McELROY METAL, INC.
MIRAGE PANEL, PBU-PANEL AND U-PANEL

CSI Sections:
07 41 13 – Metal Roof Panels

1.0 RECOGNITION

Mirage Panel, PBU-Panel and U-Panel have been evaluated for use as metal roof panels in compliance with Section 1507.4 of the IBC and Section R905.10 of the IRC.

The structural, weather resistance and fire performance properties of the metal roof panels have been evaluated for compliance with the following codes:

- 2015, 2012 and 2009 International Building Code® (IBC)
- 2015, 2012 and 2009 International Residential Code® (IRC)

2.0 LIMITATIONS

Use of the Mirage Panels, PBU-Panels and U-Panels as described in this report is subject to the following limitations:

2.1 Mirage Panels, PBU-Panels and U-Panels shall be installed and used in accordance with this report, applicable code requirements and the manufacturer's published installation guidelines. Where conflicts occur the more restrictive requirements shall prevail.

2.2 Mirage Panels, PBU-Panels and U-Panels shall not be used on roof slopes less than 2 units vertical in 12 units horizontal (16.67 percent).

2.3 Details and calculations demonstrating compliance with this report shall be submitted to the code official for approval. When required by the local jurisdiction, the structural calculations and related documents shall be prepared by a registered design professional.

2.4 Use of the panels as lateral load resisting elements in roof diaphragms is outside the scope of this report.

3.0 PRODUCT USE

3.1 Mirage Panel: Mirage Panels are used as new roof coverings installed over solid or closely fitted sheathing. Type II felt underlayment shall be installed over the sheathing and fastened in accordance with the applicable code and the underlayment manufacturer's installation instructions.

3.1.1 Design: The allowable uniform uplift wind loads for the Mirage Panel installed in accordance with the manufacturer's installation instructions are shown in Table 1 of this report.

3.1.2 Installation: Mirage Panels shall be installed with the Mirage clips described in Section 4.1 of this report. The fasteners used to attach the Mirage clips to the sheathing or supports shall be two No.10-16 by 1-inch-long (25.4 mm) self-drilling, corrosion-resistant pancake head screws per clip, spaced as described in Table 1 of this report and through the roof sheathing to steel supports of minimum No.16 gage [0.0568 inch (1.44 mm)] framing having a minimum yield strength of 55 ksi (379 MPa). Sealant shall be applied for roof slopes of 2 units vertical in 12 units horizontal to 3 units vertical in 12 units horizontal (16.67 to 25 percent) to the joints as shown in Figure 4. The sealant installation instructions of the panel assembly shall in accordance with the sealant manufacturer's installation instructions. Additional panel trim and accessories are provided to fit the specific needs of the jobsite.

3.2 PBU-Panels and U- Panels: PBU- and U-Panels are used as new roof coverings installed over solid or closely fitted sheathing. Type II felt underlayment shall be installed over the solid or closely fitted sheathing and fastened in accordance with the applicable code and the underlayment manufacturer's installation instructions.

3.2.1 Design: The allowable uniform negative wind loads and section properties for the PBU- and U-Panels, installed in accordance with the manufacturer's installation instructions, are shown in Tables 2 and 4, respectively, of this report. The allowable uniform negative wind loads were determined using AISI S100 design specifications and the section properties shown in Tables 3 and 5, respectively, of this report.

3.2.2 Installation: PBU- and U-Panels shall be secured using No.12-14 by 1¼-inch (32 mm) HWH self-drilling tapping screws spaced as shown in Figure 5 of this report and through the roof sheathing to the No.16 gage [0.0568 inch (1.44 mm)] steel supports having a minimum yield strength of 55 ksi (379 MPa). The Mirage Panels, PBU-Panels and U-Panels are attached using galvanized or stainless-steel fasteners that are painted with corrosion-resistant coatings for sealant and a sealing cap for the stainless steel.

