



# CONSTRUCTION MATERIALS

## TECHNOLOGIES

### LABORATORY TEST REPORT

**Report for:** Firestone Building Products Company, LLC  
200 4<sup>th</sup> Avenue South  
Nashville, TN 37201  
USA

**Attention:** Jenny Sherwin

<b>Assemblies:</b>	UltraPly TPO & RubberGard EPDM	<b>Manufacturer:</b>	Firestone Building Products Co.
<b>Project No.:</b>	FBP-393-02-01	<b>Source:</b>	Firestone Building Products Co.
<b>Date Received:</b>	See Sampling	<b>Date Tested:</b>	May 25 & 29, 2018

**Purpose:** Determine the dynamic wind uplift resistance for the specified roof assembly in accordance with **CSA A123.21: Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems.**

**Test Methods:** Testing was conducted as described in CSA A123.21-14: *Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems* using Dynamic Wind Load Cycles prescribed in Method 2. The specimen was tested in a 12' wide to incorporate a minimum two component joints x 24' long to incorporate a minimum of two structural spans.

**Sampling:** The following materials were received by PRI.

<u>Product</u>	<u>Source</u>	<u>Date</u>
Firestone UltraPly TPO (45 mil)	Indianapolis, IN	Sep. 14, 2017
RubberGard EPDM SA (60 mil)	Chagrin Falls, OH	Oct. 11, 2016
Firestone ISO 95+ GL	Jacksonville, FL	Mar. 29, 2018
Firestone Heavy Duty Fastener	Wellford, SC	Sep. 5, 2017
		Jan. 13, 2016
Firestone Insulation Fastening Plates	Prescott, AR	Apr. 4, 2018
Firestone I.S.O. Twin Pack	Prescott, AR	Apr. 4, 2018
Firestone Single-Ply LVOC Bonding Adhesive	Prescott, AR	Apr. 4, 2018
Firestone V-Force Vapor Barrier Membrane	Plainfield, IN	Apr. 17, 2015

All other roofing components were procured by PRI through local distribution.

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**Results:** Testing was performed at ambient conditions. Test pressures were applied in accordance with Method 2 beginning with Level A. Results are shown below. Additional installation details are contained in Appendix A. Raw data are attached in Appendix B.

**Table 1. Wind Uplift Results for Assembly #1**

Component:	Description	Attachment	Attachment Detail	Wind Uplift Resistance <sup>1</sup>
Deck:	22 ga., Grade 33, Type B steel deck secured to supports space 6-ft o.c. incorporating a total for four (4) structural spans	-	-	<b>66.7 psf/ 3.19 kPa</b>
Thermal Barrier:	1/2" thick DensDeck Prime (4-ft x 8-ft boards)	Insulation Fastening Plates and Heavy Duty fasteners	Secured at a rate of 16 fasteners per 4-ft x 8-ft board (1 fastener per 2-ft <sup>2</sup> )	
Vapor Barrier:	V-Force Vapor Barrier Membrane 3" wide side laps	Self-Adhered	Adhered to the top of the thermal barrier	
Insulation:	2" thick ISO 95+ GL (4-ft x 8-ft boards)	I.S.O. Twin Pack	Adhered in 3/4" wide ribbons spaced 6" o.c.	
Cover Board:	1/4" thick SECUROCK Gypsum-Fiber Roof Board (4-ft x 8-ft boards)	I.S.O. Twin Pack	Adhered in 3/4" wide ribbons spaced 6" o.c.	
Membrane:	45 mil UltraPly TPO 1.5" wide side laps with 1.5" heat weld	Single-Ply LVOC Bonding Adhesive	Applied at a rate of 45-60-ft <sup>2</sup> /gal	

Notes: 1) Wind uplift resistance is calculated by dividing the maximum sustained pressure by the minimum safety factor of 1.5.

**Remarks:** When used in conjunction with FBP-044-02-01, the following component substitutions may apply:

Insulation: Minimum 2" ISO 95+ GL or RESISTA adhered in 3/4" wide ribbons of I.S.O. Twin Pack, I.S.O. Stick or I.S.O. Spray R or 1" wide ribbons of Twin Jet spaced a maximum 6" o.c.

