type X gypsum board conforming to ASTM C1396/C1396M and three layers of 6 pcf (96 kg/m^3) ceramic fiber blanket (four layers of each in the back section) has been found suitable (see Appendix X2 for a detailed description of the test structure that was used in the development of the method described in this annex).*

B7.2 Floor–Ceiling Support

The CLT floor-ceiling slab shall be supported across the full 8-foot (2438-mm) width of the room by the front wall at one end and by a protected beam at the other end. The beam shall be located at a sufficient distance from the front wall to result in a clear span of at least 15 feet (4572 mm). The remaining portion of the ceiling over the burner shall be protected.

B7.3 Front Wall

The 8-foot (2438-mm) tall bearing wall at the front end of the room shall be capable of supporting the CLT floor-ceiling slab for the duration of the fire test.

B7.4 Back Wall

The 8-foot (2438-mm) tall bearing wall at the back end of the room shall be capable of supporting the protected ceiling over the burner for the duration of the fire test.

B7.5 Non–Loadbearing Side Walls

The 10-foot (3048 mm) tall, 19-foot (5791-mm) long side walls of the test room shall be capable of remaining in place without deflection for the duration of the fire test. A narrow gap along each of the side walls shall permit the floor-ceiling slab to deflect freely without contacting the side walls. The gap between the side wall and the CLT floor-ceiling slab shall be covered with ceramic fiber blanket to prevent smoke and hot gases from leaking and exposing the long edges of the CLT slab.

B7.6 Wall Opening Dimensions

All four walls shall be enclosed except for a ventilation opening in the front 8-foot (2438-mm) wall, which shall have dimensions of 36 ± 2 inches (914 ± 51 mm) in width by 75 ± 2 inches (1905 ± 51 mm) in height.

B7.7 Protected Beam

The beam shall be located 15 feet ± 4 inches (4572 ± 102 mm) from the interior of the front wall, and shall be capable of supporting the CLT floor-ceiling slab and the protected ceiling over the burner for the duration of the fire test.

B7.8 Burner Compartment

The back part of the test room shall consist of a 9 feet ± 4 inches (2743 mm ± 102 mm) wide by 7 feet ± 2 inches (2134 mm ± 51 mm) high burner compartment, and shall be open to the front part of the test room where the CLT floor-ceiling slab is located. The burner compartment shall be protected to ensure that its walls and ceiling remain in place without deflection for the duration of the fire test.

B8 Instrumentation

B8.1 Hot Gas Layer (Ceiling) Thermocouples

Five 1/8-inch- (3.2-mm-) diameter exposed junction Inconel-sheathed type K thermocouples shall be located 4 inches (102 mm) below the ceiling in the following locations: at the center of the exposed ceiling and at the center of each of the four quadrants of the CLT floor-ceiling slab.

Note B2: *To obtain an indication of the temperature evolution at the glue-lines, 1/16-inch- (1.6-mm-) diameter grounded junction Inconel-sheathed type K thermocouples can be inserted from the unexposed side of the CLT. Since the thermal exposure conditions vary somewhat between the front and the back of the test room, it is recommended that embedded thermocouples be installed at three locations along the long dimension of the CLT floor-ceiling slab, i.e., at the center and the quarter points of the clear span. It is further recommended that thermocouples be located at the bottom first, second, and third gluelines, and as far as possible from joints and edges. For example, for CLT made with 1-3/8-in- (35-mm-) thick laminations, the following thermocouple locations apply: 1.38, 2.75, and 4.13 inches (35, 70, and 105 mm) from the exposed side (bottom) of the CLT floor-ceiling slab. The measurement uncertainty of the embedded thermocouples is due to the error associated with the assumed depth at which the thermocouple is located, heat conduction along the thermocouple wires, the potential presence of gaps and/or local density variations (such as knots) in the vicinity of the thermocouple, etc. Consequently, the optional embedded thermocouple measurements are indicative, and are not part of the acceptance criteria.*

B8.2 Gaseous fuel shall be supplied to the burner at a time-varying rate to obtain the heat release rate profile established from calibration testing (see Section B10).

B8.3 Temperatures and the fuel flow rate shall be recorded throughout the test.

B9 Loading

B9.1 The superimposed load on the CLT floor-ceiling slab shall result in 25% of the effective ASD reference flatwise bending moment.

B10 Calibration Test Method

B10.1 Calibration testing shall be conducted to determine the fuel flow rate for the qualification tests. The fuel flow rate shall provide an average temperature of the five ceiling thermocouple temperatures as shown in Figure B1. The time-temperature curve in Figure B1 is achieved by using a diffusion burner placed in the back of the test room, and by changing the burner fuel flow rate in steps at 0, 13, 38, 58, and 88 min. The average ceiling thermocouple temperature at those times shall be within the tolerances given in Table B1. The temperatures at other times in Table B1 are provided for guidance. In no case shall any ceiling thermocouple temperature drop more than 10% below the average of the recorded ceiling thermocouple temperatures.

Note B3: A burner consisting of a 2-by-6-by-1-foot- (610-by-1829-by-305-mm-) tall steel box with open top, filled with gravel and supplied with propane gas has been found suitable. See Appendix X2 for a detailed description of the burner that was used in the development of the method described in this annex.

B10.2 The CLT floor-ceiling slab shall be protected from the bottom with three layers of 5/8-inch (15.9-mm) Type X gypsum wallboard conforming to ASTM C1396/C1396M. The gypsum wallboard shall be attached with Type S drywall screws every 12 inches (305 mm) o.c. with a minimum penetration into the wood of at least 1 inch (25.4 mm).

B11 Qualification Test Method

B11.1 The fuel flow rate determined in Section B10.1 shall be used for the qualification tests.

B11.2 The unprotected CLT floor-ceiling slab, complying with Section B6, shall be tested for 240 minutes.

Note B4: If the CLT floor-ceiling slab clearly fails prior to 240 minutes, the test should be permitted to be terminated early.

B12 Acceptance Criteria

B12.1 The unprotected CLT floor-ceiling slab shall sustain the applied load during the specified fire exposure for a period of 240 minutes.

B12.2 After 150 minutes, none of the ceiling thermocouples shall exceed 950 °F (510 °C).

B13 Report

B13.1 The report shall contain the following minimum information:

B13.1.1 Description of the CLT floor-ceiling sample including the lamination species, lamination dimensions, slab thickness, and the manufacturer;

B13.1.2 Adhesive manufacturer, adhesive type, and adhesive formulation identification;

B13.1.3 Description of the test room construction;

B13.1.4 Description of the loading method;

B13.1.5 Results of the calibration test including the fuel flow rates and thermocouple data;

B13.1.6 Time-temperature curve for the ceiling thermocouples; and

B13.1.7 Visual observations during and after the test.

FIGURE B1

CALIBRATION TIME-TEMPERATURE CURVE

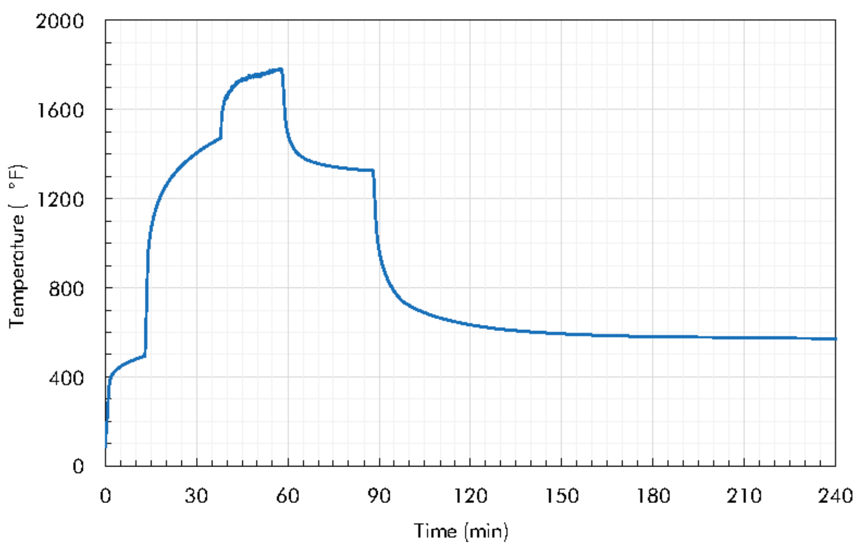


TABLE B1

CALIBRATION TEMPERATURES AND TOLERANCES AT SPECIFIC TIMES

Time (min.)	Temperature (°F)	Tolerance (°F)	Temperature (°C)	Tolerance (°C)
13	493	±36	256	±20
28	1383		751	
38	1472	±45	800	±25
48	1746		952	
58	1778	±54	970	±30
68	1366		741	
78	1338		725	
88	1326	±45	719	±25
120	634		335	
150	594		312	
180	581	±36	305	±20
240	572		300	

APPENDIX X1. Examples of CLT Appearance Classifications (Non-Mandatory)

This appendix contains examples of CLT appearance classifications for CLT panels manufactured with lumber laminations for reference only. These requirements are based on the appearance at the time of manufacturing. The actual CLT panel appearance requirements are recommended to be agreed upon between the end-user and the CLT manufacturer.

X1-1 Architectural Appearance Classification

An appearance classification normally suitable for applications where appearance is an important, but not overriding consideration. Specific characteristics of this classification are as follows:

- In exposed surfaces, all knot holes and voids measuring over 3/4 inch (19 mm) are filled with a wood-tone filler or clear wood inserts selected for similarity with the grain and color of the adjacent wood.
- The face layers exposed to view are free of loose knots and open knot holes are filled.
- Knot holes do not exceed 3/4 inch (19 mm) when measured in the direction of the lamination length with the exception that a void may be longer than 3/4 inch (19 mm) if its area is not greater than 1/2 in.^{2} (323 mm^2).
- Voids greater than 1/16 inch (1.6 mm) wide created by edge joints appearing on the face layers exposed to view are filled.
- Exposed surfaces are surfaced smooth with no misses permitted.

X1-2 Industrial Appearance Classification

An appearance classification normally suitable for use in concealed applications where appearance is not of primary concern. Specific characteristics of this classification are as follows:

- Voids appearing on the edges of laminations need not be filled.
- Loose knots and knot holes appearing on the face layers exposed to view are not filled.
- Members are surfaced on face layers only and the appearance requirements apply only to these layers.
- Occasional misses, low laminations or wane (limited to the lumber grade) are permitted on the surface layers and are not limited in length.

APPENDIX X2. Test Setup Used in the Development of Annex B (Non-Mandatory)

X2-1 Introduction

This appendix provides a detailed description of the room that was used in the development of the test method described in Annex B.

X2-2 Test Room

A test room was constructed with nominal interior dimensions 9 feet 4 inches (2845 mm) in width, 19 feet (5791 mm) in length, and 8 feet (2438 mm) in height. The ventilation opening in the front wall was nominally 36 inches (914 mm) in width by 75 inches (1905 mm) in height. The test room was built directly on the concrete floor of the laboratory, but the test room floor was protected with several layers of type X gypsum board. Drawings of the finished test room can be found in Figures X2-1 through X2-4. A detailed description follows.

Two steel I-beams of 12 inches (305 mm) in height and 41 lbf/foot (0.6 kN/m) by weight welded together were located at approximately 15 feet (4572 mm) from the front wall to subdivide the test room into two sections. The ceiling of the front section was left open and allowed for the exposure of a 16-foot- (4877-mm-) long by 8-foot- (2438-mm-) wide mass timber ceiling panel. The panel was simply supported by the front wall at one end (bearing length ≈ 6 inches or 152 mm), and by the steel I-beam at the other end (bearing length ≈ 5-1/4 inches or 133 mm). The sides of the panel were not supported, and the panel was allowed to deflect freely between the two side walls. A gas burner to create the desired fire exposure was located in the back section of the room, as shown in Figure X2-5. Construction details for the test room walls, floor and ceiling are as follows:

X2–2.1 Front Wall

The front wall of the test room consisted of 8-foot- (2438-mm-) tall and 6-inch- (152-mm-) deep, 16-gauge steel studs at 12 inches (305 mm) on center, and with 16-gauge track top and bottom. The interior surface of the frame was covered with three layers of 5/8-inch (15.9-mm) type X gypsum board (National Gypsum Fire-Shield®), 20-gauge galvanized sheet steel, and three layers of 1-inch- (25.4-mm-) thick ceramic fiber blanket (Morgan Thermal Ceramics 6 pcf or 96 kg/m^3 Cerablanket®). The exterior surface was covered with two layers of 5/8-inch (15.9-mm) type X gypsum board, 20-gauge galvanized sheet steel (top half only), and one layer of 1-inch- (25.4-mm-) thick ceramic fiber blanket (additional layers of blanket were used at the soffit and above the ventilation opening).

X2–2.2 Side Walls

The side walls of the test room consisted of three layers of 4-foot- (1219-mm-) wide by 10-foot- (3048-mm-) tall 5/8-inch (15.9-mm) type X gypsum board attached to steel racks. The interior surface of the gypsum board was covered with three layers of 1-inch- (25.4-mm-) thick ceramic fiber blanket. An additional layer of blanket was attached to the side walls in the back section of the test room. In the front section of the test room, the web of a 6-inch- (152-mm-) deep steel stud covered with 16-gauge track was attached to the side walls at 8 feet (2438 mm) above the floor. The bottom of the covered studs was protected with three layers of 5/8-inch (15.9-mm) type X gypsum board. Two layers were used to protect the vertical and top surfaces. The studs and track mounted along the side walls were covered with four layers of ceramic fiber blanket to reduce the width of the opening in the front section of the test room from 9 feet 4 inches (2845 mm) to 8 feet 5 inches (2565 mm), as shown in Figure X2-5. The gaps along the edges of the panel were filled with ceramic fiber blanket, and the top and bottom of the gaps were then covered with a strip ceramic fiber blanket attached to the panel and a side wall of the test room, as shown in Figure X2-6.

X2–2.3 Back Wall

The back wall of the test room consisted of 8-foot- (2440-mm-) tall, 3-5/8-inch- (92-mm-) deep, 18-gauge steel studs at 12 inches (305 mm) on center and with 18-gauge track top and bottom. The interior surface of the frame was covered with four layers of 5/8-inch (15.9-mm) type X gypsum board and three layers of 1-inch- (25.4-mm-) thick ceramic fiber blanket. The exterior surface was not finished. An opening at the bottom of the back wall allowed the 2-inch- (50.8-mm-) diameter propane pipe nipple from the burner to pass-through to connect to the supply hose outside the test room. The opening was sealed with ceramic fiber blanket.

X2–2.4 I–beams

The space between the exposed surfaces of the flanges and web were filled with several layers of 5/8-inch (15.9-mm) type X gypsum board, and the beams were then wrapped with four layers of 1-inch- (25.4-mm-) thick ceramic fiber blanket.

X2–2.5 Back Section Ceiling

The ceiling above the burner consisted of a spare 4.5-foot (1372-mm) by 8-foot (2438-mm) CLT panel, protected with four layers of 5/8-inch (15.9-mm) type X gypsum board and four layers of 1-inch-(25.4-mm-) thick ceramic fiber blanket. The front edge of the CLT panel was supported by one of the two I-beams. At the back edge, the CLT panel was attached to a 3-1/2-inch (89-mm) by 3-1/2-inch (89-mm) by 1/4-inch (6.4-mm) angle iron welded to the racks supporting the side walls.

Fastener details are as follows:

First layer of gypsum board: 1-7/8-inch (48-mm) #6 type S bugle head drywall screws.

Second layer of gypsum board: 2-1/2-inch (64-mm) #6 type S bugle head drywall screws.

Third and fourth layer of gypsum board: 3-inch (76-mm) #8 type S bugle head drywall screws.

First and second layer of ceramic fiber blanket: 4-1/2-inch (114-mm) coarse thread screws with 1-inch (25.4-mm) washers.

Third and fourth layer of ceramic fiber blanket: 12-gauge galvanized steel wire bent into horseshoe shape.

Screw spacing was approximately 12 inches (305 mm). Wires were used where needed. All joints were staggered with at least 1 foot (305 mm) separation.

X2-3 Gas Burner

X2–3.1 Burner Construction

A gas burner was constructed to create the exposing fire. The burner consisted of a 6-foot- (1829-mm-) long by 2-foot- (610-mm-) wide by 1-foot- (305-mm-) tall steel box with open top. Five pieces of 2-inch (51-mm) by 3-inch (76 mm) steel rectangle tube were welded to the bottom plate, elevating the burner approximately 2 inches (51 mm) above the floor (see Figure X2-5). The burner was supplied with propane through a 2-inch-(51-mm-) diameter pipe. The gas flow was evenly distributed to eight downward-facing release points as shown in Figure X2-7. The burner was filled with coarse gravel to ensure relatively uniform propane flow at the top surface (see Figure X2-5).

TABLE X2-1

BURNER HRR STEP PROFILE

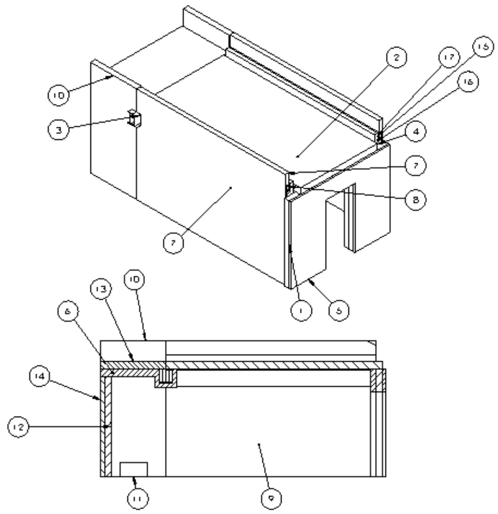
Start (min.)	End (min.)	HRR (kW)
0	13	250
13	38	1075
38	58	1377
58	88	834
88	End of Test	250

X2–3.2 Burner Heat Release Rate Profile

Propane was supplied from two tanks via a vaporizer, a regulator, and a 2-inch- (51-mm-) diameter pipe with several shut-off valves and a control valve. The propane flow rate was manually controlled, and measured with a Coriolis mass flow sensor. The burner profile is shown in Table X2-1 and Figure X2-8.

FIGURE X2-1

3-D VIEW OF TEST ROOM



Item No.	Description	Quantity
1	Front wall	1
2	CLT panel	1
3	I beam 12 x 41	2
4	Front wall interior insulation	1
5	Front wall exterior insulation	1
6	Burner section ceiling insulation	1
7	Side wall CLT section	2
8	Sidewall studs and track	4
9	Sidewall stud insulation blanket	2
10	Burner section side wall	2
11	Burner	1
12	Burner section back wall	1
13	Burner section CLT panel	1
14	Burner section outside gyp	1
15	Sidewall stud-side gyp	2
16	Sidewall stud under gyp	2
17	Sidewall stud top gyp	2

FIGURE X2-2

PLAN VIEW AND SIDE ELEVATION (SECTION) OF TEST ROOM (Units in inches)

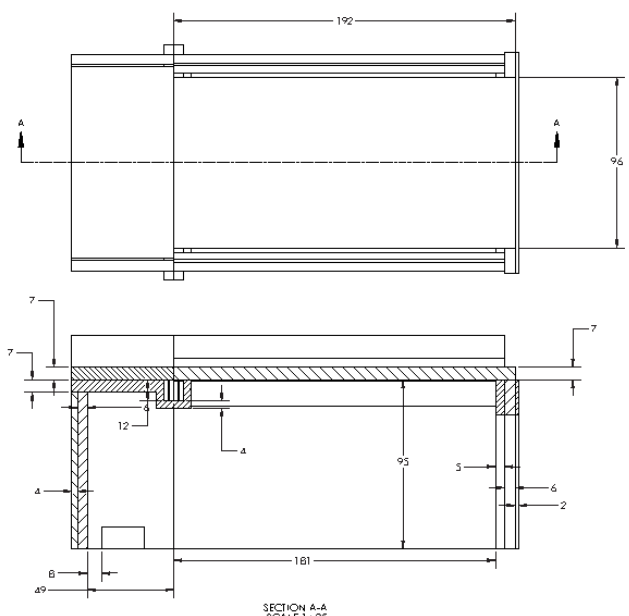


FIGURE X2-3

PLAN VIEW (SECTION) AND SIDE ELEVATION (SECTION) OF TEST ROOM (Units in inches)

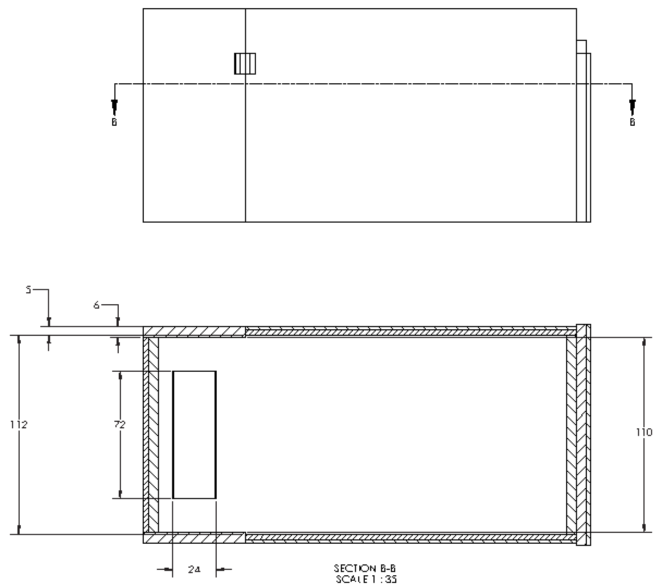


FIGURE X2-4

FRONT ELEVATION AND CONSTRUCTION DETAIL TO NARROW GAP ALONG SIDES OF CLT SAMPLE (Units in inches)

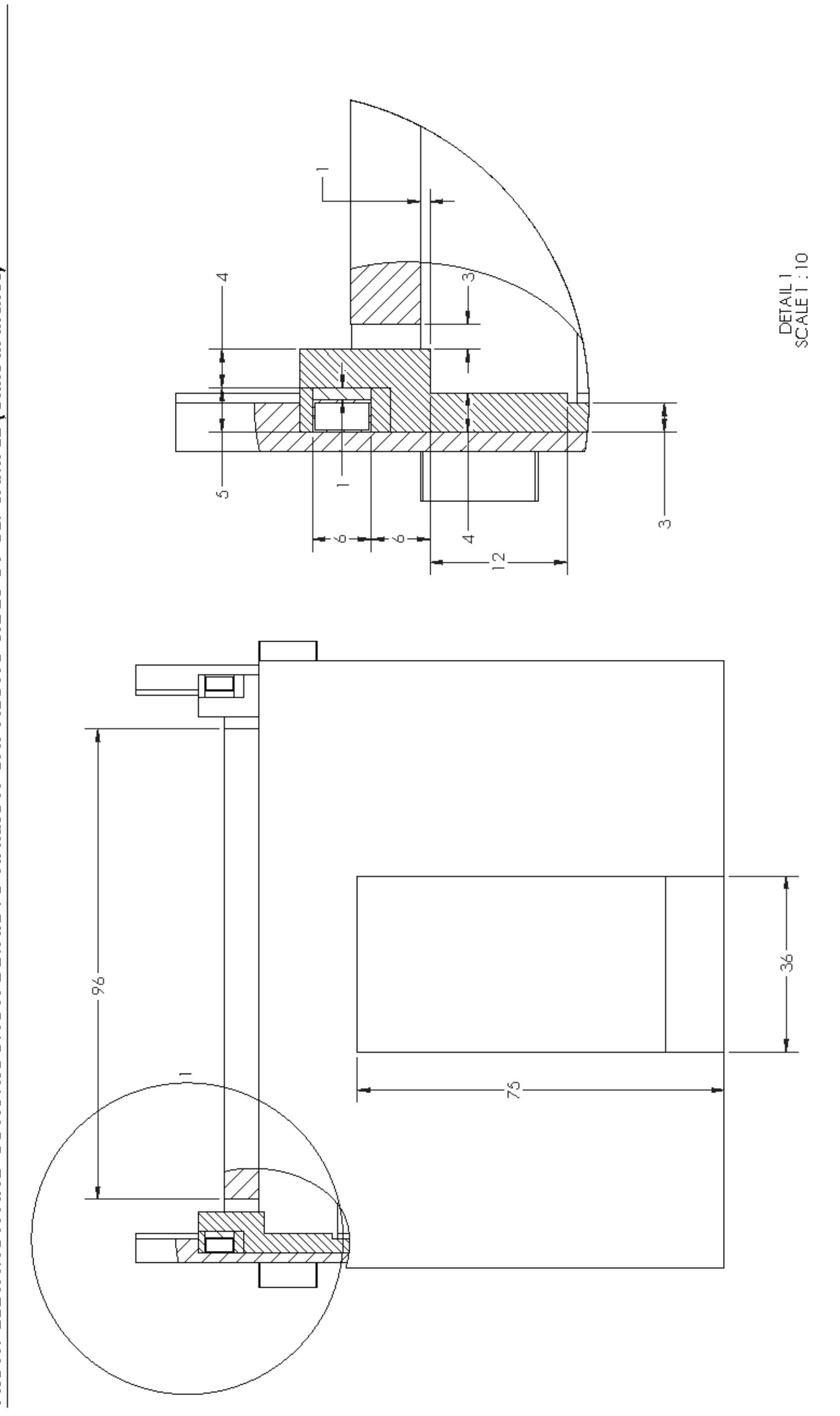


FIGURE X2-5

PROPANE DIFFUSION BURNER

FIGURE X2-6

PICTURE ILLUSTRATING CERAMIC FIBER COVER AROUND PANEL PERIMETER

FIGURE X2-7

SCHEMATIC OF BURNER ILLUSTRATING DISTRIBUTION OF PROPANE FLOW

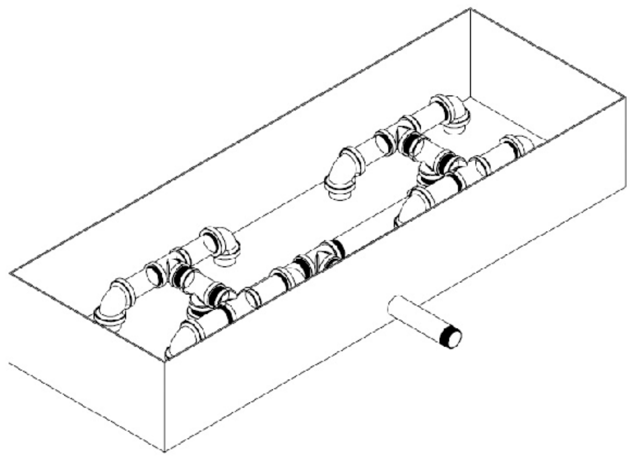
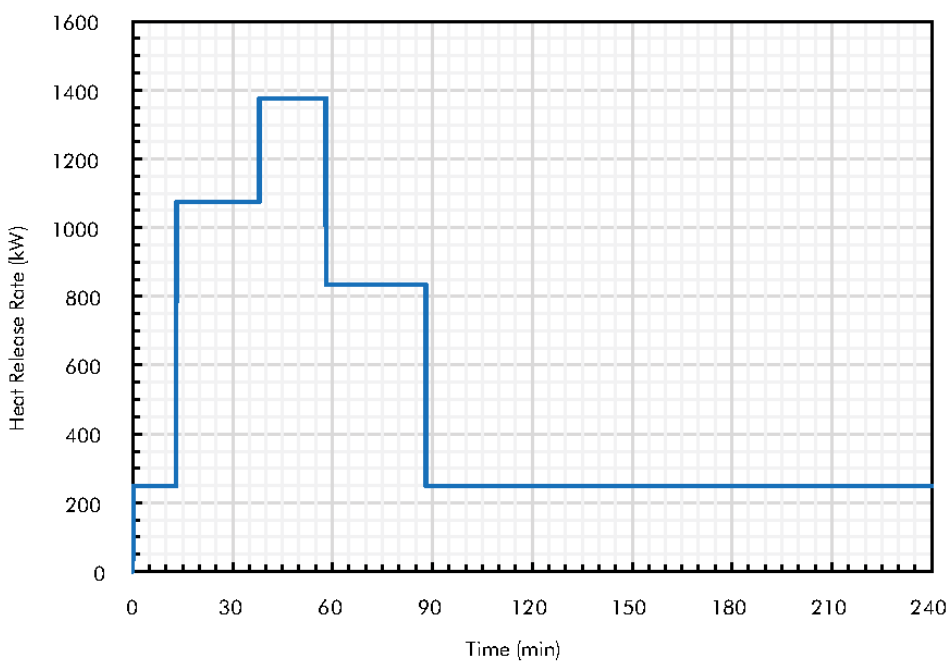


FIGURE X2-8

BURNER HEAT RELEASE RATE PROFILE



APPENDIX X3. Engineering Model Used in the Development of Design Values in Annex A (Non-Mandatory)

X3.1 General

This appendix provides engineering formulas for the determination of CLT design values published in Annex A based on the shear-analogy model and CSA O86. This methodology has been recognized by the consensus-based canvas committee that developed this standard.

These formulas are applicable to CLT grades and layups that are symmetric using laminations with design properties recognized by the *approved agency*. For other grades and layups, such as unsymmetrical layups or the layups having adjacent layers oriented in the same direction, additional consideration may be necessary when using these formulas.

For calculating the CLT design properties, such as those shown in Tables A2 and A4, the transverse E of the lamination is customarily assumed to be E/30, the longitudinal G of the lamination is assumed to be E/16, and the transverse G of the lamination is assumed to be longitudinal G/10.

X3.2 Flatwise Bending Moment

$$(F_bS)_{eff,f,0} = \left(\frac{1}{12}\right) 0.85\, F_{b,major}\, S_{eff,f,0} \qquad \text{[X3-1 ASD]}$$

$$(f_bS)_{eff,f,0} = 0.85\, f_{b,major}\, S_{eff,f,0} \qquad \text{[X3-1 LSD]}$$

$$(F_bS)_{eff,f,90} = \left(\frac{1}{12}\right) F_{b,minor}\, S_{eff,f,90} \qquad \text{[X3-2 ASD]}$$

$$(f_bS)_{eff,f,90} = f_{b,minor}\, S_{eff,f,90} \qquad \text{[X3-2 LSD]}$$

where

$(F_b,S)_{eff,f,0}$ = Effective ASD reference flatwise bending moment of CLT, in lbf-ft/ft of width, in the CLT major strength direction

$(f_b,S)_{eff,f,0}$ = Effective LSD flatwise bending moment resistance of CLT, in N-mm/m of width, in the CLT major strength direction

$(F_b,S)_{eff,f,90}$ = Effective ASD reference flatwise bending moment of CLT, in lbf-ft/ft of width, in the CLT minor strength direction

$(f_b,S)_{eff,f,90}$ = Effective LSD flatwise bending moment resistance of CLT, in N-mm/m of width, in the CLT major strength direction

$F_{b,major}$ = ASD reference bending stress of the lamination in the CLT major strength direction, in psi

$f_{b,major}$ = LSD specified bending strength of the lamination in the CLT major strength direction, in MPa

$F_{b,minor}$ = ASD reference bending stress of the lamination in the CLT minor strength direction, in psi

$f_{b,minor}$ = LSD specified bending strength of the lamination in the CLT minor strength direction, in MPa

$S_{eff,f,0}$ $= \frac{(EI)_{eff,f,0}}{E_{major}} \frac{2}{t_p}$, in in.^{3}/ft or mm^3/m of width, in the CLT major strength direction

$S_{eff,f,90}$ $= \frac{(EI)_{eff,f,90}}{E_{minor}} \frac{2}{(t_p - t_1 - t_n)}$, in in.^{3}/ft or mm^3/m of width, in the CLT minor strength direction

$(EI)_{eff,f,0}$ = effective flatwise bending stiffness of the CLT, in lbf-in.^{2}/ft (N-mm^2/m) of width, in the CLT major strength direction

$(EI)_{eff,f,90}$ = effective flatwise bending stiffness of the CLT, in lbf-in.^{2}/ft (N-mm^2/ft) of width, in the CLT minor strength direction

E_{major} = ASD or LSD modulus of elasticity of the lamination, in psi (MPa), in the CLT major strength direction

E_{minor} = ASD or LSD modulus of elasticity of the lamination, in psi (MPa), in the CLT minor strength direction

t_p = gross thickness of CLT, in in. (mm)

t_1 = thickness of the bottom layer(s) of the lamination parallel to the CLT major strength direction, in in. (mm)

t_n = thickness of the top layer(s) of the lamination parallel to the CLT major strength direction, in in. (mm)

X3.3 Flatwise Bending Stiffness

$$(EI)_{eff,f,0} = \sum_{i=1}^{n} E_i b_0 \frac{t_i^3}{12} + \sum_{i=1}^{n} E_i b_0 t_i z_i^2 \qquad \text{[X3-3]}$$

$$(EI)_{eff,f,90} = \sum_{i=2}^{n-1} E_i b_{90} \frac{t_i^3}{12} + \sum_{i=2}^{n-1} E_i b_{90} t_i z_i^2 \qquad \text{[X3-4]}$$

where

$(EI)_{eff,f,0}$ = Effective flatwise bending stiffness of CLT, in lbf-in.^{2}/ft (N-mm^2/m) of width, in the CLT major strength direction

$(EI)_{eff,f,90}$ = Effective flatwise bending stiffness of CLT, in lbf-in.^{2}/ft (N-mm^2/m) of width, in the CLT minor strength direction

b_0 = CLT width in the CLT major strength direction, in in./ft (mm/m) of width

b_{90} = CLT width in the CLT minor strength direction, in in./ft (mm/m) of width

E_i = modulus of elasticity of the lamination in the i-th layer, in psi (MPa)

G_i = modulus of rigidity (shear modulus) of the lamination in the i-th layer, in psi (MPa)

t_i = thickness of laminations in the i-th layer, in in. (mm)

z_i = distance between the center point of the i-th layer and the neutral axis, in in. (mm)

n = number of layers in the CLT

X3.4 Flatwise Shear Rigidity

$$(GA)_{eff,f,0} = \frac{(t_p - \frac{t_1}{2} - \frac{t_n}{2})^2}{\left[\left(\frac{t_1}{2G_1 b_0}\right) + \left(\sum_{i=2}^{n-1} \frac{t_i}{G_i b_0}\right) + \left(\frac{t_n}{2G_n b_0}\right)\right]} \qquad \text{[X3-5]}$$

$$(GA)_{eff,f,90} = \frac{(t_p - \frac{t_1}{2} - \frac{t_n}{2})^2}{\left[\left(\frac{t_1}{2G_1 b_{90}}\right) + \left(\sum_{i=2}^{n-1} \frac{t_i}{G_i b_{90}}\right) + \left(\frac{t_n}{2G_n b_{90}}\right)\right]} \qquad \text{[X3-6]}$$

where

$(GA)_{eff,f,0}$ = Effective flatwise shear rigidity of CLT, in lbf/ft (N/m) of width, in the CLT major strength direction

$(GA)_{eff,f,90}$ = Effective flatwise shear rigidity of CLT, in lbf/ft (N/m) of width, in the CLT minor strength direction

Other terms are as defined in previously sections.

X3.5 Flatwise (Rolling) Shear Capacity

$$V_{s,0} = F_{s,minor} \frac{2\ A_{gross,0}}{3} \qquad \text{[X3-7 ASD]}$$

$$v_{s,0} = f_{s,minor} \frac{2\ A_{gross,0}}{3} \qquad \text{[X3-7 LSD]}$$

$$V_{s,90} = F_{s,major} \frac{2\ A_{gross,90}}{3} \qquad \text{[X3-8 ASD]}$$

$$v_{s,90} = f_{s,major} \frac{2\ A_{gross,90}}{3} \qquad \text{[X3-8 LSD]}$$

where

$V_{s,0}$ = ASD reference flatwise shear capacity, in lbf/ft of width, in the CLT major strength direction

$v_{s,0}$ = LSD flatwise shear resistance, in N/m of width, in the CLT major strength direction

$V_{s,90}$ = ASD reference flatwise shear capacity, in lbf/ft of width, in the CLT minor strength direction

$v_{s,90}$ = LSD flatwise shear resistance, in N/m of width, in the CLT minor strength direction

$F_{s,major}$ = ASD reference planar (rolling) shear stress of a lamination in the CLT major strength direction = $\frac{F_{v,\ major}}{3}$, in psi

$F_{v,major}$ = ASD reference shear stress of a lamination in the CLT major strength direction, in psi

$f_{s,major}$ = LSD specified planar (rolling) shear strength of a lamination in the CLT major strength direction = $\frac{f_{v,\ major}}{3}$, in MPa

$f_{v,major}$ = LSD specified shear strength of a lamination in the CLT major strength direction, in MPa

$F_{s,minor}$ = ASD reference planar (rolling) shear stress of a lamination in the CLT minor strength direction = $\frac{F_{v,\ minor}}{3}$, in psi

$F_{v,minor}$ = ASD reference shear stress of a lamination in the CLT minor strength direction, in psi

$f_{s,minor}$ = LSD specified planar (rolling) shear strength of a lamination in the CLT minor strength direction = $\frac{f_{v,\,minor}}{3}$, in MPa

$f_{v,minor}$ = LSD specified shear strength of a lamination in the CLT minor strength direction, in MPa

$A_{gross,0}$ = gross cross-sectional area of CLT, in in.^{2}/ft (mm^2/m) of width

$A_{gross,90}$ = gross cross-sectional area of CLT excluding the outermost longitudinal layers, in in.^{2}/ft (mm^2/m) of width

NOTE X3-1: For a CLT panel manufactured with multiple longitudinal outermost layers, all these are excluded from $A_{gross,90}$.

APPENDIX X4. History of Standard (Non-Mandatory)

In March 2010, the APA Standards Committee on Standard for Performance-Rated Cross-Laminated Timber was formed to develop a national standard under the consensus processes accredited by the American National Standards Institute (ANSI). This national consensus standard, designated as ANSI/APA PRG 320, was developed based on broad input from around the world. It should be especially recognized that this standard incorporates draft standards that were developed by FPInnovations in Canada, as part of the joint effort between the U.S. and Canada in the development of a bi-national CLT standard.

The first version of this standard was approved by ANSI for publication on December 20, 2011. Subsequent revisions resulted in the publication of the following versions:

- ANSI/APA PRG 320-2012 on October 30, 2012,
- ANSI/APA PRG 320-2017 on October 6, 2017,
- ANSI/APA PRG 320-2018 on February 6, 2018, and
- ANSI/APA PRG 320-2019 (this standard).

Inquiries or suggestions for improvement of this standard should be directed to:

Secretariat, ANSI/APA PRG 320
APA – The Engineered Wood Association
7011 South 19th Street
Tacoma, WA 98466
Internet address: www.apawood.org
e-mail address: help@apawood.org

The names of the ANSI/APA PRG 320 Committee members when this version of the standard is published are as shown below. The current list of the committee membership is available from the committee secretariat upon request.

Name	Affiliation	Note
Deepareddy Akula	Stella-Jones (Formerly McFarland Cascade)	
Joshua Bartlett	Franklin International	
Mark Bartel	International Beams	
Kevin Below	Cross Laminated Timber Canada Inc.	
Todd Black	DR Johnson Wood Innovations	
Hans-Erik Blomgren	Katerra	
Scott Breneman	WoodWorks - Wood Products Council	ExSub Member
Darryl Byle	CLT Solutions LLC	
Kevin Cheung	Western Wood Products Association	
Mark Clark	Momentive Inc.	
Steve Craft	CHM Fire Consultants Ltd.	
Randy Daudet	Simpson Strong-Tie	
Don DeVisser	Pacific Lumber Inspection Bureau	
Bruno Di Lenardo	Canadian Construction Materials Centre	
Brad Douglas	American Wood Council	
Pat Farrell	Freres Lumber Company	
Julie Frappier	Nordic Structures	Vice-Chair
Sylvain Gagnon	FPInnovations	
Bill Gareis	Ashland Inc.	
Bill Gould	ICC Evaluation Service Inc.	
Jim Henjum	SmartLam LLC	
Ben Herzog	University of Maine	
Frank Lam	University of British Columbia	
Dean Lewis	DCI Engineers	
Jeff Linville	Weyerhaeuser Company	
Robert Malczyk	Equilibrium Consulting Inc.	
Andre Morf	Structurlam Products, LP	
Jeff Morrison	Rosboro LLC	
David Moses	Moses Structural Engineers Inc.	
Lech Muszynski	Oregon State University	
John Neels	National Lumber Grades Authority	
Scott Nyseth	Stonewood Structural Engineers Inc.	
Ciprian Pirvu	WoodTech Consulting	
Henry Quesada-Pineda	Virginia Tech University	
Douglas Rammer	USDA Forest Products Laboratory	
Alexander Salenikovich	Université Laval	ExSub Member
Sheldon Shi	University of North Texas	
Scott Skinner	Akzo Nobel Coatings Inc.	
Kurt Stochlia	KSPE Inc.	
Phil Vacca	Louisiana-Pacific Corp.	
Chris Whelan	Henkel Corporation	
Tom Williamson	T.Williamson-Timber Engineering LLC	Chair
Steve Winistorfer	PFS TECO	
B.J. Yeh	APA – The Engineered Wood Association	Secretariat
Cory Zurell	Blackwell Structural Engineers	

ANSI/APA PRG 320-2019
Standard for Performance-Rated Cross-Laminated Timber

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Form No. PRG 320-2019/Issued January 2020

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Existing Building

36

S10266

Date Submitted	02/12/2022	**Section**	502.3	**Proponent**	Conn Cole FDEM SFMO
Chapter	5	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

Provide that non-substantial additions in flood hazard areas do increase the nonconformity of buildings that do not conform to current flood requirements.

Rationale

Based on FEMA 2024 IEBC proposal EB154-22. Subject to 553.73(7)(a) as flood requirement for inclusion in 9th Ed. FBCB includes requirements for alterations & additions (improvements) to existing buildings in floodplains. Compliance trigger is in definition for “substantial improvement” (50% rule); requires compliance if cost of improvements equals or exceeds 50% market value of the building before work is done. FEMA guidance, like EB 1103.3, distinguishes compliance of additions from compliance of existing (or base) buildings. EB 502.1 states alterations must be made to ensure existing buildings are “not less complying with” the code than the existing building was before the addition. EB 1101.2 echoes that: additions “shall not create or extend any nonconformity.” Buildings in floodplains built before communities adopted regs are usually nonconforming. Proposal reinforces existing reqmt by making clear that additions less than 50% of market value must not make nonconforming buildings more nonconforming. This is done by having specific reqmts stating additions must not be lower than the lowest floors of existing buildings because being lower renders the buildings more nonconforming. Also, non-substantial additions to conforming or compliant buildings must not make buildings nonconforming. Proposal accounts for buildings that are elevated higher than required by the code by specifying additions must be at least as high as the elevations required in FBCB 1612 or FBCR R322. Another scenario addressed is if owners of buildings elevated on columns/ pilings decide to enclose area underneath. Enclosing meets the definition of addition because it creates an “extension or increase in floor area.” Even when enclosing underneath is not a “substantial improvement” based on cost, the work is only allowed when the walls and use of the enclosure comply with requirements for enclosures. Otherwise, enclosing creates noncompliance or extends nonconformance.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

It makes it easier to enforce the general requirement in the existing building code that work must not make nonconforming buildings more nonconforming.

Impact to building and property owners relative to cost of compliance with code

No change; clarifies the application of the existing requirement that work must not make a nonconforming building more nonconforming. The proposal is consistent with the existing requirement that additions must not create or extend any nonconformity.

Impact to industry relative to the cost of compliance with code

No change in costs (same as impact on buildings and owners).

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, by making it clearer that nonconformities must not be extended.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, by making it clearer that nonconformities must not be extended.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No change in materials or methods.

Does not degrade the effectiveness of the code

No, because it'll be clearer that nonconformities must not be extended.

Alternate Language

2nd Comment Period

S10266-A2

Proponent	Rebecca Quinn obo FL Div Emerg Mgnt	**Submitted**	8/9/2022 8:40:26 AM	**Attachments**	Yes

Rationale:
This alternate starts with the original proposed language and does not change the intent of the original proposal. The alternative does two things. One, it fixes FDEM's original error to show correct 502.2 language for additions (we inadvertently used Sec. 503.2 for alterations). Two, it shows changes to Sec. 1103.5 and Sec. 1401.3.3 to match FEMA's changes made to the same proposal for the IEBC, which were Approved as Modified at the ICC Committee Action Hearing.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Original, with amendments, makes it easier to enforce the general requirement in the existing building code that work must not make nonconforming buildings more nonconforming.

Impact to building and property owners relative to cost of compliance with code

No change; amendment further clarifies the application of the existing requirement that work must not make a nonconforming building more nonconforming. The proposal is consistent with the existing requirement that additions must not create or extend any nonconformity.

Impact to industry relative to the cost of compliance with code

No change in costs (same as impact on buildings and owners).

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, by making it clearer that nonconformities must not be extended.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, by making it clearer that nonconformities must not be extended.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No change in materials or methods.

Does not degrade the effectiveness of the code

No, because it'll be clearer that nonconformities must not be extended.

1st Comment Period History

S10266-A1

Proponent	Rebecca Quinn obo FL Div Emerg Mgnt	**Submitted**	4/16/2022 11:33:05 AM	**Attachments**	Yes

Rationale:
Submitted on behalf of the FDEM State Floodplain Manager, we recommend alternate language. FEMA submitted the proposal for the International Existing Building Code as proposal EB50-22, which was Approved as Modified at the Committee Action Hearing. The modifications correct an error on FEMA's part and correct a typographical error on FDEM's part. The modifications make sure the requirements apply only to the non-substantial additions, not the entire existing building. Only Sec. 1103.3 and 1401.3.3 are modified; no change needed for the definition and Sec. 503.2.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

no change from original

Impact to building and property owners relative to cost of compliance with code

no change from original

Impact to industry relative to the cost of compliance with code

no change from original

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

no change from original

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

no change from original

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

no change from original

Does not degrade the effectiveness of the code

no change from original

2nd Comment Period

S10266-G1

Proponent	Scott McAdam	Submitted	8/21/2022 3:55:00 PM	Attachments	No

Comment:

BOAF CDC Committee supports this modification alternate 2

LOWEST FLOOR. The lowest floor of the lowest enclosed area, including basement, but excluding any unfinished or flood-resistant enclosure, usable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the structure in violation of Section 1612 of the Florida Building Code or Section R322 of the Florida Residential Code, as applicable.

[BS] 502.2 ~~503.2~~ [Additions ~~Alterations~~] Flood hazard areas. For buildings and structures in *flood hazard areas* established in Section 1612.3 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable, any addition ~~*alteration*~~ that constitutes *substantial improvement* of the existing structure shall comply with the flood design requirements for new construction, and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design.

For buildings and structures in *flood hazard areas* established in Section 1612.3 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable, any additions ~~*alterations*~~ that do not constitute *substantial improvement* of the existing structure are not required to comply with the flood design requirements for new construction provided that both of the following apply:

1. The addition shall not create or extend a nonconformity of the existing building or structure with the flood resistant construction requirements than the existing building or structure was prior to the addition

2. The lowest floor of the addition shall be at or above the lower of the lowest floor of the existing building or structure or the lowest floor elevation required in Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

[BS] 1103.5 Flood Hazard Areas. *Additions* and *foundations* in *flood hazard areas* shall comply with the following requirements:

1. For horizontal *additions* that are structurally interconnected to the *existing building*:

1.1. If the *addition* and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable.

1.2. If the *addition* constitutes *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable.

1.3 If the addition does not constitute substantial improvement the addition ~~existing structure~~ is not required to comply with the flood design requirements for new construction provided that both of the following apply.

1.3.1 The addition shall not create or extend any nonconformity of the existing building with the flood resistant construction requirements.

1.3.2 The lowest floor of the addition shall be at or above the lower of the lowest floor of the existing building or the lowest floor elevation required in Section 1612 of the Florida Building Code, or Section R322 of the Florida Residential Code, as applicable.

2. For horizontal *additions* that are not structurally interconnected to the *existing building*:

2.1. The *addition* shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable.

2.2. If the *addition* and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable.

3. For vertical *additions* and all other proposed work that, when combined, constitute *substantial improvement*, the *existing building* shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable.

4. For a raised or extended foundation, if the foundation work and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* shall comply with Section 1612 of the *Florida Building Code, Building,* or Section R322 of the *Florida Building Code, Residential*, as applicable.

5. For a new foundation or replacement foundation, the foundation shall comply with Section 1612 of the *Florida Building Code, Building*,or Section R322 of the *Florida Building Code, Residential*, as applicable.

[B]1401.3.3 Compliance with flood hazard provisions. In *flood hazard areas*, buildings that are evaluated in accordance with this section shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable if the work covered by this section constitutes *substantial improvement*. If the work covered by this section is a structurally connected horizontal addition that does not constitute substantial improvement, the ~~building~~ addition is not required to comply with the flood design requirements for new construction provided that both of the following apply.

1. The addition shall not create or extend any nonconformity of the existing building with the flood resistant construction requirements.

2. The lowest floor of the addition shall be at or above the lower of the lowest floor of the existing building or the lowest floor elevation required in Section 1612 of the Florida Building Code, or Section R322 of the Florida Residential Code, as applicable.

[B] 1103.3 Flood hazard areas. Additions and foundations in flood hazard areas shall comply with the following requirements:

1. For horizontal additions that are structurally interconnected to the existing building:

1.1. If the addition and all other proposed work, when combined, constitute substantial improvement, the existing building and the addition shall comply with Section 1612 of the Florida Building Code, or Section R322 of the Florida Residential Code, as applicable.

1.2. If the addition constitutes substantial improvement, the existing building and the addition shall comply with Section 1612 of the Florida Building Code, or Section R322 of the Florida Residential Code, as applicable.

1.3. If the addition does not constitute substantial improvement the addition ~~existing structure~~ is not required to comply with the flood design requirements for new construction provided that both of the following apply.

1.3.1 The addition shall not create or extend any nonconformity of the existing building with the flood resistant construction requirements.

1.3.1 The lowest floor of the addition shall be at or above the ~~lower~~ lowest floor of the existing building or the lowest floor elevation required in Section 1612 of the Florida Building Code, or Section R322 of the Florida Residential Code, as applicable.

[B] 1401.3.3 Compliance with flood hazard provisions. In flood hazard areas, buildings that are evaluated in accordance with this section shall comply with Section 1612 of the Florida Building Code, or Section R322 of the Florida Residential Code, as applicable, if the work covered by this section constitutes substantial improvement. If the work covered by this section is a structurally connected horizontal addition that does not constitute substantial improvement, the ~~building~~ addition is not required to comply with the flood design requirements for new construction provide that both of the following apply.

1.3.1 The addition shall not create or extend any nonconformity of the existing building with the flood resistant construction requirements.

1.3.1 The lowest floor of the addition shall be at or above the lower of the lowest floor of the existing building or the lowest floor elevation required in Section 1612 of the Florida Building Code, or Section R322 of the Florida Residential Code, as applicable.

LOWEST FLOOR. The lowest floor of the lowest enclosed area, including basement, but excluding any unfinished or flood-resistant enclosure, usable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the structure in violation of Section 1612 of the Florida Building Code or Section R322 of the Florida Residential Code, as applicable.

[BS] 503.2 [Alterations] Flood hazard areas. For buildings and structures in *flood hazard areas* established in Section 1612.3 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable, any *alteration* that constitutes *substantial improvement* of the existing structure shall comply with the flood design requirements for new construction, and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design.

For buildings and structures in *flood hazard areas* established in Section 1612.3 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable, any alterations that do not constitute *substantial improvement* of the existing structure are not required to comply with the flood design requirements for new construction provided that both of the following apply:

1. The addition shall not create or extend a nonconformity of the existing building or structure with the flood resistant construction requirements than the existing building or structure was prior to the addition

2. The lowest floor of the addition shall be at or above the lower of the lowest floor of the existing building or structure or the lowest floor elevation required in Section 1612 of the International Building Code, or Section R322 of the International Residential Code, as applicable.

[BS] 1103.5 Flood Hazard Areas. *Additions* and *foundations* in *flood hazard areas* shall comply with the following requirements:

1. For horizontal *additions* that are structurally interconnected to the *existing building*:

1.1. If the *addition* and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable.

1.2. If the *addition* constitutes *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable.

1.3 If the addition does not constitute substantial improvement the existing structure is not required to comply with the flood design requirements for new construction provided that both of the following apply.

1.3.1 The addition shall not create or extend any nonconformity of the existing building with the flood resistant construction requirements.

1.3.2 The lowest floor of the addition shall be at or above the lower of the lowest floor of the existing building or the lowest floor elevation required in Section 1612 of the Florida Building Code, or Section R322 of the Florida Residential Code, as applicable.

2. For horizontal *additions* that are not structurally interconnected to the *existing building*:

2.1. The *addition* shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable.

2.2. If the *addition* and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable.

3. For vertical *additions* and all other proposed work that, when combined, constitute *substantial improvement*, the *existing building* shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable.

4. For a raised or extended foundation, if the foundation work and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* shall comply with Section 1612 of the *Florida Building Code, Building,* or Section R322 of the *Florida Building Code, Residential*, as applicable.

5. For a new foundation or replacement foundation, the foundation shall comply with Section 1612 of the *Florida Building Code*, *Building*,or Section R322 of the *Florida Building Code, Residential*, as applicable.

[B] 1401.3.3 Compliance with flood hazard provisions. In *flood hazard areas*, buildings that are evaluated in accordance with this section shall comply with Section 1612 of the *Florida Building Code, Building*, or Section R322 of the *Florida Building Code, Residential*, as applicable if the work covered by this section constitutes *substantial improvement*. <u>If the work covered by this section is a structurally connected horizontal addition that does not constitute substantial improvement, the building is not required to comply with the flood design requirements for new construction provided that both of the following apply.</u>

<u>1. The addition shall not create or extend any nonconformity of the existing building with the flood resistant construction requirements.</u>

<u>2. The lowest floor of the addition shall be at or above the lower of the lowest floor of the existing building or the lowest floor elevation required in Section 1612 of the Florida Building Code, or Section R322 of the Florida Residential Code, as applicable.</u>

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S10270

37

Date Submitted	02/12/2022	**Section**	202	**Proponent**	Robert Koning
Chapter	2	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

Add: Definition of Exterior Wall Covering Assembly System Methods

Rationale

These definitions and systems are historic and well established. The verbiage is derived from, Durability by Design 2nd Edition, U.S. Department of Housing and Urban Development, ASTM E 2128 Standard Guide for Evaluating Water Leakage of Building Walls, ASTM E 2266 Standard Guide for Design and Construction of Low-Rise Frame Building Wall Systems to Resist Water Intrusion, Architectural Graphical Standards, and other industry publications. Currently the code only addresses the application of Weather Resistant Barriers and ASTM C926 and 1063 (Application of Cement Based Plaster and Metal Lath respectively) which are intended for use with a concealed barrier system with a colored cementitious finish without paints or coatings (even though the ASTM documents contain an “unless otherwise specified” provision to accommodate all the other systems), accordingly, thousands of jobs are being affected by consultants and code officials who cite them as “code deficient” for cement cladding because there is only one system mentioned in the code text – and therefore only one wall method that is code compliant. This will clear up the ambiguity and provide clarity of design intent.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10270-G1

Proponent	Robert Koning	Submitted	8/26/2022 2:38:40 PM	Attachments	No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The code needs to address by way of definitions at least the generic types of wall systems or assemblies used in modern construction. These definitions are taken from Federal, State and Industry publications and are all in harmony.

Exterior Wall Covering Assembly System Methods. The design of a wall system can be described in two broad categories: barrier walls and water managed walls. A wall system may have characteristics of both a barrier wall and a drainage wall in various combinations. Every wall must have an identifiable mechanism to resist leakage, whether it is a distinct barrier material whose only function is to resist the movement of water toward the interior, or a combination of several wall elements intended to function together to provide leakage resistance. The anticipated volume of rain penetration, the method of controlling rain that penetrates, the location of a barrier within the wall assembly, the interaction of the wall components, the materials used, and the exposure of the barrier to environmental wind pressure and rain, determine how a wall is intended to function and how it is categorized. Systems are categorized as follows:

1. Drainage Wall Systems. The mechanism intended to prevent leakage in this type of wall is the control and discharge of anticipated and accepted amounts of water that penetrates the exterior surfaces.

a. Drained Cavity System. The drained cavity method relies on deflection, drainage, and drying to protect the wall from moisture damage. There are many possible variations. In general, a cavity exists to separate the cladding material from the surface of the underlying water-resistive barrier. The depth of the cavity, however, may vary. For example, siding may be placed directly on the WRB layer and still provide a cavity only restricted at points of contact (e.g., nail flanges). A minimum cavity depth of 3/8” is sometimes recommended, but often a depth of ¾” or 1 ½” is used based on the standard thickness of wood furring materials. For anchored masonry (brick) veneer, a minimum cavity depth is recommended to allow space for brick placement and mortar excesses. The drained cavity approach also can be applied to Portland cement stucco with use of a drainage mat or other appropriate means of creating a drainage cavity.

b. Concealed Barrier Drain System. The concealed barrier method relies on porous cladding material adhered to or placed directly on an internal (concealed) water barrier or drainage plane. A common example is conventional stucco applied on two layers of Grade D building paper attached to a wood-frame wall. This method also relies primarily on deflection of rainwater (like the face-sealed system) but also has limited capability to absorb moisture to later dry and to drain moisture through weeps (e.g., weep screed) at the base of the wall. However, there is no open drainage pathway to allow water to freely drain from the concealed moisture barrier.

2. Barrier Wall System. The mechanism intended to prevent leakage in this type of wall is blocking or interrupting the movement of water to the interior and are broken into two subcategories:

a. Face Sealed System. The exterior surfaces are relied upon as the only barrier. All surfaces, joints and interfaces must be sealed to provide a continuous exterior barrier, and the absorption properties of the materials must also be controlled. The materials within the wall assembly must be able to sustain occasional short-term wetting as might occur between maintenance cycles of the exterior seals or from unintended incidental water infiltration. The system can also incorporate a secondary water-resistant system in selected areas where incidental infiltration is anticipated.

b. Mass Barrier System. The thickness and properties of wall materials are relied upon to provide a barrier. The wall mass itself may absorb water, but permeation to the interior is prevented by sufficient thickness and absorption capacity, or a layer with low permeability within the wall. Examples: solid multi-wythe masonry and stone walls; masonry walls with filled collar joints.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

38

S10274

Date Submitted	02/12/2022	**Section**	202	**Proponent**	Robert Koning
Chapter	2	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

Add Definition Of Veranda and synonyms of same so professionals can differentiate between a roofing deck for slope, covering and other roofing system requirements.

Rationale

Rationale: Consultants, Inspectors and Plan Reviewers sometimes get confused regarding the applicable code provisions of a roof deck versus a veranda or balcony regarding roofing system applications and slope requirements. The roofing requirements for system design and slope may or may not be required for a veranda. Veranda's are frequently waterproofed with a waterproofing membrane or system and slope may or may not be required. Placing a 1/4" per foot slope (as required for a roof deck) will provide a 1" fall across a table and chairs will not seat properly. Therefore these are waterproofed using lower slope per foot requirements. Per the ACI 318 definitions: Waterproofing: Above grade, waterproofing is found wherever protection is required against the passage of liquid water from leakage, washing down or other sources. Examples are swimming pools, fountains, decks and plazas above portions of buildings, balconies, air-conditioning ponds, parking garages, malls, kitchens, showers and wet rooms of any kind. Occupied space beneath the deck must be protected from entrance of moisture.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10274-G1

Proponent	Robert Koning	Submitted	8/26/2022 2:45:56 PM	Attachments	No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The code needs to address by way of definitions at least the generic types of of usable walking or flooring decks vs roof deck assemblies used in modern construction. These are subject to different code provisions. These definitions are taken from Federal, State and Industry publications and are all in harmony.

Veranda, or Verandah: A covered, partially covered or open deck, porch or balcony, usually extending along the outside of a building, or cantilevered floor section enclosed with a railing or balustrade when required. Entirely, or in part, open to the outdoors, unconditioned space, or atrium. Primarily planned for leisure enjoyment with minimal deck slope requirements . Common synonyms are terrace; lanai, plaza, balcony, or porch.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S10384

39

Date Submitted	02/14/2022	**Section**	202	**Proponent**	Joseph Belcher
Chapter	2	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

R301.2.1.1.1.2 A new section addressing sun control structures

Summary of Modification

The modification provides a definition for sun control structures.

Rationale

Sun control structures with operable louvers to direct sunlight are becoming increasingly popular as they allow enjoyment of the outdoors without direct sunlight. All jurisdictions currently require the engineered design of such structures, but the code does not provide guidance to the engineer or jurisdiction for the design parameters. This code change proposal is intended to provide the needed design criteria.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No Impact.

Impact to building and property owners relative to cost of compliance with code

No impact or a reduction in cost in areas with a lower wind speed.

Impact to industry relative to the cost of compliance with code

No impact or a reduction in cost in areas with a lower wind speed.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal has a reasonable and positive impact on the health, safety, and welfare of the general public by providing design criteria for sun control structures allowing for safe designs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by providing missing design criteria for sun control structures.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code and improves the effectiveness of the code.

Alternate Language

2nd Comment Period

S10384-A2

Proponent Joseph Belcher **Submitted** 8/24/2022 12:41:24 PM **Attachments** Yes

Rationale:

This alternate language proposal is to incorporate comments by the Structural TAC. Sun control structures with or without motorized louvers are becoming increasingly popular throughout the state. The lack of criteria in the code has resulted in widely varying requirements for the design of such structures. The original intent of the Mod was to provide a definition to correlate with another Mod providing design criteria (Mod 10386). This proposed definition eliminates unnecessary language, as identified by TAC member Mr. Lavrich.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No fiscal impact. Jurisdictions are already reviewing plans and doing inspections. The change will provide a definition, and a correlating change will provide design criteria.

Impact to building and property owners relative to cost of compliance with code

No fiscal impact. Approval could result in reduced costs where excessive provisions were applied due to the lack of a definition and design criteria in the code.

Impact to industry relative to the cost of compliance with code

No fiscal impact. Approval could result in reduced costs where excessive provisions were applied due to the lack of definition and design criteria in the code.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal positively affects the health, safety, and welfare of the general public by providing a definition for an increasingly popular structure.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by defining an increasingly popular structure currently undefined by the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposal does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not degrade the effectiveness of the code

The proposal upgrades the effectiveness of the code by providing a clear definition for an increasingly popular structure.

1st Comment Period History

S10384-A1

Proponent Joseph Belcher **Submitted** 4/15/2022 9:29:45 PM **Attachments** Yes

Rationale:

Discussion with builders revealed that classifying Sun Control Structures relying on a host structure for support as accessory structures was problematic. The modification clarifies that Sun Control Structures relying on a host structure for support are the same occupancy class as the host structure, while independently supported Sun Control Structures are accessory structures.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No fiscal impact. Jurisdictions are already reviewing plans and doing inspections. The change will provide a definition and a correlating change provides design criteria (Mod S10386).

Impact to building and property owners relative to cost of compliance with code

No fiscal impact. Approval could result in reduced costs where excessive provisions were applied due to a lack of definition and design criteria in the code (Mod 10386).

Impact to industry relative to the cost of compliance with code

No fiscal impact. Approval could result in reduced costs where excessive provisions were applied due to a lack of definition and design criteria in the code. (Mod 10386)

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change improves public safety by defining an increasingly popular accessory structure and providing design criteria in a correlating code change (Mod. S10386).

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change strengthens the code y by defining an increasingly popular accessory structure and providing design criteria in a correlating code change (Mod. S10386).

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not degrade the effectiveness of the code

The change does not degrade the effectiveness of the code but increases the effectiveness of the code.

2nd Comment Period

S10384-G1

Proponent	Scott McAdam	Submitted	8/24/2022 7:02:07 PM	Attachments	No

Comment:

BOAF CDC committee supports this MOD alternate language A2

R202 Sun Control Structure. An independently supported accessory structure consisting of columns or posts supporting an open roof of girders, beams, or cross rafters with or without fixed or operational louvers serving to direct sunlight. Sun Control Structures attached to and depending on a building for support are considered the same occupancy class as the supporting building.

R202 Sun Control Structure. An independently supported accessory structure consisting of parallel columns or posts supporting an open roof of girders and cross rafters with or without louvers serving to direct sunlight. Louvers may be fixed or operational. Sun Control Structures attached to and depending on a building for support are considered the same occupancy class as the supporting building.

R202 Sun Control Structure. An accessory structure consisting of parallel columns or posts supporting an open roof of girders and cross rafters with louvers serving to direct sunlight. Louvers may be fixed or operational.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S10017

40

Date Submitted	02/01/2022	**Section**	301.1...324.4.1.1	**Proponent**	T Stafford
Chapter	3	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

Summary of Modification

This modification is one of a series of modifications that delete the seismic and snow requirements from the code. In accordance with Exception 2 to Section 101.2 of the FBCB, seismic and snow requirements are not to be utilized or enforced in the State of Florida.

Rationale

This modification is the culmination of a project funded by the Florida Building Commission through Building a Safer Florida (BASF) that the deletes the seismic and snow provisions from the Florida Building Codes. In accordance with Exception 2 to Section 101.2 of the Florida Building Code, Building, the seismic and snow provisions are exempted from the scope of the Florida Building Codes. Exception 2 to Section 101.2 states the following: "2. Code requirements that address snow loads and earthquake protection are pervasive; they are left in place but shall not be utilized or enforced because Florida has no snow load or earthquake threat." These modifications clarify and simplify the code by deleting requirements that do not apply in the State of Florida.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
No impact to local entities relative to enforcement of the code.
Impact to building and property owners relative to cost of compliance with code
No impact to building and property owners relative to cost of compliance with the code.
Impact to industry relative to the cost of compliance with code
No impact to industry relative to the cost of compliance with the code.
Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
Clarifies and simplifies the code by deleting requirements that do not apply in the State of Florida.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by deleting requirements that do not apply in the State of Florida.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This proposal does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

S10017-A1

Proponent T Stafford **Submitted** 7/24/2022 7:10:41 PM **Attachments** Yes

Rationale:

The alternate language modification simply corrects an error in the original Mod pointed out by the TAC. While Section R301.2.2 was correctly shown as "Reserved" in the original Mod, it failed to strike-through the language that followed. This alternate language Mod corrects this error.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to cost of compliance with the code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to the cost of compliance with the code.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Corrects an error to make the code consistent throughout all volumes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Corrects an error to make the code consistent throughout all volumes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This mod does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This mod does not degrade the effectiveness of the code.

Replace the original mod in its entirety with the following language:

Revise as follows:

R301.1 Application. Buildings and structures, and parts thereof, shall be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, ~~snow loads,~~ and wind loads ~~and seismic loads~~ as prescribed by this code. The construction of buildings and structures in accordance with the provisions of this code shall result in a system that provides a complete load path that meets the requirements for the transfer of loads from their point of origin through the load-resisting elements to the foundation. Buildings and structures constructed as prescribed by this code are deemed to comply with the requirements of this section.

> **Exception:** Buildings and structures located within the High Velocity Hurricane Zone shall comply with Sections R302 to R328, inclusive and the provisions of Chapter 44, Sections R301.2.5 and R406. In addition, buildings and structures located in flood hazard areas established in Table R301.2(1) shall comply with Sections R301.2.4, R301.2.5 and R322.

Delete Figure R301.2(2) in its entirety and show as Reserved.

FIGURE R301.2(2)

SEISMIC DESIGN CATEGORIES—SITE CLASS D

Reserved

Delete Figure R301.2(5) in its entirety and show as Reserved.

FIGURE R301.2(5)

GROUND SNOW LOADS, P_g, FOR THE UNITED STATES (lb/ft^2)

Reserved

Delete Sections R301.2.2 through R301.2.2.4 in their entirety and show as Reserved:

R301.2.2 Seismic provisions. Reserved. ~~The seismic provisions of this code shall apply as follows:~~

~~1. *Townhouses* in Seismic Design Categories C, D_0, D_1 and D_2.~~

~~2. Detached one- and two-family *dwellings* in Seismic Design Categories, D_0, D_1 and D_2.~~

Same for Sections R301.2.2.1 through R301.2.2.4.

Delete section in its entirety and show as Reserved:

R301.2.3 Snow loads. Reserved. ~~Wood-framed construction, cold-formed, steel-framed construction and masonry and concrete construction, and structural insulated panel construction in regions with ground snow loads 70 pounds per square foot (3.35 kPa) or less, shall be in accordance with Chapters 5, 6 and 8. Buildings in regions with ground snow loads greater than 70 pounds per square foot (3.35 kPa) shall be designed in accordance with accepted engineering practice.~~

Revise as follows:

R301.3 Story height. The provisions of this code shall apply to buildings with *story heights* not exceeding the following:

(*no change to Items 1 through 5*)

Individual walls or wall studs shall be permitted to exceed these limits as permitted by Chapter 6 provisions, provided that *story heights* are not exceeded. An engineered design shall be provided for the wall or wall framing members where the limits of Chapter 6 are exceeded. Where the *story height* limits of this section are exceeded, the design of the building, or the noncompliant portions thereof, to resist wind ~~and seismic~~ loads shall be in accordance with the *Florida Building Code, Building*.

Revise as follows:

R301.6 Roof load. The roof shall be designed for the live load indicated in Table R301.6 ~~or the snow load indicated in Table R301.2(1), whichever is greater~~.

Revise as follows:

R324.4.1.1 Roof load. Portions of roof structures not covered with photovoltaic panel systems shall be designed for dead loads and roof loads in accordance with Sections R301.4 and R301.6. Portions of roof structures covered with photovoltaic panel systems shall be designed for the following load cases:

1. Dead load (including photovoltaic panel weight) ~~plus snow load in accordance with TableR301.2(1)~~.

2. Dead load (excluding photovoltaic panel weight) plus roof live load ~~or snow load, whichever is greater,~~ in accordance with Section R301.6.

Revise as follows:

R301.1 Application. Buildings and structures, and parts thereof, shall be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, ~~snow loads,~~ and wind loads ~~and seismic loads~~ as prescribed by this code. The construction of buildings and structures in accordance with the provisions of this code shall result in a system that provides a complete load path that meets the requirements for the transfer of loads from their point of origin through the load-resisting elements to the foundation. Buildings and structures constructed as prescribed by this code are deemed to comply with the requirements of this section.

> **Exception:** Buildings and structures located within the High Velocity Hurricane Zone shall comply with Sections R302 to R328, inclusive and the provisions of Chapter 44, Sections R301.2.5 and R406. In addition, buildings and structures located in flood hazard areas established in Table R301.2(1) shall comply with Sections R301.2.4, R301.2.5 and R322.

Delete Figure R301.2(2) in its entirety and show as Reserved.

FIGURE R301.2(2)

SEISMIC DESIGN CATEGORIES—SITE CLASS D

Reserved

Delete Figure R301.2(5) in its entirety and show as Reserved.

FIGURE R301.2(5)

GROUND SNOW LOADS, P_g, FOR THE UNITED STATES (lb/ft^2)

Reserved

Delete Sections R301.2.2 through R301.2.2.4 in their entirety and show as Reserved:

R301.2.2 Seismic provisions. Reserved.The seismic provisions of this code shall apply as follows:

1. *Townhouses* in Seismic Design Categories C, D_0, D_1 and D_2.

2. Detached one- and two-family *dwellings* in Seismic Design Categories, D_0, D_1 and D_2.

Same for Sections R301.2.2.1 through R301.2.2.4.

Delete section in its entirety and show as Reserved:

R301.2.3 Snow loads. Reserved. ~~Wood-framed construction, cold-formed, steel-framed construction and masonry and concrete construction, and structural insulated panel construction in regions with ground snow loads 70 pounds per square foot (3.35 kPa) or less, shall be in accordance with Chapters 5, 6 and 8. Buildings in regions with ground snow loads greater than 70 pounds per square foot (3.35 kPa) shall be designed in accordance with accepted engineering practice.~~

Revise as follows:

R301.3 Story height. The provisions of this code shall apply to buildings with *story heights* not exceeding the following:

(*no change to Items 1 through 5*)

Individual walls or wall studs shall be permitted to exceed these limits as permitted by Chapter 6 provisions, provided that *story heights* are not exceeded. An engineered design shall be provided for the wall or wall framing members where the limits of Chapter 6 are exceeded. Where the *story height* limits of this section are exceeded, the design of the building, or the noncompliant portions thereof, to resist wind ~~and seismic~~ loads shall be in accordance with the *Florida Building Code, Building*.

Revise as follows:

R301.6 Roof load. The roof shall be designed for the live load indicated in Table R301.6 ~~or the snow load indicated in Table R301.2(1), whichever is greater~~.

Revise as follows:

R324.4.1.1 Roof load. Portions of roof structures not covered with photovoltaic panel systems shall be designed for dead loads and roof loads in accordance with Sections R301.4 and R301.6. Portions of roof structures covered with photovoltaic panel systems shall be designed for the following load cases:

1. Dead load (including photovoltaic panel weight) ~~plus snow load in accordance with TableR301.2(1)~~.

2. Dead load (excluding photovoltaic panel weight) plus roof live load ~~or snow load, whichever is greater,~~ in accordance with Section R301.6.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

41

S10257

Date Submitted	02/12/2022	**Section**	322.1.6	**Proponent**	Conn Cole FDEM SFMO
Chapter	3	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

Exterior equipment in flood hazard areas that is flood damaged and replaced must be elevated.

Rationale

Based on FEMA 2024 IRC proposal RB136-22. Subject to 553.73(7)(a) as flood requirement for inclusion in 9th Edition. Many buildings in floodplains were built before communities started regulating and requiring buildings to be elevated and constructed to minimize exposure to flooding. During a flood, exterior equipment that serves those buildings gets damaged, even when the building itself is not substantially damaged. When homes are flooded and elevated exterior equipment remains functional, clean up and drying out are easier and faster. This means dangerous mold conditions are less likely to develop and families can more quickly move back into safer homes. The code change requires replacement exterior equipment damaged by flood to be raised to or above the elevation required based on flood zone, unless the replacement equipment meets the limitations of the exception to be located below those elevations. Methods used to raise replacement exterior equipment are the same as the methods used when equipment is installed to serve new construction (pedestal, platforms, or platforms that are cantilevered from or knee braced to the structure). Photographs in an attachment to this proposal show typical methods of elevating equipment that serves dwellings. FEMA's Mitigation Assessment Team reports prepared after some significant flood events document widespread damage to non-elevated exterior equipment. Elevating equipment at the time of replacement also saves homeowners from having to pay for replacement equipment after the subsequent flood event.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No anticipated impact.

