Evaluation of CFR Roof Panels- 24-DrJ-0066
April 23, 2024

Mr. Mark J Klos
Nucor
1550 Coraopolis Heights Rd Ste 600
Moon Township, PA 15108-2973

Re: Evaluation of CFR Roof Panels

Dear Mr. Klos:

DrJ Engineering, LLC (DrJ) has been asked to provide a Florida professional engineering accepted engineering practice review with respect to the CFR Roof Panels. This work has been performed pursuant to our areas of expertise. The purpose of the DrJ review is to provide an engineering assessment of the conformance of the CFR Roof Panel with the 2023 Florida Building Code (FBC).

CFR Roof Panels conform to Section 1501 through Section 1507 and Section 2603 of the 2023 FBC. CFR panels have a polyisocyanurate (polyiso) plastic core with a minimum density of 2.0 pcf and two steel facers. These facers are made from galvanized coated steel or Galvalume® AZ50 coated steel (minimum 33 ksi) and are 22 ga, 24 ga or 26 ga thick (26 ga. option isn't available for exterior facer). These thicknesses meet the weather protection requirements in Section 1405.2 and Section 1406.2.1.1 in the FBC. The available thicknesses of the CFR panels are 2″, 2.5″, 3″, 4″, 5″ and 6″. The panels have a coverage width of 36" or 42". Panels shall be installed on roofs down to a minimum slope of $^1/_2$″:12″ using butyl tape sealant per Section 1507.4.2 of the FBC.

Panels must be attached to supports that are a minimum of 16 ga steel (minimum F_y = 50 ksi). Panels shall be fastened through the supports to the framing members using $^1/_4$″-14 Type 3 hex head self-drilling screws. Fasteners must be long enough to penetrate through the support at least 3 threads. For 12 ga or thicker supports a $^1/_4$″-20 or $^1/_4$″-28 Type 5 self-drilling screws may be used instead. Self-tapping screws may be used as well. All fasteners must be corrosion resistant. Panel attachment must include fastening a corrosion resistant steel panel clip using 3 fasteners per indicated position to the structural support below (See Figure 1). The exterior standing seam shall be mechanically hand crimped after the installation of the clip and is mechanically seamed after the adjacent panel is installed.

The maximum allowable inward and outward transverse loads for different spans of this product can be found in **Table 1** through **Table 8**. These tables conform to the requirements of the FBC.

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This Research Report, created by an Approved Source, is valid through April 1, 2025.

Table 1. Allowable Inward Loads for 24Ga/26Ga Faced CFR 42 Roof Panel with L/240 Deflection Ratio[1,2,3,4]

Thickness	# of Spans	Support Spacing (ft)							
		3	4	5	6	8	10	12	14
2	1	128	79	58	46	33	26	19	13
	2	89	67	54	45	33	27	22	19
	3+	91	68	55	45	34	27	23	19
2.5	1	161	99	72	56	40	32	25	17
	2	108	81	65	54	40	32	27	23
	3+	110	82	66	55	41	33	27	23
3	1	204	125	90	71	50	39	31	22
	2	131	99	79	66	49	39	32	27
	3+	133	99	79	66	49	39	33	28
4	1	311	191	137	107	75	58	42	31
	2	184	140	112	93	70	55	46	39
	3+	187	139	111	92	69	55	46	39
5	1	324	205	149	118	83	64	52	44
	2	197	149	120	100	74	59	48	41
	3+	198	147	117	98	73	58	48	42
6	1	341	221	163	129	92	71	58	49
	2	209	159	127	106	79	62	51	44
	3+	209	155	124	103	77	61	51	44

1. Based on Allowable Stress Design (ASD). No factor has been applied for loads limited by deflection.
2. Allowable inward loads shown in this table are based on the lowest value of panel wrinkling, shear and deflection ratio limits
3. Structural capacity of the panel supports is not considered in this table
4. Please contact Metl-Span Engineering for additional information and assistance

