

# ICC-ES Evaluation Report

**ESR-1625**

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**DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES**
**Section: 06 50 00—Structural Plastics**
**Section: 06 63 00—Plastic Railings**
**REPORT HOLDER:**
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**EVALUATION SUBJECT:**
**EVERGRAIN WOOD-THERMOPLASTIC COMPOSITE DECK BOARDS AND GUARDRAIL SYSTEMS**
**1.0 EVALUATION SCOPE**
**Compliance with the following codes:**

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

**Properties evaluated:**

- Structural properties
- Surface-burning characteristics
- Durability

**2.0 USES**

The Evergrain composite decking described in this report is limited to exterior use as deckboards for balconies, porches, and decks of buildings of Type V-B (IBC) construction, Type V-N (UBC) construction and dwellings constructed in accordance with the IRC. The Evergrain guardrail systems described in this report are used in exterior applications as guards for balconies, porches and decks, (1) of Group R Occupancy, or (2) any occupancy group in buildings of Type V-B (IBC) construction and other types of construction in applications where untreated wood is permitted by IBC Section 1406.3, and Type V-N (UBC) construction and (3) structures constructed in accordance with the IRC. (See Table 3 for occupancy and other restrictions.)

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

Evergrain Decking, Traditional Railing system components and the 2-by-4 Traditional Railing system components are

manufactured by a compression molding and/or extrusion process in accordance with the approved quality control manual. The Designer Railing system is manufactured by an extrusion process in accordance with the approved quality control manual. The Evergrain Decking and guardrail systems consist of wood fibers, polyethylene, fillers and colorants as described in the manufacturer's quality control manual.

**3.2 Deck Board:**

**3.2.1 General:** Evergrain decking is manufactured in solid sections having the nominal sizes of 1-by-6 [actually 0.94 inch by 5.50 inches (23.9 by 140 mm)], and 2-by-6 [actually 1.44 by 5.50 inches (37 by 140 mm)]. The average installed weights of 1-by-6 and 2-by-6 Evergrain decking are 5.3 psf and 8.2 psf (0.25 and 0.39 kN/m<sup>2</sup>), respectively. The product is available in seven colors: Cape Cod Grey, Redwood, Cedar, Weathered Wood, Golden Oak, CherryWood and Thunderstorm Grey.

**3.2.2 Durability:** When subjected to weathering, insect attack, and other decaying elements, material used to manufacture the Evergrain decking is equivalent to preservative-treated or naturally durable lumber when used in locations described in Section 2.0 of this report. Evergrain decking has been evaluated for a temperature range from -20°F (-29°C) to 130°F (54°C).

**3.2.3 Surface-burning Characteristics:** When tested in accordance with ASTM E 84, Evergrain decking has a flame-spread index of no greater than 200.

**3.3 Guardrail System:**

**3.3.1 Traditional Railing:** The Evergrain Traditional Railing system is manufactured to a height of 42 inches (1067 mm) and a rail length of 68 inches (1727 mm). The top cap rail is a combination of a nominally 2-by-6-inch [actually 1.44 inch as by 5.5 inches (37 by 140 mm)] solid cap rail and a nominally 2-by-4-inch [actually 1.44 by 3.50 inches (37 by 89 mm)] top side rail. The bottom side rail is a nominally 2-by-4-inch [actually 1.44 by 3.50 inches (37 by 89 mm)] solid board. The balusters are nominally 2-by-2-inch [actually 1.5 by 1.5 inches (38 by 38 mm)] solid components. See Figure 2 for typical component cross sections.

**3.3.2 Traditional Railing:** The Evergrain 2-by-4 Traditional Railing System is manufactured to a height of 42 inches (1067 mm) and a rail length of 68 inches (1727 mm). The assembly is similar to the Traditional Railing system with the exception that the top rail terminates at a newel post (supplied by others). See Figure 2 for typical component cross sections.

