

**EVALUATION REPORT OF
VARCO PRUDEN BUILDINGS
'SSR ROOF PANEL'**

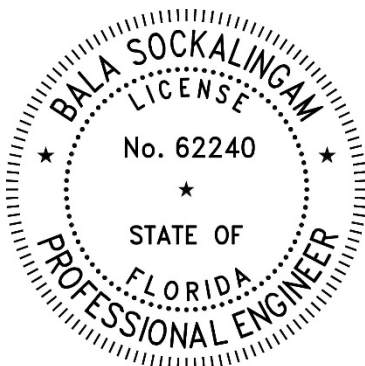
**FLORIDA BUILDING CODE 8TH EDITION (2023)
FLORIDA PRODUCT APPROVAL
FL 12763.3-R6
STRUCTURAL COMPONENTS
ROOF DECK**

**Prepared For:
Varco Pruden Buildings
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**This report consists of
Evaluation Report (3 Pages including cover)
Design Procedure (7 Pages)
Installation Details (6 Pages)**

**Report No. C2708-3
Date: 8.12.2023**



This item has been digitally signed and sealed by Bala Sockalingam, PE, on the date indicated.

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Manufacturer: Varco Pruden Buildings

Product Name: SSR

Panel Description: Standing seam panel with 24" wide coverage and 3" high ribs

Materials: Min 24 ga., 50 ksi galvanized coated steel (ASTM A653) or galvalume coated steel (ASTM A792). Corrosion resistant as per FBC 2023 Section 1507.4.3.

Support Description: Min. 16 ga., 55 ksi steel section

Slope: 1/4:12 or greater in accordance with FBC 2023 Section 1507.4.2

Design Uplift Pressure: The allowable uplift loads shown on Page 7 of the Design Procedure were determined from ASTM E1592 testing and are applicable for the panel and panel to clip connection. Clip fastener, purlin, frames and support connections must be designed to resist all loads. The factors of safety were determined in accordance with FBC 2023 Section 1504.9, ASTM E1592 test standard and the procedures of Section I6.3.1, K2.1.1 and K2.1.2 of the AISI S100-16(2020) w/S2-20.

Panel Attachment: Clip Type: SSR sliding clip – maximum 5" tall.
Clip tab: 0.038" galvanized, 7.5" wide, Clip base: 0.0965" thick galvanized, 5.5" wide. Fastened to supports with min (2) ¼"-14 x 1-1/4" long Teks/3 SDS per clip. Clips and fasteners are corrosion resistant as per FBC 2023 Section 1506.7 and 1507.4.4, respectively.

Test Standards: Roof assembly tested in accordance with ASTM E1592-05(2012) 'Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference' and FM 4471 'Approval Standard for Class I Panel Roofs'.

Test Equivalency: The test procedures in ASTM E1592-05(2012) comply with test procedures prescribed in ASTM E1592-05(2017).


Code Compliance: The product described herein has demonstrated compliance with FBC 2023 Section 1507.4.

Product Limitations: Design wind loads shall be determined for each project in accordance with FBC 2023 Section 1609 or ASCE 7-22 using allowable stress design. The maximum clip spacing listed herein shall not be exceeded. The design pressure for reduced clip spacing may be computed using rational analysis prepared by a Florida Professional Engineer or based on Varco load span table. This evaluation report is not applicable in High Velocity Hurricane Zone. Fire classification is not within the

scope of this Evaluation Report. Refer to FBC 2023 Section 1505 and current approved roofing materials directory or ASTM E108/UL790 report from an accredited laboratory for fire ratings of this product.

Supporting Documents: ASTM E1592 Test Reports
ENCON Technology Inc.
C2012-1, Reporting Date 11/30/2015
C2072-1, Reporting Date 3/4/2016

FM 4471 Test Report
FM Approvals
1Z4A8.AM, Reporting Date 12/3/1997

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SSR ROOF PANEL

A. PANEL MATERIAL (MS 05-01)

Panels are rolled using ASTM A 653 or A 792 material, for Grade see Table in Section C below. For complete material specifications and material weights, refer to Material Specifications Documents MS-05-01.

