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# ICC-ES Report

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# ESR-1627

Reissued 12/2016  
This report is subject to renewal 12/2017.

**DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION**  
**SECTION: 07 44 00—FACED PANELS**

**REPORT HOLDER:**

**KMEW CO., LTD.**

**13F CRYSTAL TOWER, 1-2-27 SHIROMI, CHUO-KU  
OSAKA, 540-6013  
JAPAN**

**EVALUATION SUBJECT:**

**CERACLAD RAIN SCREEN SYSTEM: FIBER-REINFORCED CEMENT EXTERIOR  
WALL PANEL SYSTEM**



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# ICC-ES Evaluation Report

**ESR-1627**

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**1.0 EVALUATION SCOPE**

**1.1 Compliance with the following codes:**

- 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2012, 2009 and 2006 *International Residential Code*® (IRC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)<sup>†</sup>

<sup>†</sup>The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

**Properties evaluated:**

- Durability
- Transverse loading
- Exterior wall covering
- Fire-resistive-rated construction

**1.2 Evaluation to the following green code(s) and/or standards:**

- 2013 California Green Building Standards Code (CALGreen), Title 24, Part 11
- 2012 and 2008 ICC 700 *National Green Building Standard*™ (ICC 700-2012 and ICC 700-2008)

**Attributes verified:**

- See Section 3.1

**2.0 USES**

The CERACLAD Rain Screen System is an alternative exterior wall covering to those materials described in IBC Section 1405.2, and IRC Section R703.1. The CERACLAD Rain Screen System may be used as a component of a fire-resistance-rated wall assembly when installed in accordance with Section 4.3 of this report.

**3.0 DESCRIPTION**

**3.1 General:**

The CERACLAD Hollow Core and CERACLAD Solid Core Rain Screen System consists of ceramic-coated, extruded,

fiber-reinforced cement panels and mounting clips installed over code-complying solid sheathing attached to wood framing or steel studs. The reinforced fiber cement panels comply with ASTM C1186, Type A. The CERACLAD panels are supplied with standard mounting hardware, which includes hot dip zinc-aluminum-magnesium (ZAM) alloy coated steel mounting clips, screws, and galvanized steel starter bars.

The attributes of the cladding panels have been verified as conforming to the requirements of (i) 2013 CALGreen Section A4.405.1.3 for prefinished building materials and Section A5.406.1.2 for reduced maintenance; (ii) ICC 700-2012 Sections 601.7, 11.601.7, and 12.1(A).601.7 for site-applied finishing materials; and (iii) ICC 700-2008 Section 601.7 for site-applied finishing materials. Note that decisions on compliance for those areas rest with the user of this report. The user is advised of the project-specific provisions that may be contingent upon meeting specific conditions, and the verification of those conditions is outside the scope of this report. These codes or standards often provide supplemental information as guidance.

**3.2 Materials:**

**3.2.1 CERACLAD Panels:** The panels are manufactured primarily from portland cement, silica sand and fly ash reinforced with polypropylene fiber and pulp, and coating materials mixed and applied respectively in accordance with the specifications and procedures described in the approved quality control manual. The exposed face is finished with baked-on ceramic. The panels are available in various architectural surface profiles and colors. Panel dimensions and weights must be as shown in Table 1.

**3.2.2 Fasteners:** The panels must be fastened to supports using CERACLAD No. 22 gage [0.03 inch (0.8 mm)] mounting clips, which provide a <sup>3</sup>/<sub>16</sub>-inch (5 mm) or <sup>9</sup>/<sub>16</sub>-inch (15 mm) drainage space between the back of the panels and the sheathing. The mounting clips are made from hot dip ZAM alloy coated steel, complying with ASTM A924. Mounting clips are secured with screws supplied by the manufacturer. The appropriate number, size and type of screw required for each mounting clip for a given assembly are described in Table 2.

**3.2.3 Starter Bars:** The panels must be installed with supplied vented galvanized steel starter bars having a minimum G90 galvanized coating. The vented starter bar is available in a standard length of 120 inches (3030 mm).

**3.2.4 Water-resistive Barrier:** A water-resistive barrier complying with IBC Section 140.2 or IRC Section R703.2 must be used in conjunction with the CERACLAD Rain Screen System.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design:

The framing and sheathing must be designed to resist loads in accordance with the applicable code. When the CERACLAD Hollow and Solid Core Rain Screen System is installed in accordance with Section 4.2 of this report, allowable positive and negative transverse loads for the CERACLAD panels are listed in Table 2.

