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# ICC-ES Report

## ESR-1421

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Reissued 01/2016  
This report is subject to renewal 01/2018.

**DIVISION: 06 00 00—WOOD PLASTICS AND COMPOSITES**

**SECTION: 06 16 00—SHEATHING**

**REPORT HOLDER:**

**WARMBOARD, INC.**

8035 SOQUEL DRIVE #41A  
APTOS, CA 95003

**EVALUATION SUBJECT:**

**WARMBOARD-S™ RADIANT-FLOOR HEATING PANEL**



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# ICC-ES Evaluation Report

**ESR-1421**

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**DIVISION: 06 00 00—WOOD PLASTICS AND  
COMPOSITES**
**Section: 06 16 00—Sheathing**
**REPORT HOLDER:**
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**EVALUATION SUBJECT:**
**WARMBOARD-S RADIANT-FLOOR HEATING PANEL**

## 1.0 EVALUATION SCOPE

**Compliance with the following codes:**

- 2015, 2012, 2009, and 2006 *International Building Code*® (IBC)
- 2015, 2012, 2009, and 2006 *International Residential Code*® (IRC)
- 1997 *Uniform Building Code*™ (UBC)

**Properties evaluated:**

- Span rating
- Diaphragm construction

## 2.0 USES

Subfloor sheathing to accommodate radiant floor tubing.

## 3.0 DESCRIPTION

Warmboard-S radiant-floor heating panels are used as subfloor sheathing, and have grooves to accommodate radiant-floor tubing. Warmboard-S panels are manufactured from APA-rated Sturd-I-Floor plywood from approved sources identified in Warmboard's quality documentation. The panels have a nominal thickness of 1<sup>1</sup>/<sub>8</sub> inches (28.6 mm) and a minimum thickness of 1.065 inches (27.05 mm). The panels are 4 feet by 8 feet (1219 mm by 2438 mm) and have tongue-and-groove edges. One face of each panel has channel grooves routed into the face surface, to accommodate radiant-floor tubing. Grooves are approximately 0.69 inch (17.5 mm) deep and 0.68 inch (17.3 mm) wide, and are spaced 12 inches (305 mm) on center, parallel to the length of the panel, and 6 inches from the panel edge. Nine inches (229 mm) from the panel end, the grooves bend at

90 degrees and 180 degrees to permit the radiant-floor tubing to return to the field of the panel. Panels have an overlay of 0.025-inch-thick (0.64 mm) aluminum bonded to the grooved surface.

Two square-profile slots (<sup>3</sup>/<sub>8</sub> inch deep and wide) (9.5 mm) are permitted to be factory-routed into the back side of the panels at both ends. Each slot is 5<sup>1</sup>/<sub>2</sub> inches (139.7 mm) long and located 11<sup>5</sup>/<sub>8</sub> inches (295.3) from each edge.

## 4.0 DESIGN

### 4.1 Allowable Spans and Loads:

Warmboard-S is a wood structural panel meeting the requirements of 2015 IBC Section 2303.1.5, 2012, 2009, and 2006 IBC Section 2303.1.4, 2015, 2012, 2009, and 2006 IRC Section R503.2, and UBC Standard 23-3, DOC PS-2, and UBC Section 2312. The single-floor panel span rating is 24 inches (610 mm) on center. The span rating applies to panels at least 24 inches (610 mm) wide. The allowable total and live loads at the maximum 24-inch (610 mm) span are 110 psf (5.3 kN/m<sup>2</sup>) and 100 psf (4.2 kN/m<sup>2</sup>), respectively. The span rating and allowable loads are based on panels installed with the grooves and the panel strength axis are perpendicular to the joists. Panels must be installed with grooves perpendicular to the joists.

### 4.2 Allowable Diaphragm Values:

Warmboard-S panels used in horizontal diaphragms may be used to resist horizontal forces not exceeding those set forth in Table 1 of this report for UBC and Table 2 of this report for 2015, 2012, 2009, and 2006 IBC. The general requirements for horizontal diaphragms specified in 2015, 2012, 2009, and 2006 IBC Sections 2305.2, 2015, 2012, and 2009 IBC Section 2306.2, 2006 IBC Sections 2306.3.1 and 2306.3.2, and UBC Section 2315.1, are applicable to Warmboard-S panels.

### 4.3 Installation:

The dimension of the framing member to which the Warmboard™ panel is attached must be at least 2 inches (nominal). Panel edges must be butted together and centered over the framing members. Nails must be placed not less than <sup>3</sup>/<sub>8</sub> inch (9.5 mm) in from the panel edge; must be spaced not more than 6 inches (152 mm) on center along panel edge bearings; and must be firmly driven into the framing members. A floor finish material recommended by Warmboard, Inc., must be installed over the Warmboard-S panel.