Sealant shall be applied for roof slopes of 2 units vertical in 12 units horizontal to 3 units vertical in 12 units horizontal (16.67 to 25 percent) to the side lap joints. PBU- and U-Panels are installed in single sheets with no end laps. Both panel ends shall be secured to the steel supports with one screw placed midway at the panel's corrugation. The fasteners being installed at the interior, have a screw installed in between alternate corrugations. In the two fastening

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patterns, the stitch fasteners are installed 1 foot 8 inches (508 mm) on center at the corrugation's top at the side laps as illustrated in Figure 5 of this report. Additional panel trim and accessories are provided to fit the specific needs of the jobsite.

3.3 Fire Classification: The panels are considered nonclassified roofing when installed over wood decks in accordance with Sections 3.1 or 3.4 of this report.

4.0 PRODUCT DESCRIPTION

4.1 Mirage Panel: The Mirage Panel is a standing seam metal roof covering that is rolled and pressure-formed from sheet steel complying with ASTM A792, Grade 50 (Class 1 or 4) with an AZ50 or AZ55 aluminum-zinc alloy coating. The 24 gage panel minimum base-metal design thickness is 0.0224 inch (0.57 mm). The panel's width is 16 inches (406 mm) and its height is $1^5/_8$ inch (41.3 mm) with 8-inch-on-center (203 mm) ribs that are equally spaced between the taller profiles. The panels are available in lengths of 3 to 50 feet (0.9 m to 15.2 m) and delivered to the jobsite as shown in Figure 1 of this report.

The Mirage Clip is pressure-formed steel having a No.20 gage [0.0338-inch (0.86 mm)] minimum design base-metal thickness complying with ASTM A653 SS Grade 50 or ASTM A792 SS Grade 50.

4.2 U-Panel: The U-Panel is a through-fastened metal roof covering that is rolled and pressure-formed from sheet steel complying with ASTM A792, Grade 50 (Class 1 or 4) or Grade 80 with an AZ50 aluminum-zinc alloy coating. The 24 gage panel minimum base-metal design thickness is 0.0224 inch (0.57 mm); the 26 gage is 0.0176 inch (0.45 mm), and the 29 gage is 0.0141 inch (0.36 mm). The panel width is 36 inches (914 mm) and its height is $^{43}/_{64}$ inch (17.1 mm) with 6-inch-on-center (152 mm) continuous corrugations. The panels are available in lengths of 3 to 45 feet (0.9 m to 13.7 m) long and delivered to the jobsite as shown in Figure 2 of this report.

4.3 PBU-Panel: The PBU-Panel is identical to the U-Panel, except the PBU-Panel has a purlin-bearing edge that provides reinforcement in the corrugation's side lap as illustrated in Figure 3 of this report.

5.0 IDENTIFICATION

Mirage Panel, U-Panel and PBU-Panel are identified with a label on the package of trim material or the pallet identifying the company name (McElroy Metal, Inc.), the product name, the IAPMO UES Marks of Conformity and the Evaluation Report Number (ER-270).

IAPMO ES ® or UES ™

6.0 SUBSTANTIATING DATA

6.1 Data in accordance with ICC-ES Acceptance Criteria for Metal Roof Coverings (AC166), approved October 2012, editorially revised June 2015.

6.2 Test results from laboratories in compliance with ISO/IEC 17025.

6.3 Manufacturer's descriptive literature and installation instructions.

6.4 IAPMO Uniform ES approved Quality Control Manual.

7.0 CONTACT INFORMATION

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8.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by the IAPMO Uniform Evaluation Service on Mirage Panel, PBU-Panel and U-Panel manufactured in Adelanto, California to assess their conformance to the codes shown in Section 1.0 of this report, and documents the product's certification.

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For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org

TABLE 1—ALLOWABLE UNIFORM UPLIFT FOR MIRAGE PANEL (psf)

MATERIAL – 24 gage / Fy-50 ksi	
Span (ft)	Allowable Load (psf)
1.5	92.1
2.0	86.4
2.5	80.8
3.0	75.1
3.5	69.5
4.0	63.8
4.5	58.2
5.0	52.5

For **SI:** 1 inch = 2.54 mm; 1 ksi = 6.89 MPa; 1 psf = 48 Pa.