Impact to building and property owners relative to cost of compliance with code

Increased costs for pedestal or platform to raise replacement equipment and minor costs to extend wiring & piping. Two long-term benefits offset upfront costs: damage avoided and cost of complete replacement if flooded, and faster drying, cleanup, and reoccupancy after subsequent floods.

Impact to industry relative to the cost of compliance with code

No anticipated impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, it facilitates drying, cleanup, and reoccupancy after flood events.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by helping post-flood recovery.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No change in the type or size of equipment.

Does not degrade the effectiveness of the code

Improves the code by helping post-flood recovery.

Alternate Language

2nd Comment Period

S10257-A2

Proponent Rebecca Quinn obo FL Div Emerg Mgnt **Submitted** 8/9/2022 8:55:01 AM **Attachments** Yes

Rationale:

Alternate language offered at the suggestion of a TAC member who suggested requirements for replacements (which occur at existing buildings) should be done in the FBC Existing Building. Many buildings in floodplains were built before communities started regulating and requiring buildings to be elevated and constructed to minimize exposure to flooding. During a flood, exterior equipment that serves those buildings gets damaged, even when the building itself is not substantially damaged. When homes are flooded and elevated exterior equipment remains functional, clean up and drying out are easier and faster. This means dangerous mold conditions are less likely to develop and families can more quickly move back into safer homes. The code change requires replacement exterior equipment damaged by flood to be raised to or above the elevation required based on flood zone, unless the replacement equipment meets the limitations of the exception to be located below those elevations. Methods used to raise replacement exterior equipment are the same as the methods used when equipment is installed to serve new construction (pedestal, platforms, or platforms that are cantilevered from or knee braced to the structure). Photographs attached to the original proposal show typical methods of elevating equipment that serves dwellings. FEMA's Mitigation Assessment Team reports prepared after some significant flood events document widespread damage to non-elevated exterior equipment. Elevating equipment at the time of replacement also saves homeowners from having to pay for replacement equipment after the subsequent flood event.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No anticipated impact.

Impact to building and property owners relative to cost of compliance with code

Increased costs for pedestal or platform to raise replacement equipment and minor costs to extend wiring & piping. Two long-term benefits off-set upfront costs: damage avoided and cost of complete replacement if flooded, and faster drying, cleanup, and reoccupancy after subsequent floods

Impact to industry relative to the cost of compliance with code

No anticipated impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, it facilitates drying, cleanup, and reoccupancy after future flood events

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by helping recovery after future flood events.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No change in the type or size of equipment.

Does not degrade the effectiveness of the code

Improves the code by helping recovery after future flood events.

1st Comment Period History

Proponent Rebecca Quinn obo FL Div Emerg Mgnt **Submitted** 4/16/2022 11:27:50 AM **Attachments** Yes

Rationale:

Submitted on behalf of the FDEM State Floodplain Manager, we recommend approval by the TAC and Commission because this will help many homeowners after the next flood. The frequency of flooding is increasing across the state. This proposal was submitted by FEMA for the International Residential Code as RB136-22, which was Disapproved at the Committee Action Hearing. FDEM has helped a number of Florida communities to prepare language for local technical amendments to require ALL new exterior equipment and ALL replacement exterior equipment to be elevated, regardless of whether there is other work on the building. FDEM supports that as a Florida-specific amendment to the residential code, and offers it as alternate language to replace the sentence shown in SP10257.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Easier to enforce for ALL new/replacements, and not have to know whether the unit being replaced was damaged by flooding.

Impact to building and property owners relative to cost of compliance with code

Initial increase in cost for more owners replacing units, not just those owners who experienced flooding

Impact to industry relative to the cost of compliance with code

Same as original

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Broader benefits because any owner replacing units will avoid future flood damage, not just owners replacing flooded units.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Same as original

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Same as original

Does not degrade the effectiveness of the code

Same as original

2nd Comment Period

10257-G1

Proponent	Rebecca Quinn obo FL Div Emerg Mgnt	Submitted	8/9/2022 8:58:35 AM	Attachments	No

Comment:

Request Approve the original proposal as Submitted to limit application to exterior equipment that is damaged by flooding and needs to be replaced.

701.3 Flood hazard areas. In flood hazard areas~~,~~:

1. alterations that constitute substantial improvement shall require that the building comply with Section 1612 of the Florida Building Code, Building, or Section R322 of the Florida Building Code, as applicable.

2. Replacement of exterior equipment and exterior appliances damaged by flood shall meet the requirements of Section 612 of the Florida Building Code, Building, or Section R322.1.6 of the Florida Building Code, as applicable.

R322.1.6 Protection of mechanical, plumbing and electrical systems. Electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall be located at or above the elevation required in Section R322.2 or R322.3. New exterior equipment, replacement exterior equipment, new exterior appliances, and replacement exterior appliances shall meet the requirements of this section. ~~Replacement of exterior equipment and exterior appliances damaged by flood shall meet the requirements of this section.~~ If replaced as part of a substantial improvement, electrical systems, equipment and components; heating, ventilating, air conditioning and plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall meet the requirements of this section. Systems, fixtures, and equipment and components shall not be mounted on or penetrate through walls intended to break away under flood loads.

R322.1.6 Protection of mechanical, plumbing and electrical systems. Electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall be located at or above the elevation required in Section R322.2 or R322.3. Replacement of exterior equipment and exterior appliances damaged by flood shall meet the requirements of this section. If replaced as part of a substantial improvement, electrical systems, equipment and components; heating, ventilating, air conditioning and plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall meet the requirements of this section. Systems, fixtures, and equipment and components shall not be mounted on or penetrate through walls intended to break away under flood loads.

> **Exception:** Locating electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment is permitted below the elevation required in Section R322.2 or R322.3 provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the required elevation in accordance with ASCE 24. Equipment for pools, spas and water features shall be permitted below the elevation required in Section R322.2 or R322.3 provided it is elevated to the extent practical and is anchored to prevent floatation and resist flood forces and is supplied by branch circuits that have ground-fault circuit interrupter protection. Electrical wiring systems are permitted to be located below the required elevation provided that they conform to the provisions of the electrical part of this code for wet locations.

Attachment for INSERT PROPOSAL NUMBER

Photographs from FEMA's proposal for the 2024 IRC used with permission.

Photographs are provided courtesy of: FEMA P-348, Rebecca Quinn, and Rebecca Quinn

Cost Impact: The code change proposal will increase the cost of construction
When nonconforming dwellings have non-elevated exterior equipment, this code change proposal requires compliance when the exterior equipment is replaced after being damaged by flooding. Most equipment is elevated; although most typical exterior equipment is not designed to satisfy the requirements and limitations of the exception, that option remains available. Increased costs incurred would be the cost of the pedestal or platform on which the replacement equipment is raised elevated and minor costs to extend wiring and piping, if necessary. The actual cost increase depends on the method of elevation (pedestal, platform, cantilevered/knee braced platform), how high above grade is necessary to meet the elevation requirements of R322.2 or R322.3, as applicable, and other factors such as soil type. The cost of a professionally built 6-foot high wooden platform is approximately $500, with an additional estimated $100 for 10 feet of copper refrigerant line, for a total of approximately $600. At least two long-term benefits off-set the upfront additional installation costs: damage avoided and cost of complete replacement if flooded, and faster drying, clean-up, and reoccupancy after subsequent flood events.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S10351

42

Date Submitted	02/14/2022	Section	322.1.10	Proponent	Conn Cole FDEM SFMO
Chapter	3	Affects HVHZ	No	Attachments	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

Building Section 1612, #10349, to add definition and make similar change to where elevation data are prepared and sealed.

Summary of Modification

Clarify that licensed professional surveyors and mappers survey and seal elevation data and add a definition for Professional Surveyor and Mapper.

Rationale

The FBC defines “registered design professional,” citing Florida Statutes for Chapter 471 (Engineering) and Chapter 481 (Architecture). The term does not include professional surveyors and mappers licensed pursuant to Chapter 472, Florida Statutes. In 2021, the Florida Board of Professional Surveyors and Mappers determined and verified that only Surveyors and Mappers with Florida licenses in good standing “may certify elevation data in Florida pursuant to 472.0366.” Therefore, it is appropriate to define ‘professional surveyor and mapper” in the FBC, Building and FBC, Residential, and clarify in the sections that specify which professionals may certify elevations. The FEMA NFIP Elevation Certificate relies on the laws of each state that specify which licensed professionals may certify elevations.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Local entities should verify that a certifier of elevation data is a Professional Surveyor and Mapper licensed by the FBPSM.

Impact to building and property owners relative to cost of compliance with code

None, certification of elevations is already required.

Impact to industry relative to the cost of compliance with code

None, certification of elevations is already required.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, because the appropriately licensed professional is required to prepare certifications.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, because the appropriately licensed professional is required to prepare certifications.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not affect materials and methods of construction.

Does not degrade the effectiveness of the code

Improves effectiveness because the appropriately licensed professional is required to prepare certifications.

Alternate Language

2nd Comment Period

S10351-A1

Proponent	Rebecca Quinn obo FL Div Emerg Mgnt	**Submitted**	8/9/2022 8:24:47 AM	**Attachments**	Yes

Rationale:
To coordinate with #10349 which adds licensed professional surveyor and mapper to the FBC Building for certifying elevations (TACs recommended Approval). This alternate retains registered design professional based on TAC discussion, despite the 2021 determination of the Florida Board of Professional Surveyors and Mappers that only Surveyors and Mappers with Florida licenses in good standing “may certify elevation data in Florida pursuant to 472.0366.”

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None, certification of elevations is already required.

Impact to building and property owners relative to cost of compliance with code

None, certification of elevations is already required.

Impact to industry relative to the cost of compliance with code

None, certification of elevations is already required.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

No change

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No change

Does not degrade the effectiveness of the code

No change

202 Definitions.

PROFESSIONAL SURVEYOR AND MAPPER. An individual who is licensed or registered to engage in the practice of surveying and mapping under Chapter 472, Florida Statutes.

R322.1.10 As-built elevation documentation. A licensed professional surveyor and mapper or registered design professional shall prepare and seal documentation of the elevations specified in Section R322.2 or R322.3.

202 Definitions.

PROFESSIONAL SURVEYOR AND MAPPER. An individual who is licensed or registered to engage in the practice of surveying and mapping under Chapter 472, Florida Statutes.

R322.1.10 As-built elevation documentation. A licensed professional surveyor and mapper ~~registered design professional~~ shall prepare and seal documentation of the elevations specified in Section R322.2 or R322.3.

STATE OF FLORIDA

DIVISION OF EMERGENCY MANAGEMENT

Ron DeSantis
Governor

Kevin Guthrie
Director

MEMORANDUM

TO: Florida Floodplain Managers and Building Officials

FROM: Conn Cole, Florida NFIP State Coordinator

Digitally signed by Conn Cole
DN: dc=org, dc=fleoc, ou=DEM_Users, ou=Mitigation, ou=HazardMitigationAssistance, cn=Conn Cole, email=Conn.Cole@em.myflorida.com
Date: 2021.11.11 10:06:30 -05'00'

DATE: November 11, 2021

RE: Certification of Elevation Data

From time to time, the State Floodplain Management Office is asked which professionals licensed in Florida are authorized to certify elevation data. In addition, most communities require submission of the FEMA/NFIP Elevation Certificate to satisfy the Florida Building Code requirements related to foundation inspections and final inspections (see FBC, Building, Sec. 110.3).

By email dated November 2, 2021 (attached), the Executive Director of the Board of Professional Surveyors and Mappers advises that "[o]nly Surveyors and Mappers licensed by the Board of Professional Surveyors and Mappers with licenses in good standing may certify elevation data in Florida according to 472.0366 [Florida Statutes] and verified by the board at the August 2, 2021 meeting."

The FEMA/NFIP Elevation Certificate clarifies that only professionals "authorized by law to certify elevation information" may sign and seal Section D of the Elevation Certificate. Therefore, the fact that the Elevation Certificate lists "land surveyor, engineer, or architect" does not, by itself, authorize all such licensed professionals to certify surveyed elevation data.

This memorandum and other guidance prepared by the State Floodplain Management Office is available online:

www.floridadisaster.org/dem/mitigation/floodplain/community-resources
(Guidance, Ordinance Amendments, FBC Amendments, and Sample Forms)

CHC/

Attachment: November 2, 2021 Email from Executive Director of the Board of Professional Surveyors and Mappers

Rebecca C. Quinn

From:	Compton, Liz <Patricia.Compton@fdacs.gov>
Sent:	Tuesday, November 02, 2021 10:55 AM
To:	Conn Cole; Mckibben, Amanda
Cc:	Kristabel Moore; Rebecca C. Quinn (rcquinn@earthlink.net)
Subject:	RE: Elevation Data Certification

Dear Mr. Cole,

That is correct. Only Surveyors and Mappers licensed by the Florida Board of Professional Surveyors and Mappers with licenses in good standing may certify elevation data in Florida pursuant to 472.0366 and verified by the board at the August 2, 2021 meeting.

Sincerely,

Liz Compton, CPM
Executive Director
Board of Professional Surveyors and Mappers
Florida Department of Agriculture and Consumer Services

Liz.compton@FDACS.gov
850.410.3674

The Rhodes Building
2005 Apalachee Parkway
Tallahassee, FL 32399

www.FDACS.gov

From: Conn Cole <Conn.Cole@em.myflorida.com>
Sent: Tuesday, November 2, 2021 8:45 AM
To: Compton, Liz <Patricia.Compton@fdacs.gov>; Mckibben, Amanda <Amanda.McKibben@fdacs.gov>
Cc: Kristabel Moore <Kristabel.Moore@em.myflorida.com>; Rebecca C. Quinn (rcquinn@earthlink.net) <rcquinn@earthlink.net>
Subject: [External] Elevation Data Certification

Liz and Ms. McKibben,

Thank you for your quick response and assistance in clearing up the confusion on this topic. Would you please reply to confirm that only Professional Surveyors and Mappers licensed by the Florida Board of Professional Surveyors and Mappers may certify elevation data in Florida?

Best regards,
Conn

Conn H. Cole, MBA/PA, CFM
Florida NFIP State Coordinator | State Floodplain Manager
State Floodplain Management Office
Florida Division of Emergency Management
(850) 815-4507 Desk
(850) 509-1813 Cell
Conn.Cole@em.myflorida.com

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

43

S10386

Date Submitted	02/14/2022	**Section**	301	**Proponent**	Joseph Belcher
Chapter	3	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

R202 definition for sun control structures

Summary of Modification

Provides design criteria for sun control structures.

Rationale

Sun control structures with operable louvers to direct sunlight are becoming increasingly popular as they allow enjoyment of the outdoors without direct sunlight. All jurisdictions currently require the engineered design of such structures, but the code does not provide guidance to the engineer or jurisdiction for the design parameters. This code change proposal is intended to provide the needed design criteria.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No Impact.

Impact to building and property owners relative to cost of compliance with code

No impact or a reduction in cost in areas with a lower wind speed.

Impact to industry relative to the cost of compliance with code

No impact or a reduction in cost in areas with a lower wind speed.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal has a reasonable and positive impact on the health, safety, and welfare of the general public by providing design criteria for sun control structures allowing for safe designs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by providing missing design criteria for sun control structures.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code and improves the effectiveness of the code.

Alternate Language

2nd Comment Period

S10386-A1

Proponent Joseph Belcher **Submitted** 8/24/2022 12:57:32 PM **Attachments** Yes

Rationale:

This alternate language proposal is to incorporate comments by members of the Structural TAC. 1. The TAC expressed concern that the locking of the louvers in the open position necessary to prevent the wind from closing them was not addressed (Mr. Gascon, P.E.). The change clearly states operable louvers are to be locked in the open position to prevent the wind from blowing them closed. 2. The TAC suggested changing the wind speeds to 75 mph for consistency with other code provisions (Mr. Gascon, P.E.). 3. The U.S. Weather Bureau was corrected to the National Weather Service to reflect the current name of the agency. 4. The language related to the locking of operable louvers in the warning label was modified to be more precise. Sun control structures with operable louvers to direct sunlight are becoming increasingly popular as they allow enjoyment of the outdoors without direct sunlight. All jurisdictions currently require the engineered design of such structures, but the code does not provide guidance to the engineer or jurisdiction for the design parameters. This code change proposal is intended to provide the needed design criteria.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No Impact.

Impact to building and property owners relative to cost of compliance with code

No impact or a reduction in cost in some areas.

Impact to industry relative to the cost of compliance with code

No impact or a reduction in cost because the design criteria will provide guidance to architects and engineers in designing the structures. The change will also provide criteria and guidance to plan reviewers and inspectors in evaluating the structures.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal has a reasonable and positive impact on the health, safety, and welfare of the general public by providing design criteria for sun control structures allowing for safe designs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal strengthens the code by providing missing design criteria for sun control structures.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code and improves the effectiveness of the code.

2nd Comment Period

S10386-G1

Proponent Scott McAdam Submitted 8/24/2022 7:04:47 PM Attachments No

Comment:

BOAF CDC committee supports this MOD alternate language A1

R301.2.1.1.1.2 Sun Control Structure Design. A registered design professional shall design sun control structures.

R301.2.1.1.1.2.1 Free-standing sun control structures shall be permitted to be designed to resist wind speeds for Risk Category I of Figure 1609.3(4) of the *Florida Building Code-Building*. Sun control structures relying on a host structure for support shall be designed for the Risk Category of the host structure.

R301.2.1.1.1.2.2 Operable louvers shall be repositioned and locked in the vertical open position when wind speeds are predicted to be 75 mph or greater. The contractor shall post a legible and readily visible permanent decal or sign stating words to the effect that the operable louvers are to be locked in the vertically open position when wind speeds are predicted to be 75 mph and during a hurricane warning or alert as designated by the National Weather Service. The warning label should essentially read:

THIS SUN CONTROL STRUCTURE SHALL HAVE LOUVERED BLADES LOCKED IN THE VERTICAL POSITION DURING A HURRICANE WARNING OR ALERT AS DESIGNATED BY THE NATIONAL WEATHER SERVICE OR WHEN WIND SPEEDS ARE PREDICTED TO BE 75 MPH.

R301.2.1.1.1.3 Electrical Installations. All electrical components and installations shall comply with Chapter 34 of this Code.

R301.2.1.1.1.2 Sun Control Structure Design. A registered design professional shall design sun control structures.

R301.2.1.1.1.2.1 Free standing sun control structures shall be permitted to be designed to resist wind speeds for Risk Category I of Figure 1609.3(4) of the *Florida Building Code-Building*. Sun control structures relying on a host structure for support shall be designed for the Risk Category of the host structure.

R301.2.1.1.1.2.2 Operable louvers shall be repositioned in the vertical open position when wind speeds are predicted to be 60 mph or greater. Operable louvers shall be repositioned in the vertical open position when wind speeds are predicted to be 45 mph or greater In the High Velocity Hurricane Zone. The contractor shall post a legible and readily visible permanent decal or sign stating words to the effect that the operable louvers are to be moved to the vertically open position when such wind speeds are predicted and during such periods of time as designated by the Us weather bureau as being a hurricane warning or alert. The warning label should essentially read:

-

THIS SUN CONTROL STRUCTURE SHALL HAVE LOUVERED BLADES POSITIONED TO THE VERTICAL POSITION DURING A HURRICANE WARNING OR ALERT AS DESIGNATED BY THE U.S. WEATHER BUREA OR WHEN WIND SPEEDS ARE PREDICTED TO BE 60 MPD OR 45 MPH IN HVHZ.

-

R301.2.1.1.1.3 Electrical Installations. All electrical components and installations shall comply with Chapter 34 of this Code.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S10018

44

Date Submitted	02/01/2022	**Section**	401.1...407.3	**Proponent**	T Stafford
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

Summary of Modification

This modification is one of a series of modifications that delete the seismic and snow requirements from the code. In accordance with Exception 2 to Section 101.2 of the FBCB, seismic and snow requirements are not to be utilized or enforced in the State of Florida.

Rationale

This modification is the culmination of a project funded by the Florida Building Commission through Building a Safer Florida (BASF) that the deletes the seismic and snow provisions from the Florida Building Codes. In accordance with Exception 2 to Section 101.2 of the Florida Building Code, Building, the seismic and snow provisions are exempted from the scope of the Florida Building Codes. Exception 2 to Section 101.2 states the following: "2. Code requirements that address snow loads and earthquake protection are pervasive; they are left in place but shall not be utilized or enforced because Florida has no snow load or earthquake threat." These modifications clarify and simplify the code by deleting requirements that do not apply in the State of Florida.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to cost of compliance with the code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to the cost of compliance with the code.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clarifies and simplifies the code by deleting requirements that do not apply in the State of Florida.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by deleting requirements that do not apply in the State of Florida.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This proposal does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

S10018-A1

Proponent	T Stafford	**Submitted**	7/24/2022 7:25:07 PM	**Attachments**	Yes

Rationale:

This alternate language Mod corrects an error in the original proposal that was pointed out by the TAC. In Section R403.4.1, the original Mod inadvertently deleted the requirement that crushed stone footings be consolidated using a vibratory plate in a maximum of 8-inch lifts. The TAC correctly pointed out that this requirement is unrelated to seismic or snow loads. This alternate language Mod retains all of the modifications in the original code change, but removes the strike-through of the language related consolidation of crushed stone footings.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to cost of compliance with the code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to cost of compliance with the code.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Corrects an error to make the code consistent throughout all volumes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Corrects an error to make the code consistent throughout all volumes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This modification does not degrade the effectiveness of the code.

Replace the original Mod in its entirety with the following language:

Revise as follows:

R401.1 Application. The provisions of this chapter shall control the design and construction of the foundation and foundation spaces for buildings. In addition to the provisions of this chapter, the design and construction of foundations in flood hazard areas as established by Table R301.2(1) shall meet the provisions of Section R322. Wood foundations shall be designed and installed in accordance with AWC PWF.

Exception: The provisions of this chapter shall be permitted to be used for wood foundations only in the following situations:

1. In buildings that have no more than two floors and a roof.
2. Where interior *basement* and foundation walls are constructed at intervals not exceeding 50 feet (15 240 mm).
3. Buildings and structures located within the High-Velocity Hurricane Zone shall comply with the provisions of Chapter 44 and, as applicable, Section R322 in flood hazard areas.

~~Wood foundations in Seismic Design Category D0, D1 or D2 shall be designed in accordance with accepted engineering practice.~~

Revise as follows:

TABLE R403.1(1)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION (inches)[a, b]

~~SNOW LOAD OR~~ ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000

(*no change to table values*)

Revise as follows:

TABLE R403.1(2)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION WITH BRICK VENEER (inches)[a, b]

~~SNOW LOAD OR~~ ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000

(*no change to table values*)

Revise as follows:

TABLE R403.1(3)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS

WITH CAST-IN-PLACE CONCRETE OR FULLY GROUTED MASONRY WALL CONSTRUCTION (inches)[a, b]

~~SNOW LOAD OR~~ ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000

(*no change to table values*)

Delete section in its entirety:

~~**R403.1.6.1 Foundation anchorage in Seismic Design Categories C, D_0, D_1 and D_2.** In addition to the requirements of Section R403.1.6, the following requirements shall apply to wood light-frame structures in Seismic Design Categories D_0, D_1 and D_2 and wood light-frame townhouses in Seismic Design Category C.~~

-

~~1. Plate washers not less than 0.229 inch by 3 inches by 3 inches (5.8 mm by 76 mm by 76 mm) in size shall be provided for all anchor bolts over the full length of required *braced wall lines* except where *approved* anchor straps are used. Properly sized cut washers shall be permitted for anchor bolts in wall lines not containing *braced wall panels*. The hole in the plate washer is permitted to be diagonally slotted with a width of up to 3/16 inch (5 mm) larger than the bolt diameter and a slot length not to exceed 13/4 inches (44 mm), provided that a standard cut washer is placed between the plate washer and the nut.~~

~~2. Interior braced wall plates shall have anchor bolts spaced at not more than 6 feet (1829 mm) on center and located within 12 inches (305 mm) of the ends of each plate section when supported on a continuous foundation.~~
~~3. Interior bearing wall sole plates shall have anchor bolts spaced at not more than 6 feet (1829 mm) on center and located within 12 inches (305 mm) of the ends of each plate section when supported on a continuous foundation.~~
~~4. The maximum anchor bolt spacing shall be 4 feet (1219 mm) for buildings over two stories in height.~~

~~5. Stepped cripple walls shall comply with Section R602.3.~~
~~6. Where continuous wood foundations in accordance with Section R404.2 are used, the force transfer shall have a capacity equal to or greater than the connections required by Item 1 of this section or the *braced wall panel* shall be connected to the wood foundations in accordance with the *braced wall panel* to floor fastening requirements of Section R602.3.~~

Revise as follows:

R403.4.1 Crushed stone footings. Clean crushed stone shall be free from organic, clayey or silty soils. Crushed stone shall be angular in nature and meet ASTM C33, with the maximum size stone not to exceed 1/2 inch (12.7 mm) and the minimum stone size not to be smaller than 1/16 inch (1.6 mm). Crushed stone footings for precast foundations shall be installed in accordance with Figure R403.4(1) and Table R403.4. Crushed stone footings shall be consolidated using a vibratory plate in a maximum of 8-inch (203 mm) lifts. ~~Crushed stone footings shall be limited to Seismic Design Categories A, B and C.~~

Revise as follows:

TABLE R404.1.1(2)

8-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d = 5 INCHES[a, c, f]

(*no change to table values*)

b. Alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per lineal foot of wall shall be permitted provided the spacing of the reinforcement does not exceed 72 inches i~~n Seismic Design Categories A, B and C, and 48 inches in Seismic Design Categories D_0, D_1 and D_2~~.

(*no change to remaining notes*)

Revise as follows:

TABLE R404.1.1(3)

10-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d ? 6.75 INCHES[a, c, f]

(*no change to table values*)

b. Alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per lineal foot of wall shall be permitted provided the spacing of the reinforcement does not exceed 72 inches i~~n Seismic Design Categories A, B and C, and 48 inches in Seismic Design Categories D_0, D_1 and D_2~~.

(*no change to remaining notes*)

Revise as follows:

TABLE R404.1.1(4)

12-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d ? 8.75 INCHES[a, c, f]

(*no change to table values*)

b. Alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per lineal foot of wall shall be permitted provided the spacing of the reinforcement does not exceed 72 inches i~~n Seismic Design Categories A, B and C, and 48 inches in Seismic Design Categories D_0, D_1 and D_2~~.

(*no change to remaining notes*)

Revise as follows:

R404.1.2.1 Masonry foundation walls. Concrete masonry and clay masonry foundation walls shall be constructed as set forth in Table R404.1.1(1), R404.1.1(2), R404.1.1(3) or R404.1.1(4) and shall also comply with applicable provisions of Section R606. ~~In buildings assigned to Seismic Design Categories D_0, D_1 and D_2, concrete masonry and clay masonry foundation walls shall also comply with Section R404.1.4.1.~~ Rubble stone masonry foundation walls shall be constructed in accordance with Sections R404.1.8 and R606.4.2. ~~Rubble stone masonry walls shall not be used in Seismic Design Categories D_0, D_1 and D_2.~~

Revise as follows:

R404.1.3.2 Reinforcement for foundation walls. Concrete foundation walls shall be laterally supported at the top and bottom. Horizontal reinforcement shall be provided in accordance with Table R404.1.2(1). Vertical reinforcement shall be provided in accordance with Table R404.1.2(2), R404.1.2(3), R404.1.2(4), R404.1.2(5), R404.1.2(6), R404.1.2(7) or R404.1.2(8). Vertical reinforcement for flat *basement* walls retaining 4 feet (1219 mm) or more of unbalanced backfill is permitted to be determined in accordance with Table R404.1.2(9).
For *basement* walls supporting above-grade concrete walls, vertical reinforcement shall be the greater of that required by Tables R404.1.2(2) through R404.1.2(8) or by Section R608.6 for the above-grade wall. ~~In buildings assigned to Seismic Design Category D_0, D_1 or D_2, concrete foundation walls shall also comply with Section R404.1.4.2.~~

Revise as follows:

R404.1.3.3.1 Compressive strength. The minimum specified compressive strength of concrete, f'_c, shall comply with Section R402.2 and shall be not less than 2,500 psi (17.2 MPa) at 28 days ~~in buildings assigned to Seismic Design Category A, B or C and 3000 psi (20.5 MPa) in buildings assigned to Seismic Design Category D_0, D_1 or D_2~~.

Revise as follows:

R404.1.3.3.7.1 Steel reinforcement. Steel reinforcement shall comply with the requirements of ASTM A615, A706, or A996. ASTM A996 bars produced from rail steel shall be Type R. ~~In buildings assigned to Seismic Design Category A, B or C, t~~The minimum yield strength of reinforcing steel shall be 40,000 psi (Grade 40) (276 MPa). ~~In buildings assigned to Seismic Design Category D_0, D_1 or D_2, reinforcing steel shall comply with the requirements of ASTM A706 for low-alloy steel with a minimum yield strength of 60,000 psi (Grade 60) (414 MPa).~~

Delete section in its entirety and show as Reserved:

R404.1.3.4 Requirements for Seismic Design Category C. Reserved.~~Concrete foundation walls supporting above-grade concrete walls in townhouses assigned to Seismic Design Category C shall comply with ACI 318, ACI 332 or PCA 100 (see Section R404.1.3).~~

Delete section in its entirety and show as Reserved:

R404.1.4 Seismic Design Category D_0, D_1 or D_2. Reserved.

R404.1.4.1 Masonry foundation walls. Reserved.~~In buildings assigned to Seismic Design Category D_0, D_1 or D_2, as established in Table R301.2(1), masonry foundation walls shall comply with this section. In addition to the requirements of Table R404.1.1(1), plain masonry foundation walls shall comply with the following:~~

-

~~1. Wall height shall not exceed 8 feet (2438 mm).~~

~~2. Unbalanced backfill height shall not exceed 4 feet (1219 mm).~~

~~3. Minimum nominal thickness for plain masonry foundation walls shall be 8 inches (203 mm).~~
~~4. Masonry stem walls shall have a minimum vertical reinforcement of one No. 4 (No. 13) bar located a maximum of 4 feet (1219 mm) on center in grouted cells. Vertical reinforcement shall be tied to the horizontal reinforcement in the footings.~~

-

~~Foundation walls, supporting more than 4 feet (1219 mm) of unbalanced backfill or exceeding 8 feet (2438 mm) in height shall be constructed in accordance with Table R404.1.1(2), R404.1.1(3) or R404.1.1(4). Masonry foundation walls shall have two No. 4 (No. 13) horizontal bars located in the upper 12 inches (305 mm) of the wall.~~

R404.1.4.2 Concrete foundation walls. Reserved.~~In buildings assigned to Seismic Design Category D_0, D_1 or D_2, as established in Table R301.2(1), concrete foundation walls that support light-frame walls shall comply with this section, and concrete foundation walls that support above-grade concrete walls shall comply with ACI 318, ACI 332 or PCA 100 (see Section R404.1.3). In addition to the horizontal reinforcement required by Table R404.1.2(1), plain concrete walls supporting light-frame walls shall comply with the following.~~

-

~~1. Wall height shall not exceed 8 feet (2438 mm).~~

~~2. Unbalanced backfill height shall not exceed 4 feet (1219 mm).~~
~~3. Minimum thickness for plain concrete foundation walls shall be 7.5 inches (191 mm) except that 6 inches (152 mm) is permitted where the maximum wall height is 4 feet, 6 inches (1372 mm).~~

-

~~Foundation walls less than 7.5 inches (191 mm) in thickness, supporting more than 4 feet (1219 mm) of unbalanced backfill or exceeding 8 feet (2438 mm) in height shall be provided with horizontal reinforcement in accordance with Table R404.1.2(1), and vertical reinforcement in accordance with Table R404.1.2(2), R404.1.2(3), R404.1.2(4), R404.1.2(5), R404.1.2(6), R404.1.2(7) or R404.1.2(8). Where Tables R404.1.2(2) through R404.1.2(8) permit plain concrete walls, not less than No. 4 (No. 13) vertical bars at a spacing not exceeding 48 inches (1219 mm) shall be provided.~~

Revise as follows:

R404.1.5.3 Pier and curtain wall foundations. Use of pier and curtain wall foundations shall be permitted to support light-frame construction not more than two stories in height, provided the following requirements are met:

1. All load-bearing walls shall be placed on continuous concrete footings placed integrally with the exterior wall footings.
2. The minimum actual thickness of a load-bearing masonry wall shall be not less than 4 inches (102 mm) nominal or 33/8 inches (92 mm) actual thickness, and shall be bonded integrally with piers spaced in accordance with Section R606.6.4.
3. Piers shall be constructed in accordance with Sections R606.7 and R606.7.1, and shall be bonded into the load-bearing masonry wall in accordance with Section R606.13.1 or R606.13.1.1.
4. The maximum height of a 4-inch (102 mm) loadbearing masonry foundation wall supporting wood-frame walls and floors shall be not more than 4 feet (1219 mm).
5. Anchorage shall be in accordance with Section R403.1.6, Figure R404.1.5(1), or as specified by engineered design accepted by the *building official*.
6. The unbalanced fill for 4-inch (102 mm) foundation walls shall not exceed 24 inches (610 mm) for solid masonry or 12 inches (305 mm) for hollow masonry.
7. Reserved. ~~In Seismic Design Categories D_0, D_1 and D_2, prescriptive reinforcement shall be provided in the horizontal and vertical direction. Provide minimum horizontal joint reinforcement of two No. 9 gage wires spaced not less than 6 inches (152 mm) or one 1/4-inch-diameter (6.4 mm) wire at 10 inches (254 mm) on center vertically. Provide minimum vertical reinforcement of one No. 4 bar at 48 inches (1220 mm) on center horizontally grouted in place.~~

Revise as follows:

R404.1.8 Rubble stone masonry. Rubble stone masonry foundation walls shall have a minimum thickness of 16 inches (406 mm), shall not support an unbalanced backfill exceeding 8 feet (2438 mm) in height, shall not support a soil pressure greater than 30 pounds per square foot per foot (4.71 kPa/m)~~, and shall not be constructed in Seismic Design Categories D_0, D_1, D_2 or townhouses in Seismic Design Category C, as established in Figure R301.2(2)~~.

Delete section in its entirety and show as Reserved:

R404.1.9.4 Seismic design of masonry piers. Reserved.~~Masonry piers in *dwellings* located in Seismic Design Category D_0, D_1 or D_2, and townhouses in Seismic Design Category C, shall be designed in accordance with accepted engineering practice.~~

Revise as follows:

R404.5.2 Precast concrete foundation design drawings. Precast concrete foundation wall design drawings shall be submitted to the *building official* and *approved* prior to installation. Drawings shall include, at a minimum, the following information:

1. Design loading as applicable.

2. Footing design and material.

3. Concentrated loads and their points of application.

4. Soil bearing capacity.

5. Maximum allowable total uniform load.

6. Reserved. ~~Seismic design category.~~

7. Basic wind speed.

Revise as follows:

R407.3 Structural requirements. The columns shall be restrained to prevent lateral displacement at the bottom end. Wood columns shall be not less in nominal size than 4 inches by 4 inches (102 mm by 102 mm). Steel columns shall be not less than 3-inch-diameter (76 mm) Schedule 40 pipe manufactured in accordance with ASTM A53 Grade B or *approved* equivalent.

Exception: ~~In Seismic Design Categories A, B and C, c~~Columns not more than 48 inches (1219 mm) in height on a pier or footing are exempt from the bottom end lateral displacement requirement within under-floor areas enclosed by a continuous foundation.

Revise as follows:

R401.1 Application. The provisions of this chapter shall control the design and construction of the foundation and foundation spaces for buildings. In addition to the provisions of this chapter, the design and construction of foundations in flood hazard areas as established by Table R301.2(1) shall meet the provisions of Section R322. Wood foundations shall be designed and installed in accordance with AWC PWF.

Exception: The provisions of this chapter shall be permitted to be used for wood foundations only in the following situations:

1. In buildings that have no more than two floors and a roof.
2. Where interior *basement* and foundation walls are constructed at intervals not exceeding 50 feet (15 240 mm).
3. Buildings and structures located within the High-Velocity Hurricane Zone shall comply with the provisions of Chapter 44 and, as applicable, Section R322 in flood hazard areas.

~~Wood foundations in Seismic Design Category D0, D1 or D2 shall be designed in accordance with accepted engineering practice.~~

Revise as follows:

TABLE R403.1(1)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION (inches)[a, b]

~~SNOW LOAD OR~~ ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000

(*no change to table values*)

Revise as follows:

TABLE R403.1(2)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION WITH BRICK VENEER (inches)[a, b]

~~SNOW LOAD OR~~ ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000

(*no change to table values*)

Revise as follows:

TABLE R403.1(3)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS

WITH CAST-IN-PLACE CONCRETE OR FULLY GROUTED MASONRY WALL CONSTRUCTION (inches)[a, b]

~~SNOW LOAD OR~~ ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000

(*no change to table values*)

Delete section in its entirety:

~~**R403.1.6.1 Foundation anchorage in Seismic Design Categories C, D_0, D_1 and D_2.** In addition to the requirements of Section R403.1.6, the following requirements shall apply to wood light-frame structures in Seismic Design Categories D_0, D_1 and D_2 and wood light-frame townhouses in Seismic Design Category C.~~

-

~~1. Plate washers not less than 0.229 inch by 3 inches by 3 inches (5.8 mm by 76 mm by 76 mm) in size shall be provided for all anchor bolts over the full length of required *braced wall lines* except where *approved* anchor straps are used. Properly sized cut washers shall be permitted for anchor bolts in wall lines not containing *braced wall panels*. The hole in the plate washer is permitted to be diagonally slotted with a width of up to 3/16 inch (5 mm) larger than the bolt diameter and a slot length not to exceed 13/4 inches (44 mm), provided that a standard cut washer is placed between the plate washer and the nut.~~

~~2. Interior braced wall plates shall have anchor bolts spaced at not more than 6 feet (1829 mm) on center and located within 12 inches (305 mm) of the ends of each plate section when supported on a continuous foundation.~~
~~3. Interior bearing wall sole plates shall have anchor bolts spaced at not more than 6 feet (1829 mm) on center and located within 12 inches (305 mm) of the ends of each plate section when supported on a continuous foundation.~~
~~4. The maximum anchor bolt spacing shall be 4 feet (1219 mm) for buildings over two stories in height.~~

~~5. Stepped cripple walls shall comply with Section R602.3.~~
~~6. Where continuous wood foundations in accordance with Section R404.2 are used, the force transfer shall have a capacity equal to or greater than the connections required by Item 1 of this section or the *braced wall panel* shall be connected to the wood foundations in accordance with the *braced wall panel* to floor fastening requirements of Section R602.3.~~

Revise as follows:

R403.4.1 Crushed stone footings. Clean crushed stone shall be free from organic, clayey or silty soils. Crushed stone shall be angular in nature and meet ASTM C33, with the maximum size stone not to exceed 1/2 inch (12.7 mm) and the minimum stone size not to be smaller than 1/16 inch (1.6 mm). Crushed stone footings for precast foundations shall be installed in accordance with Figure R403.4(1) and Table R403.4. ~~Crushed stone footings shall be consolidated using a vibratory plate in a maximum of 8-inch (203 mm) lifts. Crushed stone footings shall be limited to Seismic Design Categories A, B and C.~~

Revise as follows:

TABLE R404.1.1(2)

8-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d = 5 INCHES[a, c, f]

(*no change to table values*)

b. Alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per lineal foot of wall shall be permitted provided the spacing of the reinforcement does not exceed 72 inches i~~n Seismic Design Categories A, B and C, and 48 inches in Seismic Design Categories~~ ~~D_0, D_1 and D_2~~.

(*no change to remaining notes*)

Revise as follows:

TABLE R404.1.1(3)

10-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d ? 6.75 INCHES[a, c, f]

(*no change to table values*)

b. Alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per lineal foot of wall shall be permitted provided the spacing of the reinforcement does not exceed 72 inches i~~n Seismic Design Categories A, B and C, and 48 inches in Seismic Design Categories~~ ~~D_0, D_1 and D_2~~.

(*no change to remaining notes*)

Revise as follows:

TABLE R404.1.1(4)

12-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d ? 8.75 INCHES[a, c, f]

(*no change to table values*)

b. Alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per lineal foot of wall shall be permitted provided the spacing of the reinforcement does not exceed 72 inches i~~n Seismic Design Categories A, B and C, and 48 inches in Seismic Design Categories~~ ~~D_0, D_1 and D_2~~.

(*no change to remaining notes*)

Revise as follows:

R404.1.2.1 Masonry foundation walls. Concrete masonry and clay masonry foundation walls shall be constructed as set forth in Table R404.1.1(1), R404.1.1(2), R404.1.1(3) or R404.1.1(4) and shall also comply with applicable provisions of Section R606. ~~In buildings assigned to Seismic Design Categories~~ ~~D_0, D_1 and D_2, concrete masonry and clay masonry foundation walls shall also comply with Section R404.1.4.1.~~ Rubble stone masonry foundation walls shall be constructed in accordance with Sections R404.1.8 and R606.4.2. ~~Rubble stone masonry walls shall not be used in Seismic Design Categories~~ ~~D_0, D_1 and D_2.~~

Revise as follows:

R404.1.3.2 Reinforcement for foundation walls. Concrete foundation walls shall be laterally supported at the top and bottom. Horizontal reinforcement shall be provided in accordance with Table R404.1.2(1). Vertical reinforcement shall be provided in accordance with Table R404.1.2(2), R404.1.2(3), R404.1.2(4), R404.1.2(5), R404.1.2(6), R404.1.2(7) or R404.1.2(8). Vertical reinforcement for flat *basement* walls retaining 4 feet (1219 mm) or more of unbalanced backfill is permitted to be determined in accordance with Table R404.1.2(9). For *basement* walls supporting above-grade concrete walls, vertical reinforcement shall be the greater of that required by Tables R404.1.2(2) through R404.1.2(8) or by Section R608.6 for the above-grade wall. ~~In buildings assigned to Seismic Design Category~~ ~~D_0, D_1 or D_2, concrete foundation walls shall also comply with Section R404.1.4.2.~~

Revise as follows:

R404.1.3.3.1 Compressive strength. The minimum specified compressive strength of concrete, f'_c, shall comply with Section R402.2 and shall be not less than 2,500 psi (17.2 MPa) at 28 days ~~in buildings assigned to Seismic Design Category A, B or C and 3000 psi (20.5 MPa) in buildings assigned to Seismic Design Category~~ ~~D_0, D_1 or D_2~~.

Revise as follows:

R404.1.3.3.7.1 Steel reinforcement. Steel reinforcement shall comply with the requirements of ASTM A615, A706, or A996. ASTM A996 bars produced from rail steel shall be Type R. ~~In buildings assigned to Seismic Design Category A, B or C, t~~The minimum yield strength of reinforcing steel shall be 40,000 psi (Grade 40) (276 MPa). ~~In buildings assigned to Seismic Design Category~~ ~~D_0, D_1 or D_2, reinforcing steel shall comply with the requirements of ASTM A706 for low-alloy steel with a minimum yield strength of 60,000 psi (Grade 60) (414 MPa).~~

Delete section in its entirety and show as Reserved:

R404.1.3.4 Requirements for Seismic Design Category C. Reserved.~~Concrete foundation walls supporting above-grade concrete walls in townhouses assigned to Seismic Design Category C shall comply with ACI 318, ACI 332 or PCA 100 (see Section R404.1.3).~~

Delete section in its entirety and show as Reserved:

R404.1.4 Seismic Design Category D_0, D_1 or D_2. Reserved.

R404.1.4.1 Masonry foundation walls. Reserved.~~In buildings assigned to Seismic Design Category D_0, D_1 or D_2, as established in Table R301.2(1), masonry foundation walls shall comply with this section. In addition to the requirements of Table R404.1.1(1), plain masonry foundation walls shall comply with the following:~~

-

~~1. Wall height shall not exceed 8 feet (2438 mm).~~

~~2. Unbalanced backfill height shall not exceed 4 feet (1219 mm).~~

~~3. Minimum nominal thickness for plain masonry foundation walls shall be 8 inches (203 mm).~~
~~4. Masonry stem walls shall have a minimum vertical reinforcement of one No. 4 (No. 13) bar located a maximum of 4 feet (1219 mm) on center in grouted cells. Vertical reinforcement shall be tied to the horizontal reinforcement in the footings.~~

-

~~Foundation walls, supporting more than 4 feet (1219 mm) of unbalanced backfill or exceeding 8 feet (2438 mm) in height shall be constructed in accordance with Table R404.1.1(2), R404.1.1(3) or R404.1.1(4). Masonry foundation walls shall have two No. 4 (No. 13) horizontal bars located in the upper 12 inches (305 mm) of the wall.~~

R404.1.4.2 Concrete foundation walls. Reserved.~~In buildings assigned to Seismic Design Category D_0, D_1 or D_2, as established in Table R301.2(1), concrete foundation walls that support light-frame walls shall comply with this section, and concrete foundation walls that support above-grade concrete walls shall comply with ACI 318, ACI 332 or PCA 100 (see Section R404.1.3). In addition to the horizontal reinforcement required by Table R404.1.2(1), plain concrete walls supporting light-frame walls shall comply with the following.~~

-

~~1. Wall height shall not exceed 8 feet (2438 mm).~~

~~2. Unbalanced backfill height shall not exceed 4 feet (1219 mm).~~
~~3. Minimum thickness for plain concrete foundation walls shall be 7.5 inches (191 mm) except that 6 inches (152 mm) is permitted where the maximum wall height is 4 feet, 6 inches (1372 mm).~~

-

~~Foundation walls less than 7.5 inches (191 mm) in thickness, supporting more than 4 feet (1219 mm) of unbalanced backfill or exceeding 8 feet (2438 mm) in height shall be provided with horizontal reinforcement in accordance with Table R404.1.2(1), and vertical reinforcement in accordance with Table R404.1.2(2), R404.1.2(3), R404.1.2(4), R404.1.2(5), R404.1.2(6), R404.1.2(7) or R404.1.2(8). Where Tables R404.1.2(2) through R404.1.2(8) permit plain concrete walls, not less than No. 4 (No. 13) vertical bars at a spacing not exceeding 48 inches (1219 mm) shall be provided.~~

Revise as follows:

R404.1.5.3 Pier and curtain wall foundations. Use of pier and curtain wall foundations shall be permitted to support light-frame construction not more than two stories in height, provided the following requirements are met:

1. All load-bearing walls shall be placed on continuous concrete footings placed integrally with the exterior wall footings.
2. The minimum actual thickness of a load-bearing masonry wall shall be not less than 4 inches (102 mm) nominal or 33/8 inches (92 mm) actual thickness, and shall be bonded integrally with piers spaced in accordance with Section R606.6.4.
3. Piers shall be constructed in accordance with Sections R606.7 and R606.7.1, and shall be bonded into the load-bearing masonry wall in accordance with Section R606.13.1 or R606.13.1.1.
4. The maximum height of a 4-inch (102 mm) loadbearing masonry foundation wall supporting wood-frame walls and floors shall be not more than 4 feet (1219 mm).
5. Anchorage shall be in accordance with Section R403.1.6, Figure R404.1.5(1), or as specified by engineered design accepted by the *building official*.
6. The unbalanced fill for 4-inch (102 mm) foundation walls shall not exceed 24 inches (610 mm) for solid masonry or 12 inches (305 mm) for hollow masonry.
7. Reserved. ~~In Seismic Design Categories D_0, D_1 and D_2, prescriptive reinforcement shall be provided in the horizontal and vertical direction. Provide minimum horizontal joint reinforcement of two No. 9 gage wires spaced not less than 6 inches (152 mm) or one 1/4-inch-diameter (6.4 mm) wire at 10 inches (254 mm) on center vertically. Provide minimum vertical reinforcement of one No. 4 bar at 48 inches (1220 mm) on center horizontally grouted in place.~~

Revise as follows:

R404.1.8 Rubble stone masonry. Rubble stone masonry foundation walls shall have a minimum thickness of 16 inches (406 mm), shall not support an unbalanced backfill exceeding 8 feet (2438 mm) in height, shall not support a soil pressure greater than 30 pounds per square foot per foot (4.71 kPa/m)~~, and shall not be constructed in Seismic Design Categories D_0, D_1, D_2 or townhouses in Seismic Design Category C, as established in Figure R301.2(2)~~.

Delete section in its entirety and show as Reserved:

R404.1.9.4 Seismic design of masonry piers. Reserved.~~Masonry piers in *dwellings* located in Seismic Design Category D_0, D_1 or D_2, and townhouses in Seismic Design Category C, shall be designed in accordance with accepted engineering practice.~~

Revise as follows:

R404.5.2 Precast concrete foundation design drawings. Precast concrete foundation wall design drawings shall be submitted to the *building official* and *approved* prior to installation. Drawings shall include, at a minimum, the following information:

1. Design loading as applicable.

2. Footing design and material.

3. Concentrated loads and their points of application.

4. Soil bearing capacity.

5. Maximum allowable total uniform load.

6. Reserved. ~~Seismic design category.~~

7. Basic wind speed.

Revise as follows:

R407.3 Structural requirements. The columns shall be restrained to prevent lateral displacement at the bottom end. Wood columns shall be not less in nominal size than 4 inches by 4 inches (102 mm by 102 mm). Steel columns shall be not less than 3-inch-diameter (76 mm) Schedule 40 pipe manufactured in accordance with ASTM A53 Grade B or *approved* equivalent.

Exception: ~~In Seismic Design Categories A, B and C, c~~Columns not more than 48 inches (1219 mm) in height on a pier or footing are exempt from the bottom end lateral displacement requirement within under-floor areas enclosed by a continuous foundation.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S9847

45

Date Submitted	01/05/2022	**Section**	703.11.1	**Proponent**	Fernando Pages
Chapter	7	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

S8887/RB249-19

Summary of Modification

Clean up, fastener size, insulated vinyl siding.

Rationale

This change is a clean-up that will clarify what is necessary should alternative fastening, such as 24” o.c., become necessary. It also points to alternative fasteners in table R703.3.3, which is a helpful alternative to use when hitting studs becomes difficult. Finally, it brings in installation provisions for insulated vinyl siding as it is the same as vinyl siding.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification is an editorial clean-up and also offers alternative installation techniques as an option. Clarification always supports the public interest.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification improves the cade as an editorial clean-up and also offers alternative installation techniques as an option.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate against any product category.

Does not degrade the effectiveness of the code

This is an editorial clean-up that does not degrade the code.

Alternate Language

2nd Comment Period

9847-A2

Proponent Fernando Pages **Submitted** 7/27/2022 7:29:58 AM **Attachments** Yes

Rationale:

Minor editorial change. Per TAC recomendation on 27 June 2022, revised last sentance from "24 inches or greater" to more inclusive, "alternative spacing is permitted."

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clarifies code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Clarifies code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Clarifies code without discrimination. Allows for inovation.

Does not degrade the effectiveness of the code

Clarifies code.

1st Comment Period History

9847-A1

Proponent Fernando Pages **Submitted** 4/11/2022 1:26:39 PM **Attachments** Yes

Rationale:

Opens code language to a range of possible nailing patterns that may exist now or later.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Yes

Does not degrade the effectiveness of the code

Does not

R703.11.1 Installation. Vinyl siding, ~~soffit~~ insulated vinyl siding, and accessories shall be installed in accordance with the manufacturer's installation instructions.

R703.11.1.2 Penetration depth. Unless specified otherwise by the manufacturer's instructions or in accordance with Table R703.3(1), fasteners shall penetrate into building framing. The total penetration into the sheathing, furring, framing, or other nailable substrate shall be a minimum of 11/4 inches (32 mm). ~~Where specified by the manufacturer's instructions and supported by a test report, fasteners are permitted to penetrate into or fully through nailable sheathing or another nailable substrate of minimum thickness specified by the instructions or test report without penetrating into the framing. Where the fastener penetrates fully through the sheathing, the end of the fastener shall extend a minimum of 1/4 inch (6.4 mm) beyond the opposite face of the sheathing or nailable substrate.~~

R703.11.1.3 Spacing. Unless specified otherwise by the manufacturer's instructions, the maximum spacing between fasteners for horizontal siding shall be 16 inches (406 mm), and for vertical siding 12 inches (305 mm) both horizontally and vertically. Where specified by the manufacturer's instructions and supported by a test report, alternative fastener spacing is permitted.

R703.11.1.3 Spacing. Unless specified otherwise by the manufacturer's instructions, the maximum spacing between fasteners for horizontal siding shall be 16 inches (406 mm), and for vertical siding 12 inches (305 mm) both horizontally and vertically. Where specified by the manufacturer's instructions and supported by a test report, <u>alternative fastener spacing such as</u> 24 inches (610 mm) or greater fastener spacing is permitted.

Revise as follows:

R703.11.1 Installation. Vinyl siding, ~~soffit~~ insulated vinyl siding, and accessories shall be installed in accordance with the manufacturer's installation instructions.

R703.11.1.2 Penetration depth. Unless specified otherwise by the manufacturer's instructions or in accordance with Table R703.3(1), fasteners shall penetrate into building framing. The total penetration into the sheathing, furring, framing, or other nailable substrate shall be a minimum of 11/4 inches (32 mm). ~~Where specified by the manufacturer's instructions and supported by a test report, fasteners are permitted to penetrate into or fully through nailable sheathing or another nailable substrate of minimum thickness specified by the instructions or test report without penetrating into the framing. Where the fastener penetrates fully through the sheathing, the end of the fastener shall extend a minimum of 1/4 inch (6.4 mm) beyond the opposite face of the sheathing or nailable substrate.~~

R703.11.1.3 Spacing. Unless specified otherwise by the manufacturer's instructions, the maximum spacing between fasteners for horizontal siding shall be 16 inches (406 mm), and for vertical siding 12 inches (305 mm) ~~both horizontally and vertically~~. Where specified by the manufacturer's instructions and supported by a test report, 24 inches (610 mm) or greater fastener spacing is permitted.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S9849

46

Date Submitted	01/05/2022	**Section**	703.14.1.1	**Proponent**	Fernando Pages
Chapter	7	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

Summary of Modification

Clarifies installation of polypropylene siding.

Rationale

This change cleans up the section on polypropylene siding. This type of siding is unique in that it has varying installation spacing for fasteners and because it must be installed over some type of nailable substrate sheathing as defined by the code. In some cases, the product can be installed using staples, with proper testing information so that prohibition should be removed. It is also important the installation instructions be referenced be because of the unique panel sizes with each manufacturer.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clarifies installation of a distinct material class often confused with vinyl siding. This clarification supports the public interest.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

These changes are editorial and clarify standard installation practices.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate.

Does not degrade the effectiveness of the code

These changes are editorial and clarify standard installation practices. They do not degrade the code.

Alternate Language

2nd Comment Period

9849-A2

Proponent Fernando Pages **Submitted** 7/27/2022 7:37:44 AM **Attachments** Yes

Rationale:

Correction per TAC recomendation 27 June 2022: Removed refrences to staples as allowable fasnter. Reintroduced explicit prohibition of staples.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

NOne

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Improves speificity of polypropelene siding instaltion requirments.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves speificity of polypropelene siding instaltion requirments.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate

Does not degrade the effectiveness of the code

Improves the code

1st Comment Period History

9849-A1

Proponent Fernando Pages **Submitted** 4/11/2022 1:41:06 PM **Attachments** Yes

Rationale:

A more accurate prescription is needed, given real-world conditions. The new figure (attached) better illustrates installation elements.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not

Does not degrade the effectiveness of the code

Does not

Modify as follows:

R703.14.1.1 Installation. Unless otherwise specified in the manufacturer’s installation instructions, ~~P~~polypropylene siding shall be installed over and attached to wood structural panel sheathing with a minimum thickness of 7/16 inch (11.1 mm), or ~~other substrate~~ another nailable substrate, composed of wood or wood-based material and fasteners having equivalent withdrawal resistance. Accessories shall be installed in accordance with the manufacturer’s installation instructions.

R703.14.1.1.1 Starter Strip. Horizontal siding shall be installed with a starter strip at the initial course at any location. Where the installation of a starter strip is not possible, another approved equivalent shall be permitted.

R703.14.1.1.2 Under Windows and Top of Walls. Where nail hem is removed such as under windows and at top of walls, nail slot punch or pre-drilled holes shall be constructed as shown in Figure R703.14.1.1.2 (1).

(See image below)

Figure R703.14.1.1.2 (1) Trim Under Window and Top of Walls Polypropylene Siding.

R703.14.1.2Fastener requirements. Unless otherwise specified in the ~~approved~~ manufacturer’s installation instructions, nails shall be corrosion resistant, with a minimum 0.120-inch (3 mm) shank and minimum 0.313-inch (8 mm) head diameter. Nails shall be a minimum of 11/4 inches (32 mm) long or as necessary to penetrate sheathing or nailable substrate not less than 3/4 inch (19.1 mm). Where the nail fully penetrates the sheathing or nailable substrate, the end of the fastener shall extend not less than 1/4 inch (6.4 mm) beyond the opposite face of the sheathing or nailable substrate. Staples are not permitted. Spacing of fasteners shall be installed in accordance with the manufacturer’s installation instructions.

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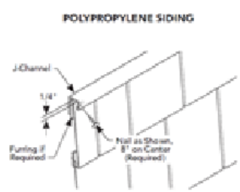

Figure R703.14.1.1.2 (1) Trim Under Window and Top of Walls Polypropylene Siding.

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R703.14.1.1.1 Starter Strip. Horizontal siding shall be installed with a starter strip at the initial course at any location. Where the installation of a starter strip is not possible, another approved equivalent shall be permitted.

Revise as follows:

R703.14.1.1 Installation. Unless otherwise specified in the manufacturer's installation instructions, ~~P~~polypropylene siding shall be installed over and attached to wood structural panel sheathing with a minimum thickness of 7/16 inch (11.1 mm), or ~~other substrate~~ another nailable substrate, composed of wood or wood-based material and fasteners having equivalent withdrawal resistance. Accessories shall be installed in accordance with the manufacturer's installation instructions.

R703.14.1.1.1 Starter Strip. Horizontal siding shall be installed with a starter strip at the initial course at any location.

R703.14.1.1.2 Under Windows and Top of Walls. Where nail hem is removed such as under windows and at top of walls, nail slot punch or pre-drilled holes shall be constructed as shown in Figure R703.14.1.1.2 (1).

(See below)

Figure R703.14.1.1.2 (1) Trim Under Window and Top of Walls Polypropylene Siding.

R703.14.1.2Fastener requirements. Unless otherwise specified in the approved manufacturer's installation instructions, nails shall be corrosion resistant, with a minimum 0.120-inch (3 mm) shank and minimum 0.313-inch (8 mm) head diameter. Nails shall be a minimum of 11/4 inches (32 mm) long or as necessary to penetrate sheathing or nailable substrate not less than 3/4 inch (19.1 mm). Where the nail fully penetrates the sheathing or nailable substrate, the end of the fastener shall extend not less than 1/4 inch (6.4 mm) beyond the opposite face of the sheathing or nailable substrate. Staples are not permitted. Spacing of fasteners shall be installed in accordance with the manufacturer's installation instructions.

Images for S9849-A2

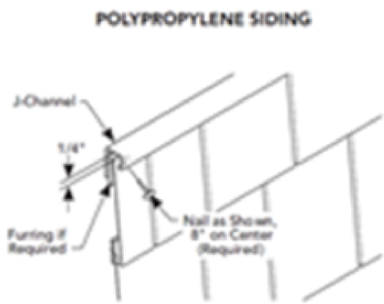


Figure R703.14.1.1.2 (1) Trim Under Window and Top of Walls Polypropylene Siding.

Image for S9849

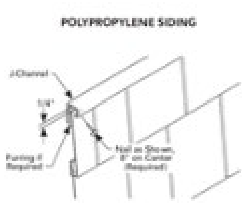
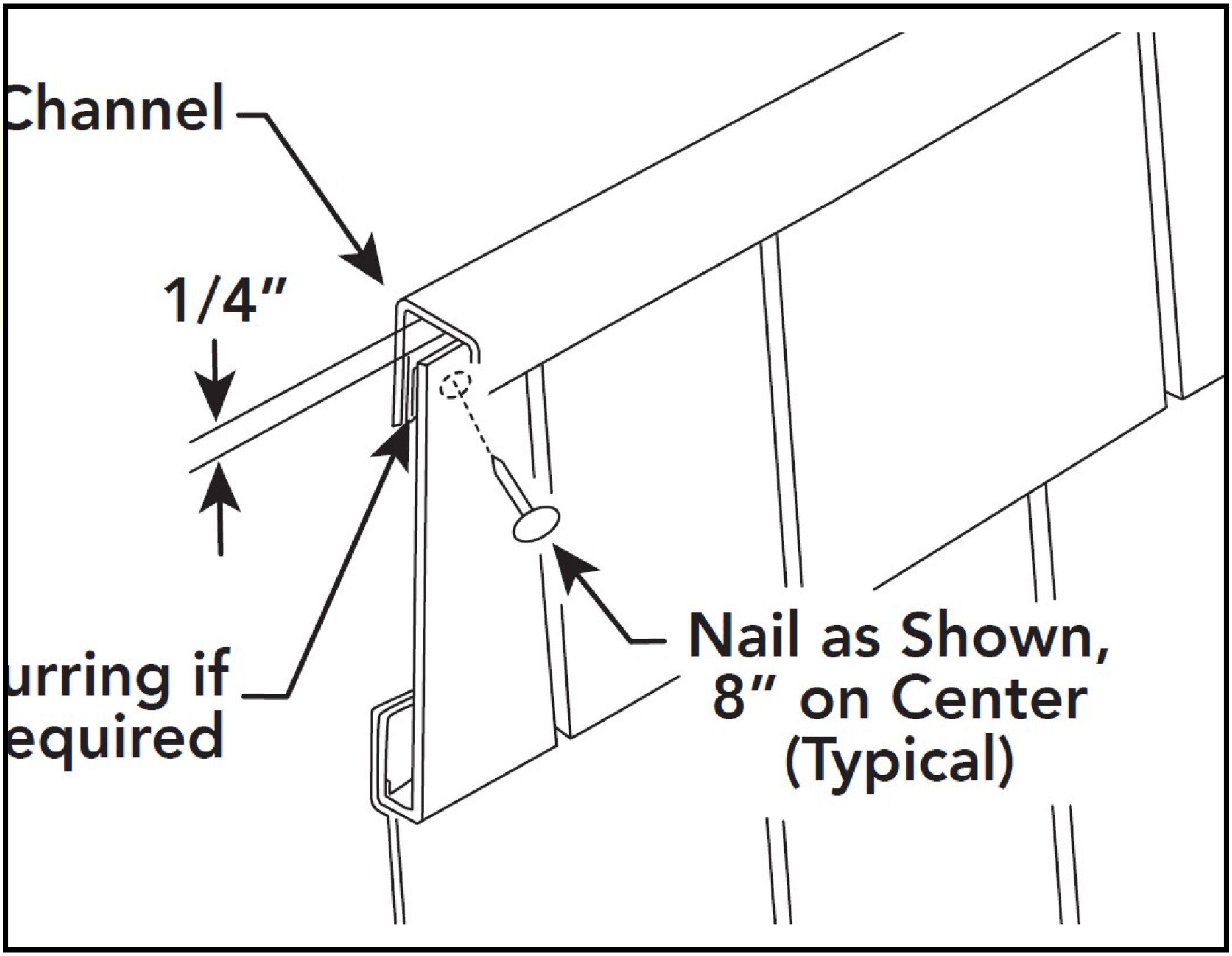


Figure R703.14.1.1.2 (1) Trim Under Window and Top of Walls Polypropylene Siding.


Channel
1/4″
urring if
equired
Nail as Shown,
8″ on Center
(Typical)

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

47

S9850

Date Submitted	01/05/2022	**Section**	703.14	**Proponent**	Fernando Pages
Chapter	7	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

703.14.2 703.14.3

Summary of Modification

Correction of Polypropelene Testing Requirement

Rationale

Reason: Currently polypropylene siding is the only cladding in both the IBC and IRC that requires an ASTM E84 test respective to specific Fire Separation Distance areas; 10 feet or closer to another building. Sections proposed for deletion do not provide any additional protection as the code already requires that if the product is used in these settings, it will need to be a part of an ASTM E119 fire-rated assembly, typically a 1-hour rated assembly. In addition, as part of the ASTM product standard, D7254, the product is required to meet an E84 tested fire performance property (max flame spread of 200) that is consistent with another exterior, combustible building materials. See full text and documentation attached.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
No impact.
Impact to building and property owners relative to cost of compliance with code
No impact.
Impact to industry relative to the cost of compliance with code
No impact.
Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
Has a reasonable connection with safety.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the code by broadening product applications.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification corrects discrimination against a product category.

Does not degrade the effectiveness of the code

This modification does not degrade the code.

Alternate Language

2nd Comment Period

S9850-A1

Proponent Fernando Pages **Submitted** 7/27/2022 8:38:17 AM **Attachments** Yes

Rationale:

Currently, polypropylene siding is the only cladding in the IBC and IRC that requires an ASTM E84 test respective to speci?c Fire Separation Distance areas; 10 feet or closer to another building. Sections proposed for deletion do not provide any additional protection as the code already requires that if the product is used in these settings, it will need to be a part of an ASTM E119 ?re rated assembly, typically a 1-hour rated assembly. In addition, as part of the ASTM product standard, D7254, the product is required to meet an E84 tested ?re performance property (max ?ame spread of 200) consistent with another exterior, combustible building materials. The code has adequate provisions for regulating building materials used in Fire Separation Distance areas, as speci?ed in Tables 601 and 705.5. To help the TAC understand the ?re properties of polypropylene siding better, VSI conducted a series of tests at the Western Fire Center that provides good ?re safe characteristic insights by using ASTM E2707 Standard Test Method for Determining Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure and an exposed wall to this test. Attached you will find VSI's Technical Reports from these tests to help the TAC better understand the ?re characteristics of this product category. Also, here is a link to the report. https://www.vinylsiding.org/wp-content/uploads/2022/01/PolypropyleneFireTest.2020reportsubmitted-004.pdf

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Suports safety and general welfare.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by maintaining saftey while permitting a material with increased wind resistance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Removes discriminatroy languge from the code.

Does not degrade the effectiveness of the code

Maintains the effectivness of the code.

Modify as follows:

R703.14 Polypropylene siding.

Polypropylene siding shall be certified and labeled as conforming to the requirements of ASTM D7254 by an approved quality control agency. ~~In addition, polypropylene siding shall conform to the fire separation distance requirements of Section R703.14.2 or R703.14.3.~~

~~R703.14.2 Fire separation.~~

~~Polypropylene siding shall not be installed on walls with a fire separation distance of less than 5 feet (1524 mm) and walls closer than 10 feet (3048 mm) to a building on another lot.~~

~~Exception: Walls perpendicular to the line used to determine the fire separation distance.~~

~~R703.14.3 Flame spread index.~~

~~The certification of the flame spread index shall be accompanied by a test report stating that all portions of the test specimen ahead of the flame front remained in position during the test in accordance with ASTM E84 or UL 723.~~

WESTERN FIRE CENTER, INC.
2204 Parrott Way, Kelso, Washington 98626
Phone: 360-423-1400 | Fax: 360-423-5003

Fire Testing of Dual Exterior Wall Systems

Investigative testing conducted using two WUI wall systems.

Conducted For:

Vinyl Siding Institute
1800 Diagonal Rd, Suite 545
Alexandria, VA 22314

WFCi Report #22018

Test Date: June 1-2, 2022

Report Issued: July 1, 2022

TABLE OF CONTENTS

INTRODUCTION

The report summarizes the fire testing of multiple dual-wall systems with polypropylene siding applied to one or two walls. The ASTM E2707 (Standard Test Method for Determining Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure) test method was modified to have an ignition wall exposed to the standard burner conditions, and another receiver wall spaced a certain distance from the burner wall. Observations were made on how the receiver wall responded to the burning of the burner wall. Additional temperature and heat release measurements were also obtained during the test.

This testing is to ascertain if representative fire separation distance provisions within the international residential code (IRC) for exterior polypropylene wall covering are unnecessary. The fire testing reported herein was designed to observe relevant fire exposure effects of exterior walls with polypropylene siding upon adjacent building walls with fire separation distances closer than 5'. This is follow-on testing performed for the Vinyl Siding Institute, WFCi Project 20032.

SUMMARY OF TEST METHOD

The ASTM E2707 prescribes a 4"×39" gas sand burner that exposes a 150 kW flame to a 4'×8' exterior wall assembly for a period of 10 min. The original standard measures the ability of the sample to resist fire penetration of the material following direct flame exposure. However, this modified test provided a 2nd receiver wall to be placed at either 4' or 6', directly opposing the burner wall (Figure 1), corresponding to 2' and 3' exterior wall separation distances, respectively. Additionally, to better determine the burning characteristics of the burner and receiver walls, the heat release rate was measured in the hood by means of oxygen consumption calorimetry. Heat flux sensors and/or thermocouples were also placed on each sample (Figure 1) to monitor how the heat flux and temperature changed over time. Tests with no polypropylene on the receiver wall had heat flux sensors, whereas maximum polypropylene siding temperatures on the receiver wall were measured with an infrared (IR) camera.

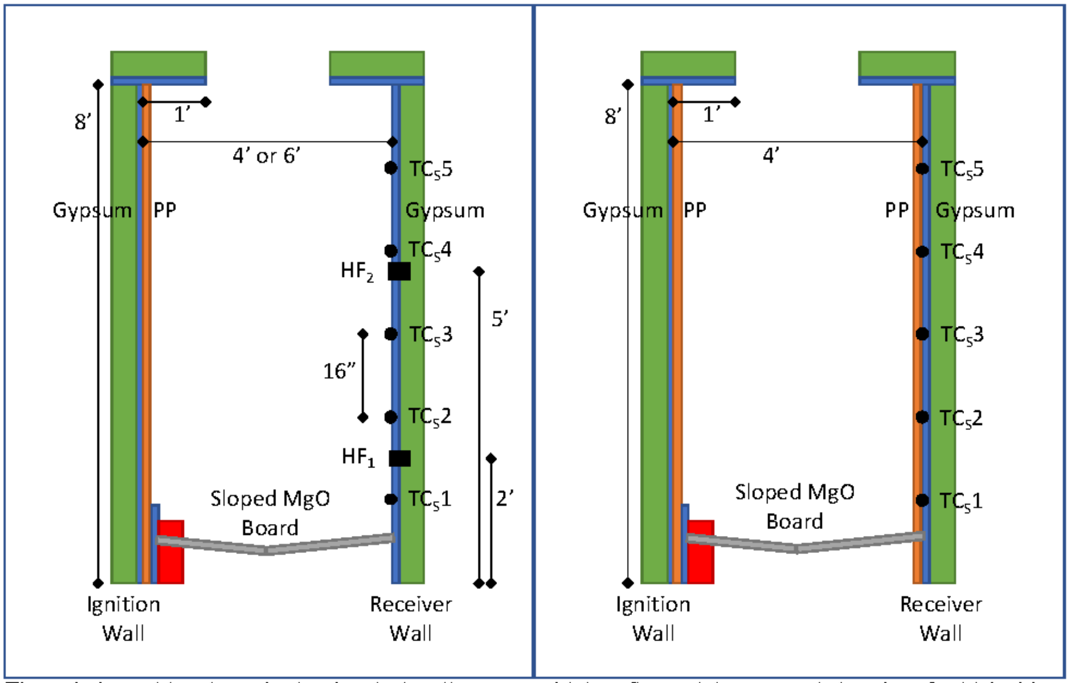


Figure 1. Assembly schematic showing dual-wall systems with heat flux and thermocouple locations for (a) ignition wall polypropylene only and (b) polypropylene on both walls.

Further varying from the standard, no wing walls were used for this test, and only a 12” soffit (horizontal projection) was used. This test was conducted under the WFCi large hood collection assembly at ambient airflow conditions. The burner heat output is verified before each day of testing. In collaboration with the client, the test was terminated after a 10 min observation period, following the 10 min burner exposure (20 min total).

Additionally, a sloped ½” MgO smooth board, representing an impervious surface, extending 1’ beyond the wall, was placed just below the top of the burner (notched) to allow for melted polypropylene to flow. The slope from the two walls formed a “V” at the center of the dual-wall system. The slope varied depending on the dual-wall distance: (4’) 1½” drop per 2’ section and (6’) 2” drop per 3’ section. The slope is to represent drainage away from the building according to the IRC requirements.

SAMPLE DESCRIPTION

The wall samples (Figure 2) consisted of a 4’×8’ representation of an exterior wall assembly. Both assemblies (burner and receiver) had a nominal 2×4 wood frame with studs spaced at 16” on center. The sheathing over the studs was a single layer of ⅝” Type X gypsum, fastened with 1⅝” drywall nails at 8” on center spacing on the edge and in the field. Over the sheathing was fastened polypropylene siding with 1½” roofing nails at stud locations. WFCi did not select the sample components and has not verified the manufacturing techniques or accuracy of the products and labeling.