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Table 2. Allowable Inward Loads for 24Ga/26Ga Faced CFR 36 Roof Panel with L/240 Deflection Ratio[1,2,3,4]

Thickness	# of Spans	Support Spacing (ft)							
		3	4	5	6	8	10	12	14
2	1	136	83	60	47	34	27	19	13
	2	89	67	54	45	33	27	22	19
	3+	91	68	55	45	34	27	23	19
2.5	1	171	104	74	58	41	32	26	18
	2	108	81	65	54	40	32	27	23
	3+	110	82	66	55	41	33	27	23
3	1	216	131	93	73	51	40	32	22
	2	130	98	79	66	49	39	32	27
	3+	133	99	79	66	49	39	33	28
4	1	331	200	142	110	76	59	43	31
	2	183	139	112	93	69	55	46	39
	3+	187	139	111	92	69	55	46	39
5	1	341	213	154	120	84	65	53	44
	2	196	149	119	99	74	59	48	41
	3+	198	147	117	98	73	58	48	42
6	1	357	228	167	132	93	72	59	50
	2	208	158	127	106	79	62	51	44
	3+	209	155	124	103	77	61	51	44

1. Based on Allowable Stress Design (ASD). No factor has been applied for loads limited by deflection.
2. Allowable inward loads shown in this table are based on the lowest value of panel wrinkling, shear and deflection ratio limits
3. Structural capacity of the panel supports is not considered in this table
4. Please contact Metl-Span Engineering for additional information and assistance

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Table 3. Allowable Outward Loads for 24Ga/26Ga Faced CFR 42 Roof Panel with 12 Ga. Supports and L/240 Deflection Ratio[1,2,3,4]

Thickness	# of Spans	Support Spacing (ft)							
		3	4	5	6	8	10	12	14
2	1	73	55	44	37	27	22	18	13
	2	86	64	52	43	32	25	21	18
	3+	90	68	55	45	34	27	23	19
2.5	1	75	56	45	37	28	22	19	16
	2	90	68	54	45	34	27	22	19
	3+	92	69	56	47	35	28	23	20
3	1	77	57	46	38	29	23	19	16
	2	94	71	57	47	35	28	23	20
	3+	94	71	57	48	36	29	24	20
4	1	80	60	48	40	30	24	20	17
	2	99	73	58	49	37	30	25	22
	3+	97	74	59	50	37	30	25	21
5	1	86	64	51	43	32	26	21	18
	2	101	77	61	51	38	30	25	21
	3+	103	78	63	53	40	32	27	23
6	1	91	68	55	45	34	37	23	19
	2	100	76	61	50	37	30	24	21
	3+	107	80	64	53	40	32	26	23

1. Based on Allowable Stress Design (ASD). No factor has been applied for loads limited by deflection.
2. Allowable outward loads shown in this table are based on the lowest value of panel wrinkling, shear, deflection ratio and fastener limits
3. Structural capacity of the panel supports is not considered in this table
4. Please contact Metl-Span Engineering for additional information and assistance

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Table 4. Allowable Outward Loads for 24Ga/26Ga Faced CFR 42 Roof Panel with 14 Ga. Supports and L/240 Deflection Ratio[1,2,3,4]

Thickness	# of Spans	Support Spacing (ft)							
		3	4	5	6	8	10	12	14
2	1	73	55	44	37	27	22	18	13
	2	81	61	49	41	30	24	20	17
	3+	90	67	54	45	34	27	22	19
2.5	1	75	56	45	37	28	22	19	16
	2	82	62	49	41	31	24	20	17
	3+	90	68	54	45	34	27	22	19
3	1	77	57	46	38	29	23	19	16
	2	82	62	50	41	31	24	20	17
	3+	90	68	54	45	34	27	22	19
4	1	80	60	48	40	30	24	20	17
	2	83	63	50	42	31	25	20	17
	3+	91	68	54	45	34	27	22	19
5	1	86	64	51	43	32	26	21	18
	2	84	63	51	42	32	25	21	18
	3+	91	68	54	45	34	27	22	19
6	1	91	68	55	45	34	27	23	19
	2	84	64	51	43	32	25	21	18
	3+	91	68	54	45	34	27	22	19