**3.3.3 Designer Railing:** The Evergrain Designer Railing system is manufactured to a height of 42 inches (1067 mm) and a rail length of 68 inches (1727 mm). The main component of the top and bottom rail is approximately 2<sup>1</sup>/<sub>2</sub> inches by 2<sup>1</sup>/<sub>2</sub> inches (64 by 64 mm). The bottom of the top rail component is provided with an approximately 1<sup>1</sup>/<sub>2</sub>-inch-wide (38 mm) channel into which the 1<sup>1</sup>/<sub>4</sub>-by-1<sup>1</sup>/<sub>2</sub>-inch (32 by 38 mm) oval solid baluster is fitted. The top of the bottom rail component provides a 0.30-inch-high (7.6 mm) lip that supports the baluster. The top rail is provided with a finish component that slides onto the main rail component. See Figure 3 for typical component cross sections.

**3.3.4 Durability:** When subjected to weathering, insect attack, and other decaying elements, material used to manufacture Evergrain is equivalent to preservative-treated or naturally durable lumber when used in locations described in Section 2.0 of this report. The Evergrain Guardrail System has been evaluated for a temperature range from -20°F (-29°C) to 130°F (54.4°C).

**3.3.5 Surface-burning Characteristics:** When tested in accordance with ASTM E 84, Evergrain railing system has a flame-spread index of no greater than 200.

## 4.0 DESIGN AND INSTALLATION

### 4.1 General:

Installation of Evergrain decking and guardrail systems 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.

### 4.2 Deck Boards:

**4.2.1 Allowable Stresses:** Table 1 lists allowable stress values for the Evergrain decking recognized in this report. These values must not be adjusted by any of the adjustment factors permitted for wood framing referred to in the applicable code, with the exception that increases for load duration, CD, are permitted.

**4.2.2 Allowable Spans:** Table 2 lists allowable spans, continuous over two or more supports, for Evergrain decking used as planking (flatwise bending). As an alternative, other allowable spans or other uses, of Evergrain decking can be permitted, provided the user/designer submits structural calculations regarding the specific application to the local code official for approval, establishing Evergrain's ability to resist the code-prescribed loads based on the allowable stresses in Table 1.

**4.2.3 Spacing:** The end-to-end gap of the deck boards must be 1/16 inch (1.6 mm) for every 20°F (-7°C) of difference between the installation temperature and the hottest anticipated temperature. A minimum 1/8-inch (3.2 mm) gap must be provided between width of boards.

**4.2.4 Decking Fasteners:** Allowable lateral design values for nails, wood screws, and bolts used as fasteners for the Evergrain deck boards must be based on an equivalent specific gravity SG = 0.50. Allowable stress or duration of load increases, indicated in the applicable code, are not permitted when fastener capacities are designed.

Fasteners used with Evergrain must comply with the following:

- a. Nails must have a diameter less than or equal to that of a 16d common nail [0.162-inch (4 mm) diameter].

- b. Wood screws must have a diameter less than or equal to that of a No. 12 screw [0.216-inch (5.5 mm) diameter].
- c. Bolts must have a diameter less than or equal to 1/2 inch (12.7 mm).

Minimum fastener edge and end distances must be 1 inch (25.4 mm) and 3/4 inch (19 mm), respectively. Minimum spacing of fasteners must be 1 inch (25.4 mm). Minimum fastener penetration must be 1 1/2 inches (38 mm) into the supporting construction.

### 4.3 Guardrail System:

**4.3.1 General:** The Evergrain Traditional Railing and 2-by-4 Traditional Railing and the Designer Railing systems provide three optional installation methods for attachment to the supporting construction. Two of the methods address the installation of the system on the outside of the rim joist of the deck. The third method addresses the installation of the systems on the inside of the rim joist. See Figure 5 for illustrations of these alternate installations. When installing fasteners for all guardrail components, pilot holes must be drilled as described in the manufacturer's published installation instructions. Screws must be either stainless steel or galvanized and must be spaced a minimum of 1 inch (25.4 mm) from the ends of the components. Each of the guardrail systems must provide intermediate support at a maximum of 30 inches (762 mm) on center as described in the manufacturer's published installation instructions.