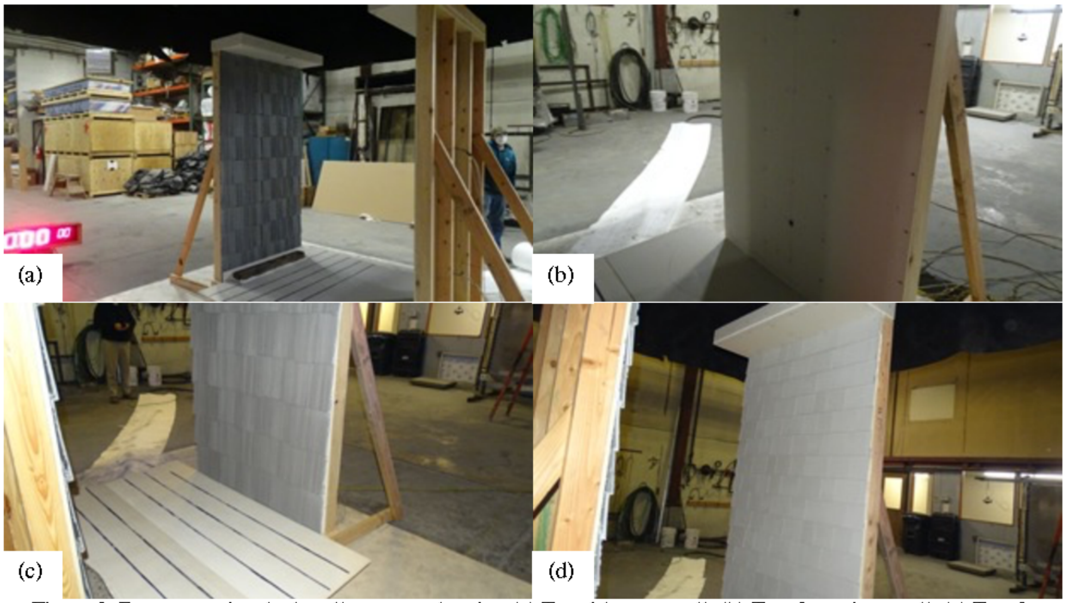


Figure 2. Representative dual-wall systems showing (a) Test 1 burner wall, (b) Test 2 receiver wall, (c) Test 3 receiver wall, and (d) Test 5 receiver wall.

The soffits were framed with 2×4 wood studs at 24” on center with a single layer of ⅝” Type X gypsum, extending 12” from the sheathing. The sides of the soffit were also protected with gypsum to prevent burning of the soffit frame during the test. A nominal 2×10 wood section was angle-cut to provide the sloped section for the MgO board. Additional lumber was fastened to the sides of the wall frame so that the walls could remain upright during the testing process. Below are the specific descriptions for each test type:

- Test 1: 6’ Separation. Burner Wall = Gypsum Sheathing & 0.125” Polypropylene Siding (meets D7254). Receiver Wall = Gypsum Sheathing & Measurements (HF & TC)
- Test 2: 4’ Separation. Burner Wall = Gypsum Sheathing & 0.125” Polypropylene Siding (meets D7254). Receiver Wall = Gypsum Sheathing & Measurements (HF & TC)
- Test 3: 4’ Separation. Burner Wall = Gypsum Sheathing & 0.125” Polypropylene Siding (meets D7254). Receiver Wall = Gypsum Sheathing & 0.125” Polypropylene Siding (meets D7254).
- Test 4: 4’ Separation. Burner Wall = Gypsum Sheathing & 0.125” Polypropylene Siding (meets D7254). Receiver Wall = Gypsum Sheathing & 0.125” Polypropylene Siding (meets D7254). Replicate of Test 3
- Test 5: 4’ Separation. Burner Wall = Gypsum Sheathing & 0.080” Polypropylene Siding. Receiver Wall = Gypsum Sheathing & 0.080” Polypropylene Siding

TEST RESULTS

Testing was performed on June 1-2, 2022 with heat source verification (148.5 ± 3.5 kW & 154.3 ± 5.1 kW, respectively) performed before testing on that day. Temperatures, heat release, and additional images are included in the figures below. Sara Krompholz and Matt Dobson from Vinyl Siding Institute and Neil Sexton of CertainTeed observed the tests

Test 1

Dual-Wall System: 6’ Separation

- Burner Wall: Gypsum Sheathing & 0.125” Polypropylene Siding
- Receiver Wall: Gypsum Sheathing & Measurements (HF & TC)

Test Date & Time: June 1, 2022 – 10:15 AM (19°C [66°F], 68% RH)

Table 1. Observations for Test 1.

Test Time (mm:ss)		**Event**	**Test Time** (mm:ss)		**Event**
00:00		Start test – 150 kW burner on	00:30		Warping/melting of PP siding
00:50		Attached flames on PP	01:30		Dripping from wall
02:45		Flames up to 5’ – most PP collecting near burner	03:30		Flames up to soffit
05:00		Flow approximately 1’ from wall	06:15		Flow approximately 18” – most PP fallen
07:25		Flow approximately 24”	09:15		Flow approximately 28”
10:00		Burner off	20:00		Terminate test – residual fire ~22” from burner wall – flowing ~28” from wall

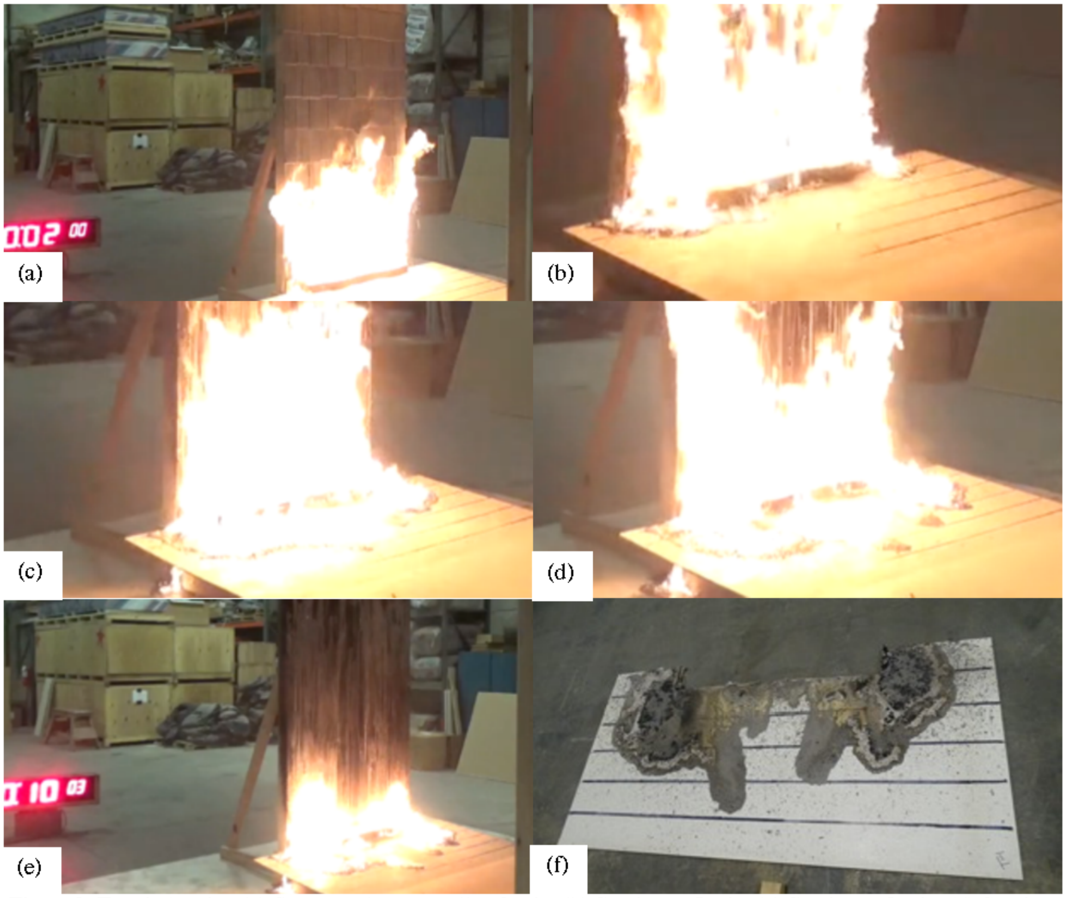


Figure 3. Test 1 showing (a) flames on burner wall at 2 min, (b) flowing at 5 min, (c) flowing at 8 min, (d) flowing near 10 min, (e) flames at 10 min, and (f) flow pattern after test.

The gypsum temperatures on the receiver wall (Figure 4a) appeared to plateau after 6 min at a maximum value of approximately 85°C (185°F). Similar behavior was observed from the heat flux measurements (Figure 4b) with a maximum heat flux of approximately 6 kW/m^2 at 2' with a decrease of heat flux once the majority of the polypropylene had been consumed from the burner wall (e.g., before burner was turned off).

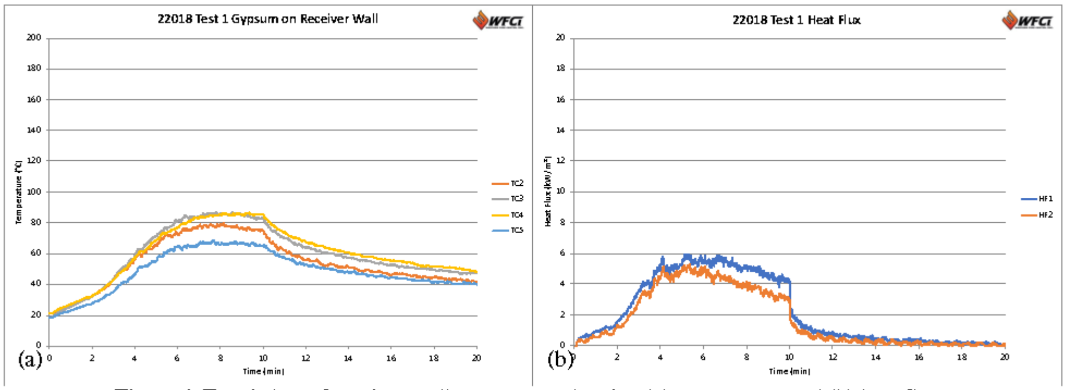


Figure 4. Test 1 data of receiver wall on gypsum showing (a) temperature and (b) heat flux.

The heat release rate of the dual-wall system, subtracting the effects of the burner, is shown in Figure 5. The peak heat release rate was 485 kW at 4 m 55 s. The total heat release (area under the curve) when the burner was turned off was 97 MJ, and was 130 MJ when the test was terminated (20 min).

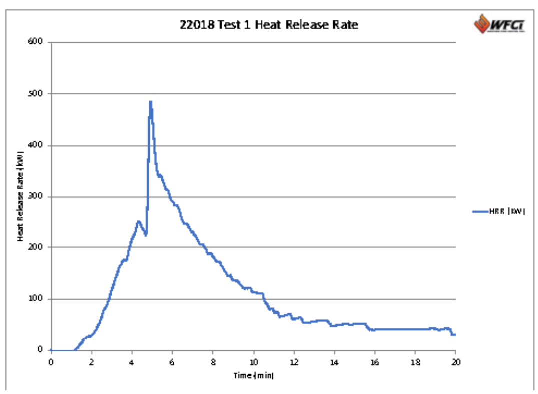


Figure 5. Test 1 heat release rate.

Test 2

Dual-Wall System: 4' Separation

- Burner Wall: Gypsum Sheathing & 0.125" Polypropylene Siding
- Receiver Wall: Gypsum Sheathing & Measurements (HF & TC)

Test Date & Time: June 1, 2022 – 11:35 AM (21°C [70°F], 64% RH)

Table 2. Observations for Test 2.

Test Time (mm:ss)	Event	Test Time (mm:ss)	Event
00:00	Start test – 150 kW burner on	00:35	Warping of PP siding
00:45	Attached flames on PP	01:10	Falling material
02:20	Flames 4' up wall	03:05	Flames up to soffit
03:30	Flow approximately 12"	05:00	Most PP material fallen
06:00	Flow approximately 18"	08:15	Flow nearly to "V" on MgO
10:00	Burner off	20:00	Terminate test – residual fire ~16" from burner wall – flowing ~24" from wall

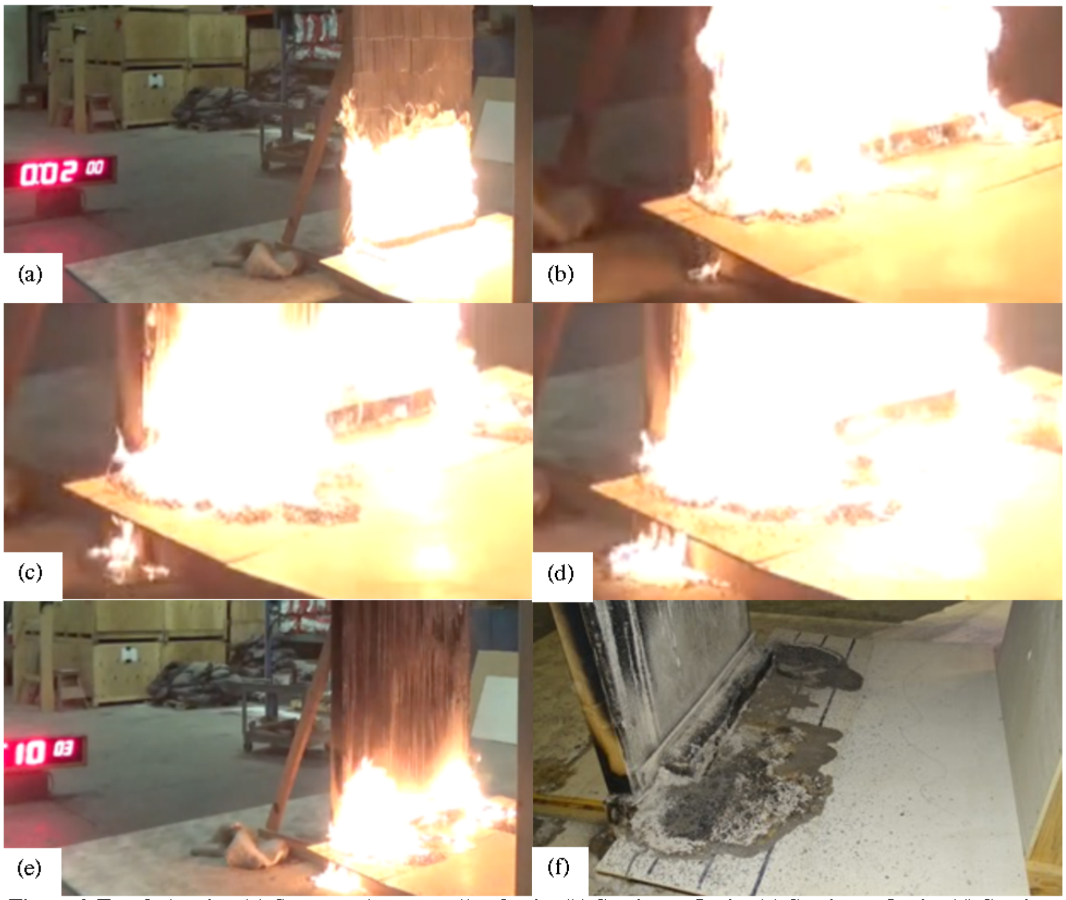


Figure 6. Test 2 showing (a) flames on burner wall at 2 min, (b) flowing at 5 min, (c) flowing at 8 min, (d) flowing near 10 min, (e) flames at 10 min, and (f) flow pattern after test.

The gypsum temperatures on the receiver wall (Figure 7a) appeared to plateau after 6 min at a maximum value of approximately 120°C (250°F). Similar behavior was observed from the heat flux measurements (Figure 7b) with a maximum heat flux of nearly 14 kW/m² at 2' with a decrease of heat flux once the majority of the polypropylene had been consumed from the burner wall (e.g., before burner was turned off).

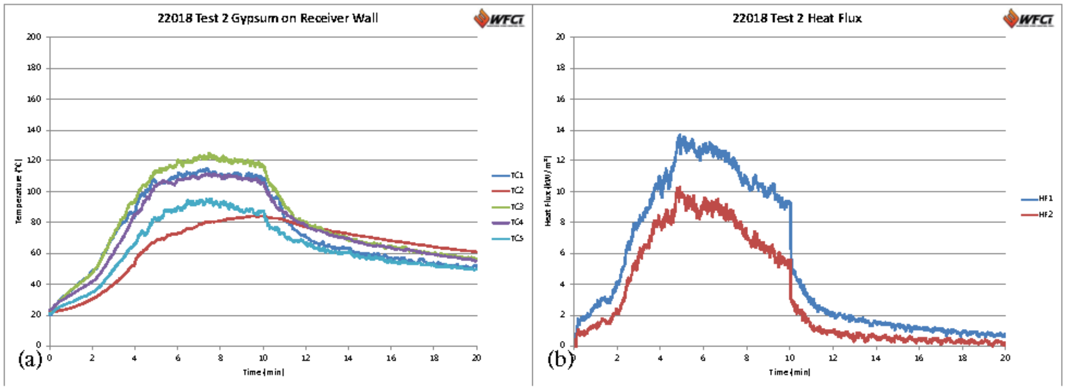


Figure 7. Test 2 data of receiver wall on gypsum showing (a) temperature and (b) heat flux.

The heat release rate of the dual-wall system, subtracting the effects of the burner, is shown in Figure 8. The peak heat release rate was 513 kW at 4 m 12 s. The total heat release (area under the curve) when the burner was turned off was 108 MJ, and was 142 MJ when the test was terminated (20 min).

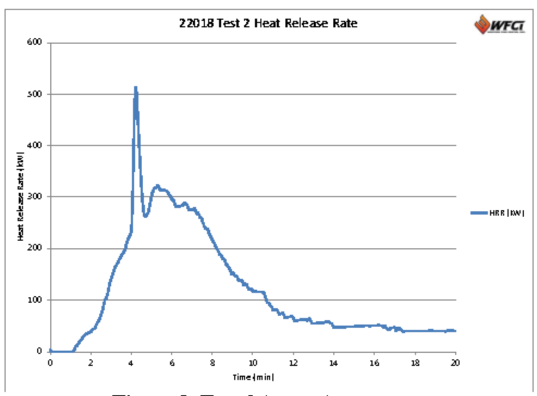


Figure 8. Test 2 heat release rate.

Test 3

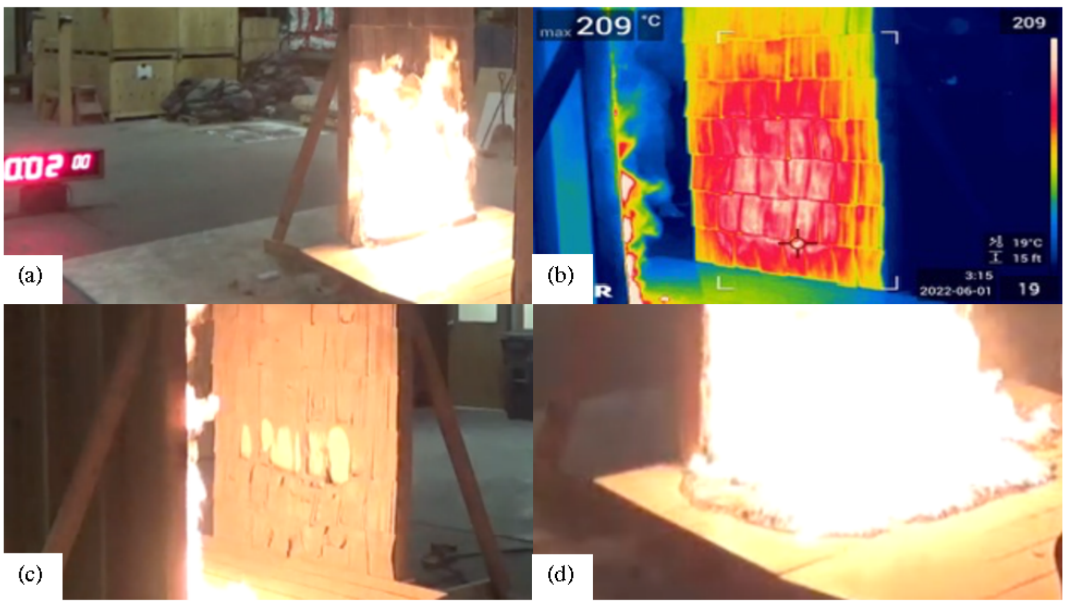
Dual-Wall System: 4' Separation

- Burner Wall: Gypsum Sheathing & 0.125" Polypropylene Siding
- Receiver Wall: Gypsum Sheathing & 0.125" Polypropylene Siding

Test Date & Time: June 1, 2022 – 3:10 PM (23°C [73°C], 62% RH)

Table 3. Observations for Test 3.

Test Time (mm:ss)	**Event**	**Test Time** (mm:ss)	**Event**
00:00	Start test – 150 kW burner on	00:50	Melting of PP material
02:00	Flames 4' up wall	02:45	Flames to soffit
03:20	Flow approximately 12" – warping of receiver wall	04:10	Most PP fallen – flow approximately 18"
04:40	Drooping of receiver wall	05:30	Flow 18" to "V" on MgO
06:20	Fallen PP on receiver wall – approximately 12" from wall	07:40	Flow approximately 2" beyond "V"
10:00	Burner off	20:00	Terminate test – residual fire ~22" from burner wall – flowing ~26" from wall – only melting from receiver wall



(a) (b) (c) (d)

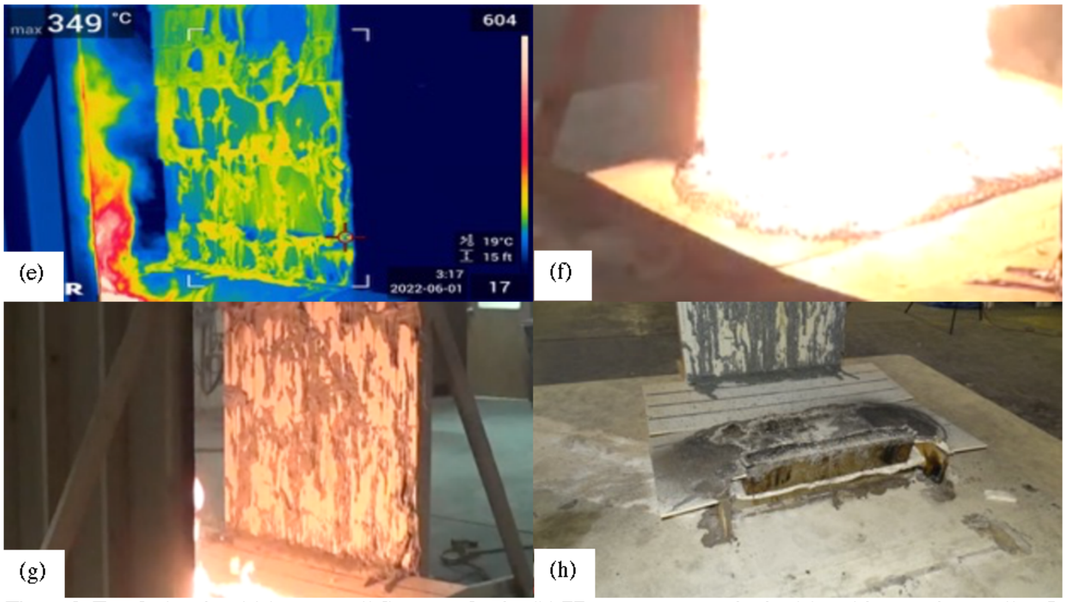


Figure 9. Test 3 showing (a) burner wall flames at 2 min, (b) PP temperature at 4 min, (c) melting receiver wall at 5 min, (d) flow at 6 min, (e) PP temperature at 6 m 30 s, (f) flow pattern at 9 min, (g) melting receiver wall at 10 min, and (h) and flow pattern after test.

The gypsum temperatures on the receiver wall (Figure 10a) appeared to peak at around 8 min at a maximum value of approximately 155°C (310°F), primarily where the polypropylene had fallen from the receiver wall. IR images were obtained of the maximum surface temperature (Figure 10b) of the melting receiver wall with nearly linear temperature growth until a peak temperature of 350°C (660°F) at 6½ min with some temperature decrease while the burner was still on (e.g., 10 min). The melted polypropylene material from the receiver wall did not ignite during the test.

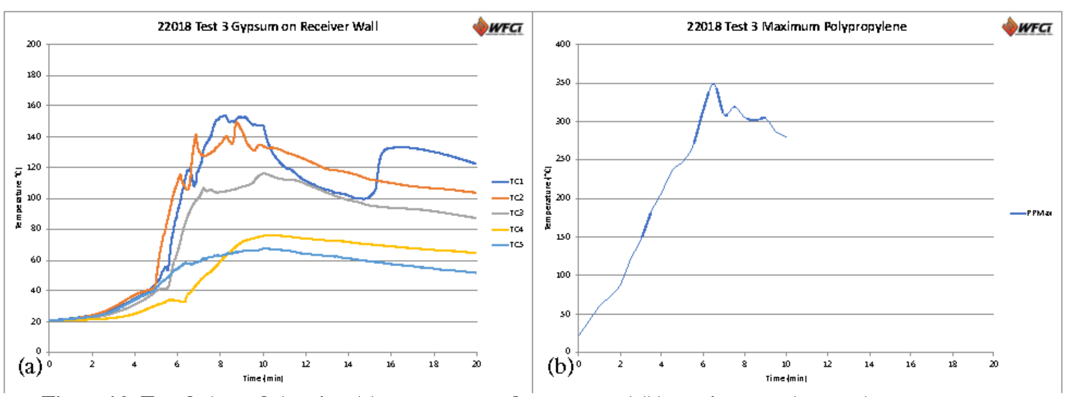


Figure 10. Test 3 data of showing (a) temperature of gypsum and (b) maximum polypropylene temperature.

The heat release rate of the dual-wall system, subtracting the effects of the burner, is shown in Figure 11. The peak heat release rate was 469 kW at 7 m 31 s. The total heat release (area under the curve) when the burner was turned off was 120 MJ, and was 175 MJ when the test was terminated (20 min).

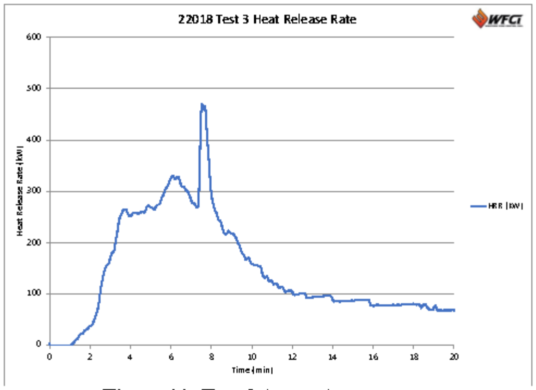


Figure 11. Test 3 heat release rate.

Test 4

Dual-Wall System: 4' Separation

- Burner Wall: Gypsum Sheathing & 0.125" Polypropylene Siding
- Receiver Wall: Gypsum Sheathing & 0.125" Polypropylene Siding

Test Date & Time: June 2, 2022 – 8:35 AM (19°C [66°F], 71% RH)

Table 4. Observations for Test 4.

Test Time (mm:ss)	**Event**	**Test Time** (mm:ss)	**Event**
00:00	Start test – 150 kW burner on	00:30	Warping of PP material
01:00	Dripping PP material	01:30	Falling material – flames 4' up wall
02:45	Flames to soffit	03:10	Warping of receiver wall PP
03:45	Flow approximately 12"	04:45	Most PP from burner wall fallen
05:05	Flow approximately 18"	05:10	Exposed gypsum of receiver wall
06:00	Flow to "V"	06:15	Melted PP from receiver wall approximately 9"
07:00	Flow approximately 3" beyond "V"	09:25	Flow approximately 5" beyond "V"
10:00	Burner off	20:00	Terminate test – residual fire ~24" from burner wall – flowing ~29" from wall – only melting from receiver wall

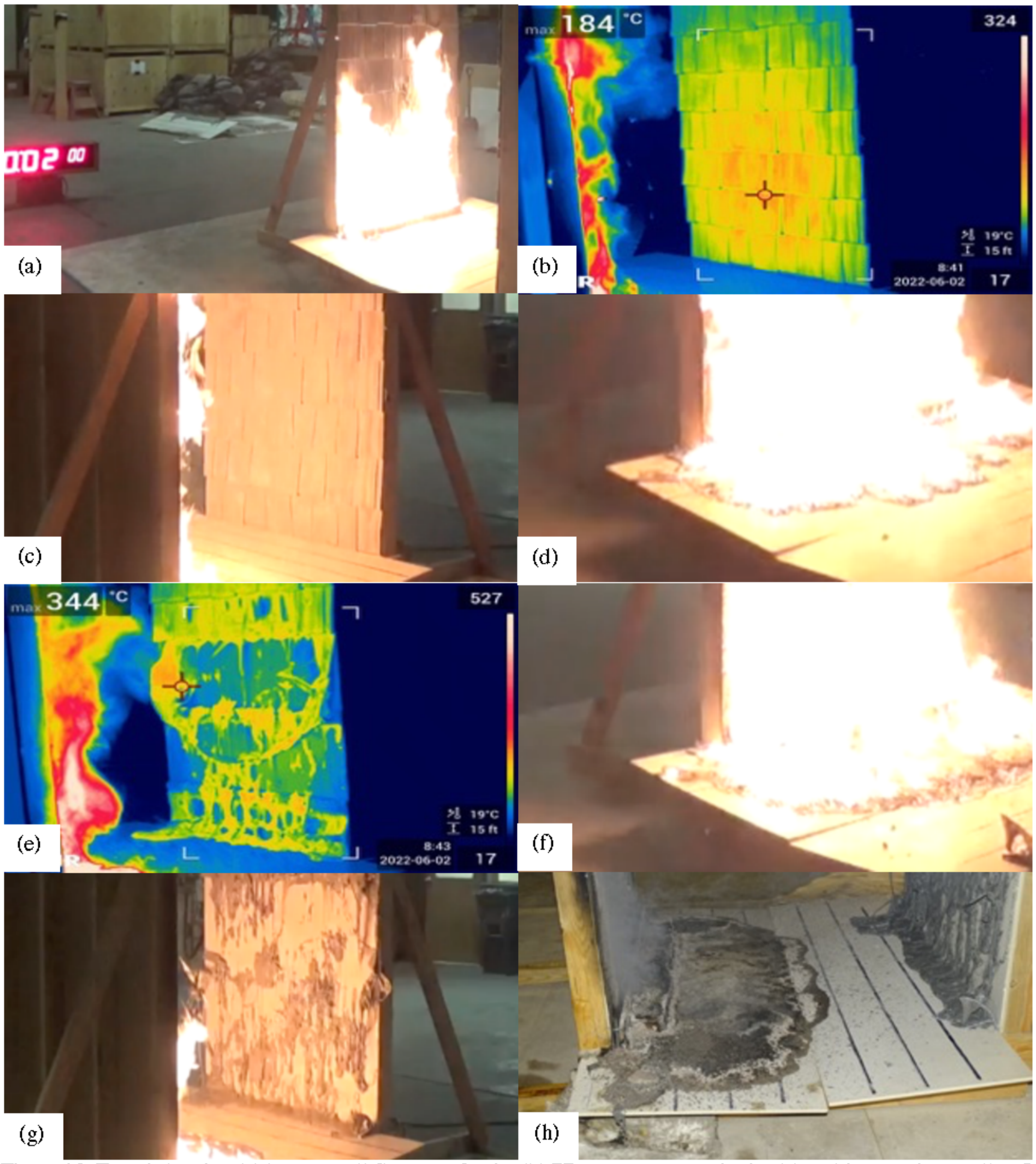


Figure 12. Test 4 showing (a) burner wall flames at 2 min, (b) PP temperature at 4 min, (c) melting receiver wall at 5 min, (d) flow at 6 min, (e) PP temperature at 6 m 30 s, (f) flow pattern at 9 min, (g) melting receiver wall at 10 min, and (h) and flow pattern after test.

The gypsum temperatures on the receiver wall (Figure 13a) appeared to peak at around 7 min at a maximum value of approximately 130°C (265°F), primarily where the polypropylene had fallen from the receiver wall. IR images were obtained of the maximum surface temperature (Figure 13b) of the melting receiver wall with nearly linear temperature growth until a peak temperature of 350°C (660°F) at 6½ min with some temperature decrease while the burner was still on (e.g., 10 min). The melted polypropylene material from the receiver wall did not ignite during the test.

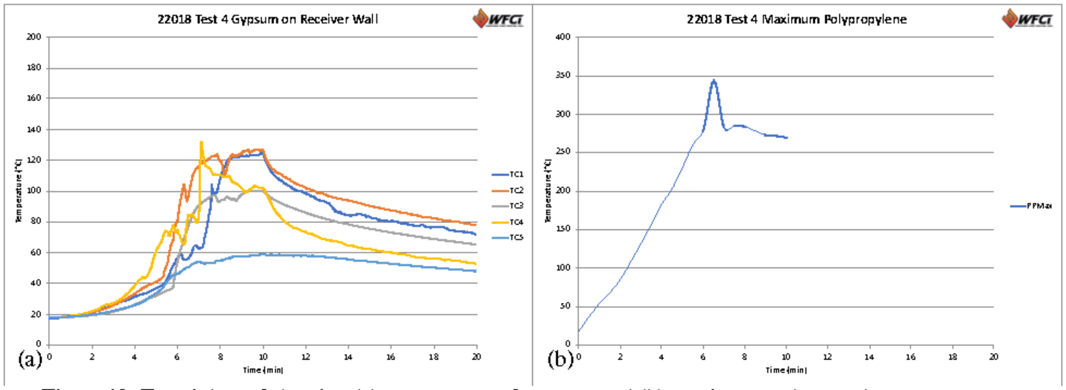


Figure 13. Test 4 data of showing (a) temperature of gypsum and (b) maximum polypropylene temperature.

The heat release rate of the dual-wall system, subtracting the effects of the burner, is shown in Figure 14. The peak heat release rate was 457 kW at 5 m 36 s. The total heat release (area under the curve) when the burner was turned off was 119 MJ, and was 153 MJ when the test was terminated (20 min).

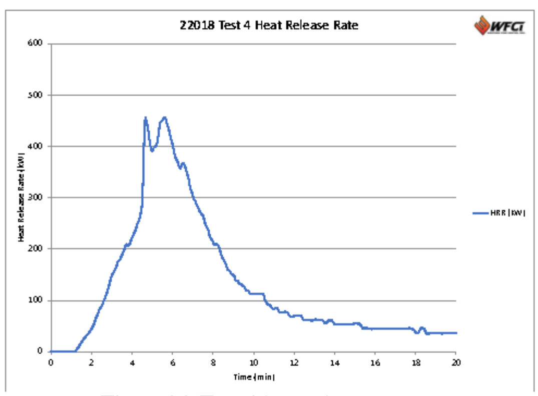


Figure 14. Test 4 heat release rate.

Test 5

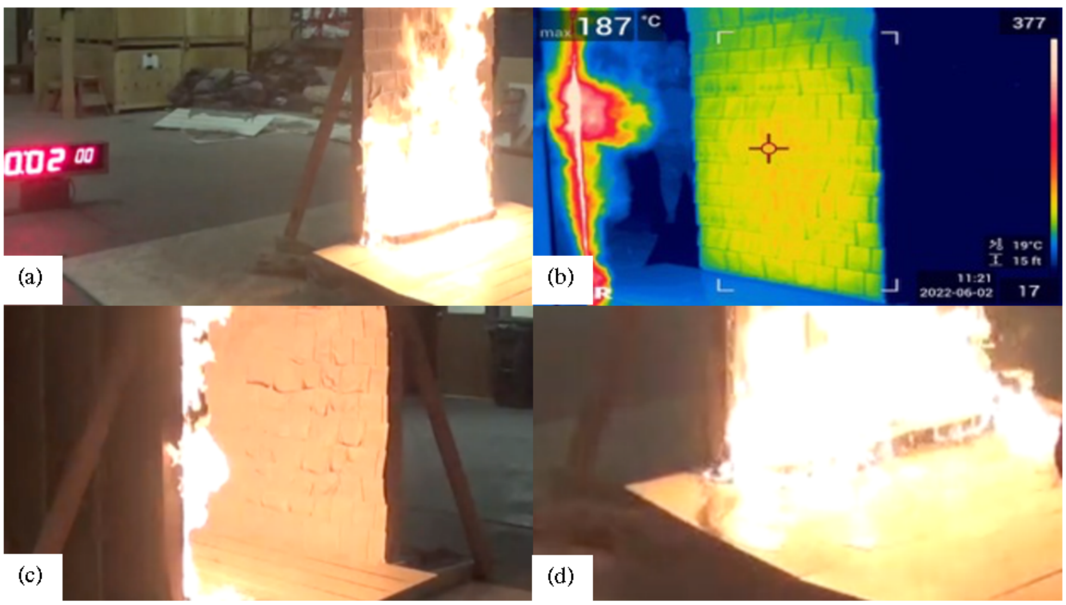
Dual-Wall System: 4’ Separation

- Burner Wall: Gypsum Sheathing & 0.080” Polypropylene Siding
- Receiver Wall: Gypsum Sheathing & 0.080” Polypropylene Siding

Test Date & Time: June 2, 2022 – 11:15 AM (21°C [70°], 71% RH)

Table 5. Observations for Test 5.

Test Time (mm:ss)	Event	Test Time (mm:ss)	Event
00:00	Start test – 150 kW burner on	00:20	Warping of PP material
00:45	Attached flames – dripping material	01:30	Flames 4' up wall
02:35	Flames to soffit	02:50	Warping receiver wall
03:30	Flow approximately 12" – spitting material	04:50	Continued warping of receiver wall
05:10	Flow approximately 18"	05:30	Exposed gypsum on receiver wall – flow from burner wall to "V"
07:25	Flow approximately 2" beyond "V"	08:30	Fallen PP from receiver wall – 3" from wall
10:00	Burner off	20:00	Terminate test – residual fire ~6" from burner wall – flowing ~28" from wall – only melting from receiver wall



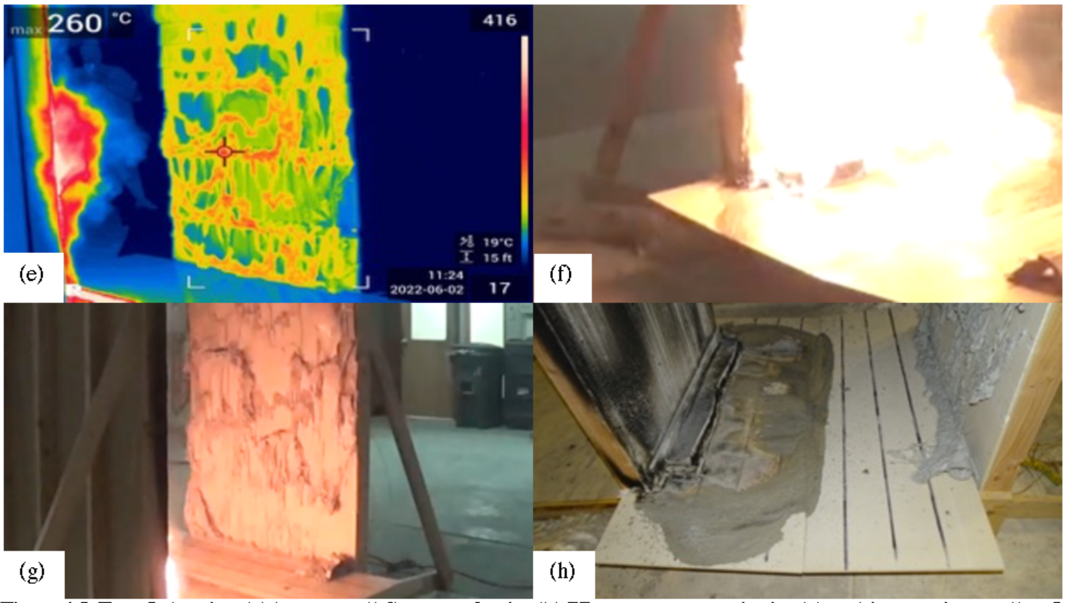


Figure 15. Test 5 showing (a) burner wall flames at 2 min, (b) PP temperature at 4 min, (c) melting receiver wall at 5 min, (d) flow at 6 min, (e) PP temperature at 6 m 30 s, (f) flow pattern at 9 min, (g) melting receiver wall at 10 min, and (h) and flow pattern after test.

The gypsum temperatures on the receiver wall (Figure 16a) appeared to peak at around 10 min at a maximum value of approximately 155°C (310°F), primarily where the polypropylene had fallen from the receiver wall. IR images were obtained of the maximum surface temperature (Figure 16b) of the melting receiver wall with nearly linear temperature growth until a plateaued temperature of approximately 275°C (525°F) at 7 min. The melted polypropylene material from the receiver wall did not ignite during the test.

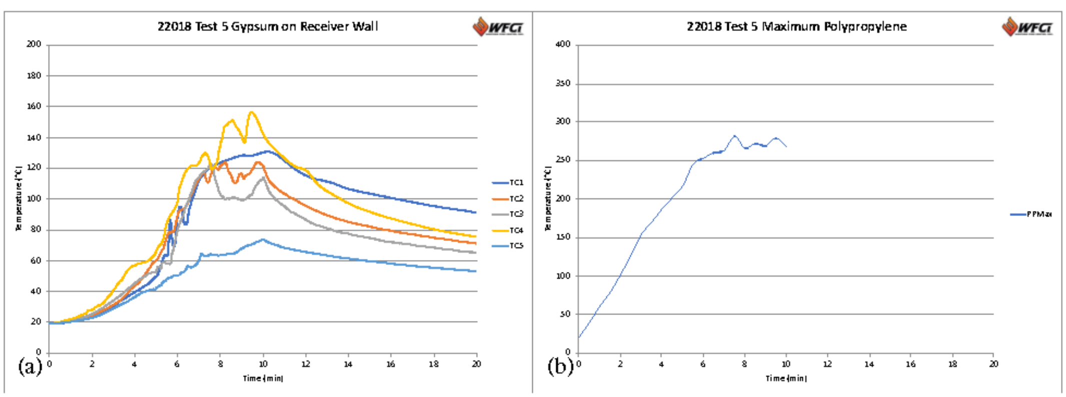


Figure 16. Test 5 data of showing (a) temperature of gypsum and (b) maximum polypropylene temperature.

The heat release rate of the dual-wall system, subtracting the effects of the burner, is shown in Figure 17. The peak heat release rate was 274 kW at 6 m 30 s. The total heat release (area under the curve) when the burner was turned off was 99 MJ, and was 123 MJ when the test was terminated (20 min).

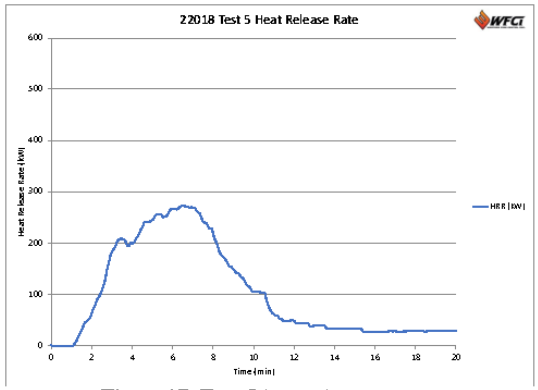


Figure 17. Test 5 heat release rate.

CONCLUSION

Various dual-wall systems were tested to a modified ASTM E2707 test where a burner wall was exposed to a 150 kW burner for 10 min with an opposing receiver wall placed at various distances from the burner wall. All burner walls were covered with polypropylene siding and responses of how that material affected the receiver walls was observed.

Two tests at 6’ and 4’ opposing distances focused on bare receiver walls with instrumentation such as thermocouples and heat flux sensors. Measured temperatures reached approximately 85°C (185°F) and 120°C (250°F), while maximum heat flux values reached 6 kW/m^2 and 14 kW/m^2, respectively. These tests also showed some flowing of the pooled material away from the burner wall.

Additional tests at 4’ distance with covered polypropylene receiver walls showed substantial melting of the siding material, but no test exhibited ignition of the receiver wall, both with thicker (0.125”) and thinner (0.080”) siding products. Maximum temperatures observed of the melting polypropylene material of the receiver wall reached approximately 350°C (660°F) but did not autoignite. The burner walls again showed flowing of the burning material, but the burning material did not reach the melted siding from the receiver wall, which did not flow.

SIGNATURES

Testing performed by,

Brent M. Pickett, Ph.D.

Technical Director

Reviewed and approved by,

Mike White

Laboratory Manager

WESTERN FIRE CENTER AUTHORIZES THE CLIENT NAMED HEREIN TO REPRODUCE THIS REPORT ONLY IF REPRODUCED IN ITS ENTIRETY

The test specimen identification is as provided by the client and WFCi accepts no responsibilities for any inaccuracies therein. WFCi did not select the specimen and has not verified the composition, manufacturing techniques or quality assurance procedures.

Version	Date Issued	Document Number	Changes
Original	July 1, 2022	22018	Original report

1500 Brigantine Drive
Coquitlam, B.C. V3K 2T3

Telephone: (604) 520-3321
Facsimile: (604) 524-9186
www.intertek.com

April 25, 2017

Letter Report No. 103020466COQ-001
Project No. G103020466

Mr. David Johnston
Vinyl Siding Institute Inc.
Suite 220, 1201 15 Street NW
Washington, DC 20005 USA

Ph: (202) 587-5100

Subject: CAN/ULC S102.2-10 Flame Spread Test Results – Flame Spread Testing on Siding Material.

Dear Mr. Johnston,

This letter concludes and represents the results of the evaluation and tests of the above referenced material to the requirements contained in the following standards:

CAN/ULC S102.2-10, *Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies.*

On April 20th 2017 and was completed April 27th, 2017, Intertek Testing Services NA Ltd. conducted a flame spread test program to determine the surface burning characteristics of siding material.

The sample materials were received at the Evaluation Center on April 13th to April 21, 2017.

Upon receipt of the samples at the Intertek Coquitlam laboratory, they were placed in a conditioning room where they remained in an atmosphere of 23 ± 3ºC (73.4 ± 5ºF) and 50 ± 5% relative humidity.

For each trial run, 17 3/8 in. wide by 24 ft. of sample material was placed on the floor of the flame spread tunnel. A layer of 6mm reinforced cement board was placed on the upper ledge of the tunnel, the tunnel lid was lowered into place, and the samples were then tested in accordance with CAN/ULC S102.2-10.

Flame Spread

The resultant flame spread ratings are as follows:

Sample Material	Flame Spread	Flame Spread Rating
IN-1 Siding	27	N/A
IN-2 Siding	56	N/A
IN-3 Siding	56	N/A
P-1 Siding	97	N/A
P-2 Siding	97	N/A
P-3 Siding	75	N/A
V-1 Siding	5	N/A
V-2 Siding	22	N/A
V-3 Siding	4	N/A

Smoke Developed

The resultant smoke developed ratings are as follows:

Sample Material	Smoke Developed	Smoked Developed Classification
IN-1 Siding	512	N/A
IN-2 Siding	563	N/A
IN-3 Siding	549	N/A
P-1 Siding	452	N/A
P-2 Siding	439	N/A
P-3 Siding	470	N/A
V-1 Siding	274	N/A
V-2 Siding	247	N/A
V-3 Siding	341	N/A

Vinyl Siding Institute Inc. Page 3 of 21 Letter Report No. 103020466COQ-001
April 25, 2017

This letter report completes our evaluation covered by Intertek Project No. G103020466.

A series of three test runs is required to conform to the requirements of the National Building Code of Canada.

If there are any questions regarding the results contained in this report, or any of the other services offered by Intertek, please do not hesitate to contact the undersigned.

Please note that this Letter Report does not represent authorization for the use of any Intertek certification marks.

Tested and Reported by:	Greg Philp	Reviewed by:	Riccardo DeSantis
Title:	Technician, Building Products Testing	Title:	Manager, Building Products
Signature:	Gregory Philp	Signature	Riccardo DeSantis
Date	April 25, 2017	Date:	April 25, 2017

Vinyl Siding Institute Inc. Page 4 of 21 Letter Report No. 103020466COQ-001
April 25, 2017

CAN/ULC S102.2-10 DATA SHEETS

Standard: Canadian ULC S102.2 Page 1 of 2

Client: Vinyl Siding Insitute
Date: 04 21 2017
Project Number: 103020466
Test Number: 1
Operator: Greg Philp

Specimen ID: IN 1 Siding

TEST RESULTS

FLAMESPREAD INDEX: 25

SMOKE DEVELOPED INDEX: 510

SPECIMEN DATA . . .

Time to Ignition (sec): 39
Time to Max FS (sec): 513
Maximum FS (mm): 2912.2
Time to 527 C (sec): Never Reached
Time to End of Tunnel (sec): Never Reached
Max Temperature (C): 315
Time to Max Temperature (sec): 581
Total Fuel Burned (cubic feet): 46.00

FS*Time Area (M*min): 14.5
Smoke Area (%A*min): 927.3
Unrounded FSI: 26.8
Unrounded SDI: 511.5

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 42.0
Red Oak Smoke Area (%A*min): 181.3

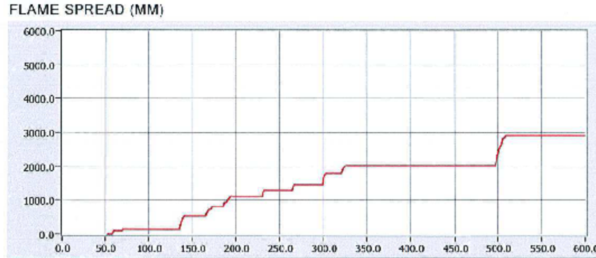
Tested By: ____________ Reviewed By: R.D. ____________

Vinyl Siding Institute Inc. Page 5 of 21 Letter Report No. 103020466COQ-001
April 25, 2017

CAN/ULC S102.2-10 DATA SHEETS

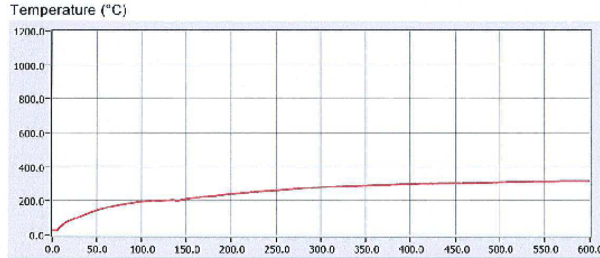
Client: Vinyl Siding Insitute
Specimen ID: IN 1 Siding
Test No.: 103020466
Standard: Canadian ULC S102.2

FLAME SPREAD (MM)



Smoke (%A)

Temperature (°C)



Time (sec)

600

Tested By: [signature] Reviewed By: R.D.

CAN/ULC S102.2-10 DATA SHEETS

Intertek

Standard: Canadian ULC S102.2 Page 1 of 2

Client: Vinyl Siding Insitute
Date: 04 21 2017
Project Number: 103020466
Test Number: 1
Operator: Greg Philp

Specimen ID: IN 2 Sicing

TEST RESULTS

FLAMESPREAD INDEX: 55

SMOKE DEVELOPED INDEX: 565

SPECIMEN DATA . . .

Time to Ignition (sec):	30
Time to Max FS (sec):	595
Maximum FS (mm):	5775.8
Time to 527C (sec):	458
Time to End of Tunnel (sec):	420
Max Temperature (C):	562
Time to Max Temperature (sec):	532
Total Fuel Burned (cubic feet):	46.01
FS*Time Area (M*min):	30.2
Smoke Area (%A*min):	1020.1
Unrounded FSI:	56.0
Unrounded SDI:	562.5

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec):	42.0
Red Oak Smoke Area (%A*min):	181.3

Tested By: ______ Reviewed By: R.D.

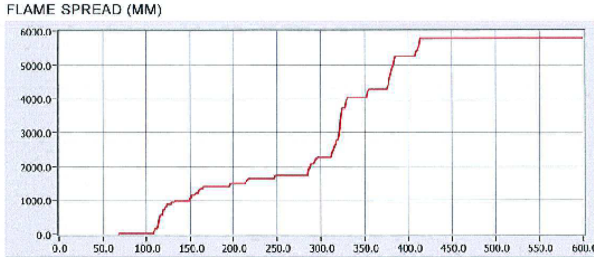
CAN/ULC S102.2-10 DATA SHEETS

Intertek

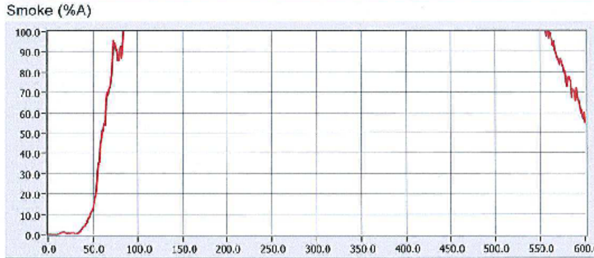
Client: Vinyl Siding Insitute Specimen ID: IN 2 Siding

Test No.: 103020466 Standard: Canadian ULC S102.2

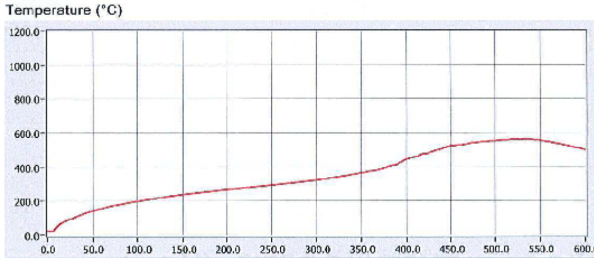
FLAME SPREAD (MM)



Smoke (%A)



Temperature (°C)



Time (sec)

600

Tested By: ______

Reviewed By: R.D.

CAN/ULC S102.2-10 DATA SHEETS

Intertek

Standard: Canadian ULC S102.2 Page 1 of 2

Client: Vinyl Siding Insitute
Date: 04 24 2017
Project Number: 103020466
Test Number: 1
Operator: Greg Philp

Specimen ID: IN 3 Siding

TEST RESULTS

FLAMESPREAD INDEX: 55

SMOKE DEVELOPED INDEX: 550

SPECIMEN DATA . . .

Time to Ignition (sec):	39
Time to Max FS (sec):	536
Maximum FS (mm):	5776.6
Time to 527 C (sec):	Never Reached
Time to End of Tunnel (sec):	500
Max Temperature (C):	448
Time to Max Temperature (sec):	522
Total Fuel Burned (cubic feet):	45.99
FS*Time Area (M*min):	30.4
Smoke Area (%A*min):	995.5
Unrounded FSI:	56.4
Unrounded SDI:	549.1

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec):	42.0
Red Oak Smoke Area (%A*min):	181.3

Tested By: ________

Reviewed By: R.D.

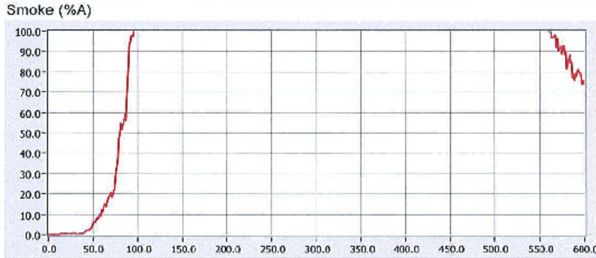
CAN/ULC S102.2-10 DATA SHEETS

Client: Vinyl Siding Insitute Specimen ID: IN 3 Siding

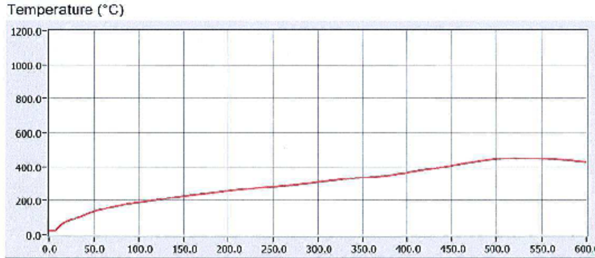
Test No.: 103020166 Standard: Canadian ULC S102.2

FLAME SPREAD (MM)

Smoke (%A)



Temperature (°C)



Time (sec)

600

Tested By: [signature] Reviewed By: R.D.

Vinyl Siding Institute Inc. | Page 10 of 21 | Letter Report No. 103020466COQ-001
April 25, 2017

Standard: Canadian ULC S102.2

Client: Vinyl Siding Irsitute
Date: 04 20 2017
Project Number: 103020466
Test Number: 1
Operator: Greg Philp

Specimen ID: P1 Siding

TEST RESULTS

FLAMESPREAD INDEX: 95
SMOKE DEVELOPED INDEX: 450

SPECIMEN DATA . . .

Time to Ignition (sec): 79
Time to Max FS (sec): 434
Maximum FS (mm): 5775.2
Time to 527C (sec): 275
Time to End of Tunnel (sec): 243
Max Temperature (C): 755
Time to Max Temperature (sec): 449
Total Fuel Burned (cubic feet): 46.01

FS*Time Area (M*min): 42.6
Smoke Area (%A*min): 820.3
Unrounded FSI: 97.4
Unrounded SDI: 452.4

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 42.0
Red Oak Smoke Area (%A*min): 181.3

Tested By: ____________ Reviewed By: R.D. ____________

CAN/ULC S102.2-10 DATA SHEETS

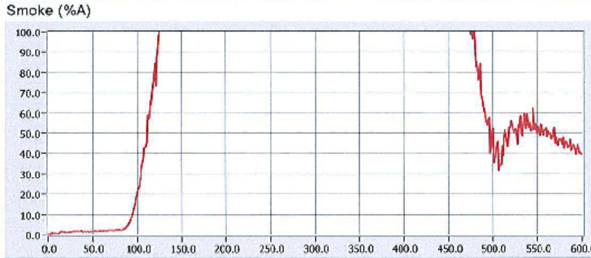
Intertek

Client: Vinyl Siding Insitute Specimen ID: P1 Siding

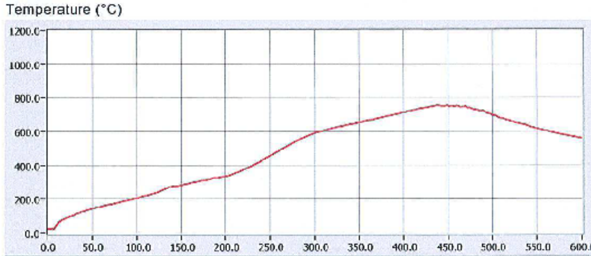
Test No.: 103020466 Standard: Canadian ULC S102.2

FLAME SPREAD (MM)

Smoke (%A)



Temperature (°C)



Time (sec)

600

Tested By: ________ Reviewed By: R.D. ________

Standard: Canadian ULC S102.2

Client: Vinyl Siding Institute
Date: 04 25 2017
Project Number: 103020466
Test Number: 1
Operator: Greg Philp

Specimen ID: P 2 Siding

TEST RESULTS

FLAMESPREAD INDEX: 95
SMOKE DEVELOPED INDEX: 440

SPECIMEN DATA . . .

Time to Ignition (sec): 33
Time to Max FS (sec): 285
Maximum FS (mm): 5775.1
Time to 527C (sec): 277
Time to End of Tunnel (sec): 251
Max Temperature (C): 682
Time to Max Temperature (sec): 437
Total Fuel Burned (cubic feet): 46.01

FS*Time Area (M*min): 42.6
Smoke Area (%A*min): 795.8
Unrounded FSI: 97.2
Unrounded SDI: 439.0

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 42.0
Red Oak Smoke Area (%A*min): 181.3

Tested By: ____________ Reviewed By: R.D. ____________

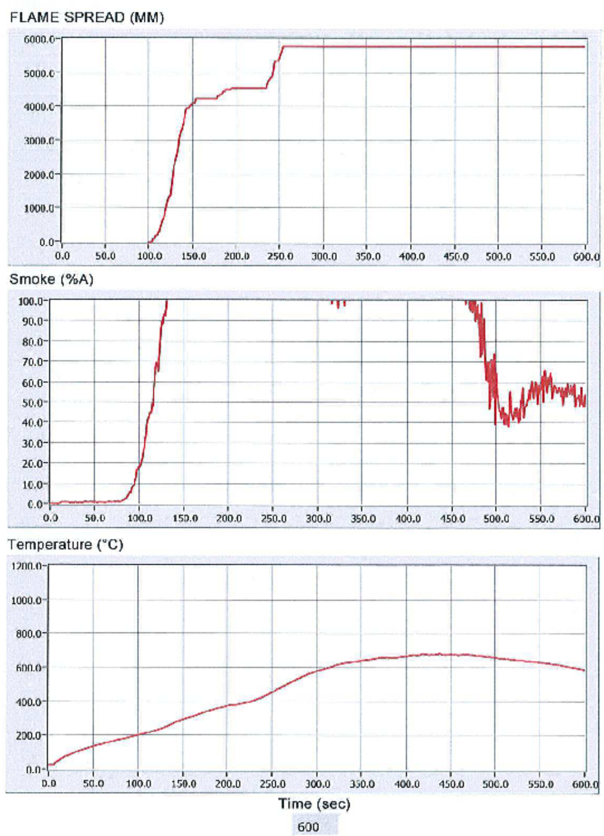
CAN/ULC S102.2-10 DATA SHEETS

Intertek

Page 2 of 2

Client: Vinyl Siding Institute Specimen ID: P 2 Siding

Test No.: 103020466 Standard: Canadian ULC S102.2



Tested By: ________ Reviewed By: R.D.

CAN/ULC S102.2-10 DATA SHEETS

Standard: Canadian ULC S102.2 Page 1 of 2

Client: Vinyl Siding Institute
Date: 04 25 2017
Project Number: 103020466
Test Number: 1
Operator: Greg Philp

Specimen ID: P 3 Siding

TEST RESULTS

FLAMESPREAD INDEX: 75
SMOKE DEVELOPED INDEX: 470

SPECIMEN DATA . . .

Time to Ignition (sec): 47
Time to Max FS (sec): 324
Maximum FS (mm): 5780.7
Time to 527C (sec): 327
Time to End of Tunnel (sec): 280
Max Temperature (C): 744
Time to Max Temperature (sec): 495
Total Fuel Burned (cubic feet): 45.99

FS*Time Area (M*min): 37.7
Smoke Area (%A*min): 851.7
Unrounded FSI: 75.4
Unrounded SDI: 469.8

CALIBRATION DATA . . .

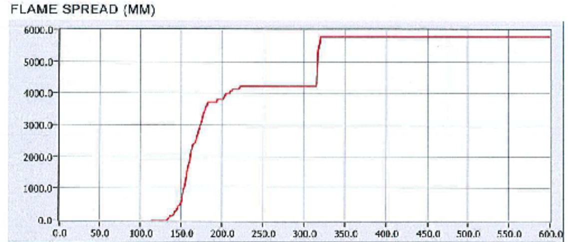
Time to Ignition of Last Red Oak (Sec): 42.0
Red Oak Smoke Area (%A*min): 181.3

Tested By: ____________ Reviewed By: R.D.

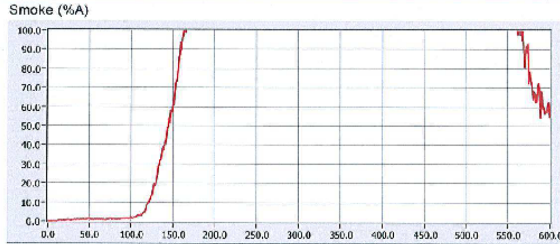
Client: Vinyl Siding Institute | Specimen ID: P 3 Siding

Test No.: 103020466 | Standard: Canadian ULC S102.2

FLAME SPREAD (MM)



Smoke (%A)



Temperature (°C)

Time (sec)

600

Tested By: ________ Reviewed By: R.D.

CAN/ULC S102.2-10 DATA SHEETS

Intertek

Standard: Canadian ULC S102.2 Page 1 of 2

Client: Vinyl Siding Institute
Date: 04 24 2017
Project Number: 103020466
Test Number: 1
Operator: Greg Philp

Specimen ID: V 1 Siding

TEST RESULTS

FLAMESPREAD INDEX: 5

SMOKE DEVELOPED INDEX: 275

SPECIMEN DATA . . .

Time to Ignition (sec): 44
Time to Max FS (sec): 544
Maximum FS (mm): 547.7
Time to 527 C (sec): Never Reached
Time to End of Tunnel (sec): Never Reached
Max Temperature (C): 264
Time to Max Temperature (sec): 599
Total Fuel Burned (cubic feet): 45.39

FS*Time Area (M*min): 2.4
Smoke Area (%A*min): 495.8
Unrounded FSI: 4.5
Unrounded SDI: 275.5

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 42.0
Red Oak Smoke Area (%A*min): 181.3

Tested By: ________ Reviewed By: R.D. ________

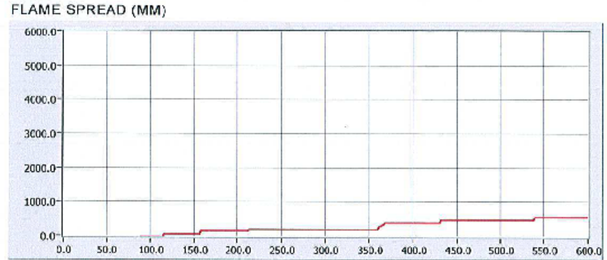
CAN/ULC S102.2-10 DATA SHEETS

Vinyl Siding Institute Inc. Page 17 of 21 Letter Report No. 103020466COQ-001
April 25, 2017

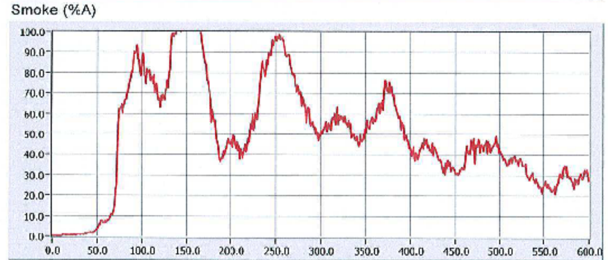
Client: Vinyl Siding Institute Specimen ID: V 1 Siding

Test No.: 103020466 Standard: Canadian ULC S102.2

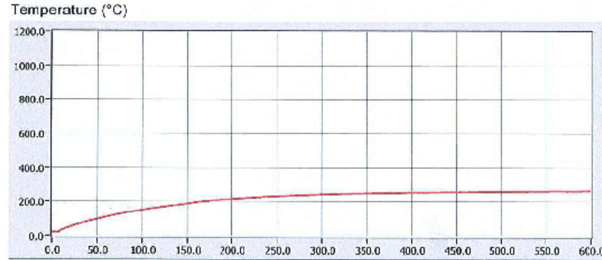
FLAME SPREAD (MM)



Smoke (%A)



Temperature (°C)



Time (sec)

600

Tested By:

Reviewed By: R.D.

CAN/ULC S102.2-10 DATA SHEETS

Intertek

Standard: Canadian ULC S102.2 Page 1 of 2

Client: Vinyl Insitute
Date: 04 212017
Project Number: 103020466
Test Number: 1
Operator: Greg Philp

Specimen ID: V2 Siding

TEST RESULTS

FLAMESPREAD INDEX: 20

SMOKE DEVELOPED INDEX: 245

SPECIMEN DATA . . .

Time to Ignition (sec):	34
Time to Max FS (sec):	176
Maximum FS (mm):	1501.2
Time to 527 C (sec):	Never Reached
Time to End of Tunnel (sec):	Never Reached
Max Temperature (C):	270
Time to Max Temperature (sec):	579
Total Fuel Burned (cubic feet):	40.01
FS*Time Area (M*min):	11.8
Smoke Area (%A*min):	447.5
Unrounded FSI:	21.9
Unrounded SDI:	246.8

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec):	42.0
Red Oak Smoke Area (%A*min):	181.3

Tested By: ____________ Reviewed By: R.D. ____________

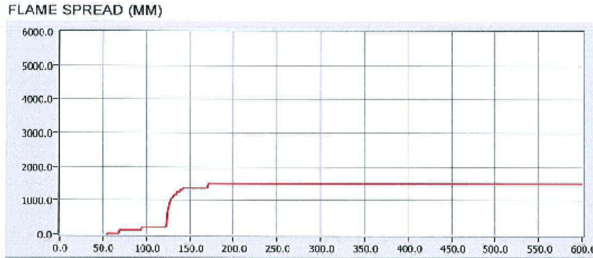
CAN/ULC S102.2-10 DATA SHEETS

Intertek

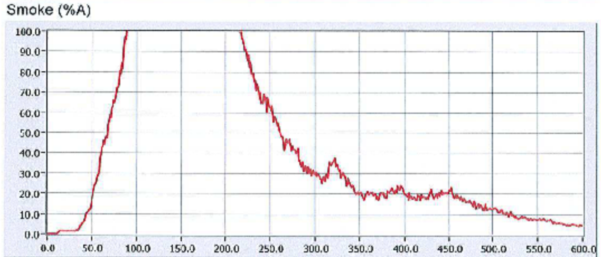
Client: Vunyl Insitute Specimen ID: V2 Siding

Test No.: 103020466 Standard: Canadian ULC S102.2

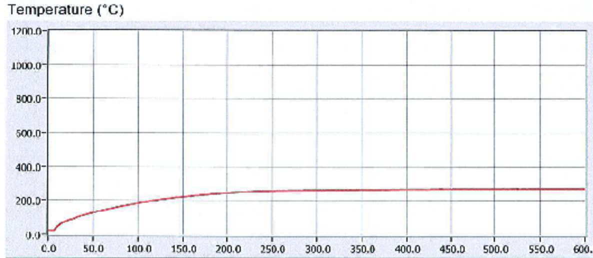
FLAME SPREAD (MM)



Smoke (%A)



Temperature (°C)



Time (sec)

600

Tested By: ______

Reviewed By: R.D.

CAN/ULC S102.2-10 DATA SHEETS

Standard: Canadian ULC S102.2 Page 1 of 2

Client: Vinyl Siding Institute
Date: 04 24 2017
Project Number: 103020466
Test Number: 1
Operator: Greg Philp

Specimen ID: V 3 Siding

TEST RESULTS

FLAMESPREAD INDEX: 5

SMOKE DEVELOPED INDEX: 340

SPECIMEN DATA . . .

Time to Ignition (sec):	68
Time to Max FS (sec):	589
Maximum FS (mm):	933.9
Time to 527 C (sec):	Never Reached
Time to End of Tunnel (sec):	Never Reached
Max Temperature (C):	290
Time to Max Temperature (sec):	600
Total Fuel Burned (cubic feet):	46.01
FS*Time Area (M*min):	2.2
Smoke Area (%A*min):	619.0
Unrounded FSI:	4.1
Unrounded SDI:	341.4

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec):	42.0
Red Oak Smoke Area (%A*min):	181.3

Tested By: ________ Reviewed By: R.D.

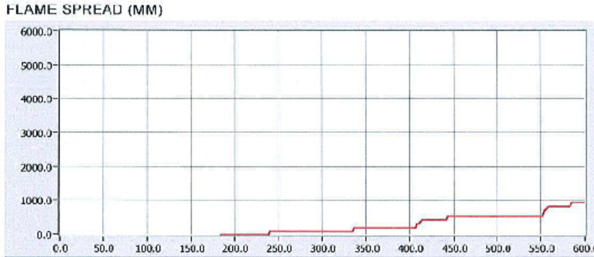
CAN/ULC S102.2-10 DATA SHEETS

Vinyl Siding Institute Inc. Page 21 of 21 Letter Report No. 103020466COQ-001
April 25, 2017

Client: Vinyl Siding Institute Specimen ID: V 3 Siding

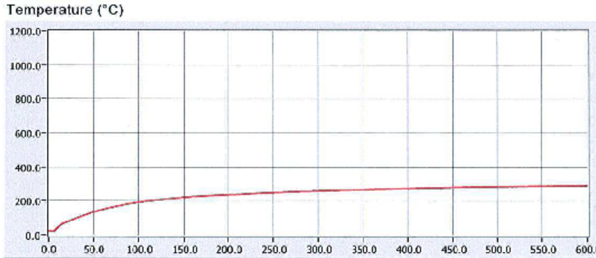
Test No.: 103020466 Standard: Canadian ULC S102.2

FLAME SPREAD (MM)



Smoke (%A)

Temperature (°C)



Time (sec)

600

Tested By: ________ Reviewed By: R.D.

VINYL SIDING INSTITUTE™

VSI Overview and Table of Contents June 16, 2022

1800 Diagonal Road, Suite 545 / Alexandria, VA 22314 / vinylsiding.org / hello@vinylsiding.org

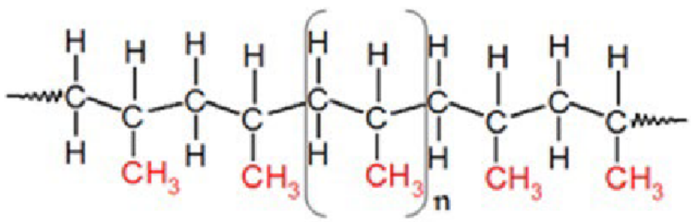
Table of Contents

What is Polypropylene Siding?

Polypropylene siding is cladding made principally from polypropylene polymer.

Polypropylene is a type of polyolefin. Polypropylene (PP) is a tough, rigid and crystalline thermoplastic produced from propene (or propylene) monomer. It is a linear hydrocarbon resin and its chemical formula is (C3H6)n. It is the lightest polymers among all commodity plastics, low density, stress-cracking resistant and the list goes on.

Polypropylene is a tough, rigid and crystalline thermoplastic produced from propene (or propylene) monomer. It is a linear hydrocarbon resin and its chemical formula is $(C_3H_6)n$.



Molecular Structure of Polypropylene

The creation of polypropylene siding utilizes an injection molding process that enables the final product to have a highly defined three-dimensional pattern in a variety of profiles and colors.

It is highly durable, able to withstand extreme heat, and will maintain its shape. This makes it an excellent choice for house siding as it is impact resistance, doesn't warp, and won't fade or corrode in the sun.