## 5.0 CONDITIONS OF USE

The Warmboard-S radiant-floor heating panel 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 Warmboard-S panels are limited to use as structural subflooring or as combined subfloor underlayment.
- 5.2 The panels are installed in accordance with this report.
- 5.3 Allowable spans, loads and diaphragm capacities comply with this report.
- 5.4 The panels are manufactured for Warmboard-S in Willits, California, under a quality-control program with inspections by ICC Evaluation Service, LLC.

**6.0 EVIDENCE SUBMITTED**

- 6.1 Data in accordance with UBC Standard 23-3 and DOC PS-2.
- 6.2 A quality control manual.

**7.0 IDENTIFICATION**

Each panel must bear a stamp identifying the evaluation report holder (Warmboard, Inc.), product name (Warmboard-S), span rating (24 o.c.), nominal panel thickness (1 1/8 inches), Exposure 1 rating, evaluation report number (ESR-1421), the mill number (487), and the inspection agency (ICC-ES). See Figure 3 for details.

**TABLE 1 – ALLOWABLE SHEAR (in pounds per foot) FOR HORIZONTAL WOOD STRUCTURAL WARMBOARD™ PANEL DIAPHRAGMS WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE (1997 UBC)**

PANEL GRADE	WARMBOARD-S NOMINAL SIZE	MINIMUM NAIL PENETRATION INTO FRAMING (inches)	MINIMUM NOMINAL PANEL THICKNESS (inches)	MINIMUM NOMINAL WIDTH OF FRAMING MEMBER (inches)	BLOCKED DIAPHRAGMS				UNBLOCKED DIAPHRAGMS			
					Nail spacing at diaphragm boundaries (all cases), at continuous panel edges parallel to load (cases 3 & 4), and at all panel edges (cases 5 & 6)				Nails spaced a maximum of 6 inches at supported edges			
					x25.4 for mm						Case 1 (No unblocked edges or continuous joints parallel to load)	All other configurations (Cases 2, 3, 4, 5 and 6)
					Nail spacing at other panel edges							
Warmboard	10d <sup>3</sup>	1 5/8	1 1/8	2	320	425	640	730	285	215		
				3	360	480	720	820	320	240		

For SI: 1 inch = 25.4 mm, 1 pound/foot = 14.6 N/m.

- <sup>1</sup> These values are for short-term loads due to wind or earthquake and shall be reduced 25 percent for normal loading. Space nails 12 inches on center along intermediate framing members. For framing of other species: (1) Find specific gravity of species of lumber in AFPA National Design Specification. (2) Find shear value from table above for nail size for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor=[1-(0.5-SG)], where SG=Specific Gravity of the framing member. This adjustment factor shall not be greater than 1.
- <sup>2</sup> Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails shall be staggered where nails are spaced 2 inches or 2 1/2 inches on center.
- <sup>3</sup> Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails shall be staggered where 10d nails having penetration of more than 1 5/8 inches into framing are spaced 3 inches or less on center.