### 4.2 Installation:

**4.2.1 General:** The CERACLAD Hollow and Solid Core Rain Screen System must be installed in accordance with the applicable code, this evaluation report (see Figure 1) and the manufacturer's published installation instructions.

**4.2.2 Panel Attachment:** Wood framing must be nominally 2 inches wide, minimum, with a minimum specific gravity of 0.42 and maximum spacing of 24 inches (610 mm) or minimum  $3\frac{5}{8}$ -inch-by- $1\frac{5}{8}$ -inch (92 mm by 41 mm) 20 gage steel studs with a maximum spacing of 16 inches (406 mm).

The CERACLAD panels are installed over solid sheathing or framing in accordance with Table 2. A code-complying wood-based sheathing, when required, must be installed over the framing and attached as required by the applicable code. A water-resistive barrier, as described in Section 3.2.4 of this report, must be installed over the sheathing.

**4.2.2.1 Horizontal Application:** CERACLAD panels must be installed by providing vented galvanized steel starter bars described in Section 3.2.3 of this report, at the base of the wall over the ground sill flashing for the first course of each floor assembly. The vented starter bars must be installed over intermediate flashing.

The CERACLAD panels must be installed horizontally over wood studs or wood-based sheathing. The mounting clips are fastened to the building structural framing assembly using No. 9, stainless steel wood screws at the middle of the clip. The mounting clips must be installed on every stud, and along the stud at 18 inches (457 mm) on center or at every panel width. Where installation of clips does not coincide with wall framing, such as at vertical panel joints over studs, clips may be fastened directly to minimum  $\frac{1}{2}$ -inch-thick wood sheathing, where applicable.

The first horizontal CERACLAD panel must be installed by working from a corner. The leading edge of the panel, which is the edge with the concealed groove, should sit squarely on the lower lip of the vented starter bar. The top edge of the panel with the shiplap edge accepts the mounting clips for the next panel course. The mounting clips must be installed along the top edge of the panel with spacing described above. Working up the wall, the next panel course must be installed with V-groove profile panel edges squarely sitting into the upper section of the mounting clips. The next row of mounting clips must be mounted to the horizontal top edge (shiplap profiles) of the panel below, and installation continues until the remaining CERACLAD panels are installed. Joints must occur over framing members. The vertical joints of the CERACLAD panels must be provided with a  $\frac{3}{8}$ -inch (10 mm) gap and must be caulked or capped.

When panels are to be butted next to trims, a  $\frac{3}{8}$ -inch (10 mm) gap is required, to allow for panel and/or trim movement. Panels must fit completely within the trim, with no exposed edges. Exposed field cuts must be end-sealed with the manufacturer's approved sealant.

**4.2.2.2 Vertical Application:** CERACLAD panels may be installed vertically over minimum  $\frac{1}{2}$ -inch-thick wood structural panel sheathing fastened in accordance with the

code to 16-inch-on-center wood or steel studs. Installation must be in accordance with Table 2. Starter bars must be fastened horizontally  $1\frac{9}{16}$  inches (40 mm) above the groundsill flashing using 1-inch-long (25.4 mm), No. 9, stainless steel wood screws spaced a maximum of 16 inches (406 mm) on center horizontally. Vertical wood strips consisting of  $\frac{9}{16}$ -inch-by-4-inch (15 mm by 100 mm) pressure-treated wood furring strips are fastened to outside and inside corners in accordance with the manufacturer's installation instructions. CERACLAD panels are placed onto the starter bar with the long dimension spanning vertically. Panel clips are installed on the panel edges and fastened to sheathing using 1-inch-long (25 mm) or  $2\frac{3}{16}$ -inch-long (55 mm), as applicable, No. 9, stainless steel screws. Panel clips are spaced 16 inches (406 mm) on center vertically.

### 4.3 One-hour Fire-resistance-rated Wall Assembly:

The CERACLAD Rain Screen System may be used as a component of a one-hour fire-resistance-rated wall assembly as described in this evaluation report.