It is also a flexible plastic that can be easily molded, allowing polymer siding to mimic the appearance of genuine wood.[(1)]

[(1)] https://omnexus.specialchem.com/selection-guide/polypropylene-pp-plastic

VSI Polypropylene Test Data

- 2020 Testing Synopsis
- 2022 Test Report

Fire Expert Testimony

- 2022

ASTM E84 - *Standard Test Method for Surface Burning Characteristics of Building Materials*

ASTM E84 Test Explanation

This 10-min fire-test-response standard for the comparative surface burning behavior of building materials is applicable to exposed surfaces such as walls and ceilings. The test is conducted with the specimen in the ceiling position with the surface to be evaluated exposed face down to the ignition source. The material, product, or assembly shall be capable of being mounted in the test position during the test. Thus, the specimen shall either be self-supporting by its own structural quality, held in place by added supports along the test surface, or secured from the back side.[2]

[2] https://www.intertek.com/building/standards/astm-e84/?utm_source=social&utm_medium=LinkedIn&utm_content=showcaseBC&utm_campaign=PBU-BC-ALL-ITK-US-2022-05-12-astme84

ASTM E119 – *Standard Test Methods for Fire Tests of Building Construction and Materials*

ASTM E119 Test Explanation

This test method relates to the hourly fire resistance rating for a wall assembly. An hourly fire rating is the time a wall assembly can be expected to contain a fire and, in the case of load-bearing walls, continue to provide some structural support. This test is not a requirement for a material to be used in noncombustible construction but can be a requirement based on the construction and occupancy types for the building. Chapter 6 of the IBC identifies where hourly-rated wall assemblies are required and what the required hourly rating is for the respective building classifications. Chapter 7 of the IBC contains a list of typical rated wall assemblies.

Combustible materials may be used in fire-rated assemblies, provided they do not change the fire rating. In other words, if a wall assembly is rated as a “two-hour” wall, adding a combustible element must not cause the fire endurance rating to be less than two hours. The air barrier material is more likely to have an effect as its mass and combustibility increase. Both mass and combustibility contribute to the overall fuel load available to burn. Hourly ratings for assemblies can be established both by testing and analysis.

NFPA 268 – *Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source*

NFPA 268 Test Explanation

This is a test to determine the ignitability characteristics of an exterior wall assembly when subjected to a radiant heat energy source. With certain building types and some exceptions which are set forth in the codes, exterior walls with foam plastic insulation shall not exhibit flaming when tested per NFPA 268.

NFPA 268 is designed to assess the potential of a fire in one building to ignite an adjacent building. This test is useful to establish minimum set-backs from property lines in urban areas for buildings with combustible cladding.

SFM Standard 12-7-A – *Materials and Construction Methods for Exterior Wildfire Exposure*

SFM Standard 12-7-A Test Explanation

This standard is used to evaluate an exterior wall assembly's ability to passively resist fire penetration from a direct-flame exposure from the exterior of the wall assembly. The ability to resist exterior fire-penetration is critical to the performance of the building in the areas where the 12-7A-1 is prescribed due to the heightened of exterior/wildland fires. The prescription of this test method is to ensure that an existing fire does not penetrate.

CAN/ULC S102 – *Surface Burning Characteristics of Building Materials and Assemblies*

CAN/ULC S102 Test Explanation

This standard pertains to the evaluation of interior building surfaces characteristics including walls, ceiling and flooring products. The CAN/ULC-S102 test, when conducted in triplicate, reports Flame Spread (FS) and Smoke Development (SD) values for the specific product or assembly evaluated.

The CAN/ULC-S102 equipment, known as the *Steiner Tunnel*, exposes the material, 21" wide x 24' long sample size, to a 90kW flame for a 10-minute duration. The flame propagation along the material's exposed surface is visually observed and average Flame Spread value determined. A light and photoelectric cell record smoke obscuration during the test to validate the material's smoke development characteristics.[3]

[3] https://canada.ul.com/ulcprograms/buildingandconstructionmaterials/surface-burning-testing/

SOUTHWEST RESEARCH INSTITUTE®

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CHEMISTRY AND CHEMICAL ENGINEERING DIVISION
FIRE TECHNOLOGY DEPARTMENT
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FAX (210) 522-3377

WILDLAND URBAN INTERFACE (WUI) BUILDING MATERIALS TESTING STANDARD CA SFM 12-7A-1, EXTERIOR WALL SIDING AND SHEATHING (2001), NONWEATHERED WALL ASSEMBLIES

Product ID: ***30138, Polypropylene Siding***

FINAL REPORT
Consisting of 13 Pages

SwRI® Project No: 01.14436.01.202a
Test Date: October 27-28, 2008
Report Date: December 5, 2008

Prepared for:

CertainTeed Corporation
803 Belden Road
Jackson, MI 49203

Prepared by:

Chad Brewer
Assistant Technical Specialist
Material Flammability Section

Approved by:

Anthony L. Sauceda
Group Leader
Material Flammability Section

HOUSTON, TEXAS (713) 977-1377 • WASHINGTON, DC (301) 881-0226

INTRODUCTION

This report presents the results of tests conducted on a material supplied by the Client, in accordance with Wildland Urban Interface Building Materials Testing Standard CA SFM 12-7A-1, *Exterior Wall Siding and* Sheathing (2001). This standard determines the performance of exterior walls of structures when exposed to direct flames. The tests were performed at Southwest Research Institute's (SwRI) Fire Technology Department, in San Antonio, TX. The results apply specifically to the specimens tested, in the manner tested, and not to similar materials, nor to the performance when used in combination with other materials.

The Client's materials are mechanically fastened to a 2 × 4-in. wood stud framing assembly, with studs spaced 16 in. on center. Sheathing material (optional) is applied over the framing assembly. If sheathing is used, the test standard requires a nominal ½-in. thick oriented-strand board of Exposure 1 rating. Other sheathing materials may be used, but will be reported. The sheathing is applied with one seam located on a selected stud with a 0.125-in. gap. The Client's cladding material is attached according to the manufacturer's directions. All potential cladding joints that represent a typical wall are incorporated into the assembly, see Figure 1. Other components, such as building felt and sheathing are chosen to meet the manufacturer's specification and/or local building codes. Cavity insulation is not used.

The standard requires that three complete assemblies be tested. Should the Client choose the optional pretest weathering, six assemblies shall be tested, three weathered, and three nonweathered. SwRI does not perform the optional pretest weathering exposure described in Section 8 of the standard; therefore, Clients choosing this option must provide SwRI with both weathered and nonweathered materials.

Prior to testing, all assemblies must be stored for at least two weeks in a conditioned space, maintained between 60 and 90 °F.

During testing, each assembly is exposed to a 150 ± 8-kW propane burner for 10 min. The test is continued for an additional 60-min observation period, or until all combustion has ceased. During the observation period, the time, location, and nature of flame penetration is noted.

The conditions of acceptance according to CA SFM 12-7A-1 are as follows:

1) Absence of flame penetration through the wall assembly at any time.
2) Absence of evidence of glowing combustion on the interior surface of the assembly at the end of the 70 min test.

Should one of the three replicates fail to meet the conditions of acceptance, three additional tests may be run. All of the additional tests must meet the conditions of acceptance.

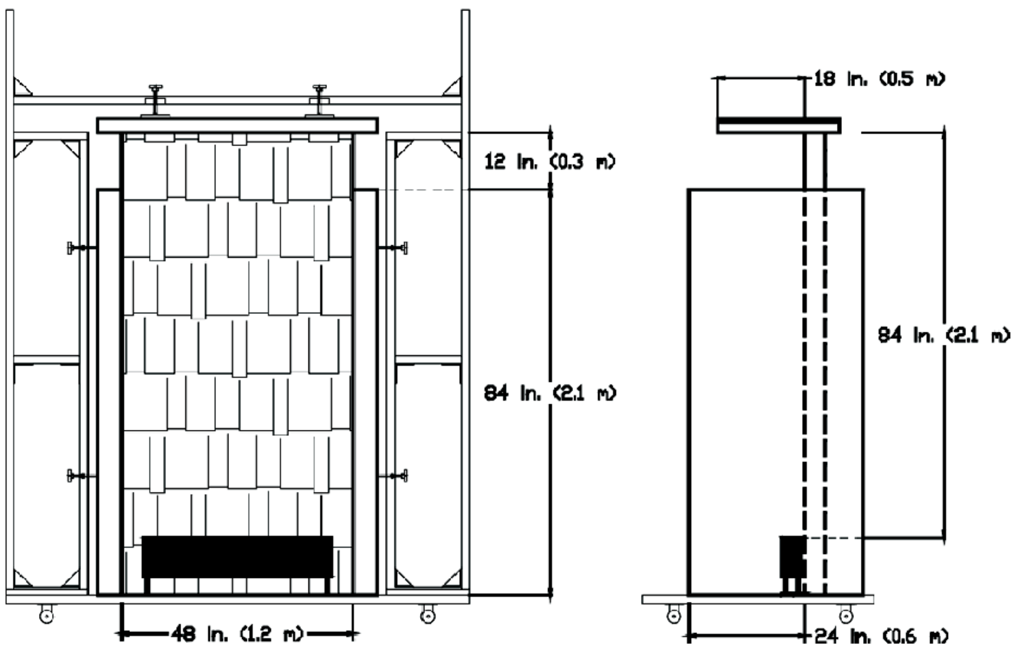


Figure 1. Exterior Wall Test Assembly.

WUI Building Materials Testing Standard
CA SFM 12-7A-1 (2001)

Client:	CertainTeed Corporation
Project No.:	01.14436.01.202a
Product ID:	*30138, Polypropylene Siding*
No. of Tests:	3
Product Description:	Polypropylene Siding, Cedar Impressions Double 7 Sable Brown/Natural Clay Molded Polypropylene Panels.
Nominal Thickness:	0.10 in.
Dimensions:	14 in. wide by 48 in. long
Composition:	Polypropylene
Construction Details:	2 × 4-in. studs, 16 in. on center with nominal ½-in. oriented strand board (OSB) with nominal ½-in. type X Gypsum wallboard for sheathing. Each wall assembly was then wrapped in Dupont Tyvek HomeWrap. Cladding attached according to manufacturer specifications.
Date Received:	October 10, 2008
Conditioning:	2 weeks at 72 °F (+/-3 °F)

Test Results

Tests 1 through 3 in Table 1 are nonweathered assemblies. Weathered assemblies were not tested.

Table 1. Results for Nonweathered Wall Assemblies.

Test No.	Date Tested	Moisture Content Range	Flame Penetration (Y/N)	Glowing Combustion (Y/N)	Pass/Fail	Observations
1	10/27/08	6%–7%	N	N	Pass	See Table 2
2	10/28/08	6%–7%	N	N	Pass	See Table 3
3	10/28/08	7%–8%	N	N	Pass	See Table 4

Select photographs taken before, during, and after testing can be found in Figures 2 through 13. The material identified as ***30138*** *(Cedar Impressions Double 7)*, meets the Conditions of Acceptance described in CA SFM 12-7A-1.

Table 2. Test 1 of 3 Observations.

Time (min:s)	Observation
00:00	**Ignition of burner.**
00:12	Discoloration of panels, light grey smoke.
00:37	Warping of panels directly above the burner.
00:56	Discoloration up to 5 ft above the floor and heavy warping of the panels up to 3 ft above the floor.
01:13	Discoloration up to 6½ ft above the floor and melting of the panels 2½ ft above the floor with light grey smoke.
01:25	Melting on left side up to 4 ft above the floor. Appearance of gypsum wallboard behind test product.
01:32	Melting on left side up to 6 ft with intermittent flame impingement of the false ceiling.
01:50	Consistent flame impingement on the false ceiling.
02:52	Flames hitting false ceiling and traveling across wall/ceiling junction and exiting both sides.
04:04	Wall fully engulfed, medium grey smoke.
04:18	Increased volume of dark grey smoke.
05:31	Decrease in dark smoke, Approximately 90% of the panels have melted off.
06:05	Decrease in flame and smoke, large pooling of material on fire under the burner.
06:49	Panels have melted off. Continued burning of the pooled material, flames up to 6 ft mostly from burner.
10:00	**Burner shut off, flames down to 2½ ft above the floor from pooled material. Begin monitoring for 60 min.**
25:06	Pooled material continues to burn below the burner, flames up to 10 in. above the floor.
30:16	Evidence of charring on left side panel. No charring or discoloration on the backside of the test panel.
59:34	No signs of charring or discoloration on the back of the test panel. Pooled material still smoldering and some flame visible.
60:00	No change.
70:00	**No flame or glowing combustion existed on subject panel at test termination. Pooled material still smoldering and some flame visible at the end of 70 min.**
70:05	**Extinguished with water. End of Test**

Note: All percentages and heights are approximate.

Table 3. Test 2 of 3 Observations.

Time (min:s)	Observation
00:00	**Ignition of burner.**
00:12	Light discoloration up to 4 ft above the floor and warping to 3 ft above the floor.
00:38	Heavy discoloration and warping up to 4 ft and melting just above the burner.
00:58	Gypsum revealed at 4 ft with medium grey smoke.
01:58	Increased flame, consistent flame impingement to the false ceiling.
02:25	Gypsum revealed at 8 ft.
02:51	Full wall involvement.
03:08	Flame exiting both sides of the wall/ceiling junction.
05:11	No change.
05:38	Flames wrapping around the top 6 in. of the test panel and charring back side of the studs.
08:00	No change.
10:00	**Burner shut off.**
10:04	Flames subside to 4 ft, pooled material continues to burn from both the floor and burner.
37:13	Lower left back corner of the test panel showing dark discoloration with a 10-in. radius, pooled material also in the lower left hand corner.
47:59	Flames subside from pooled material in burner and on the floor to only 5 to 6 in. in height.
52:28	Same conditions exist.
70:00	Same conditions exist. Test terminated. Flames extinguished with water.
70:00	**No flame or glowing combustion existed on inside wall assembly at test termination.**
70:05	Extinguished with water.

Note: All percentages and heights are approximate.

Table 4. Test 3 of 3 Observations.

Time (min:s)	Observation
00:00	**Ignition of burner.**
0:11	Medium discoloration up to 5 ft above the floor.
00:20	Dark discoloration between 1 ft and 4 ft above the floor with melting in same region.
00:32	Medium discoloration up to 6½ ft with melting up to 5 ft above the floor.
00:52	Continuous flames up to 5½ ft with intermittent flames to 8 ft above the floor.
01:00	Delamination of the sample located in the center of the wall from 1 ft to 3 ft above the floor.
01:02	Delamination of the sample located in the center of the wall from 1 ft to 5 ft above the floor.
01:28	Delamination of the sample is the width of the burner and up to 4½ ft above the floor.
01:59	Intermittent flame up to 8 ft above the floor with an increase in smoke. Black in color.
02:30	Continuous flames hitting the false ceiling at 8 ft with full wall engagement.
02:47	Flame exiting both sides of the wall/ceiling junction up to 1 ft.
03:01	Moderate reduction in flame activity with small pooling of material at the base of the wall.
03:28	Moderate reduction in flame activity again. More pooling of material at the base of the wall up to 10 in. away.
04:59	Approximately 90% of the vinyl siding consumed with large pooling in the burner and on the floor, which continues to add to the flames.
05:41	Wall has been completely consumed, with only the pools in the burner and floor adding to the flames. Still heavy dark smoke being emitted.
06:17	No discoloration or flame penetration of the inside wall assembly.
07:24	No discoloration or flame penetration of the inside wall assembly.
09:02	No change.
09:25	Flames continue up to 7 ft above the floor.
10:00	**Burner turned off. No discoloration or flame penetration on the backside of the wall assembly.**
10:03	Flames remain at 3 ft above the floor.
15;31	Flames reduce to 6 to10 in. above the burner with large pooling up to 12 in. away from the base of the wall.
21:43	Pooling with fire remains at the sample wall/side wall junction with moderate flame existing in the burner itself due to melted sample. Both left and right side wall have charring and glowing combustion due to pooling of the product in those corners.
30:07	No discoloration or flame penetration of the inside wall assembly.
59:09	No change.
70:00	**Test termination. No discoloration, flame penetration, or glowing combustion on the backside of the wall test assembly.**
70:24	Test wall extinguished with water.

Note: All percentages and heights are approximate.

Figure 1. Example of Pretest Setup.

Figure 2. Test #1: Sample *30138* at 56 s into the Test.

Figure 3. Test #1: Sample *30138* at 6 min 49 s into the Test.

Figure 4. Test #1: Sample *30138* at 70 min 6 s into the Test.

Figure 5. Test #2: Sample *30138* at 33 s into the Test.

Figure 6. Test #2: Sample *30138* at 4 min 14 s into the Test.

Figure 7. Test #2: Sample *30138* at 10 min 4 s into the Test.

Figure 8. Test #3: Sample *30138* at 54 s into the Test.

Figure 9. Test #3: Sample *30138* at 4 min 39 s into the test.

Figure 10. Test #3: Sample *30138* at 27 min 49 s into the Test.

Figure 11. Test #3: Sample *30138* at 70 min. End of Test.

TECHNICAL REPORT

POLYPROPYLENE FIRE TESTING SYNOPSIS

NOVEMBER 9, 2020

VINYL SIDING INSTITUTE™

BACKGROUND AND PURPOSE

In January 2020, the VSI Technical Committee (TC) formed the Polypropylene Fire Work Group (PPFWG) to study fire behavior in high-density population settings. The work group defined different wall installations scenarios to be tested, then identified and sourced PP siding materials. The test standard used to understand these characteristics was a modified version using a dual-wall system of ASTM E2707 Standard Test Method for Determining Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure. The polypropylene siding selected has one of the highest material densities on the market, which provided a cladding with one of the highest fuel loads in the category.

In October 2020, two VSI staff members traveled to Western Fire Center (WFC) in Kelso, Washington, to witness the polypropylene fire testing. The in-person attendees discussed each test setup with the WFC technicians and determined the sequence of the testing. Photographs were taken to capture the testing, and the testing was streamed live to the work group audience.

The purpose of the testing was to see how the polypropylene siding performed when tested in accordance with the fire separation requirement identified in the International Building Code (IBC) and the International Residential Code. Section 1403.12 of the IBC (similar in the IRC), the fire separation distance between a building with polypropylene siding and the adjacent building shall be not less than 10 feet. Additionally, testing with the fire separation being less than 10 feet was conducted to witness first-hand how the material performed during a 10-minute burn test on the burner and receiver walls replicating building to building fire spread. Polypropylene siding was installed on both the ignition source, and the walls exposed to the ignition source, to simulate fire in high density settings.

EXECUTIVE SUMMARY

The product was tested in a setting that represents tight lot line settings (i.e. close fire separation distance) by having a burner wall and an exposed receiver wall; the tests were spaced at 4', 6', and 10+' respectively. The product was tested with just the gypsum sheathing and as part of a fully combustible wood wall setup. Based on the results of the testing, the following has been noted:

- Polypropylene typically melts, spits, and falls off the wall, and in some cases, will continue to collect and burn on the floor within 18 inches of the burner wall
- At no point did any portion of the polypropylene siding receiver wall combust, even at the closest 4' wall separation
- The heat release rate of the polypropylene siding & gypsum sheathing base wall was about 65% less than the heat release rate of the polypropylene & fully combustible wood wall
- The rate of burn (speed) was significantly quicker for the fully combustible wood wall versus the wall with polypropylene siding & gypsum sheathing base wall
- Observation of the reaction of all the wall assemblies to the fire exposures during the tests clearly show and confirm that the respective fire resistive and fire separation distance sections within the building code provide the intended protection of exterior walls with polypropylene siding.

TESTING DETAILS

All walls were clad in polypropylene siding.

6' Wall Separation – Burner Wall Gypsum Board Sheathing, Receiver Wall Gypsum Board Sheathing

4' Wall Separation – Burner Wall Wood Sheathing and Gypsum Board Sheathing, Receiver Wall Wood Sheathing

10' 1" Wall Separation – Burner Wall Wood Sheathing Over Gypsum Board Sheathing, Receiver Wall Wood Sheathing

Single Wall Baseline Tests (2) – Wood Sheathing, Gypsum Board Sheathing

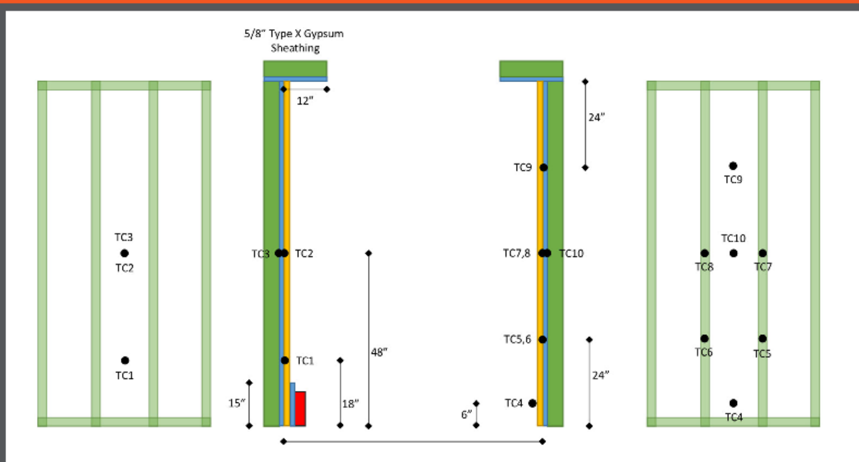


Photo of 4' burner wall

6' WALL TEST RESULTS AND CONCLUSION

ASTM E2707 Standard Test Method for Determining Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure prescribes a 4"×39" gas sand burner that exposes a 150 kW flame to a 4'×8' exterior wall assembly for a period of 10 min. The standard measures the ability of the sample to resist fire penetration of the material following direct flame exposure. However, this modified test provided for a 2nd receiver wall to be placed 6' directly opposing the burner wall. The heat release rate was measured in the hood by means of oxygen consumption calorimetry, and thermocouples were placed on each specimen wall to monitor how the temperature changed over time. Both the burner wall and the receiver wall were comprised of wood framing, covered by gypsum sheathing and polypropylene siding.

TEST TIME (MM:SS)	EVENT
00:00	Start test – 150 kW burner on
00:30	Warping of siding on burner wall
00:55	Melted siding – exposed gypsum
01:20	Flames attached 4'
02:40	Spitting (about 12" – 18" from Burner Wall) material from siding
03:40	Most of burner wall engulfed in flames
04:40	Slight warping of receiver wall siding
05:30	Collection of fire at base of burner wall - approximately 6" from side (also into burner)
06:30	Increased melting of receiver wall siding
08:15	Reduced flames on burner wall
08:40	Deformation of siding on receiver wall
09:45	Melting/deformation of siding on receiver wall, exposing gypsum sheathing
10:00	Burner off
12:30	Most flames near base of burner wall
20:00	Terminate test – no ignition of receiver wall – some deformed/melted sections of polypropylene siding

The burner wall of a dual-wall system was exposed to a 150 kW burner for 10 minutes with an opposing receiver wall placed 6' from the burner wall. Most of the polypropylene siding from the burner wall ignited and/or melted off the wall and continued to burn at the base of the wall.

The receiver wall did not ignite but had some deformation of the polypropylene siding.

4' WALL TEST RESULTS AND CONCLUSION

This test was conducted in the same setup manner as the 6' test, with the walls being spaced 4' apart. Both the burner wall and the receiver wall were comprised of wood framing, covered by OSB sheathing, covered by gypsum sheathing, and polypropylene siding.

TEST TIME (MM:SS)	EVENT
00:00	Start test – 150 kW burner on
00:30	Warping of siding on burner wall
01:00	Melted siding – exposed gypsum
01:30	Flames attached 5'
02:00	Spitting (about 12" – 18" from Burner Wall) material from siding
02:30	More intense fire
02:45	Buckling of siding on receiver wall
03:00	Most siding fallen/melted on burner wall
03:50	Drooping receiver wall siding
04:30	25% of receiver wall gypsum sheathing exposed
06:00	Small collection of fire at base of burner wall
07:15	Receiver wall siding mostly fallen – collected at base but not ignited
10:00	Burner off - collection of fire at burner wall only
20:00	Terminate test – no ignition of receiver wall – significant deformed/melted sections of polypropylene siding

The burner wall of a dual-wall system was exposed to a 150 kW burner for 10 minutes with an opposing receiver wall placed 4' directly opposed from the burner wall. Most of the polypropylene siding from the burner wall ignited and/or melted off the wall and continued to burn at the base of the wall. The receiver wall had significant deformation and melting of the polypropylene siding, exposing most of the gypsum sheathing behind it, but no ignition of the polypropylene siding.

10’ 1” WALL TEST RESULTS AND CONCLUSION

This test was conducted in the same setup manner as both the 6’ and 4’ tests, with the walls being set at 10’ 1” apart. The burner wall was comprised of a wood framing, covered by OSB sheathing, covered by gypsum sheathing and polypropylene siding. The receiver wall was comprised of wood framing, covered by OSB sheathing and polypropylene siding.

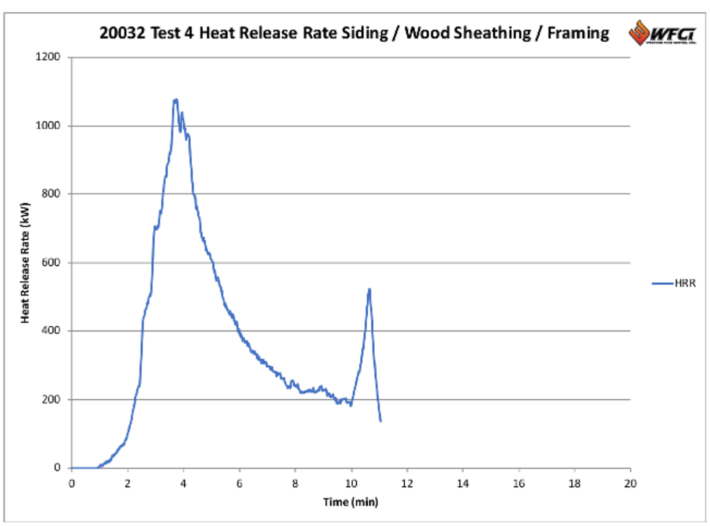
TEST TIME (MM:SS)	EVENT
00:00	Start test – 150 kW burner on
00:35	Warping of siding
01:00	Attached flames – dripping siding
01:20	Exposed OSB
01:50	Melted material up to 4’
02:30	Intense fire
03:00	Most siding burning on burner wall
04:30	Slight bowing in receiver wall siding
05:50	Reduced flames on burner wall
10:00	Burner off - collection of fire remaining on burner wall
17:30	Reduced flames
18:20	Sections of OSB falling from burner wall
20:00	Terminate test – no ignition of receiver wall – only slight bowing of siding

The burner wall of a dual-wall system was exposed to a 150 kW burner for 10 minutes with an opposing receiver wall placed 10’ 1” directly opposed from the burner wall. Most of the polypropylene siding from the burner wall ignited and/or melted off the wall and continued to burn at the base of the wall. There was also significant fire and heat release contribution from the exposed OSB sheathing. The receiver wall did not ignite and had little deformation of the polypropylene siding. Only slight bowing was observed.

BASELINE TEST RESULTS AND CONCLUSIONS

The first baseline test consisted of a single wall that was built of OSB sheathing and polypropylene siding. ASTM E2707 prescribes a 4"×39" gas sand burner that exposes a 150 kW flame to a 4'×8' exterior wall assembly for a period of 10 min. The standard measures the ability of the sample to resist fire penetration of the material following direct flame exposure. However, this modified test is intended to monitor the siding performance and not necessarily burn-through. Additionally, to better determine the burning characteristics of the burner wall, the heat release rate was measured in the hood by means of oxygen consumption calorimetry. Thermocouples were also placed on each specimen to monitor how the temperature changed over time.

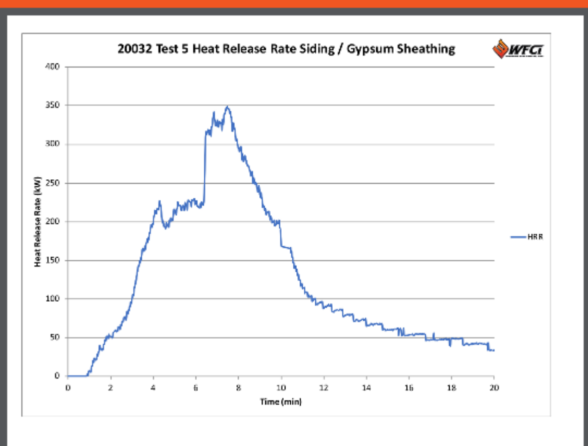
TEST TIME (MM:SS)	EVENT
00:00	Start test – 150 kW burner on
00:40	Warping of siding
01:10	Dripping material
01:25	Exposed OSB
02:00	Approximately 1/2 wall melted – increasing flames
03:00	Wall engulfed in flames – intense fire
05:10	Smoking on unexposed side
07:00	Reduced flames
07:50	Darkening on unexposed side
08:40	Glowing on unexposed side
09:55	Glowing on unexposed side
10:00	Burner off
10:45	Terminate test – need to extinguish assembly on



To the left is the heat release rate chart for Test 4.

The second baseline test consisted of a single wall that was built of an OSB base, gypsum sheathing, and polypropylene siding. All other aspects of the testing were similar to the first baseline test.

TEST TIME (MM:SS)	EVENT
00:00	Start test – 150 kW burner on
00:40	Warping of siding
00:55	Dripping material
01:10	Exposed gypsum
02:00	Flames approximately 6' up right side
03:00	Flames approximately 4' up left side
04:00	Increasing flames
04:45	Flames to soffit
07:20	Most wall engulfed
09:30	Reduced flames
10:00	Burner off - continued flames on wall and collect fire at base
20:00	Terminate test – slight flames on wall



To the left is the heat release rate chart for Test 5.

The walls of two single-wall systems were exposed to a 150 kW burner for10 min. Most of the polypropylene siding from the burner wall ignited and/or melted off the wall and continued to burn at the base of the wall. The OSB sheathing (Test 4) allowed for significantly faster and more intense flames (-4 min, peak —1100 kW) when compared to the gypsum sheathed (Test 5) assembly (-7min, peak 350 kW). The wall constructed with only OSB sheathing wall had burn-through of the sheathing prior to the burner shutting off. The gypsum sheathed wall did not have burn-through, and it also had a significantly lower heat release rate.

VINYL
SIDING
INSTITUTE™

TEST REPORT

REPORT NUMBER: G100066784COQ-004(b)
ORIGINAL ISSUE DATE: September 2 2010

EVALUATION CENTER
Intertek Testing Services NA Ltd.
1500 Brigantine Drive
Coquitlam, B.C. V3K 7C1

RENDERED TO
Novik Inc.
160 Grands-Lacs Street
St Augustin –De –Desmaures. Quebec. G3A 2K1

PRODUCT EVALUATED: Polymer Siding
EVALUATION PROPERTY: Surface Burning Characteristics

Report of testing polymer siding for compliance with the applicable requirements of the following criteria: ASTM E84-10, *Standard Test Method for Surface Burning Characteristics of Materials.*

1 Table of Contents

2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for Novik Inc. to evaluate the surface burning characteristics of polymer siding panels. Testing was conducted in accordance with the standard methods of ASTM E84-10, *Standard Test Method for Surface Burning Characteristics of Materials*.

This evaluation began August 30, 2010 and was completed the same day.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were submitted to Intertek directly from the client and were not independently selected for testing. The sample materials were received at the Evaluation Center on August 18, 2010.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The sample material consisted of six 22 in. wide by 48 in. long polymer siding panels. The samples were identified by the client as “Roughsawn Cedar Panels”.

Six 4 ft. lengths of sample product was placed on the upper ledge of the flame spread tunnel, supported with mesh and stainless steel rods which were spaced every 24 inches. A layer of 6 mm reinforced cement board was placed over top of the samples, the tunnel lid was lowered into place, and the samples were then tested in accordance with ASTM E84-10.

4 Testing and Evaluation Methods

4.1. TEST STANDARD

The results of the tests are expressed by indexes, which compare the characteristics of the sample under tests relative to that of select grade red oak flooring and asbestos-cement board.

(A) Flame Spread Classification:

This index relates to the rate of progression of a flame along a sample in the 25 foot tunnel. A natural gas flame is applied to the front of the sample at the start of the test and drawn along the sample by a draft kept constant for the duration of the test. An observer notes the progression of the flame front relative to time. This information is plotted on a graph (flame spread curve).

The test apparatus is calibrated such that the flame front for red oak flooring passes out the end of the tunnel in five minutes, thirty seconds (plus or minus 15 seconds).

Calculations: ASTM E84-10

According to the test standard, the flame spread classification is equal to $\frac{4900}{195 - A_T}$

when A_t is the total area beneath the flame spread curve, if this area exceeds 97.5 minute feet. If the area beneath the curve is less than or equal to 97.5 minute feet the classification becomes 0.515 x A_t.

(B) Smoke Developed:

A photocell is used to measure the amount of light, which is obscured by the smoke passing down the tunnel duct. When the smoke from a burning sample obscures the light beam, the output from the photocell decreases. This decrease with time is recorded and compared to the results obtained for red oak, which is defined to be 100.

Calculations:

Unrounded Smoke Developed Index = $\frac{10{,}000 - SmokeIntegration}{743} x100$

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

(A) Flame Spread

The resultant flame spread classifications are as follows:
(classification rounded to nearest 5)

Sample Material	Flame Spread	Flame Spread Classification
Polymer Roughsawn Cedar Panels	106	105

(B) Smoke Developed

The areas beneath the smoke developed curve and the related classifications are as follows: (For smoke developed indexes 200 or more, classification is rounded to the nearest 50. For smoke developed indexes less than 200, classification is rounded to nearest 5)

Sample Material	Smoke Developed	Smoked Developed Classification
Polymer Roughsawn Cedar Panels	519	500

(C) Observations

During the test the sample surface ignited at approximately 53 seconds, after ignition the material melted and dripped to the floor where it continued to burn.

6 Conclusion

The samples of polymer siding panels, submitted by Novik Inc. exhibited the following flame spread characteristics when tested in accordance with ASTM E84-10, *Standard Test Method for Surface Burning Characteristics of Materials*.

Sample Material	Flame Spread Classification	Smoke Developed Classification
Polymer Roughgsawn Cedar Panels	105	500

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK TESTING SERVICES NA LTD.

Tested and Reported by:

Greg Philp
Technician – Construction Products Testing

Reviewed by:

Scott Leduc, EIT
Reviewer, Fire Testing

GP

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APPENDIX A

DATA SHEETS

ASTM E84-10 DATA SHEETS

ASTM E84

Client: Novik
Date: 09/01/2010
Project Number: 100066784
Test Number: 1
Operator: Greg Philp

Specimen ID: Roughsawn Cedar Panels

TEST RESULTS

FLAMESPREAD INDEX: 105
SMOKE DEVELOPED INDEX: 500

SPECIMEN DATA . . .

Time to Ignition (sec):	53
Time to Max FS (sec):	245
Maximum FS (feet):	19.4
Time to 980 F (sec):	258
Time to End of Tunnel (sec):	245
Max Temperature (F):	1282
Time to Max Temperature (sec):	422
Total Fuel Burned (cubic feet):	44.90
FS*Time Area (ft*min):	148.6
Smoke Area (%A*min):	385.7
Unrounded FSI:	105.6
Unrounded SDI:	519.1

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec):	43.0
Red Oak Smoke Area (%A*min):	74.3

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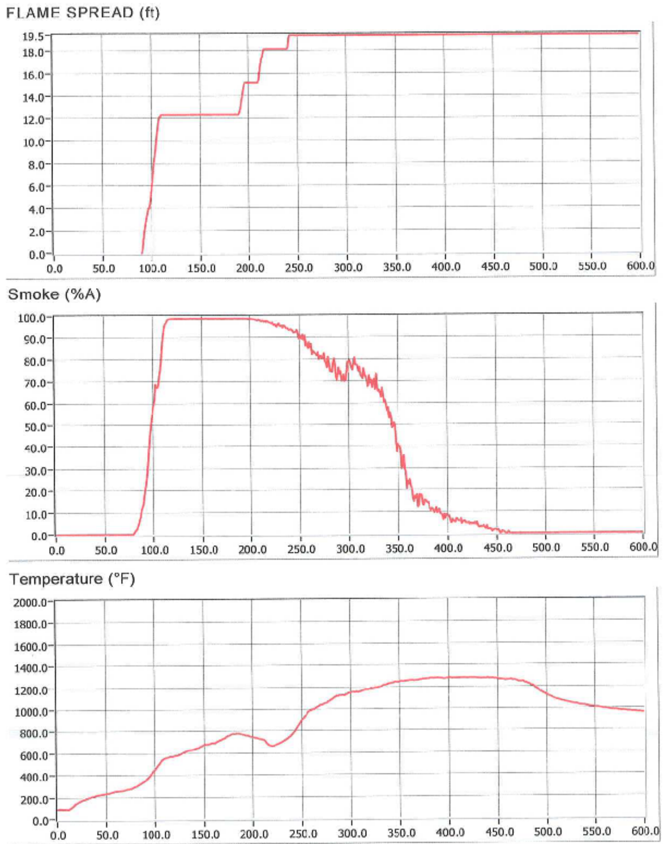
ASTM E84-10 DATA SHEETS

Project No: 100066784

Page 2 of 2



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REVISION SUMMARY

DATE	PAGE	SUMMARY
September 2, 2010	--	Original Issue Date

TEST REPORT

REPORT NUMBER: G100066784COQ-004(a)
ORIGINAL ISSUE DATE: September 2, 2010

EVALUATION CENTER
Intertek Testing Services NA Ltd.
1500 Brigantine Drive
Coquitlam, B.C. V3K 7C1

RENDERED TO
Novik Inc.
160 Grands-Lacs Street
St Augustin –De –Desmaures. Quebec. G3A 2K1

PRODUCT EVALUATED: Polymer Siding
EVALUATION PROPERTY: Surface Burning Characteristics

Report of testing polymer siding panels for compliance with the applicable requirements of the following criteria: ASTM E84-10, *Standard Test Method for Surface Burning Characteristics of Materials.*

1 Table of Contents

2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for Novik Inc. to evaluate the surface burning characteristics of polymer siding panels. Testing was conducted in accordance with the standard methods of ASTM E84-10, *Standard Test Method for Surface Burning Characteristics of Materials*.

This evaluation began August 30, 2010 and was completed the same day.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were submitted to Intertek directly from the client and were not independently selected for testing. The sample materials were received at the Evaluation Center on August 18, 2010.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The sample material consisted of six 22 in. wide by 48 in. long polymer siding panels. The panels were identified by the client as “Hand Cut Stone Panels”.

Six 4 ft. lengths of sample product was placed on the upper ledge of the flame spread tunnel, supported with mesh and stainless steel rods which were spaced every 24 inches. A layer of 6 mm reinforced cement board was placed over top of the samples, the tunnel lid was lowered into place, and the samples were then tested in accordance with ASTM E84-10.

4 Testing and Evaluation Methods

4.1. TEST STANDARD

The results of the tests are expressed by indexes, which compare the characteristics of the sample under tests relative to that of select grade red oak flooring and asbestos-cement board.

(A) Flame Spread Classification:

This index relates to the rate of progression of a flame along a sample in the 25 foot tunnel. A natural gas flame is applied to the front of the sample at the start of the test and drawn along the sample by a draft kept constant for the duration of the test. An observer notes the progression of the flame front relative to time. This information is plotted on a graph (flame spread curve).

The test apparatus is calibrated such that the flame front for red oak flooring passes out the end of the tunnel in five minutes, thirty seconds (plus or minus 15 seconds).

Calculations: ASTM E84-10

According to the test standard, the flame spread classification is equal to $\frac{4900}{195 - A_T}$

when A_t is the total area beneath the flame spread curve, if this area exceeds 97.5 minute feet. If the area beneath the curve is less than or equal to 97.5 minute feet the classification becomes 0.515 x A_t.

(B) Smoke Developed:

A photocell is used to measure the amount of light, which is obscured by the smoke passing down the tunnel duct. When the smoke from a burning sample obscures the light beam, the output from the photocell decreases. This decrease with time is recorded and compared to the results obtained for red oak, which is defined to be 100.

Calculations:

Unrounded Smoke Developed Index = $\frac{10{,}000 - SmokeIntegration}{743} x100$

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

(A) Flame Spread

The resultant flame spread classifications are as follows:
(classification rounded to nearest 5)

Sample Material	Flame Spread	Flame Spread Classification
Polymer Hand Cut Stone Panels	103	105

(B) Smoke Developed

The areas beneath the smoke developed curve and the related classifications are as follows:
(For smoke developed indexes 200 or more, classification is rounded to the nearest 50. For smoke developed indexes less than 200, classification is rounded to nearest 5)

Sample Material	Smoke Developed	Smoked Developed Classification
Polymer Hand Cut Stone Panels	796	800

(C) Observations

During the test the sample surface ignited at approximately 51 seconds, after ignition the material melted and dripped to the floor where it continued to burn.

6 Conclusion

The samples of polymer siding panels, submitted by Novik Inc. exhibited the following flame spread characteristics when tested in accordance with ASTM E84-10, *Standard Test Method for Surface Burning Characteristics of Materials*.

Sample Material	Flame Spread Classification	Smoke Developed Classification
Polymer Hand Cut Stone Panels	105	800

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK TESTING SERVICES NA LTD.

Tested and Reported by: Gregory Philp
Greg Philp
Technician – Construction Products Testing

Reviewed by:
Scott Leduc, EIT
Reviewer, Fire Testing

GP

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APPENDIX A

DATA SHEETS

ASTM E84-10 DATA SHEETS

ASTM E84

Client:	Novik
Date:	08/30/10
Project Number:	100066784
Test Number:	1
Operator:	Greg Philp
Specimen ID:	Hand Cut Stone Panels

TEST RESULTS

FLAMESPREAD INDEX:	**105**
SMOKE DEVELOPED INDEX:	**800**

SPECIMEN DATA . . .

Time to Ignition (sec):	51
Time to Max FS (sec):	253
Maximum FS (feet):	19.5
Time to 980 F (sec):	290
Time to End of Tunnel (sec):	250
Max Temperature (F):	1278
Time to Max Temperature (sec):	423
Total Fuel Burned (cubic feet):	44.90
FS*Time Area (ft*min):	147.6
Smoke Area (%A*min):	591.0
Unrounded FSI:	103.3
Unrounded SDI:	795.5

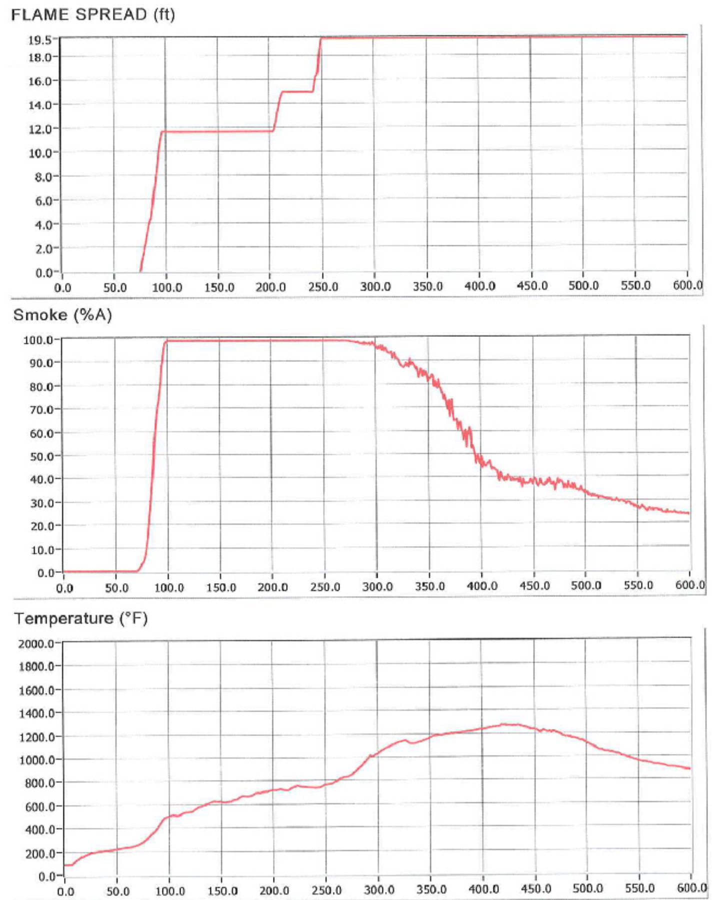
CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec):	43.0
Red Oak Smoke Area (%A*min):	74.3

ASTM E84-10 DATA SHEETS

Project No: 100066784

Page 2 of 2



Time (sec)

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REVISION SUMMARY

DATE	PAGE	SUMMARY
September 2, 2010	--	Original Issue Date

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CERTAINTEED CORPORATION
TEST REPORT

SCOPE OF WORK

REPORT OF TESTING CEDAR IMPRESSIONS D9 STAGGERED ROUGH SPLIT SHAKES FOR COMPLIANCE WITH THE APPLICABLE REQUIREMENTS OF THE FOLLOWING CRITERIA: CAN/ULC S102.2-18, STANDARD METHOD OF TESTING FOR SURFACE BURNING CHARACTERISTIS OF FLOORCOVERIG, AND MISCELLANEOUS MATERIALS AND ASSEMBILIES.

REPORT NUMBER

104006276COQ-002 R0

TEST DATE(S)

09/20/19 - 09/20/19

ISSUE DATE

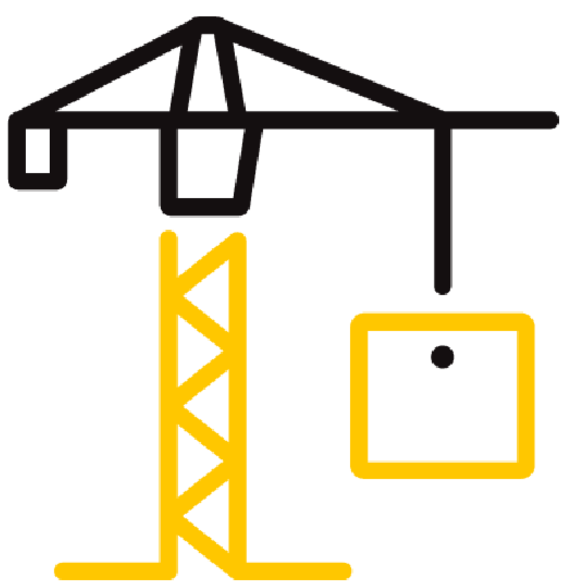
09/23/19

PAGES

15

DOCUMENT CONTROL NUMBER

GFT-OP-10c (AUGUST 27, 2018)



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Coquitlam, BC V3K 7C1

Telephone: 604-520-3321
www.intertek.com/building

TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: 104006276COQ-002 R0
Revision Date: 09/23/19

REPORT ISSUED TO
CERTAINTEED CORPORATION
803 BELDEN ROAD
JACKSON, MI 49203 USA

SECTION 1
SCOPE

Intertek Building & Construction (B&C) was contracted by CertainTeed Corporation to perform testing in accordance with S102.2-18 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies., on their Cedar Impressions D9 Staggered Rough Split Shakes. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at Intertek Testing Services NA Ltd. (Intertek) test facility in Coquitlam, BC Canada.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

SECTION 2
SUMMARY OF TEST RESULTS

The samples of Cedar Impressions D9 Staggered Rough Split Shakes submitted by CertainTeed Corporation were tested in accordance with S102.2-18, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies.

The product test results are presented in Section 10 of this report.

For INTERTEK B&C:

COMPLETED BY:	Sean Fewer	**REVIEWED BY:**	Greg Philp
TITLE:	Technician – B&C	**TITLE:**	Senior Technician – B&C
SIGNATURE:		**SIGNATURE:**	
DATE:	09/23/19	**DATE:**	09/23/19

1500 Brigantine Drive
Coquitlam, BC V3K 7C1

Telephone: 604-520-3321
www.intertek.com/building

TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: 104006276COQ-002 R0
Revision Date: 09/23/19

SECTION 3
TEST METHOD(S)

The specimens were evaluated in accordance with the following:

CAN/ULC S102.2-18, *Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies.*

SECTION 4
MATERIAL SOURCE/INSTALLATION

Intertek representative, Ken Wiedenfeld sampled and selected test samples on August 20, 2019. The sampling was conducted at CertainTeed Corporation facility located at 873 North Hickory McPherson, KS.

SECTION 5
EQUIPMENT

ASSET #	DESCRIPTION	MODEL	CAL DUE DATE
WH 2189	Photocell	Huygen 856	05/14/20
WH 2190	Smoke Opacity Meter	Huygen	05/14/20
WH 2494	Data Logger	Yokogawa DA100	07/18/20

SECTION 6
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Sean Fewer	Intertek B&C
Greg Philp	Intertek B&C

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1500 Brigantine Drive
Coquitlam, BC V3K 7C1

Telephone: 604-520-3321
www.intertek.com/building

SECTION 7
TEST CALCULATIONS

The results of the tests are expressed by indexes, which compare the characteristics of the sample under tests relative to that of select grade red oak flooring and inorganic-cement board.

(A) Flame Spread Rating:

This index relates to the rate of progression of a flame along a sample in the 25 foot tunnel. A natural gas flame is applied to the front of the sample at the start of the test and drawn along the sample by a draft kept constant for the duration of the test. An observer notes the progression of the flame front relative to time.

The test apparatus is calibrated such that the flame front for red oak flooring passes out the end of the tunnel in five minutes, thirty seconds (plus or minus 15 seconds).

(B) Smoke Developed:

A photocell is used to measure the amount of light, which is obscured by the smoke passing down the tunnel duct. When the smoke from a burning sample obscures the light beam, the output from the photocell decreases. This decrease with time is recorded and compared to the results obtained for red oak, which is defined to be 100.

SECTION 8
TEST SPECIMEN DESCRIPTION

Upon receipt of the samples at the Intertek Coquitlam laboratory they were placed in a conditioning room where they remained in an atmosphere of 23 ± 3°C (73.4 ± 5°F) and 50 ± 5% relative humidity.

The sample material was identified by the client as 0.125 in. thick by 18 in. wide by 57 in. long Cedar Impressions D9 Staggered Rough Split Shake Polypropylene panels. The panels were cut down to a width of 17 3/8 in. to accommodate the placement of the samples on the tunnel floor.

For each trial run, 17 3/8 in. wide by 24 ft. of sample material was placed on the floor of the tunnel. A layer of 6mm reinforced cement board was placed on the upper ledges of the tunnel, the tunnel lid was lowered into place, and the samples were then tested in accordance with CAN/ULC S102.2-18.

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: 104006276COQ-002 R0
Revision Date: 09/23/19

SECTION 9
TEST RESULTS

(A) Flame Spread

The resultant flame spread ratings are as follows:
(Rating rounded to nearest 5)

Cedar Impressions D9 Staggered Rough Split Shakes	Flame Spread	Flame Spread Rating
Run 1	77	75
Run 2	76	
Run 3	73	

(B) Smoke Developed

The areas beneath the smoke developed curve and the related classifications are as follows:
(Classification rounded to nearest 5)

Cedar Impressions D9 Staggered Rough Split Shakes	Smoke Developed	Smoked Developed Classification
Run 1	470	445
Run 2	431	
Run 3	441	

(C) Observations

During the test runs, surface ignition occurred between 41 and 68 seconds; the flame then began to progress along the sample length until it reached the maximum flame spread. This was the case for all three test runs.

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Coquitlam, BC V3K 7C1

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: 104006276COQ-002 R0
Revision Date: 09/23/19

SECTION 10
CONCLUSION

The samples of polypropylene Cedar Impressions D9 Staggered Rough Split Shakes submitted by CertainTeed Corporation exhibited the following flame spread characteristics when tested in accordance with S102.2-18, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies.

A series of three test runs of material was conducted to conform to the requirements of the National Building Code of Canada.

Sample Material	Flame Spread Rating	Smoke Developed Classification
Cedar Impressions D9 Staggered Rough Split Shakes	75	445

The conclusions of this test report may be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

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Coquitlam, BC V3K 7C1

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: 104006276COQ-002 R0
Revision Date: 09/23/19

SECTION 11

TEST DATA (6 PAGES)

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Coquitlam, BC V3K 7C1

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: 104006276COQ-002 R0
Revision Date: 09/23/19

CAN/ULC S102.2-18 DATA SHEETS
Run 1

Standard: Canadian ULC S102.2 Page 1 of 2

Client: CertainTeed Corp
Date: 09 20 2019
Project Number: 104006276
Test Number: 1
Operator: Sean Fewer

Specimen ID: Cedar Imprssions D9 Staggered Rough Split Shakes

TEST RESULTS

FLAMESPREAD INDEX: 75
SMOKE DEVELOPED INDEX: 470

SPECIMEN DATA . . .

Time to Ignition (sec): 41
Time to Max FS (sec): 313
Maximum FS (mm): 5781.7
Time to 527C (sec): 315
Time to End of Tunnel (sec): 313
Max Temperature (C): 763
Time to Max Temperature (sec): 513
Total Fuel Burned (cubic feet): 45.70

FS*Time Area (M*min): 38.1
Smoke Area (%A*min): 740.0
Unrounded FSI: 76.9
Unrounded SDI: 469.9

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 48.0
Red Oak Smoke Area (%A*min): 157.5

Tested By: SF Reviewed By: ____________

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1500 Brigantine Drive
Coquitlam, BC V3K 7C1

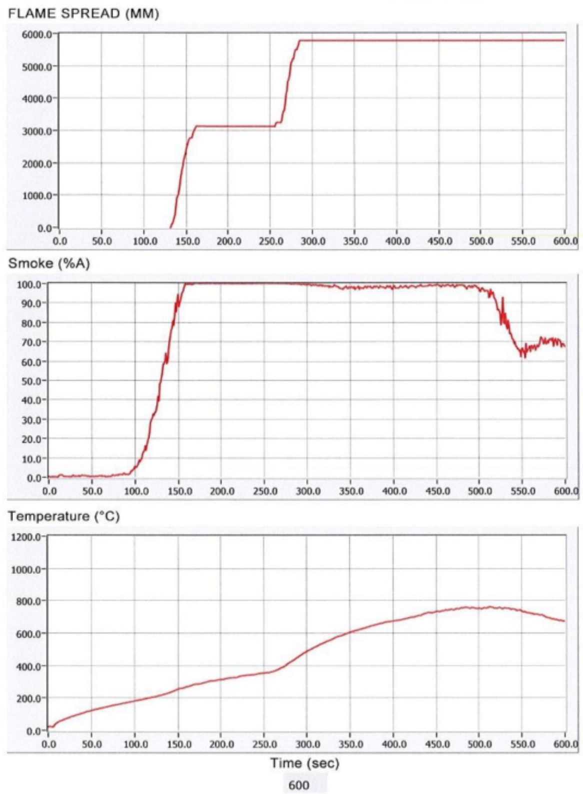
Telephone: 604-520-3321
www.intertek.com/building

TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: 104006276COQ-002 R0
Revision Date: 09/23/19

CAN/ULC S102.2-18 DATA SHEETS
Run 1

Page 2 of 2

Client: CertainTeed Corp
Specimen ID: Cedar Imprssions D9 Staggered Rough
Test No.: 104006276
Standard: Canadian ULC S102.2



Tested By: SF

Reviewed By:

CAN/ULC S102.2-18 DATA SHEETS
Run 2

Standard: Canadian ULC S102.2

Page 1 of 2

Client: CertianTeed Corp
Date: 19 20 2019
Project Number: 104006276
Test Number: 2
Operator: Sean Fewer

Specimen ID: Cedar Impressions D9 StaggeredRough Split Shakes

TEST RESULTS

FLAMESPREAD INDEX: 75

SMOKE DEVELOPED INDEX: 430

SPECIMEN DATA . . .

Time to Ignition (sec): 68
Time to Max FS (sec): 312
Maximum FS (mm): 5774.8
Time to 527C (sec): 327
Time to End of Tunnel (sec): 312
Max Temperature (C): 764
Time to Max Temperature (sec): 496
Total Fuel Burned (cubic feet): 45.70

FS*Time Area (M*min): 37.8
Smoke Area (%A*min): 678.6
Unrounded FSI: 75.6
Unrounded SDI: 430.9

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 48.0
Red Oak Smoke Area (%A*min): 157.5

Tested By: SF

Reviewed By:

Total Quality. Assured.

1500 Brigantine Drive
Coquitlam, BC V3K 7C1

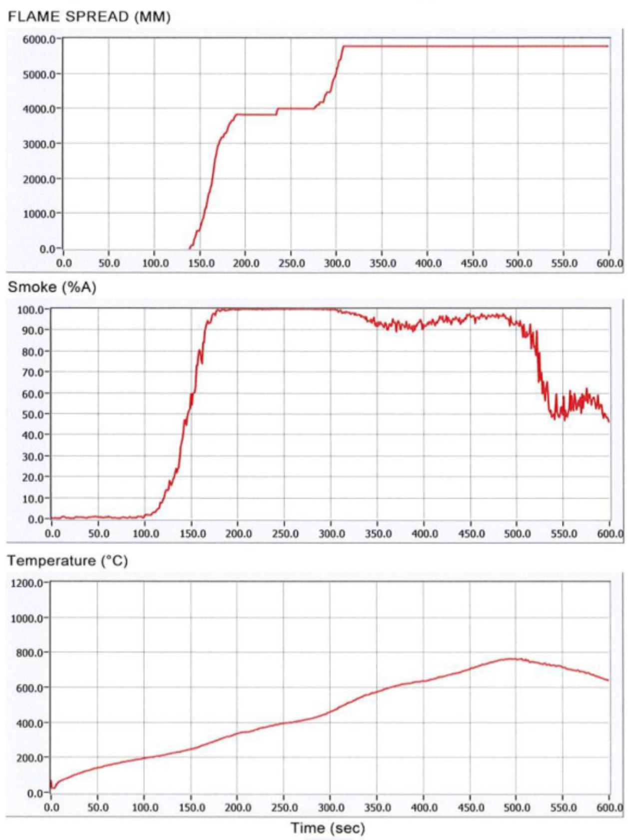
Telephone: 604-520-3321
www.intertek.com/building

TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: 104006276COQ-002 R0
Revision Date: 09/23/19

CAN/ULC S102-18 DATA SHEETS
Run 2

Page 2 of 2

Client: CertianTeed Corp | Specimen ID: Cedar Impressions D9 StaggeredRough
Test No.: 104006276 | Standard: Canadian ULC S102.2



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Tested By: SF

Reviewed By:

intertek
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1500 Brigantine Drive
Coquitlam, BC V3K 7C1

Telephone: 604-520-3321
www.intertek.com/building

TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: 104006276COQ-002 R0
Revision Date: 09/23/19

CAN/ULC S102.2-18 DATA SHEETS
Run 3

Standard: Canadian ULC S102.2

Client: CertianTeed Corp
Date: 19 20 2019
Project Number: 104006276
Test Number: 3
Operator: Sean Fewer

Specimen ID: Cedar Impressions D9 Staggered Rough Split Shakes

TEST RESULTS

FLAMESPREAD INDEX: 75
SMOKE DEVELOPED INDEX: 440

SPECIMEN DATA . . .

Time to Ignition (sec): 64
Time to Max FS (sec): 324
Maximum FS (mm): 5782.9
Time to 527C (sec): 332
Time to End of Tunnel (sec): 324
Max Temperature (C): 742
Time to Max Temperature (sec): 476
Total Fuel Burned (cubic feet): 45.70

FS*Time Area (M*min): 36.9
Smoke Area (%A*min): 694.1
Unrounded FSI: 72.8
Unrounded SDI: 440.7

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 48.0
Red Oak Smoke Area (%A*min): 157.5

Tested By: SF

Reviewed By:

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: 104006276COQ-002 R0
Revision Date: 09/23/19

CAN/ULC S102.2-18 DATA SHEETS
Run 3

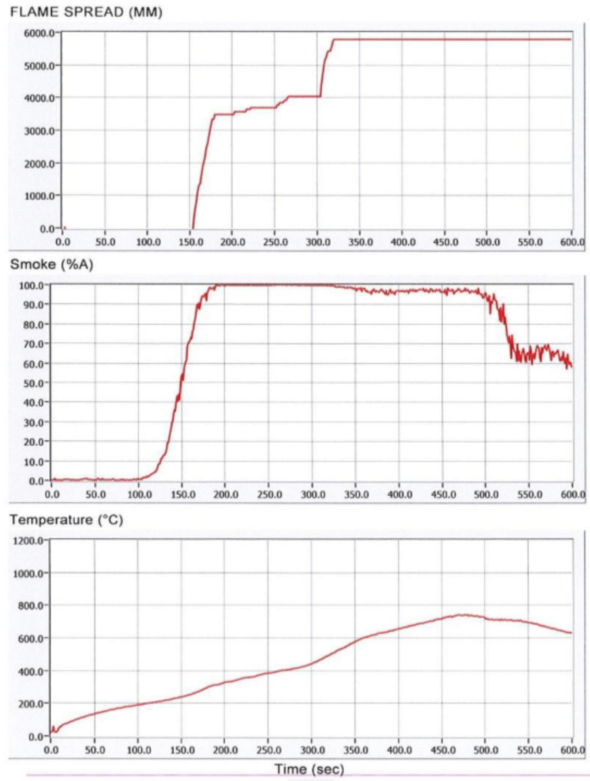
Page 2 of 2

Client: CertianTeed Corp

Specimen ID: Cedar Impressions D9 Staggered Rough

Test No.: 104006276

Standard: Canadian ULC S102.2



600

Tested By: SF

Reviewed By:

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SECTION 12
PHOTOGRAPHS

Photo No. 1
Pre-Test

Photo No. 2
Post Test

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SECTION 13
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	09/23/19	N/A	Original Report Issue

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CERTAINTEED CORPORATION
FIRE TEST REPORT

SCOPE OF WORK
NFPA 268 TESTING ON EXTERIOR WALL ASSEMBLY CONTINING CERTAINTEED CEDAR IMPRESSIONS DOUBLE 9 IN. ROUGH-SPLIT SHAKES POLYPROPYLENE SIDING (BUCK SKIN)

REPORT NUMBER
J3055.01-121-24 R0

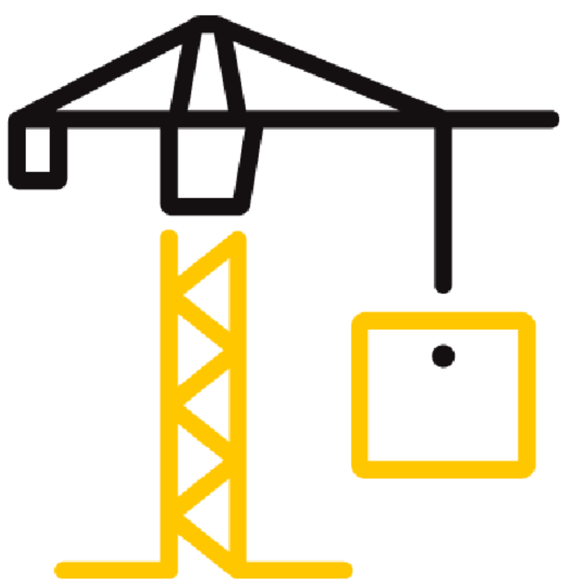
TEST DATE(S)
03/26/19

ISSUE DATE
04/05/19

RECORD RETENTION END DATE
03/26/23

PAGES
12

DOCUMENT CONTROL NUMBER
RT-R-AMER-Test-3566 (11/29/17)



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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

REPORT ISSUED TO
CertainTeed Corporation
803 Belden Road
Jackson, Michigan 49203

SECTION 1
SCOPE

Intertek Building & Construction (B&C) was contracted by CertainTeed Corporation, Jackson, Michigan to evaluate the performance of exterior walls containing Cedar Impressions Double 9" Rough-Split Shakes polypropylene siding (Buck Skin) when exposed to a radiant heat source. Testing was conducted at the Intertek B&C test facility in York, Pennsylvania. Results obtained are tested values and were secured by using the designated test method(s). A summary of test results and the complete graphical test data is reported herein.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

SECTION 2
SUMMARY OF TEST RESULTS

Wall System: Exterior Wall Assembly
Combustible Components: 2x4 wood framing, #15 felt paper, CertainTeed Cedar Impressions siding

NFPA 268 Test Results
The assembly described and tested in this report **did** meet the full, 20-minute exposure duration as required by the NFPA 268 test method. Construction of the full assembly is summarized in Section 7 of this test report.

For INTERTEK B&C:

COMPLETED BY:	Timothy Feltman	**REVIEWED BY:**	Ethan Grove
TITLE:	Technician – Fire Testing	**TITLE:**	Manager – Fire Testing
SIGNATURE:	Digitally Signed by: Timothy Feltman	**SIGNATURE:**	Digitally Signed by: Ethan Grove
DATE:	04/05/19	**DATE:**	04/05/19

TRF:ddr

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

SECTION 3
TEST METHOD

The assembly was evaluated in accordance with the following:

> **NFPA 268-2017**, *Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source*

SECTION 4
MATERIAL SOURCE/INSTALLATION

The sampled product was selected by Intertek B&C personnel. The specimen was witnessed during production and tagged prior to shipment on 02/26/19, (Reference Intertek B&C Test Specimen Selection Report No. J3055.03-103-15, dated 02/26/19). The remaining components of the test assembly were provided by the client except for the wall framing, sheathing, and weather barrier, which were acquired and assembled by Intertek B&C personnel.

SECTION 5
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Timothy Feltman	Intertek B&C
Scott Gingrich	Intertek B&C

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

SECTION 6
TEST PROCEDURE

The test specimen is installed into the test apparatus and centered both vertically and horizontally with respect to the center of the radiant exposure panel. Prior to the initiation of the test, a water-cooled radiation barrier is placed between the radiant panel and test specimen to absorb the energy from the radiant burner once the calibrated exposure is achieved. Thirty seconds after the spark igniter, located 5/8 inch away from the exposed face of the specimen, is energized, the radiation shield is removed and the test begins with the sample being subjected to the calibrated exposure. The igniter is cycled on for greater than 5 seconds and off for less than 2 seconds to create a piloted ignition source. The test is continued for 20 minutes, or until sustained flaming for a period of 5 seconds or more occurs within the 20-minute test duration.

SECTION 7
TEST ASSEMBLY DESCRIPTION

The overall dimensions of the test assembly are 4 feet wide by 8 feet high. Below is a detailed description of the components in the assembly:

Framing
Dimensional 2x4 studs spaced 16 in. on center and fastened to the top and sill plate using 3-1/4 in. framing nails.

Exterior Sheathing
7/16 in. thick oriented strand board (OSB) fastened with 2 3/8 in. nails every 8 in. around the perimeter and every 12 in. in the field to the framing.

Water-resistive Barrier
Tarco No. 15 Asphalt felt paper fastened with T50 3/8 in. staples at a minimum of 12 in. square.

Exterior Cladding
CertainTeed Cedar Impressions Double 9 in. Rough Split Shakes polypropylene siding (Buck Skin) fastened using 1 ½ in. electrogalvanized ring shank nails every 16 in. though the sheathing and on to the interior studs.

Note: The test specimen was conditioned to a constant weight at 21.1°C ± 5.6°C (70°F ± 10°F) and a relative humidity of 50 percent ± 10 percent.

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

SECTION 8
TEST OBSERVATIONS

Calibration Information:

- Calibration Date: 03/18/19
- Average Heat Flux of Four Quadrant Heat Flux Transducers: 12.9 kW/m^2
- The heat flux at the center of the calibration panel shall not exceed 15 kW/m^2 or be not less than 12.5 kW/m^2: True – Low: 12.9 kW/m^2 High: 15.0 kW/m^2
- Average Surface Temperature of Radiant Panel: 1577 °F

Test Date: 03/26/19
Lab Temperature: 64 °F
Lab Relative Humidity: 24%

TIME (Min:Sec)	OBSERVATIONS
Pre-test (-10:00)	Ignition of radiant panel burner.
Pre-test (-01:00)	Data acquisition begins.
Pre-test (-00:30)	Spark igniter initiated
00:00	Radiation shield removed. Test begins.
00:57	Warping of exposed surface
01:43	Smoke emitting from test specimen
02:13	Melting of exposed surface; weather barrier visible
05:56	Melted product dripping onto igniter
10:53	Charring of melted product on exposed weather barrier
20:00	No sustained flaming; End of Test

***__Post Test Note:__ Upon completion of test, weather barrier is observed being cracked and sheathing is visibly charred.

SECTION 9
TEST RESULTS

TEST REQUIREMENTS	TEST RESULTS	PASS/FAIL
Sustained flaming (ignition) for a period of 5 seconds or more shall not occur within the 20-minute test period.	Sustained flaming **did not** occur during the 20-minute test period.	**PASS**

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

SECTION 10
PHOTOGRAPHS

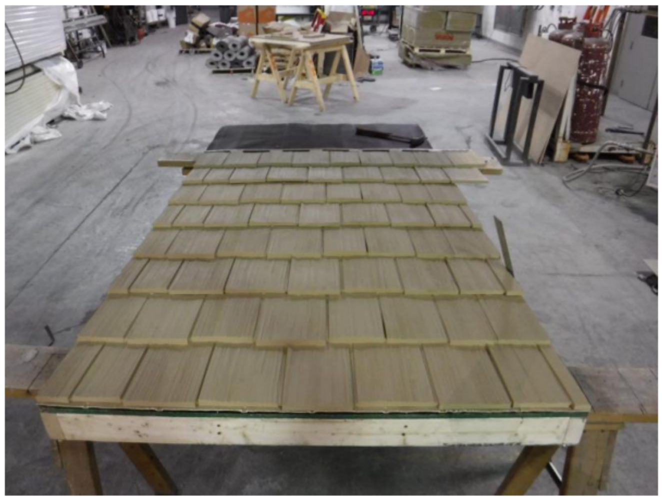

Photo No. 1
Construction of Test Assembly

Photo No. 2
Complete Assembly (Exterior)

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

SECTION 10 (Continued)
PHOTOGRAPHS

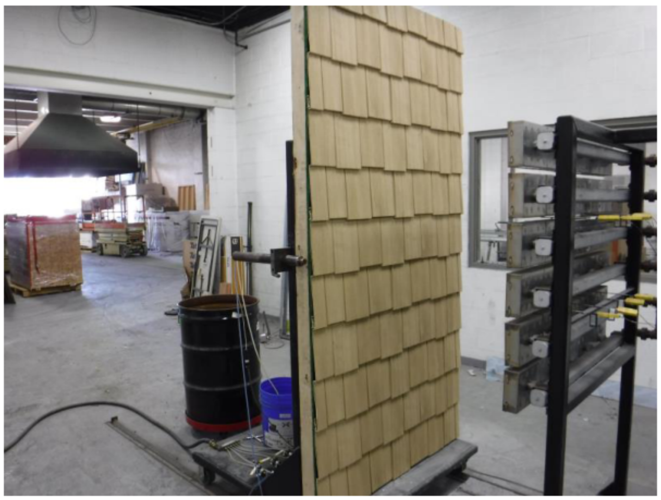

Photo No. 3
Complete Assembly (Pre-test)

Photo No. 4
Initiation of Test

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

SECTION 10 (Continued)
PHOTOGRAPHS

Photo No. 5
Melting of Exposed Surface

Photo No. 6
Weather Barrier Visible

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

SECTION 10 (Continued)
PHOTOGRAPHS

Photo No. 7
Post-test Exterior

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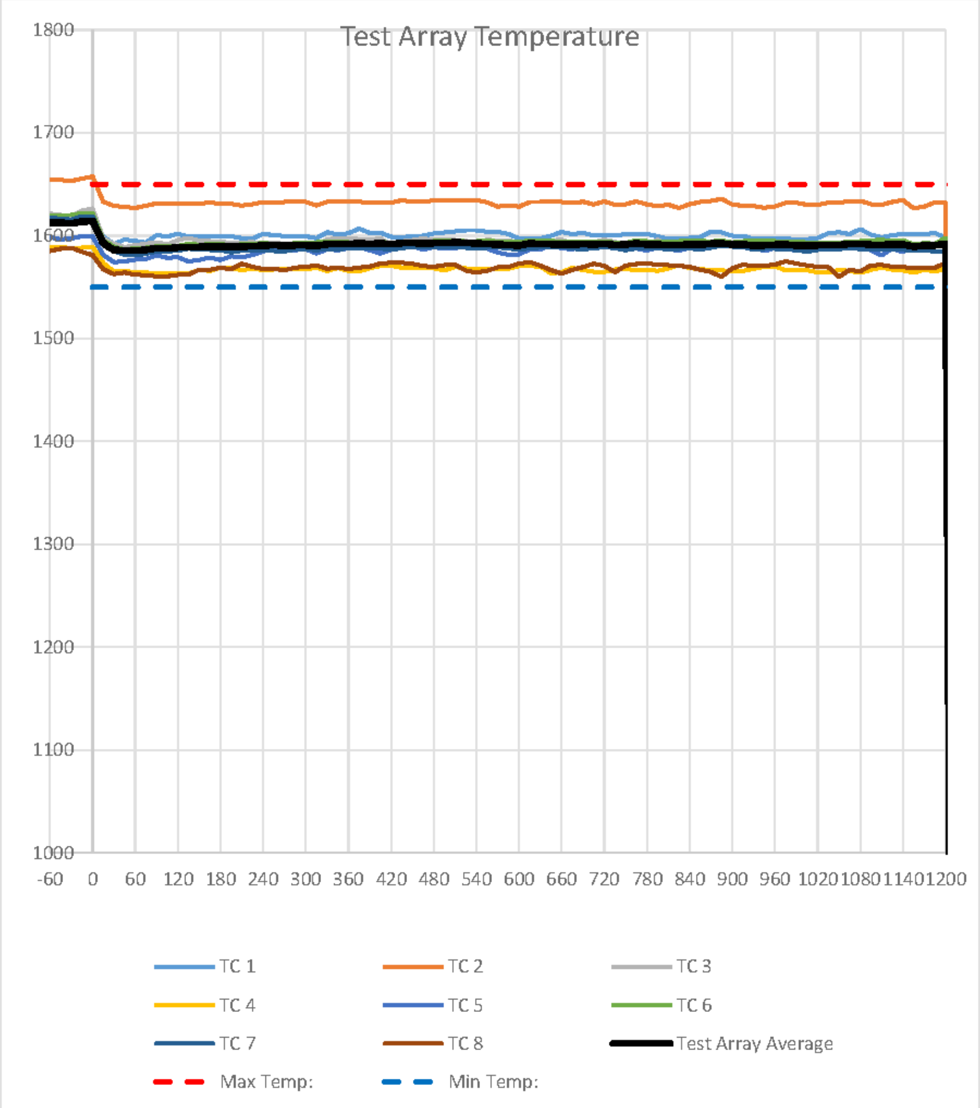
TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

SECTION 11
GRAPHS



Graph No. 1
Burner Output Verification Data

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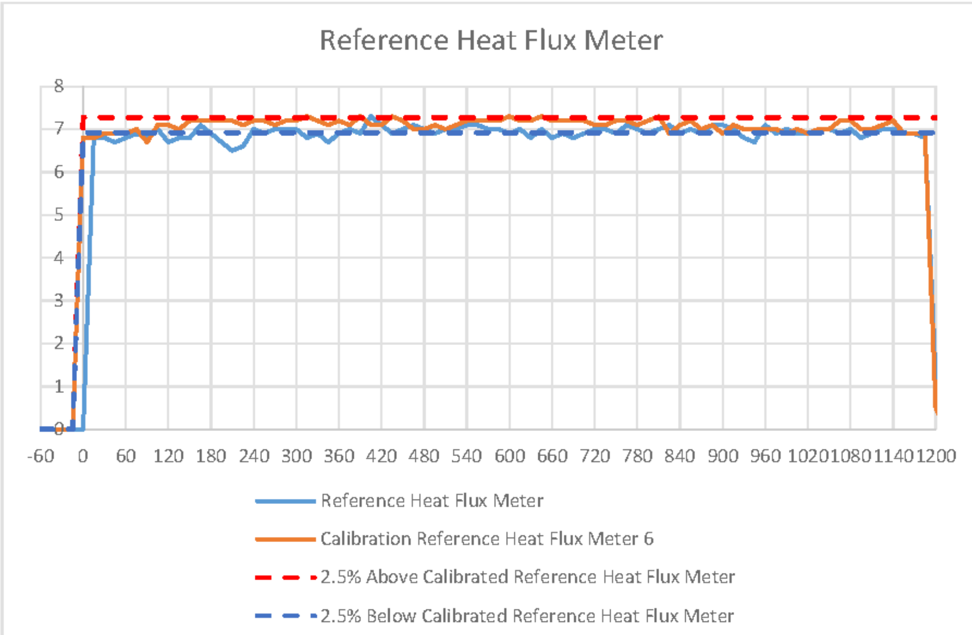
TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

SECTION 11 (Continued)

GRAPHS



Graph No. 2
Reference Heat Flux

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TEST REPORT FOR CERTAINTEED CORPORATION
Report No.: J3055.01-121-24 R0
Date: 04/05/19

SECTION 12
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	04/05/19	N/A	Original Report Issue

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CERTAINTEED LLC
FIRE TEST REPORT

SCOPE OF WORK
ASTM E84 TESTING ON CEDAR IMPRESSIONS DOUBLE 7" STRAIGHT EDGE PERFECTION SHINGLES 3G

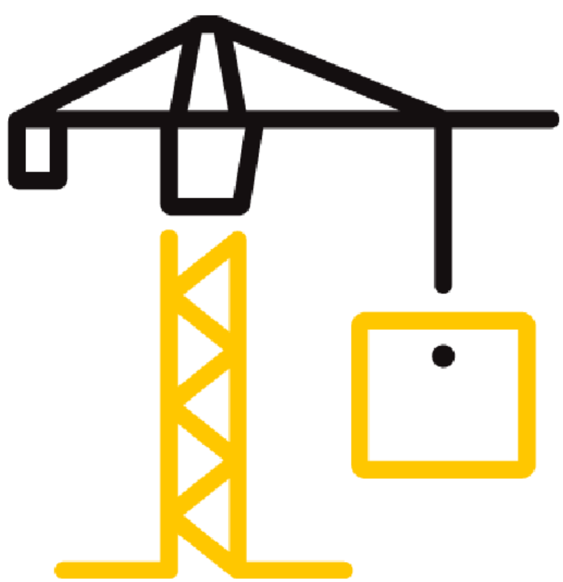
REPORT NUMBER
L1071.03-121-24

TEST DATE
07/27/20

ISSUE DATE
07/30/20

PAGES
11

DOCUMENT CONTROL NUMBER
RT-R-AMER-Test-2780 (09/19/18)



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TEST REPORT FOR CERTAINTEED LLC
Report No.: L1071.03-121-24
Date: 07/30/20

REPORT ISSUED TO
CERTAINTEED LLC
803 Belden Road
Jackson, Michigan 49203

SECTION 1
SCOPE

Intertek Building & Construction (B&C) was contracted by CertainTeed LLC, Jackson, Michigan to evaluate the flame spread and smoke developed properties of Cedar Impressions double 7" straight edge perfection shingles 3G. Testing was conducted at the Intertek B&C test facility in York, Pennsylvania. Results obtained are tested values and were secured by using the designated test method(s). A summary of test results and the complete graphical test data is reported herein.

