

## ICC-ES Evaluation Report

**ESR-1369**

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**DIVISION: 06 00 00—WOOD, PLASTICS AND  
COMPOSITES****Section: 06 53 00—Plastic Decking****Section: 06 63 00—Plastic Railings****REPORT HOLDER:**

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**EVALUATION SUBJECT:****GEODECK™ COMPOSITE DECKING AND GUARDRAIL  
SYSTEM****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)
- 1997 *Uniform Building Code*™ (UBC)

**Properties evaluated:**

- Structural
- Durability
- Surface-burning characteristics

**2.0 USES**

The GEODECK™ Composite Decking System evaluated in this report is limited to exterior use as a deck board for balconies, porches, stair treads and decks of Type V-B (IBC) and Type V-N (UBC) construction and structures constructed in accordance with the IRC. The Traditional Board and Tongue and Groove Board are limited to Use Group R buildings while the Heavy Duty Commercial Decking Plank is used in any occupancy group.

GEODECK™ Composite Guardrail described in this report is limited to exterior use as guards for balconies, porches, and decks. The product described in this report is used in exterior applications in buildings of Type V-B (IBC) construction and other types of construction in applications where untreated wood is permitted by Section 1406.3 (IBC) or buildings constructed in accordance with the IRC.

**3.0 DESCRIPTION****3.1 General:**

GEODECK™ Composite Decking is a wood thermoplastic composite lumber (WTCL) product consisting of high-density polyethylene, rice hulls, and a mineral filler with

additives and color. The product specifications are listed in the approved quality control manual. The GEODECK™ Composite Decking System components are manufactured by an extrusion process in four colors: cedar, mahogany, driftwood and walnut.

**3.2 Deck Board:**

GEODECK™ Composite Decking is manufactured in three hollow profiles in 12-, 16- and 20-foot (3658, 4877, and 6096 mm) lengths. The three profiles are GEODECK™ Decking 5/4 by 6 Traditional Board, GEODECK™ Decking 5/4 by 6 Tongue and Groove Board and GEODECK™ 2×8 Heavy Duty Commercial Plank. The walking surface of the GEODECK™ Decking System is wirebrushed to provide a coarse surface.

GEODECK™ Decking 5/4 by 6 Traditional Board (profile ID number 1015) is 5.50 inches (140 mm) wide and 1.27 inches (32 mm) thick. The wall thickness of the profile is 0.26 inch (6.6 mm). The decking profile has four ribbed cell openings created by three stiffeners which are 0.20 inch (5.1 mm) thick. See Figure 1 for the profile of this decking system component. The traditional board is also used for stair treads.

GEODECK™ Decking 5/4 by 6 Tongue and Groove Board (profile ID number 1016) is 5.50 inches (140 mm) wide and 1.27 inches (32 mm) thick. The wall thickness of the profile is 0.26 inch (6.6 mm). The decking profile has three ribbed cell openings created by two stiffeners which are each 0.235 inch (6 mm) thick. The decking board profile is shaped to interlock with adjacent decking boards. See Figure 2 for the profile of this decking system component.

GEODECK™ 2 by 8 Heavy Duty Commercial Decking Plank (profile ID number 1017) is 8.10 inches (206 mm) wide and 1.55 inches (39 mm) thick. The wall thickness of the profile is 0.26 inch (6.6 mm). The decking profile has five ribbed cell openings created by four stiffeners which are each 0.20 inch (5.1 mm) thick. See Figure 3 for the profile of this decking system component.

**3.3 Guards:**

GEODECK™ Composite Guardrail is a guard consisting of post sleeves, caps, top rails with aluminum inserts, bottom rails, balusters, and a bottom-rail support block. The GEODECK™ Composite Guardrail system components are made from the same material as the deck boards except for the aluminum insert, which is made from aluminum alloy 6061-T6. The minimum yield and tensile strength, and minimum thickness, of the aluminum inserts are specified in the approved quality control manual.

The height of the railing assembly is 36 inches or 42 inches (914 or 1067 mm) above the walking surface.