B. PANEL GEOMETRY (DP 25.5)




C. PANEL PROPERTIES (DP 25.5)

Panel Section Properties (per Ft. width of panel)				Effective Section Properties (per Ft. width of panel)			
				Outside of Panel In Compression		Inside of Panel In Compression	
Ref. Gauge	Base ¹ Metal Thickness	Panel Weight ²	I _x FULL	I _{xe} (+) DEFLECTION	S _{xe} (+) STRENGTH	I _{xe} (-) DEFLECTION	S _{xe} (-) STRENGTH
	(in.)	(psf)	(in. ⁴)	(in. ⁴)	(in. ⁴)	(in. ⁴)	(in. ³)
24	0.023	1.20	0.259	0.257	0.109	0.113	0.075
22	0.029	1.51	0.320	0.320	0.137	0.148	0.096

Notes:

1. Panel properties are determined in accordance with AISI Specification Section B.
2. Design base metal thickness is exclusive of Galvanized / Galvalume coatings and KXL finishes.
3. Weights are based on AZ55 Galvalume coated panel thickness with a material blank width of 29 - ¹¹/₁₆ inches. (ref. MS-05-01)

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D. PANEL DESIGN (DP 10.1)

Panels are designed in accordance with the “North American Specification for the Design of Cold-Formed Steel Structural Members”, AISI Standard S100. Panel design limit states and other design considerations have been summarized below.

Limit State / Design Consideration	References
Panel: <ul style="list-style-type: none"> • Section Properties • Bending Strength • Web Crippling Strength** • Shear Strength • Bending and Shear • Bending and Web Crippling 	Section B5. Section F1, F3.1, I6.2.1, I6.2.1* Section G5 Section G Section H2 (Not a limit state for panel design)
Screw Connections: <ul style="list-style-type: none"> • Tension, Pullout & Pullover Strength 	Design Procedures: DP 3.7
Deflection: <ul style="list-style-type: none"> • Limits 	Design Procedures: DP 6.2

* In accordance with AISI Section I6.1.2, for standing seam roof panel systems under uplift loadings the nominal strength (resistance) shall be determined by testing per AISI test procedure S906 (ASTM E1592). Panel strength (resistance) under gravity loading may be determined by AISI Sections F3 and F4 as referenced above.

** Not required for trapezoidal profile standing seam roof panels


D1. Panel Flexural Strength (DP 25.5)

a) AISI Flexural Strength -- kip-in. / ft. width of panel

Ref. Gage	Outside of Panel in Compression, (k")				Inside of Panel in Compression, (k")			
	Nominal Strength M_n	Allowable Strength	Design Strength	Design Resistance	Nominal Strength M_n	Allowable Strength	Design Strength	Design Resistance
		ASD	LRFD	LSD		ASD	LRFD	LSD
24	5.46	2.73	4.92	4.92	3.74	1.87	3.00	2.81
22	6.84	4.10	6.16	6.16	4.80	2.40	3.84	3.60

Notes:

- Tabulated values are for Allowable and Design Bending Strengths (Resistances) where:
 - Allowable Strength = M_n / Ω_b (ASD), kip-in.
 - Design Strength = $\phi_b M_n$ (LRFD & LSD), kip-in.
 - $\Omega_b = 2.00$ (ASD); $\phi_b = 0.80$ (LRFD); $\phi_b = 0.75$ (LSD-Canada) (excludes 22ga outside in compression)
 - $\Omega_b = 1.67$ (ASD); $\phi_b = 0.90$ (LRFD); $\phi_b = 0.90$ (LSD-Canada) (22ga outside in compression only)
- Nominal Bending Strength: $M_n = S_x F_y$, kip-in.

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b) Miami-Dade County NOA Flexural Strength (Florida HWHZ) -- kip-in. / ft. width

Ref. Gage	Outside of Panel in Compression	Inside of Panel in Compression
	Allowable Strength M_{ASD} (k")	Allowable Strength M_{ASD} (k")
24	1.618	1.121
22	1.671	1.169

Notes:

- Nominal Strength (Resistance) and resistance factors determined in accordance Miami-Dade Test Procedure TAS 125-2003 "Negative Load Test Standard Requirement for Metal Roofing Systems." References: Farabaugh Engineering and Testing Inc. Project T211-16 (24 GA SSR) and T212-16 (22 GA SSR) Test Report on VP Buildings (3" High, 24" Wide Trapezoidal Panel) At 5'-0" & 2'-0" Clip Spacing In Accordance With TAS 125-2003", dated May 31, 2016.
- Allowable strength determined based on safety factor = 2.0.


D2. Uplift Strength (DP 25.5)

a) AISI Uplift Strength (PSF)

Panel System	Loading	Nominal Strength W_n (psf)	Purlin Spacing, S_c , Limits	Allowable Strength	Design Strength	Design Resistance
				ASD	LRFD	LSD
24 Ga. SSR	Uplift	$W_n = -42S_c + 294$	$2.0' \leq S_c \leq 5'$	$\Omega = 1.70$	$\phi = 0.94$	$\phi = 0.78$
22 Ga. SSR	Uplift	$W_n = -49S_c + 350$	$2.0' \leq S_c \leq 5'$	$\Omega = 1.70$	$\phi = 0.94$	$\phi = 0.78$

Notes:

- Allowable and Design Strengths (Resistances) may be obtained from the following:
 - Allowable Strength = W_n / Ω (ASD), psf
 - Design Strength (Resistance) = ϕW_n (LRFD & LSD), psf
 - S_c = SSR clip spacing, ft., limited by testing to $2.0' \leq S_c \leq 5'$.
- Nominal Strength (Resistance) and resistance factors determined in accordance AISI Test Procedure S906 "Standard Procedures for Panel and Anchor Structural Tests." References: ENCON Technology, Inc. Project C2012-1 "Test Report on VP Buildings (24 GA., 3" High, 24" Wide Trapezoidal Panel) At 5'-0" & 2'-0" Clip Spacing In Accordance With ASTM E1592-05(2012)", dated November 30, 2015.