1. Allowable uniform uplift loads were calculated based upon equal span lengths between clips.

TABLE 2—ALLOWABLE UNIFORM NEGATIVE WIND LOAD FOR U-PANEL (PSF)

MATERIAL		SPAN (feet)																
GAGE	Fy (ksi)		1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
24	50	1 Span	407	229	146	101	74	57	45	36	30	25	21	18	16	14	12	11
		2 Span	425	246	159	111	82	63	50	40	33	28	24	20	18	15	14	12
		3 Span	500	302	197	138	102	78	62	50	42	35	30	26	22	19	17	15
		4 Span	486	284	185	129	96	73	58	47	39	33	28	24	21	18	16	14
26	50	1 Span	284	159	102	71	52	39	31	25	21	17	15	13	11	9	8	7
		2 Span	310	179	115	81	59	45	36	29	24	20	17	15	13	11	10	9
		3 Span	378	220	143	100	74	57	45	36	30	25	21	18	16	14	12	11
		4 Span	356	206	134	94	69	53	42	34	28	23	20	17	15	13	11	10
26	80	1 Span	313	176	112	78	57	44	34	28	23	19	16	14	12	11	9	8
		2 Span	345	199	129	90	66	51	40	32	27	22	19	16	14	12	11	10
		3 Span	421	245	160	112	83	63	50	41	33	28	24	21	18	16	14	12
		4 Span	397	230	150	105	77	59	47	38	31	26	22	19	17	15	13	11
29	80	1 Span	221	124	79	55	40	31	24	19	16	13	11	10	8	7	6	6
		2 Span	232	135	87	61	45	34	27	22	18	15	13	11	9	8	7	6
		3 Span	282	165	108	76	56	43	34	27	23	19	16	14	12	10	9	8
		4 Span	266	155	101	71	52	40	32	26	21	18	15	13	11	10	9	8

For **SI:** 1 inch = 2.54 mm; 1 ksi = 6.89 MPa; 1 psf = 48 Pa.

1. Allowable uniform loads are based upon equal lengths
2. Negative wind is wind suction or uplift and is NOT increased by 33-1/3 percent.
3. The weight of the panel has NOT been deducted from the allowable loads.
4. Negative wind values are limited to combined shear and bending using Eq. C3.3.1-1 of the AISI Specification.
5. Load Tables are limited to a maximum allowable load of 500 psf.

TABLE 3—EFFECTIVE SECTION PROPERTIES FOR U-PANEL

SECTION PROPERTIES						TOP IN COMPRESSION			BOTTOM IN COMPRESSION		
GAGE	F_y (ksi)	WEIGHT (psf)	V_a (kip/ft)	P_{a_end} (lbf/ft)	P_{a_int} (lbf/ft)	I_x (in^4/ft)	S_e (in^3/ft)	M_a (kip-in/ft)	I_x (in^4/ft)	S_e (in^3/ft)	M_a (kip-in/ft)
24	50	1.09	1.0997	426.63	629.13	0.0263	0.0514	1.5393	0.018	0.0459	1.3753
26	50	0.86	0.866	276.23	401.1	0.0193	0.0372	1.112	0.013	0.0321	0.9597
26	80	0.85	0.9537	314.65	455.98	0.0183	0.0346	1.2417	0.0123	0.0365	1.0577
29	80	0.67	0.5857	202.03	287.8	0.0127	0.0235	0.846	0.009	0.0208	0.747

For **SI:** 1 inch = 2.54 mm; 1 ksi = 6.89 MPa; 1 psf = 48 Pa.
1. Section properties are calculated in accordance with the AISI S100 for the Design of Cold-Formed Steel Structural Members.
2. V_a is the allowable shear
3. P_a is the allowable load for web crippling on end and interior supports using a bearing length of 2 inches (50 mm).
4. I_x is for deflection determination.
5. S_e is for bending.
6. M_a is the allowable bending moment.
7. All values are for one foot of panel width.