1. Based on Allowable Stress Design (ASD). No factor has been applied for loads limited by deflection.
2. Allowable outward loads shown in this table are based on the lowest value of panel wrinkling, shear, deflection ratio and fastener limits
3. Structural capacity of the panel supports is not considered in this table
4. Please contact Metl-Span Engineering for additional information and assistance

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Table 5. Allowable Outward Loads for 24Ga/26Ga Faced CFR 42 Roof Panel with 16 Ga. Supports and L/240 Deflection Ratio[1,2,3,4]

Thickness	# of Spans	Support Spacing (ft)							
		3	4	5	6	8	10	12	14
2	1	73	55	44	37	27	22	18	13
	2	65	49	39	32	24	19	16	14
	3+	72	54	43	36	27	22	18	15
2.5	1	75	56	45	37	28	22	19	16
	2	65	49	39	33	24	19	16	14
	3+	72	54	43	36	27	22	18	15
3	1	77	57	46	38	29	23	19	16
	2	66	50	40	33	25	20	16	14
	3+	72	54	43	36	27	22	18	15
4	1	80	60	48	40	30	24	20	17
	2	66	50	40	34	25	20	16	14
	3+	73	54	43	36	27	22	18	15
5	1	86	64	51	43	32	26	21	18
	2	67	51	41	34	25	20	16	14
	3+	73	54	43	36	27	22	18	15
6	1	91	68	55	45	34	27	23	19
	2	68	51	41	34	25	20	17	14
	3+	73	54	43	36	27	22	18	15

1. Based on Allowable Stress Design (ASD). No factor has been applied for loads limited by deflection.
2. Allowable outward loads shown in this table are based on the lowest value of panel wrinkling, shear, deflection ratio and fastener limits
3. Structural capacity of the panel supports is not considered in this table
4. Please contact Metl-Span Engineering for additional information and assistance

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Table 6. Allowable Outward Loads for 24Ga/26Ga Faced CFR 36 Roof Panel with 12 Ga. Supports and L/240 Deflection Ratio[1,2,3,4]

Thickness	# of Spans	Support Spacing (ft)							
		3	4	5	6	8	10	12	14
2	1	85	64	51	43	32	26	19	13
	2	89	67	54	45	33	27	22	19
	3+	91	68	55	45	34	27	23	19
2.5	1	87	66	52	44	33	26	22	18
	2	105	79	63	53	39	31	26	22
	3+	108	81	65	54	41	33	27	23
3	1	89	67	54	45	34	27	22	19
	2	109	83	66	55	41	33	27	23
	3+	110	83	66	56	42	33	28	24
4	1	94	70	56	47	35	28	23	20
	2	117	86	68	57	43	35	29	25
	3+	114	86	69	58	44	35	29	25
5	1	100	75	60	50	37	30	25	21
	2	117	89	72	60	44	35	29	25
	3+	121	91	74	62	46	37	31	28
6	1	106	80	64	53	40	32	27	23
	2	116	88	70	59	44	34	28	24
	3+	125	93	74	62	46	37	31	26

1. Based on Allowable Stress Design (ASD). No factor has been applied for loads limited by deflection.
2. Allowable outward loads shown in this table are based on the lowest value of panel wrinkling, shear, deflection ratio and fastener limits
3. Structural capacity of the panel supports is not considered in this table
4. Please contact Metl-Span Engineering for additional information and assistance

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Table 7. Allowable Outward Loads for 24Ga/26Ga Faced CFR 36 Roof Panel with 14 Ga. Supports and L/240 Deflection Ratio[1,2,3,4]