#### 4.3.1 First Assembly:

**4.3.1.1 Interior Face:** One layer of minimum  $\frac{5}{8}$ -inch-thick (15.9 mm), Type X gypsum wallboard complying with ASTM C36 or ASTM C1396 is installed on the interior side of minimum nominally 2-by-4 Douglas fir wood studs spaced a maximum of 16 inches (406 mm) on center. The wallboard is attached with  $1\frac{5}{8}$ -inch-long (41 mm), No. 6 drywall screws located 6 inches (152 mm) on center at wallboard edge joints and 12 inches (305 mm) on center in the field of the wallboard. Wallboard joints must be backed by minimum nominally 2-by-4 wood framing, taped and treated with joint compound in accordance with ASTM C840 or GA-216. Fastener heads must also be treated with joint compound in accordance with ASTM C840 or GA-216.

**4.3.1.2 Exterior Face:** One layer of  $\frac{1}{2}$ -inch-thick (12.7 mm) oriented strand board (OSB) sheathing complying with DOC Standard PS-2 is fastened on the exterior face of the wall using 2-inch-long (50.4 mm), minimum 6d common nails every 12 inches (305 mm) on center. The OSB is covered with one layer of  $\frac{5}{8}$ -inch-thick (15.9 mm), Type X, water-resistant core-treated gypsum sheathing, complying with ASTM C79 or ASTM C1396, fastened with 2-inch-long (50.4 mm) No. 6 drywall screws located at 6 inches (152 mm) on center at board edges and 12 inches (305 mm) on center in field areas of the board. Minimum No. 15, asphalt-saturated nonperforated felt complying as Type I, in accordance with ASTM D226 (IBC or IRC), is applied on the exterior side of the gypsum sheathing. CERACLAD panels are installed on the exterior side of the wall with vertical joints located over studs in accordance with this report.

**4.3.1.3 Design Stresses:** The design axial compressive stresses within the studs must be limited to the least of the following:

- 419 psi.
- $0.70 F'_c$ .
- $0.70 F'_c$ , where  $F'_c$  is calculated assuming a slenderness ratio of 29.6.

#### 4.3.2 Second Assembly:

**4.3.2.1 Interior Face:** One layer of minimum  $\frac{5}{8}$ -inch-thick (15.9 mm) Type X gypsum wallboard complying with ASTM C36 or ASTM C1396 is installed on the interior side of minimum nominally 2-by-4 Douglas fir wood studs spaced a maximum of 16 inches (406 mm) on center. The wallboard is attached with  $1\frac{5}{8}$ -inch-long (41 mm), No. 6 drywall screws located 6 inches (152 mm) on center at

wallboard edge joints and 12 inches (305 mm) on center in the field of the wallboard. Wallboard joints must be backed by minimum nominally 2-by-4 wood framing, taped and treated with joint compound in accordance with ASTM C840 or GA-216. Fastener heads must also be treated with joint compound in accordance with ASTM C840 or GA-216.

**4.3.2.2 Exterior Face:** One layer of 5/8-inch-thick (15.9 mm), Type X, water-resistant core-treated gypsum sheathing, complying with ASTM C79 or ASTM C1396, fastened with 1 5/8-inch-long (41 mm) No. 6 drywall screws located at 6 inches (152 mm) on center at board edges and 12 inches (305 mm) on center in field areas of the board. Minimum No. 15, asphalt-saturated nonperforated felt complying as Type I in accordance with ASTM D226 (IBC or IRC) is applied on the exterior side of the wall. CERACLAD panels are installed on the exterior side of the wall with vertical joints located over studs in accordance with this report.

**4.3.2.3 Design Stresses:** The design axial compressive stresses within the studs must be limited to the least of the following:

- a. 229 psi.
- b. 0.38 F'c.
- c. 0.38 F'c, where F'c is calculated assuming a slenderness ratio of 29.6.

**5.0 CONDITIONS OF USE**

The CERACLAD Rain Screen System described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

**5.1** The products must be manufactured, identified and

installed in accordance with this report, the manufacturer's published instructions and the applicable code. In the event of a conflict between the manufacturer's published installation instructions and this report, this report governs.

