



Code Compliance Research Report

CCRR-0114

Subject to Renewal: 11/23/2012
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1.0 Subject

Guardrail Systems

RadianceRail[®] Composite Guardrail System

RadianceRail[®] Express Guardrail System

2.0 Research Scope

2.1. Building Codes:

- 2009 International Building Code (IBC)
- 2009 International Residential Code (IRC)
- 2006 International Building Code (IBC)
- 2006 International Residential Code (IRC)

2.2. Properties:

- Structural Performance
- Durability
- Surface Burning
- Decay Resistance
- Termite Resistance

3.0 Description

3.1. General – The *TimberTech*[®] guardrails are offered in two assemblies, *RadianceRail*[®] and *RadianceRail*[®] Express, and are guardrails (guards) under the definitions of the referenced codes. Guards are intended for exterior use at or near the open sides of elevated walking areas of buildings and walkways as required by the referenced codes.

3.1.1. Level guards with heights of 36 inches or 42 inches above the floor surface are provided in rail lengths up to 91.75 inches. This provides a maximum 8 feet (96 inches) from post center to post center. See Table 1 for qualified lengths and configurations.

3.1.2. Stair guards are provided in rail lengths up to 91” inches as measured along the upper rail. See Table 1 for qualified lengths and configurations.

3.2. The *RadianceRail*[®] composite guardrail system includes top and bottom rails, two support rails, vertical balusters, post sleeves, rail-to-post brackets, support blocks, foot blocks, and decorative moldings.

3.2.1. *RadianceRail*[®] rails (top, bottom, and support) and post sleeves are manufactured from extruded shapes in seven colors; Coastal White, Mountain Cedar, Classic Black, SandRidge, RiverRock, Traditional Walnut, and Antique White. All components are co-extruded with a PVC color cap layer and wood/plastic composite core. See Figure 1 and Figure 7(a).

3.2.2. Balusters can be either the same PVC capped composite composition as the rails or an expanded PVC core with a co-extruded PVC cap layer. A small extruded or drilled pilot hole located in the center of each end, provides a means for locating a fastener. See Figures 3(a) and 3(b).

3.2.3. The top rail assembly consists of two rails, an upper rail assembled over a support rail. The two rails are held together with a series of coated screws. See Figure 8.

3.2.4. The bottom rail consists of two rails, a bottom cap rail assembled over a support rail.

3.3. The *RadianceRail*[®] Express guardrail system includes top and bottom rails, vertical balusters, post sleeves, rail-to-post brackets, foot blocks and decorative moldings. All components are produced in White.

3.3.1. *RadianceRail*[®] Express rails (top and bottom) and post sleeves are co-extruded with a PVC color cap layer and wood/plastic composite core. See Figure 2 and Figure 7(b).

3.3.2. Balusters are hollow, co-extruded PVC material. See Figure 3(c).

4.0 Performance Characteristics

4.1. The *TimberTech*[®] guardrail systems described in this report have demonstrated the capacity to resist the design loadings specified in Chapter 16 of the IBC and Section R301 of IRC when tested in accordance with ICC-ES AC174.

4.2. Structural performance has been demonstrated for a temperature range from -20°F to 125°F.

4.3. Materials used are deemed equivalent to preservative treated or naturally durable wood for resistance to weathering effects, decay, and attack from termites.

4.4. The composite core material with PVC capstock and the components with PVC material have flame spread index values of 75 and 30 respectively when tested according to ASTM E 84. The referenced criteria within AC174, requires a flame spread index not exceeding 200 when tested in accordance with ASTM E 84.

5.0 Installation

Installation shall be in accordance with the manufacturer's installation instructions and this report. Where differences occur between this report and the manufacturer's installation instructions, this report shall govern. See Tables 2 and 3 and Figures 8 through 11 for installation details.

5.1. Foot blocks are a section of nominal 1.2" square extruded composite picket with a solid composite insert or expanded PVC core to facilitate fastening. Foot blocks shall be installed at approximate 1/3 intervals for rails over six feet in length or at mid-span for rails less than six feet in length of the bottom guardrail between the deck surface and the guard rail. See Table 3 and Figures 8 through 11.

5.2. Guardrail systems may be attached to conventional 4x4 wood posts or other suitable wood support structure. The wood in the supporting structure shall have a specific gravity of 0.50 or greater (Southern Yellow Pine or better) and a minimum thickness to allow full penetration of the bracket mounting screws. Conventional 4x4 wood posts or other wood supports are outside the scope of this report.

6.0 Supporting Evidence

6.1. Drawings and installation instructions submitted by the manufacturer.

6.2. Reports of testing and engineering analysis demonstrating compliance with the performance requirements of ICC-ES AC174, Acceptance Criteria for Deck Board Span ratings and Guardrail Systems (Guards and Handrails), effective July 1, 2010.

6.3. The reports of testing and engineering analysis demonstrating compliance with the performance requirements ASTM D 7032-07, Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails).

6.4. A quality control manual that is in accordance with the ICC-ES AC10, Acceptance Criteria for Quality Documentation, approved June 2011.

7.0 Conditions of Use

The guard assemblies identified in this report are deemed to comply with the intent of the provisions of the referenced building codes subject to the following conditions.