Thickness	# of Spans	Support Spacing (ft)							
		3	4	5	6	8	10	12	14
2	1	85	64	51	43	32	26	19	13
	2	89	67	54	45	33	27	22	19
	3+	49	37	30	25	18	15	12	11
2.5	1	87	66	52	44	33	26	22	18
	2	95	72	57	48	36	28	23	20
	3+	68	51	41	34	25	20	17	15
3	1	89	67	54	45	34	27	22	19
	2	95	72	58	48	36	28	24	20
	3+	91	68	54	45	34	27	23	19
4	1	94	70	56	47	35	28	23	20
	2	96	73	59	49	36	29	24	20
	3+	106	79	63	53	39	31	26	22
5	1	100	75	60	50	37	30	25	21
	2	97	74	59	49	37	29	24	20
	3+	106	79	63	53	39	31	26	22
6	1	106	80	64	53	40	32	27	23
	2	98	74	60	50	37	29	24	21
	3+	106	79	63	53	39	31	26	22

1. Based on Allowable Stress Design (ASD). No factor has been applied for loads limited by deflection.
2. Allowable outward loads shown in this table are based on the lowest value of panel wrinkling, shear, deflection ratio and fastener limits
3. Structural capacity of the panel supports is not considered in this table
4. Please contact Metl-Span Engineering for additional information and assistance

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Table 8. Allowable Outward Loads for 24Ga/26Ga Faced CFR 36 Roof Panel with 16 Ga. Supports and L/240 Deflection Ratio[1,2,3,4]

Thickness	# of Spans	Support Spacing (ft)							
		3	4	5	6	8	10	12	14
2	1	85	64	51	43	32	26	19	13
	2	76	57	46	38	28	22	19	16
	3+	84	63	50	42	31	25	21	18
2.5	1	87	66	52	44	33	26	22	18
	2	76	57	46	38	28	23	19	16
	3+	84	63	50	42	31	25	21	18
3	1	89	67	54	45	34	27	22	19
	2	76	58	46	38	29	23	19	16
	3+	84	63	50	42	31	25	21	18
4	1	94	70	56	47	25	28	23	20
	2	77	58	47	39	29	23	19	16
	3+	85	63	51	42	31	25	21	18
5	1	100	75	60	50	27	30	25	21
	2	78	59	47	39	29	23	19	16
	3+	85	63	51	42	31	25	21	18
6	1	106	80	64	53	40	32	27	23
	2	78	60	48	40	60	23	19	16
	3+	85	63	51	42	62	25	21	18

5. Based on Allowable Stress Design (ASD). No factor has been applied for loads limited by deflection.
6. Allowable outward loads shown in this table are based on the lowest value of panel wrinkling, shear, deflection ratio and fastener limits
7. Structural capacity of the panel supports is not considered in this table
8. Please contact Metl-Span Engineering for additional information and assistance

This panel is not currently available for use in High-Velocity Hurricane Zones (HVHZ).

DrJ's procedures are fully compliant with the ISO/IEC 17065 certification process and DrJ's scope of expertise.

If there are any additional questions or concerns, we will gladly provide a Florida professional engineering[1] and ANAB ISO/IEC 17065 accredited[2] approved agency response. Pursuant to the 2023 FBC Code Section 1707.1[3] we would sincerely appreciate knowing the specific sections of the adopted building code and/or professional engineering law that this engineering evaluation

[1] Approved Source. An independent person, firm or corporation, approved by the building official, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses. https://up.codes/viewer/florida/fl-building-code-2023/chapter/2/definitions#approved_source

[2] Approved Agency. An established and recognized agency that is regularly engaged in conducting tests, furnishing inspection services or furnishing product certification where such agency has been approved by the building official. https://up.codes/viewer/florida/fl-building-code-2023/chapter/2/definitions#approved_agency

[3] In the absence of approved rules or other approved standards, the building official shall make, or cause to be made, the necessary tests and investigations; or the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies. The cost of all tests and other investigations required under the provisions of this code shall be borne by the owner or the owner's authorized agent.

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does not comply with so that we can cure any non-compliance. From specifics, we can then delineate a path forward for everyone involved to cure any violations, as this will serve everyone's free and fair market competition's best interests.