- 5.2** A water-resistive barrier, as described in Section 3.2.4 of this report, must be installed over the sheathing assembly as required by the applicable code.
- 5.3** The CERACLAD Rain Screen System must be limited to applications where Type V construction is permitted.
- 5.4** The allowable transverse loads must be as set forth in Table 2 and Section 4.1 of this report.
- 5.5** The CERACLAD Rain Screen System is manufactured by KMEW Co., Ltd., at their facilities in Iga Ueno, Mie, Japan; Ohama, Osaka, Japan; and Ashikaga, Tochigi, Japan, under a quality control program with inspections by ICC-ES.

**6.0 EVIDENCE SUBMITTED**

- 6.1** Data in accordance with the ICC-ES Acceptance Criteria for Fiber Cement Siding Used as Exterior Wall Siding (AC90), dated June 2012 (editorially revised November 2013).
- 6.2** Reports of testing in accordance with ASTM E119.

**7.0 IDENTIFICATION**

The CERACLAD Hollow and Solid Core Rain Screen System panels and boxes of accessories are labeled with the name and address of the manufacturer (KMEW Co., Ltd.); the product name; and the evaluation report number (ESR-1627).

**TABLE 1—CERACLAD PANEL DIMENSIONS**

	HOLLOW CORE				SOLID CORE			
	Thickness	Length	Height	Weight (lbs)	Thickness	Length	Height	Weight (lbs)
Caulking Joint	5/8"	9' - 11 1/4"	18"	42	5/8"	9' - 11 1/4"	18"	60

For **SI**: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 lbs = 0.4536 kg.

**TABLE 2—ALLOWABLE TRANSVERSE LOADS<sup>1,2</sup>**

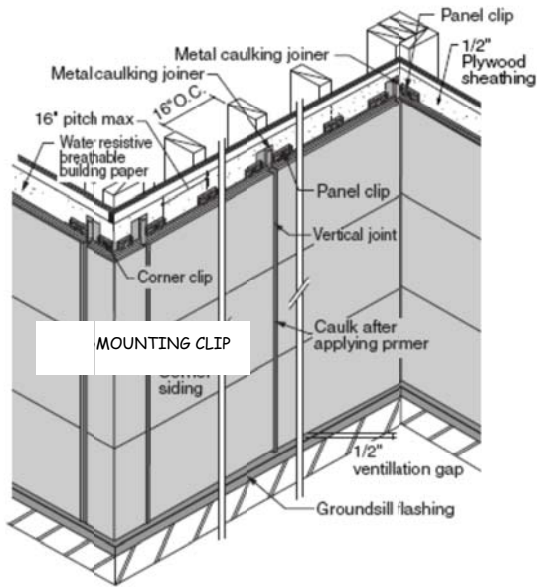
CERACLAD PANEL TYPE Solid Core		
Wall Assembly	CERACLAD Assembly	Allowable positive and negative loads
2x4 wood studs 24" o.c. no sheathing	Horizontal application 1" No. 9 screw per clip, clip placed 24" o.c. directly to wood stud	21 psf
CERACLAD PANEL TYPE Hollow Core		
Wall Assembly	CERACLAD Assembly	Allowable positive and negative loads
2x4 wood stud framing 16" o.c. with 1/2" plywood sheathing	Horizontal application 1" No. 9 screw per clip, clip placed 16" o.c. attached through plywood sheathing to wood stud	18 psf
2x4 wood stud framing 16" o.c. with 1/2" plywood sheathing, and 5/8" Densglass Gold over plywood	Horizontal application 2 3/16" No. 9 screw per clip, clip placed 16" o.c. attached through plywood and DensGlass Gold sheathing to wood stud	22 psf
3 5/8" x 1 5/8" 20GA steel stud 16" o.c., 5/8" DensGlass Gold Sheathing, 1/2" plywood furring strips attached to steel studs	Horizontal application 1" No. 9 screw 2 per clip, clip placed 16" o.c. attached to plywood furring	18 psf
2x4 wood stud framing 16" o.c. with 1/2" plywood sheathing	Vertical application 1" No. 9 screws 2 per clip attached into plywood sheathing	20 psf
2x4 wood stud framing 16" o.c. with 1/2" plywood sheathing and 5/8" Densglass Gold over plywood	Vertical application 2 3/16" No. 9 screws 2 per clip attached into plywood sheathing through DensGlass Gold	20 psf

For **SI**: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 psf = 47.88 Pa.