This report does not constitute performance certification of this product nor an opinion or endorsement by this laboratory. Intertek B&C will service this report for the entire test record retention period. The test record retention period ends four years after the test date. Test records, such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation, will be retained for the entire test record retention period.

SECTION 2
SUMMARY OF TEST RESULTS

Specimen I.D.: Cedar Impressions double 7" straight edge perfection shingles 3G by CertainTeed LLC

ASTM E84 Test Results

FLAME SPREAD INDEX	SMOKE DEVELOPED INDEX
95	750

*See Section 8 for additional information and commentary

For INTERTEK B&C:

COMPLETED BY:	Ben Samson	**REVIEWED BY:**	Ethan Grove
TITLE:	Technician – Fire Testing	**TITLE:**	Manager – Fire Testing
SIGNATURE:	Digitally Signed by: Benjamin Samson	**SIGNATURE:**	Digitally Signed by: Ethan Grove
DATE:	07/30/20	**DATE:**	07/30/20

BTS:ddr

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SECTION 3
TEST METHOD

The specimens were evaluated in accordance with the following:

ASTM E84-20, *Standard Test Method for Surface Burning Characteristics of Building Materials*

SECTION 4
MATERIAL SOURCE/INSTALLATION

The samples were randomly selected from production stock on 07/01/20 by Intertek representative Dale Trahan, at the CertainTeed Corporation manufacturing facility, located at 10131 Governor Lane, Williamsport, Maryland 21795. Details regarding the composition and traceability of the selected material is included in Intertek Inspection Report L1071.02-103-15-R0. The samples, identified as Cedar Impressions double 7" straight edge perfection shingles 3G by CertainTeed LLC, were received in good order.

The test specimen identification is as provided by the client and Intertek accepts no responsibility for any inaccuracies therein. Intertek selected the specimen randomly at the point of manufacture but has not verified the composition, manufacturing techniques or quality assurance procedures (Reference Intertek Test Specimen Selection Report No. L1071.02-103-15-R0, dated 07/01/20.

SECTION 5
LIST OF OBSERVERS

NAME	COMPANY
Ben Samson	Intertek B&C
Micah Brillhart	Intertek B&C

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TEST REPORT FOR CERTAINTEED LLC
Report No.: L1071.03-121-24
Date: 07/30/20

SECTION 6
TEST PROCEDURE

This report describes the results of testing conducted in accordance with ASTM E84-20; Standard Test Method for Surface Burning Characteristics of Building Materials. The test method is for comparative surface burning behavior of building materials by determining a flame spread index (FSI) and a smoke developed index (SDI). This test is applicable to exposed surfaces, such as finish materials for ceilings or walls, and is conducted with the specimen in the ceiling position with the surface to be evaluated facing down toward the ignition source. The material, or assembly of materials, shall be capable of being mounted into the test position by its own self-supporting structural quality or the manner in which it is tested and intended for use, by using added supports along the test surface or by securement from the back side.

> *"The use of supporting materials on the underside of the test specimen may lower the flame spread index from that which might be obtained if the specimen could be tested without such support. These test results do not necessarily relate to those indices obtained by testing materials without such support."* – ASTM E84-20 Section 1.4

The purpose of the method is to determine the relative burning behavior of the material by observing flame spread along the test specimen. Flame Spread Index and Smoke Developed Index are reported, however, there is not necessarily a relationship between these two measurements.

It is the intent of the test method to provide measurement of surface flame spread of the tested material when subjected to a fire exposure that is calibrated with select grade red oak flooring and fiber-cement board. It is also the intent of the test method to provide the comparative measurement of smoke development of the tested material against smoke development measurements for a running average value of 295 ± 2 grams of Liquid Heptane (high-performance liquid chromatography [HPLC] Grade). The test method exposes a nominal 24-ft (7.32-m) long by 20-in. (508-mm) wide test specimen to a controlled air flow and flaming fire exposure adjusted to produce a specific flame spread distance vs time calibration using select grade red oak flooring.

The test method does not provide information regarding heat transmission through the tested surface, the effect of aggravated flame spread behavior resulting from the proximity of combustible walls and ceilings, or the classification or definition of materials as non-combustible using flame spread index alone.

This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

There were no deviations from the requirements prescribed in ASTM E84.

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SECTION 7

TEST SPECIMEN DESCRIPTION

MANUFACTURER*	CertainTeed LLC.
PRODUCT TYPE*	Rigid polymer siding
SERIES/MODEL*	Cedar Impressions double 7" straight edge perfection shingles 3G
COMPOSITION*	Polypropylene
CONDITIONING TIME	72+ hr.
SPECIMEN SIZE	24 in. wide x 14 in. long
THICKNESS	Material: 1/8 in. Profile: 1/2 in.
SPECIMEN SECTIONS	21
TOTAL WEIGHT	1.6 lb.
COLOR	Sterling Gray
SIDE TO FLAME*	Client specified front (exposed) face
SUPPORT USED*	1/4 in. diameter steel rods spaced every 24 in. on center and 20 gauge, 2-in. (51-mm) hexagonal galvanized steel netting
MOUNTING METHOD	ASTM E84-20 Annexes A4.5, A4.6, A4.8 and A4.8.1
SUBSTRATE USED*	No substrate was utilized
NOTES/ADDITIONAL SAMPLE INFO	N/A
CEMENT BOARD	1/4 in. thick fiber cement board was placed on top of the sample.

*From the client's material description and/or instructions

Note: Specimens were conditioned as per the requirements of Section 6.4 of ASTM E84-20.

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TEST REPORT FOR CERTAINTEED LLC
Report No.: L1071.03-121-24
Date: 07/30/20

SECTION 8
TEST RESULTS

TEST RESULTS	
Test Date	07/27/20
Test Operator	Ben Samson
Flame Spread Index (FSI)	95
Smoke Developed Index (SDI)	750

TEST DATA	
FSI (unrounded)	96.9
SDI (unrounded)	744.3
FS * Time Area (Ft * Min)	144.5
Smoke Area (% * Min)	482.3
Fuel Area (°F * Min)	7662.4

TEST OBSERVATIONS	
Ignition Time	00:39 (Min:Sec)
Max Flame Front Advance	19.5 Feet
Time to Max Flame Front	04:18 (Min:Sec)
Max Temp At Exposed T/C	1150.6°F
Time To Max Temp	06:53 (Min:Sec)
Dripping Observed	00:52 (Min:Sec)
Flaming On Floor Observed	00:56 (Min:Sec)
After Flame Top Observed	10:06 (Min:Sec)
After Flame Floor Observed	10:03 (Min:Sec)
Sagging Observed	00:33 (Min:Sec)
Delamination Observed	None
Shrinkage Observed	None
Fallout Observed	None
Cracking Observed	None
Additional Observations	Material dripped to floor ahead of flame front

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SECTION 8 (Continued)

TEST RESULTS

COMMENTARY ON CLASSIFICATION

Neither ASTM E84 nor UL 723 include classification criteria for the results obtained from testing. The International Building Code® (IBC), NFPA 101: Life Safety Code® (NFPA 101), and NFPA 5000: Building Construction and Safety Code® (NFPA 5000) all describe a set of classification criteria required for interior wall and ceiling finish materials based on Flame Spread Index and Smoke Developed Index when tested in accordance with ASTM E84 or UL 723. The classification criteria for all three model codes is the same:

Class	Flame Spread Index	Smoke Developed Index
A	0-25	0-450
B	26-75	0-450
C	76-200	0-450

Note that classification under this scheme for interior wall and ceiling finishes does not strictly apply to all products or materials tested in accordance with ASTM E84 or UL 723 because not all products or materials are recommended or suitable for use as interior wall or ceiling finish materials in buildings, regardless of the surface burning characteristics. Consult with the product manufacturer and the local authority having jurisdiction (AHJ) regarding specific applications of a given product or material.

COMMENTARY ON ADDITIONAL OBSERVATIONS

Per International Building Code® (IBC) Section 1404.12.1 and International Residential Code (IRC) Section R703.14.3, all portions of the test specimen ahead of the flame front must remain in position during testing. Should any portion of the test specimen ahead of the flame front not remain in position during testing, reference International Building Code® (IBC) Section 1404.12 and International Residential Code (IRC) Section R703.14 for usage and limitations based on this performance criteria.

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TEST REPORT FOR CERTAINTEED LLC
Report No.: L1071.03-121-24
Date: 07/30/20

SECTION 9
PHOTOGRAPHS

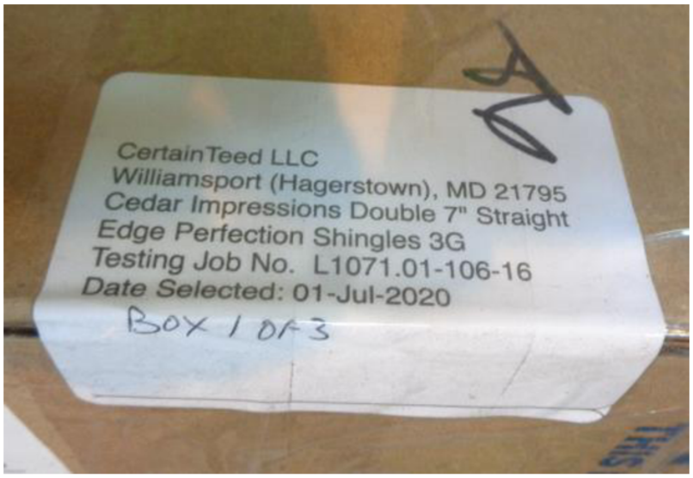

Photo No. 1
Inspector's Initials

Photo No. 2
Exposed Surface of the Test Specimen (Pre-test)

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SECTION 9 (Continued)

PHOTOGRAPHS

Photo No. 3
Unexposed Surface of the Test Specimen (Pre-test)

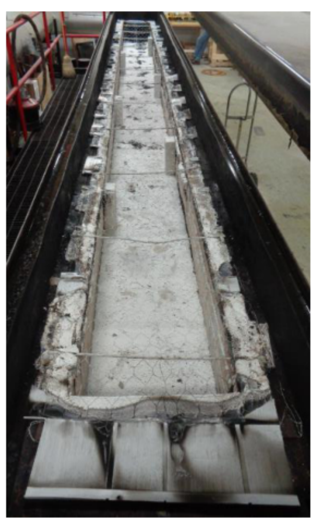

Photo No. 4
Unexposed Surface of the Test Specimen (Post-test)

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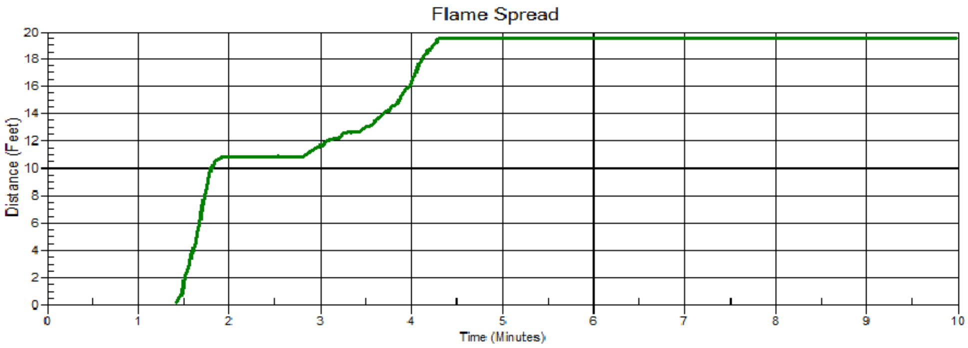
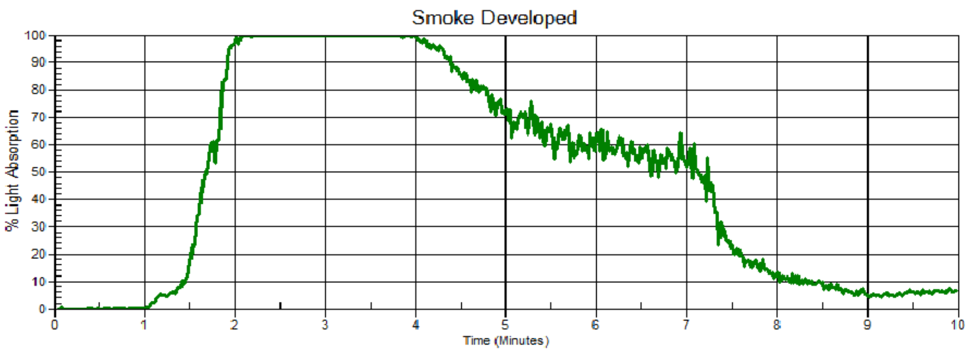
TEST REPORT FOR CERTAINTEED LLC
Report No.: L1071.03-121-24
Date: 07/30/20

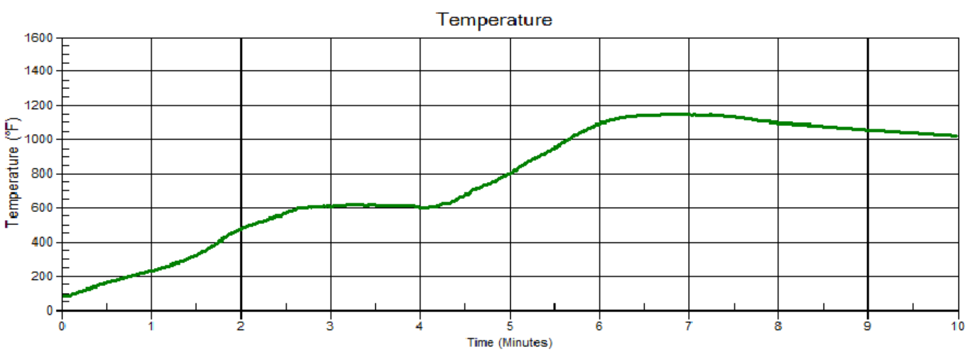
SECTION 10
GRAPHS



Graph No. 1 - Flame Spread Distance Versus Time



Graph No. 2 – Light Obscuration Versus Time



Graph No. 3 – Tunnel Air Temperature Versus Time

130 Derry Court
York, Pennsylvania 17406

Telephone: 717-764-7700
Facsimile: 717-764-4129
www.intertek.com/building

SECTION 11
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	07/30/20	N/A	Original Report Issue

Intertek | Architectural Testing

ASTM E119

PERFORMANCE TEST REPORT

Report No.: G2313.01-121-24
Test Date: December 16th and December 28th, 2016

Rendered to:

PLY GEM SIDING GROUP
Sidney, Ohio

PRODUCT TYPE: Loadbearing Wall Assembly
SERIES/MODEL: Mastic Cedar Discovery Split Shake CD95HS 17 Everest

This report contains in its entirety:

Cover Page:	1 page
Report Body:	7 pages
Graphical Data:	2 pages
Numerical Data:	4 pages
Photographs:	6 pages
Drawings:	1 page

4.0 Report Issued To: Ply Gem Siding Group
2405 Campbell Road
Sidney, Ohio 45365

5.0 Test Laboratory: Architectural Testing, Inc., an Intertek company ("Intertek-ATI")
130 Derry Court
York, Pennsylvania 17406-8405
717-764-7700

6.0 Test Method Information:

6.7 Introduction: The purpose of Fire Resistance testing is to measure a building element's ability to resist the transfer of energy and hot gases through the element and subjecting adjacent rooms, structures, etc. from a single standardized fire scenario. The standard measures this performance by quantifying the temperature rise on the unexposed face of the building element when the exposed side is subjected to the ASTM E119 Time vs. Temperature curve. It addition to exposing the element to the fire test, the standard references procedures for the element to be able to resist the cooling effects of a water hose stream test. After the fire test, the specimen is subjected to the hose stream procedures outlined in ASTM E2226. If the end-use of the element is intended for structural support, it must also maintain its integrity by holding the design load during the standard fire exposure and hose stream procedures.

It is important for the user of fire standards and data generated from them to understand the method only exposes the system to one standard exposure. The standard does not address every possible scenario or hazard associated with an actual fire.

7.0 Project Summary:

7.7 Product Type: Loadbearing Wall Assembly

7.8 Series/Model: : Mastic Cedar Discovery Split Shake CD95HS 17 Everest

7.9 Compliance Statement: Results obtained are tested values and were secured by using the designated test method(s). The specimen(s) were tested and evaluated against the requirements of the standard. A summary of the results is listed in the Test Results section and the complete graphical test data is included in Appendix A of this report.

7.10 Test Date: 12/16/2016 and 12/28/2016

7.11 Ambient Conditions: 12/16 – 52°F and 28% RH, 12/28 – 61°F and 30% RH

7.12 Test Location: Intertek-ATI test facility in York, Pennsylvania

7.13 Test Sample Source: The specimen was selected by Intertek/ATI personnel. The specimens were witnessed during production and tagged prior to shipment on October 21, 2016 by Warren Hayes, (Reference Intertek/ATI Test Specimen Selection Report No. G2313.02-117-38, dated 10/21/2016).

4.0 Project Summary: (Continued)

4.8 Test Method(s), Practices and/or Classifications:

ASTM E119-14, Standard Test Methods for Fire Tests of Building Construction and Materials

4.9 List of Official Observers:

Name	Company
Alan Hoying	Ply Gem Siding Group – 12/16/2017 only
Tim Feltman	Intertek-ATI
Scott Gingrich	Intertek-ATI
Ben Green	Intertek-ATI

5.0 Test Specimen Description:

Interior Wall Cladding: The simulated interior surface was clad with 5/8 in. thick National Gypsum Gold Bond® Type-X Gypsum Board (complying with ASTM C1396). The gypsum board was attached to the steel framing with #6 x 1-1/2 in. long self-drilling drywall screws. The gypsum was installed with the length running vertical with the studs. The gypsum board joints and fastener heads were finished with USG Sheetrock® Brand 90 Minute Joint Compound. USG Sheetrock® Brand Paper Joint Tape was used in conjunction with the joint compound to cover all gypsum board joints.

Insulation: 4 in. thick x 16 in. wide x 48 in. long Owens Corning® Thermafiber® SAFB™ Mineral Wool Insulation was installed upon completion of the exterior sheathing installation. The insulation was friction fit inside each stud cavity.

Framing Members: Framing members consisted of 16 gauge steel 3-5/8" thick studs. These steel studs were cut to 10 ft. lengths and placed on 16 in. centers in two 10 ft. long sections of 16 gauge steel track. The framing members were fastened to the track using #6-20 x 1/2 in. long, pan head, self-drilling fasteners. No lateral bracing was utilized.

5.0 Test Specimen Description: (Continued)

Exterior Sheathing: 5/8 in. thick National Gypsum Gold Bond® eXP® exterior gypsum sheathing, meeting ASTM C1177, was mounted to the assembly vertically with the studs. These sections were staggered so no joint intersected with the interior surface gypsum. The gypsum was fastened to the framing members with #6 x 1-5/8 in. type W bugle head fasteners spaced every 8 inches along the perimeter and every 12 in. in the field.

Air Vapor Barrier: Dupont™ Tyvek® Home Wrap® was applied over the full surface of the exterior sheathing horizontally and utilized a 2 in. overlap. The barrier was secured to the assembly with 5/16 in., T50 staples spaced nominally at 12 in. on centers. The top overlap was 2 in. and cut to fit inside the assembly.

Exterior Cladding: Ply Gem® Mastic Cedar Discovery Mano-split shake siding was cut to 72 in. long and 48 in. long sections. The first row started with the 72 in. piece, with the 48 in. long section engaging into the 72 in. piece using the mortise and tendon profile on the edge of the section lengths. These sections were fastened to the core wall using #6 x 1-5/8 in. type W bugle head fasteners at every stud location. The rows were then staggered with the next row starting with the 48 in. piece. This ensured that the seams were not inline. This pattern continued up the face of the assembly until all of the surface was covered.

6.0 Test Details:

6.1 Equipment: Furnace used for testing has an exposure space of 14 ft. wide by 12 ft. tall by 4 ft. deep. The furnace is equipped with six burners capable of producing 1.5 MBtu/hr of energy each. Three burners are positioned on each side wall of the furnace to allow for an even distribution of heat flux across the surface area of the test specimen. The exposed area of the furnace is reduced to 10 ft. by 10 ft. by utilizing a frame consisting of steel and concrete with the exposed surface protected by fiber ceramic blankets. The temperature inside the furnace is controlled by adjusting the blower speed of the air provided to the burners. This temperature is determined by the average of the nine thermocouples symmetrically placed behind the assembly. The neutral-pressure-plane is controlled by two pressure transducers that adjust the opening of the damper.

6.2 Loading Calculation & Procedure: Four RC-258 ENERPAC single acting actuators were spaced evenly below a reinforced steel free floating beam that held the test specimen and framing blocks. Specimen was centered on this beam to allow concentric loading. Sides of the assembly were held in place with lumber and set screws to allow for in-plane loading only, but did not constrain the sides. The hydraulic lines of the actuators were attached to a manifold system and that created pressure by an electric pump. When pumped, the actuators lifted the free floating beam so the test specimen was bearing on the top of the frame. The specimen was loaded to 441 psi 15 minutes prior to the start of the test and load was maintained until noted in the observation section of this report.

6.0 Test Details: (Continued)

6.3 Loading Calculation & Procedure:

$$Ft = W + DL * N$$

$$A = Na * Aeff.$$

$$P = \frac{Ft}{A}$$

Variable	**Description**	**Value**	**Unit**
W	Uniform Load of Dead Weight	2,639.5	lb.
DL	Design Load*	1,240	lb./stud
N	Number of Studs*	9	--
N_a	Number of Actuators	4	--
$A_{eff.}$	Effective Area / Actuator	5.15	in.^{2}
A	Total Area	20.6	in.^{2}
F_t	Total Force	13,800	lb.
P	**Pressure in Hydraulic Line**	**670**	**PSI**

*Design load based on pounds per stud.

6.0 Test Details: (Continued)

6.4 Test Observations:

12/16/2016 Fire Resistance Test

Time (hr:min:sec)	**Observations**
Fire Exposure	
00:01	Test Started
02:51	Ignition observed on the exposed wall.
04:19	Smoke begins to emit from unexposed surface.
15:00	Deflection measured left 6-5/8 in. center 6-1/2 in. right 6-1/2 in.
30:00	Deflection measured left 7-3/4 in. center 7-3/4 in. right 7-3/4 in.
45:00	Deflection measured left 7-5/8 in. center 7-5/8 in. right 7-5/8 in.
57:45	Deflection measured left 8 in. center 8 in. right 8 in.
01:00:00	Fire endurance test ends.
Post Fire Resistance Test	Hose stream test was conducted and an opening develop that permitted the projection of water beyond the unexposed surface.
Post Hose Stream Test	Fire endurance test concluded. **PASS.** The hose stream test did not meet the requirements of E2226. **FAIL**

12/28/2016 Hose Stream Retest

Time (hr:min:sec)	**Observations**
Fire Exposure	
00:01	Test Started
02:46	Ignition observed on the exposed wall.
30:00	Test Ended.
Post Fire Resistance/Hose Stream test	Hose stream test was conducted. **PASS.**

6.5 Test Results:

Variable	Description	Test Value
C	Correction Factor	43 seconds
I	Indicated FR Period	60 minutes
A	Area under Indicated FR Period for first 3/4 of test period	59399
As	Area under Standard E119 Time vs. Temp. Curve for first 3/4 of test period	58289
L	Lag Correction	3240°F*min
FR Period	**Fire-Resistance Period**	**60 minutes**

7.0 Test Conclusion:

The load-bearing assembly described in this report and tested by Intertek-ATI achieved a 60 minute fire-resistance rating when tested in accordance with ASTM E119. The load-bearing assembly described in this report also meet the requirements of ASTM E2226.

Intertek-ATI will service this report for the entire test record retention period. The service life of this report will expire on the stated Test Record Retention End Date, at which time such materials as drawings, data sheets, samples of test specimens, copies of this report, and any other pertinent project documentation, shall be discarded without notice.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For INTERTEK-ATI:

Digitally Signed by: Scott Gingrich
Scott Gingrich
Senior Technician – Fire Testing

Digitally Signed by: Ethan Grove
Ethan Grove
Manager – Fire Testing

SDG:ddr

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A: Graphical Data (2)
Appendix B: Numerical Data (4)
Appendix C: Photographs (6)
Appendix D: Drawings (1)

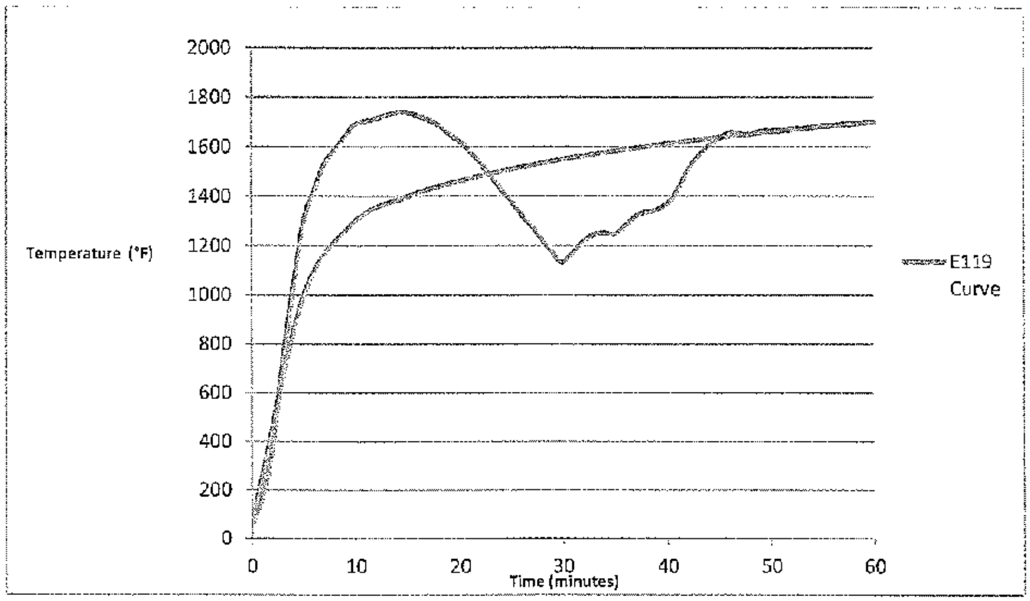
Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	03/01/2017	N/A	Original Report Issue

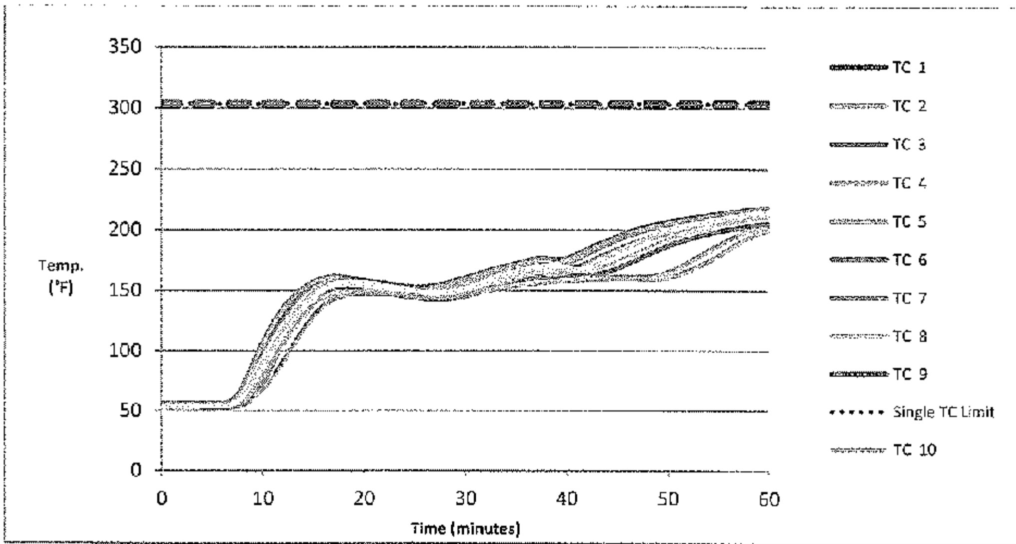
This report produced from controlled document template ATI 00662, revised 04/30/15

Appendix A

Graphical Data



Graph No. 1
Average Furnace Temperature vs. Standard Temperature



Graph No. 2
Unexposed Surface Temperatures

Appendix B

Numerical Data

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York, PA 17406

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p. 717.764.7700
f. 717.764.4129

Table 1
Average Furnace Temperature

Time (min)	Ave. Temp Furnace
0	54
1	175
2	377
3	739
4	1039
5	1299
6	1423
7	1530
8	1588
9	1643
10	1690
11	1704
12	1714
13	1730
14	1738
15	1738
16	1726
17	1709
18	1688
19	1652
20	1627
21	1584
22	1538
23	1484
24	1431
25	1382
26	1327
27	1279
28	1226
29	1175
30	1132
31	1172
32	1219
33	1245
34	1253

Time (min)	Ave. Temp Furnace
35	1249
36	1282
37	1320
38	1338
39	1345
40	1372
41	1424
42	1505
43	1563
44	1603
45	1634
46	1657
47	1655
48	1650
49	1664
50	1665
51	1667
52	1674
53	1675
54	1680
55	1686
56	1687
57	1692
58	1695
59	1698
60	1702

Table No. 2
Exterior TC Data

Time (Hr:Min:Sec)	TC Ave.	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	TC 10
0:00:00	53	55	56	53	52	54	52	53	52	53	54
0:01:00	53	55	56	53	52	54	52	53	52	53	54
0:02:00	53	55	56	53	52	54	52	53	52	53	54
0:03:00	53	55	56	53	52	54	52	53	52	53	54
0:04:00	53	55	56	53	52	54	52	53	52	53	54
0:05:00	53	55	56	53	52	54	52	53	52	53	54
0:06:00	54	56	56	53	53	54	52	53	52	53	54
0:07:00	56	59	58	54	57	56	53	56	55	54	55
0:08:00	63	68	64	55	70	63	59	65	64	56	61
0:09:00	74	82	74	61	88	75	68	78	78	61	72
0:10:00	88	98	87	73	107	89	80	93	93	68	86
0:11:00	102	114	102	90	123	103	92	107	108	78	99
0:12:00	115	127	115	107	135	117	105	119	121	91	112
0:13:00	127	139	127	122	145	130	118	130	132	104	124
0:14:00	137	148	138	134	152	141	128	140	140	117	135
0:15:00	145	154	146	143	157	149	137	147	147	128	144
0:16:00	151	157	152	149	160	155	144	154	151	137	151
0:17:00	154	159	156	151	162	158	147	158	154	143	155
0:18:00	155	158	157	152	161	158	149	159	155	146	157
0:19:00	155	157	157	151	160	158	149	159	155	147	157
0:20:00	154	156	157	150	158	157	149	158	154	148	156
0:21:00	153	154	156	149	156	156	149	157	153	148	155
0:22:00	152	152	154	148	154	154	148	156	152	147	154
0:23:00	151	151	153	147	152	153	147	155	151	147	153
0:24:00	149	150	152	145	151	152	146	154	150	146	151
0:25:00	149	150	150	144	150	150	145	153	149	147	150
0:26:00	148	151	149	143	149	149	144	153	148	148	149
0:27:00	148	153	149	143	150	148	143	154	148	150	148
0:28:00	149	155	148	143	151	147	143	156	148	153	148
0:29:00	151	158	149	144	153	147	144	158	149	156	150
0:30:00	153	161	150	146	156	148	146	160	151	159	152

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Test Report No.: G2313.01-121-24
Report Date: 02/03/2017
Test Record Retention End Date: 12/28/2020

Time (Hr:Min:Sec)	TC Ave.	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	TC 10
0:31:00	155	163	151	148	159	148	148	163	153	162	154
0:32:00	157	164	153	150	162	150	151	166	156	165	158
0:33:00	160	165	155	153	164	151	154	168	158	167	161
0:34:00	161	166	156	155	165	153	158	170	161	169	164
0:35:00	163	166	158	157	166	154	161	172	163	171	166
0:36:00	164	166	159	159	167	155	163	174	165	172	168
0:37:00	165	165	160	160	166	156	166	176	166	172	169
0:38:00	166	166	160	161	165	157	167	177	167	172	170
0:39:00	166	169	161	162	164	158	169	175	168	171	170
0:40:00	167	173	161	162	166	158	170	177	168	172	169
0:41:00	169	177	161	162	169	159	170	180	167	176	168
0:42:00	171	182	161	163	173	159	170	184	167	180	170
0:43:00	173	186	161	163	177	160	169	188	168	184	173
0:44:00	175	191	161	165	180	160	170	191	170	188	177
0:45:00	178	195	161	168	184	160	173	194	173	192	182
0:46:00	180	198	161	172	187	160	177	197	177	195	186
0:47:00	183	201	161	176	190	160	181	199	181	198	190
0:48:00	185	203	162	180	193	160	185	201	185	201	193
0:49:00	188	205	163	183	196	160	188	203	188	203	196
0:50:00	190	207	165	187	198	161	192	205	192	205	199
0:51:00	193	208	169	190	200	163	195	207	195	207	202
0:52:00	195	210	173	193	202	166	198	209	198	208	204
0:53:00	198	211	178	195	204	170	200	210	201	210	206
0:54:00	200	212	183	197	205	174	202	212	203	211	207
0:55:00	202	213	188	199	207	179	205	213	205	212	209
0:56:00	205	215	192	201	209	184	207	214	207	214	211
0:57:00	207	216	196	202	210	189	208	215	208	215	212
0:58:00	208	217	199	204	211	194	210	216	210	216	213
0:59:00	210	218	202	205	213	198	211	217	211	217	214
1:00:00	211	218	203	205	213	199	212	218	211	217	215
MAX Temp	211	218	203	205	213	199	212	218	211	217	215
PASS/FAIL		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	

Appendix C

Photographs

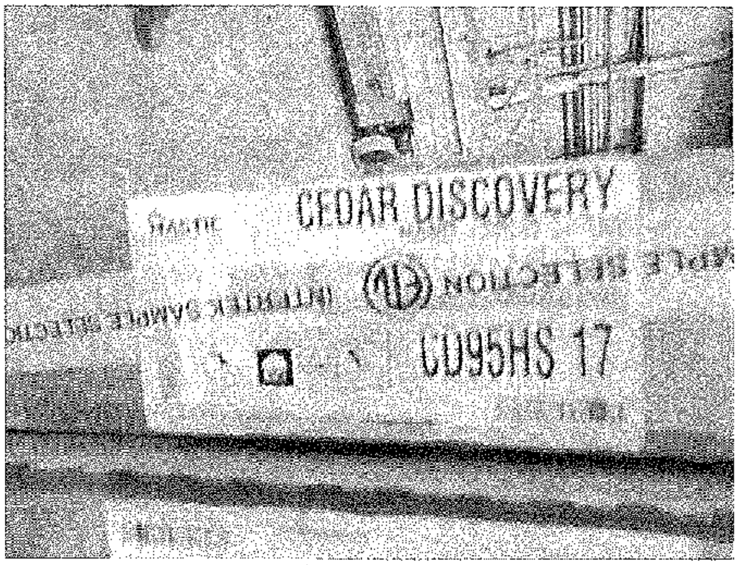

Photo No. 1
Sampling Markings on Wall Panels

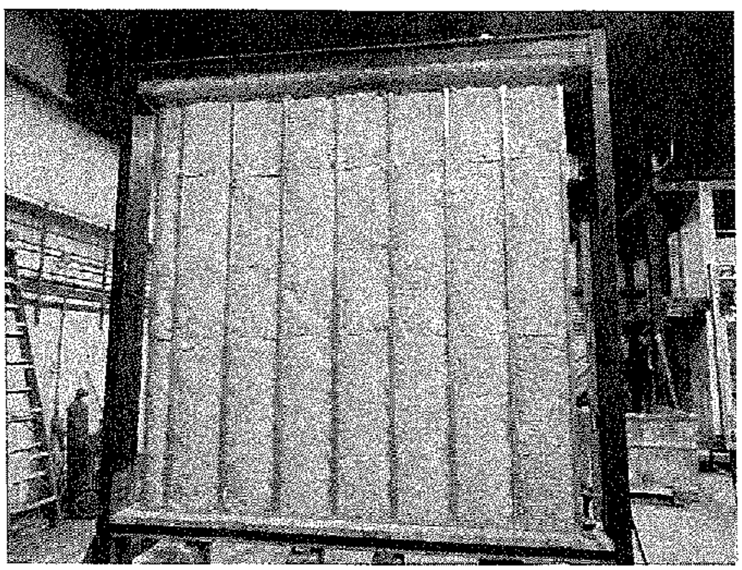
Photo No. 2
Wall Framed and Insulation Installed

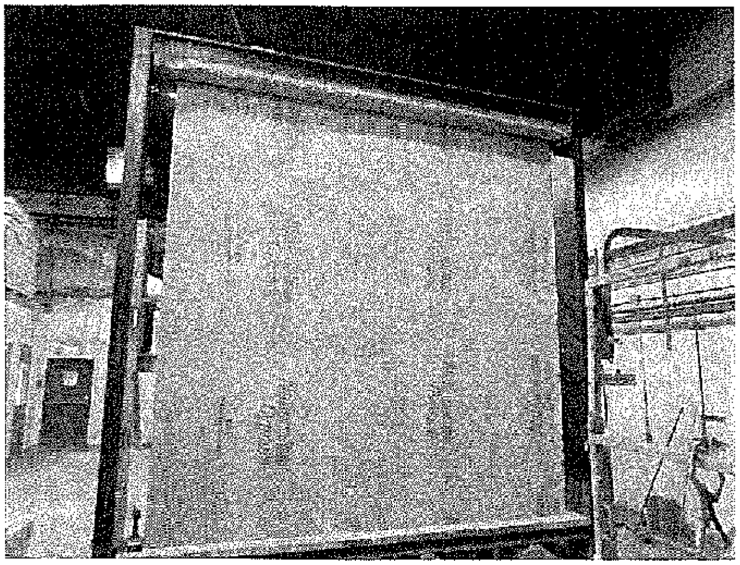

Photo No. 3
Installed Gold Bond® 5/8 inch Thick Exterior Gypsum Board

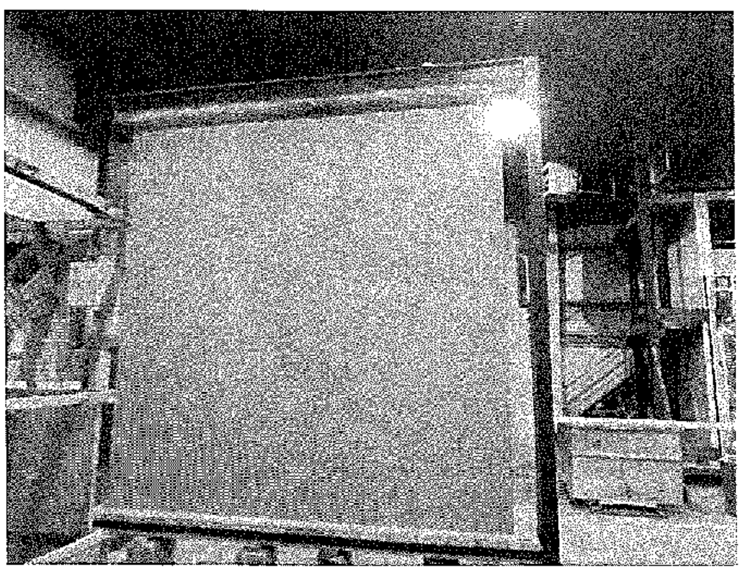

Photo No. 4
Installed 5/8 inch thick Type X Gypsum

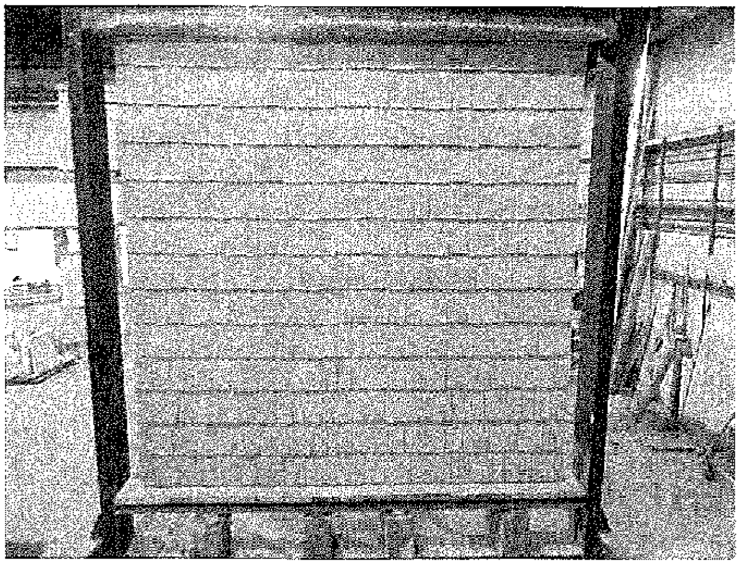

Photo No. 5
Installed Mastic Cedar Discovery Mano-Split Shake Siding

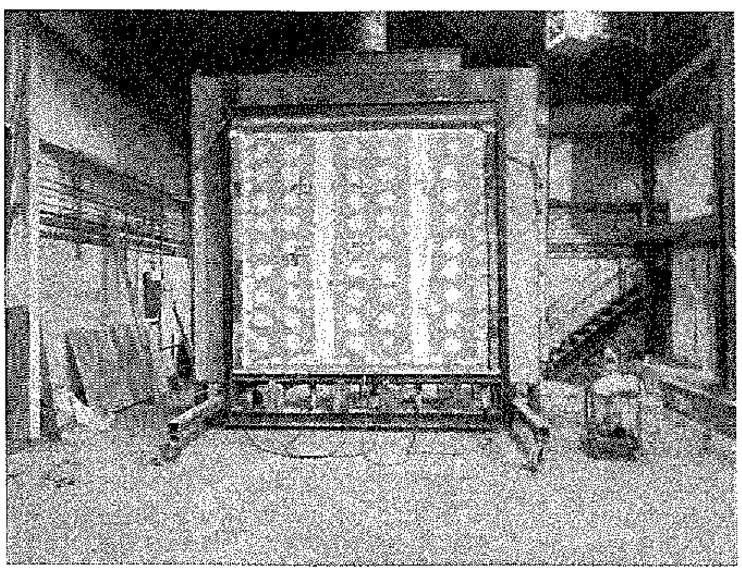

Photo No. 6
Complete Assembly (Pre-test)

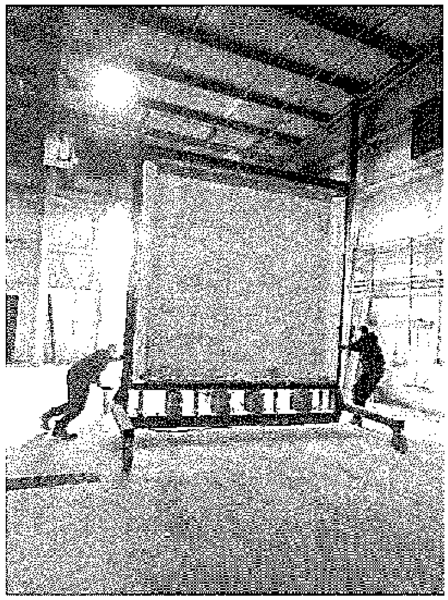

Photo No. 7
Exposed Surface (Post-Test)

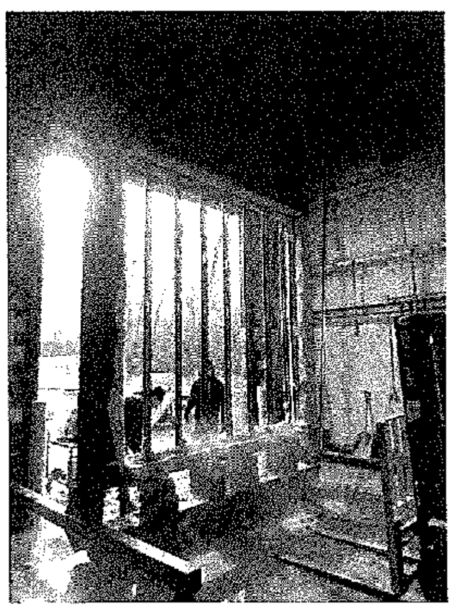

Photo No. 9
Post Hose Stream Test

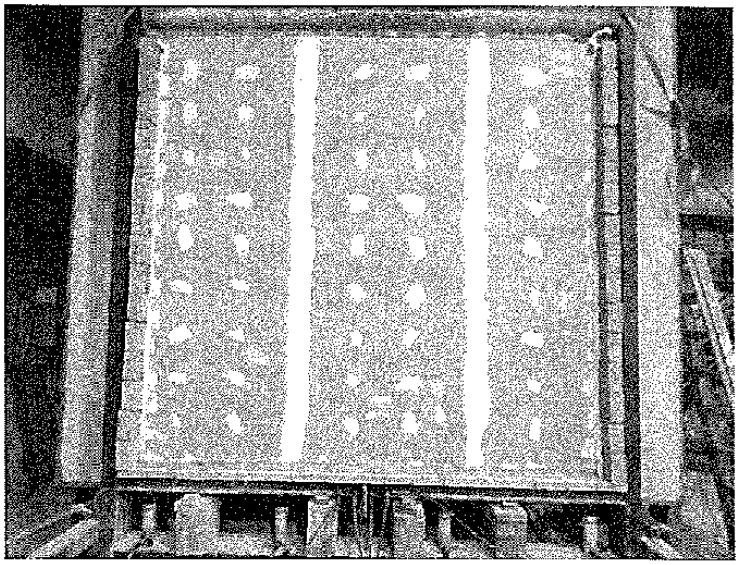

Photo No. 10
Hose Stream Retest Final Assembly

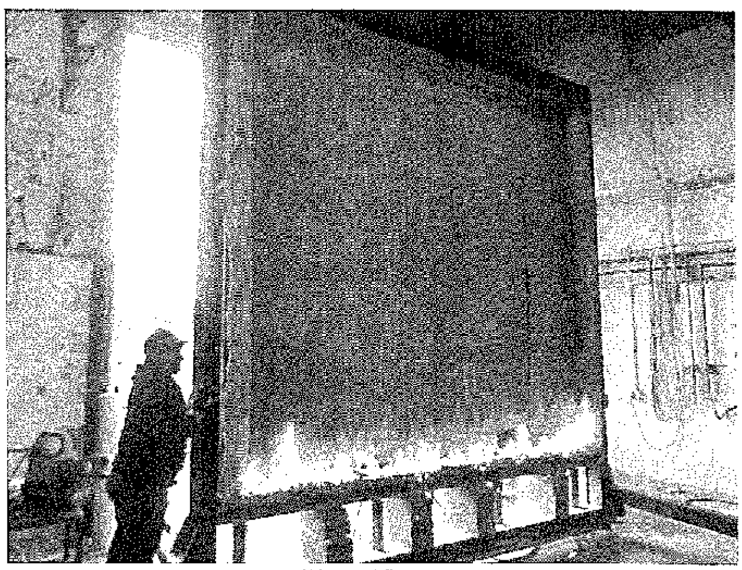

Photo No. 11
Hose Stream Retest Exposed Surface

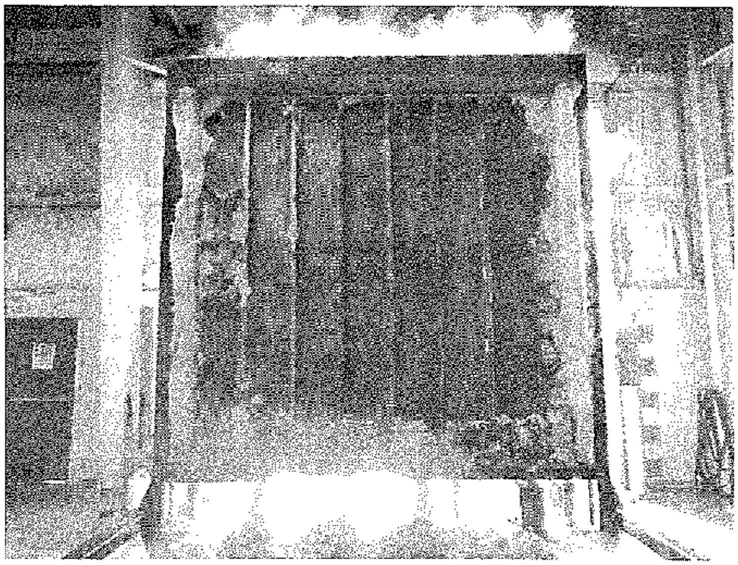

Photo No. 12
Hose Stream Retest Exposed Surface (Post Retest Test)

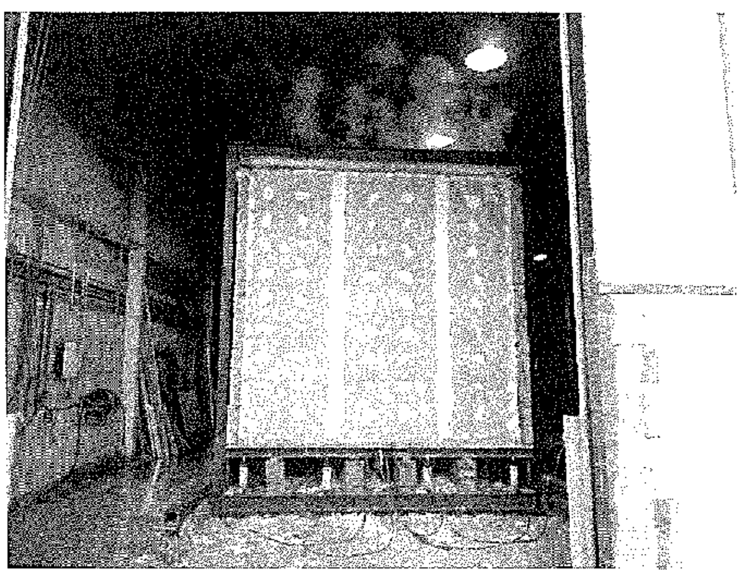

Photo No. 13
Hose Stream Retest Non-exposed Surface (Post Retest Test)

Appendix D

Drawings

130 Derry Court
York, PA 17406

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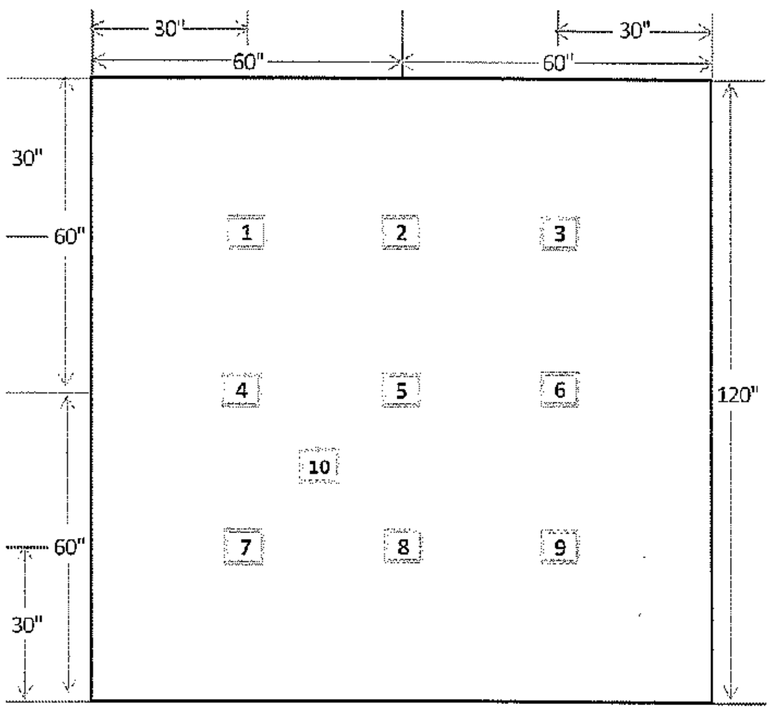
f. 717.764.4129



TC Locations

WESTERN FIRE CENTER, INC.
2204 Parrott Way, Kelso, Washington 98626
Phone: 360-423-1400 | Fax: 360-423-5003

FEBRUARY 28, 2022

EXTERIOR POLYPROPYLENE SIDING

PROPOSED CHANGE FOR POLYPROPYLENE SIDING REQUIREMENTS WITHIN THE INTERNATIONAL RESIDENTIAL CODE

BRENT M. PICKETT, PH.D.
WESTERN FIRE CENTER, INC.
Kelso, WA

Brent M. Pickett, Ph.D. is the Technical Director for Western Fire Center, Inc. (WFCi) located in Kelso, WA, and he has been employed at WFCi for over 10 years. WFCi is an independent fire testing laboratory that is uniquely qualified to run various large-scale fire tests for building materials. As the Technical Director, Dr. Pickett manages the various projects including standardized testing, client research and development, and litigation support. He is an active member of ASTM E05 (Fire), with task group responsibilities within various standards. Prior to working for WFCi, Dr. Pickett worked as a US Air Force contractor in their Fire Research Group. Dr. Pickett received a B.S. degree in Chemical Engineering from Brigham Young University in 2005, followed by a Ph.D. in Chemical Engineering from Brigham Young University in 2008, with an emphasis in wildland fire combustion.

The current International Residential Code (IRC 2021) currently prescribes exterior polypropylene (PP) siding as follows:

> **R703.14 Polypropylene siding**. *Polypropylene siding* shall be certified and *labeled* as conforming to the requirements of ASTM D7254, and those of Section R703.14.2 or Section R703.14.3, by an *approved* quality control agency.
>
> **R703.14.2 Fire separation**. *Polypropylene siding* shall not be installed on walls with a *fire separation distance* of less than 5 feet (1524 mm) and walls closer than 10 feet (3048 mm) to a building on another lot.
>
> **Exception**: Walls perpendicular to the line used to determine the *fire separation distance*.
>
> **R703.14.3 Flame spread index**. The certification of the flame spread index shall be accompanied by a test report stating that all portions of the test specimen ahead of the flame front remained in position during the test in accordance with ASTM E84 or UL 723.

This current code specification is redundant and should be adapted by removing Sections R703.14.2 and R703.14.3. Regarding Section R703.14.2, the code already has adequate provisions regarding building materials used within a fire separation distance closer than 10'. Regarding Section R703.14.3, the ASTM D7254 specification already requires an ASTM E84 test. Thus, these two Sections are not needed and potentially put additional restrictions upon exterior PP siding, which is the only cladding in both the IBC and IRC that requires an ASTM E84 test respective to a fire separation distance.

The requirement found in Section R703.14.2 is redundant because the IRC Section R302 already specifies that exterior walls must have a fire separation distance of at least 10' (5 feet to the property line) or be a 1-hour rated assembly tested in accordance with ASTM E119.

Specifically, Table R302.1(1) stipulates a minimum 1-hour fire resistance rating for any exterior wall with a fire separation distance of under 10' (5 feet to the property line). Most 1-hour rated assemblies will have at least one layer of ⅝" Type X gypsum on each side of the framing members, either wood or steel studs.

TABLE R302.1(1)
EXTERIOR WALLS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the *International Building Code* with exposure from both sides	0 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood[a, b]	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Openings in walls	Not allowed	NA	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet

For SI: 1 foot = 304.8 mm.
NA = Not Applicable.
a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.

To show a large-scale fire resistance test, an exemplar ASTM E119 fire resistance test with exterior PP siding was performed in 2016. The main 1-hr assembly consisted of 3⅝" loaded steel studs with mineral wool insulation. The exterior and interior sides of the studs were covered with exterior and interior (⅝" Type X) gypsum, respectively. Additionally, the exterior gypsum had house wrap and a representative PP siding fastened to the studs. The test went the full 60 min with an average unexposed temperature of approximately 211°F at the end of the test, well below the average temperature threshold (250°F + ambient). No flames were observed on the unexposed side and maintained the load for the duration of the test. On a 2nd identical assembly tested at half the fire duration, there was no water penetration through the assembly, passing the hose-stream requirements. There was some significant feedback from the assembly causing the furnace temperature to increase at around 12 min into the test, but once the PP siding burned away from the assembly, the furnace could be better controlled. Regardless of the performance of the exterior PP siding as an individual component of the fire test, the complete assembly still met all the requirements for a 1-hr fire resistance.

In addition to the E119 fire resistance test, other standard and modified or research fire tests have been performed on exterior PP siding to show their overall fire performance in a realistic "on-the-wall" fire environment. Multiple exterior PP sidings have been tested to NFPA 268 to determine the ignitability of an exterior 4'×8' wall system by exposing the exterior portion of the wall (7/16" OSB, house wrap, PP siding) to a 12.5 kW/m^2 radiant panel for 20 min with a pilot spark ignitor providing a potential ignition source for the material. The standard specifies ignition as sustained flames on the exposed side of the wall, yet none of these PP systems showed any ignition on the surface. Significant melting of the PP siding occurred within 1 to 4 min of the beginning of the test, yet the increased fluidity of the PP and newly exposed wrap and OSB did not ignite the wall.

A CSFM 12-7A-1 (similar to ASTM E2707) test was performed on a representative PP 4'×8' wall system (½" OSB, ½" Type X gypsum, house wrap, PP siding) in 2008. This test ignites the bottom of the wall with a 150 kW gas burner, exposing the exterior wall for 10 min, then observing the assembly for additional 60 min for potential burn-through to the interior side of the sample. Tests were performed in triplicate, and none of the tests had flame penetration or glowing of the walls at the end of the tests. The PP material had pooled at the bottom of the wall, indicating that much of the material had fallen off the wall during the test. Even the use of ½" gypsum can provide sufficient protection to the assembly to meet the 12-7A-1 requirements.

Additionally, multiple dual-wall fire tests were performed using a modified ASTM E2707 approach, each with a 4'×8' ignition wall and receiver wall. The ignition wall was exposed to the sample 150 kW burner as the ASTM E2707 test, and the receiver wall was placed at a specified distance away opposing the ignition wall, 4', 6' and 10'1". On walls under 10', both the ignition and receiver walls had ⅝" Type X gypsum closest to the exterior PP siding. On all tests, the ignition wall had PP siding pool at the base of the wall which was largely consumed during the test. None of the receiver walls ignited, though the amount of warped and fallen material varied substantially with distance (see Figure 1 below). Generally, the PP material on the receiver wall began to warp and/or melt at around 90°C to 100°C, but the temperatures peaked on the receiver walls at 248°C, 138°C, and 105°C for the 4', 6', and 10'1" walls, respectively. The heat release rate of a PP siding and gypsum sheathed wall was about 65% less than the heat release of a PP siding and OSB sheathed wall, so the use of gypsum sheathing aids in the overall fire protection, which is what is expected in a 1-hr (or higher) fire resistance wall. The full dual-wall tests are reported at the following link:

https://www.vinylsiding.org/wp-content/uploads/2022/01/PolypropyleneFireTest.2020reportsubmitted-004.pdf

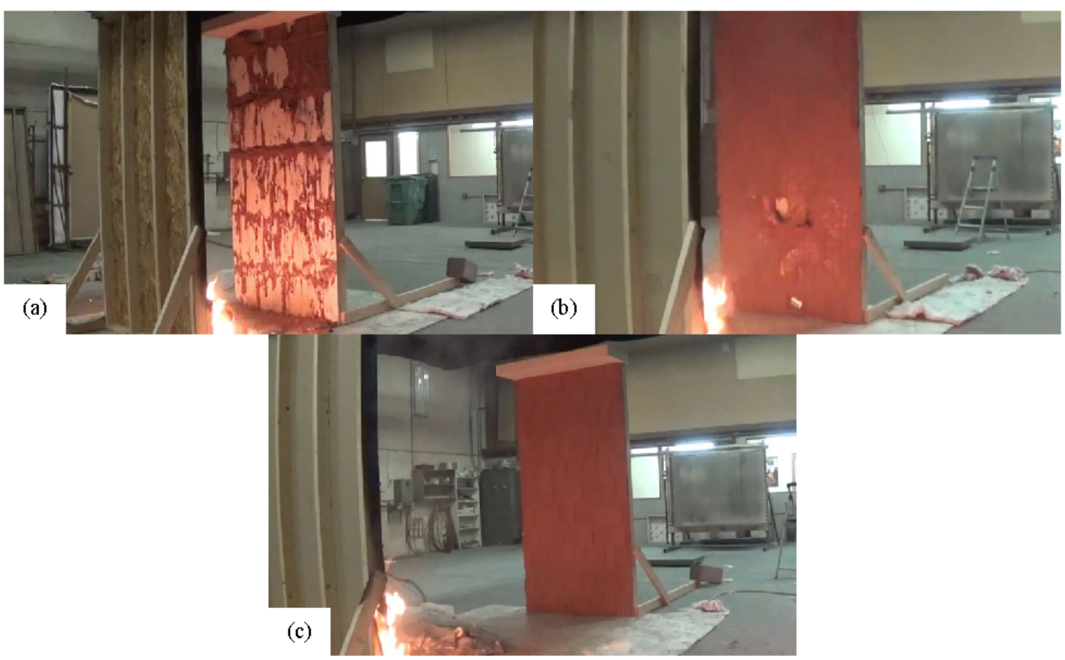


Figure 1. Receiver walls at 10 min burner exposure on ignition wall showing (a) 4' separation, (b) 6' separation, and (c) 10'1" separation.

The requirement found in Section R703.14.3 is redundant because the specifications found in ASTM D7254 already require the passage of an ASTM E84 test as follows:

> **5.5** *Surface flame spread* – The siding shall exhibit a flame spread index not exceeding 200 (or at least Class C) when tested in accordance with 6.6.
>
> **6.6** *Surface flame spread* – Conduct the test on surface flame spread characteristics in accordance with Test Method E84. The test specimen shall either be self-supporting by its own structural characteristics or held in place by added supports along the test specimen surface.

Multiple ASTM E84 tests have been performed on various exterior types and manufacturers of PP siding. Their flame spread indices range between 41 and 106 with an average of 82.7, which qualifies for at least a Class C material, below the specified 200 limit. Ignition usually occurred within the first minute of the test with complete flame spread through the tunnel within the first 5 minutes. By these tests, the PP exterior siding meets the requirements outlined in the standard.

The use of the E84 specifically relating to fire separation distances is questionable (see Section 4.3.2 below).

> **4.3.2** [This standard does not provide] The effect of aggravated flame spread behavior of an assembly resulting from the proximity of combustible walls and ceilings.

Since the standard does not provide flame spread results when combined with combustible proximity walls, their dependence of using them as limitations, as used in the current IRC, for fire separations distances is inadequate.

The E84 tests above were supported by using wire mesh and ¼" steel rods at 24" spacing, which is probably the most robust support system available for this type of material, yet nearly all of the test reports showed that there was still some form of dripping, sagging, and/or flames on the floor of the tunnel, similar to what is seen in the various "on-the-wall" tests above. To completely limit the dripping or falling of the PP material is not possible, yet to consider the flame spread index valid if the material cannot naturally behave as its custom during a fire is also not applicable (see X4.7.7 and X.4.7.8 below). It is a difficult problem, but completely restricting the falling of the material as outlined in R703.14.3 is untenable.

> **X4.7.7** Some materials, such as cellular plastics and thermoplastic materials, can be difficult to evaluate. Thermoplastic materials not mechanically fastened will often fall to the floor of the tunnel. Accordingly, these materials as well as thermosetting cellular plastics can also receive relatively low FSI (Ref 11, 12). If supported on wire screen, rods or other supports, some plastic materials can be completely engulfed in flame, and a questionable comparison would result between the flame spread indices and smoke developed indices of these materials and those of materials that are unsupported.
> **X4.7.8** The materials described above, that is, those that drip, melt, delaminate, draw away from the fire, or require artificial support present unique problems and require careful interpretation of the test results. Some of these materials that are assigned a low FSI based on this method may exhibit an increasing propensity for generating flame-over conditions during room fire test with increasing area of exposure of the material and increasing intensity of the fire exposure. The result, therefore, may not be indicative of their performance if evaluated under large-scale test procedures. Alternative means of testing may be necessary to fully evaluate some of these materials.

Because of the overall redundancy of the two sections (R703.14.2 and R703.14.3), these items should be struck from the code language, allowing the language of ASTM D7254 determine the applicability of the exterior PP material. The code already provides adequate language regarding fire separation distances in that there must be at minimum 1-hr fire resistance for anything closer than 10'. Many tests show that the exterior PP siding will drip and melt from the substrate, and trying to completely restrict the falling of material is not an option for this specific material.

TEST REPORT

REPORT NUMBER: 101817859COQ-005.2
ORIGINAL ISSUE DATE: April 13, 2015
REVISION DATE : May 5, 2015

EVALUATION CENTER
Intertek Testing Services NA Ltd.
1500 Brigantine Drive
Coquitlam, B.C. V3K 7C1

RENDERED TO

Novik Inc.
160 rue des Grands Lacs
Saint Augustin de Desmaures
Quebec, QC. G3A 2K1

PRODUCT EVALUATED: NOVISTONE PHC Polymer Composite Panels
EVALUATION PROPERTY: Surface Burning Characteristics

Report of testing NOVISTONE PHC Polymer Composite Panels for compliance with the applicable requirements of the following criteria: ASTM E84-15, *Standard Test Method for Surface Burning Characteristics of Materials*

1 Table of Contents

2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for Novik Inc., to evaluate the surface burning characteristics of NOVISTONE PHC Polymer Composite Panels. Testing was conducted in accordance with the standard methods of ASTM E84-15, *Standard Test Method for Surface Burning Characteristics of Materials.*

This evaluation began April 13, 2015, and was completed the same day.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were submitted to Intertek directly from the client and were not independently selected for testing. The sample materials were received at the Evaluation Center on January 28, 2015.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Upon receipt of the samples at the Intertek Coquitlam laboratory, they were placed in a conditioning room where they remained in an atmosphere of 23 ± 3°C (73.4 ± 5°F) and 50 ± 5% relative humidity.

The sample product was identified by the client as "NOVISTONE PHC Polymer Composite Panels (Formulation 2)". The material was gray in colour and each panel measured 18 ½ in. wide by 48 in. long.

For this test run, 24 in. wide by 24 ft. of sample material was placed on the upper ledge of the flame spread tunnel to form the required sample length. The sample material was supported by ¼ in. steel rods spaced every 24 in. and 20 ga. 2 in. x 2 in. galvanized steel netting spanning the upper ledge of the flame spread tunnel. A layer of 6mm reinforced cement board was placed over top of the samples, the tunnel lid was lowered into place, and the samples were then tested to ASTM E84-15.

4 Testing and Evaluation Methods

4.1. TEST STANDARD

The results of the tests are expressed by indexes, which compare the characteristics of the sample under tests relative to that of select grade red oak flooring and inorganic-cement board.

(A) Flame Spread Index:

This index relates to the rate of progression of a flame along a sample in the 25 foot tunnel. A natural gas flame is applied to the front of the sample at the start of the test and drawn along the sample by a draft kept constant for the duration of the test. An observer notes the progression of the flame front relative to time. This information is plotted on a graph (flame spread curve).

The test apparatus is calibrated such that the flame front for red oak flooring passes out the end of the tunnel in five minutes, thirty seconds (plus or minus 15 seconds).

(B) Smoke Developed:

A photocell is used to measure the amount of light, which is obscured by the smoke passing down the tunnel duct. When the smoke from a burning sample obscures the light beam, the output from the photocell decreases. This decrease with time is recorded and compared to the results obtained for red oak, which is defined to be 100.

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

(A) Flame Spread

The resultant flame spread Indexes are as follows:
(index rounded to nearest 5)

Sample Material	Flame Spread	Flame Spread Index
NOVISTONE PHC Polymer Composite Panels	89	90

(B) Smoke Developed

The areas beneath the smoke developed curve and the related indexes are as follows:
(For smoke developed indexes 200 or more, index is rounded to the nearest 50. For smoke developed indexes less than 200, index is rounded to nearest 5)

Sample Material	Smoke Developed	Smoked Developed Index
NOVISTONE PHC Polymer Composite Panels	734	750

(C) Observations

The sample surface ignited at 54 seconds. The flame then began to progress along the sample length until it reached the maximum flame spread. All portions of the test specimens ahead of the flame front remained in position during the test in accordance with ASTM E84.

6 Conclusion

The sample of NOVISTONE PHC Polymer Composite Panels (Formulation 2), submitted by Novik Inc, exhibited the following flame spread characteristics when tested to ASTM E84-15, *Standard Test Method for Surface Burning Characteristics of Materials.*

Sample Material	Flame Spread Index	Smoke Developed Index
NOVISTONE PHC Polymer Composite Panels	90	750

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK TESTING SERVICES NA LTD.

Tested and Reported by: Gregory Philp
Greg Philp
Technician – Building Products Testing

Reviewed by: Riccardo DeSantis
Riccardo DeSantis
Manager – Building Products

APPENDIX A

DATA SHEETS

ASTM E84-15 DATA SHEETS

ASTM E84

Page 1 of 2

Client: Novik
Date: 04 13 2015
Project Number: 101817859
Test Number: 1
Operator: Greg Philp

Specimen ID: Novik Priemium Hand Cut Stone NOVISTONE PHC (Formulation 2)

TEST RESULTS

FLAMESPREAD INDEX: 90

SMOKE DEVELOPED INDEX: 750

SPECIMEN DATA . . .