Cover Board: Minimum 1/4" DensDeck Prime or SECUROCK Gypsum-Fiber Roof Board adhered in 3/4" wide ribbons of I.S.O. Twin Pack, I.S.O. Stick or I.S.O. Spray R or 1" wide ribbons of Twin Jet spaced a maximum 6" o.c.

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Membrane Option #1: Min. 45 mil UltraPly TPO SA or 60 mil RubberGard EPDM SA self-adhered

Membrane Option #2: Min. 45 mil UltraPly TPO adhered in Single-Ply LVOC Bonding Adhesive 1168, Single-Ply LVOC Bonding Adhesive, or UltraPly Bonding Adhesive at a rate of 45-60 ft<sup>2</sup>/gal

Membrane Option #3: Min. 45 mil UltraPly TPO adhered in Water Based Bonding Adhesive P at a rate of 100-120 ft<sup>2</sup>/gal

Membrane Option #4: Min. UltraPly TPO XR 100 adhered in XR Bonding Adhesive at a rate of 70-90 ft<sup>2</sup>/gal

Membrane Option #5: Min. UltraPly TPO XR 100 adhered in Perma Mop or ASTM D 312, Type IV hot asphalt or Owens Corning's Perma-Mop at a rate of 20-30 lb/100 ft<sup>2</sup>

Membrane Option #6: Min. 45 mil RubberGard LS-FR, Fire Retardant RubberGard, RubberGard EcoWhite, RubberGard MAX, and RubberGard MAX FR adhered in BA-2004 T, Single-Ply LVOC Bonding Adhesive or Single-Ply LVOC Bonding Adhesive 1168 at a rate of 45-60 ft<sup>2</sup>/gal

Membrane Option #7: Min. 45 mil RubberGard LS-FR, Fire Retardant RubberGard, RubberGard EcoWhite, RubberGard MAX, and RubberGard MAX FR adhered in Water Based Bonding Adhesive P at a rate of 100-120 ft<sup>2</sup>/gal

Membrane Option #8: Min. 45 mil RubberGard LS-FR, Fire Retardant RubberGard, RubberGard EcoWhite, RubberGard MAX, and RubberGard MAX FR adhered in EPDM Solvent Free Bonding Adhesive at a rate of 150 ft<sup>2</sup>/gal applied to the substrate only.

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**Table 2. Wind Uplift Results for Assembly #2**

Component:	Description	Attachment	Attachment Detail	Wind Uplift Resistance <sup>1</sup>
Deck:	22 ga., Grade 33, Type B steel deck secured to supports space 6-ft o.c. incorporating a total for four (4) structural spans	-	-	<b>66.7 psf/ 3.19 kPa</b>
Thermal Barrier:	1/2" thick DensDeck Prime (4-ft x 8-ft boards)	Insulation Fastening Plates and Heavy Duty fasteners	Secured at a rate of 16 fasteners per 4-ft x 8-ft board (1 fastener per 2-ft <sup>2</sup> )	
Vapor Barrier:	V-Force Vapor Barrier Membrane 3" wide side laps	Self-Adhered	Adhered to the top of the thermal barrier	
Insulation:	2" thick ISO 95+ GL (4-ft x 8-ft boards)	I.S.O. Twin Pack	Adhered in 3/4" wide ribbons spaced 6" o.c.	
Membrane:	RubberGard EPDM SA Side laps primed with Single-Ply LVOC Primer at a rate of 250-ft <sup>2</sup> /gal and sealed with QuickSeam 3" Splice Tape	Self-Adhered	Adhered to the top of the insulation	

Notes: 1) Wind uplift resistance is calculated by dividing the maximum sustained pressure by the minimum safety factor of 1.5.

**Remarks:** When used in conjunction with FBP-044-02-01, the following component substitutions may apply:

Insulation: Minimum 2" ISO 95+ GL or RESISTA adhered in 3/4" wide ribbons of I.S.O. Twin Pack, I.S.O. Stick or I.S.O. Spray R or 1" wide ribbons of Twin Jet spaced a maximum 6" o.c.