<sup>1</sup>Fastener must penetrate minimum 1 inch into wood framing.

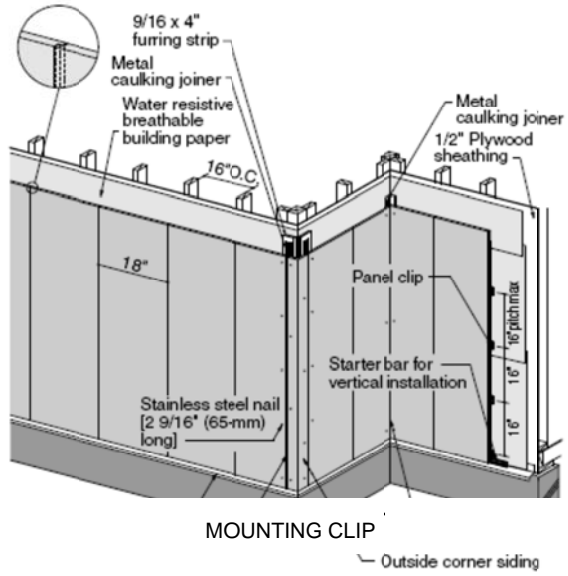
<sup>2</sup>Installation of CERACLAD panels must comply with Section 4.2 of this report.

1



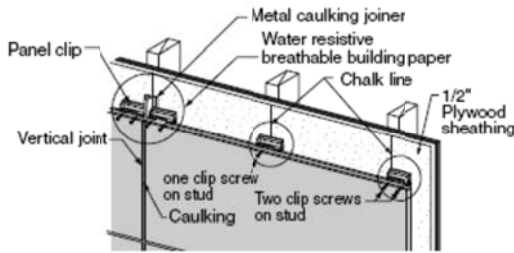
MOUNTING CLIP

3

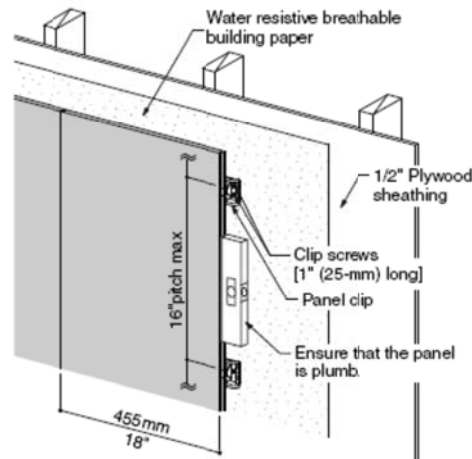


MOUNTING CLIP

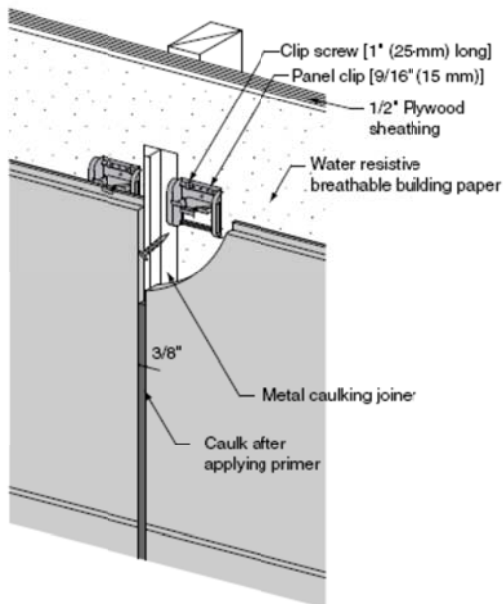
Outside corner siding



4



2



5

[Key points of the ventilation structure]

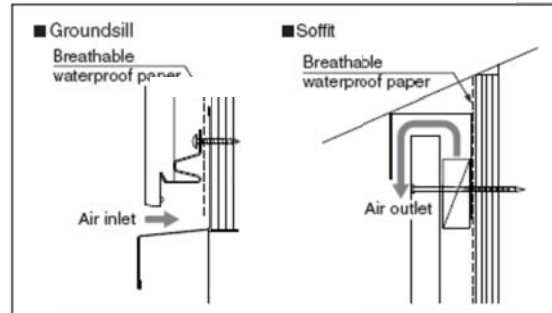


FIGURE 1—PANEL INSTALLATION