Each post is covered with a 4-inch-by-4-inch composite post sleeve. The top rail has an oval shape. The oval-shaped rail is 3.36 inches (85 mm) wide at the top and has a depth of 2.00 inches (51 mm) and a wall thickness of 0.36 inch (9.14 mm). Both top and bottom rails are available in 6- and 8-foot lengths (1.83 and 2.44 m). See Figure 4 for the profile of the rail system components.

The balusters are hollow square extruded pickets. The pickets are 1<sup>3</sup>/<sub>4</sub> inches (44.4 mm) square, and have a wall thickness of 1/4-inch. When the pickets are installed in the rails, there is a clear space of approximately 3.37 inches (86 mm) between pickets for 8-foot long (2.44 m) assemblies and 3.49 inches (87 mm) between pickets for 6-foot long (1.83 m) assemblies.

The post sleeves are 4.3 inches (109 mm) square and have a wall thickness of either 0.26 inch (6.6 mm). See Figure 4 for dimensioned profiles of the post sleeves, top and bottom rails, top rail aluminum inserts, and balusters. The mounting brackets are made from steel conforming to ASTM A1008 CS Type B with a plastic cover. The 8-foot and 6-foot (2.44 m and 1.83 m) rail systems utilize intermediate bottom rail supports. The 8-foot (2.44 m) rail system has three supports located at quarter points. The 6-foot (1.83 m) rail system has two supports located at third points.

### 3.4 Durability:

When subjected to weathering, insect attack and other decaying elements, GEODECK™ decking and guardrail material is equivalent in durability to preservative-treated or naturally durable lumber. Accordingly, it is permitted to be used as an alternative to preservative-treated or naturally durable lumber on exterior decks, porches and balconies, stair treads and guardrail. The GEODECK™ decking and guardrail material has been evaluated for structural capacity when exposed to temperatures from -20°F (-29°C) to 125°F (52°C).

### 3.5 Surface-burning Characteristics:

When tested in accordance with ASTM E 84, GEODECK™ decking and guardrail have a flame-spread index of no greater than 200.

## 4.0 INSTALLATION AND DESIGN

### 4.1 General:

Installation of the GEODECK™ Composite Decking System and the GEODECK™ Composite Guardrail System must comply with this report and the manufacturer's published installation instructions. The manufacturer's published installation instructions must be available at the jobsite at all times during installation.

### 4.2 Deck Boards:

#### 4.2.1 Design:

**4.2.1.1 Deck Boards:** The GEODECK™ Composite Decking System, when used as a deck board, has an allowable capacity (span rating) as shown in Table 1.

**4.2.1.2 Deck Boards Used as Stair Treads:** GEODECK™ Composite Decking, when used as a stair tread, is satisfactory to resist the code-prescribed concentrated loads of 300 lbf (1.34 kN) when installed at a maximum center-to-center spacing of the supporting construction as shown in Table 2.

**4.2.2 Installation:** Installation of GEODECK™ Composite Decking System must comply with this report and the manufacturer's published installation instructions. The manufacturer's published installation instructions must be available at the jobsite at all times during installation. When the manufacturer's published installation instructions differ from this report, this report governs.

Tongue and Groove Board must be installed by one of the following methods: (1) a No. 8 or No. 9 by 2.5 inch long (63.5 mm) stainless or coated trim head screw; or (2) an 8d by 2.5 inch long (63.5 mm) stainless or coated ring shank nail. Apply one fastener per joist, through the tongue, at a 55-60 degree angle.

Traditional Boards must be installed by one of the following methods: (1) a No. 8 or No. 9 by 2.5 inch long (63.5 mm) stainless or coated deck screw or trim head screw; or (2) an 8d, 2.5 inch long (63.5 mm) stainless or coated ring shank nail. Apply two fasteners per joist, fastened through the face of the board.

Heavy Duty Commercial Decking Plank must be installed by one of the following methods: (1) No. 10 by 3.0-inch-long (76 mm) stainless steel or coated deck screw or (2) No. 10d, 3.0-inch-long (76 mm) stainless steel or coated ring shank nail. Apply 3 fasteners per joist, fastened through the face of the board.