**4.3.2 Traditional Railing:** The top cap rail of the Evergrain Traditional Railing system is attached to the top side rail utilizing one No. 8 by 2 1/2-inch (64 mm) screw at a maximum of 16 inches (406 mm) on center. The top rail is designed to be a continuous rail that is attached to the supporting construction (post supplied by others) with two No. 8 by 3 1/2-inch (89 mm) screws. The top and bottom side rails are attached to each post with two No. 8 by 3 1/2-inch (89 mm) screws. The balusters are attached to the top and bottom rails at a maximum of 5 inches (127 mm) on center with two No. 8 by 2 1/2-inch (64 mm) screws into the top and bottom side rails. One alternate installation method involves the extension of the balusters providing intermediate support down below the deck surface, with these being attached directly to the rim joist/supporting construction with two No. 8 by 2 1/2-inch (64 mm) screws in each baluster. A second alternate method involves the installation of the balusters without utilizing a bottom side rail. In this method, the balusters are continuous down to the rim joist/supporting construction and are attached with two No. 8 by 2 1/2-inch (64 mm) screws in each baluster. See Figure 5 for typical Traditional Railing and alternative assemblies.

**4.3.3 2-by-4 Traditional Railing:** The first baluster must be attached to the supporting construction/posts utilizing four No. 8 by 3 1/2-inch (89 mm) screws spaced as shown in the manufacturer's published installation instructions. The top cap rail, is fastened to the second baluster with one No. 8 by 2 1/2-inch (64 mm) screw and to side rails with one No. 8 by 2 1/2-inch (64 mm) screw at 16 inches (406 mm) on center. The remaining balusters are attached to top and bottom side rails with two No. 8 by 2 1/2-inch (64 mm) screws attached to, both top and bottom side rails, and with baluster spacing no greater than 5 inches (127 mm) on center. See Figure 4 for typical Evergrain 2-by-4 Traditional Railing assembly.

**4.3.4 Designer Railing:** The balusters are attached to the top and bottom rails at a maximum of 5 inches (127 mm) on center with one No. No. 8 by 3-inch (76 mm)

screw installed through the top and bottom rail into the end of each baluster. The top and bottom rails are fastened to the adjoining post or supporting construction utilizing L-clip brackets supplied by the manufacturer. The top and bottom rails must be secured to the bracket using three No. 10 by 1-inch (25.4 mm) screws. The L-clip brackets must be attached with two No. 10 by 2<sup>1</sup>/<sub>2</sub>-inch (64 mm) screws installed into the post or supporting construction. See Figure 6 for typical Evergrain Designer Railing assembly.

## 5.0 CONDITIONS OF USE

The Evergrain deck boards and guardrails 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 The Evergrain decking described in this report is limited to exterior use for balconies, porches, and decks of buildings of Type V-B (IBC) construction, Type V-N (UBC) construction and dwellings constructed in accordance with IRC.
- 5.2 The Evergrain guardrail systems described in this report must be limited to exterior use as guards for balconies, porches and decks (1) of Group R Occupancy, or (2) any occupancy group in buildings of Type V-B (IBC) construction and other types of construction in applications where untreated wood is permitted by IBC Section 1406.3, and Type V-N (UBC) construction and (3) structures constructed in accordance with the IRC.
- 5.3 Installation must comply with this report, the manufacturer's published installation instructions and the applicable code. Only those fasteners and fastener configurations described in this report have been evaluated for the installation of the Evergrain decking and guardrail systems. When the manufacturer's published installation instructions differ from this report, this report governs.
- 5.4 The use of the Evergrain decking as a component of a fire-resistance-rated assembly is outside the scope of this report.
- 5.5 The compatibility of the fasteners, metal components and other metal hardware with the supporting construction, including chemically treated wood, is outside the scope of this report.
- 5.6 The Evergrain Traditional Railing System, the 2×4 Traditional Railing system and the Designer Railing system have not been evaluated with posts installed in the system. The determination of the ability of the supporting construction to resist the code-specified loads is outside the scope of this report.
- 5.7 When a guardrail 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.
- 5.8 Adjustment factors outlined in the AF&PA National Design Specification and applicable codes must not apply to the allowable capacity and maximum spans for Evergrain.
- 5.9 Deck boards must be installed in a minimum of a two-span condition.
- 5.10 Evergrain decking and guardrail systems must be fastened directly 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 must 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.
- 5.11 Evergrain decking and components of the Evergrain Traditional Railing and the 2-by-4 Traditional Railing systems are produced by TAMKO Building Products, Inc., at the Lamar North Plant and the Lamar South Plant, Missouri, under a quality control program with inspections by PFS Corporation (AA-652).
- 5.12 The components of the Evergrain Designer Railing system are produced by TAMKO Building Products, Inc., in Lamar, Missouri, and Chilhowie, Virginia, under a quality control program with inspections by PFS Corporation (AA-652).

