ICC Evaluation Service, Inc.
www.icc-es.org

Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543
Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800
Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2305

DIVISION: 05—METAL
Section: 05310—Steel Deck

DIVISION: 07—THERMAL AND MOISTURE PROTECTION
Section: 07410—Metal Roof and Wall Panels

REPORT HOLDER:

McELROY METAL, INC.
1500 HAMILTON ROAD
BOSSIER CITY, LOUISIANA 71111
(318) 747-8000
www.mcelroymetal.com
tjohnson@mcelroymetal.com

EVALUATION SUBJECT:

MIRAGE PANEL, U-PANEL AND PBU-PANEL

1.0 EVALUATION SCOPE

Compliance with the following code:

2006 *International Building Code*® (IBC)

Properties evaluated:

- Fire classification
- Structural
- Weather resistance

2.0 USES

Mirage Panels, U-Panels and PBU-Panels are used as Class A roof coverings on new roofs over solid or closely fitted sheathing. U-Panels and PBU-Panels are also used to support roof live, wind and snow loads when installed over spaced supports without sheathing.

3.0 DESCRIPTION

3.1 Mirage Panel:

The Mirage Panel is a standing seam steel roof panel that is pressure-formed from sheet steel having a design base-metal thickness of 0.0225 inch (0.57 mm) (No. 24 gage). The steel conforms to ASTM A 792, Grade 50B, with an aluminum-zinc alloy coating designation of AZ50 or AZ55. The panel is 16 inches wide (406 mm) with 1.591-inch-high (40.41 mm) profiles on 8-inch (203 mm) centers with two lower ribs located approximately equally between the taller profiles. The panels are delivered to the job already formed in lengths from 3 to 50 feet long (0.9 m to 15.2 m). See Figure 1 for further profile details.

3.2 U-Panel and PBU-Panel:

The U-Panel and PBU-Panel are corrugated steel roof panels that are pressure-formed from 0.0225-inch-thick (0.57 mm) (No. 24 gage) design base-metal thickness, 0.0177-inch-thick (0.45 mm) (No. 26 gage) design base-metal thickness or 0.0141-inch-thick (0.36 mm) (No. 29 gage) design base-metal thickness cold-formed sheet steel. The steel conforms to ASTM A 792, Grade 50B or Grade 80, with an aluminum-zinc alloy coating designation of AZ50. The panel is 36 inches wide (914 mm) with 0.7344-inch-high (18.65 mm) repeating corrugations on 6-inch centers (152 mm). The U-Panel and the PBU-Panel are similar except the PBU-Panel has a purlin-bearing edge on one of the outside edges to give support to the corrugation at the side lap. The panels are delivered to the job already formed in lengths from 3 feet to 45 feet (0.9 m to 13.7 m) long. See Figures 2 and 3 for further profile details.

3.3 Fasteners and Clips:

The following fasteners and clips are components of the roof covering system:

3.3.1 Mirage Clip: The Mirage clip is pressure-formed steel complying with ASTM A 653 SS Grade 50 or ASTM A 792 SS Grade 50 having a 0.0338-inch (0.86 mm) (No. 20 gage) minimum design base-metal thickness.

3.3.2 Screw Fasteners: Screw fasteners used to attach the Mirage clip to sheathing or supports are corrosion-resistant, No. 10, pancake head steel screws. The fasteners used to directly attach PBU- and U-Panels to sheathing or supports are corrosion-resistant, No. 12, self-drilling steel screws.

4.0 DESIGN AND INSTALLATION

4.1 Mirage Panel:

4.1.1 General: The Mirage roof panel must be installed over solid sheathing or closely fitted sheathing complying with the IBC. The panels must be installed on roofs having a minimum slope of 2:12 (16.67%). The solid or closely fitted sheathing must be covered with a minimum of one layer of Type II felt underlayment, installed in accordance with the IBC.

4.1.2 Design: The allowable wind uplift loads for the Mirage panels are indicated in Table 1. Positive wind and live loads must be carried by the sheathing material. Allowable stress increases are not permitted.

4.1.3 Installation: Anchor clips, called Mirage clips, are supplied by McElroy Metal, Inc., along with the Mirage panels. Each clip must be secured through the roof sheathing to the steel support [minimum 54-mil thickness (No. 16 gage) with minimum yield strength of 55 ksi] using two No. 10-16 by 1-inch-long (25.4 mm) pancake head screws per clip, with the clips spaced according to spans in Table 1 of this report. Sealant must be applied to the side lap joints for roof slope of 2:12 to 3:12 (16.67% to 25% slope). Panels must be installed in single sheets with no end laps.