Membrane Option #1: Min. 45 mil UltraPly TPO SA or 60 mil RubberGard EPDM SA self-adhered

Membrane Option #2: Min. 45 mil UltraPly TPO adhered in Single-Ply LVOC Bonding Adhesive 1168, Single-Ply LVOC Bonding Adhesive, or UltraPly Bonding Adhesive at a rate of 45-60 ft<sup>2</sup>/gal

Membrane Option #3: Min. 45 mil UltraPly TPO adhered in Water Based Bonding Adhesive P at a rate of 100-120 ft<sup>2</sup>/gal

Membrane Option #4: Min. 45 mil RubberGard LS-FR, Fire Retardant RubberGard, RubberGard EcoWhite, RubberGard MAX, and RubberGard MAX FR adhered in BA-2004 T,

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Single-Ply LVOC Bonding Adhesive or Single-Ply LVOC Bonding Adhesive 1168 at a rate of 45-60 ft<sup>2</sup>/gal

Membrane Option #5: Min. 45 mil RubberGard LS-FR, Fire Retardant RubberGard, RubberGard EcoWhite, RubberGard MAX, and RubberGard MAX FR adhered in Water Based Bonding Adhesive P at a rate of 100-120 ft<sup>2</sup>/gal

Membrane Option #6: Min. 45 mil RubberGard LS-FR, Fire Retardant RubberGard, RubberGard EcoWhite, RubberGard MAX, and RubberGard MAX FR adhered in EPDM Solvent Free Bonding Adhesive at a rate of 150 ft<sup>2</sup>/gal applied to the substrate only.

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**Table 4. Wind Uplift Results for Assembly #4**

Component:	Description	Attachment	Attachment Detail	Wind Uplift Resistance <sup>1</sup>
Deck:	22 ga., Grade 33, Type B steel deck secured to supports space 6-ft o.c. incorporating a total for four (4) structural spans	-	-	<b>50 psf/ 2.4 kPa</b>
Vapor Barrier:	V-Force Vapor Barrier Membrane 3" wide side laps	Self-Adhered	Adhered to the top flange of the steel deck ribs	
Insulation:	2" thick ISO 95+ GL (4-ft x 8-ft boards)	Insulation Fastening Plates and Heavy Duty fasteners	Secured at a rate of 8 fasteners per 4-ft x 8-ft board (1 fastener per 4-ft <sup>2</sup> )	
Membrane:	RubberGard EPDM SA Side laps primed with Single-Ply LVOC Primer at a rate of 250-ft <sup>2</sup> /gal and sealed with QuickSeam 3" Splice Tape	Self-Adhered	Adhered to the top of the insulation	

Notes: 1) Wind uplift resistance is calculated by dividing the maximum sustained pressure by the minimum safety factor of 1.5.

**Remarks:** When used in conjunction with FBP-044-02-01, the following component substitutions may apply:

Insulation: Minimum 2" ISO 95+ GL, RESISTA, or ISOGARD HD Composite secured with Heavy Duty Fasteners and Insulation Fastening Plates at a rate of 1 fastener per 4-ft<sup>2</sup>

Cover Board: Minimum 1/4" DensDeck Prime or SECUROCK Gypsum-Fiber Roof Board adhered in 3/4" wide ribbons of I.S.O. Twin Pack, or I.S.O. Spray R or 1" wide ribbons of Twin Jet spaced a maximum 6" o.c.