### 4.3 Guards:

**4.3.1 General:** Refer to Figure 4 for component cross sections and guard assemblies.

**4.3.2 Design:** The GEODECK™ Composite Guardrail is satisfactory to resist the loads specified in Section 1607.7.1 of the IBC and Table R301.5 of the IRC, when installed at a maximum clear span spacing, as noted in Table 3. When the railing is supported on one or both ends by the supporting construction, the maximum distance must be measured from edge-of-post to edge-of-structure or from edge-of-structure to edge-of-structure.

**4.3.3 Installation:** The guardrail system is a 6-foot-long or 8-foot-long assembly in which the top and bottom rails are hollow oval members. The assembly has aluminum inserts in the top rail only. The rails are attached to a post and sleeve, rigid column or building wall with metal brackets secured with four No. 8 by 2-inch-long stainless steel wood screws. The rail end slides over the bracket and is secured to the bracket with one No. 8 by 1/2-inch-long, self-drilling, stainless steel sheet metal screws. The pickets are 1<sup>3</sup>/<sub>4</sub> inches square and are spaced 3.37 inches apart (open clear space) for the 8-foot rail system and 3.49 inches apart for the 6-foot rail system. The top and bottom rails are routed to accept the pickets with no further attachment.

## 5.0 CONDITIONS OF USE

The GEODECK™ Composite Decking and Guardrail 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** This product must be limited to exterior use as a deck board for balconies, porches, decks, stair treads and similar appendages of Type V-B (IBC) and Type V-N (UBC) construction and structures constructed in accordance with the IRC. The Traditional Board and Tongue and Groove Board are limited to Use Group R buildings while the Heavy Duty Commercial Decking Plank is used in any occupancy group.

GEODECK™ Composite Guardrail described in this report is limited to exterior use as guards for balconies, porches, and decks. The product described in this report is used in exterior applications in buildings of Type V-B (IBC) construction and other types of construction in applications where untreated wood is permitted by Section 1406.3 (IBC) or buildings constructed in accordance with the IRC.

**5.2** Installation must comply with this report, the manufacturer's published instructions and the

applicable code. When the manufacturer’s published installation instructions differ from this report, this report governs.

- 5.3 The use of the GEODECK™ Composite Decking as a component of a fire-resistance-rated assembly is outside the scope of this report.
- 5.4 Only those fasteners and fastener configurations described in this report have been evaluated for the installation of the GEODECK™ Composite Decking and Guardrail. The compatibility of the fasteners with the supporting construction, including chemically treated wood, is outside the scope of this report.
- 5.5 GEODECK™ Composite Decking and Guardrail must be directly fastened to supporting construction. Where required by the code official, engineering calculations and construction documents consistent with this report must be submitted for approval. The calculations shall verify that the supporting construction complies with the applicable building code requirements and is adequate to resist the loads imparted upon it from the products and systems discussed in this report. The documents must contain details of the attachment to the supporting structure consistent with the requirements of this report. The documents must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.6 Adjustment factors outlined in the AF&PA National Design Standard and applicable codes must not apply to the allowable capacity and maximum spans of the decking system.

- 5.7 The use of wood posts, with or without post sleeves, are outside the scope of this report.
- 5.8 The top rail component of the GEODECK™ Composite Guardrail System must not be permitted to be used as a handrail for stairways or ramps.
- 5.9 The use of a corner rail connection that is connected to a rail post is outside the scope of this report.
- 5.10 GEODECK™ Composite Decking and Guardrail components are produced in Green Bay, Wisconsin, under a quality control program with inspections by PFS Corporation (AA-652).

**6.0 EVIDENCE SUBMITTED**

Data in accordance with the ICC-ES Acceptance Criteria for Deck Board Span Ratings and Guardrail Systems (Guards and Handrails) (AC174), dated February 2008.