## 6.0 EVIDENCE SUBMITTED

- 6.1 Data establishing compliance of the Evergrain decking with the ICC-ES Acceptance Criteria for Thermoplastic Composite Lumber Products (AC109), dated June 2006.
- 6.2 Data establishing compliance of the Evergrain guardrail systems with the ICC-ES Acceptance Criteria for Deck Board Span Ratings and Guardrail Systems (Guards and Handrails) (AC174), dated July 2010.

## 7.0 IDENTIFICATION

The Evergrain decking and guardrail systems described in this report must be identified on each individual piece or on the packaging by a stamp bearing the manufacturer's name (TAMKO Building Products, Inc.), the product type, the name of the inspection agency (PFS Corporation) and the evaluation report number (ESR-1625).

**TABLE 1—ALLOWABLE DESIGN STRESS VALUES FOR EVERGRAIN DECKING HAVING A MAXIMUM 2-INCH THICKNESS**

PROPERTY	ALLOWABLE DESIGN VALUE (psi)
Flexural stress ( $F_b$ )	245
Modulus of elasticity ( $MOE$ )	53,000
Tensile stress—parallel to longitudinal direction ( $F_t$ )	295
Compressive stress—parallel to longitudinal direction ( $F_c$ )	860
Compressive stress—perpendicular to longitudinal direction ( $F_{c\perp}$ )	400
Shear stress ( $F_v$ )	225

For **SI**: 1 psi = 6.9 kPa.

**TABLE 2—EVERGRAIN DECKING SPAN CHART<sup>1,2</sup>**

MEMBER SIZE	ALLOWABLE MEMBER SPAN BETWEEN SUPPORTS WHEN SUPPORTING 100 psf UNIFORM LIVE LOADING <sup>3,4</sup> (inches)	ALLOWABLE MEMBER SPAN BETWEEN SUPPORTS WHEN SUPPORTING 60 psf UNIFORM LIVE LOADING <sup>3,4</sup> (inches)
1-by-6	16	---
2-by-6	20	24

For **SI**: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m<sup>2</sup>.

<sup>1</sup>Tabulated span values are for members used as planking (flatwise bending). The values are permitted to be used in lieu of application-specific calculations.

<sup>2</sup>Members shall be supported by a minimum of three joists and must be fastened at each joist.

<sup>3</sup>Tabulated spans are based on a deflection limit of L/180.

**TABLE 3—MAXIMUM GUARDRAIL SPAN<sup>2,3</sup>**

PRODUCT NAME	APPLICABLE BUILDING CODE <sup>4</sup>			MAXIMUM SPAN (ft-in) <sup>1</sup>
	IBC	IRC	UBC	
Evergrain Traditional Railing	Yes <sup>5</sup>	Yes	Yes <sup>5</sup>	5' - 8"
Evergrain 2-by-4 Traditional Railing	Yes <sup>6</sup>	Yes	Yes <sup>6</sup>	5' - 8"
Evergrain Designer Railing	Yes <sup>6</sup>	Yes	Yes <sup>6</sup>	5' - 8"

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

<sup>1</sup>Maximum span shall be measured from edge-of-supporting-construction to edge-of-supporting-construction.