Membrane Option #1: Min. 45 mil UltraPly TPO SA or 60 mil RubberGard EPDM SA self-adhered

Membrane Option #2: Min. 45 mil UltraPly TPO adhered in Single-Ply LVOC Bonding Adhesive 1168, Single-Ply LVOC Bonding Adhesive, or UltraPly Bonding Adhesive at a rate of 45-60 ft<sup>2</sup>/gal

Membrane Option #3: Min. 45 mil UltraPly TPO adhered in Water Based Bonding Adhesive P at a rate of 100-120 ft<sup>2</sup>/gal

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Membrane Option #4: Min. 45 mil RubberGard LS-FR, Fire Retardant RubberGard, RubberGard EcoWhite, RubberGard MAX, and RubberGard MAX FR adhered in BA-2004 T, Single-Ply LVOC Bonding Adhesive or Single-Ply LVOC Bonding Adhesive 1168 at a rate of 45-60 ft<sup>2</sup>/gal

Membrane Option #5: Min. 45 mil RubberGard LS-FR, Fire Retardant RubberGard, RubberGard EcoWhite, RubberGard MAX, and RubberGard MAX FR adhered in Water Based Bonding Adhesive P at a rate of 100-120 ft<sup>2</sup>/gal

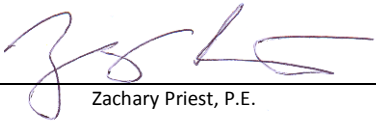
Membrane Option #6: Min. 45 mil RubberGard LS-FR, Fire Retardant RubberGard, RubberGard EcoWhite, RubberGard MAX, and RubberGard MAX FR adhered in EPDM Solvent Free Bonding Adhesive at a rate of 150 ft<sup>2</sup>/gal applied to the substrate only.

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**Statement of Compliance:**

Testing was conducted in accordance with **CSA A123.21: Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems**

Signed:   
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Zachary Priest, P.E.  
Director

**Report Issue History:**

Issue #	Date	Pages	Revision Description (if applicable)
Original	05/29/2018	14	NA

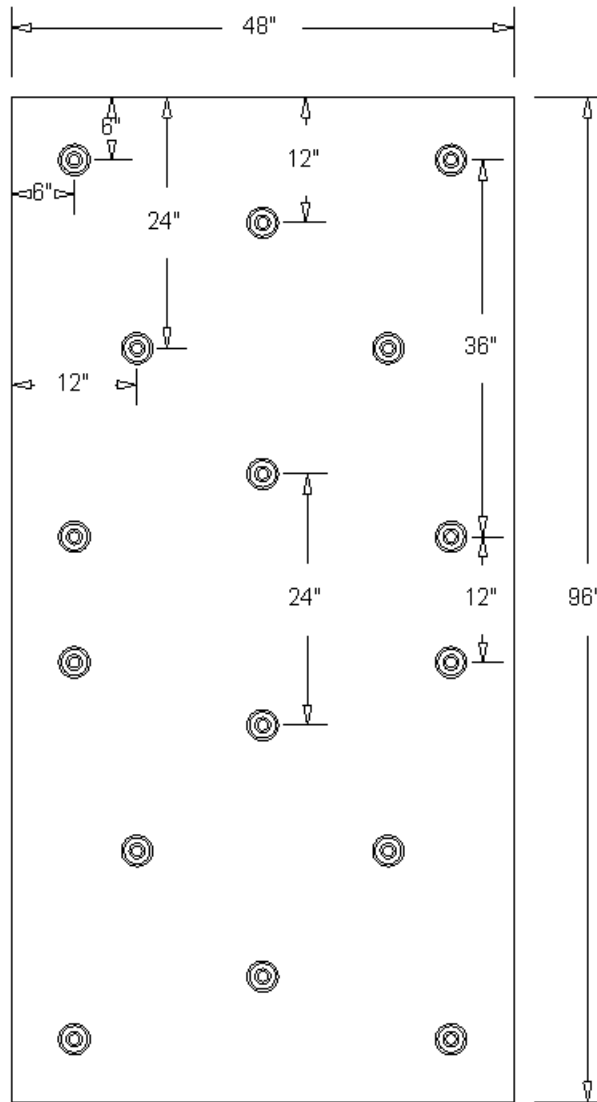
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**Installation Details for Assembly #1 and #2**