4.2 U-Panels and PBU-Panels:

4.2.1 General: The U and PBU roof panels are installed over solid or closely fitted sheathing complying with the IBC, or

over spaced supports. The panels are installed on roofs having a minimum slope of 2:12 (16.67% slope). The solid or spaced sheathing must be covered with a minimum of one layer of Type II felt underlayment, installed in accordance with the IBC.

4.2.2 Design: The allowable wind uplift loads and section properties for the U-Panels are indicated in Tables 2 and 3. The allowable wind uplift loads and section properties for the PBU-Panels are indicated in Tables 4 and 5. Allowable stress increases must not be permitted. The allowable loads due to positive wind pressure, uniform live loads and concentrated live loads over spaced framing must be designed using AISI-NASPEC design specifications and the section properties given in Tables 2 and 4 of this report.

4.2.3 Installation: U-Panels and PBU-Panels must be secured through the roof sheathing (if sheathing is applicable) to the supporting steel framing [minimum 54- mil thickness (16 gage)] using No. 12-14 by $1^1/_4$-inch-long (32 mm), HWH self-drilling tapping screws, with the framing spaced according to spans in Tables 3 and 5. Sealant must be applied to the side lap joints for roof slopes of 2:12 to 3:12 (16.67% to 25% slope). Panels are installed in single sheets with no end laps. The two ends of the panels are fastened to the supporting steel with one screw placed between each corrugation of the panel. For interior fasteners, a screw is placed between every other corrugation. In both cases, stitch fasteners are placed 1 foot 8 inches (508 mm) apart in the top of the corrugation on the side laps. See Figure 4 for details of the fastener patterns.

4.3 Fire Classification:

Mirage Panels, U-Panels and PBU-Panels, when installed in accordance with Section 4.1 or 4.2, are components of Class A roof coverings under IBC Section 1505.2.

4.4 Accessories:

Accessories such as gutters, drip angles, fascias, ridge caps, window or gable trim, valley and hip flashings, etc., are fabricated to suit each job condition. Details must be submitted to the code official for each installation.

5.0 CONDITIONS OF USE

The Mirage Panels, U-Panels and PBU-Panels described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Panels must be manufactured, identified and installed in accordance with this report and the manufacturer's published instructions. When the manufacturer's published installation instructions differ from this report, this report governs.

5.2 The roofing system is limited to a minimum slope of 2:12 (16.67% slope).

5.3 For each installation, justifying calculations for anchor clip placement and details for ridge, valley, hip and other flashing must be submitted to the code official for approval. The drawings and calculations must be prepared by a registered design professional when required by the statutes of the jurisdiction in which the project is to be constructed.

5.4 Panels used as components of horizontal diaphragms are outside the scope of this report.

5.5 The sealant used at the panel joints is to be approved by the code official.

5.6 This report is limited to the Mirage Panels, U-Panels and PBU-Panels manufactured at the McElroy Metals, Inc., Adelanto, California, manufacturing facility.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Metal Roof Coverings (AC166), dated May 2008.

6.2 Data in accordance with Section 3.2.1 of the ICC-ES Acceptance Criteria for Steel Decks (AC43), dated February 2008.

7.0 IDENTIFICATION

Each pallet of panels must be labeled with the McElroy Metals, Inc., name and address, the product name, the base-metal thickness, the steel strength and the evaluation report number (ESR-1600).

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

MATERIAL		SPAN (feet)							
GAGE	F_y	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
24	50	98	88	83	78	74	68	64	59

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

Allowable uniform uplift loads are based upon the panel having equal span lengths between clips.

TABLE 2—EFFECTIVE SECTION PROPERTIES FOR U-PANELS

SECTION PROPERTIES						TOP IN COMPRESSION			BOTTOM IN COMPRESSION		
GAGE	F_y (ksi)	WEIGHT (psf)	V_a (lbs/ft.)	P_{a_end} (lbs/ft.)	P_{a_int} (lbs/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	1.1046	380.99	634.37	0.0267	0.0519	1.5547	0.0183	0.0463	1.3857
26	50	0.87	0.8708	236.29	405.37	0.0197	0.0376	1.1243	0.0133	0.0324	0.9687
26	80	0.87	1.0216	283.55	486.44	0.0190	0.0363	1.3043	0.0130	0.0310	1.1130
29	80	0.70	0.6483	176.72	316.94	0.0140	0.0259	0.9297	0.0097	0.0225	0.8087

For **SI:** 1 inch = 2.54 mm; 1 ksi = 6.89 MPa; 1 lb./ft. = 14.5939 N/m; 1 inch-kips = 12.8 N-m; 1 lb. = 4.448 N; 1 psf = 48 Pa.

1. Section properties are calculated in accordance with the 2001 AISI-NAS with the 2004 supplement.
2. V_a is the allowable shear.
3. P_a is the allowable load for web crippling on end and interior supports with bearing length of 2 inches.
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 1 foot of panel width.