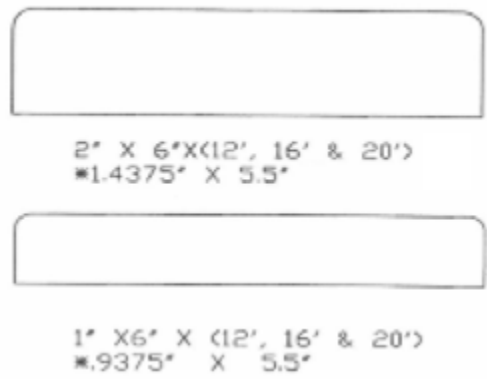
<sup>2</sup>Maximum allowable span has been adjusted for durability. No further increases are permitted.

<sup>3</sup>Evaluation of this guardrail does not include the post, post sleeve or post base attachment. The ability of the supporting construction to resist the reactionary loads shall be established as required by the code official.

<sup>4</sup>Indicates compliance with the respective building codes.

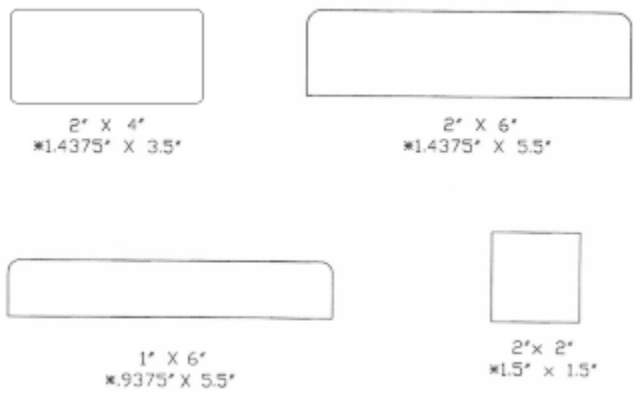
<sup>5</sup>For use in any occupancy group in buildings of Type V-B (IBC) construction and Type V-N (UBC) construction.

<sup>6</sup>For use in Group R occupancy only.



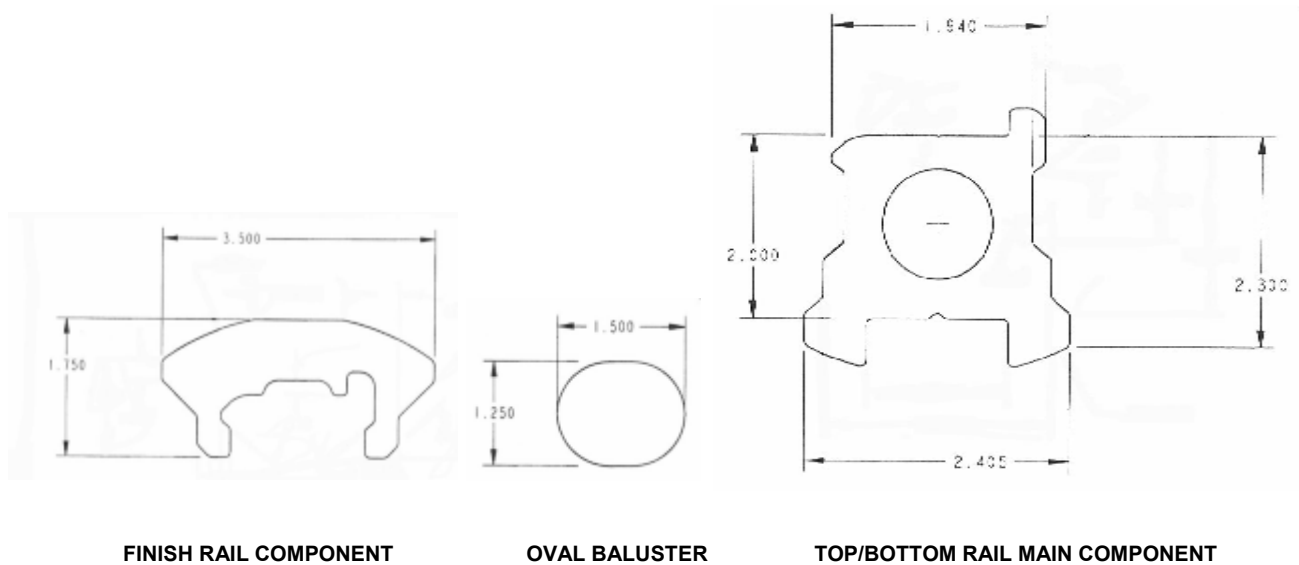
For SI: 1 inch = 25.4 mm.