**7.0 IDENTIFICATION**

The GEODECK™ Composite Decking described in this report must be identified on each individual piece by a laser engraving bearing the manufacturer’s name Green Bay Decking, LLC), the product type, the name of the inspection agency (PFS Corporation), production date and time, and the evaluation report number (ESR-1369).

The GEODECK™ Composite Guardrail described in this report is identified on the rails by a laser engraving bearing the manufacturer’s name (Green Bay Decking, LLC), product type, name of the inspection agency (PFS Corporation), production date and time, and the evaluation report number (ESR-1369). The balusters are identified by a stamp bearing the profile number (1004) and the production date.

**TABLE 1— DECK BOARD SPAN RATING**

PRODUCT NAME	MAXIMUM SPAN <sup>1</sup> (inches)	ALLOWABLE CAPACITY <sup>2</sup> (lbf/ft <sup>2</sup> )
GEODECK™ Decking 5/4 by 6 Traditional Board (Hollow)	24	100
GEODECK™ Decking 5/4 by 6 Tongue & Groove Board (Hollow)	24	100
GEODECK™ Decking 2 by 8 Heavy Duty Commercial Plank (Hollow)	30 <sup>3</sup>	100

For **SI**: 1 inch = 25.4 mm; 1 lbf/ft<sup>2</sup> = 47.9 Pa.

<sup>1</sup>Maximum span is measured center-to-center of the supporting construction.

<sup>2</sup>Maximum allowable capacity is adjusted for durability. No further increases are permitted.

<sup>3</sup>Based on a minimum 2-span installation.

**TABLE 2—MAXIMUM STAIR TREAD SPANS<sup>2</sup>**

DECK BOARDS USED AS STAIR TREADS	MAXIMUM SPAN (inches) <sup>1</sup>
GEODECK™ Decking 5/4 by 6 Traditional Board (Hollow)	16
GEODECK™ Decking 5/4 by 6 Tongue & Groove Board (Hollow)	16
GEODECK™ Decking 2 by 8 Heavy Duty Commercial Plank (Hollow)	16

For **SI**: 1 inch = 25.4 mm; 1 lbf/ft<sup>2</sup> = 47.9 Pa.

<sup>1</sup>Maximum span is measured center-to-center of the supporting construction.

<sup>2</sup>Based on a minimum 2-span installation.

**TABLE 3—MAXIMUM GUARDRAIL SYSTEM SPANS<sup>1</sup>**

PRODUCT NAME/COMPONENT	APPLICABLE BUILDING CODE <sup>2, 5</sup>		MAXIMUM SPAN <sup>3, 4</sup> (ft-in)
	IBC	IRC	
GEODECK™ Composite Guardrail	Yes	Yes	6 - 0
GEODECK™ Composite Guardrail	Yes	Yes	8 - 0

For **SI**: 1 inch = 25.4 mm; 1 ft = 305 mm.

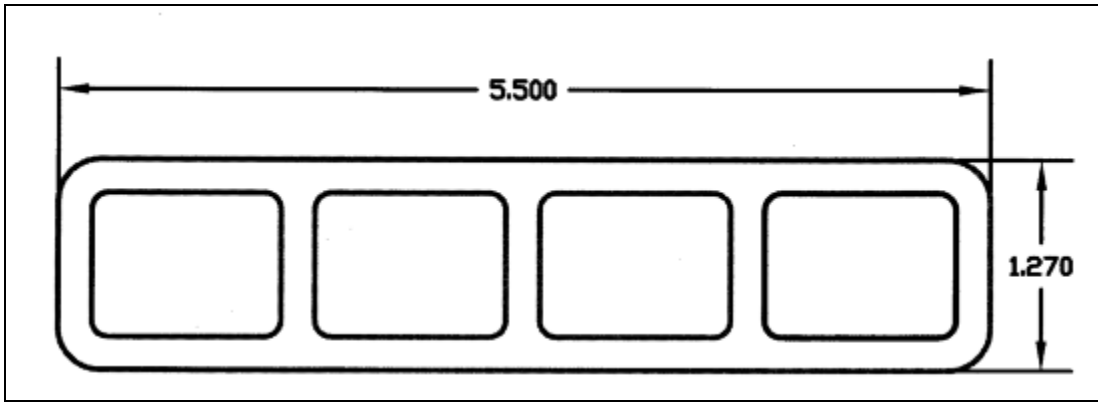
<sup>1</sup>The ability of the supporting construction to resist the reactionary loads must be justified to the satisfaction of the code official.