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b) Miami-Dade County NOA Available Uplift - PSF (Florida HWHZ)

Span (Feet)	24 GA SSR					22 GA SSR				
	Allow (ASD)	Ext R	Int R	Sup Mom	Mid Mom	Allow (ASD)	Ext R	Int R	Sup Mom	Mid Mom
2	127	129	127	313	298	133	134	133	322	312
2.25	113	115	113	250	238	119	120	119	257	249
2.5	102	104	102	202	193	107	108	107	208	202
2.75	93	94	93	167	159	97	98	97	172	167
3	85	87	85	141	134	89	90	89	145	140
3.25	79	80	79	120	114	82	83	82	123	119
3.5	73	74	73	103	98	76	77	76	106	103
3.75	68	69	68	90	86	71	72	71	93	90
4	64	65	64	79	75	67	67	67	81	79
4.25	60	61	60	70	67	63	63	63	72	70
4.5	57	58	57	62	60	59	60	59	64	62
4.75	53	55	54	56	53	56	57	56	58	56
5	48	52	51	51	48	50	54	54	52	50

Notes:


1. Allowable and Design Strengths (Resistances) are ASD (Allowable loads - PSF)
2. Nominal Strength (Resistance) and resistance factors determined in accordance Miami-Dade Test Procedure TAS 125-2003 "Negative Load Test Standard Requirement for Metal Roofing Systems." References: Farabaugh Engineering and Testing Inc. Project T211-16 (24 GA SSR) and T212-16 (22 GA SSR) Test Report on VP Buildings (3" High, 24" Wide Trapezoidal Panel) At 5'-0" & 2'-0" Clip Spacing In Accordance With TAS 125-2003", dated May 31, 2016.
3. Deflection requirements of L/240 do not govern over design loads in Table.

D3. Panel Shear Strength (DP 25.5) kips / ft. width of panel

Ref. Gage	Nominal Strength V_n	Allowable Strength	Design Strength	Design Resistance
		ASD	LRFD	LSD
24	1.49	0.93	1.41	1.19
22	1.94	1.22	1.85	1.56

Notes:

1. Tabulated values are for Allowable and Design Shear Strengths (Resistances) where:
 - Allowable Strength = V_n / Ω_v (ASD), kips per ft. width of panel
 - Design Strength (Resistance) = $\phi_v V_n$ (LRFD & LSD), kips per ft. width of panel
 - $\Omega_v = 1.6$ (ASD); $\phi_v = 0.95$ (LRFD); $\phi_v = 0.80$ (LSD-Canada)
2. Nominal Shear Strength: V_n per AISI G5, kips per ft. width of panel.

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D4. Gravity Load Resistance (DP 25.5)

a) AISI - Available Gravity Strength – Uniformly Distributed Load (PSF)

SSR Panel System	Loading	Nominal Strength W_n (psf)	Purlin Spacing, S_c , Limits	Allowable Strength	Design Strength	Design Resistance
				ASD	LRFD	LSD
24 Ga or 22 Ga	Uniform Gravity	$W_n = -120S_c + 840$	$2.0' \leq S_c \leq 5'$	$\Omega = 2.00$	$\phi = 0.80$	$\phi = 0.70$

Notes:

- Allowable and Design Strengths (Resistances) may be obtained from the following:
 - Allowable Strength = W_n / Ω (ASD), psf
 - Design Strength (Resistance) = ϕW_n (LRFD & LSD), psf
 - S_c = SSR clip spacing, ft., limited by testing to $2.0' \leq S_c \leq 5'$.
- Nominal Strength (Resistance) and resistance factors determined in accordance AISI Test Procedure S906 "Standard Procedures for Panel and Anchor Structural Tests." References: ENCON Technology, Inc. Project C2013-1 "Test Report on VP Buildings (24 GA., 3" High, 24" Wide Trapezoidal Panel) At 5'-0" Clip Spacing In Accordance With ASTM E1592-05(2012) for Gravity Loads", dated November 30, 2015

b) AISI - Maximum Gravity Reaction Strength – kips / ft. width of panel

The reaction or bearing strength for gravity loads of the SSR roof system, including clips, has been derived from gravity load tests identified below.