7.1. Guards are installed in accordance with manufacturer's published installation instructions and this report. Where the manufacturer's instructions differ from this report this report shall govern.

7.2. Guardrail systems recognized in this report and regulated by the IBC or IRC are limited to exterior use in all construction types where wood is permitted in accordance with Section 1406.3 of the IBC and in One and Two Family Dwellings regulated by the IRC.

7.3. Conventional wood supports for guards are not within the scope of this report and are subject to evaluation and approval by the building official. Supports must satisfy the design load requirements specified in Chapter 16 of the IBC and must provide suitable material for anchorage of the rail brackets. Where required by the building official, engineering calculations and details shall be provided.

7.4. Compatibility of fasteners and other metallic components with the supporting structure, including chemically treated wood, is not within the scope of this report.

7.5. Compatibility of the supporting construction materials with all fasteners, metal post mount components, and other hardware components is subject to approval by the building code official.

7.6. Only those types of fasteners and fastening methods described in this report have been evaluated for the installation of *TimberTech*[®] guardrail systems; other methods of attachment are outside the scope of this report.

7.7. Where required by the building official, engineering calculations and details shall be provided. The calculations shall verify that the anchorage complies with the building codes for the type and condition of the supporting construction.

7.8. *TimberTech*[®] guardrail systems, with the exception of the balusters, are manufactured by TimberTech Limited in Columbus, Ohio. The balusters are manufactured by Crane Plastics Manufacturing in Columbus, Ohio in accordance with the manufacturer's approved quality control system with inspections by Architectural Testing (IAS AA-676.)

8.0 Identification

The guard systems produced by *TimberTech*[®] identified in this report shall be identified with labeling on the individual components or the packaging and include the following;

8.1. Name and/or trademark of the manufacturer.

8.2. The applicable guardrail assembly performance levels as stipulated in Table 1 of CCRR-0114.

8.3. The designation "ASTM D 7032"

8.4. The phrase "For Use in One- and Two-Family Dwellings Only" when applicable.

8.5. The Architectural Testing Code Compliance Research Report mark and number (CCRR-0114).

9.0 Code Compliance Research Report Use

9.1. Approval of building products and/or materials can only be granted by a building official having legal authority in the specific jurisdiction where approval is sought.

9.2. Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product by Architectural Testing, Inc.

9.3. Reference to the Architectural Testing internet web site address at www.ati-es.com is recommended to ascertain the current version and status of this report.

Table 1 - Railing System Building Code Recognition

TimberTech [®] Guard Systems	Type of System	Guard System Size (Length x Height)	
		IBC ⁽³⁾	IRC ⁽⁴⁾
RadianceRail[®] Level and Stair	Level/In-Line Application ⁽¹⁾	91" x 42"	91" x (36" or 42")
	Level/45° Application ⁽¹⁾		
	Stair Systems ⁽²⁾	91" x 42"	91" x (36" or 42")
RadianceRail[®] Express Level and Stair	Level/In-Line Application ⁽¹⁾	91.75" x 42"	91.75" x (36" or 42")
	Level/45° Application ⁽¹⁾	90" x 42"	90" x (36" or 42")
	Stair Systems ⁽²⁾	86.375" x 42"	86.375" x (36" or 42")

⁽¹⁾ Level Railing lengths are maximum clear length between supports. Railing height is the minimum installed height from walking surface to top of top rail.

⁽²⁾ Stair Railing lengths are maximum clear length between supports. Stair Heights are measured vertically from the leading edge of the stair nose.

⁽³⁾ All Use Groups

⁽⁴⁾ Limited to use in One- and Two-Family Dwellings.

Table 2 - Rail and Baluster Descriptions

Guardrail System	Rail Description	Baluster Style	Baluster Fastening
RadianceRail®	<p><u>Top Rail Assembly:</u> The upper and support rails (Figure 1) are fastened with a series of four equally spaced #8 x 2" long coated screws that pass through pre-drilled holes in the baluster side support rail and threaded into the top rail.</p> <p><u>Bottom Rail Assembly:</u> The bottom rail includes two independent rails: a support rail and a bottom cap rail. Figure 1.</p>	Nominal 1.25" square extruded composite picket and an expanded PVC core or hollow with an inserted composite plug. Hollow version has an approx. 0.12" wall thickness. Figures 3(a) and 3(b).	<p>A solid PVC composite baluster with an expanded core or a hollow PVC composite with a PVC composite plug approximately 2 inches in length inserted into each end of the baluster with an extruded or drilled pilot hole at its center to provide a means for locating a fastener.</p> <p>Balusters are held-in-place with coated screws inserted through pre-drilled holes in the upper support and lower rail sections. One #8 x 3" long coated screw is utilized in the top and one #8 x 2" long coated screw is used through the lower rail.</p>
RadianceRail® Express	Top and Bottom rails have co-extruded wood-plastic composite "breadloaf" profiles (Figure 2) that consist of pre-routed holes to receive balusters.	Nominal 1.25" square, hollow, co-extruded PVC baluster. Figure 3(c).	The top and bottom rails include pre-routed holes to receive balusters.