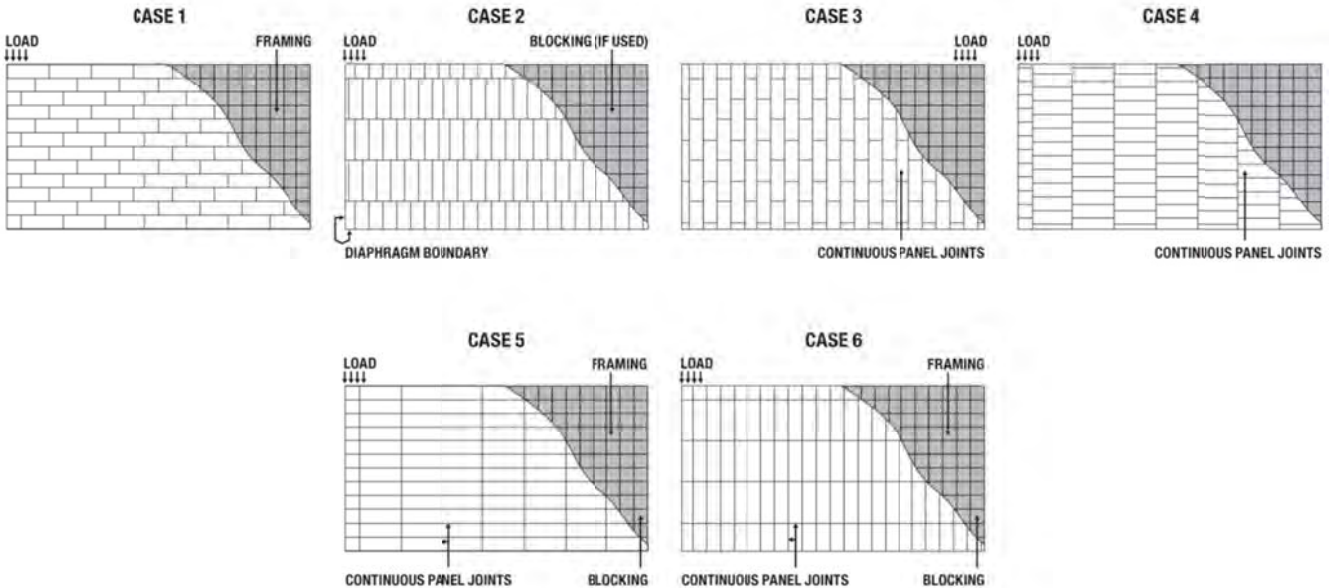


FIGURE 1

**TABLE 2—ALLOWABLE SHEAR (POUNDS PER FOOT) FOR HORIZONTAL WOOD STRUCTURAL WARMBOARD-S PANEL DIAPHRAGMS FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE<sup>a</sup> FOR WIND OR SEISMIC LOADING<sup>f,g,h</sup> (2015, 2012, 2009, AND 2006 IBC)**

PANEL GRADE	COMMON NAIL SIZE	MINIMUM FASTENER PENETRATION IN FRAMING <sup>d</sup> (inches)	MINIMUM NOMINAL PANEL THICKNESS <sup>i</sup> (inches)	MINIMUM NOMINAL WIDTH OF FRAMING MEMBERS AT ADJOINING PANEL EDGES AND BOUNDARIES <sup>e</sup> (inches)	BLOCKED DIAPHRAGMS				UNBLOCKED DIAPHRAGMS	
					Fastener Spacing (inches) at diaphragm boundaries (all cases) at continuous panel edges parallel to load (Cases 3 & 4), and at all panel edges (Cases 5 & 6) <sup>b</sup>				Fasteners spaced 6 max. at supported edges <sup>f</sup>	
					6	4	2 <sup>1/c</sup> / <sub>2</sub>	2 <sup>c</sup>	Case 1 (No unblocked edges or continuous joints parallel to load)	All other configurations (Cases 2, 3, 4, 5, and 6)
					Fastener spacing (inches) at other panel edges (Cases 1, 2, 3, and 4) <sup>b</sup>					
		6	6	4	3					
Warmboard-S	10d	1 <sup>1/2</sup>	1 <sup>1/8</sup>	2	320	425	640	730	285	215
				3	360	480	720	820	320	240

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m

a. For framing of other species: (1) Find specific gravity for species of lumber in AF&PA NDS. (2) For nails find shear value from table above for nail size for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor = [1-(0.5-SG)], where SG = Specific Gravity of the framing lumber. This adjustment factor shall not be greater than 1.

b. Space fasteners maximum 12 inches o.c. along intermediate framing members (6 inches o.c. where supports are spaced 48 inches o.c.).

c. Framing at adjoining panel edges shall be 3 inches nominal or wider. And nails shall be staggered where nails are spaced 2 inches o.c. or 2-1/2 inches o.c.

d. Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails shall be staggered where both of the following conditions are met: (1) 10d nails having penetration into framing of more than 1-1/2 inches and (2) nails are spaced 3 inches o.c. or less.

e. The minimum nominal width of framing members not located at boundaries or adjoining panel edges shall be 2 inches.

f. For shear loads of normal or permanent load duration as defined by the AF&PA NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.

g. Diaphragm resistance depends on the direction of continuous panel joints with respect to the loading direction and direction of framing members, and is independent of the panel orientation.

h. For wind design, the values from table above are permitted to be increased 40 percent per IBC section 2306.3.

i. The panel thickness at the point of nailing shall be no less than 19/32 inch.

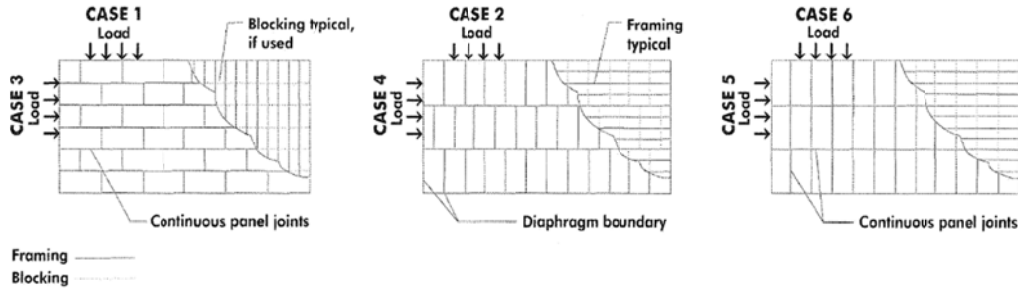


FIGURE 2



FIGURE 3