<sup>2</sup>Indicates compliance with the respective building codes.

<sup>3</sup>Maximum span is measured from edge-of-post to edge-of-post.

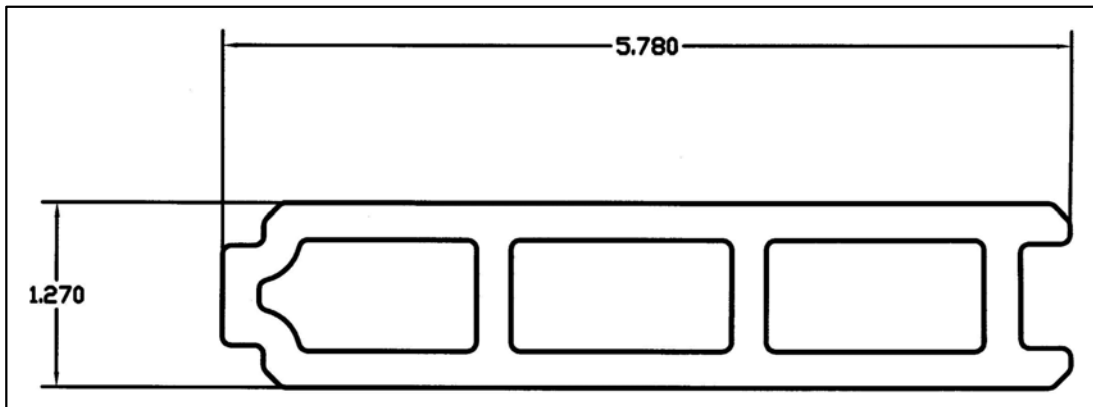
<sup>4</sup>Maximum allowable span has been adjusted for durability. No further increases are permitted.

<sup>5</sup>The minimum height of the top rail is 42 inches for the IBC (Section 1013.2) and 36 inches for the IRC (Section R312).



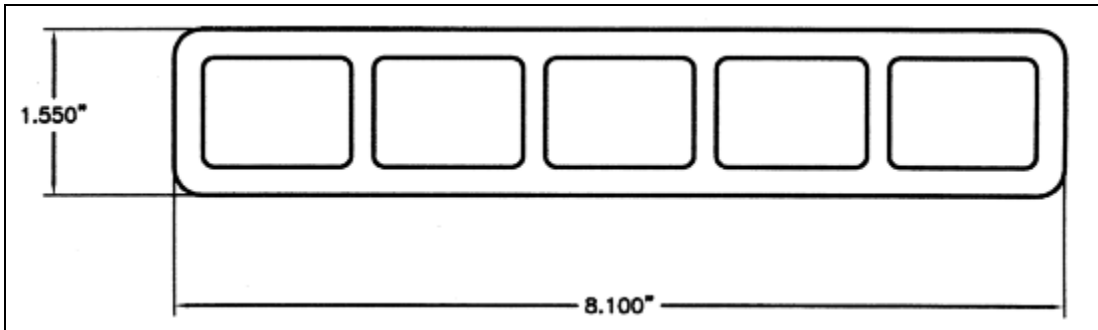
For SI: 1 inch = 25.4 mm.

FIGURE 1—GEODECK™ DECKING 5/4 BY 6 TRADITIONAL BOARD (HOLLOW)



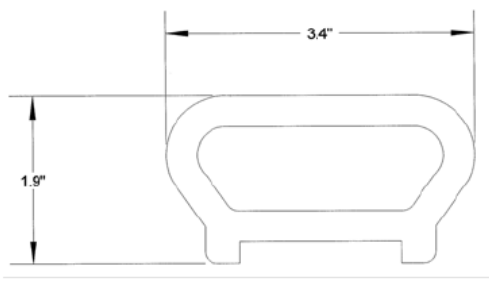
For SI: 1 inch = 25.4 mm.