Table 3 - Rail/Bracket Fastening Schedule

Guardrail System	Rail Bracket to Rails	Foot Block to Bottom Rail	Rail Bracket to Post
RadianceRail® Level/45° and Stair	One metal-reinforced plastic bracket (Figure 5) is attached to each end of the upper and lower support rail using three #8 x 0.75" pan-head screws.	One #8 x 2" pan-head screw. See Figure 8.	<p><u>Plastic Support Blocks to Posts:</u> Two #8 x 3" pan-head screws per block. One support block for each end of the lower support rail for level assemblies. Four support blocks are used for stair assemblies located on the posts where the support rails meet the posts.</p> <p><u>Metal-Reinforced Plastic Mounting Bracket to Posts:</u> Two #8 x 3" coated pan-head screws.</p>
RadianceRail® Express	Level & 45° One stainless steel "L" bracket is attached to each end of the top and bottom rails using three #10 x 1-5/8" pan-head screws. Figure 6(a).	One #10 x 3" pan-head screw. See Figure 10.	<u>Stainless Steel "L" Bracket to Posts:</u> Two #10 x 1-5/8" pan-head screws.
	Stair <u>Acute Angle Bracket</u> , Figure 6(c): Two #10 x 1-5/8" pan-head screws <u>Obtuse Angel Bracket</u> , Figure 6(b): Two #10 x 1" pan-head screws		