Our goal with the foregoing analysis is to provide both the accepted engineering analysis and regulatory compliance substance to support a systematic path to approval. Please contact us if we can help further in any way. If your request is time-sensitive, please contact Jill Zimmerman at (920) 988-7165. Thank you very much.

Respectfully yours,

Larry Wainright
Vice President Product Certification
608-310-6742

Ryan Dexter, P.E.
Florida P.E. No. 69484
Vice President
608-310-6744

RYAN JOSEPH DEXTER LICENSE No 69484 STATE OF FLORIDA PROFESSIONAL ENGINEER

DrJ Engineering, LLC
Certificate of Authorization #29766

RYAN J DEXTER

Digitally signed by RYAN J DEXTER
DN: c=US, o=Florida, dnQualifier=A01410D0000017AED3AB9CE0000A494, cn=RYAN J DEXTER
Date: 2024.04.23 15:05:06 -04'00'

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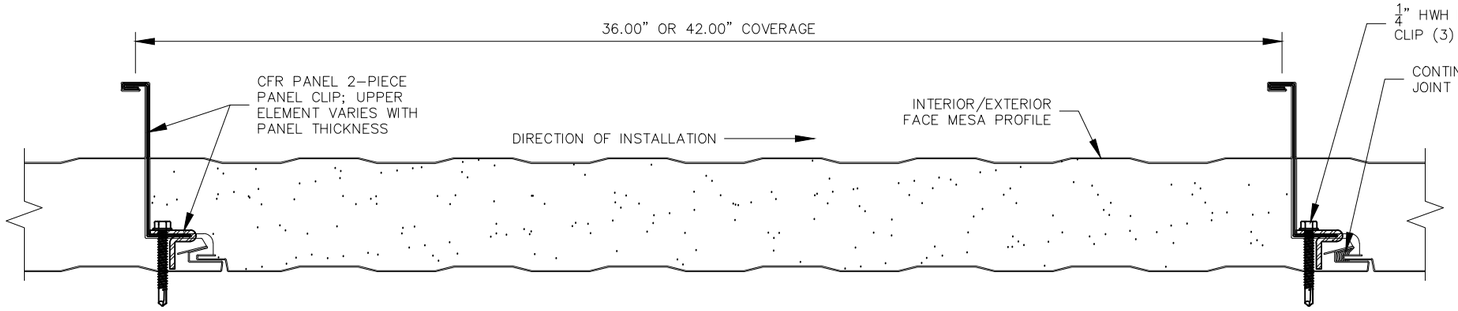
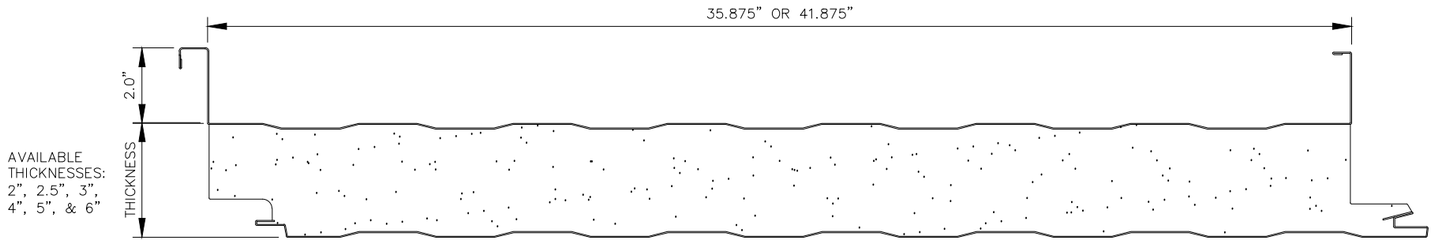
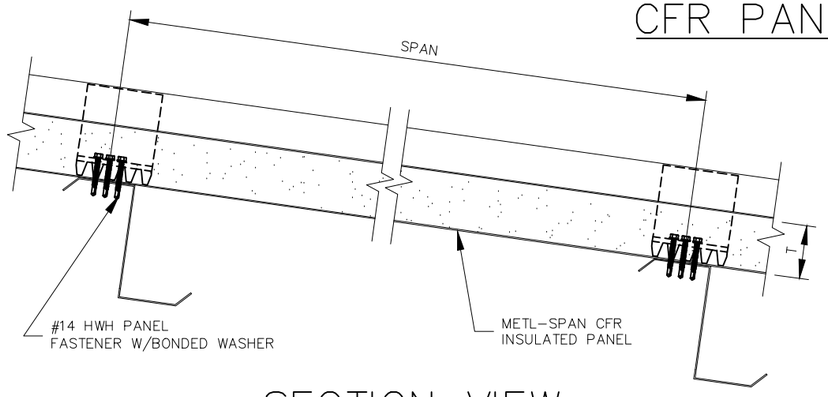