**Layout of thermal barrier attachment:**

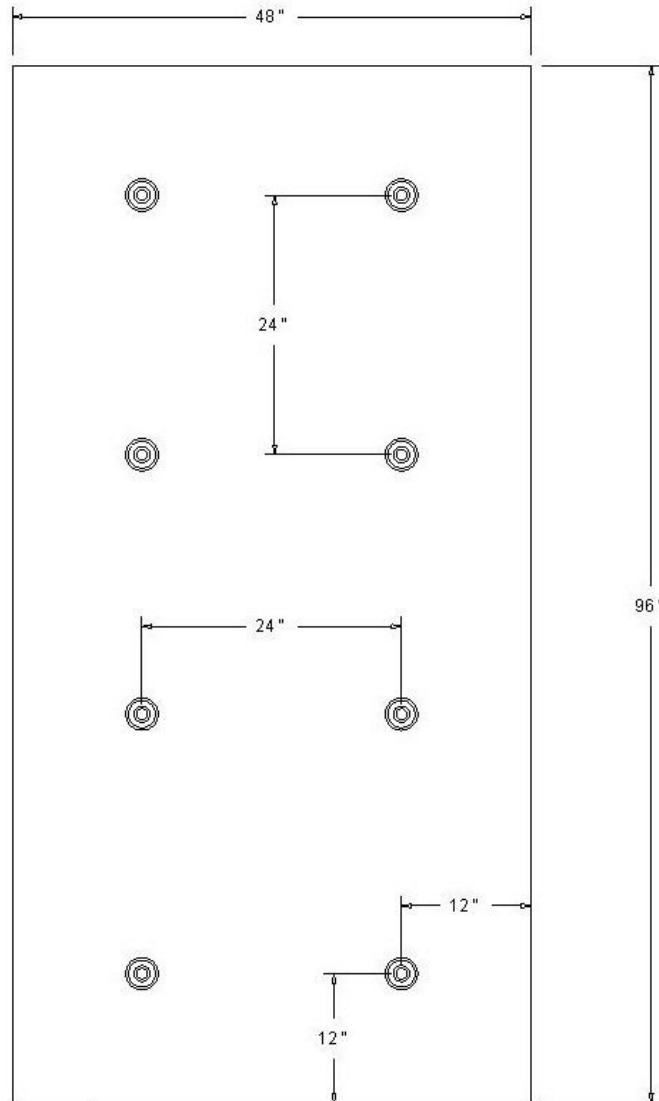


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### Installation Details for Assembly #4

#### Layout of insulation attachment:



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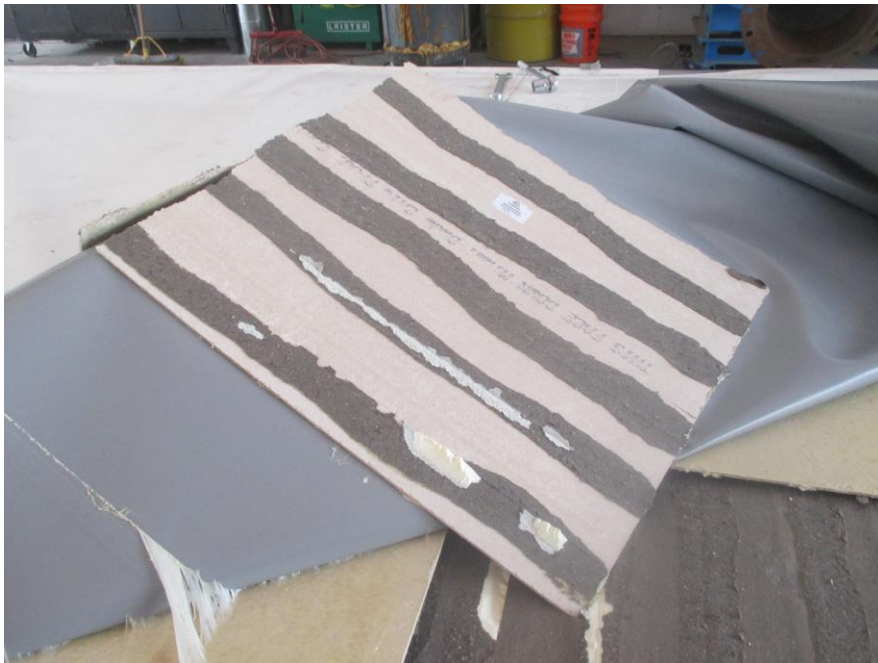
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Raw Data from Uplift Testing for Assembly #1