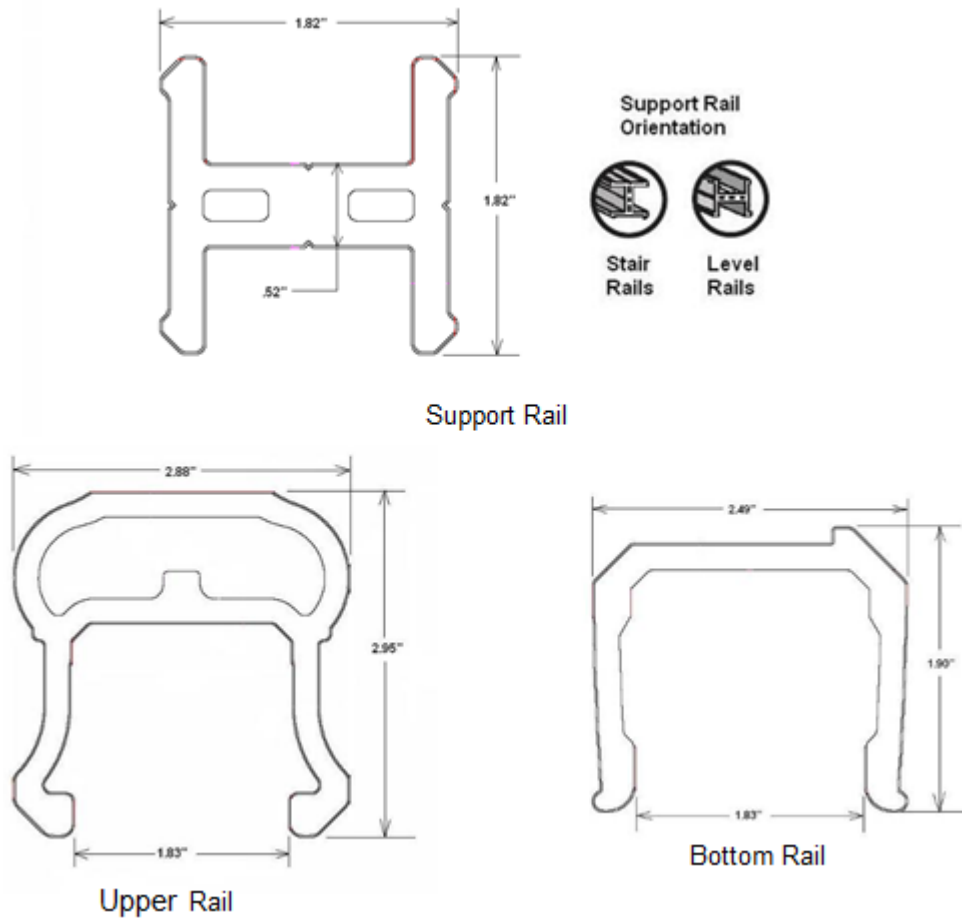


Figure 1 - RadianceRail[®], Rail Profiles

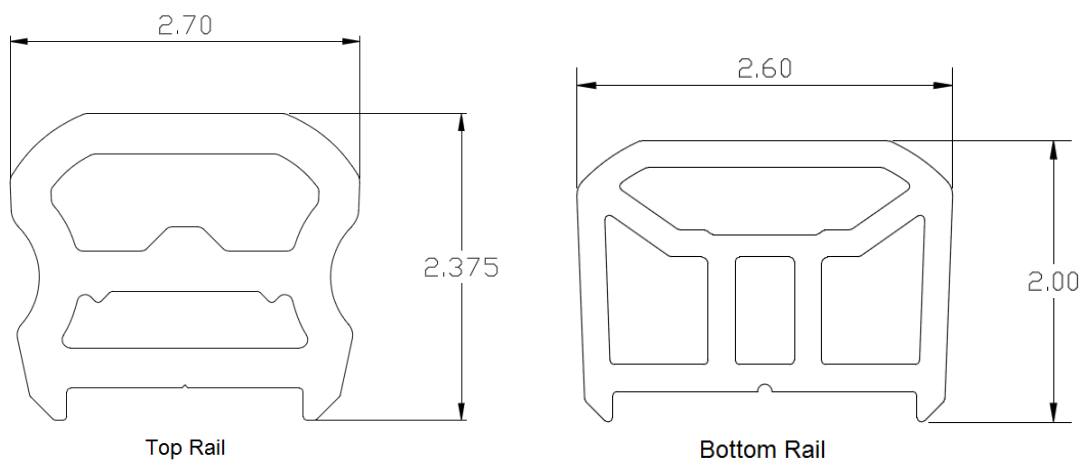


Figure 2 - RadianceRail[®] Express, Rail Profiles

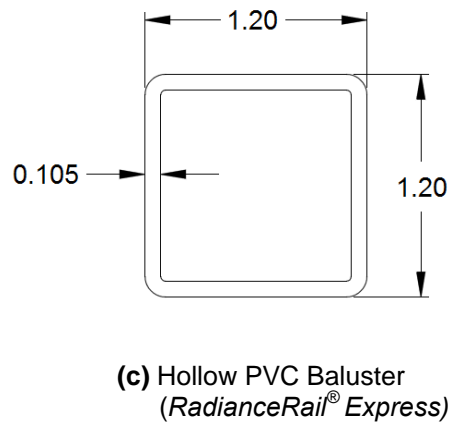
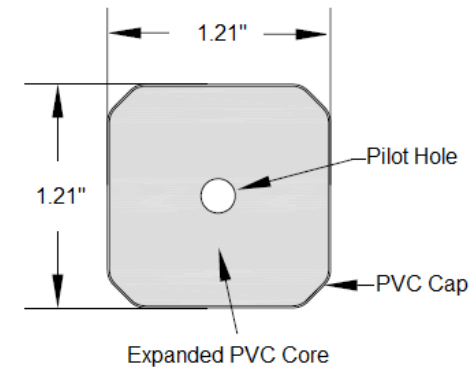
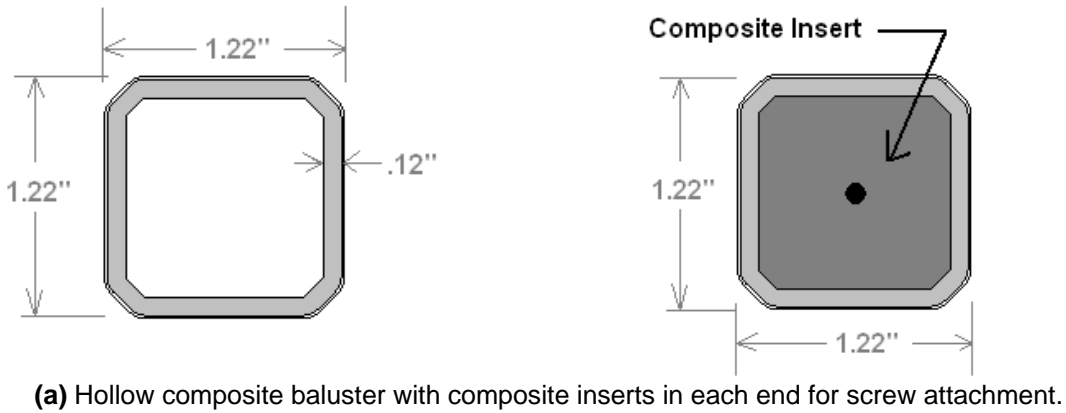
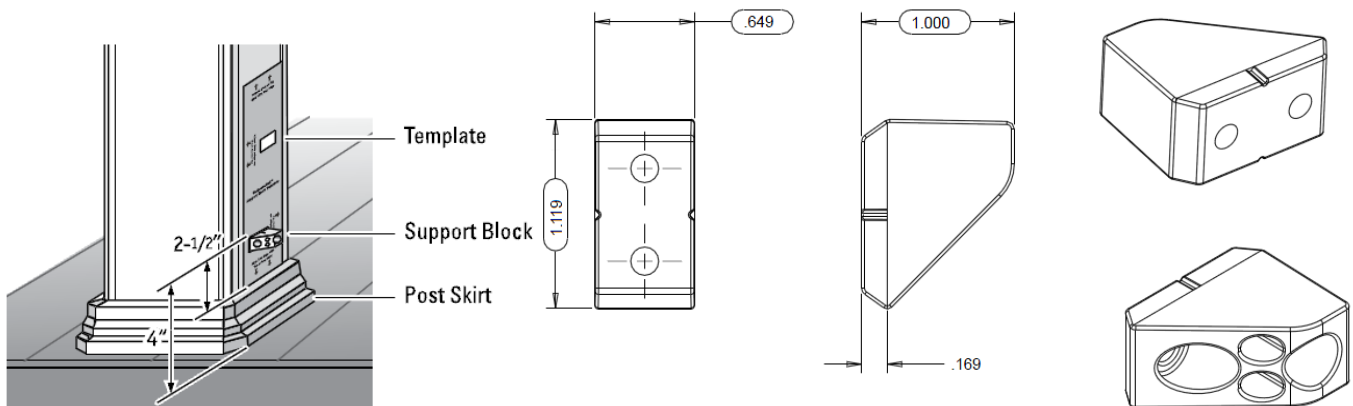