Time to Ignition (sec): 54
Time to Max FS (sec): 301
Maximum FS (feet): 19.0
Time to 980 F (sec): 364
Time to End of Tunnel (sec): 301
Max Temperature (F): 1284
Time to Max Temperature (sec): 429
Total Fuel Burned (cubic feet): 47.00

FS*Time Area (ft*min): 139.9
Smoke Area (%A*min): 812.7
Unrounded FSI: 89.0
Unrounded SDI: 734 2

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 47.0
Red Oak Smoke Area (%A*min): 110.7

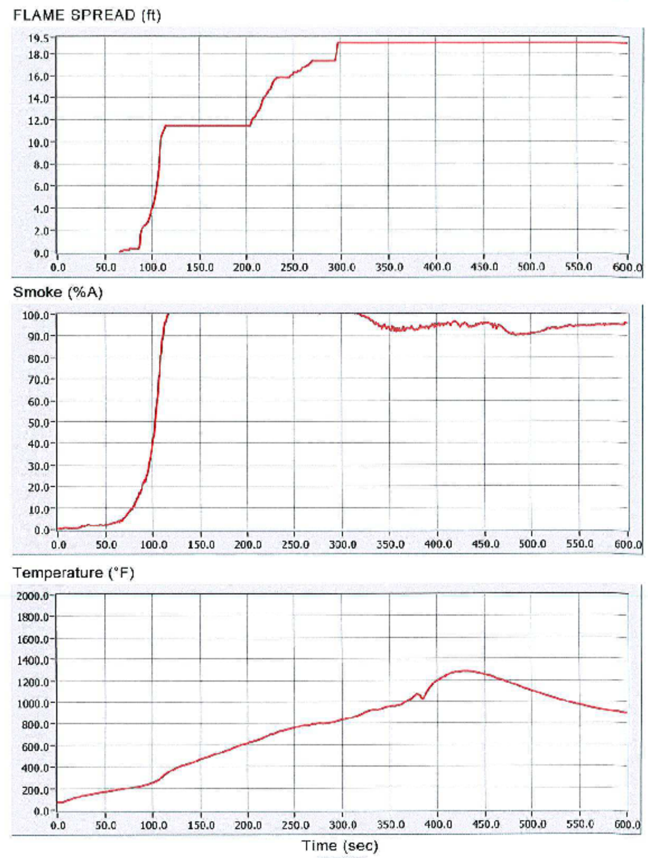
TESTED BY

REVIEWED BY

ASTM E84-15 DATA SHEETS

Project No: 101817859

Page 2 of 2



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REVISION SUMMARY

DATE	PAGE	SUMMARY
April 13, 2015	All	Original Issue Date
May 5, 2015	5	Included Statement. All portions of the test specimens ahead of the flame front remained in position during the test in accordance with ASTM E84. in Observations Section.

SOUTHWEST RESEARCH INSTITUTE®

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CHEMISTRY AND CHEMICAL ENGINEERING DIVISION

FIRE TECHNOLOGY DEPARTMENT
WWW.FIRE.SWRI.ORG
FAX (210) 522-3377

FIRE PERFORMANCE EVALUATION IN ACCORDANCE WITH NFPA 268 (2012) *STANDARD TEST METHOD FOR DETERMINING IGNITIBILITY OF EXTERIOR WALL ASSEMBLIES USING A RADIANT HEAT ENERGY SOURCE*

MATERIAL ID1: ***VSI 2.58.075 POLYPROPYLENE SIDING***
MATERIAL ID2: ***VSI 1.1.124 POLYPROPYLENE SIDING***

FINAL REPORT
Consisting of 6 Pages

SwRI® Project No.: 01.21604.16.104
Test Date: July 6, 2016
Report Date: July 21, 2016

Prepared for:

Vinyl Siding Institute
1201 15th St., NW Suite 220
Washington, DC 20005

Prepared by:

Natasha Albracht
Engineer
Material Flammability Section

Approved by:

For Matthew S. Blais, Ph.D.
Director
Fire Technology Department

1.0 INTRODUCTION

This report describes a fire performance evaluation conducted for Vinyl Siding Institute, in accordance with the National Fire Protection Association (NFPA) 268, 2012 Edition, *Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source*. Testing was conducted at the Fire Technology Department of Southwest Research Institute (SwRI), located in San Antonio, Texas.

This test method should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all the factors that are pertinent to an assessment of the fire hazard of a particular end use.

This report describes the testing of the assembly tested and the results obtained. The results presented in this report apply specifically to the material tested, in the manner tested, and not to the entire production of these or similar materials, nor to the performance when used in combination with other materials.

2.0 SAMPLE DESCRIPTION

The siding materials were received by SwRI on June 24, 2016, and constructed by SwRI personnel on a later date. The wall assembly consisted of 2 × 4 in. wood studs spaced 16 in. on center, 7/16 in. OSB sheathing, house wrap, and the polypropylene siding material. Construction details were provided by the Client. The panels were conditioned in accordance with the standard and are described below in Table 1.

Table 1. Sample Descriptions for Vinyl Siding Institute's Panels.

Material ID	Description
VSI 2.58.075 Polypropylene Siding	0.075-in. thick Cape Cod gray (approx. weight 0.55 lb/sqft)
VSI 1.1.124 Polypropylene Siding	0.125-in. thick Cedar shake (approx. weight 1.0 lb/sqft)

3.0 TEST SETUP

A calibration test was performed to establish the distance from the radiant panel to the calibration panel in order to maintain an average heat flux of 12.5 kW/m² ± 5% for a 20 min period. The distance required to maintain the specified heat flux was measured to be 32 in. The 12.5 kW/m² heat flux was determined by averaging the output of four heat flux meters located at the corners of the central square foot of the calibration panel. During both the calibration and the test, a side-mounted reference heat flux meter was located 4.5 in from the vertical edge of the test specimen to the centerline of the gauge.

4.0 CONCLUSION

During the 20-min test period, neither panel assembly had sustained flaming for a period greater than 5 s which **meets** the acceptance criteria stated in NFPA 268. Graphical data and visual observations can be found in Appendix A. Video recordings will be provided on a DVD.

APPENDIX A

GRAPHICAL DATA AND VISUAL OBSERVATIONS

(CONSISTING OF 2 PAGES)

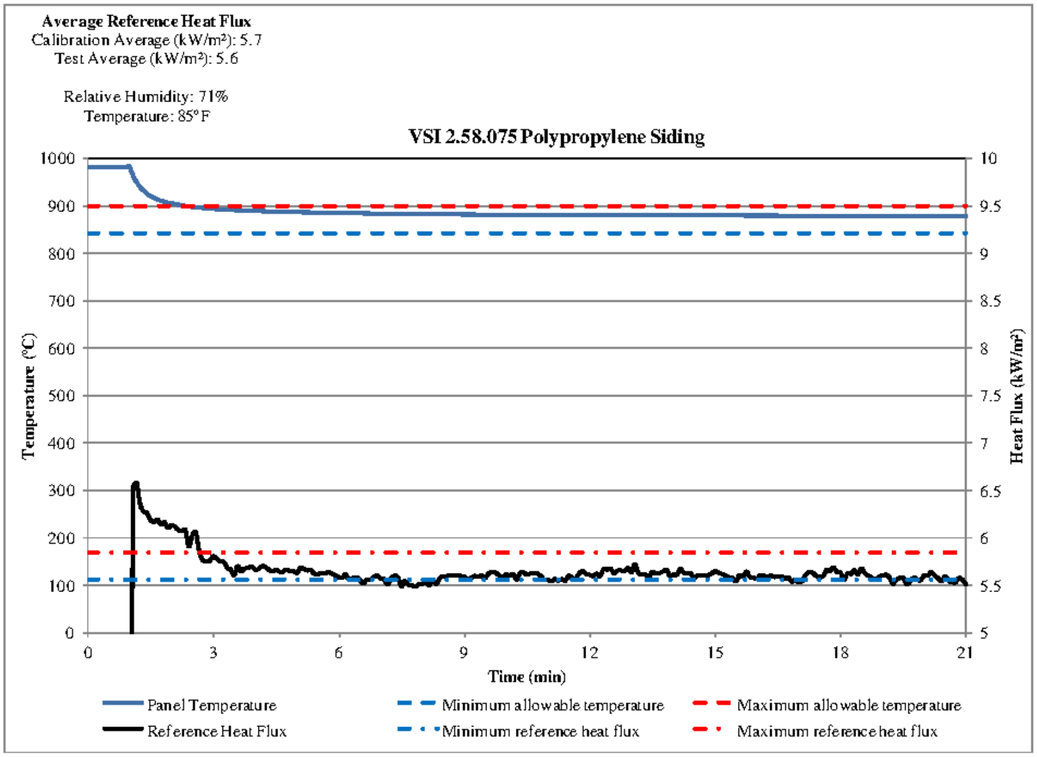

Figure A-1. Reference Heat Flux and Panel Temperature.

Table A-1. Visual Observations.

Time	Observation
-01:00	Baseline
00:00	Start of test. Radiant heat shield removed.
00:35	Warping and bubbling/blistering
01:10	Smoking
01:24	Blistering
01:36	Melting
20:00	End of test.

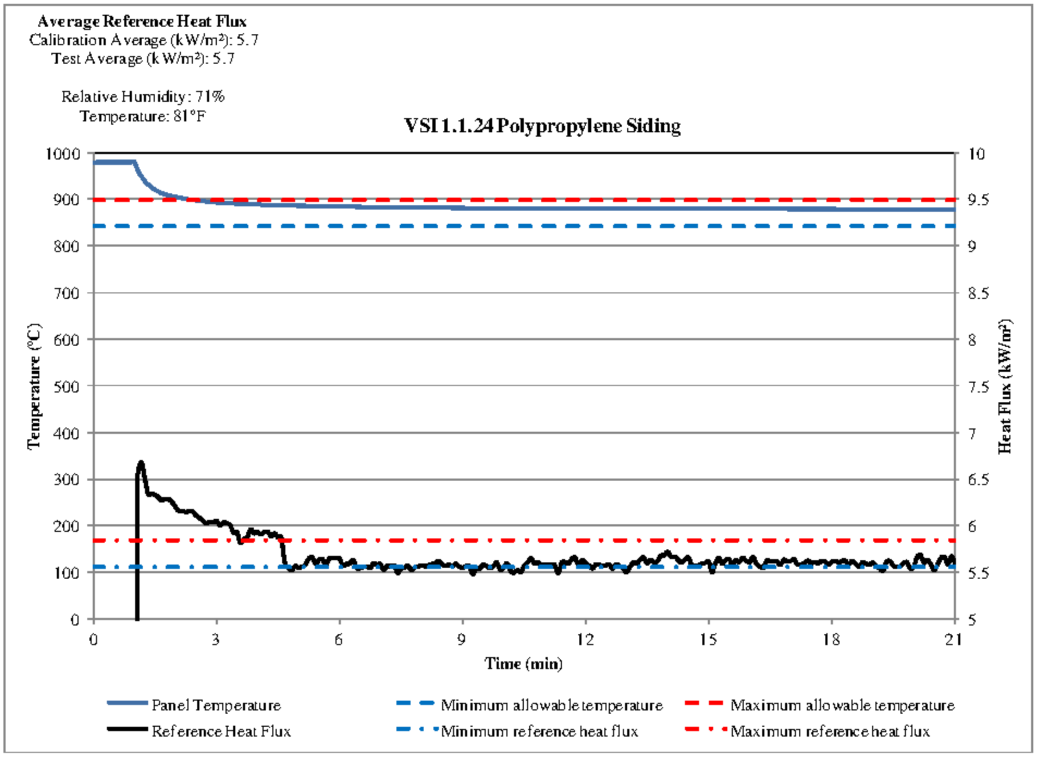

Figure A-2. Reference Heat Flux and Panel Temperature.

Table A-2. Visual Observations.

Time	Observation
-01:00	Baseline
00:00	Start of test. Radiant heat shield removed.
00:35	Warping
00:54	Discoloration
01:24	Smoking
01:36	Charring
01:46	Melting
02:16	House wrap melting
02:31	Sagging/melting
20:00	End of test.

Western Fire Center, Inc.
2204 Parrott Way, Kelso, Washington 98626
Phone: 360-423-1400 | Fax: 360-423-5003 | Toll Free: 877-423-1401

Testing of Exterior Vinyl Siding Samples in Accordance with Urban Wildland Interface Building Test Standards 12-7A-1: *Fire Resistive Standards for Exterior Wall Siding and Sheathing and a Hybrid ICAL/UWIT Test Method*

PN# 06074

Conducted for:

VINYL SIDING INSTITUTE
1201 15TH STREET, NW, STE 220
WASHINGTON, DC 20005

TESTING CONDUCTED ON: OCTOBER 10 - 12, 2006

REPORT ISSUED ON: NOVEMBER 27, 2006

Testing • Research • Investigation • Consulting • Modeling • Animation • Litigation

TABLE OF CONTENTS

INTRODUCTION

This report documents the CSFM 12-7A-1 and hybrid Intermediate Scale Calorimeter (ICAL) testing of fifteen samples performed by Western Fire Center, Inc. (WFCi) for:

VINYL SIDING INSTITUTE
1201 15TH STREET, NW, STE 220
WASHINGTON, DC 20005.

Mike White of WFCi conducted the tests with the assistance of Wayne Beres, Logan Byman on October 10 - 12, 2006.

The 4' X 8' samples were constructed at WFCi prior to testing. A detailed description of the samples can be found on page 12 of this report.

The purpose of these tests was to evaluate the fire endurance characteristics of the client's exterior siding constructions when subjected to laboratory fire exposure conditions.

This test is used to measure and describe the properties of materials, products or assemblies in response to heat and flame under controlled laboratory conditions and is not intended to be used to describe or appraise the fire hazard or fire risk of the materials, products or assemblies.

SUMMARY OF THE TEST METHODS

From CSFM 12-7A-1: *Fire Resistive Standards for Exterior Wall Siding and Sheathing*:

(a) Application. The minimum design, construction and performance standards set forth herein for exterior wall siding and sheathing are those deemed necessary to establish conformance to the provisions of these regulations. Materials and assemblies that meet the performance criteria of this standard are acceptable for use in Very High Fire Hazard Zones as defined in California Building Code, Chapter 7A.

(b) Scope. This standard determines the performance of exterior walls of structures when exposed to direct flames.

(i) Conduct of Tests.

1. **Airflow.** The wall test shall be conducted under conditions of ambient airflow.
2. **Number of tests**. Conduct the tests on three replicate wall assemblies (six for weathered performance)**.**
3. **Burner output verification.** Without the wall assembly in place, adjust the burner for 150 ± 8 kW output. Extinguish the burner.
4. **Burner configuration**. Center the burner relative to the width of the cladding-wall assembly and 0.75 in. (20 mm) from the wall. The distance from the floor to the top of the burner shall be 12 in. (300 mm).
5. **Procedure**
   i) Ignite the burner, controlling for constant 150 ± 8 kW output.
   ii) Continue the exposure until flame penetration of the cladding-wall assembly occurs, or for a 10-min period.
   iii) If penetration does not occur, continue the test for an additional 60 min or until all combustion has ceased.
6. **Observations.** Note the time, location, and nature of flame penetration.

For this study, the test was terminated upon observation of signs of progressive glowing combustion.

This test method was utilized in Tests 1, 2 and 15 of the test series described in this report.

Description of the Hybrid ICAL / UWIT Test Method

This method is a modification/augmentation of the procedure described in 12-7a-1, and provides for an assessment of the performance of exterior walls of structures, including siding, when exposed to simulated fire exposure conditions. This 'hybrid ICAL/UWIT test method' augments the UC FPL protocol and incorporates radiant heating exposure methodology described in ASTM E1623. This methodology is currently under consideration as a draft standard by ASTM Task Group E5.14.01.

Figures 1 – 5 show various views of the test methods utilized in this study.

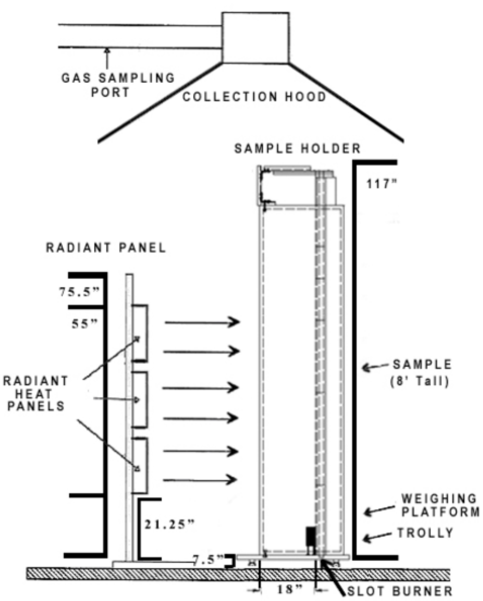

Figure 1. Schematic View of the Hybrid Exterior Wall Fire Test Method

Figure 2. 4' x 8' Exterior Wall Prior to ICAL Exposure.

Figure 3. Start of test. Water cooled shield in front of ICAL has been pulled away.

Figure 4. Ignition and Spread of Flames over a Specimen.

Figure 5. Slot Burner at Bottom is Ignited after 5 Minutes of Radiant Flux Exposure

The 'hybrid' test can be used to determine various fire performance responses of a wall construction under simulated wildfire exposure conditions, including heat release and fire penetration. The radiant heat flux exposure is intended to simulate radiant exposure from an approaching fire front and/or combustion of items (vegetation or structures) in close proximity to the wall construction. A gas burner at the base of the wall is intended to simulate direct flame impingement from burning items in contact with the structure.

Before the test begins, the specimen is vertically mounted to a specimen holder, which permits a prefabricated 4 x 8 ft (1.2 by 2.4 m) wall section to be inserted from the rear and to seal in such a way that protects the edges from fire. The specimen is then exposed to a uniform heat flux from the gas-fired radiant panel of the ICAL. Radiant heat exposures can be established in the range of 12.5 to 50 kW/m^2. This test may be conducted either with or without a pilot ignition applied to the specimen. A 4 x 39 in. (100 x 1000 mm) natural gas diffusion burner (slot burner) is placed centered against the bottom of the sample and a natural gas output of 40 ±2 kW is ignited at five minutes into the test, and is maintained on the sample for five minutes until the test is terminated at ten minutes, or when failure appears imminent.

During the test, the rear of the assembly is monitored for signs of visible flaming or progressive glowing combustion. The test shall be terminated when failure occurs (as defined by flaming or progressive glowing combustion on the unexposed surface of the assembly), or when there are no longer signs of glowing combustion within the 60 minute post fire exposure observation period.

This test method was utilized in Tests 3 - 14 of the test series described in this report.

SAMPLE DESCRIPTION

Fifteen 4′ x 8′ wall assemblies were constructed at the WFCi laboratory using materials shipped from the client. Each assembly included nominal 2″ X 4″ wood studs spaced at 16″ on center.

Samples also included a sheathing layer of either 7/16″ OSB or 1/2″ regular gypsum wallboard (GWB) fastened at 12″ on center in the field and 6″ on center on the perimeter and joints. Fasteners used were 8d common nails on the OSB sheathing and 1-1/4″ roofing nails on the GWB. The sheathing in all tests was attached with a vertical joint over one of the center studs.

The siding listed below as "Hollow-Back" was GP Double 5″ Standard Lap Vinyl Siding (Hollow-Back). The siding listed as "Insulated" was Foam Insulated-Back Vinyl Siding.

Test #	Siding Type	Sheathing Type	Flux Exposure	Method Used
1	Hollow-Back	7/16″ OSB	150 kW Burner	12-7A-1
2	Hollow-Back	1/2″ GWB	150 kW Burner	12-7A-1
3	Hollow-Back	7/16″ OSB	12.5 kW/m²	Hybrid
4	Hollow-Back	1/2″ GWB	12.5 kW/m²	Hybrid
5	Hollow-Back	7/16″ OSB	25 kW/m²	Hybrid
6	Hollow-Back	1/2″ GWB	25 kW/m²	Hybrid
7	Hollow-Back	1/2″ GWB	50 kW/m²	Hybrid
8	Insulated	7/16″ OSB	12.5 kW/m²	Hybrid
9	Insulated	1/2″ GWB	12.5 kW/m²	Hybrid
10	Insulated	1/2″ GWB	25 kW/m²	Hybrid
11	Insulated	1/2″ GWB	50 kW/m²	Hybrid
12	Polypropylene Siding	7/16″ OSB	12.5 kW/m²	Hybrid
13	Polypropylene Siding	1/2″ GWB	12.5 kW/m²	Hybrid
14	Polypropylene Siding	1/2″ GWB	25 kW/m²	Hybrid
15	Insulated	1/2″ GWB	150 kW Burner	12-7A-1

Ten thermocouples were used to monitor temperatures on the sample during each test. TC's 1-4 were located at approximate quarter points on the exposed sides of the studs beneath the exposed membrane. TC's 5, 7 and 9 were placed at the approximate vertical center of the unexposed surface and 6', 4' and 2' up from the bottom of the sample, respectively. TC's 6, 8 and 10 were placed in the same basic locations as 5, 7 and 9, respectively, but with 1.5"x1.5" pads placed over the TCs.

TEST OBSERVATIONS

TEST #1: HOLLOW-BACK SIDING, OSB, 150 KW BURNER

Time	Observation
0:00:00	Start Test, Ignite Burner
0:00:07	Warping
0:00:24	Ignition of sample
0:00:45	Heavy smoke, fire growing
0:02:50	Entire sample surface is involved
0:03:00	Most of the vinyl siding has melted from the surface
0:05:00	Charring on the unexposed surface at top of the wall
0:10:00	Burner off, remaining siding material continues to burn
0:14:00	Glowing on the lower right unexposed surface - glow point is directly behind where the siding continued to flame. Flames persist on the exposed face lower corners near burner
0:18:00	Glowing combustion progressing about 4' up near the left edge of the sample
0:21:30	Stop Test
Date	10/10/2006, 11:45 AM
Sample Description	Hollow-Back Siding, OSB, 150 kW Burner
Sample Exposure	150 kW Burner
Sample Moisture Content	6% (OSB)

TEST #2: HOLLOW-BACK, GWB, 150 KW BURNER

Time	Observation
0:00:00	Start Test, Ignite Burner
0:00:15	Ignition of sample
0:00:50	Flames to eve and heavy smoke
0:01:30	Pieces of siding falling off and landing on the floor
0:02:50	More siding material melting from sample
0:04:30	Not much siding material left on the wall
0:10:00	Burner off, sample material left in burner tray continues to burn and smoke
0:14:45	No change on unexposed surface
0:24:00	Dark spots on unexposed GWB at joint and 1' up
0:33:00	Very brief glowing of paper on backside adjacent to stud in dark area. This area is opposite a small fire that is still going in top of the burner pan with the melted siding material
0:42:00	Stop Test, very small smoking spot in burner pan, GWB spots seam to be cooling down and not progressing.
Date	10/10/2006, 2:00 PM
Sample Description	Hollow-Back, GWB, 150 kW Burner
Sample Exposure	150 kW Burner
Sample Moisture Content	--

TEST #3: HOLLOW-BACK, OSB, 12.5 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:30	Siding material melting from panel
0:00:56	Ignition at pilot burner
0:01:04	Flames went out
0:01:24	Siding material drooping down the panel
0:03:00	Material continues to melt
0:04:15	Material ignited by pilot
0:04:43	Material that was near the pilot burner fell and went out
0:05:25	Ignition of sand burner, ignition of siding material that melted into burner
0:06:46	Flames to top of sample at right side
0:07:30	Majority of the sample is burning
0:08:30	Entire surface is involved, smoke from the unexposed surface at top left side
0:10:00	Close shield and turn off burner
0:11:50	3-4 small spots on face that continue to burn
0:12:45	Smoke from backside is decreasing, small area on edge of exposed surface still burning
0:14:25	Dark spot forming on back 5' up at OSB joint opposite glowing spot on front
0:17:02	Dark spot forming on right side 6' up
0:17:34	Progressive glowing on back side adjacent to stud 5' up at OSB joint – Stop Test
Date	10/11/2006, 8:21 AM
Sample Description	Hollow-Back, OSB, 12.5 kW ICAL
Sample Exposure	12.5 kW
Sample Moisture Content	6% (OSB)

TEST #4: HOLLOW-BACK, GWB, 12.5 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:23	Material is melting and drooping
0:01:00	Pilot out- siding material melted over the top of it
0:01:30	Siding material is sagging badly
0:05:00	Turn on 40kW burner
0:05:15	Large blob of melted material fell to the floor in front of the burner
0:06:27	Material in burner tray is ignited
0:09:00	No change to unexposed surface
0:10:00	Turn off burner and close shield
0:11:00	Some material in burner pan still ignited
0:11:54	Flames in pan have gone out
0:15:00	Stop Test- very small amount of smoke from pan, no visible combustion
Date	10/11/2006, 9:20 AM
Sample Description	Hollow-Back, GWB, 12.5 kW ICAL
Sample Exposure	12.5 kW

TEST #5: HOLLOW-BACK, OSB, 25 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:13	Material beginning to melt
0:00:20	Pilot went out
0:00:35	Relight pilot
0:01:30	Large piece of sample material fell
0:02:30	OSB is darkening, most of the siding material has melted away
0:03:25	Ignition of exposed OSB, had to adjust pilot closer to wall
0:05:00	Turn on 40 kW burner, entire sample still burning
0:06:45	OSB warping on left side
0:07:45	Dark area appearing at top edges of unexposed surface and some smoke
0:09:00	Dark area forming over bottom half of unexposed sample
0:10:00	Glowing near sample center 25" up
0:11:00	Stop Test, More glowing areas have formed on unexposed side 8" down from top in the center of the sample
Date	10/11/2006, 10:00 AM
Sample Description	Hollow-Back, OSB, 25 kW
Sample Exposure	25 kW ICAL
Sample Moisture Content	12% @ stud, 6% OSB

TEST #6: HOLLOW-BACK, GWB, 25 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:13	Material melting and sagging
0:01:49	Pilot went out
0:02:30	Most of the sample material has melted from the wall into the burner pan
0:03:00	Exposed GWB darkening
0:04:00	Exposed GWB paper glowing
0:05:00	Light 40 kW burner, sample material in pan ignited
0:07:00	No change to unexposed surface
0:10:00	Turn off burner, close shield
0:19:00	Sample material still burning in pan
0:25:00	Very small flames in pan
0:25:45	Flames out, still glowing in pan
0:26:45	Stop Test- no signs of combustion on unexposed surface
Date	10/11/2006, 10:45 AM
Sample Description	Hollow-Back, GWB, 25 kW
Sample Exposure	25 kW ICAL
Sample Moisture Content	12% @ stud

Test #7: Hollow-Back, GWB, 50 kW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:06	Melting of sample material
0:00:22	Material is sagging
0:00:30	Pilot out
0:02:00	Exposed GWB paper glowing and black
0:03:30	Light smoke from back of sample
0:05:00	Turn on 40 kW burner, ignition of sample material that has melted into pan
0:07:30	Material burning on floor
0:10:00	Turn off burner and close shield, no change to unexposed surface
0:15:00	Dark area on unexposed side at center and 1' up, flames out in burner pan
0:17:30	Material continues to smolder in pan
0:21:15	Dark area on back not getting any worse there is a small crack in that area that reached from stud to stud
0:23:00	Turn off data acquisition
0:30:00	Stop Test- still some minor glowing in burner but the unexposed sample is cooling
Date	10/11/2006, 1:26 PM
Sample Description	Hollow-Back, GWB, 50 kW
Sample Exposure	50 kW ICAL
Sample Moisture Content	12% @ stud

TEST #8: INSULATED, OSB, 12.5 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:13	Bubbling of sample material
0:00:35	Material sagging
0:01:03	Exposed foam is melting
0:02:00	Sample material continues to sag and melt
0:03:11	Exposed OSB darkening
0:05:00	Light 40 kW burner
0:05:45	Entire surface is ignited
0:08:15	Darkening on backside upper corners and smoke from center bay 2' up
0:10:00	Turn off burner and close shield, dark areas on backside are smoking
0:11:30	More dark spots forming on center of backside
0:12:05	Flames in top corner of right bay, flaming for a few seconds then goes out. Fail
0:13:14	More dark areas forming on bottom half
0:14:02	Glowing in center bay 1' up
0:15:00	Stop Test, Glowing progressing at two spots on back
Date	10/11/2006, 2:40 PM
Sample Description	Insulated, OSB, 12.5 kW ICAL
Sample Exposure	12.5 kW ICAL
Sample Moisture Content	12-13% @ stud, 6% OSB

TEST #9: INSULATED, GWB, 12.5 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:23	Sample material is melting and sagging
0:01:21	Material is falling down and exposing GWB
0:03:25	Approx. 75-80% of material is melted down into burner pan
0:05:00	Light 40 kW burner
0:07:00	Most material has melted into the pan
0:10:00	Turn off burner and close shield, no change to unexposed surface
0:12:10	Small flame continues in burner
0:15:00	Very small flame in right side of burner is the only continuing combustion
0:16:00	Flames out in burner
0:18:00	All out, Stop Test
Date	10/11/2006, 3:15 PM
Sample Description	Insulated, GWB, 12.5 kW ICAL
Sample Exposure	12.5 kW ICAL
Sample Moisture Content	12-13% @ stud

TEST #10: INSULATED, GWB, 25 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:24	Sample material is sagging
0:01:30	Sample material is melting down into burner pan
0:02:00	Exposed GWB paper darkening
0:05:00	Turn on 40 kW burner, ignition of material in pan and small amount still on sample
0:07:20	Light smoke from back side of sample
0:10:00	Turn off burner and close shield, no change to unexposed surface
0:17:00	Some material still burning in pan
0:30:00	Stop Test- Small flames remain in pan that won't affect the sample.
Date	10/12/2006, 8:00 AM
Sample Description	Insulated, GWB, 25 kW ICAL
Sample Exposure	25 kW ICAL
Sample Moisture Content	12-13% @ stud

TEST #11: INSULATED, GWB, 50 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:13	Material is sagging
0:00:25	Material is darkening
0:01:00	Heavy smoke from sample
0:01:30	Material melting into burner and onto floor
0:02:30	Exposed GWB paper glowing
0:03:55	Ignition of sample material in pan, auto, no pilot
0:05:00	Turn on 40 kW burner, no noticeable difference
0:05:30	Steam from unexposed side of panel
0:07:15	Material on floor and pan continues to burn, no change on unexposed side
0:10:00	Turn off burner and close shield, no change on unexposed surface
0:11:03	Material in pan continues to burn
0:14:00	Flames from pan lessening
0:15:00	Burning debris in pan not impacting test sample, flames continue to lessen
0:17:00	Stop Test
Date	10/12/2006, 9:18 AM
Sample Description	Insulated, GWB, 50 kW ICAL
Sample Exposure	50 kW ICAL
Sample Moisture Content	12-13% @ stud

TEST #12: POLYPROPYLENE, OSB, 12.5 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:29	Warping of sample material
0:01:00	Melting material almost in contact with pilot burner
0:02:00	Material continues to melt
0:02:20	Ignition at pilot
0:03:00	Material dripping into burner pan
0:03:20	Exposed OSB is ignited
0:04:17	Most of sample surface is involved
0:05:00	Turn on 40 kW burner
0:06:00	Light smoke from back side of sample
0:07:30	Very small holes appearing on unexposed OSB center 1' up
0:09:00	Several pools of sample material burning on the floor around sample holder
0:10:00	Turn off burner and close shield
0:10:15	Several dark spots forming on backside from bottom to 2' up, smoke
0:12:44	Glowing on backside center bay 1.5' up
0:13:30	Several glowing spots on back of sample, progressive glowing combustion, Stop Test
Date	10/12/2006, 10:10 AM
Sample Description	Polypropylene, OSB, 12.5 kW ICAL
Sample Exposure	12.5 kW ICAL
Sample Moisture Content	13% @ stud, 6% OSB

TEST #13: POLYPROPYLENE, GWB, 12.5 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:45	Warping of sample material
0:01:10	Material is melting and sagging
0:03:34	Ignition at pilot
0:04:00	Ignited material dripping into pan
0:05:00	Turn on 40 kW burner
0:05:30	Flames spreading up wall
0:06:00	Heavy flaming over the entire sample surface
0:09:00	Some steam from back of sample
0:10:00	Turn off burner and close shield
0:13:50	Sample material still burning in pan, no change to unexposed surface
0:24:00	No change to unexposed surface
0:25:00	Starting to darken along joint on back at stud
0:26:30	Dark spot on back near stud is growing
0:27:30	Small glowing spot on backside GWB paper.
0:29:00	Glowing spot continues to grow on both sides of the stud
0:30:00	Glowing combustion progressing. Stop Test
Date	10/12/2006, 11:10 AM
Sample Description	Polypropylene, GWB, 12.5 kW ICAL
Sample Exposure	12.5 kW ICAL
Sample Moisture Content	13% @ stud

TEST #14: POLYPROPYLENE, GWB, 25 KW ICAL

Time	Observation
0:00:00	Start Test, Open Panel
0:00:15	Warping of sample material
0:00:45	Material is melting and sagging
0:01:38	Ignition at pilot
0:02:09	Flames hitting eve
0:02:21	Entire wall is involved
0:03:00	Sample is throwing flaming material
0:05:00	Turn on 40 kW burner
0:06:30	Flaming is mostly contained to burner tray and surrounding floor
0:10:00	Turn off burner and close shield, material in pan continues to burn
0:13:30	Unexposed surface has not changed
0:16:30	No change to unexposed surface
0:18:00	Turn off ICAL, material in pan still burning
0:21:16	One little dark spot forming on back side near stud joint
0:24:00	Small dark spot on back doesn't appear to be growing
0:30:00	No change to unexposed surface
0:36:22	Slight discoloration forming on back center 1' up opposite small fire still burning in pan
0:47:00	Progressive glowing combustion on left side of stud joint, Stop Test
Date	10/12/2006, 1:15 PM
Sample Description	Polypropylene, GWB, 25 kW ICAL
Sample Exposure	25 kW ICAL
Sample Moisture Content	13% @ stud

TEST #15: INSULATED, GWB, 150 KW BURNER

Time	Observation
0:00:00	Start Test, Ignite Burner
0:00:22	Ignition of sample
0:00:44	Flames up to eve
0:01:06	Melting material falling to burner and floor
0:03:05	Piles of burning material on floor near burner and some in the burner pan
0:04:00	No change to unexposed surface
0:07:45	Most siding material is gone from the sample, no change on backside
0:10:00	Turn off burner
0:11:00	Small amount of material still burning in pan
0:13:00	Flames decreasing
0:20:45	Flames in pan not impacting wall sample, no change to unexposed sample, Stop Test
Date	10/12/2006, 2:58 PM
Sample Description	Insulated, GWB, 150 kW Burner
Sample Exposure	150 kW Burner
Sample Moisture Content	13% @ stud

FINAL HEAT RELEASE DATA SUMMARY

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Project ID	06074 VSI	06074 VSI	06074 VSI	06074 VSI	06074 VSI	06074 VSI
Test Date	10/10/06	10/10/06	10/11/06	10/11/06	10/11/06	10/11/06
Heat:						
Peak HRR, (kW)	701	379	499	108	763	127
Time to Peak HRR, (s)	110	75	490	416	277	377
60 sec avg HRR, (kW)	135	117	11	8	7	5
180 sec avg HRR, (kW)	426	213	15	21	13	15
300 sec avg HRR, (kW)	423	214	14	24	143	17
Total Heat Released, q, (kJ)	292,962	150,164	87,910	40,183	138,109	53,513

	Test 7	**Test 8**	**Test 9**	**Test 10**	**Test 11**	**Test 12**
Project ID	06074 VSI	06074 VSI	06074 VSI	06074 VSI	06074 VSI	06074 VSI
Test Date	10/11/2006	10/11/2006	10/11/2006	10/12/2006	10/12/2006	10/12/2006
Heat:						
Peak HRR, (kW)	155	717	109	188	250	933
Time to Peak HRR, (s)	504	375	425	348	352	340
60 sec avg HRR, (kW)	8	14	6	15	15	3
180 sec avg HRR, (kW)	12	21	15	18	20	12
300 sec avg HRR, (kW)	16	23	17	15	44	65
Total Heat Released, q, (kJ)	42,156	136,530	32,932	63,951	56,600	265,731

	Test 13	Test 14	Test 15
Project ID	06074 VSI	06074 VSI	06074 VSI
Test Date	10/12/2006	10/12/2006	10/12/2006
Heat:			
Peak HRR, (kW)	762	809	432
Time to Peak HRR, (s)	486	205	138
60 sec avg HRR, (kW)	18	17	113
180 sec avg HRR, (kW)	22	96	258
300 sec avg HRR, (kW)	27	305	256
Total Heat Released, q, (kJ)	356,367	200,197	156,580

TEST RESULTS

Test #	Siding Type	Sheathing Type	Exposure	Method Used	Test Result
1	Hollow-Back	7/16" OSB	150 kW Burner	12-7A-1	Terminated at 14:00 due to progressive glowing combustion on the unexposed surface
2	Hollow-Back	1/2" GWB	150 kW Burner	12-7A-1	Terminated at 33:00 due to progressive glowing combustion on the unexposed surface
3	Hollow-Back	7/16" OSB	12.5 kW/m²	Hybrid	Terminated at 17:34 due to progressive glowing combustion on the unexposed surface
4	Hollow-Back	1/2" GWB	12.5 kW/m²	Hybrid	Pass at 15:00
5	Hollow-Back	7/16" OSB	25 kW/m²	Hybrid	Terminated at 10:00 due to progressive glowing combustion on the unexposed surface
6	Hollow-Back	1/2" GWB	25 kW/m²	Hybrid	Pass at 26:45
7	Hollow-Back	1/2" GWB	50 kW/m²	Hybrid	Pass at 30:00
8	Insulated	7/16" OSB	12.5 kW/m²	Hybrid	Terminated at 12:05 due to flaming combustion on the unexposed surface
9	Insulated	1/2" GWB	12.5 kW/m²	Hybrid	Pass at 18:00
10	Insulated	1/2" GWB	25 kW/m²	Hybrid	Pass at 30:00
11	Insulated	1/2" GWB	50 kW/m²	Hybrid	Pass at 17:00
12	Polypropylene Siding	7/16" OSB	12.5 kW/m²	Hybrid	Terminated at 12:44 due to progressive glowing combustion on the unexposed surface
13	Polypropylene Siding	1/2" GWB	12.5 kW/m²	Hybrid	Terminated at 27:30 due to progressive glowing combustion on

					the unexposed surface
14	Polypropylene Siding	1/2” GWB	25 kW/m²	Hybrid	Terminated at 47:00 due to progressive glowing combustion on the unexposed surface
15	Insulated	1/2” GWB	150 kW Burner	12-7A-1	Pass at 20:45

SIGNATURE PAGE

Prepared by,

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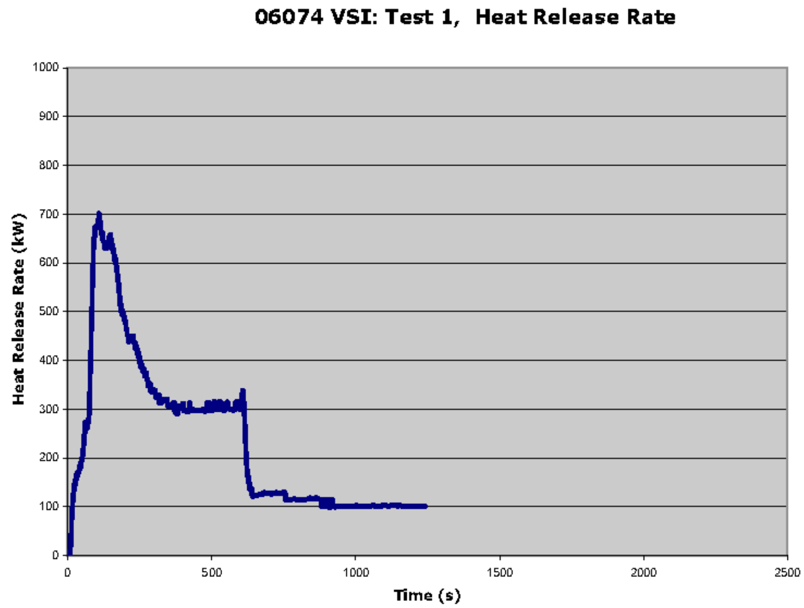
WESTERN FIRE CENTER AUTHORIZES THE CLIENT NAMED HEREIN TO REPRODUCE THIS REPORT ONLY IF REPRODUCED IN ITS ENTIRETY

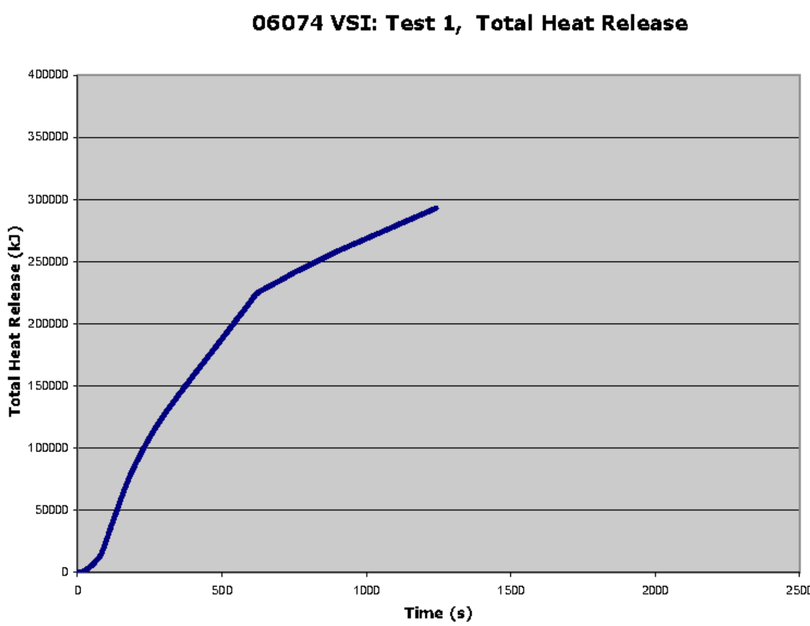
The test specimen identification is as provided by the client and WFCi accepts no responsibilities for any inaccuracies therein. WFCi did not select the specimen and has not verified the composition, manufacturing techniques or quality assurance procedures.

APPENDIX A:
TEST GRAPHS

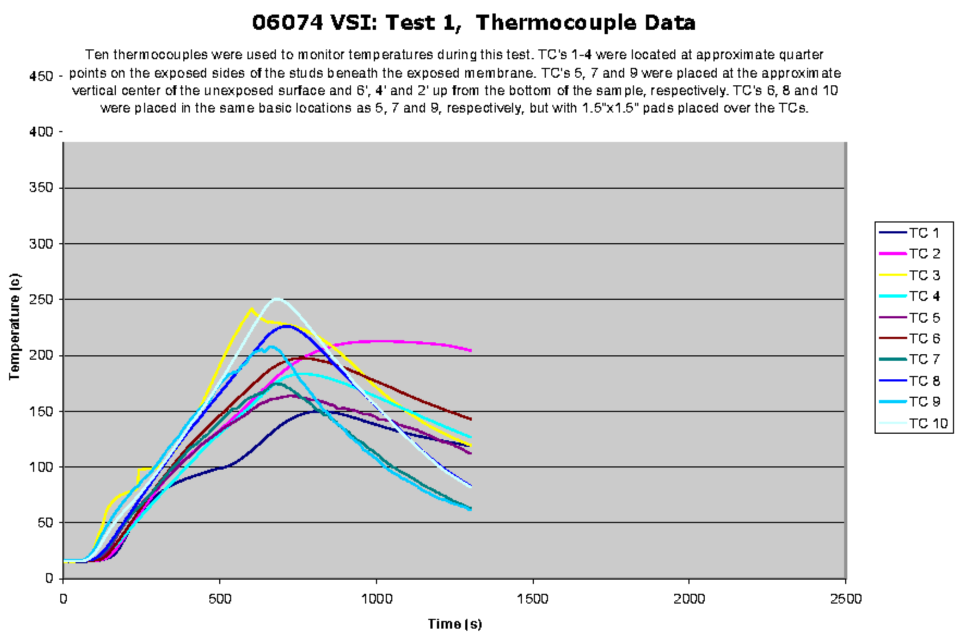
Test 1 Heat Release Rate



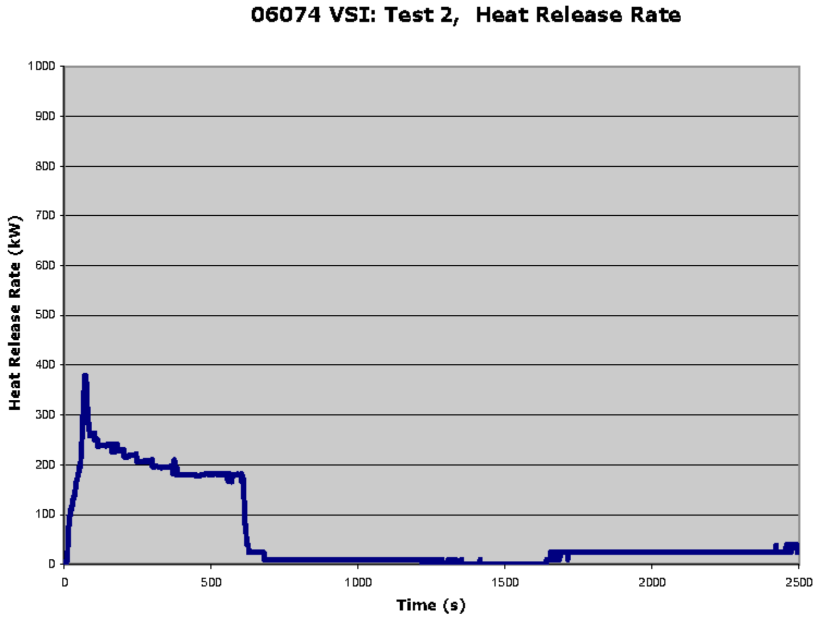
Test 1 Total Heat Released



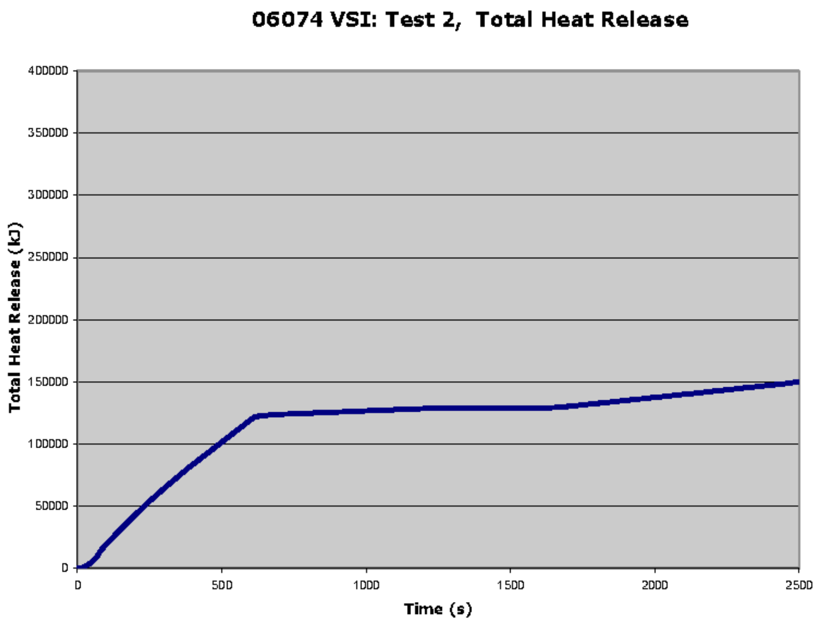
Test 1 Thermocouple Data



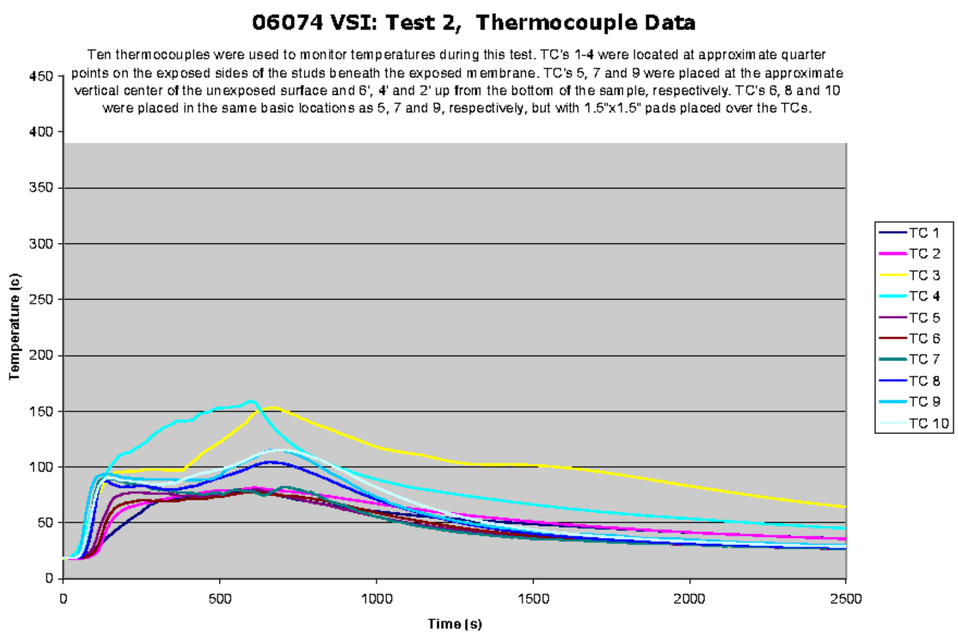
Test 2 Heat Release Rate



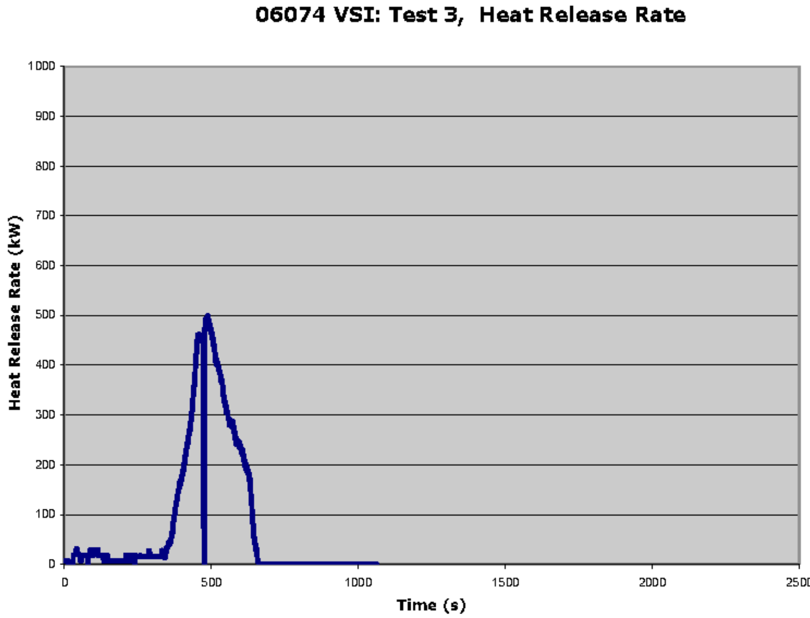
Test 2 Total Heat Released



Test 2 Thermocouple Data



Test 3 Heat Release Rate



Test 3 Total Heat Released

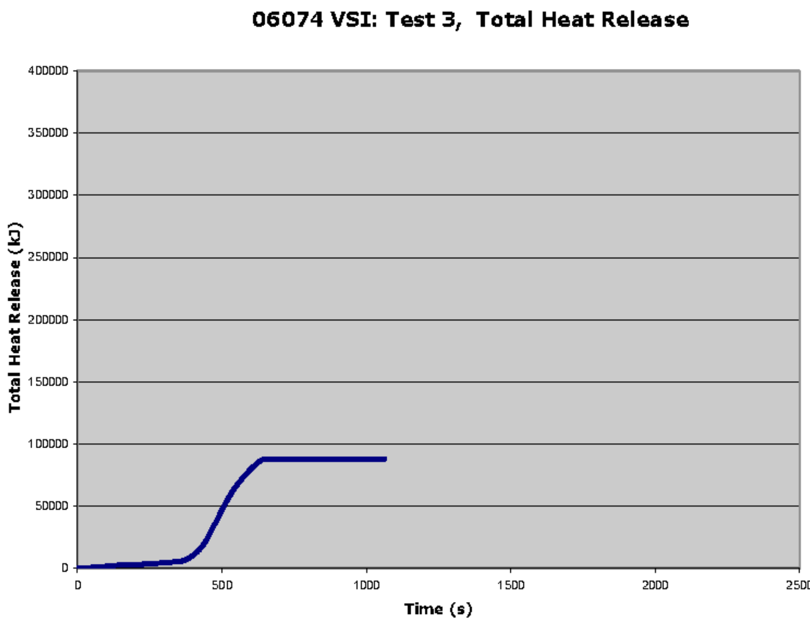
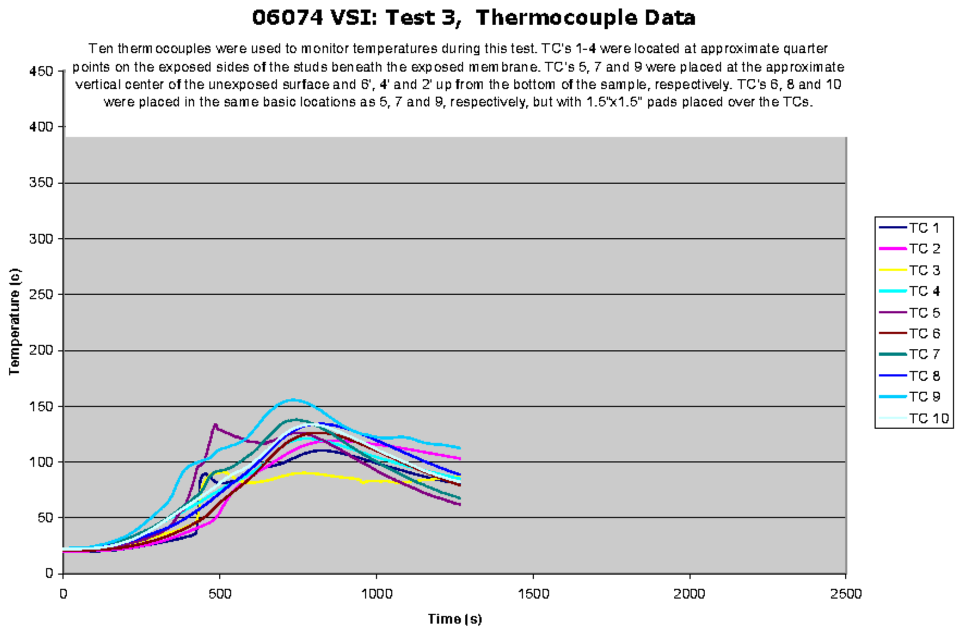
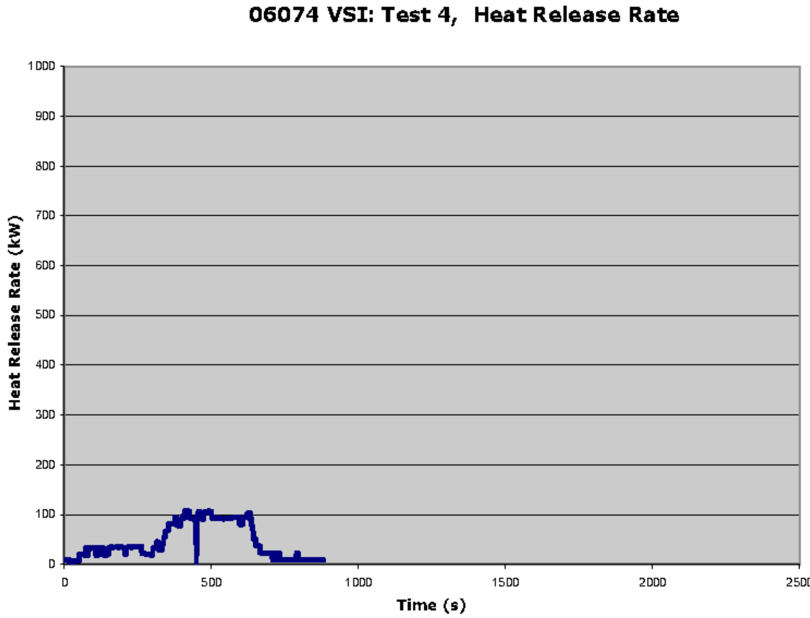


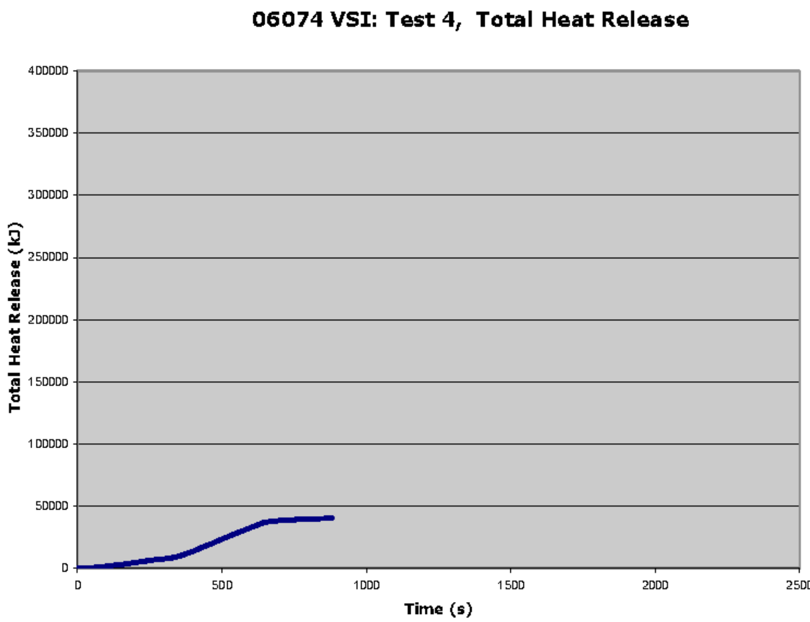
Chart 15: Test 3 Thermocouple Data



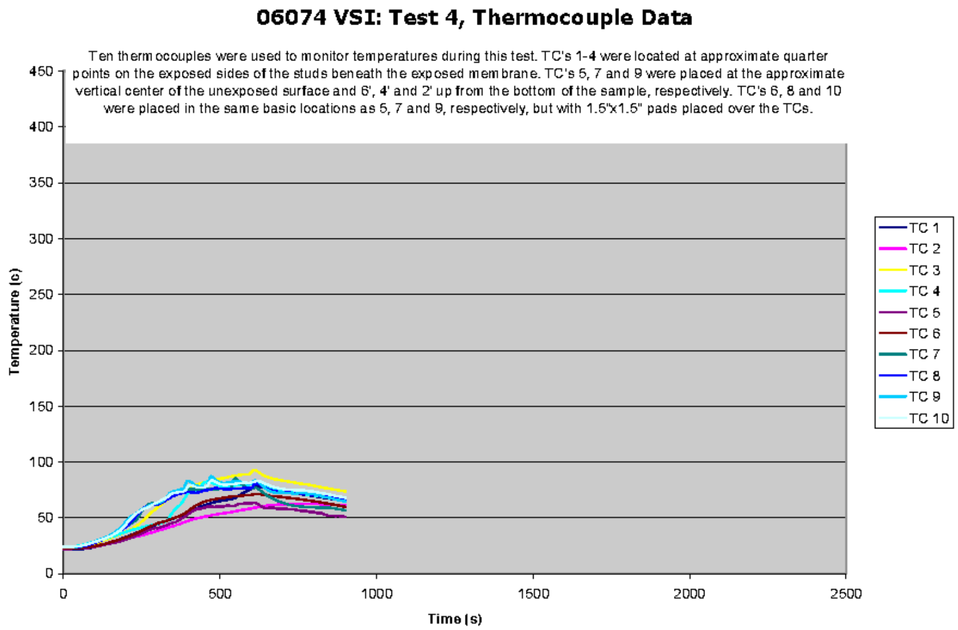
Test 4 Heat Release Rate



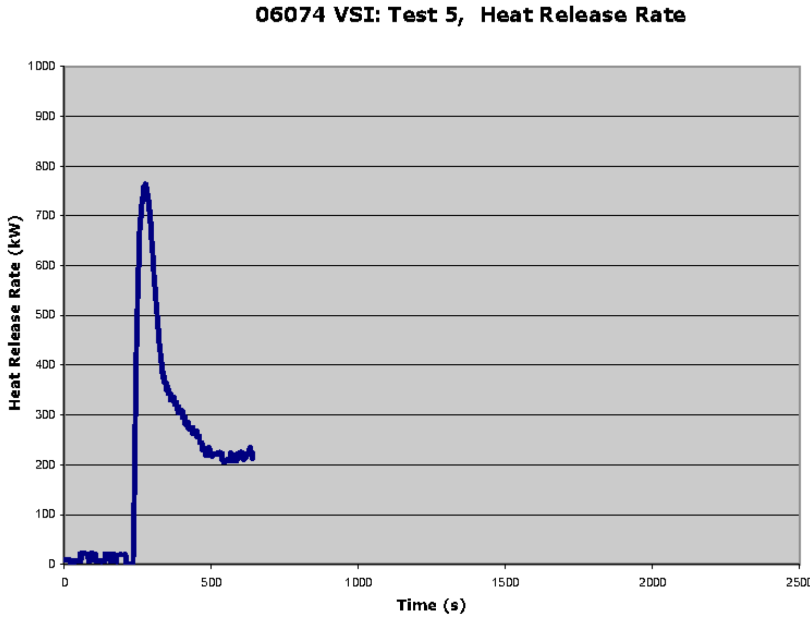
Test 4 Total Heat Released



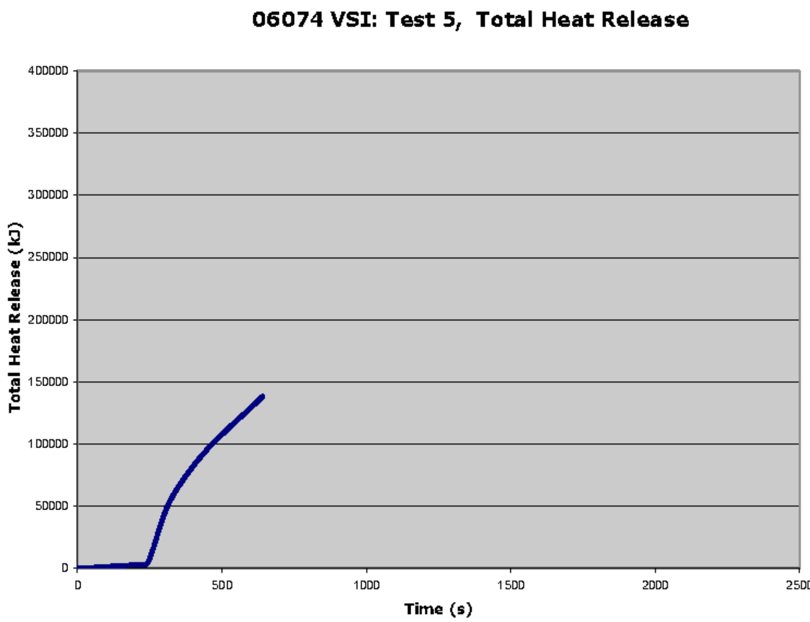
Test 4 Thermocouple Data



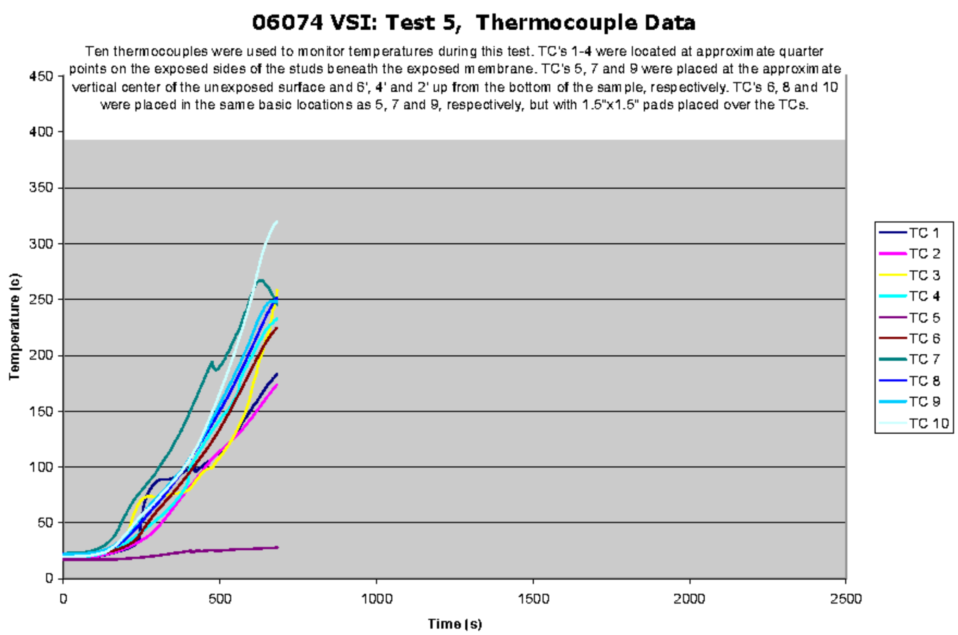
Test 5 Heat Release Rate



Test 5 Total Heat Released

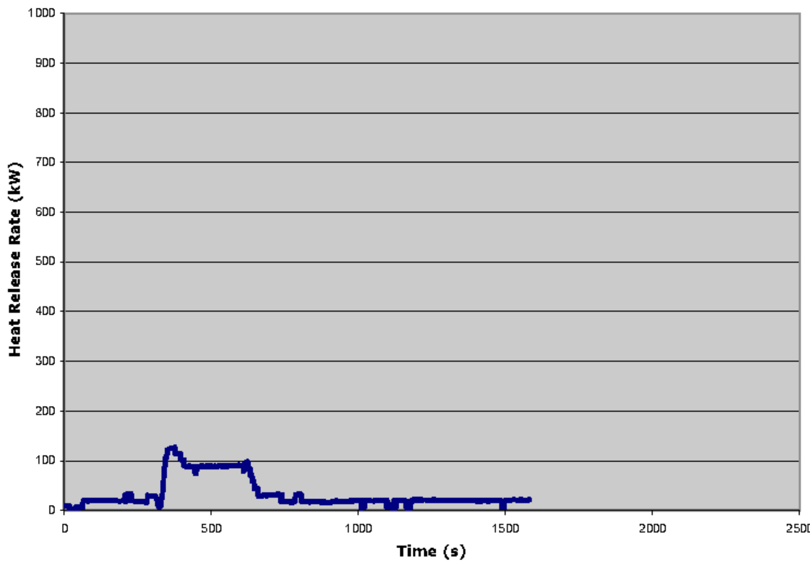


Test 5 Thermocouple Data



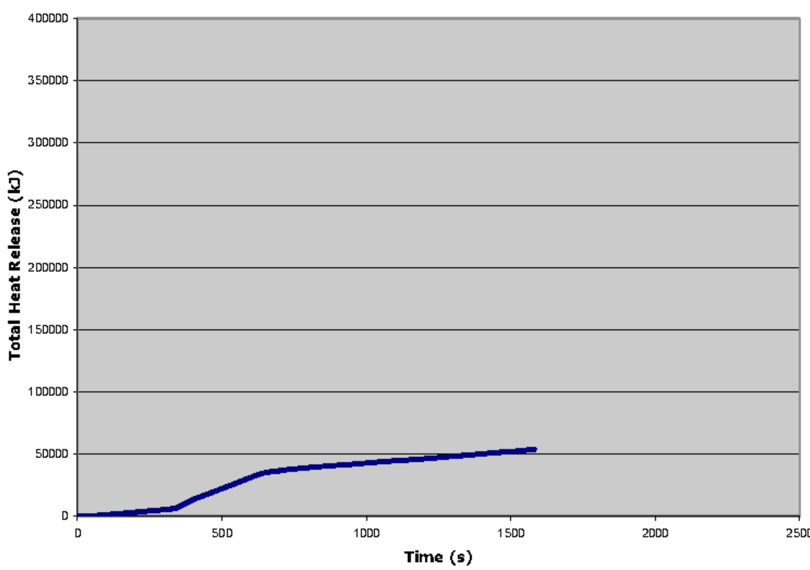
Test 6 Heat Release Rate

06074 VSI: Test 6, Heat Release Rate

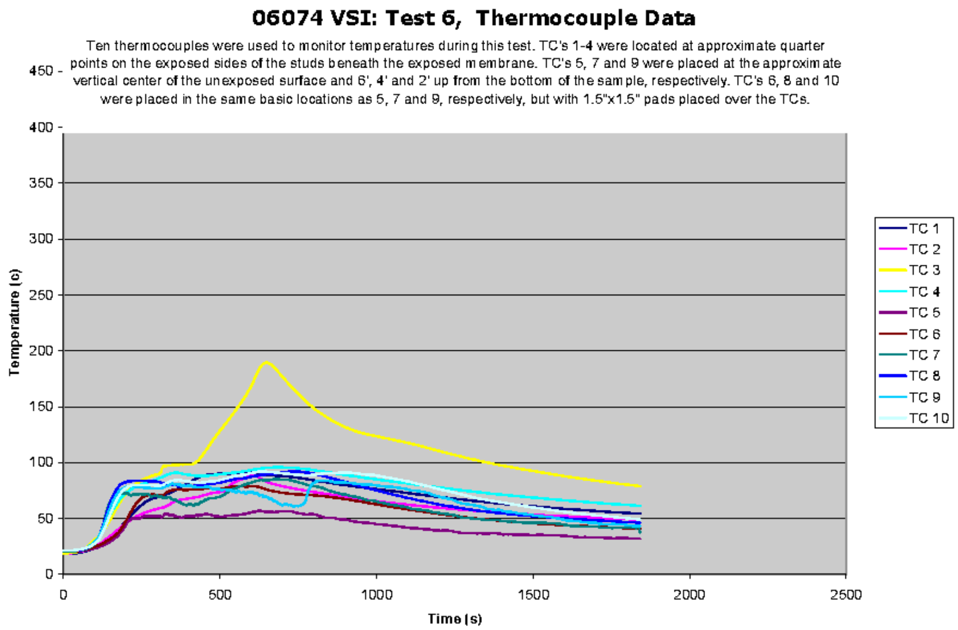


Test 6 Total Heat Released

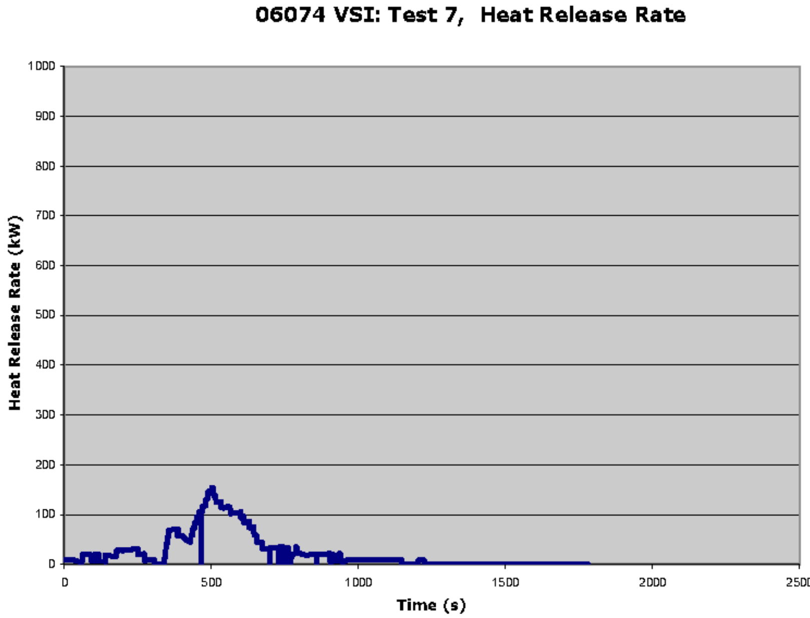
06074 VSI: Test 6, Total Heat Release



Test 6 Thermocouple Data



Test 7 Heat Release Rate



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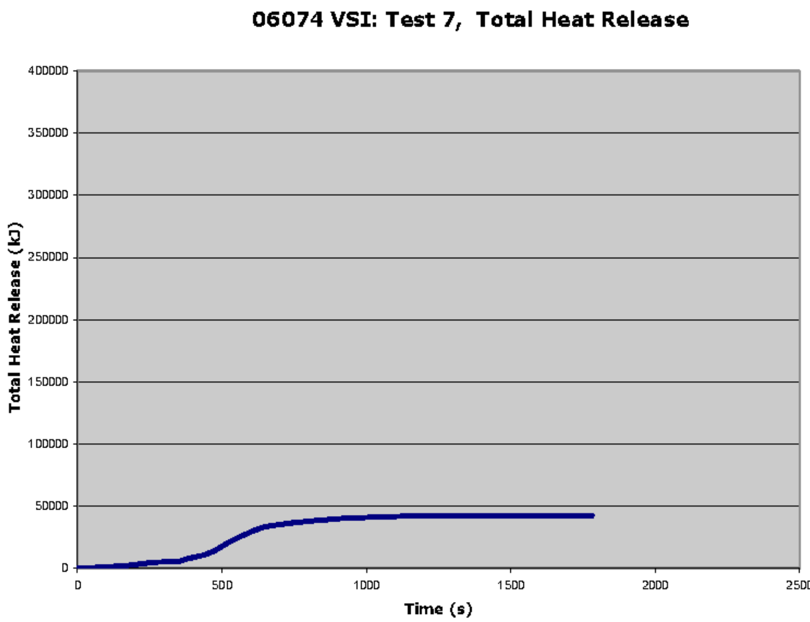