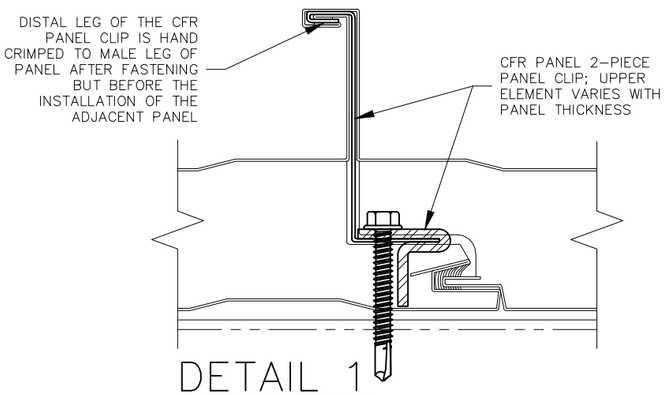
TYPICAL ROOF PANEL INSTALLATION CROSS SECTION



CFR PANEL-AS DELIVERED



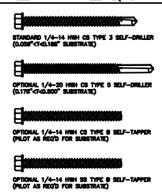
SECTION VIEW



DETAIL 1

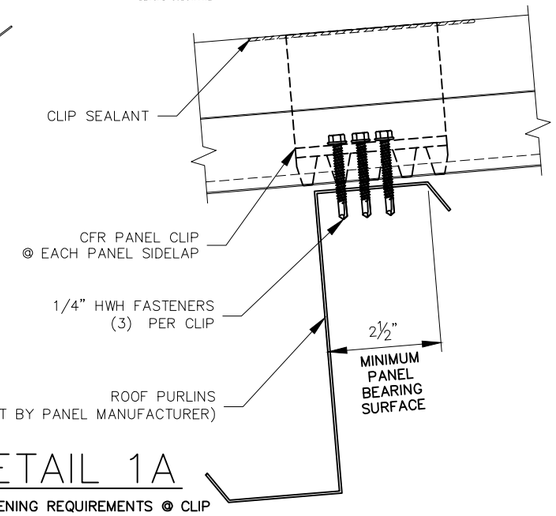
SECTION @ CLIP

FASTENER REQUIREMENTS



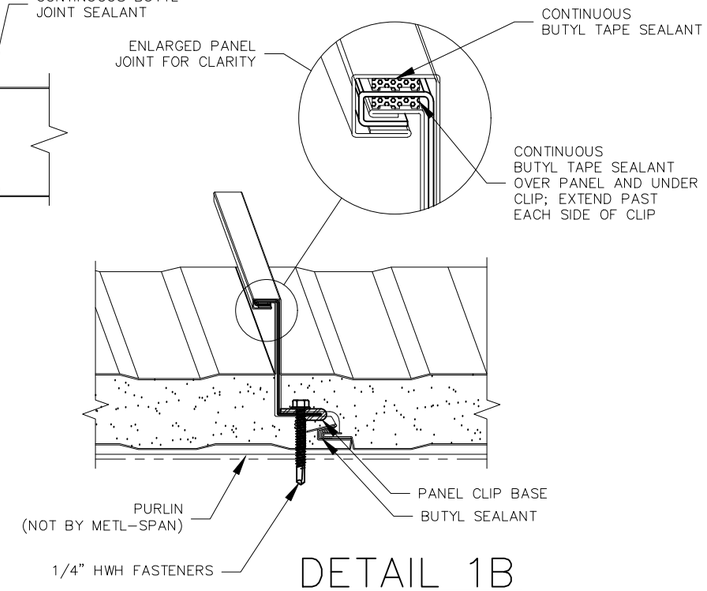
PERMITTED FASTENERS FOR CFR

STANDARD FASTENER LENGTH IS 2-INCH; OTHER CONDITIONS MAY REQUIRE LONGER LENGTHS TO ENSURE (3) FULL THREADS EXPOSED BEYOND SUBSTRATE



DETAIL 1A

FASTENING REQUIREMENTS @ CLIP



DETAIL 1B

SEALANT REQUIREMENTS @ CLIP

GENERAL NOTES:

1.) THE CFR STRUCTURAL ROOF PANEL SYSTEM HAS BEEN DESIGNED IN ACCORDANCE WITH FLORIDA BUILDING CODE (FBC) FOR ALLOWABLE STRESS DESIGN (ASD). THE DESIGN WIND PRESSURES AS DETERMINED FROM SECTION 1609 AND ASCE 7 MUST BE MULTIPLIED BY 0.6 AND COMBINED WITH LIVE LOAD REQUIREMENTS FROM SECTION 1607.

2.) REQUIRED DESIGN WIND LOADS SHALL BE DETERMINED FOR EACH PROJECT. THIS PANEL SYSTEM MAY NOT BE INSTALLED WHEN THE REQUIRED DESIGN WIND LOADS ARE GREATER THAN THE ALLOWABLE WIND LOADS ASSOCIATED TO A SPECIFIC SPAN INDICATED IN THE LOAD SPAN TABLES.

3.) PANELS SHALL BE INSTALLED OVER A MINIMUM 16 GAGE (MIN. 0,059"), Fy=50KSI MINIMUM STEEL ROOF FRAMING SYSTEM SUITABLE FOR CONVEYANCE OF FORCES NORMAL TO THE PANEL EQUAL TO THE APPLICABLE DESIGN WIND LOAD.