Figure 3 - Baluster Profiles



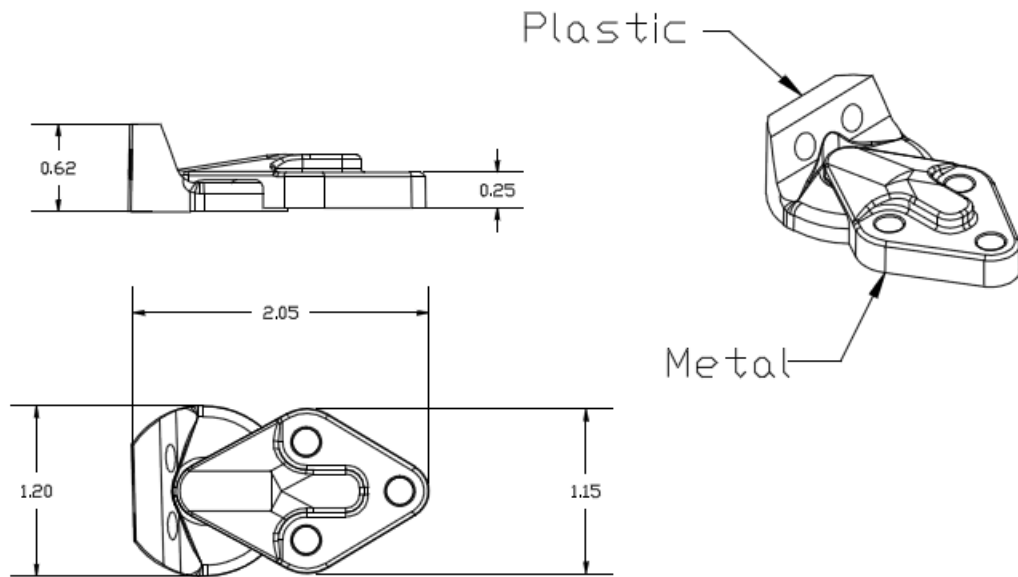
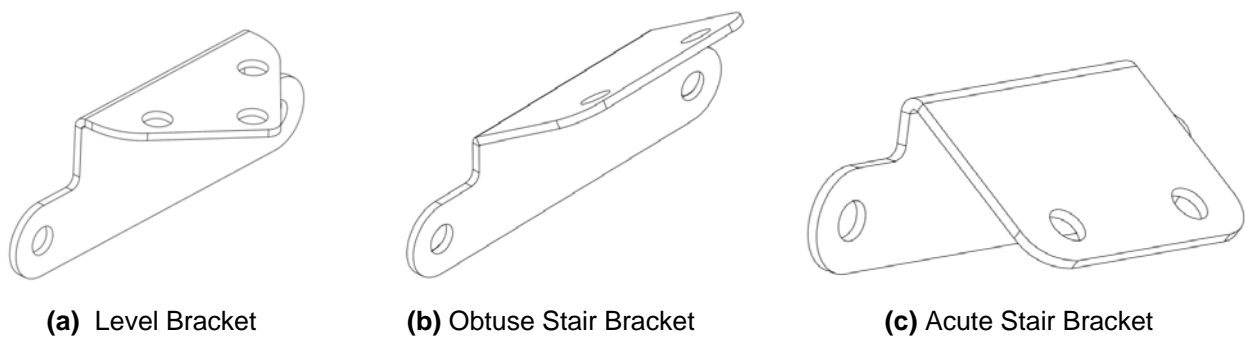