FIGURE 1—EVERGRAIN DECKING CROSS SECTIONS



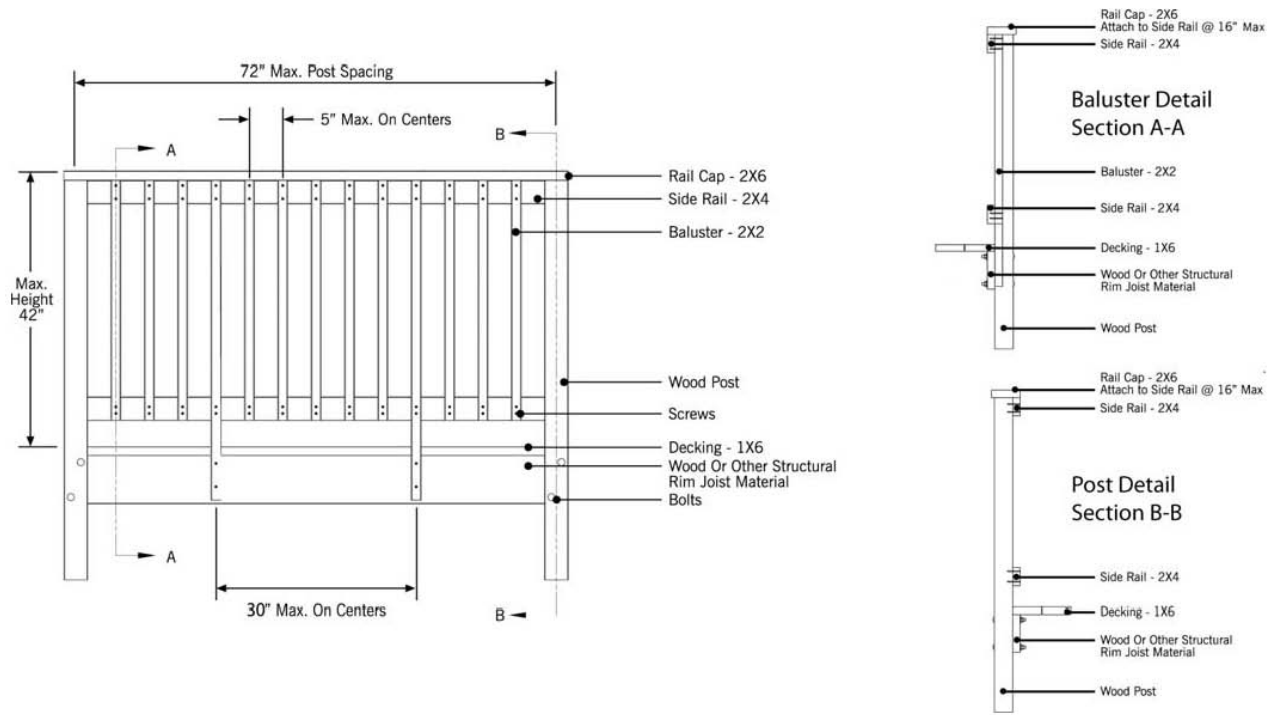
For SI: 1 inch = 25.4 mm.