TABLE 4— ALLOWABLE UNIFORM NEGATIVE WIND LOAD FOR PBU-PANEL (PSF)

MATERIAL		SPAN (feet)																
GAGE	F_y (ksi)		1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
24	50	1 Span	424	238	152	106	77	59	47	38	31	26	22	19	16	14	13	11
		2 Span	432	250	162	113	83	64	50	41	34	28	24	21	18	16	14	12
		3 Span	500	307	200	140	104	80	63	51	42	35	30	26	23	20	17	16
		4 Span	496	288	188	131	97	74	59	48	39	33	28	24	21	18	16	14
26	50	1 Span	298	167	107	74	54	41	33	26	22	18	15	13	11	10	9	8
		2 Span	316	182	118	82	60	46	36	29	24	20	17	15	13	11	10	9
		3 Span	386	224	146	102	75	58	46	37	30	26	22	19	16	14	12	11
		4 Span	363	210	136	95	70	54	43	34	28	24	20	17	15	13	12	10
26	80	1 Span	329	185	118	82	60	46	36	29	24	20	17	15	13	11	10	9
		2 Span	351	202	131	92	67	52	41	33	27	23	19	17	14	13	11	10
		3 Span	427	249	162	114	84	64	51	41	34	29	24	21	18	16	14	12
		4 Span	402	234	152	106	78	60	48	38	32	27	23	19	17	15	13	12
29	80	1 Span	233	131	83	58	42	32	25	20	17	14	12	10	9	8	7	6
		2 Span	238	138	89	62	46	35	28	22	18	15	13	11	10	8	7	7
		3 Span	290	169	110	77	57	44	35	28	23	19	16	14	12	11	9	8
		4 Span	273	159	103	72	53	41	32	26	21	18	15	13	11	10	9	8

For **SI:** 1 inch = 2.54 mm; 1 ksi = 6.89 MPa; 1 psf = 48 Pa.
1. Allowable uniform loads are based upon equal lengths
2. Negative wind is wind suction or uplift and is NOT increased by 33-1/3 percent.
3. The weight of the panel has NOT been deducted from the allowable loads.
4. Negative wind values are limited to combined shear and bending using Eq. C3.3.1-1 of the AISI Specification.
5. Load Tables are limited to a maximum allowable load of 500 psf.

TABLE 5—EFFECTIVE SECTION PROPERTIES FOR PBU-PANEL

SECTION PROPERTIES						TOP IN COMPRESSION			BOTTOM IN COMPRESSION		
GAGE	F_y (ksi)	WEIGHT (psf)	V_a (lbf/ft)	P_{a_end} (lbf/ft)	P_{a_int} (lbf/ft)	I_x (in^4/ft)	S_e (in^3/ft)	M_a (kip-in/ft)	I_x (in^4/ft)	S_e (in^3/ft)	M_a (kip-in/ft
24	50	1.11	1.154	463.6	683.4	0.0267	0.052	1.56	0.0183	0.0479	1.433
26	50	0.88	0.9087	300.17	435.67	0.0197	0.0377	1.13	0.0133	0.0336	1.0067
26	80	0.88	0.9537	314.65	455.98	0.0183	0.0351	1.263	0.0127	0.0309	1.111
29	80	0.71	0.6353	219.6	312.6	0.013	0.024	0.8613	0.0093	0.0219	0.787

For **SI:** 1 inch = 2.54 mm; 1 ksi = 6.89 MPa; 1 psf = 48 Pa.

1. Section properties are calculated in accordance with the AISI S100 for the Design of Cold-Formed Steel Structural Members.
2. V_a is the allowable shear
3. P_a is the allowable load for web crippling on end and interior supports using a bearing length of 2 inches (5.08 mm).
4. I_x is for deflection determination.
5. S_e is for bending.
6. M_a is the allowable bending moment.
7. All values are for one foot of panel width.