Figure 5 - RadianceRail® Attachment Bracket

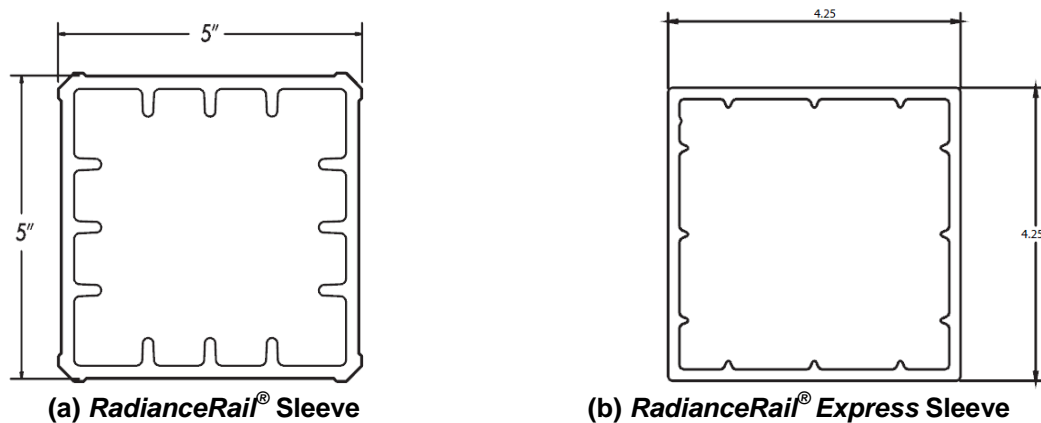


(a) Level Bracket

(b) Obtuse Stair Bracket

(c) Acute Stair Bracket

Figure 6 - RadianceRail® Express Brackets



(a) RadianceRail® Sleeve