FIGURE 2—EVERGRAIN TRADITIONAL RAILING AND 2x4 TRADITIONAL RAILING COMPONENT CROSS SECTIONS



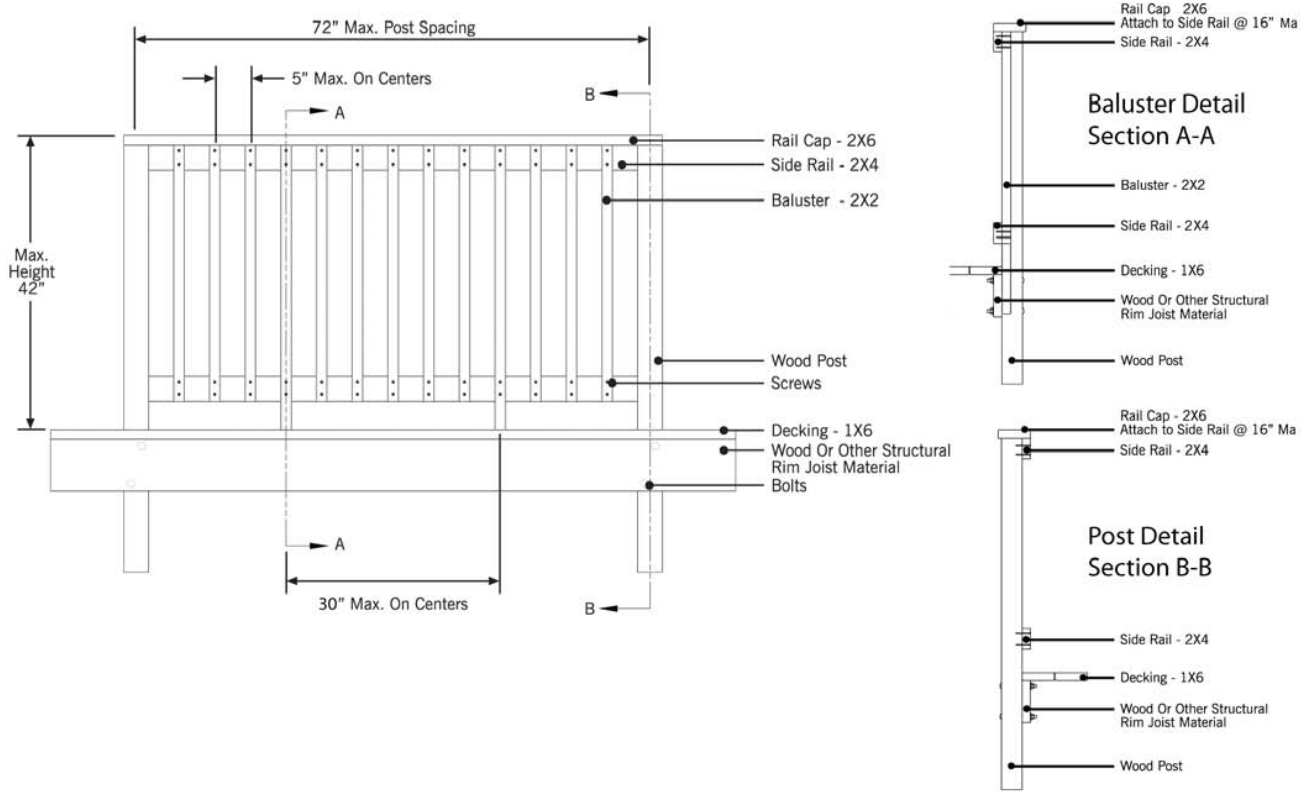
For SI: 1 inch = 25.4 mm.