TABLE 3—ALLOWABLE UNIFORM UPLIFT FOR U-PANELS (psf)

MATERIAL		SPAN (feet)							
GAGE	F_y	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
24	50	114	108	102	96	91	85	79	73
26	50	111	103	94	85	77	68	59	51
26	80	115	108	101	94	86	79	72	65
29	80	112	103	95	86	78	69	61	52

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

Allowable uniform uplift loads are based upon the panel having equal span lengths between clips.

TABLE 4—EFFECTIVE SECTION PROPERTIES FOR PBU-PANELS

SECTION PROPERTIES						TOP IN COMPRESSION			BOTTOM IN COMPRESSION		
GAGE	F_y (ksi)	WEIGHT (psf)	V_a (lbs/ft.)	P_{a_end} lbs/ft.	P_{a_int} (lbs/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	1.1590	414.23	689.08	0.0267	0.0521	1.5600	0.0187	0.0483	1.4467
26	50	0.88	0.9138	256.95	440.33	0.0197	0.0380	1.1373	0.0137	0.0339	1.0163
26	80	0.88	1.0965	308.35	528.4	0.0193	0.0367	1.3190	0.0133	0.0325	1.1693
29	80	0.71	0.7036	192.22	344.28	0.0143	0.0263	0.9437	0.0100	0.0237	0.8523

For **SI:** 1 inch = 2.54 mm; 1 ksi = 6.89 MPa; 1 lb./ft. = 14.5939 N/m; 1 inch-kips = 12.8 N-m; 1 lb. = 4.448 N; 1 psf = 48 Pa.

1. Section properties are calculated in accordance with the 2001 AISI-NAS with the 2004 supplement.
2. V_a is the allowable shear.
3. P_a is the allowable load for web crippling on end and interior supports with bearing length of 2 inches.
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 1 foot of panel width.

TABLE 5—ALLOWABLE UNIFORM UPLIFT FOR PBU-PANELS (psf)

MATERIAL		SPAN (feet)							
GAGE	**F_y**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**
24	50	114	108	102	96	91	85	79	73
26	50	111	103	94	85	77	68	59	51
26	80	115	108	101	94	86	79	72	65
29	80	112	103	95	86	78	69	61	52

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

Allowable uniform uplift loads are based upon the panel having equal span lengths between clips.