4.) PANELS MUST BE INSTALLED OVER A MINIMUM 2 SUPPORTS. PANEL END LAPS MAY BE LOCATED AT MINIMUM 5-1/2" WIDE SUPPORTS TO PERMIT EACH PANEL END TO BE INDEPENDENTLY CLIP FASTENED, FLASHED AND PROPERLY SEALED PER METL-SPAN STANDARD DETAILS AND SPECIFICATIONS.

5.) CFR SANDWICH PANELS ARE EITHER 42" OR 36" WIDE AND 26GA INTERIOR G-90 GALVANIZED OR AZ-50 ALUMINUM-ZINC COATED STEEL SKINS (Fy = MIN. 33 KSI) WITH A FOAMED IN PLACE, PIR FOAM CORE.

6.) ALL PANEL FASTENING SHALL BE MADE WITH CORROSION RESISTANT SCREWS.

7.) PROPER USE OF THE PROVIDED HAND CRIMPER & ROOF SEAMER IS CRITICAL TO THE INSTALLED PERFORMANCE OF THE CFR ROOF SYSTEM.

8.) CFR WALL PANELS SHALL NOT BE CONSIDERED VIABLE FOR SHEAR TRANSFER OR DIAPHRAGM ACTION TO ADD STABILITY TO THE PRIMARY BUILDING FRAME.

1720 LAKEPOINTE DR. STE. 436
LEWISVILLE, TEXAS 75057
TEL: (972) 221-6556
FAX: (972) 436-7028
WWW.METL-SPAN.COM

CFR Roof Panel
Florida Product
Installation Standard

PROJECT:

REVISION	DATE
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REVISION	DATE
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DRAWN BY: MJK
CHECKED BY: ----
DATE: Feb 2024
SCALE: AS NOTED

PROJECT NUMBER: ----

SHEET: CFR-1