FIGURE 3—EVERGRAIN DESIGNER RAILING COMPONENT CROSS SECTIONS



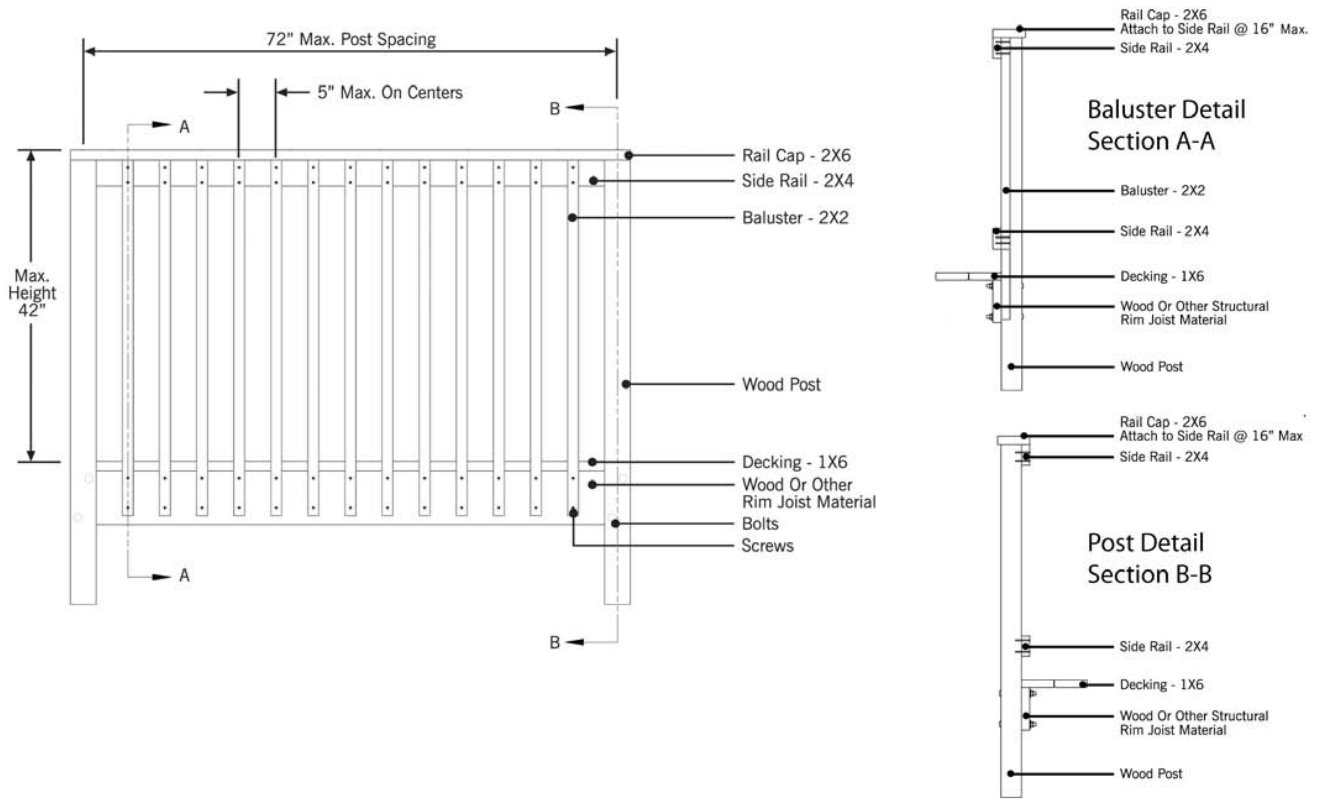
For SI: 1 inch = 25.4 mm.

FIGURE 4—EVERGRAIN POST MOUNTED OUTSIDE JOIST BALUSTER TO RAIL



For SI: 1 inch = 25.4 mm.

FIGURE 5—EVERGRAIN POST MOUNTED INSIDE JOIST BALUSTER TO RAIL



For SI: 1 inch = 25.4 mm.

FIGURE 6—EVERGRAIN POST MOUNTED OUTSIDE JOIST BALUSTER TO DECK