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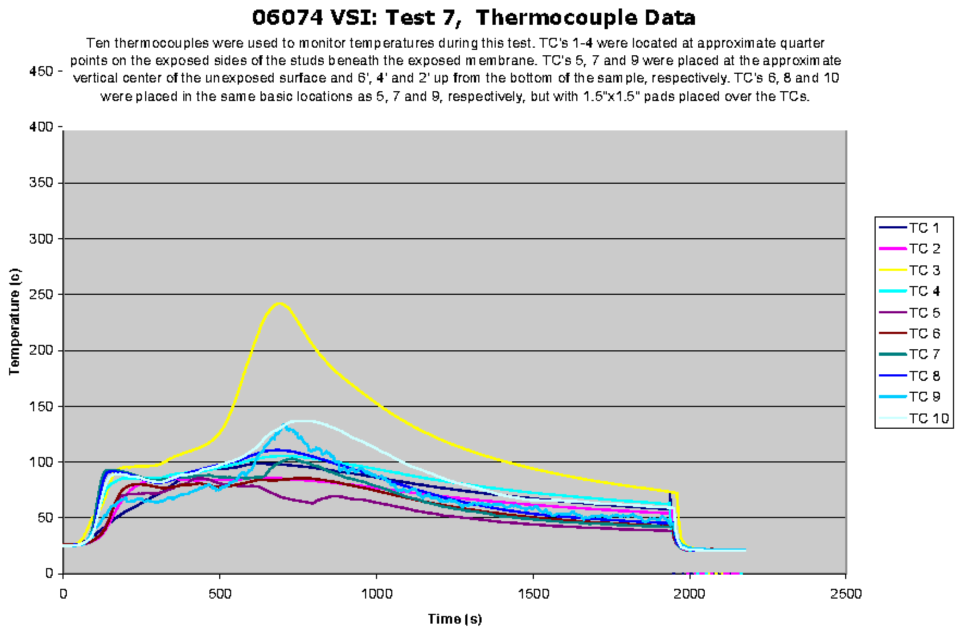

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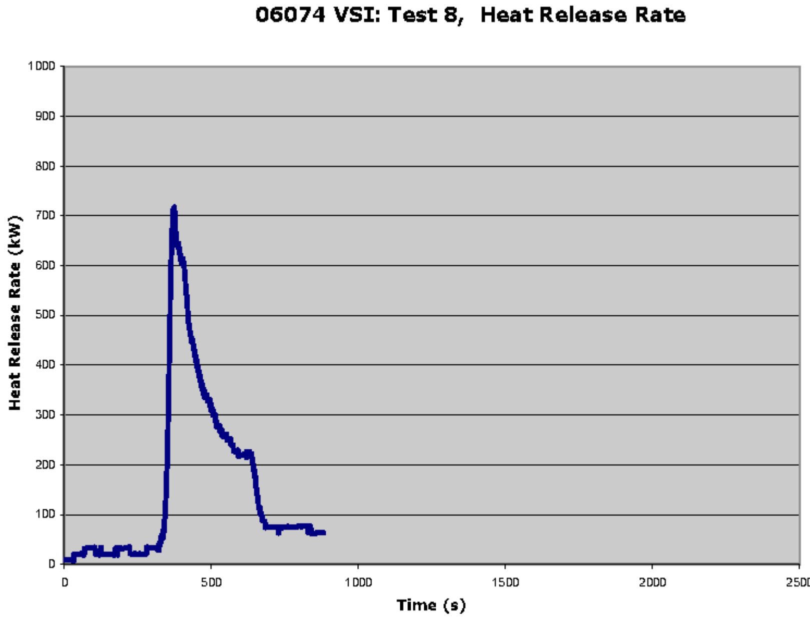

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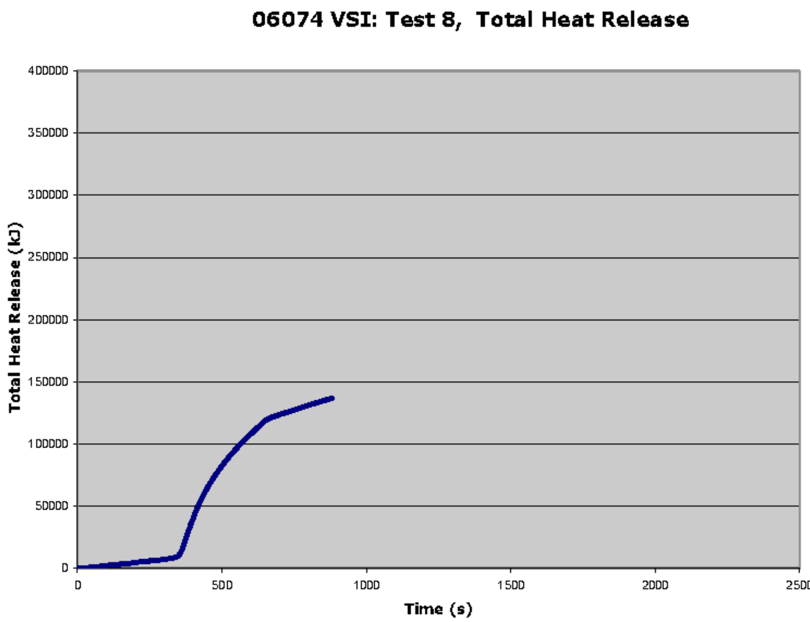

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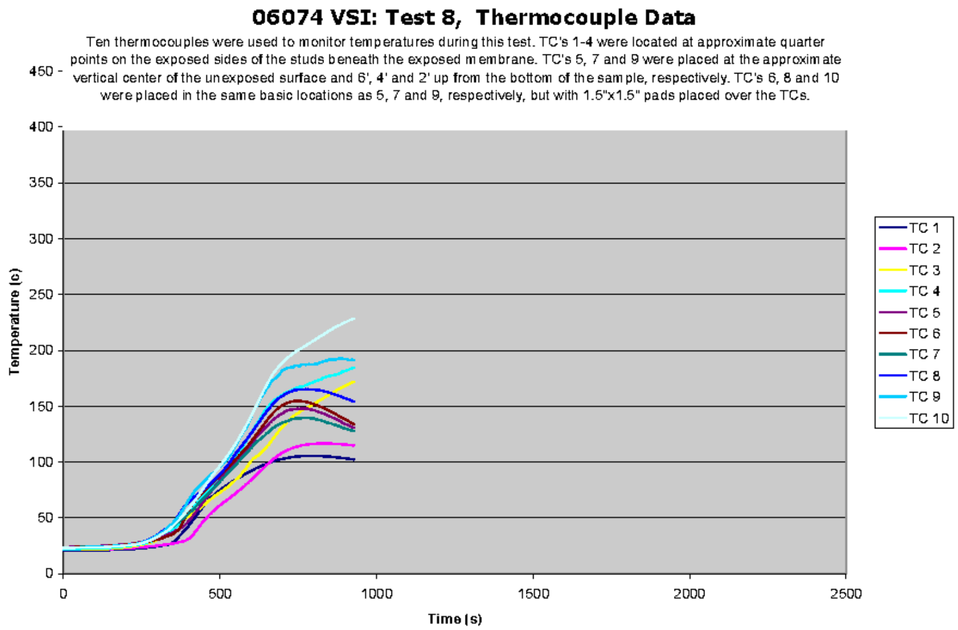

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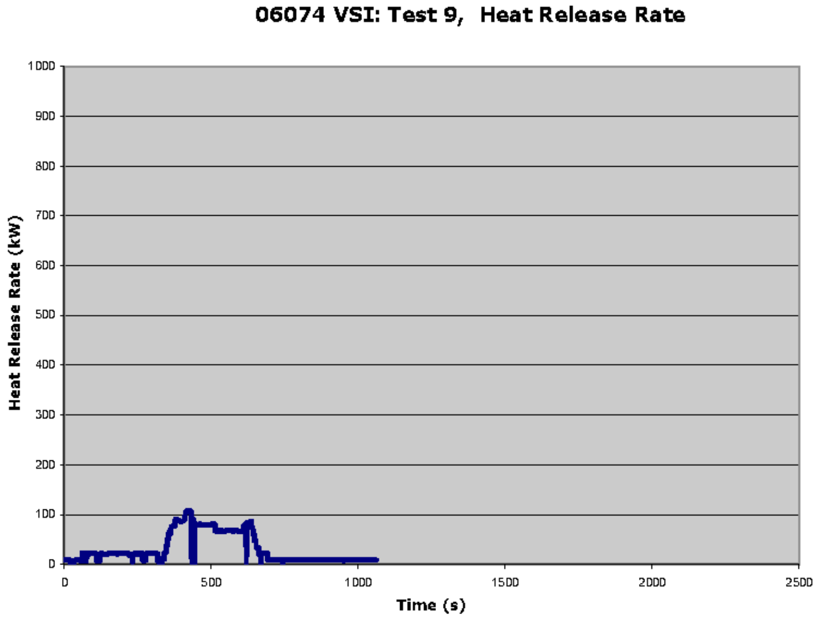
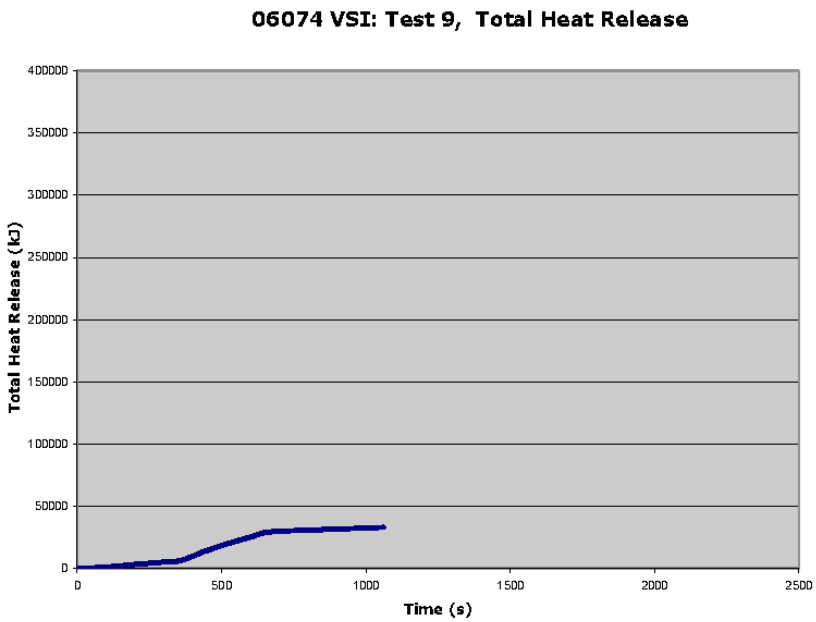


Test 9 Total Heat Released



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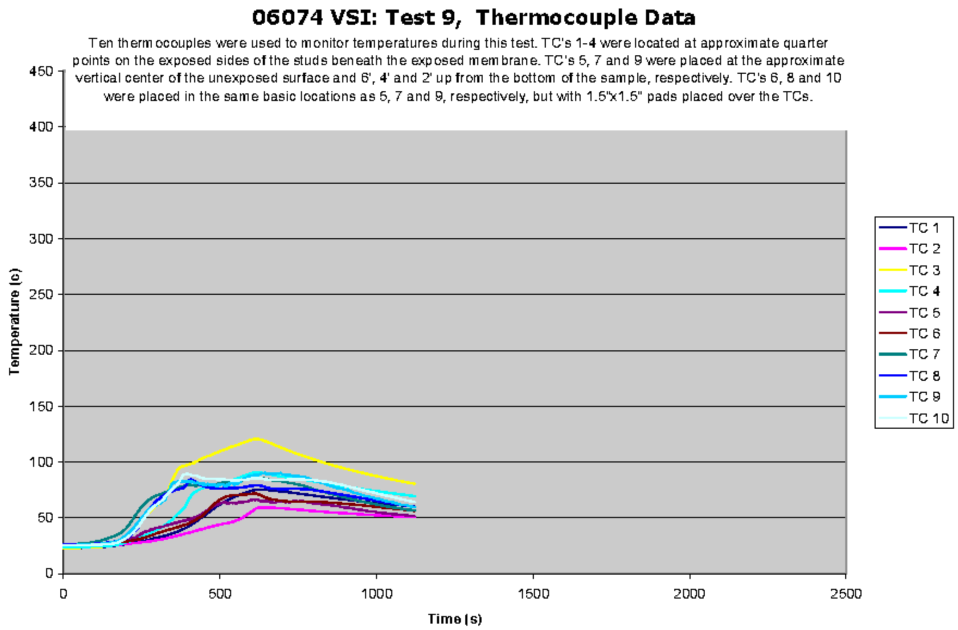

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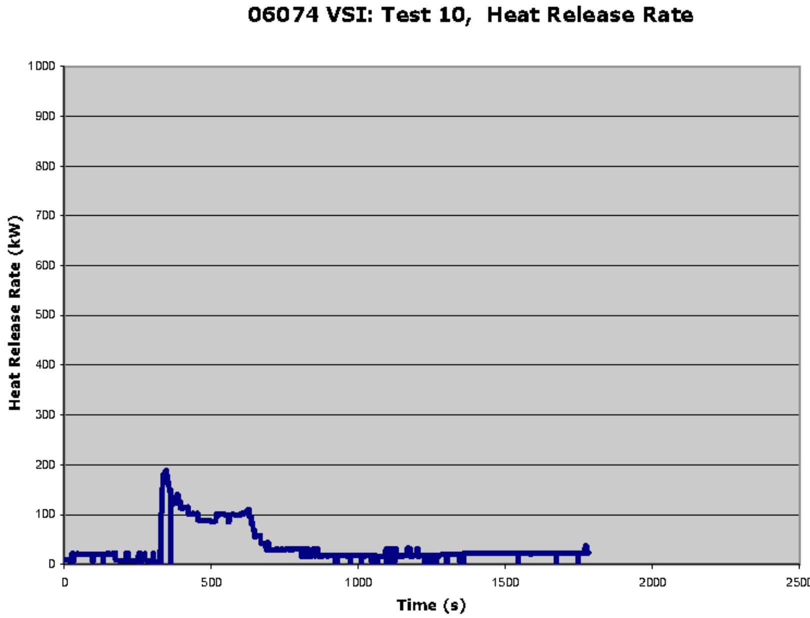

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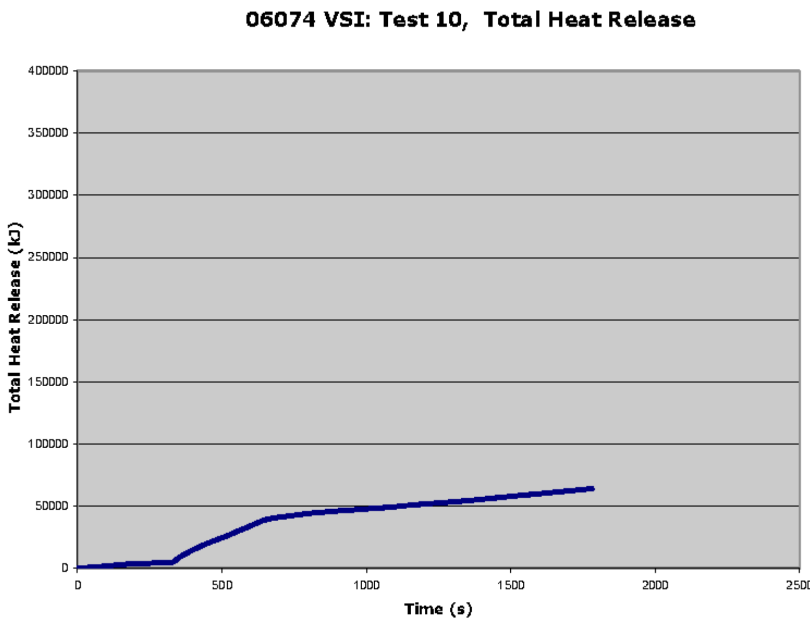

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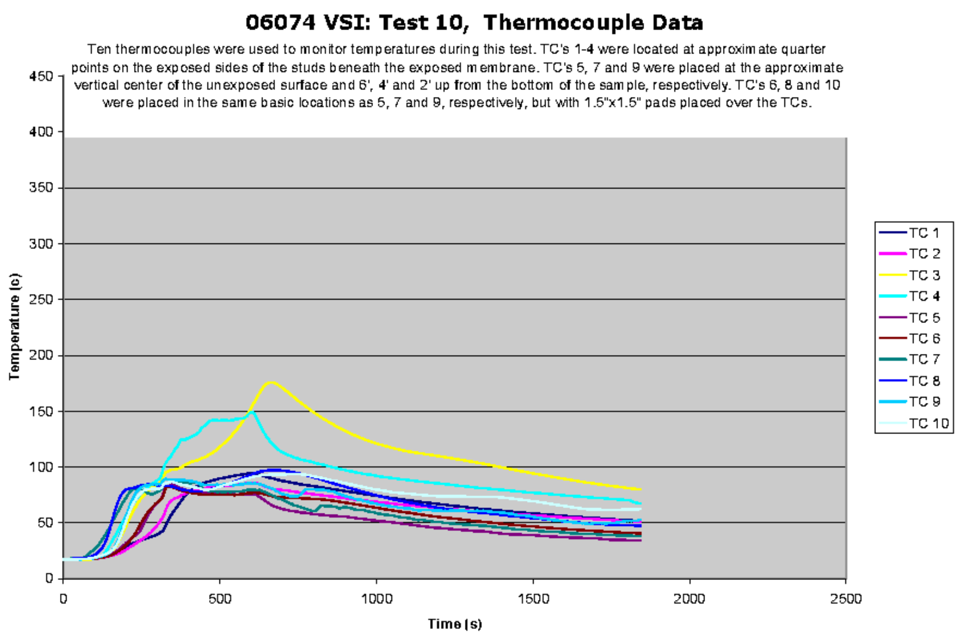

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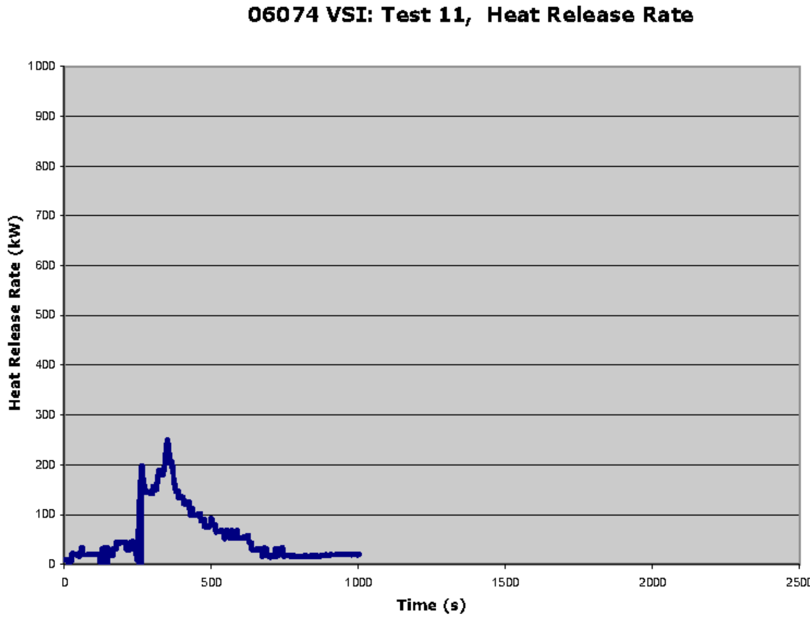

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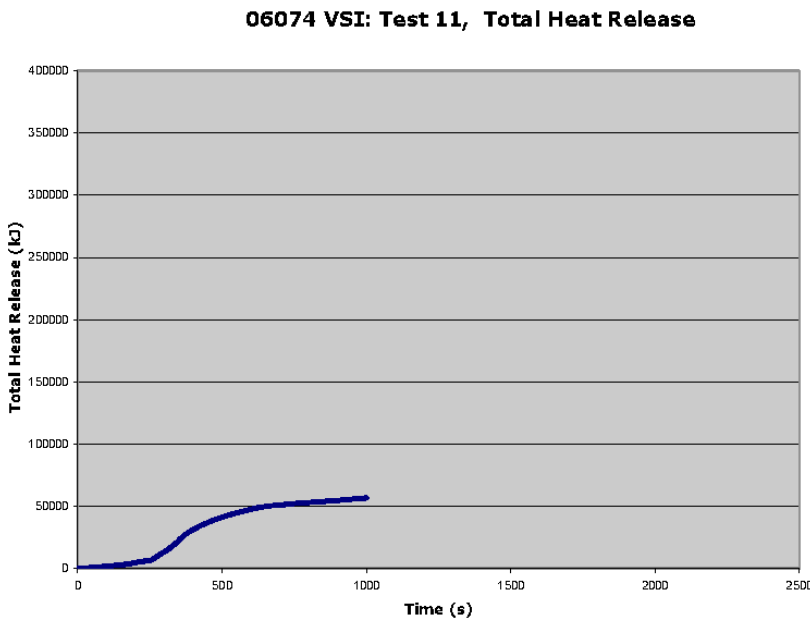

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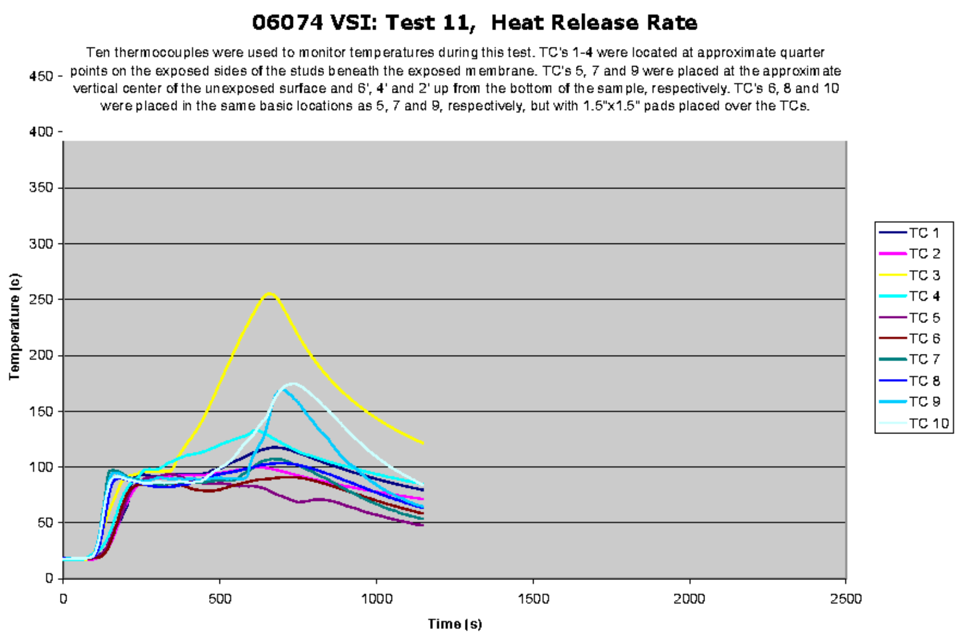

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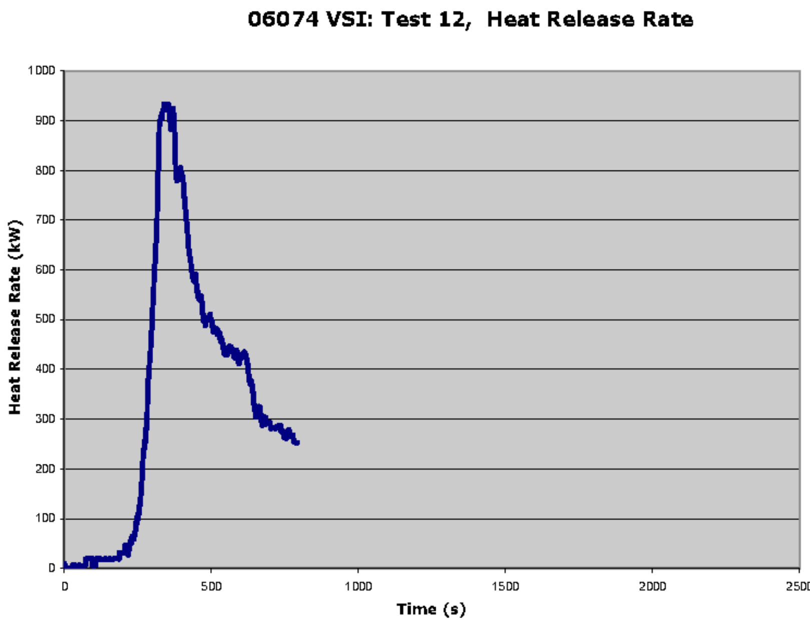

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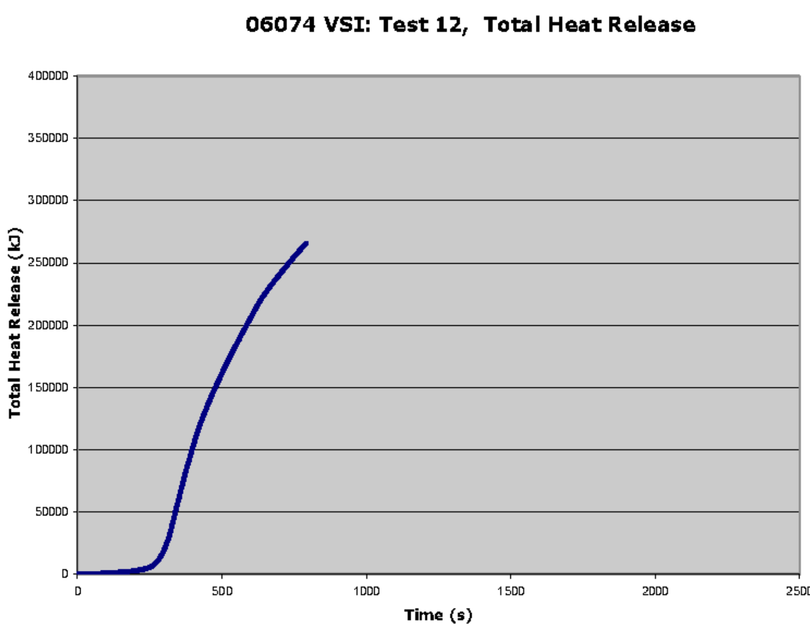

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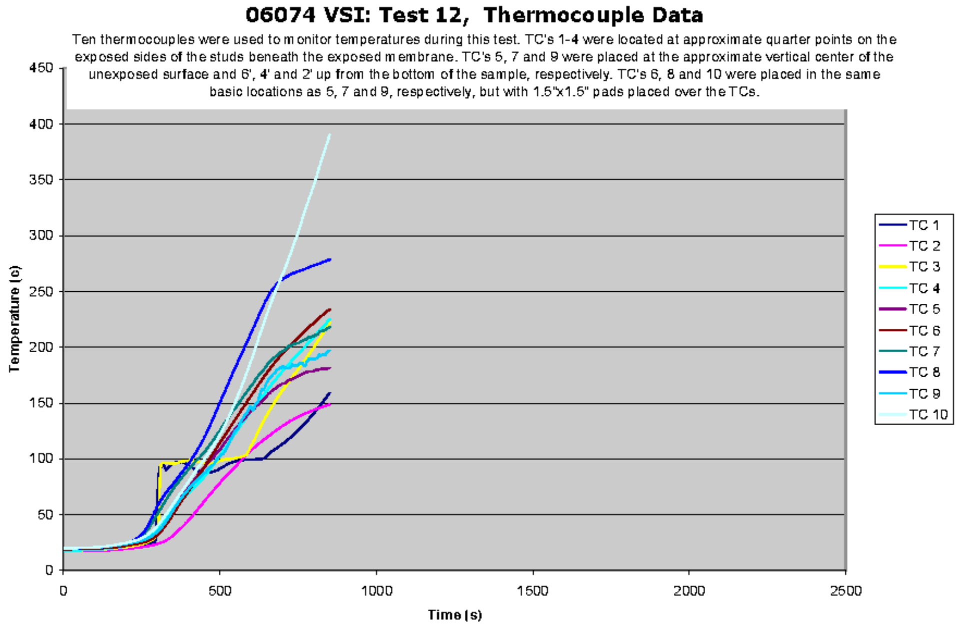

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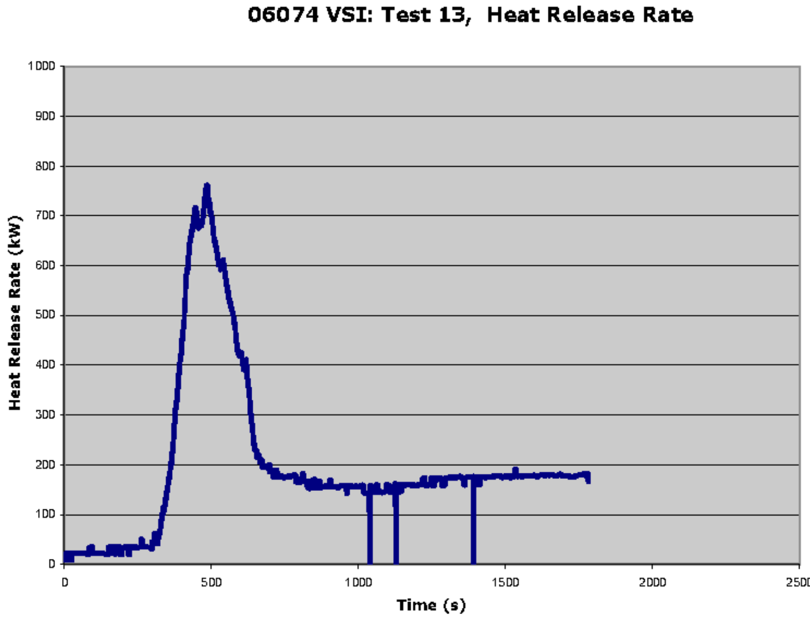
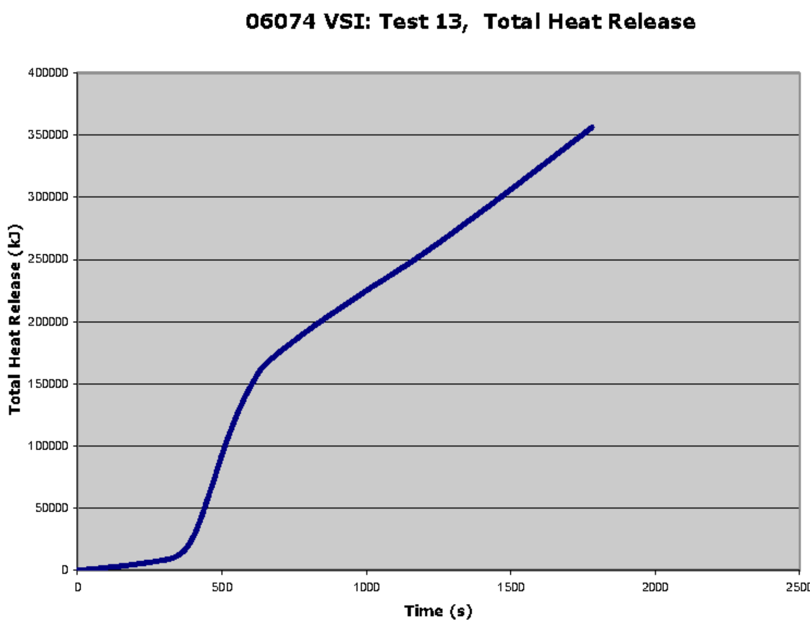
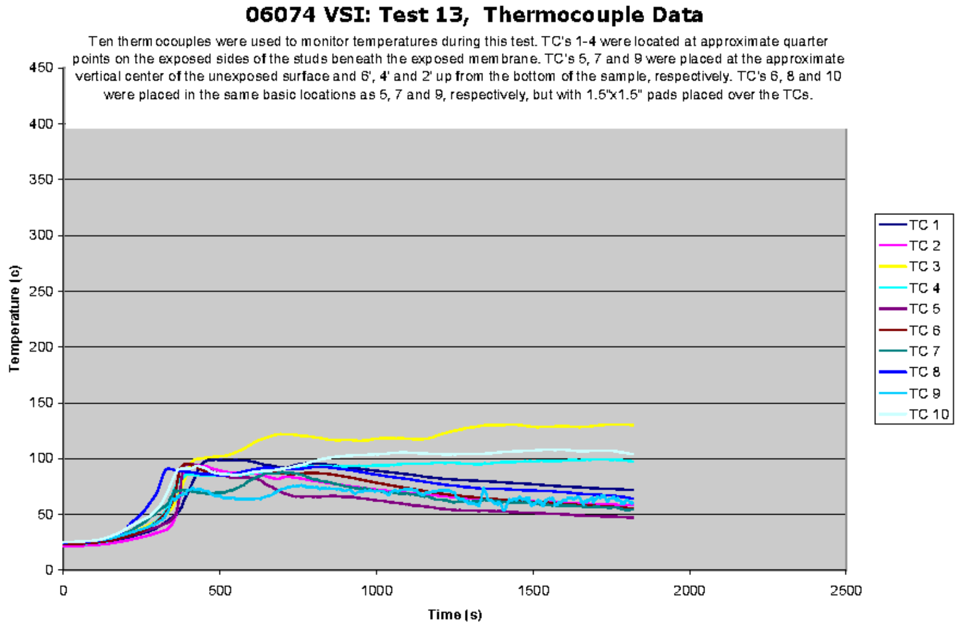


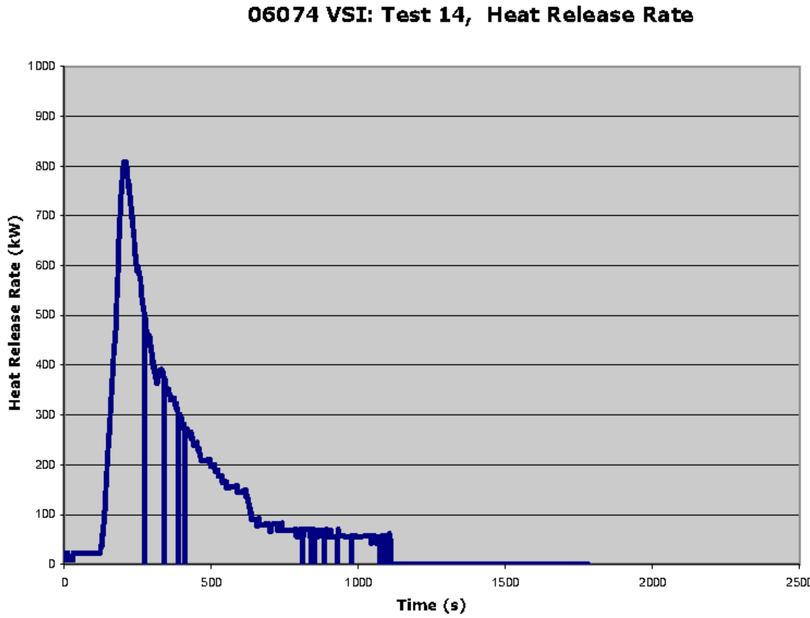
Test 13 Total Heat Released



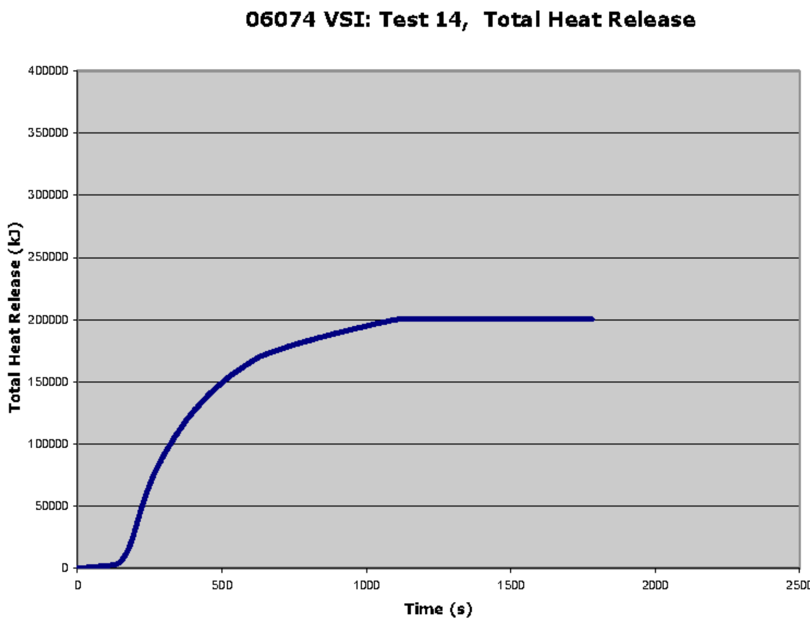
Test 13 Thermocouple Data



Test 14 Heat Release Rate



Test 14 Total Heat Released



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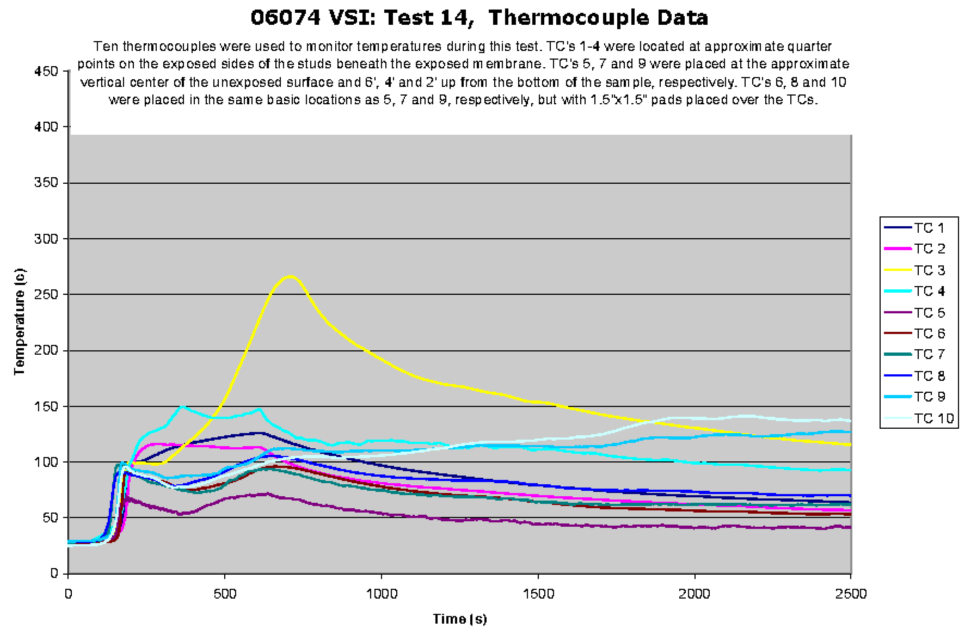
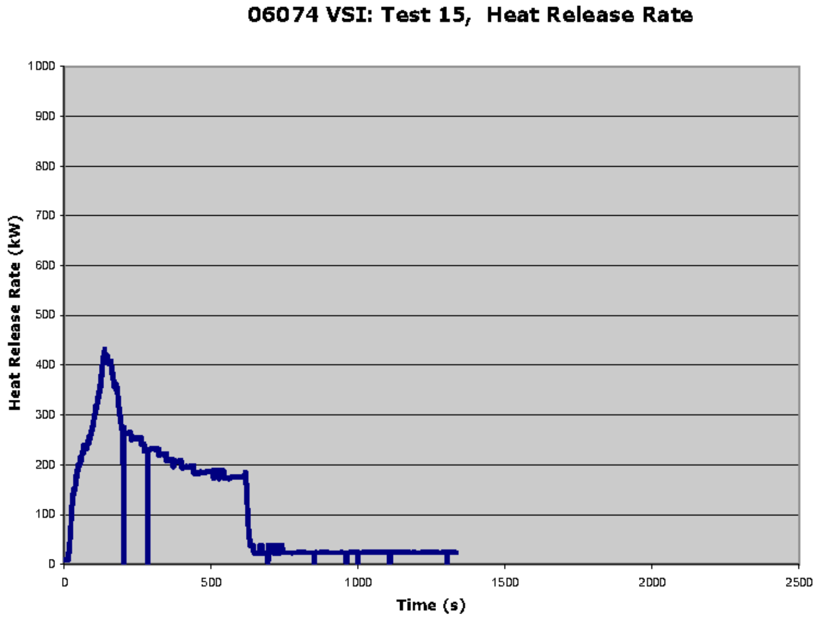
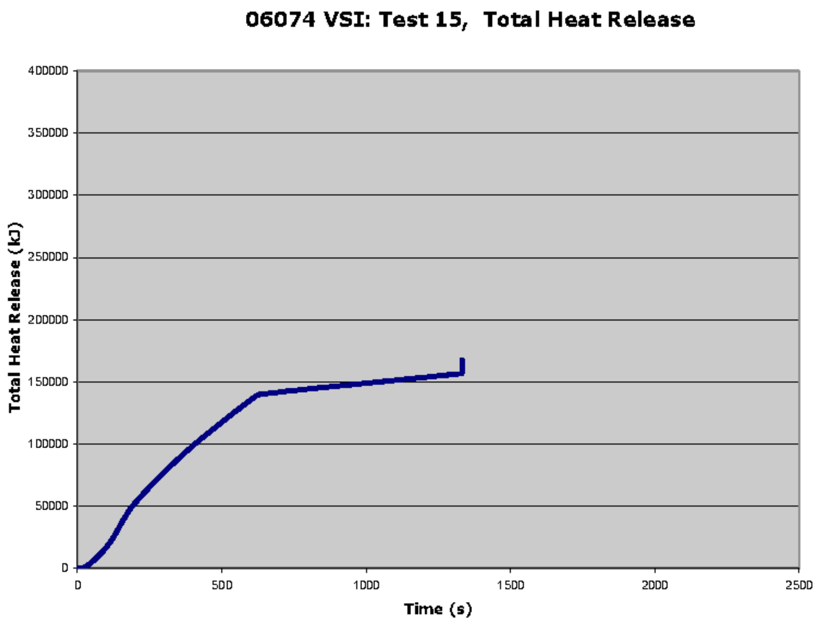


Test 15 Heat Release Rate



Test 15 Total Heat Released



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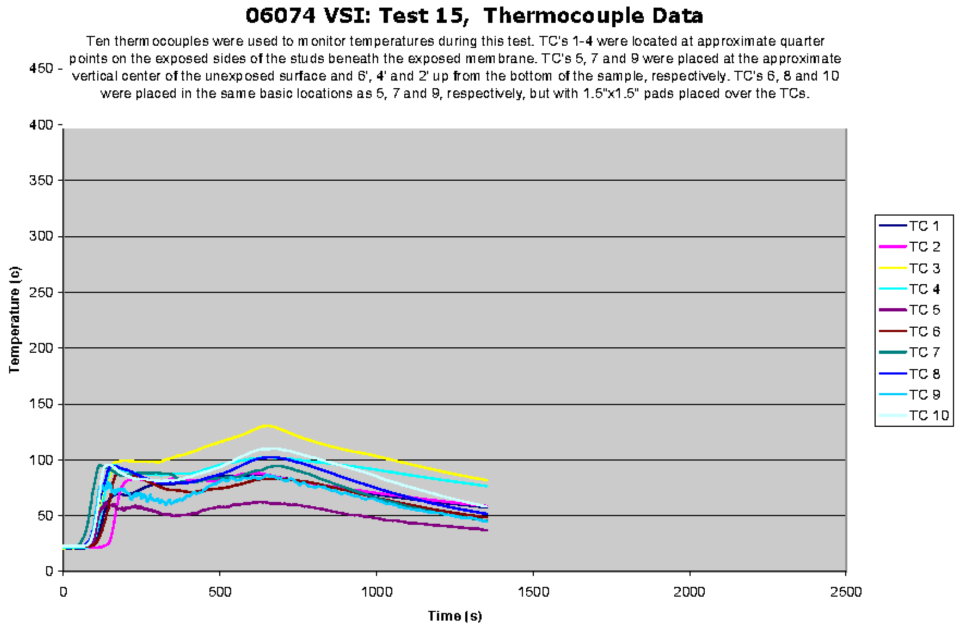


APPENDIX B:
TEST PICTURES

Picture 1: Test 1 Sample Installed before Testing

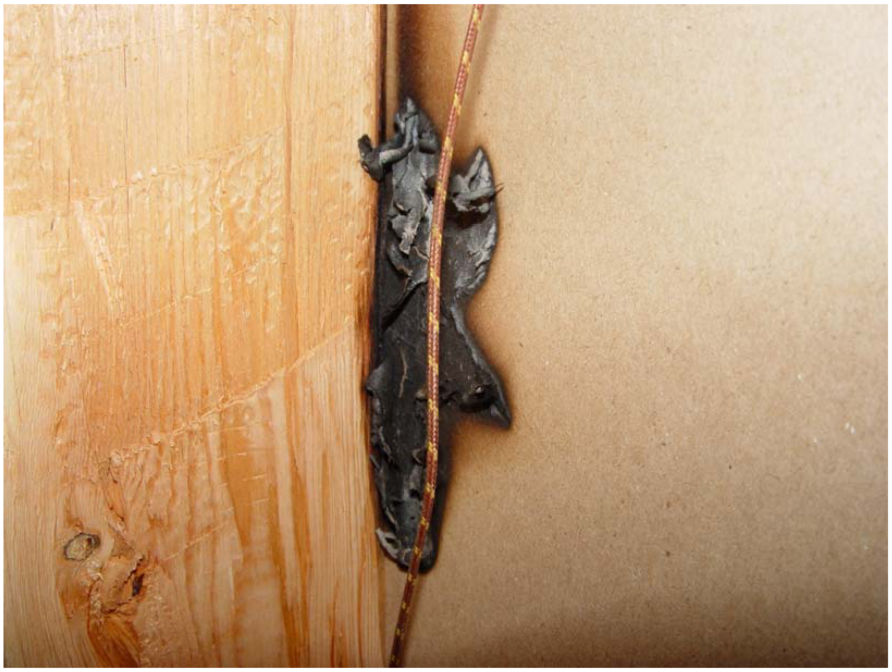
Picture 2: Test 1 Sample during Test.

Picture 3: Test 1 Sample during Test

Picture 4: Test 1 Sample at End of Test

Picture 5: Test 2 Sample during Test

Picture 6: Test 2 Sample during Test



Picture 7: Test 2 Sample at End of Test

Picture 8: Test 3 Sample during Test

Picture 9: Test 3 Sample during Test

Picture 10: Test 3 Sample during Test

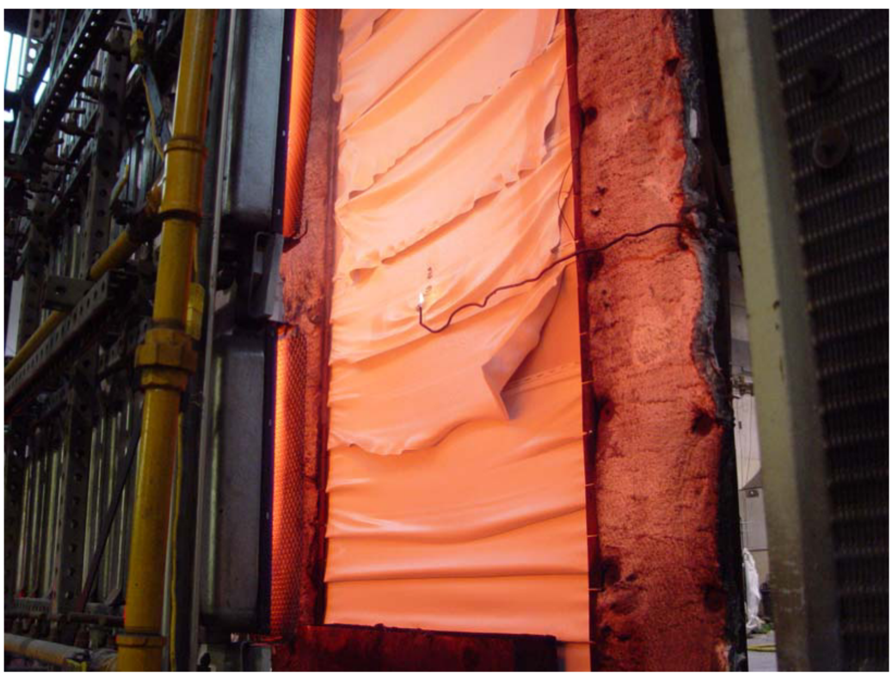

Picture 11: Test 3 Sample at End of Test


Picture 12: Test 4 Sample during Test

Picture 13: Test 4 Sample Post-Test

Picture 14: Test 5 Sample during Test

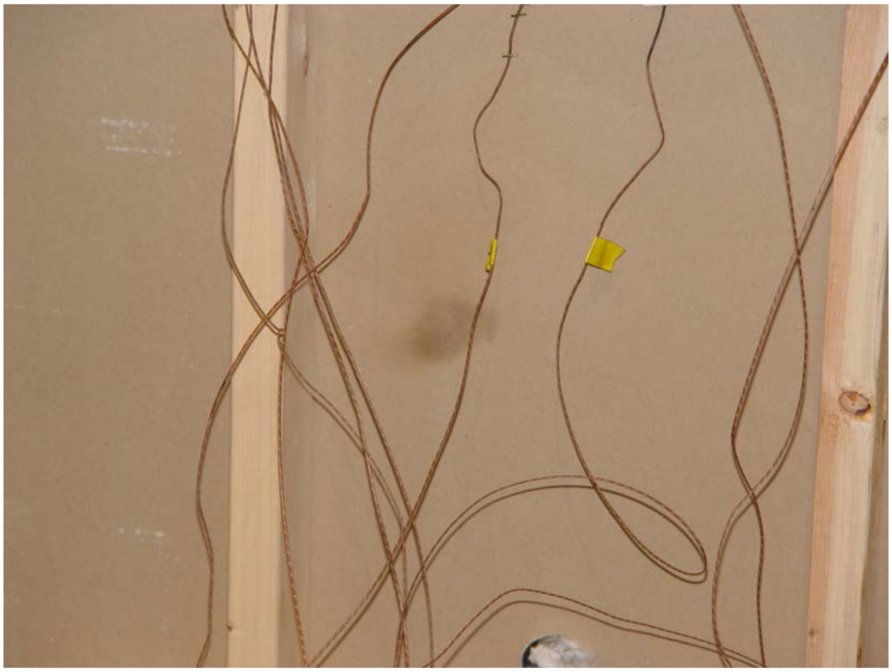
Picture 15: Test 5 Sample at End of Test



Picture 16: Test 6 Sample during Test

Picture 17: Test 6 Sample during Test

Picture 18: Test 7 Sample during Test



Picture 19: Test 7 Sample at End of Test

Picture 20: Test 8 Sample during Test

Revise as follows:

R703.14 Polypropylene siding.

Polypropylene siding shall be certified and labeled as conforming to the requirements of ASTM D7254 by an approved quality control agency. ~~In addition, polypropylene siding shall conform to the fire separation distance requirements of Section R703.14.2 or R703.14.3.~~

Delete without substitution:

~~**R703.14.2 Fire separation.** Polypropylene siding shall not be installed on walls with a fire separation distance of less than 5 feet (1524 mm) and walls closer than 10 feet (3048 mm) to a building on another lot.~~
~~Exception: Walls perpendicular to the line used to determine the fire separation distance.~~

Intertek

Architectural Testing

TEST REPORT

Report No.: G8270.01-121-24
Test Date: March 9. 2017

Rendered to:

PLY GEM SIDING GROUP
Sidney, Ohio

PRODUCT TYPE: Polypropylene Siding
SERIES/MODEL: Cedar Discovery Hand Split (CD95HS)

TEST METHOD: ASTM E 84-16, *Standard Test Method for Surface Burning Characteristics of Building Materials*

Summary of ASTM E 84 Test Results	
Flame Spread Index	**Smoke Developed Index**
40	550

This report contains in its entirety:

Cover Page:	1 page
Report Body:	6 pages
Graphs:	1 page
Photographs:	1 page

Reference must be made to Intertek-ATI Report No. G8270.01-121-24 for complete test specimen descriptions.

1.0 Report Issued To: Ply Gem Siding Group
2405 Campbell Road
Sidney, Ohio 45365-0132

2.0 Test laboratory: Architectural Testing, Inc., an Intertek company ("Intertek-ATI")
130 Derry Court
York, Pennsylvania 17406-8405
717-764-7700

3.0 Introduction:

The Steiner Tunnel test apparatus is used to evaluate the surface burning characteristics and smoke development of building materials. The tunnel is considered to be under calibrated conditions when the flame front reaches the end of the tunnel within 5 minutes and 30 seconds (plus or minus 15 seconds) during a red oak test. An initial preheat of the tunnel is performed and the test specimen is installed when the tunnel temperature drops to 105°F. When the test is initiated, the 88 KW dual burner and 240 feet per minute air current creates a flame that extends 4.5 feet down the tunnel. The flame progression is tracked from this point to the exhaust end of the tunnel which is 19.5 feet downstream. An observer simultaneously notes any test specimen anomalies such as melting, dripping, sagging, delamination, fall-out, etc. The smoke that is generated during the test is measured by a photometer. The flame spread and smoke developed data are automatically logged and graphed versus time by a data acquisition and computer system. The Flame Spread Index (FSI) and the Smoke Developed Index (SDI) are based on an area under the curve calculation and the red oak flooring calibration data.

4.0 Project Summary:

4.1 Product Type: Polypropylene Siding

4.2 Series/Model: Cedar Discovery Hand Split (CD95HS)

4.3 Compliance Statement: Results obtained are tested values and were secured by using the designated test method(s). The specimen(s) were tested to evaluate the flame spread and smoke developed properties. A summary of the results is listed in the Test Results section and the complete graphical test data is included in Appendix A of this report.

4.4 Test Date: 3/9/2017

4.5 Test Location: Intertek-ATI test facility in York, Pennsylvania

4.6 Test Sample Source: The sample was provided by the client. Representative samples of the test specimen will be retained by Intertek-ATI for a minimum of four years from the test completion date.

4.0 Project Summary: (Continued)

4.7 List of Official Observers:

Name	Company
Alan Hoying	Ply Gem Siding Group
Ben Green	Intertek-ATI
Scott Gingrich	Intertek-ATI

5.0 Test Method(s), Practices and/or Classifications:

ASTM E 84-16, *Standard Test Method for Surface Burning Characteristics of Building Materials*

6.0 Test Specimen Description:

Date Tested:	3/9/2017
Manufacturer*:	Ply Gem Siding Group
Product Type:	Polypropylene Siding
Series/Model:	Cedar Discovery Hand Split (CD95HS)
Composition*:	Polypropylene
Conditioning Time:	24+ hr.
Specimen Size:	24 in. wide x 20-3/4 in. long
Thickness:	3/4 in.
Specimen Sections:	16
Total Weight:	1.8 lbs.
Color:	Red
Side to Flame:	Exterior surface
Support Used*:	1/4 in. diameter steel rods spaced every 24 inches and 20 gauge hexagonal steel poultry netting
Mounting Method:	E84-16 X1.1.2.2(a) and X1.1.2.3
Substrate Used*:	No substrate was utilized
Cement Board:	The fiber cement board was placed on top of the sample.

*From the client's material description and/or instructions

Note: Specimens were conditioned as per the requirements of Section 6.4 of ASTM E84-16 *Standard Test Method for Surface Burning Characteristics of Building Materials*

7.0 Test Results: The test results are tabulated as follows:

Test Results	
Flame Spread Index (FSI):	40
Smoke Developed Index (SDI):	550
Test Operator:	Ben Green
Red Oak Calibration (% * Min):	99.18

Test Data	
FSI (unrounded):	40.7
SDI (unrounded):	552.7
FS * Time Area (Ft * Min):	79.0
Smoke Area (% * Min):	548.1
Fuel Area (°F * Min):	7650.9

Observations	
Ignition Time:	00:39 (Min:Sec)
Max Flame Front Advance:	10.0 Feet
Time to Max Flame Front:	03:18 (Min:Sec)
Max Temp At Exposed T/C:	1102.5°F
Time To Max Temp:	09:12 (Min:Sec)
Dripping Observed:	00:36 (Min:Sec)
Flaming On Floor Observed:	00:57 (Min:Sec)
After Flame Top Observed:	10:41 (Min:Sec)
After Flame Floor Observed:	10:42 (Min:Sec)
Sagging Observed:	No
Delamination Observed:	No
Shrinkage Observed:	No
Fallout Observed:	01:11 (Min:Sec)
Cracking Observed:	No
Observations After the Test:	None

Reference Appendix A for graphs.

7.0 Test Results: (Continued)

In Accordance with ASTM E 84-16 the use of supporting materials on the underside of the test specimen has the ability to lower the flame spread index from those which might be obtained if the specimen could be tested without such support. These test results do not necessarily relate to indices obtained by testing materials without such support (E84-16, 1.3).

This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire-hazard or fire-risk assessment of the materials, products, or assemblies under actual fire condition s (E84-16, 1.7).

This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the sole responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use (E84-16, 1.8).

8.0 Codes and Regulations:

The 2009 International Building Code® (Chapter 8 Interior Finishes, Section 803 Wall and Ceiling Finishes) and NFPA 5000, (Chapter 10 Interior Wall or Ceiling Finish Testing and Classification) classify materials based on their Flame Spread and Smoke Developed indices. The classification criteria are listed below:

Classification	Flame Spread Index	Smoke Developed Index
A	0-25	0-450
B	26-75	0-450
C	76-200	0-450

Intertek-ATI will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Intertek-ATI for the entire test record retention period.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI

For INTERTEK-ATI:

Digitally Signed by: Benjamin C. Green	Digitally Signed by: Ethan Grove
Ben Green	Ethan Grove
Technician – Fire Testing	Manager – Fire Testing

BCG:ddr

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix-A: Graphs (1)
Appendix-B: Photographs (1)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	3/20/2017	N/A	Original Report Issue

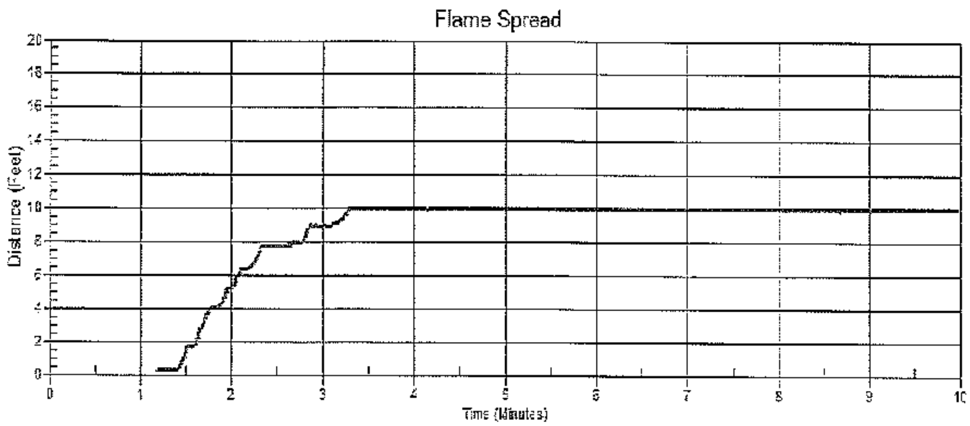
This report produced from controlled document template ATI 00537, revised 04/16/15.

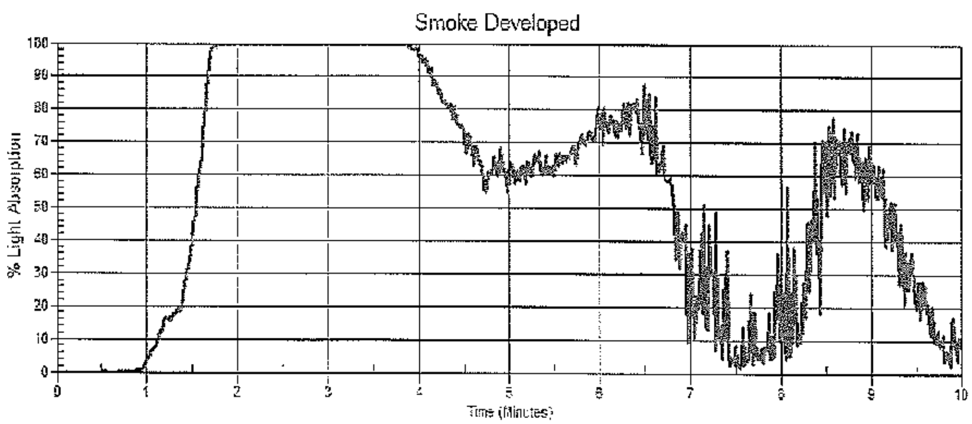
Appendix A

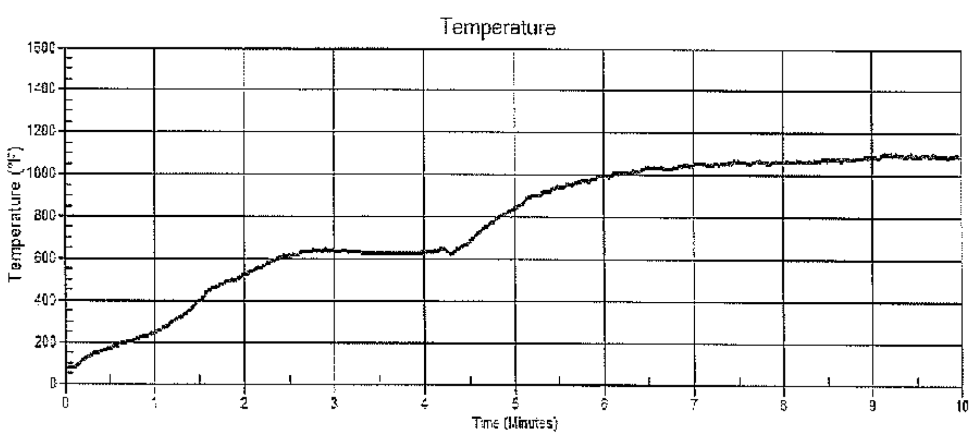
Graphs

Intertek | Architectural Testing

Test Report No.: G8270.01-121-24
Report Date: 3/20/2017
Test Record Retention End Date: 3/09/2021







Appendix B

Photographs

130 Derry Court
York, PA 17406

www.archtest.com · www.intertek.com/building

p. 717.764.7700
f. 717.764.4129

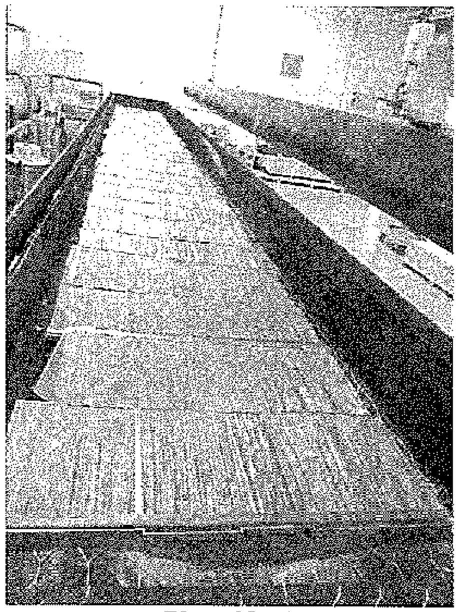


Photo No. 1
Specimen Mounted in Tunnel Unexposed Surface (Pre-Test)

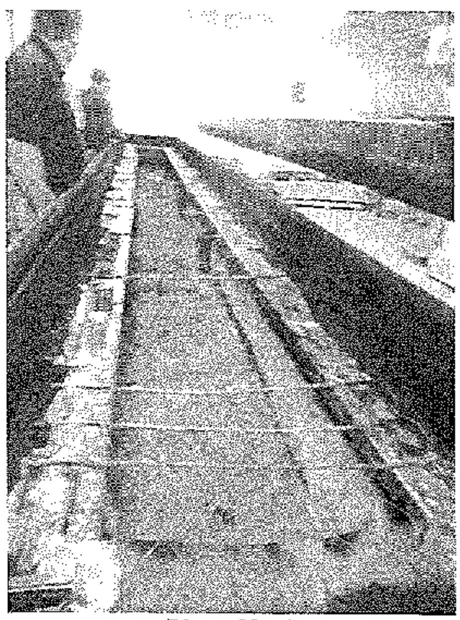


Photo No. 2
Specimen Mounted in Tunnel Unexposed Surface (Post Test)

Correction of PP Testing Requirement

IRC: R703.14, R703.14.2, R703.14.3

Reason: Currently, polypropylene siding is the only cladding in both the Florida Building and Residential codes that requires an ASTM E84 test respective to specific Fire Separation Distance areas; 10 feet or closer to another building.

The sections proposed for deletion do not provide any additional protection as the code already requires that if the product is used in these settings, it will need to be a part of an ASTM E119 fire rated assembly, typically a 1-hour rated assembly. In addition, as part of the ASTM product standard, D7254, the product must meet an E84 tested fire performance property (max flame spread of 200) consistent with another exterior, combustible building materials.

The current code language proposed for deletion is superfluous. The code has adequate provisions for regulating building materials used with Fire Separation Distance areas, as specified in Tables 601 and 705.5.

To help the committee better understand the fire properties of polypropylene siding, the Vinyl Siding Institute (VSI) conducted a series of tests at the Western Fire Center. These tests provide fire-safety insights by using ASTM E2707 Standard Test Method for Determining Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure and an exposed wall to this test.

Attached to this modification proposal is a VSI Technical Report from these tests to help the committee better understand the fire characteristics of this product category.

The following is an overview of these tests:

-The product was tested in a setting and application that represents tight lot line settings (close Fire Separation Distance) by having a burner wall and exposed (receiver wall) facing each other – tests were spaced at 4’ and 6’ with gypsum backing to represent a rated assembly.

-The product was also tested at a typical unprotected separation distance 10+’ apart

-The product was tested with gypsum sheathing on a protected wall assembly and as part of an unprotected, combustible material wall assembly.

Based on the results of the test, it is worth noting the following:

-Polypropylene typically melts, spits, and falls off the wall and, in some cases, will collect and continue to burn on the ground within 18 inches of the burner wall.

-At no point did any portion of the receiver wall with polypropylene siding combust, even at the 4’ wall spacing.

-The heat release rate of the polypropylene siding/gypsum sheathing (protected) base wall was about 65% less than the heat release rate of the polypropylene siding / fully combustible wood wall-Heat release peaks occurred faster into the tests and at higher magnitudes for the polypropylene siding /wood combustible wall vs. the wall with polypropylene siding/gypsum assembly-Observation of the reaction of all the wall assemblies to the fire exposures during the tests clearly show and confirm that the respective fire-resistive and fire separation distance sections within the building code provide the intended protection of exterior walls with polypropylene siding.

There are no examples of the hazard this specific product presents. All data provided has not been in the application of siding.

The image below is an example of a house fire near another house (approximately 15 feet) during Hurricane Isaias. The resulting fire caused no hazard to the house next to it, clad with polypropylene siding, other than melting the cladding. This situation is what the special highlights, yet both testing and real-world experience shows that it does not represent a problem—the adjacent building did not burn.

TECHNICAL REPORT

POLYPROPYLENE FIRE TESTING SYNOPSIS

NOVEMBER 9, 2020

VINYL SIDING INSTITUTE™

BACKGROUND AND PURPOSE

In January 2020, the VSI Technical Committee (TC) formed the Polypropylene Fire Work Group (PPFWG) to study fire behavior in high-density population settings. The work group defined different wall installations scenarios to be tested, then identified and sourced PP siding materials. The test standard used to understand these characteristics was a modified version using a dual-wall system of ASTM E2702 Standard Test Method for Determining Fire Penetration of Exterior Wall Assemblies Using a Direct Flam Impingement Exposure. The polypropylene siding selected has one of the highest material densities on the market, which provided a cladding with one of the highest fuel loads in the category.

In October 2020, two VSI staff members traveled to Western Fire Center (WFC) in Kelso, Washington, to witness the polypropylene fire testing. The in-person attendees discussed each test setup with the WFC technicians and determined the sequence of the testing. Photographs were taken to capture the testing, and the testing was streamed live to the work group audience.

The purpose of the testing was to see how the polypropylene siding performed when tested in accordance with the fire separation requirement identified in the International Building Code (IBC) and the International Residential Code. Section 1403.12 of the IBC (similar in the IRC), the fire separation distance between a building with polypropylene siding and the adjacent building shall be not less than 10 feet. Additionally, testing with the fire separation being less than 10 feet was conducted to witness first-hand how the material performed during a 10-minute burn test on the burner and receiver walls replicating building to building fire spread. Polypropylene siding was installed on both the ignition source, and the walls exposed to the ignition source, to simulate fire in high density settings.

EXECUTIVE SUMMARY

The product was tested in a setting that represents tight lot line settings (i.e. close fire separation distance) by having a burner wall and an exposed receiver wall; the tests were spaced at 4', 6', and 10+' respectively. The product was tested with just the gypsum sheathing and as part of a fully combustible wood wall setup. Based on the results of the testing, the following has been noted:

- Polypropylene typically melts, spits, and falls off the wall, and in some cases, will continue to collect and burn on the floor within 18 inches of the burner wall
- At no point did any portion of the polypropylene siding receiver wall combust, even at the closest 4' wall separation
- The heat release rate of the polypropylene siding & gypsum sheathing base wall was about 65% less than the heat release rate of the polypropylene & fully combustible wood wall
- The rate of burn (speed) was significantly quicker for the fully combustible wood wall versus the wall with polypropylene siding & gypsum sheathing base wall
- Observation of the reaction of all the wall assemblies to the fire exposures during the tests clearly show and confirm that the respective fire resistive and fire separation distance sections within the building code provide the intended protection of exterior walls with polypropylene siding.

TESTING DETAILS

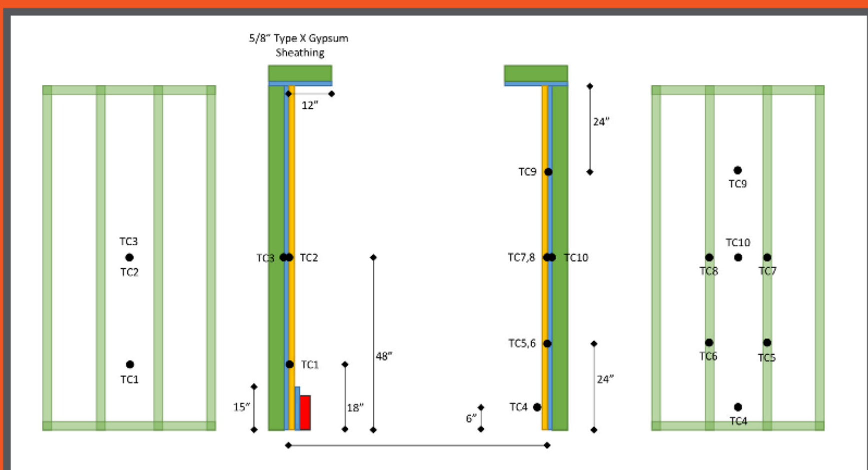
All walls were clad in polypropylene siding.

6' Wall Separation – Burner Wall Gypsum Board Sheathing, Receiver Wall Gypsum Board Sheathing

4' Wall Separation – Burner Wall Wood Sheathing and Gypsum Board Sheathing, Receiver Wall Wood Sheathing

10' 1" Wall Separation – Burner Wall Wood Sheathing Over Gypsum Board Sheathing, Receiver Wall Wood Sheathing

Single Wall Baseline Tests (2) – Wood Sheathing, Gypsum Board Sheathing



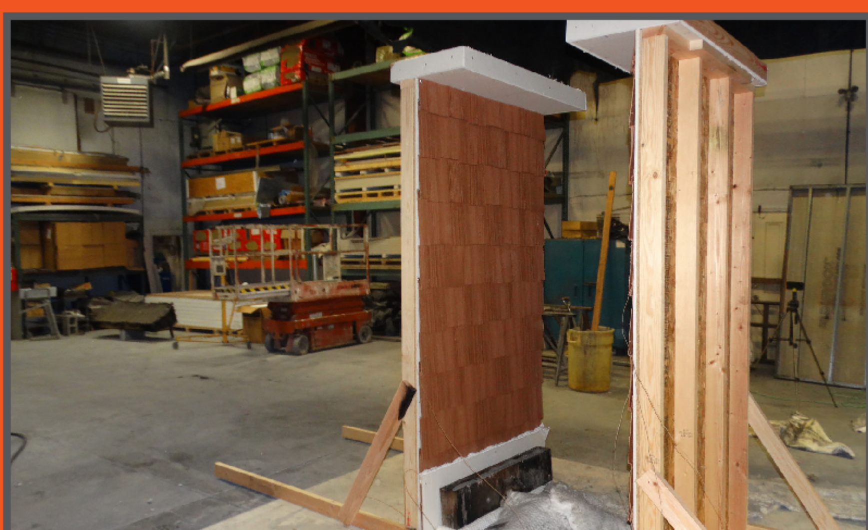


Photo of 4' burner wall

6' WALL TEST RESULTS AND CONCLUSION

ASTM E2707 Standard Test Method for Determining Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure prescribes a 4"×39" gas sand burner that exposes a 150 kW flame to a 4'×8' exterior wall assembly for a period of 10 min. The standard measures the ability of the sample to resist fire penetration of the material following direct flame exposure. However, this modified test provided for a 2nd receiver wall to be placed 6' directly opposing the burner wall. The heat release rate was measured in the hood by means of oxygen consumption calorimetry, and thermocouples were placed on each specimen wall to monitor how the temperature changed over time. Both the burner wall and the receiver wall were comprised of wood framing, covered by gypsum sheathing and polypropylene siding.

TEST TIME (MM:SS)	EVENT
00:00	Start test – 150 kW burner on
00:30	Warping of siding on burner wall
00:55	Melted siding – exposed gypsum
01:20	Flames attached 4'
02:40	Spitting (about 12" – 18" from Burner Wall) material from siding
03:40	Most of burner wall engulfed in flames
04:40	Slight warping of receiver wall siding
05:30	Collection of fire at base of burner wall - approximately 6" from side (also into burner)
06:30	Increased melting of receiver wall siding
08:15	Reduced flames on burner wall
08:40	Deformation of siding on receiver wall
09:45	Melting/deformation of siding on receiver wall, exposing gypsum sheathing
10:00	Burner off
12:30	Most flames near base of burner wall
20:00	Terminate test – no ignition of receiver wall – some deformed/melted sections of polypropylene siding

The burner wall of a dual-wall system was exposed to a 150 kW burner for 10 minutes with an opposing receiver wall placed 6' from the burner wall. Most of the polypropylene siding from the burner wall ignited and/or melted off the wall and continued to burn at the base of the wall.

The receiver wall did not ignite but had some deformation of the polypropylene siding.