FIGURE 2—GEODECK™ DECKING 5/4 BY 6 TONGUE & GROOVE BOARD (HOLLOW)

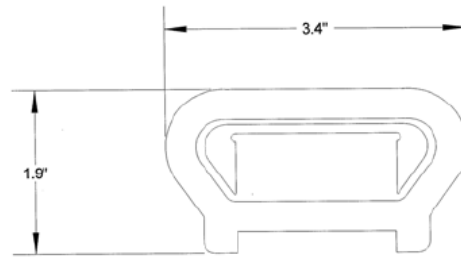


For SI: 1 inch = 25.4 mm.

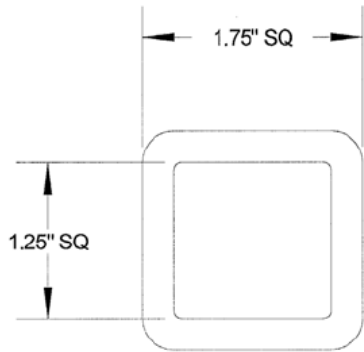
FIGURE 3—GEODECK™ DECKING 2 BY 8 HEAVY DUTY COMMERCIAL PLANK (HOLLOW)



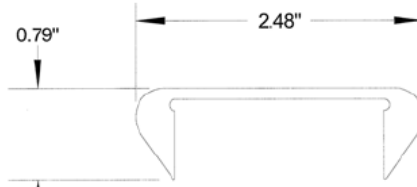
**BOTTOM RAIL**



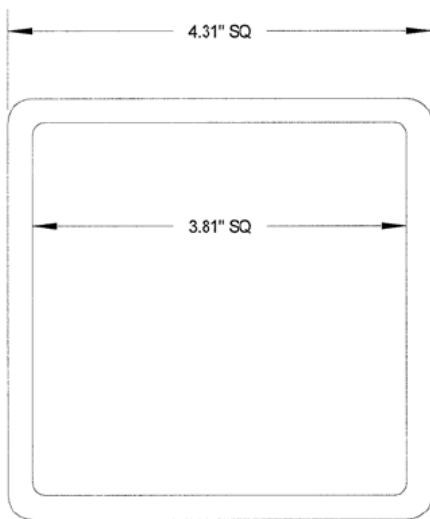
**TOP RAIL**



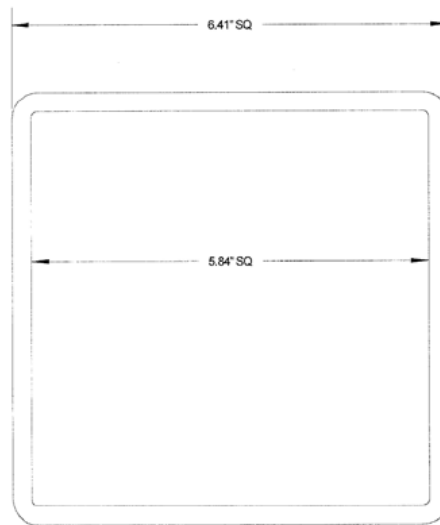
**PICKET**



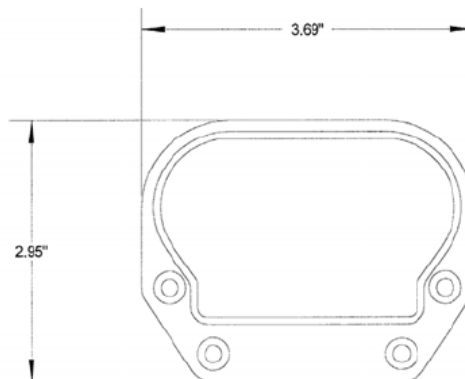
**ALUMINUM INSERT FOR TOP RAIL**



**POST SLEEVE**



**POST SLEEVE**



**BRACKET COVER**

**FIGURE 4—GUARDRAIL**