**Conditioning:** Start Temperature(F): 74  
Start Date: Apr. 12, 2018

**Testing:** Start Temperature(F): 82  
Start Date: May 29, 2018  
End Temperature(F): 84  
End Date: May 29, 2018

Property	Results
Load Cycle Method	2
Test Duration (h:min)	2:32
Test Load, P, (psf)	100
Highest Level Completed	A
Failure Level	Level B, Group 2
Failure Mode	Cofacer separation
Safety Factor	1.5
Wind Uplift Resistance, (psf)	66.7
Load per fastener, (lbf)	200



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Raw Data from Uplift Testing for Assembly #2

**Conditioning:** Start Temperature(F): 74  
Start Date: Apr. 12, 2018

**Testing:** Start Temperature(F): 84  
Start Date: May 25, 2018  
End Temperature(F): 84  
End Date: May 25, 2018

Property	Results
Load Cycle Method	2
Test Duration (h:min)	2:44
Test Load, P, (psf)	100
Highest Level Completed	A
Failure Level	Level B, Group 2
Failure Mode	Cofacer separation
Safety Factor	1.5
Wind Uplift Resistance, (psf)	66.7
Load per fastener, (lbf)	200



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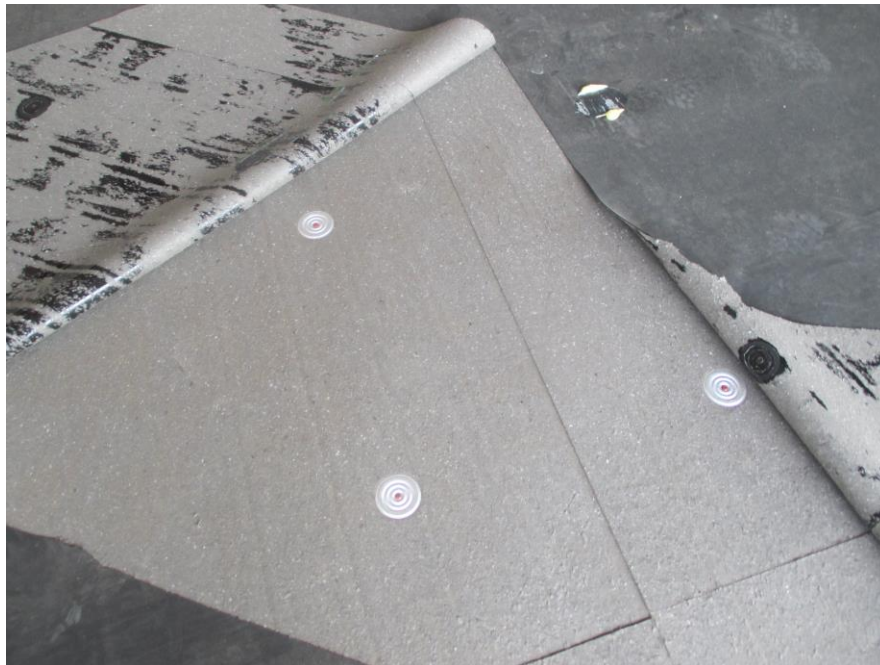
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Raw Data from Uplift Testing for Assembly #4

**Conditioning:** Start Temperature(F): 74  
Start Date: Apr. 12, 2018

**Testing:** Start Temperature(F): 84  
Start Date: May 25, 2018  
End Temperature(F): 85  
End Date: May 25, 2018

Property	Results
Load Cycle Method	2
Test Duration (h:min)	3:41
Test Load, P, (psf)	60
Highest Level Completed	B
Failure Level	Level C, Group 3
Failure Mode	Cofacer separation
Safety Factor	1.5
Wind Uplift Resistance, (psf)	50
Load per fastener, (lbf)	200



**END OF REPORT**

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