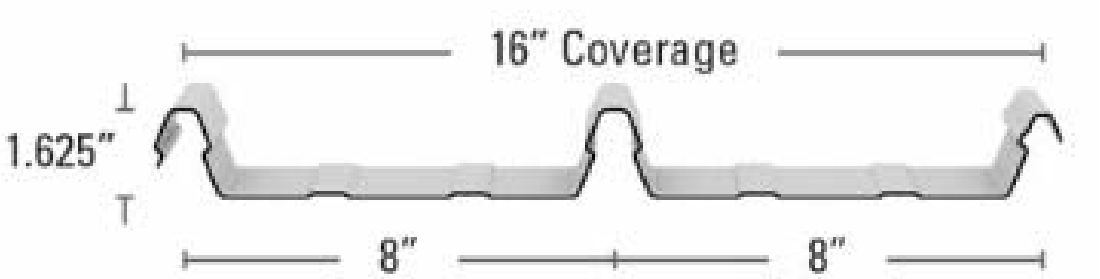

FIGURE 1—MIRAGE PANEL

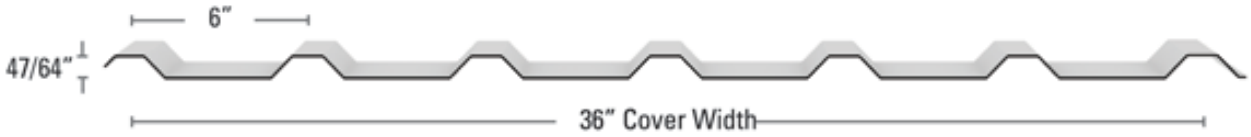

FIGURE 2—PBU-PANEL

FIGURE 3—U PANEL

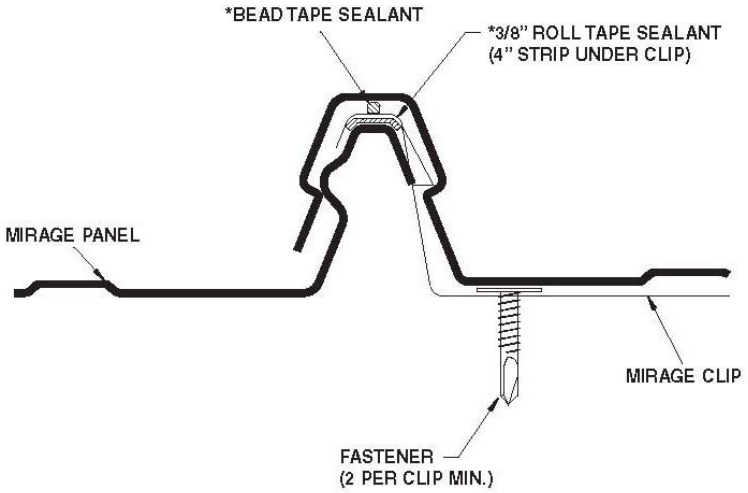

FIGURE 4 – MIRAGE SIDE LAP DETAIL

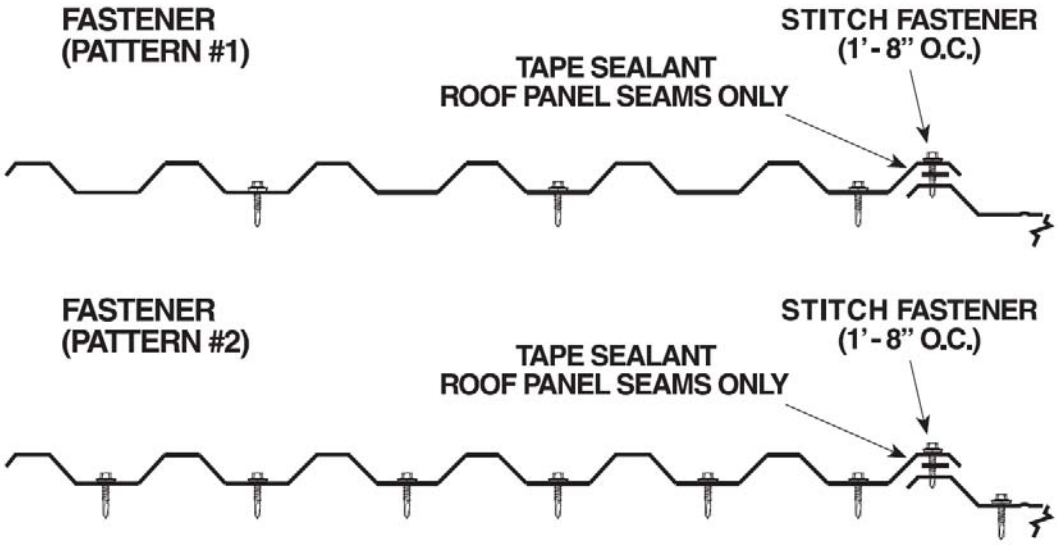

FIGURE 5 – TYPICAL FRAMING AND STITCH FASTENER PATTERNS