4' WALL TEST RESULTS AND CONCLUSION

This test was conducted in the same setup manner as the 6' test, with the walls being spaced 4' apart. Both the burner wall and the receiver wall were comprised of wood framing, covered by OSB sheathing, covered by gypsum sheathing, and polypropylene siding.

TEST TIME (MM:SS)	EVENT
00:00	Start test – 150 kW burner on
00:30	Warping of siding on burner wall
01:00	Melted siding – exposed gypsum
01:30	Flames attached 5'
02:00	Spitting (about 12" – 18" from Burner Wall) material from siding
02:30	More intense fire
02:45	Buckling of siding on receiver wall
03:00	Most siding fallen/melted on burner wall
03:50	Drooping receiver wall siding
04:30	25% of receiver wall gypsum sheathing exposed
06:00	Small collection of fire at base of burner wall
07:15	Receiver wall siding mostly fallen – collected at base but not ignited
10:00	Burner off - collection of fire at burner wall only
20:00	Terminate test – no ignition of receiver wall – significant deformed/melted sections of polypropylene siding

The burner wall of a dual-wall system was exposed to a 150 kW burner for 10 minutes with an opposing receiver wall placed 4' directly opposed from the burner wall. Most of the polypropylene siding from the burner wall ignited and/or melted off the wall and continued to burn at the base of the wall. The receiver wall had significant deformation and melting of the polypropylene siding, exposing most of the gypsum sheathing behind it, but no ignition of the polypropylene siding.

10' 1" WALL TEST RESULTS AND CONCLUSION

This test was conducted in the same setup manner as both the 6' and 4' tests, with the walls being set at 10' 1" apart. The burner wall was comprised of a wood framing, covered by OSB sheathing, covered by gypsum sheathing and polypropylene siding. The receiver wall was comprised of wood framing, covered by OSB sheathing and polypropylene siding.

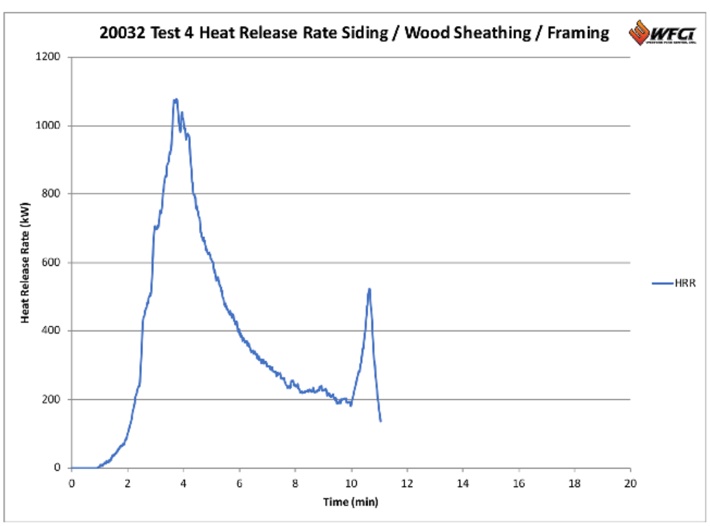
TEST TIME (MM:SS)	EVENT
00:00	Start test – 150 kW burner on
00:35	Warping of siding
01:00	Attached flames – dripping siding
01:20	Exposed OSB
01:50	Melted material up to 4'
02:30	Intense fire
03:00	Most siding burning on burner wall
04:30	Slight bowing in receiver wall siding
05:50	Reduced flames on burner wall
10:00	Burner off - collection of fire remaining on burner wall
17:30	Reduced flames
18:20	Sections of OSB falling from burner wall
20:00	Terminate test – no ignition of receiver wall – only slight bowing of siding

The burner wall of a dual-wall system was exposed to a 150 kW burner for 10 minutes with an opposing receiver wall placed 10' 1" directly opposed from the burner wall. Most of the polypropylene siding from the burner wall ignited and/or melted off the wall and continued to burn at the base of the wall. There was also significant fire and heat release contribution from the exposed OSB sheathing. The receiver wall did not ignite and had little deformation of the polypropylene siding. Only slight bowing was observed.

BASELINE TEST RESULTS AND CONCLUSIONS

The first baseline test consisted of a single wall that was built of OSB sheathing and polypropylene siding. ASTM E2707 prescribes a 4"×39" gas sand burner that exposes a 150 kW flame to a 4'×8' exterior wall assembly for a period of 10 min. The standard measures the ability of the sample to resist fire penetration of the material following direct flame exposure. However, this modified test is intended to monitor the siding performance and not necessarily burn-through. Additionally, to better determine the burning characteristics of the burner wall, the heat release rate was measured in the hood by means of oxygen consumption calorimetry. Thermocouples were also placed on each specimen to monitor how the temperature changed over time.

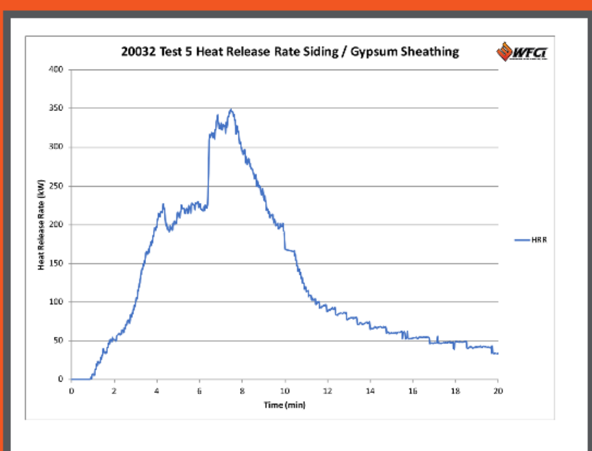
TEST TIME (MM:SS)	EVENT
00:00	Start test – 150 kW burner on
00:40	Warping of siding
01:10	Dripping material
01:25	Exposed OSB
02:00	Approximately 1/2 wall melted – increasing flames
03:00	Wall engulfed in flames – intense fire
05:10	Smoking on unexposed side
07:00	Reduced flames
07:50	Darkening on unexposed side
08:40	Glowing on unexposed side
09:55	Glowing on unexposed side
10:00	Burner off
10:45	Terminate test – need to extinguish assembly on



To the left is the heat release rate chart for Test 4.

The second baseline test consisted of a single wall that was built of an OSB base, gypsum sheathing, and polypropylene siding. All other aspects of the testing were similar to the first baseline test.

TEST TIME (MM:SS)	EVENT
00:00	Start test – 150 kW burner on
00:40	Warping of siding
00:55	Dripping material
01:10	Exposed gypsum
02:00	Flames approximately 6' up right side
03:00	Flames approximately 4' up left side
04:00	Increasing flames
04:45	Flames to soffit
07:20	Most wall engulfed
09:30	Reduced flames
10:00	Burner off - continued flames on wall and collect fire at base
20:00	Terminate test – slight flames on wall



To the left is the heat release rate chart for Test 5.

The walls of two single-wall systems were exposed to a 150 kW burner for10 min. Most of the polypropylene siding from the burner wall ignited and/or melted off the wall and continued to burn at the base of the wall. The OSB sheathing (Test 4) allowed for significantly faster and more intense flames (-4 min, peak —1100 kW) when compared to the gypsum sheathed (Test 5) assembly (-7min, peak 350 kW). The wall constructed with only OSB sheathing wall had burn-through of the sheathing prior to the burner shutting off. The gypsum sheathed wall did not have burn-through, and it also had a significantly lower heat release rate.

VINYL SIDING INSTITUTE™

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

48

S9851

Date Submitted	01/05/2022	**Section**	703	**Proponent**	Fernando Pages
Chapter	7	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

704

Summary of Modification

Addresses prescriptive installation for fascia.

Rationale

Reason: Currently the code does not provide specific instructions for the installation of fascia at the eaves and rakes. This is an area the code needs to address, as it has been identified as a point of weakness for failure during wind events. Based on results of recent testing, aluminum fascia can be installed with one fastener at the leg with a 1” or more coverage at the drip edge, although issues with fascia in non-high wind areas is not a noted issue. In high wind conditions fascia will be required to have two fasteners, at the face and leg, or using utility trim and punch locks at drip edge. Attached are results from those tests.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact

Impact to building and property owners relative to cost of compliance with code

No impact

Impact to industry relative to the cost of compliance with code

No impact

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Fascia blow-off is the primary reason for soffit blow-off, which can lead to water infiltration. This modification supports public welfare.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the code by adding a critical missing element.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate.

Does not degrade the effectiveness of the code

This modification does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

S9851-A3

Proponent Joseph Belcher **Submitted** 8/24/2022 12:27:57 AM **Attachments** Yes

Rationale:

The current code does not address the installation of aluminum fascia. The Vinyl Siding Institute (VSI) proposed adding provisions to address the issue. VSI requested denial at the Structural TAC hearing to work with the Aluminum Association of Florida (AAF), the Florida Home Builders Association (FHBA) and the Insurance Institute for Business and Home Safety (IBHS) to develop an alternate language comment. The change as submitted would have resulted in oilcanning due to thermal expansion and contraction because of the proposed face nail schedule. The AAF engaged Dr. Timothy Reinhold, P.E., to perform engineering analysis, and the results were adopted into the submitted alternate language public comment. The changes have been accepted by AAF, FHBA, VSI, and IBHS. IBHS is submitting an alternate language public comment for Mod S10090 to include the same provisions in the FBC-B.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact. Plan reviewers and inspectors will have criteria to assure proper installation.

Impact to building and property owners relative to cost of compliance with code

No impact. Property owners will be assured of proper installation.

Impact to industry relative to the cost of compliance with code

No impact. The industry will have prescriptive provisions assuring proper installation.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change has a connection to public health, safety, and welfare because it provides prescriptive requirements to an area not addressed previously by the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change strengthens the code by proving prescriptive provisions to a subject not currently addressed by the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

Upgrades the effectiveness of the code.

Modify as follows:

R703.1.2.1 Wind resistance of exterior soffits.

Exterior soffits and their attachments shall comply with Section R704.

R704.2.1 Vinyl soffit panels. Vinyl soffit panels shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or sub fascia component in accordance with Figure R704.2.1. Where the unsupported span of soffit panels is greater than 12 inches, intermediate nailing strips shall be provided in accordance with Figure R704.2.2 unless a larger span is permitted in accordance with the manufacturer's product approval specification. Vinyl soffit panels shall be installed in accordance with the manufacturer's product approval specification and limitations of use. Fascia covers shall be installed in accordance with the manufacturer's product approval specification and limitations of use and Section R704.3.

Add a new Section as follows:

R704.3 Aluminum Fascia. Aluminum fascia shall have a minimum thickness of 0.019 inches and be installed per the manufacturer's instructions and this code. Fasteners shall be aluminum or stainless steel. Aluminum fascia shall be attached in accordance with Section R704.3.1, R704.3.2 or R704.3.3. The drip edge shall comply with R905.2.8.5, and the thickness of the drip edge shall be in accordance with Table R903.2.1.

R704.3.1 Fascia installation where the design wind pressure is 30 psf or less. Where the design wind pressure is 30 pounds per square foot (1.44kPA) or less, aluminum fascia shall be attached as follows:

1. Finish nails shall be provided in the return leg (1 ¼ x 0.057 x 0.177 head diameter) spaced a maximum of 24 inches (610 mm) on center, and

2. The fascia shall be inserted under the drip edge with not less than half the height of the drip edge or 1.0 inch (25 mm), whichever is greater, of the fascia material covered by the drip edge. One finish nail shall be centered in the face of the fascia from each end of the fascia material section located no more than 1 inch below the drip edge.

R704.3.2 Fascia installation where the design wind pressure exceeds 30 psf but is 60 psf or less. Where the design wind pressure is 60 pounds per square foot (2.88kPA) or less, aluminum fascia shall be attached in accordance with Section R704.3.2.1 or Section R704.3.2.2.

R704.3.2.1. Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is less than or equal to 6.5 inches (165 mm) or less, aluminum fascia shall be attached as follows:

1. Finish nails shall be provided in the return leg (1 ¼ x 0.057 x 0.177 head diameter) spaced a maximum of 24 inches (610 mm) on center.

2. The fascia shall be inserted under the drip edge with not less than half the height of the drip edge or 1.0 inch (25 mm), whichever is greater, of the fascia material covered by the drip edge. One finish nail shall be centered in the face of the fascia from each end of the fascia material section located no more than 1 inch below the drip edge.

R704.3.2.2 Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is greater than 6.5 inches (165 mm), the top edge of the fascia shall be secured using utility trim installed beneath the drip edge with snap locks punched into the fascia spaced no more than 6 inches on center.

R704.3.3 Fascia installation where the design wind pressure exceeds 60 psf. Where the design wind pressure is greater than 60 pounds per square foot (2.88kPA), aluminum fascia shall be attached as follows in accordance with Section R704.3.3.1 or Section R704.3..3.2.

R704.3.3.1. Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is less than or equal to 4.5 inches (114 mm) or less aluminum fascia shall be attached as follows:

1. Finish nails shall be provided in the return leg (1 ¼ x 0.057 x 0.177 head diameter) spaced a maximum of 16 inches on center, and

2. The fascia shall be inserted under the drip edge with not less than half the height of the drip edge or 1.0 inch (25 mm), whichever is greater, of the fascia material covered by the drip edge. One finish nail shall be centered in the face of the fascia from each end of the fascia material section located no more than 1 inch below the drip edge.

R704.3.3.2 Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is greater than 4.5 inches (114 mm), the top edge of the fascia shall be secured using utility trim installed beneath the drip edge with snap locks punched into the fascia spaced no more than 6 inches on center.

R704.4 Corners on Hip Roofs. Fascia shall be bent around corners and extend at least 12 inches beyond the corner. The next fascia material section shall overlap the extension a minimum of 3" and be fastened through the return leg at the overlap.

R704.5 Corners on Gable Roofs. Fascia shall be wrapped (tabbed) around and extend at least 1 inch beyond the corner. The gable fascia material section shall overlap the tab and be fastened through the fascia cover and the tab at the end with two face nails (1 ¼ x 0.057 x 0.177 head diameter) for a 2x4-inch sub fascia and three face nails for 2x6-inch and greater sub fascia.

(See image below)

FIGURE 704.2.1 TYPICAL SINGLE-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

(See image below)

FIGURE 704.2.2 TYPICAL DOUBLE-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

Images for S9851-A3

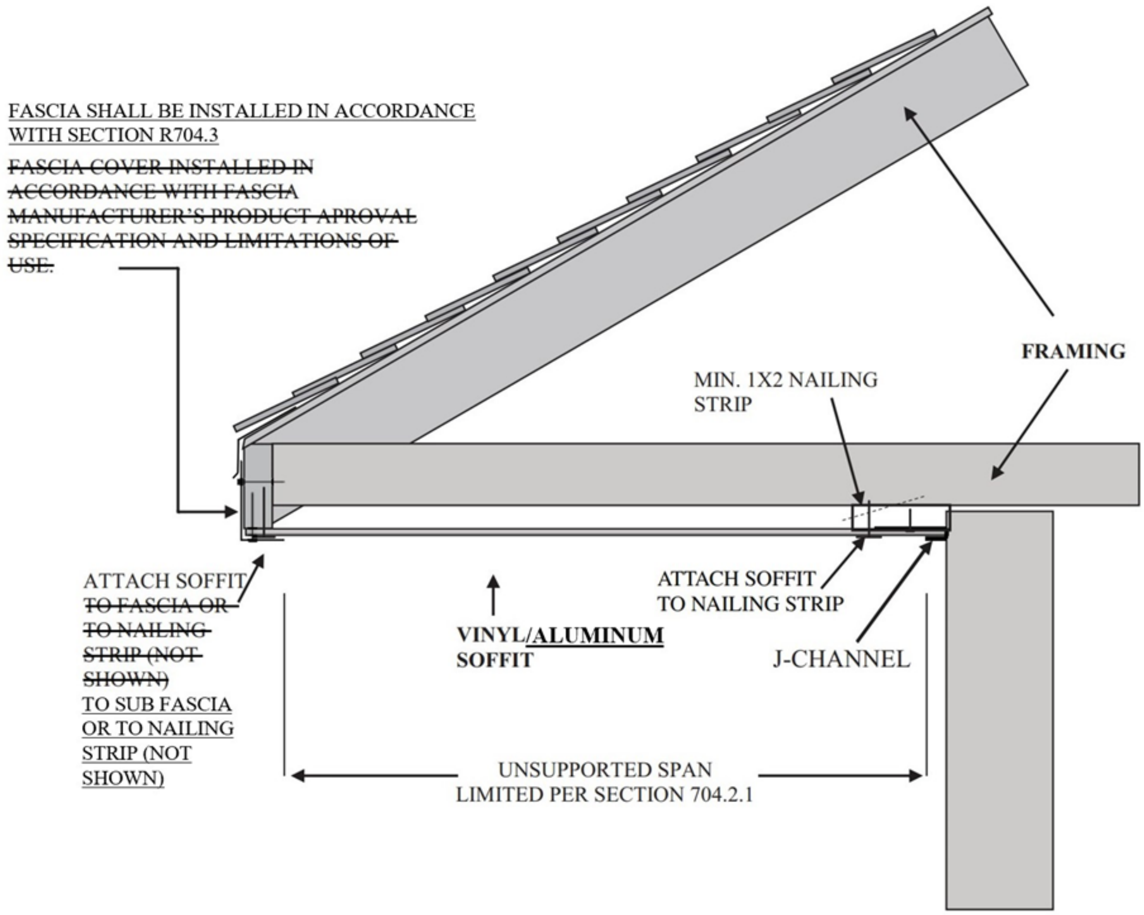


Figure 704.2.1 Typical Single-Span Vinyl or Aluminum Soffit Panel Support

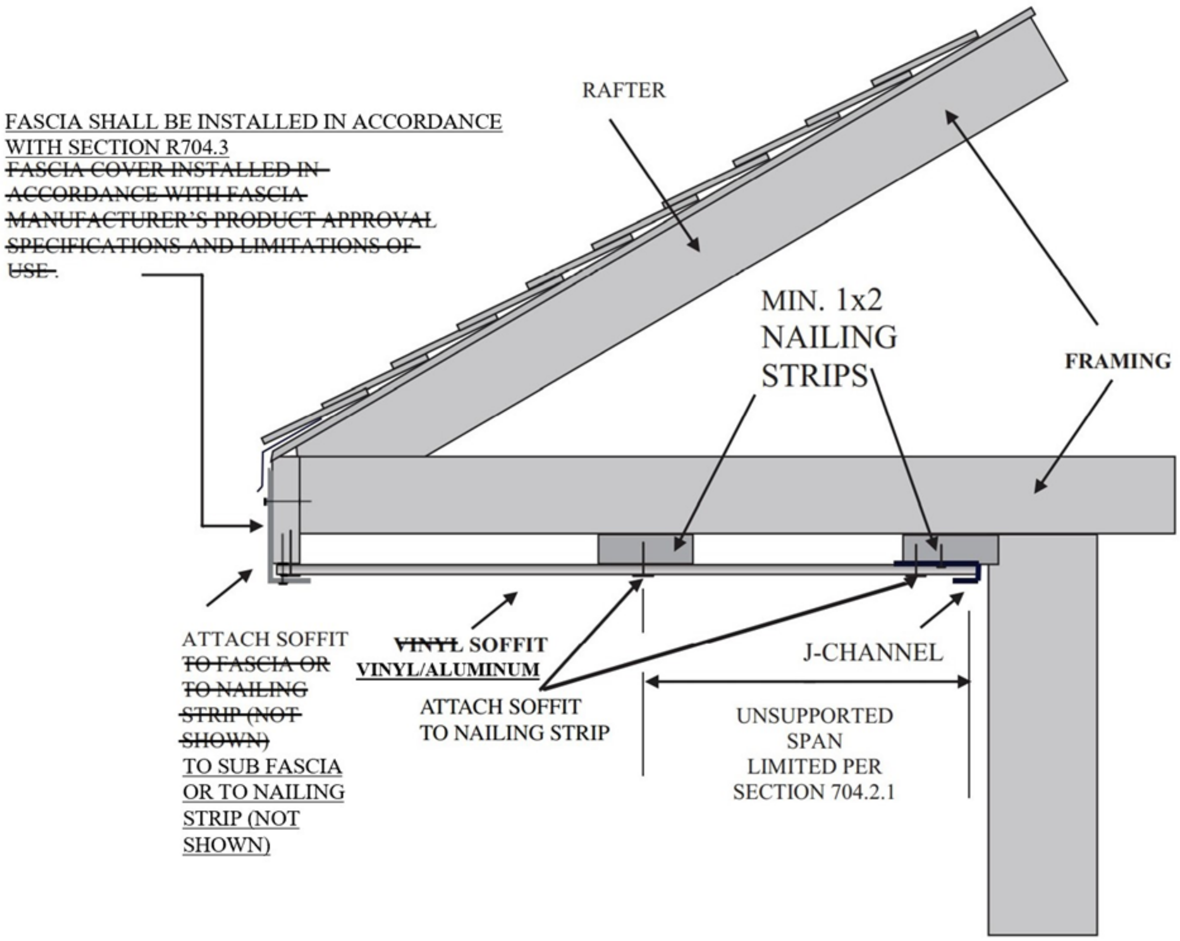


Figure 704.2.2 Typical Double-Span Vinyl <u>or Aluminum</u> Soffit Panel Support

Images for S9851

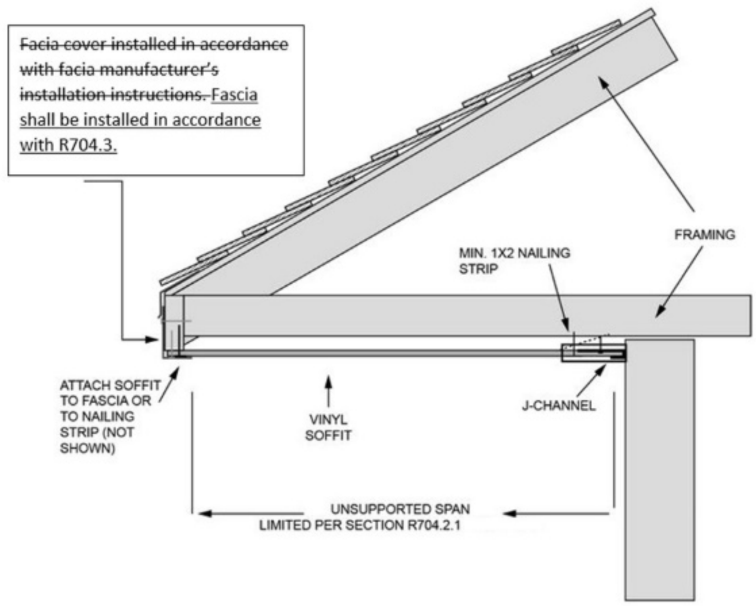


Figure R704.2.1

Typical Single-Span Vinyl Soffit Panel Support

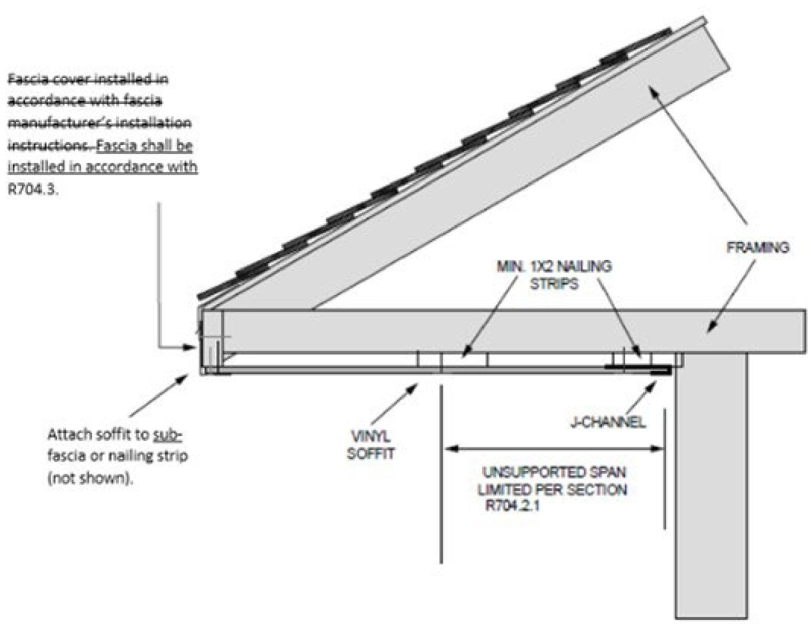


Figure R704.2.2

Typical Multi-Span Vinyl Soffit Panel Support

Please see uploaded file.

Modify text as follows:

SECTION R703

EXTERIOR WALL COVERING

R703.1.2.1 Wind resistance of exterior soffits.

Exterior soffits and their attachments shall comply with Section R704.

SECTION R704

EXTERIOR SOFFITS AND FASCIAS

Modify figures and text as follows:

(See above for image)

FIGURE R704.2.1
TYPICAL SINGLE-SPAN VINYL SOFFIT PANEL SUPPORT

(See above for image)

FIGURE R704.2.2
TYPICAL MULTI-SPAN VINYL SOFFIT PANEL SUPPORT

Add new section as follows:

SECTION R704.3
FASCIA

R704.3 Fascia Installation. Fascia shall be installed in accordance with the manufacturer's instructions.

R704.3.1 Aluminum Fascia. Aluminum Fascia shall be installed in accordance with the manufacturer's installation instructions and comply with Sections R704.3.2 or R704.3.3.

R704.3.2 Fascia installation where the design wind pressure is 30 psf or less. Where the design wind pressure is 30 pounds per square foot (1.44kPA) or less, aluminum fascia shall be attached with one finish nail (1 ¼ x 0.057 x 0.177 head diameter) in the return leg spaced a maximum of 24 inches (610 mm) on center, and the fascia shall be inserted under the drip edge with at least 1 inch (305 mm) of fascia material covered by the drip edge. Where the fascia cannot be inserted under the drip edge, the top edge of the fascia shall be secured using one finish nail (1 ¼ x 0.057 x 0.177 head diameter) located not more than 1 inch below the drip edge and spaced a maximum of 24 inches on center.

R704.3.3 Fascia installation where the design wind pressure exceeds 30 psf..Where the design wind pressure is greater than 30 pounds per square foot (1.44kPA), aluminum fascia shall be attached with one finish nail (1 ¼ x 0.057 x 0.177 head diameter) in the return leg spaced a maximum of 16 inches on center and one finish nail located no more than 1 inch below the drip edge spaced a maximum of 16 inches on center. As an alternative, the top edge of the fascia is permitted to be secured using utility trim installed beneath the drip edge with snap locks punched into the fascia spaced no more than 6 inches on center.

#12 Fascia (8030)

IRC: SECTION R703, SECTION R704, FIGURE R704.2.1(1), FIGURE R704.2.1(2), R704.3.1, R704.4 (New)

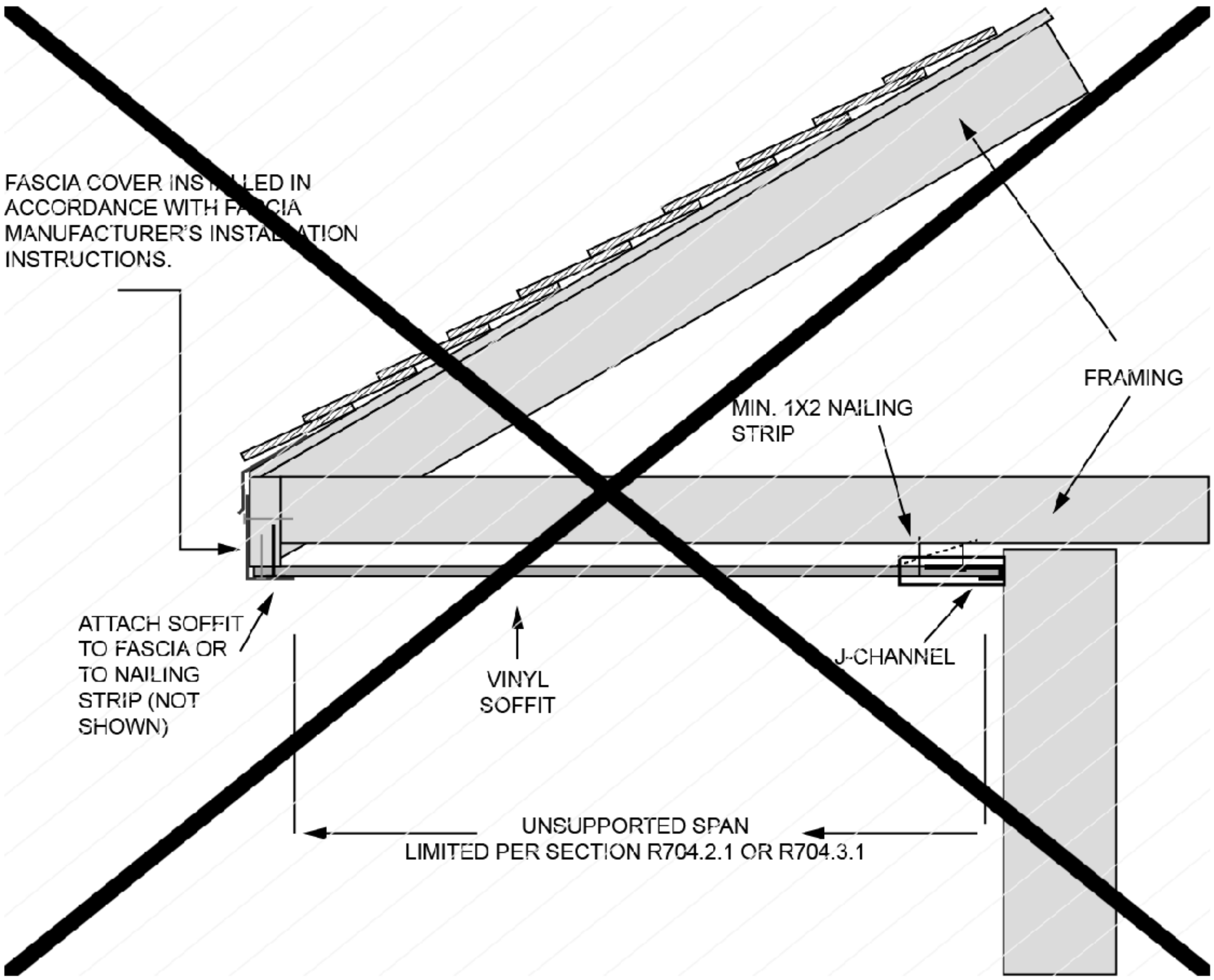
Proponents:

2021 International Residential Code

Revise as follows:

SECTION R703
EXTERIOR WALL COVERING

SECTION R704
EXTERIOR SOFFITS AND FASCIAS


FASCIA COVER INSTALLED IN ACCORDANCE WITH FASCIA MANUFACTURER'S INSTALLATION INSTRUCTIONS.
FRAMING
MIN. 1X2 NAILING STRIP
ATTACH SOFFIT TO FASCIA OR TO NAILING STRIP (NOT SHOWN)
VINYL SOFFIT
J-CHANNEL
UNSUPPORTED SPAN LIMITED PER SECTION R704.2.1 OR R704.3.1

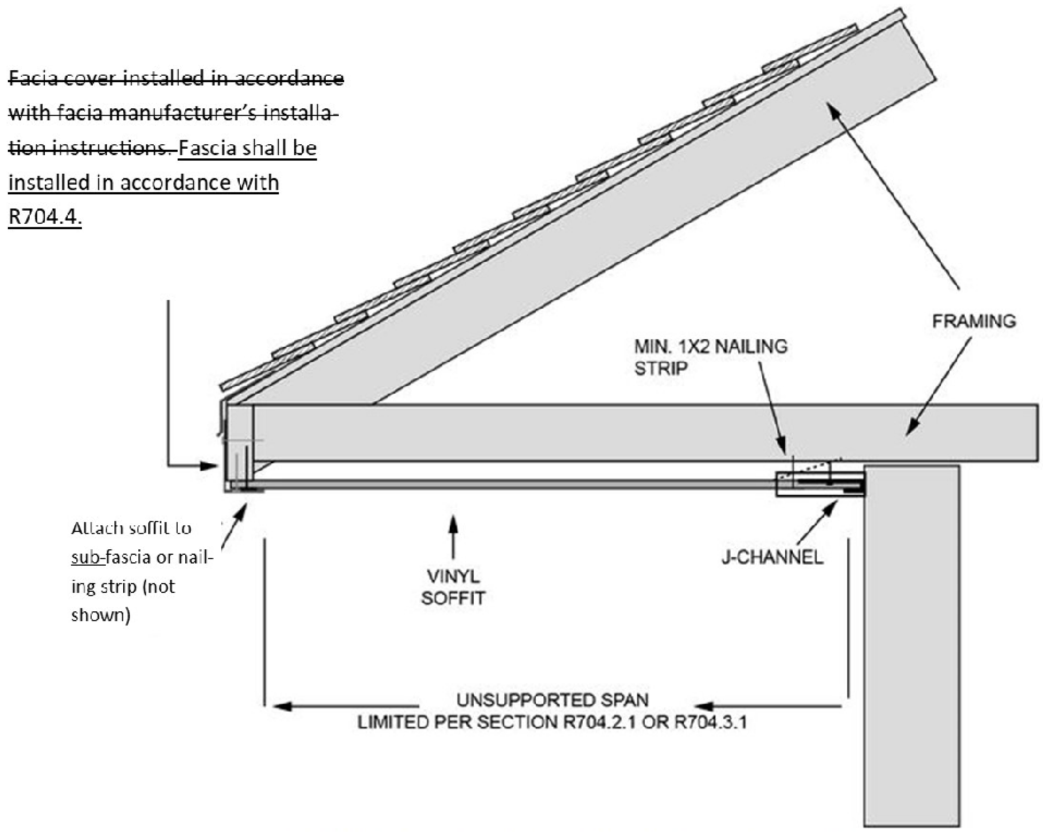
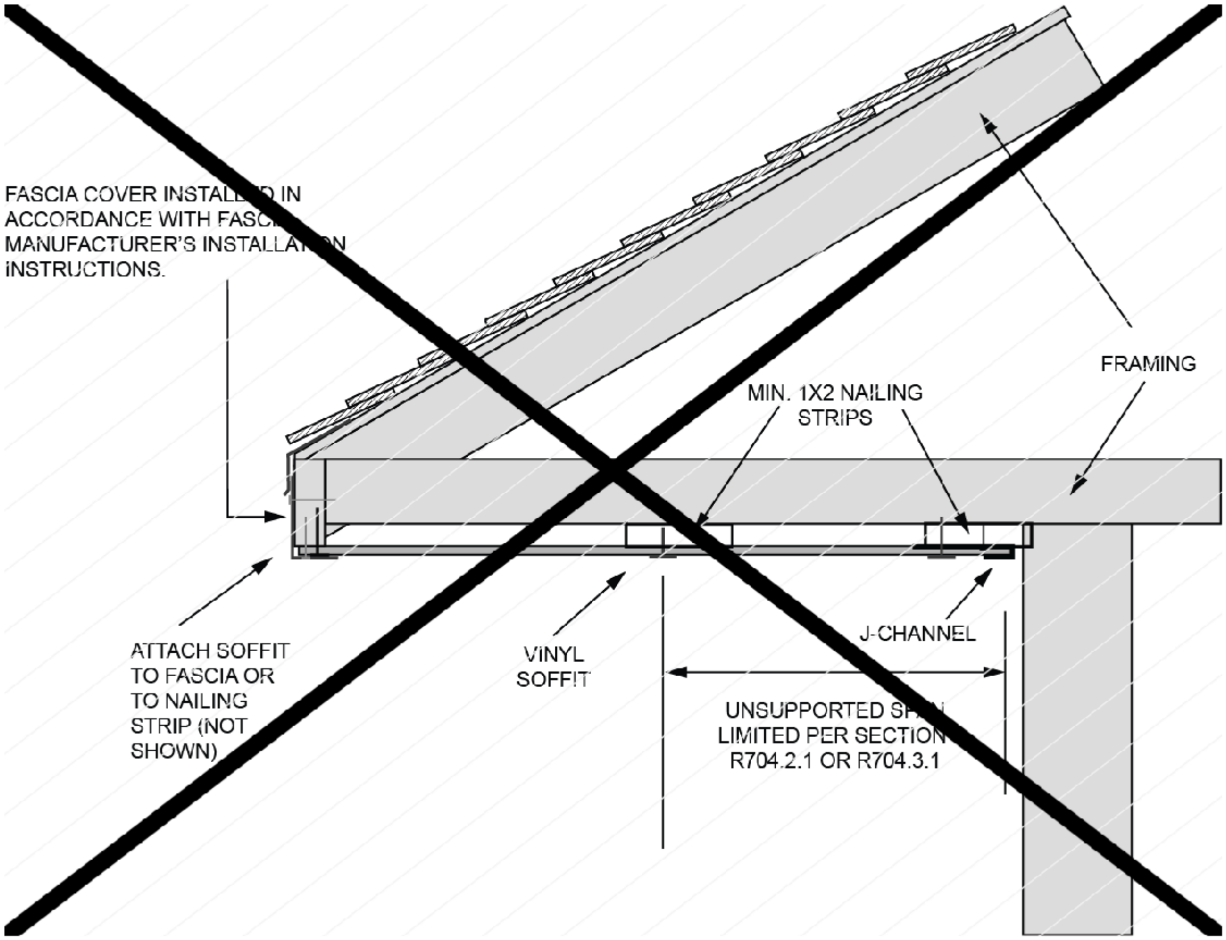


FIGURE R704.2.1(1) TYPICAL SINGLE-SPAN VINYL SOFFIT PANEL SUPPORT

S9851Text Modification

FIGURE R704.2.1(1) TYPICAL SINGLE-SPAN VINYL SOFFIT PANEL SUPPORT

S9851Text Modification



Mod_9851_ Text_Section R703 -- Fascia.pdf Page: 5

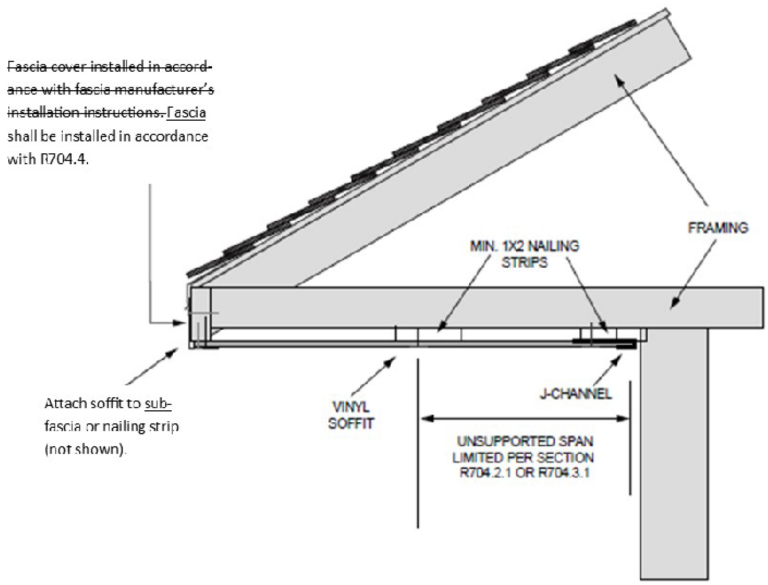


FIGURE R704.2.1(2)
TYPICAL DOUBLE-SPAN VINYL SOFFIT PANEL SUPPORT

FIGURE R704.2.1(2) TYPICAL DOUBLE-SPAN VINYL SOFFIT PANEL SUPPORT

R704.3.1 Vinyl soffit panels. Vinyl soffit panels and their attachments shall be capable of resisting wind loads specified in Table R301.2.1(1) for walls using an effective wind area of 10 square feet (0.929 m^2) and adjusted for height and exposure in accordance with Table R301.2.1(2) . Vinyl soffit panels shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component in accordance with Figure R704.2.1(1). Where the unsupported span of soffit panels is greater than 12 inches (305 mm), intermediate nailing strips shall be provided in accordance with Figure R704.2.1(2). Vinyl soffit panels shall be installed in accordance with the manufacturer's installation instructions. ~~Fascia covers shall be installed in accordance with the manufacturer's installation instructions.~~

Add new text as follows:

R704.4 Fascia. Fascia shall be installed in accordance with *manufacturer's installation instructions.*
R704.4.1 Aluminum Fascia. Aluminum Fascia shall be installed in accordance with *manufacturer's installation instructions* and comply with Sections R704.4.1 or R704.4.2.

R704.4.1.1 Where the design wind pressure is 30 pounds per square foot (1.44kPA) or less, fascias shall be installed using a one corrosion-resistant nail with a minimum 0.057-inch (1.5 mm) shank, 0.177-inch (4.5 mm) head, and 1 1/4-inch (32 mm) length at the return leg with a maximum spacing between fasteners of 24 inches (610 mm), and the fascia shall be inserted under the drip edge with at least 1-inch (26 mm) of fascia material covered by the drip edge.

R704.4.2.1 Where the design wind pressure is greater than 30 pounds per square foot (1.44kPA), fascias shall be installed using two corrosion-resistant nails with a minimum 0.057-inch (1.5 mm) shank, 0.177-inch (4.5 mm) head, and 1 1/4" (32 mm) length finish nails, one installed no more than 1-inch (26 mm) below the drip edge, or utility trim may be installed under the drip edge and snap locks punched into fascia spaced no more than 6 inches (152 mm) apart and one finish nail at the return leg of the of the fascia with a maximum spacing between fasteners of 24 inches (610 mm).

Reason: Currently the code does not provide specific instructions for the installation of fascia at the eaves and rakes. This is an area the code needs to address, as it has been identified as a point of weakness for failure during wind events. Based on results of recent testing, aluminum fascia can be installed with one fastener at the leg with a 1" or more coverage at the drip edge, although issues with fascia in non-high wind areas is not a noted issue.
In high wind conditions fascia will be required to have two fasteners, at the face and leg, or using utility trim and punch locks at drip edge.

Attached are results from those tests.

Example from FEMA MAT reports include noted issues that this change will address.

- H-Harvey: See Section 4.1.4: "Being the leading edge of the roof system, soffits and fascia are particularly vulnerable to high winds."

- H-Irma: Multiple observations of fascia failure that appeared to initiate soffit and roof covering damage.

Here are examples of a failure from Hurricane Laura from 2020 where the fascia failed and also led to fascia and soffit failure.

Cost Impact: The code change proposal will increase the cost of construction
This change will increase the cost of construction in high wind areas. The increase would be the addition of finish nails and labor for installation which if fairly minimal consider how fascia is installed today or a more significant cost would be the addition of utility trim and punch locks. But again this would be for just high wind areas and this change really completes the exterior wall covering / roof connection point of the building where failures have been noted during hurricane and high wind conditions.'

The change will not increase the cost of construction in non-coastal areas as the proposed prescription is already being done in many cases.

Reason:

Currently the code does not provide specific instructions for the installation of fascia at the eaves and rakes. This is an area the code needs to address, as it has been identified as a point of weakness for failure during wind events. Based on results of recent testing, aluminum fascia can be installed with one fastener at the leg with a 1" or more coverage at the drip edge, although issues with fascia in non-high wind areas is not a noted issue.

In high wind conditions fascia will be required to have two fasteners, at the face and leg, or using utility trim and punch locks at drip edge.

Attached are results from those tests.

Example from FEMA MAT reports include noted issues that this change will address.

- H-Harvey: See Section 4.1.4: "Being the leading edge of the roof system, soffits and fascia are particularly vulnerable to high winds."

- H-Irma: Multiple observations of fascia failure that appeared to initiate soffit and roof covering damage.

Here follow examples of a failure from Hurricane Laura from 2020 where the fascia failed and led to fascia and soffit failure.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S9878

49

Date Submitted	01/09/2022	**Section**	704.2.1	**Proponent**	Fernando Pages
Chapter	7	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

Summary of Modification

This code change proposal adds aluminum soffit requirements to the existing vinyl soffit subsection.

Rationale

Currently the code does not provide specific requirements for the installation of the aluminum soffit. This code change proposal adds aluminum soffit requirements to the existing vinyl soffit subsection because provisions for both materials are essentially the same. In addition, this change includes some correlation edits to remove soffit references from Section R703 where soffits were addressed prior to the development of Section R704.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Aids keeping a common soffit material on the building.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the code by including previously excluded common applications.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate against products as the change references a generic category.

Does not degrade the effectiveness of the code

Does not degrade, but strengthens the code.

Alternate Language

2nd Comment Period

9878-A1

Proponent Fernando Pages **Submitted** 7/27/2022 7:41:29 AM **Attachments** Yes

Rationale:

Adds aluminum soffits. Removes refrence to staples as allowable fastern.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Adds soffit material commonly used into the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Adds soffit material commonly used into the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against any brand.

Does not degrade the effectiveness of the code

Improves effectivness of the code.

Modify text as follows:

R704.2.1 Vinyl and aluminum soffit panels. Vinyl and aluminum soffit panels shall be installed using aluminum, galvanized, stainless steel or rust-preventative coated nails or other *approved* corrosion-resistant fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia, or subfascia component in accordance with Figure R704.2.1. Where the unsupported span of soffit panels is greater than 12 inches, intermediate nailing strips shall be provided in accordance with Figure R704.2.2. unless a larger span is permitted in accordance with the manufacturer's product approval specification. Vinyl and aluminum soffit panels shall be installed in accordance with the manufacturer's installation product approval specification and limitations of use. Fascia covers shall be installed in accordance with the manufacturer's product approval specification and limitations of use.

Modify figures CAPTIONS as follows:

FIGURE R704.2.1

TYPICAL SINGLE-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

FIGURE R704.2.2

TYPICAL MULTI-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

Related code: SECTION R704.

9878

Modify text as follows:

R704.2.1 Vinyl and aluminum soffit panels. Vinyl and aluminum soffit panels shall be installed using aluminum, galvanized, stainless steel or rust-preventative coated nails or staples or other *approved* corrosion-resistant fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia, or subfascia component in accordance with Figure R704.2.1. Where the unsupported span of soffit panels is greater than 12 inches, intermediate nailing strips shall be provided in accordance with Figure R704.2.2. unless a larger span is permitted in accordance with the manufacturer's product approval specification. Vinyl and aluminum soffit panels shall be installed in accordance with the manufacturer's installation product approval specification and limitations of use. Fascia covers shall be installed in accordance with the manufacturer's product approval specification and limitations of use.

Modify figures CAPTIONS as follows:

FIGURE R704.2.1

TYPICAL SINGLE-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

FIGURE R704.2.2

TYPICAL MULTI-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S10288

50

Date Submitted	02/12/2022	**Section**	701.1	**Proponent**	Robert Koning
Chapter	7	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

Adds required wind limitation per R302.1.1

Rationale

Rationale: The current prescriptive attachment methods for claddings found in the ASTM C 926 and ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The South Florida Building code and subsequent editions of the Florida Building Code HVHZ addressed attachment in these regions as 2 fasteners per square foot. This was eliminated in the 2010 leaving designers to use the “unless otherwise specified” provision of the ASM C926 and 1063 to modify attachment spacing configuration. This will codify the needed requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

Alternate Language

1st Comment Period History

S10288-A3

Proponent Robert Koning **Submitted** 4/8/2022 4:21:53 PM **Attachments** Yes

Rationale:

Rationale: 1. The section referred to in the original Mod upload was incorrect. The Mod cites wind design per R302.1.1, and it now correctly reads R301.2.1 and R301.2.1.1. 2. As originally written, the wind design provisions could be taken to apply to interior wall coverings. Modified to correct the reference and strike the word “assemblies” and insert the words “exterior wall coverings.” i.e., Where the wind speed is greater than 115 Vult, exterior wall coverings shall meet the requirement of R301.2.1 Wind Design Criteria and R301.2.1.1 Wind Design Required

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - Applies needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10288-G1

Proponent Robert Koning Submitted 8/26/2022 3:08:43 PM Attachments No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. This modification is important in that persons referencing this section are made aware of the Wind Design Requirements and do no rely on the referenced prescriptive provisions that are inadequate for most of Florida.

R701.1 Application.
The provisions of this chapter shall control the design and construction of the interior and exterior wall covering for buildings.
Exception:
1. Buildings and structures located within the High-Velocity Hurricane Zone shall comply with the provisions of Chapter 44.
2. Where the windspeed is greater than 115 Vult, exterior wall coverings shall meet the requirement of R301.2.1 Wind Design Criteria and R301.2.1.1 Wind Design Required

R701.1 Application.
The provisions of this chapter shall control the design and construction of the interior and exterior wall covering for buildings.
Exception:
1. Buildings and structures located within the High-Velocity Hurricane Zone shall comply with the provisions of Chapter 44.
2. Where the windspeed is greater than 115 Vult, assemblies must meet the requirement of R302.1.1 Wind Design Required

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

51

S10289

Date Submitted	02/12/2022	**Section**	703.7	**Proponent**	Robert Koning
Chapter	7	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

Adds required exceptions for wind limitations regarding prescriptive provisions in referenced standards and publications and allows for other approved application processes

Rationale

Rationale: 1. The ASTM C926 defines at 3.2.11.9 “skim coat, n—a thin finish coat applied to an existing plaster surface or other substrate to improve appearance.” This application does not require a defined thickness nor more than one coat. Neither does a Decorative Cementitious Finish. Cement plaster can be applied cosmetically to mimic faux finishes on both wet and dry locations. The current Section does not segregate locations or application purposes. 2. The current prescriptive attachment methods for claddings found in the ASTM C 926 and ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The South Florida Building code and subsequent editions of the Florida Building Code HVHZ addressed attachment in these regions as 2 fasteners per square foot. This was eliminated in the 2010 leaving designers to use the “unless otherwise specified” provision of the ASTM C926 and ASTM C1063 to modify attachment spacing configuration. This will codify the needed requirement. 3. Face Barrier Systems have been the predominant application process in Florida since the inception of applied exterior stucco systems. The ASTM C926 is for a concealed drainage system with the application of an 1/8” colored cementitious finish coat in low wind regions over open framing or non-structural sheathing. It does not address the application processes for other systems. The requirement for the ASTM E300 and ASTM E331 assures attachment according to weather protection requirements pursuant to R302.2.1.1 Wind Design Required

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

Alternate Language

1st Comment Period History

S10289-A1

Proponent Robert Koning **Submitted** 4/8/2022 3:50:49 PM **Attachments** Yes

Rationale:

Rationale: 1. The ASTM C926 defines at 3.2.11.9 “skim coat, n—a thin finish coat applied to an existing plaster surface or other substrate to improve appearance.” This application does not require a defined thickness nor more than one coat. Neither does a Decorative Cementitious Finish. Cement plaster can be applied cosmetically to mimic faux finishes on both wet and dry locations. The current Section does not segregate locations or application purposes. 2. The current prescriptive attachment methods for claddings found in the ASTM C 926 and ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The South Florida Building code and subsequent editions of the Florida Building Code HVHZ addressed attachment in these regions as 2 fasteners per square foot. This was eliminated in the 2010 leaving designers to use the “unless otherwise specified” provision of the ASTM C926 and ASTM C1063 to modify attachment spacing configuration for fastener withdrawal and flexural failure. This will codify the needed requirement. 3. Face Barrier Systems have been the predominant application process in Florida since the inception of applied exterior stucco systems. The ASTM C926 is for a concealed drainage system with the application of an 1/8” colored cementitious finish coat in low wind regions over open framing or non-structural sheathing. It does not address the application processes for other systems. The requirement for the ASTM E300 and ASTM E331 assures attachment according to weather protection requirements pursuant to R301.2.1 Wind Design Criteria and R301.2.1.1 Wind Design Required

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

none

Impact to building and property owners relative to cost of compliance with code

none

Impact to industry relative to the cost of compliance with code

none

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Needed clarifications

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

no

Does not degrade the effectiveness of the code

no

2nd Comment Period

S10289-G1

Proponent Robert Koning Submitted 8/26/2022 3:14:18 PM Attachments No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application of cement plaster – both in current and historical provisions and referenced documents. Incorrect code provisions are being applied to incorrect systems.

R703.7 Exterior plaster. (add to bottom of existing paragraph)

Exceptions:

1.Systems Applied as ASTM C926 Skim Coats, Face Sealed Systems, Decorative Cementitious Finishes or specialty cosmetic applications of cement plaster.

2. Where the windspeed is greater than 115 Vult, metal, wire, plastic, fiberglass or other lathing attachment for cement claddings or systems must be engineered for fastener withdrawal and cladding flexure to ensure the superimposed wind load requirements of R301.2.1 Wind Design Criteria and R301.2.1.1 Wind Design Required are satisfied or tested in accordance with ASTM E330 for required wind load attachment and flexural stability using the Factor of Safety of 2.5 pursuant to Florida Building Code 1709.3.

3. Where the Exterior Wall Covering Assembly System Method is a Face Sealed System approved in accordance with ASTM E300 for required wind loads of R301.2.1 Wind Design Criteria and R301.2.1.1 Wind Design Required and in accordance with the ASTM E331 weather protection requirements of 703.1.1 Water Resistance.

R703.7 Exterior plaster. (add to bottom of existing paragraph)
Exceptions:
1.Systems Applied as ASTM C926 Skim Coats, Face Sealed Systems, Decorative Cementitious Finishes or specialty cosmetic applications of cement plaster.
2. Where the windspeed is greater than 115 Vult, metal, wire, plastic, fiberglass or other lathing attachment for cement claddings or systems must be engineered for fastener withdrawal and cladding flexure to ensure the superimposed wind load requirements of R302.1.1 Wind Design Required are satisfied or tested in accordance with ASTM E330 for required wind load attachment using the Factor of Safety of 2.5 pursuant to Florida Building Code 1709.3.
3. Where the Exterior Wall Covering Assembly System Method is a Face Sealed System approved in accordance with ASTM E300 for required wind loads of R302.2.1.1 Wind Design Required and accordance with the ASTM E331 weather protection requirements of 703.1.1 Water Resistance.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

52

S10290

Date Submitted	02/12/2022	**Section**	703.7.1	**Proponent**	Robert Koning
Chapter	7	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

Adds required exceptions for wind limitations regarding prescriptive provisions in referenced standards and publications and allows other approved application processes

Rationale

2. The current prescriptive attachment methods for claddings found in the ASTM C926 and ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The South Florida Building code and subsequent editions of the Florida Building Code HVHZ addressed attachment in these regions as 2 fasteners per square foot. This was eliminated in the 2010 leaving designers to use the “unless otherwise specified” provision of the ASM C926 and ASTM C1063 to modify attachment spacing configuration. This will codify the needed requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier
Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work
Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work
Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
No change to health safety and welfare
Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

Alternate Language

1st Comment Period History

S10290-A1

Proponent Robert Koning **Submitted** 4/8/2022 4:29:20 PM **Attachments** Yes

Rationale:

2. The current prescriptive attachment methods for claddings found in the ASTM C 926 and ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The South Florida Building code and subsequent editions of the Florida Building Code HVHZ addressed attachment in these regions as 2 fasteners per square foot. This was eliminated in the 2010 leaving designers to use the “unless otherwise specified” provision of the ASM C926 and 1063 to modify attachment spacing configuration. This will codify the needed requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - applies needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as always - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10290-G1

Proponent Robert Koning Submitted 8/26/2022 3:19:30 PM Attachments No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application of cement plaster – both in current and historical provisions and referenced documents. Incorrect code provisions are being applied to incorrect systems.

Exception:
1. Lath is not required over masonry, cast-in-place concrete, precast concrete or stone substrates prepared in accordance with ASTM C1063
2. Where the windspeed is greater than 115 Vult, metal, wire, plastic, fiberglass or other lathing attachment for cement claddings or systems must be engineered for fastener sizing, fastener placement patterns, fastener withdrawal and cladding flexure to ensure the superimposed wind load requirements of R301.2.1 Wind Design Criteria and R301.2.1.1 Wind Design Required
are satisfied or tested in accordance with ASTM E330 for required wind load attachment using the Factor of Safety of 2.5 pursuant to Florida Building Code 1709.3.

Exception:

1. Lath is not required over masonry, cast-in-place concrete, precast concrete or stone substrates prepared in accordance with ASTM C1063

2. Where the windspeed is greater than 115 Vult, metal, wire, plastic, fiberglass or other lathing attachment for cement claddings or systems must be engineered for fastener sizing, fastener placement patterns, fastener withdrawal and cladding flexure to ensure the superimposed wind load requirements of R302.2.1.1 are satisfied or tested in accordance with ASTM E330 for required wind load attachment using the Factor of Safety of 2.5 pursuant to Florida Building Code 1709.3.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S10291

53

Date Submitted	02/12/2022	**Section**	703.7.1.1	**Proponent**	Robert Koning
Chapter	7	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

Adds new provision for approved application publication. Free to public

Rationale

Rationale: The current prescriptive attachment methods for claddings found in the ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The Safe Attachment Tables with PRI Reports contain published attachment patterns and fastener specifications for common applications including their allowable loads tabulated in in Tables with graphical representations of all requirements for each specimen. All data tested according to the requirements of ASTM E330 with accredited laboratory reports. Publication is free

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10291-G1

Proponent	Robert Koning	Submitted	8/26/2022 3:31:00 PM	Attachments	No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The listing of a published technical design document with the code authorized ASTM E330, ASTM E331 and ASTM E74 testing approval and Florida Product Approval Number #FL30710-R1 seems to be without objection.

Add new 703.7.1.1

R703.7.1.1 The Safe Attachment Tables For Metal and Wire Lath with PRI Reports as Published by the Stucco Institute shall be accepted as conforming to accepted engineering practices for metal lath or wire attachment.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

54

S10292

Date Submitted	02/12/2022	**Section**	703.4	**Proponent**	Robert Koning
Chapter	7	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

Needed provisions for flashing locations

Rationale

Rationale: While required of the drawings in Chapter 1, these penetrations are rarely being properly flashed or sealed in the field where they are a leading source of water intrusion into the building envelope. Flashing should be the responsibility of the installing subcontractor. Placing this requirement here, clarifies and reinforces the requirements for installation in the Residential Code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

None

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

None

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

None

Does not degrade the effectiveness of the code

None

Alternate Language

1st Comment Period History

S10292-A1

Proponent Robert Koning **Submitted** 4/8/2022 5:30:48 PM **Attachments** Yes

Rationale:

Rationale: While required of the drawings in Chapter 1, these penetrations are rarely being properly flashed or sealed in the field where they are a leading source of water intrusion into the building envelope. Flashing should be the responsibility of the installing subcontractor. Placing this requirement here, clarifies and reinforces the requirements for installation in the Residential Code and recognizes the range of flashings materials.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Saves Money by not having to perform unnecessary work

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - applies needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as always - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10292-G1

Proponent Robert Koning Submitted 8/26/2022 3:34:22 PM Attachments No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application of cement plaster – both in current and historical provisions and referenced documents.

Add to R703.4

7. At built-in gutters.
8. Around all penetrations, such as pipes, conduit, utility services or outlets, cabling, ducts or others, through the building envelope, such flashings shall include ferrous metals, flexible membranes, toolable sealants or other approved materials or gaskets.

…7. At built-in gutters.

8. Around all penetrations, such as pipes, conduit, utility services or outlets, cabling, ducts or others, through the building envelope (other than fasteners for claddings).

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

55

S10298

Date Submitted	02/12/2022	**Section**	703.7.3	**Proponent**	Robert Koning
Chapter	7	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language No**

Related Modifications

Summary of Modification

Adds required exception

Rationale

Rationale: Face Sealed Systems have been the predominant application process in Florida since the inception of applied exterior stucco systems. The ASTM C926 is for a concealed drainage system with the application of an 1/8” colored cementitious finish coat in low wind regions over open framing or non-structural sheathing. It does not address the application processes for other systems. The requirement for the ASTM E300 and ASTM E331 assures attachment according to weather protection requirements pursuant to R302.1.1 Wind Design Required.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier
Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work
Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work
Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
No change to health safety and welfare
Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10298-G2

Proponent	Robert Koning	Submitted	8/26/2022 3:41:00 PM	Attachments	No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application of cement plaster – both in current and historical provisions and referenced documents. I would like to impart the importance of the modification.

2nd Comment Period

S10298-G3

Proponent	Robert Koning	Submitted	8/26/2022 3:43:32 PM	Attachments	No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application of cement plaster – both in current and historical provisions and referenced documents. I would like to impart the importance of the modification.

1st Comment Period History

S10298-G1

Proponent	Danko Davidovic	Submitted	4/15/2022 1:34:34 PM	Attachments	No

Comment:

I have the following concerns with proposed code change: 1) The face sealed stucco cladding system relies solely on the exterior surface of the stucco and sealants used to control the water intrusion into the whole system. In other words, there is no mechanism to manage the moisture once it penetrates the exterior seal. It might be proponent's experience that these systems work in practice, however, there is no good track record about performance of these systems and what is rate of failure due to poor installation and lack of maintenance. 2) It is inappropriate to place structural requirements for these cladding systems into the section of the code which addresses only the water management of the stucco cladding system. 3) The current code does not define and recognize the face sealed stucco systems, and introducing partial provisions for performance of these systems would create more confusion to the industry and society than providing ultimate benefit. In particular reference to ASTM E331 for testing water resistance does not proide detailed specs what tested wall assembly should include (opaque wall only, any control/expansion joints, penetrations, transitions, etc.). 4) It might be helpful to strategically develope other code sections defining the scope, description, structural performance of these face sealed stucco systems, before addressing the water integrity aspect as proposed here. 5) Even ASTM E2128-17: "Standard Guide for Evaluating Water Leakage of Building Walls" in Appendix X5: Cement Stucco and Tile Systems, Appendix X5.3.2 acknowledges that "stucco alone should not be considered a permanent barrier to water penetration".

Add to R703.7.3 Water-resistive barriers.
1. Exception: Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.
2. Where the Exterior Wall Covering Assembly System Method is a Face Sealed System approved in accordance with ASTM E300 for required wind loads of R302.1.1 Wind Design Required and accordance with the ASTM E331 weather protection requirements of 703.1.1 Water Resistance.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

S10299

56

Date Submitted	02/12/2022	Section	703.1.2.2	Proponent	Robert Koning
Chapter	7	Affects HVHZ	Yes	Attachments	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language Yes**

Related Modifications

Summary of Modification

Adds new paragraph

Rationale

Rationale: The current prescriptive attachment methods for claddings found in the ASTM C 926 and ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The South Florida Building code and subsequent editions of the Florida Building Code HVHZ addressed attachment in these regions as 2 fasteners per square foot. This was eliminated in the 2010 leaving designers to use the “unless otherwise specified” provision of the ASM C926 and 1063 to modify attachment spacing configuration. This will codify the needed requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
None - makes enforcement clearer and easier
Impact to building and property owners relative to cost of compliance with code
Saves Money by not having to perform unnecessary work
Impact to industry relative to the cost of compliance with code
Saves Money by not having to perform unnecessary work
Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
No change to health safety and welfare
Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Yes - reinstates needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as alwayas - no change

Does not degrade the effectiveness of the code

No, improves understanding

Alternate Language

1st Comment Period History

S10299-A1

Proponent Robert Koning **Submitted** 4/8/2022 4:36:52 PM **Attachments** Yes

Rationale:

Rationale: The current prescriptive attachment methods for claddings found in the ASTM C 926 and ASTM C1063 requirements are for applications where the wind speeds are less than 115 Vult. The South Florida Building code and subsequent editions of the Florida Building Code HVHZ addressed attachment in these regions as 2 fasteners per square foot. This was eliminated in the 2010 leaving designers to use the “unless otherwise specified” provision of the ASM C926 and 1063 to modify attachment spacing configuration. This will codify the needed requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - makes enforcement clearer and easier

Impact to building and property owners relative to cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to industry relative to the cost of compliance with code

Saves Money by not having to perform unnecessary work

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to health safety and welfare

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes - applies needed provisions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No - same products as always - no change

Does not degrade the effectiveness of the code

No, improves understanding

2nd Comment Period

S10299-G1

Proponent Robert Koning Submitted 8/26/2022 3:46:25 PM Attachments No

Comment:

I was not notified of the previous meeting and should have inquired as to its date so that I could explain the proposed modification. I apologize for any committee inconvenience and accept responsibility for not attending. I sincerely wish to be heard on this modification because several misstatements were made by published comments and/or audio recording regarding its application and implementation. These are important issues that need addressed. The public is not being protected by partial, incomplete or misinterpretation of the current code provision regarding the application of cement plaster – both in current and historical provisions and referenced documents. I would like to impart the importance of the modification.

R703.1.2.2 Wind Resistance for Exterior Lath.
Where the windspeed is equal to or greater than 115 Vult, metal, wire, plastic, fiberglass or other lathing attachment for cement claddings or systems must be engineered for fastener withdrawal and cladding flexure to ensure the superimposed wind load requirements of R301.2.1 Wind Design Criteria and R301.2.1.1 Wind Design Required are satisfied or tested in accordance with ASTM 330 for required wind load attachment using the Factor of Safety of 2.5 pursuant to Florida Building Code 1709.3.

R703.1.2.2 Wind Resistance for Exterior Lath.
Where the windspeed is equal to or greater than 115 Vult, metal, wire, plastic, fiberglass or other lathing attachment for cement claddings or systems must be engineered for fastener withdrawal and cladding flexure to ensure the superimposed wind load requirements of R301.2.1.1 Wind Design Required are satisfied or tested in accordance with ASTM E330 for required wind load attachment using the Factor of Safety of 2.5 pursuant to Florida Building Code 1709.3.

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Residential

57

S9879

Date Submitted	01/09/2022	**Section**	401.5	**Proponent**	Fernando Pages
Chapter	3310	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language Yes**

Related Modifications

Summary of Modification

A short provision is added on the importance of a nailable substrate.

Rationale

This is a simple addition to the existing building appendix, it is like how the IEBC handles wall coverings, as it points to the exterior wall covering chapter. In addition, a short provision is added on the importance of a nailable substrate.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Helps prevent siding blow-off due to improper installation over week substrate.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the code, and provides better methods of construction

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not degrade the effectiveness of the code

This modification does not degrade the effectiveness of the code

Alternate Language

2nd Comment Period

9879-A3

Proponent Fernando Pages **Submitted** 7/27/2022 12:29:56 PM **Attachments** Yes

Rationale:

This is a simple addition to the existing building appendix; it points to the exterior wall covering chapter seven. In addition, it adds a short provision on the importance of a nailable substrate. This alternate language reflects the TAC correction of 27 June 2022, removing the phrase, “or other substrate suitable for mechanical fasteners.”

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Improves welfare by sepcifying ciritcal instalation elemnt when recladING.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves welfare by specifying critical installation elements when reccladING.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate

Does not degrade the effectiveness of the code

Improves the code by specifying critical installation elements when reccladING.

2nd Comment Period

9879-A2

Proponent Fernando Pages **Submitted** 7/27/2022 7:21:43 AM **Attachments** Yes

Rationale:

Minor editorial change. Per TAC recommendation 6/27/22, removed the ambiguity of “other substrate suitable for Mechanical fasters," and replaced it with "attached to a nailable substrate."

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

Improvement clarifying requirments for recladING.

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Improvement clarifying requirments for recladING.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improvement clarifying requirments for recladING.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Applies to all polymeric claddings.

Does not degrade the effectiveness of the code

Improvement clarifying requirments for reclading.

1st Comment Period History

9879-A1

Proponent	Fernando Pages	**Submitted**	4/11/2022 1:46:57 PM	**Attachments**	Yes

Rationale:

Update per manufacturers

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not

Does not degrade the effectiveness of the code

Does not

AJ 401.5Exterior Wall Coverings. Exterior wall coverings shall comply with the requirements of Chapter 7. ~~Exterior wall coverings~~ Insulated Vinyl Siding, Polypropylene Siding, and Vinyl Siding shall be attached to a nail-able substrate.

Add new text as follows:

AJ 401.5 Exterior Wall Coverings.

AJ 401.5Exterior Wall Coverings. Exterior wall coverings shall comply with the requirements of Chapter 7. ~~Exterior wall coverings~~ Insulated Vinyl Siding, Polypropylene Siding, and Vinyl Siding shall be attached to a nailable substrate.

AJ 401.5Exterior Wall Coverings. Exterior wall coverings shall comply with the requirements of Chapter 7. ~~Exterior wall coverings~~ Insulated Vinyl Siding, Polypropylene Siding, and Vinyl Siding shall be attached to a nail-able substrate or other substrate suitable for mechanical fasteners.

Add new text as follows:

AJ 401.5 Exterior Wall Coverings.

Exterior wall coverings shall comply with the requirements of Chapter 7. Exterior wall coverings shall be attached to a n*ailable substrate.*

TAC: Structural

Total Mods for **Structural** in **Denied : 46**

Total Mods for report: 58

Sub Code: Test Protocols

S10093

58

Date Submitted	02/05/2022	**Section**	7	**Proponent**	Gaspar Rodriguez
Chapter	1	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Denied				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

Summary of Modification

Revises test procedure for self-adhered underlayment used on roof tile installations.

Rationale

This modification provides improved testing procedures that verify self-adhered underlayment installed on mechanically fastened anchor sheet meet the minimum requirements established by code. The changes are intended to more accurately reflect the performance of self-adhered underlayment when used as roof tile underlayment.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None.

Impact to building and property owners relative to cost of compliance with code

None.

Impact to industry relative to the cost of compliance with code

Product performance testing is an ongoing cost for product manufacturers, this testing will help manufacturers in verification of their product performance.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, improves the verification of product performance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, improves the verification of product performance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate.

Does not degrade the effectiveness of the code

Does not degrade, strengthens verification of product performance.

Alternate Language

2nd Comment Period

S10093-A1

Proponent Gaspar Rodriguez **Submitted** 8/25/2022 8:19:07 AM **Attachments** Yes

Rationale:

This mod provides improved testing procedures to require underlayment test to failure and then receive a Maximum Design Pressure Rating.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None.

Impact to building and property owners relative to cost of compliance with code

None.

Impact to industry relative to the cost of compliance with code

Product performance testing is an ongoing cost for product manufacturers verifying their product's performance.

Impact to small business relative to the cost of compliance with code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate.

Does not degrade the effectiveness of the code

Does not degrade.

7.1 This test covers the determination of the wind uplift resistance of materials specified in Section 1 of this Protocol in accordance with TAS 114 Appendix C~~124~~ except as noted below.

7.1.1 Test Deck Construction

7.1.1.1 Test is being conducted on materials noted in Section 1 of this Protocol; therefore, any reference to "roof membrane" in TAS 114 appendix C~~124~~ shall be regarded as 'underlayment.'

7.1.1.2 Three (3) ~~Four (4)~~ 6'~~8'~~ × 10'~~8'~~ test decks shall be constructed of 40/20 19/32 in. APA Rated Plywood Sheathing attached to wood joists spaced 24 o.c. ~~Each test deck shall consist of four (4) panels of said sheathing, the corners of which shall meet at the center of each test deck, leaving a 1/8 in. gap between panels.~~ Plywood Sheathing shall be attached to wood joists with 8d ring shank nails spaced 6" o.c. at the panel edges and at intermediate supports.

7.1.1.3 To each test deck ~~A~~adhere one (1) layer of the proposed TAS 103 self-adhered underlayment onto an approved or prescriptive, mechanically attached anchor sheet, ~~to~~ which will be included within the product approval's scope of use. ~~to each test deck.~~

7.1.2 Procedure

7.1.2.1 Test shall be performed in an approved laboratory. ~~test not a field test; therefore, any instruction in TAS 124 which references "building or outdoor conditions" shall be regarded as "laboratory conditions."~~

7.1.2.2 Regulate the negative pressure in the chamber. Begin by raising the negative pressure in the chamber to 30 lbf/ft^2 and holding this pressure for one (1) minute. Thereafter, raise the negative pressure in increments of 15 lbf/ft^2, holding each incremented pressure for one (1) minute, until ~~the negative pressure has been held at 90 lbf/ft^2 for one (1) minute~~ failure occurs.

7.1.3 Report results in accordance with TAS 114 Appendix C and as specified herein.

7.1.3.1 Any test specimen which exhibits any significant separation between the membrane and tested ~~substrate anchor sheet~~shall be considered as failing ~~the wind uplift test~~. Any test specimen which exhibits fastener pull out of the substrate or fastener pull through of the anchor sheet shall be considered as failing.

7.1 This test covers the determination of the wind uplift resistance of materials specified in Section 1 of this Protocol in accordance with TAS 114 Appendix C~~124~~ except as noted below.

7.1.1 Test Deck Construction

7.1.1.1 Test is being conducted on materials noted in Section 1 of this Protocol; therefore, any reference to “roof membrane” in TAS 114 appendix C~~124~~ shall be regarded as ‘underlayment.’

7.1.1.2 Three (3) ~~Four (4)~~ 6’~~8'~~ × 10’~~8'~~ test decks shall be constructed of 40/20 $^{19}/_{32}$ in. APA Rated Plywood Sheathing attached to wood joists spaced 24 o.c. ~~Each test deck shall consist of four (4) panels of said sheathing, the corners of which shall meet at the center of each test deck, leaving a $^{1}/_{8}$ in. gap between panels.~~ Plywood Sheathing shall be attached to wood joists with 8d ring shank nails spaced 6” o.c. at the panel edges and at intermediate supports.

7.1.1.3 To each test deck ~~A~~adhere one (1) layer of the proposed TAS 103 self-adhered underlayment onto a mechanically attached, approved or prescriptive anchor sheet, which will be included within the product approval’s scope of use. ~~to each test deck.~~

7.1.2 Procedure

7.1.2.1 Test shall be performed in an approved laboratory. ~~test not a field test; therefore, any instruction in TAS 124 which references “building or outdoor conditions” shall be regarded as “laboratory conditions.”~~

7.1.2.2 Regulate the negative pressure in the chamber. Begin by raising the negative pressure in the chamber to 30 lbf/ft^2 and holding this pressure for one (1) minute. Thereafter, raise the negative pressure in increments of 15 lbf/ft^2, holding each incremented pressure for one (1) minute, until the negative pressure has been held at 90 lbf/ft^2 for one (1) minute.

7.1.3 Report

7.1.3.1 Any test specimen which exhibits any significant separation between the membrane and tested substrate shall be considered as failing the wind uplift test.