Ref. Gage	End Reactions				Interior Reactions			
	Nominal Strength R_n	Allowable Strength	Design Strength	Design Resistance	Nominal Strength R_n	Allowable Strength	Design Strength	Design Resistance
		ASD	LRFD	LSD		ASD	LRFD	LSD
24 & 22	0.474	0.237	0.379	0.332	1.358	0.679	1.086	0.951

Notes:

- Tabulated values are for Allowable and Design Strengths (Resistances) where:
 - Allowable Strength = R_n / Ω (ASD), kips per ft. width of panel
 - Design Strength (Resistance) = ϕR_n (LRFD & LSD), kips per ft. width of panel
 - $\Omega = 2.0$ (ASD); $\phi = 0.8$ (LRFD); $\phi = 0.7$ (LSD-Canada)
- ENCON Technology, Inc. Project C2013-1 "Test Report on VP Buildings (24 GA., 3" High, 24" Wide Trapezoidal Panel) At 5'-0" Clip Spacing In Accordance With ASTM E1592-05(2012) for Gravity Loads", dated November 30, 2015.

D5. Panel Connections

Standard panel-to-secondary support connections are made with a minimum of (2) ¼”-14 self-drilling structural fasteners per clip. For FM ratings, Miami-Dade Co. and 22 Ga. panels, (3) ¼”-14 self-drilling structural fasteners per clip are required to develop the panel strength.

a) Pullout Strength (DP 3.7.1.VP)

Screw Pull-Out Strength¹ from Z/C Secondary, (lbs. / Screw)

Secondary ² Properties		¼ - 14 Screws (d = 0.250”)			
F _{u2} (ksi)	Thick. t ₂ (in.)	Nominal Strength P _{not}	Allow. Strength (ASD)	Design Strength (LRFD)	Design Resist. (LSD)
70	0.060	893	298	446	357
	0.068	1012	337	506	405
	0.073	1086	362	543	434
	0.079	1175	392	588	470
	0.088	1309	436	655	524
	0.098	1458	486	729	583
	0.113	1681	560	840	672

Notes:

1. AISI Section J4.4.1, $\Omega = 3.00$ (ASD), $\phi = 0.50$ (LRFD), $\phi = 0.40$ (LSD)
2. The above values may be factored by the ratio of Fu for other materials.

D6. Panel Deflections (DP 25.5)


For pressure (+) loading producing compression on the panel outside panel deflections are obtained by using $I_{xe}(+)$. For suction (-) loading producing compression on the panel inside, panel deflections are obtained by using $I_{xe}(-)$. Standard BlueScope deflection requirements for panels are listed in Design Procedure DP 6.2

a) Miami-Dade County NOA (UPLIFT ONLY) –

Panel deflections are based on test results. From testing an EI_{equiv} has been determined.

$$24 \text{ GA \& 22 GA SSR Uplift} \rightarrow EI_{equiv} = 3486 \text{ k-in}^2$$

For deflections from load types other than wind, use AISI procedure using I_{xe} .

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E. (AISI) PANEL LOAD TABLE (VP PANEL LOAD TABLES REV21)

		Allowable Uniform Load (psf)													
		Span = 2.0'		Span = 2.5'		Span = 3.0'		Span = 3.5'		Span = 4.0'		Span = 4.5'		Span = 5.0'	
Gage	Fy	P	S	P	S	P	S	P	S	P	S	P	S	P	S
24 Ga.	50	300	124	270	111	240	99	210	85	180	74	150	62	120	49
22 Ga.	50	300	148	270	134	240	119	210	105	180	91	150	76	120	62

Notes:

1. P = Pressure on outside of panel, S = suction on outside of face.
2. Tabulated values are Allowable Strength Design (ASD) format in accordance with the 2012 AISI Specification considering bending, shear, web crippling, combined bending and shear and fastener pullover from panel.
3. Gravity and suction loads derived from full scale ASTM E1592 Tests.
4. Panel allowable loads are limited by L/60 deflection.
5. Standard construction assumes (2) fasteners per clip for 24 gage and (3) fasteners per clip for 22 gage panel.
6. All values shown are for 3 or more spans.
7. For fastener pullout strength from secondary refer to Section D5.

Document and Revision History

REV. #	DATE	NAME	DESCRIPTION
0	09/22/2017	R.Benton	Original document (Reproduced to match previous submittals using new documents and formats)
1	09/2020	R. Benton	Updating for 2020 FBC release. Separated Panel Rib and SSR into separate docs. Renamed and renumbered to coincide with the actual panel DP
1a			AISI S100-16 reference
2	08/2023	R. Benton	Changed FPA number from 12763.2 to 12763.3 to match FPA evaluator change.