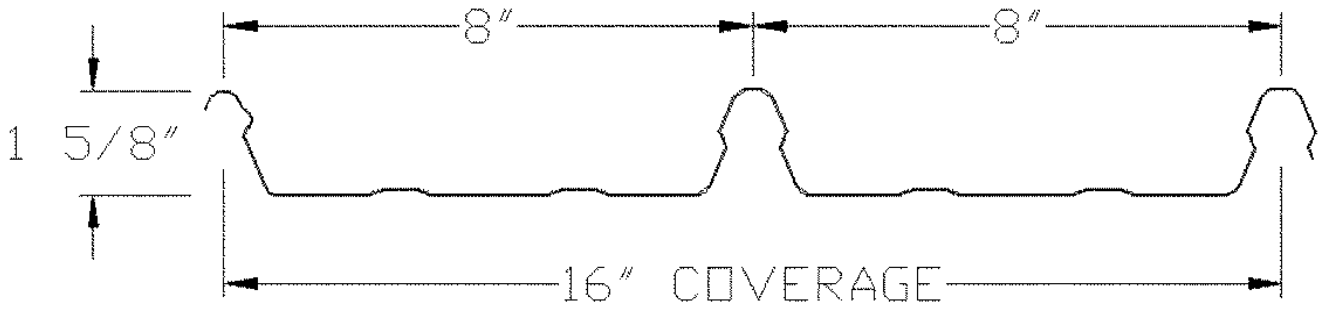


FIGURE 1—MIRAGE PANEL

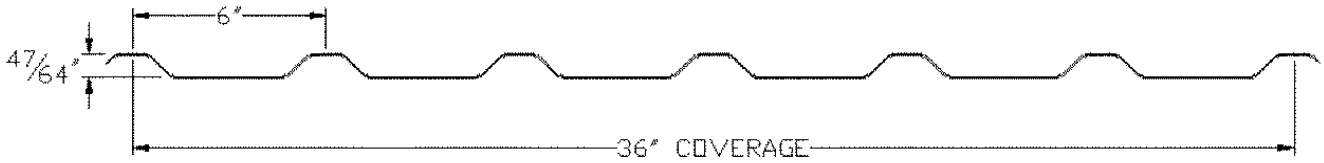


FIGURE 2—U-PANEL 24

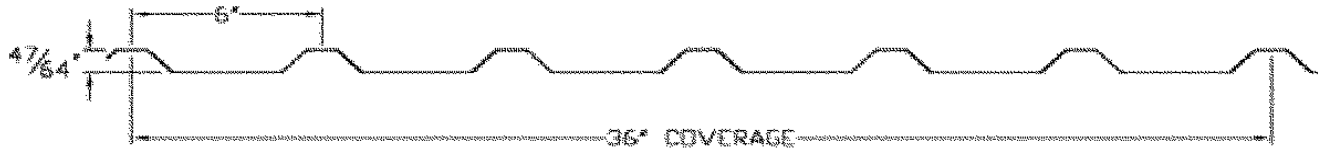
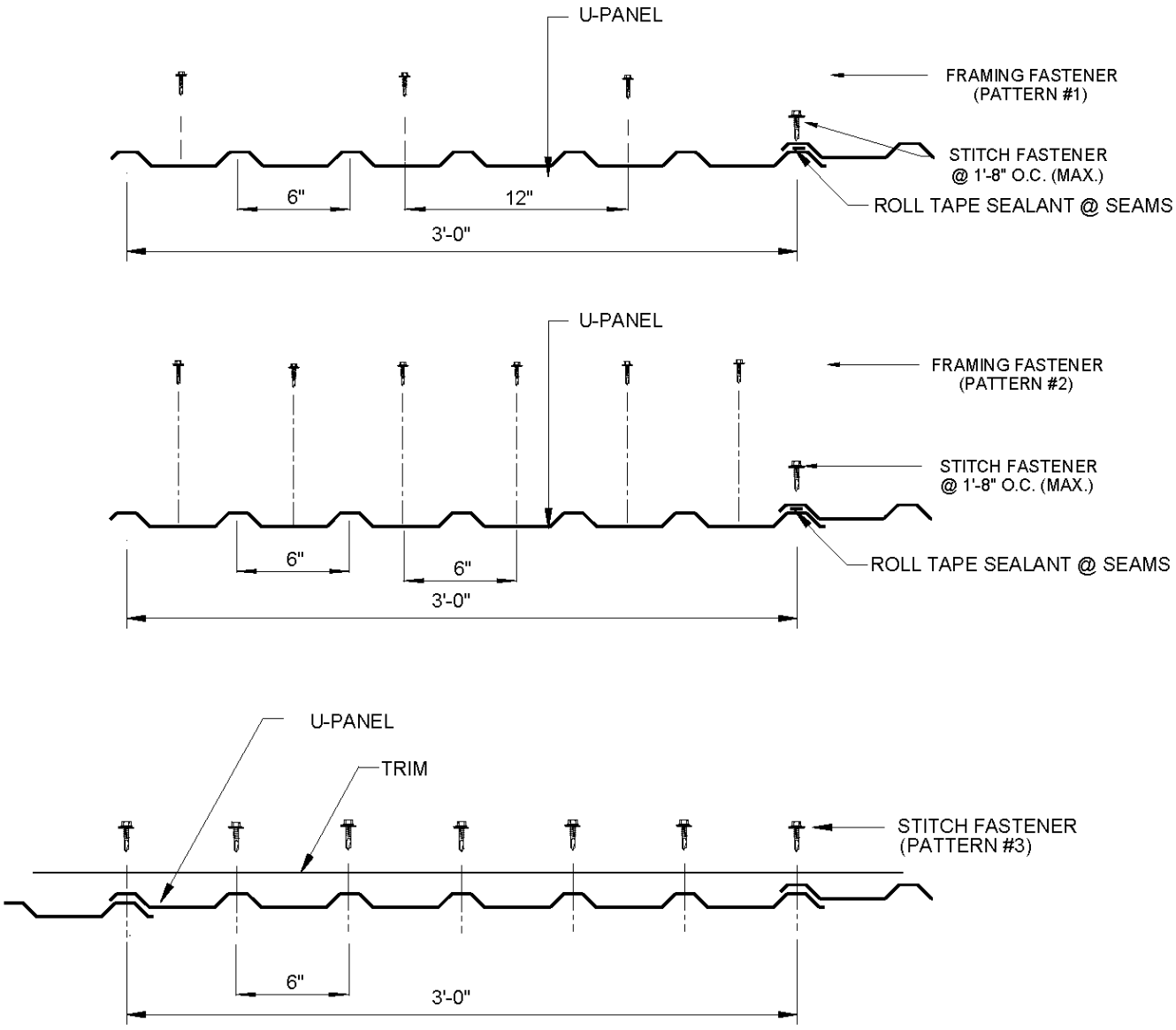


FIGURE 3—PBU-PANEL 24



NOTE: TAPE SEALANT ON WALL SEAMS AND BOTH SIDES OF CLOSURE IS OPTIONAL.

FIGURE 4—TYPICAL FRAMING AND STITCH FASTENER PATTERNS