(b) RadianceRail® Express Sleeve

Figure 7 - Post Sleeve Profiles

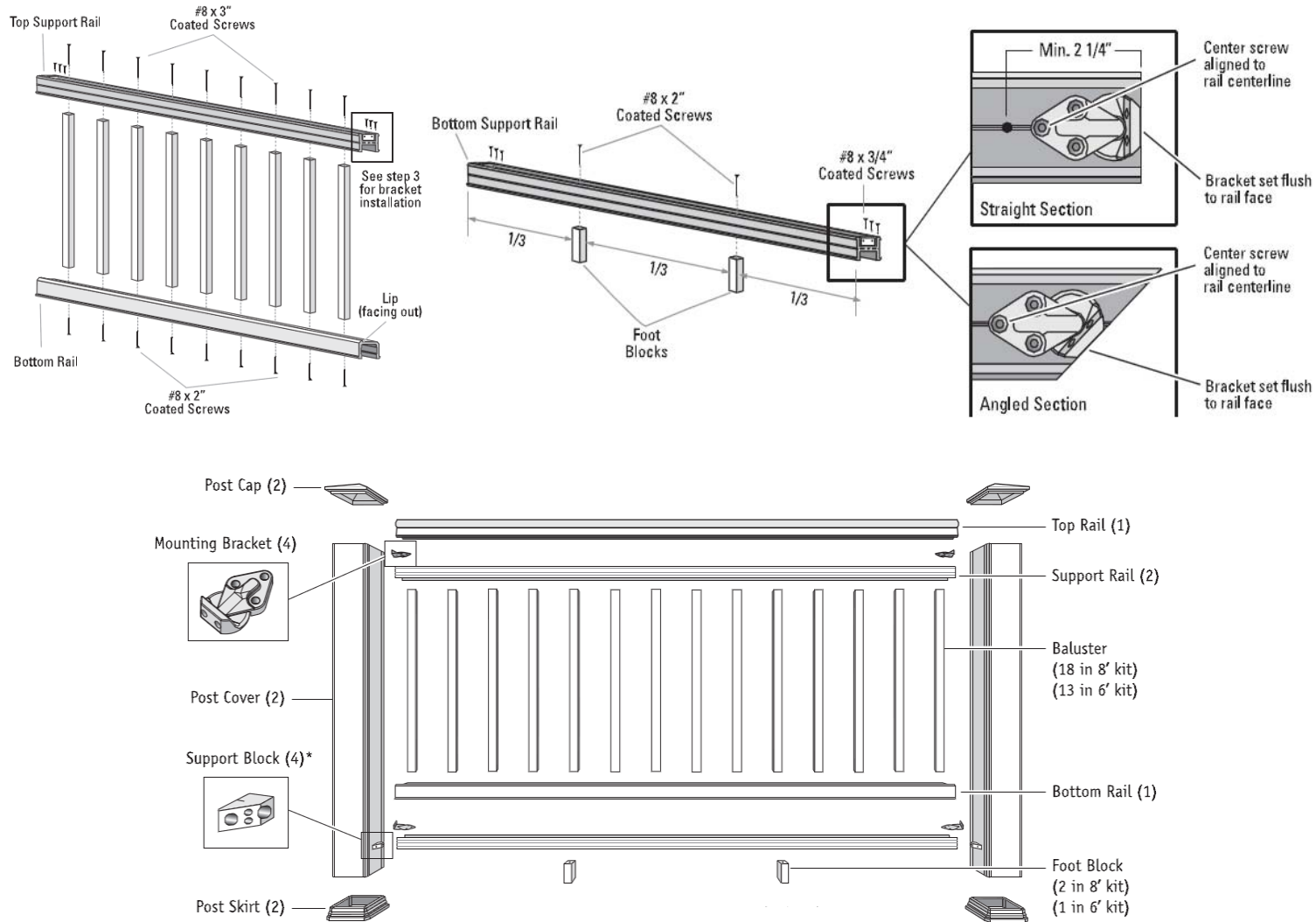


Figure 8 - RadianceRail® Typical Level Assembly

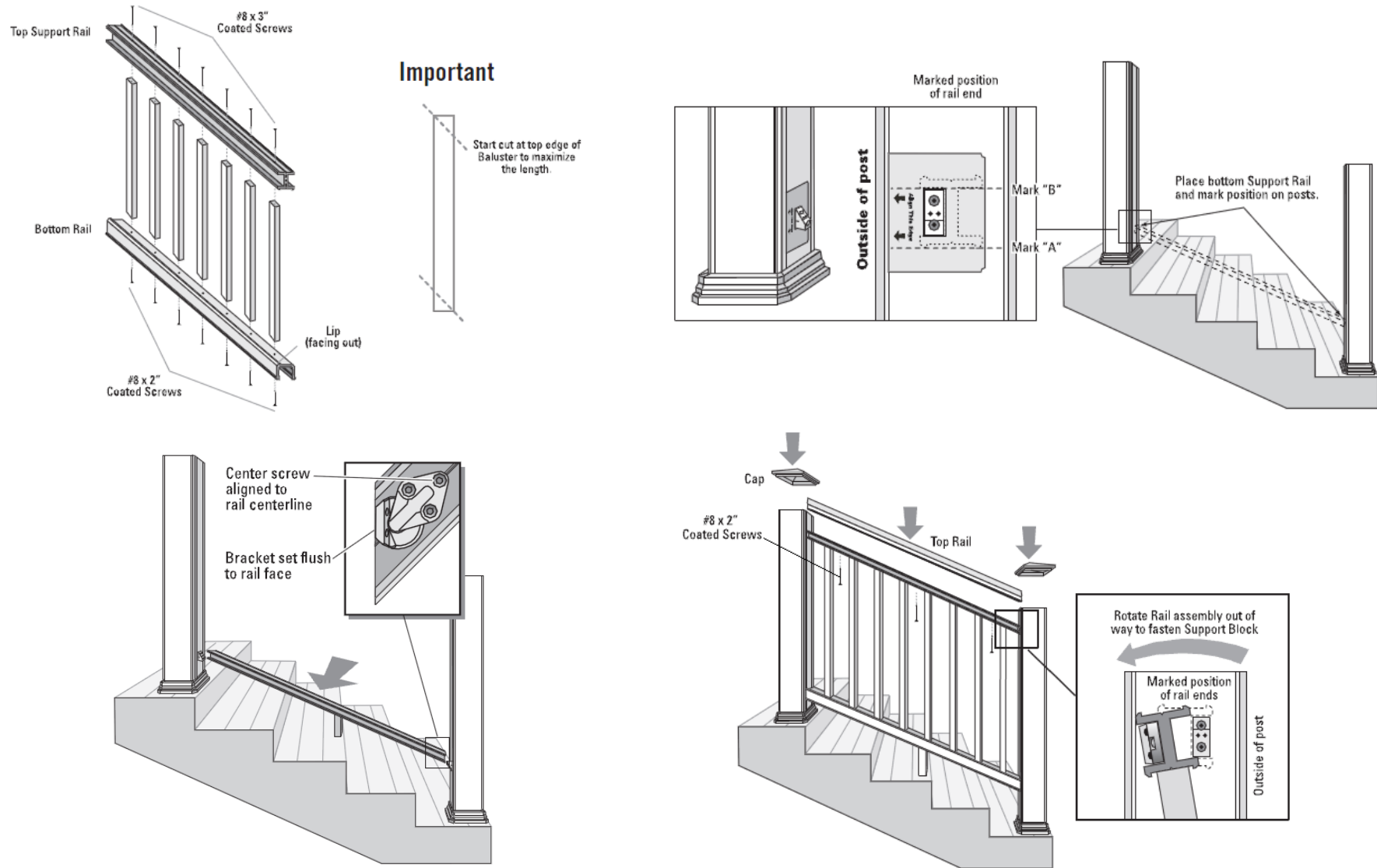


Figure 9 - RadianceRail® Typical Stair Assembly

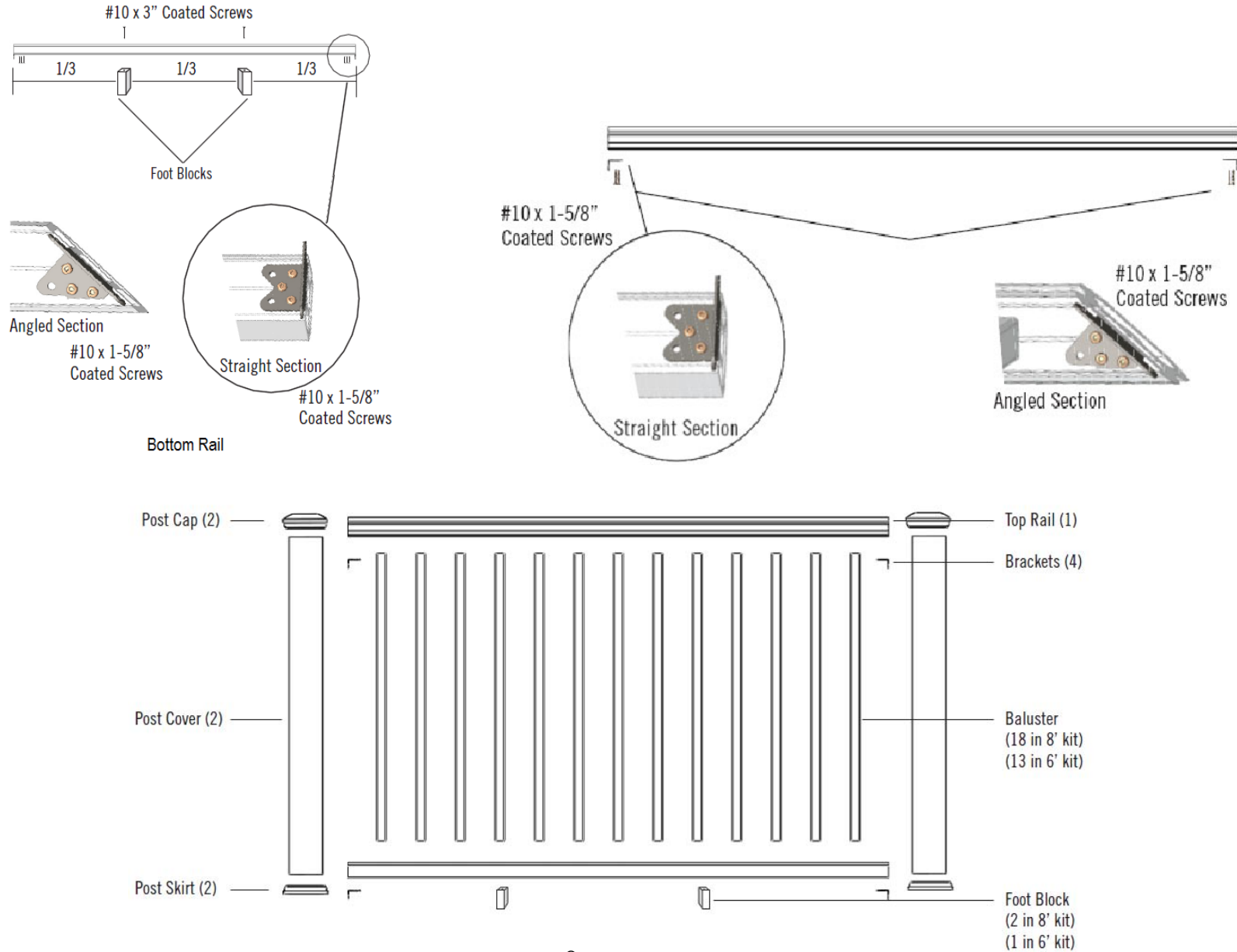


Figure 10 - RadianceRail® Express Typical Level Assembly

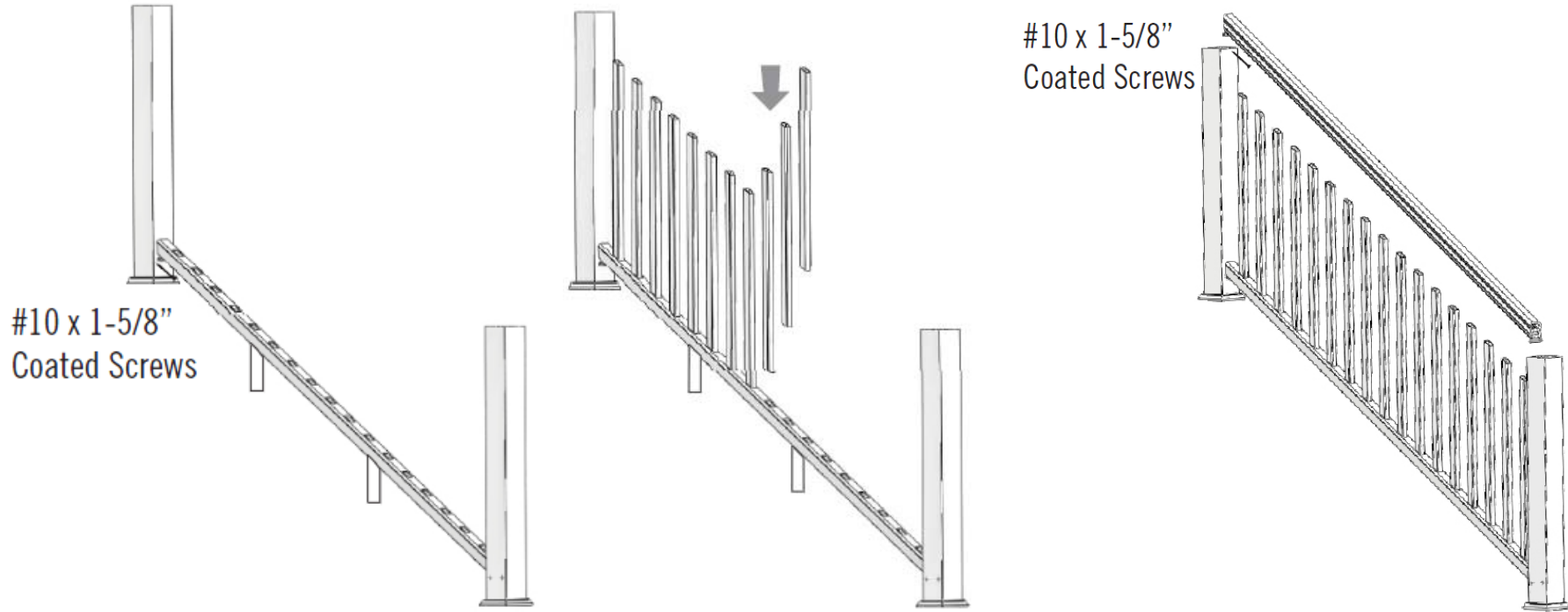


Figure 11 - RadianceRail® Express Typical Stair Assembly