

**Code Compliance Research Report****CCRR-0114**

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1.0 SubjectGuardrail Systems*TimberTech® RadianceRail®**TimberTech® RadianceRail® Express**AZEK Premier**AZEK Trademark**AZEK Reserve***2.0 Research Scope****2.1. Building Codes:**

2015, 2012 International Building Code
 (IBC)

2015, 2012 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 the *AZEK* series guardrails offer three assemblies, *Premier*, *Trademark*, and *Reserve*. All are guardrails under the definitions of the referenced codes. Guardrails 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 guardrails with heights of 36 inches or 42 inches above the floor surface are provided in rail lengths up to 114.5 inches. This provides a maximum 10 feet (120 inches) from post center to post center. See Table 1 for qualified lengths and configurations.

3.1.2. Stair guardrails are provided in rail lengths up to 120" inches as measured along the upper rail. See Table 1 for qualified lengths and configurations.

3.2. The *RadianceRail®*, *Premier*, *Trademark*, and *Reserve* composite guardrail system includes top and bottom rails, two support rails, infill, post sleeves, rail-to-post brackets, support blocks, foot blocks, and decorative moldings.

3.2.1. Support rails are a composite extrusion for rail lengths up to 92"

3.2.2. For length exceeding 92" the top support rail is an aluminum extrusion with a composite bottom support rail.

3.2.3. Rails (top, bottom, and support) and post sleeves are manufactured from extruded shapes in six colors; Coastal White (White), Mountain Cedar, Classic Black (Black), SandRidge (Brownstone), RiverRock (Slate Grey), and Traditional Walnut (Kona),. All components are co-extruded with a PVC color cap layer and wood/plastic composite core.

3.2.3.1. *RadianceRail®*, *Premier*, *Trademark*, and *Reserve* infill options are described in Table 2.

3.2.4. 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 Figures 1, 2, 4, 5 & 6.

3.2.5. 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 Classic Black (Black), Coastal White (White), and Traditional Walnut (Kona).

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 3.

3.3.2. Radiance Rail Express balusters are hollow, co-extruded PVC material. See Figure 8.

4.0 Performance Characteristics

4.1. The *TimberTech®* and *AZEK* 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 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 1 – 3 for assembly descriptions.

5.1. Foot blocks are a section of nominal 1.2" square extruded composite picket with an 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 guardrail. See Table 3 and Figures 14 through 19.

5.2. Guardrail systems may be attached to conventional 4x4, or 6x6 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 and 6x6 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), revised February 2014.

6.3. The reports of testing and engineering analysis demonstrating compliance with the performance requirements ASTM D 7032-08 (2012 IBC) and ASTM D 7032-10a (2015 IBC), 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, dated June 2014.

7.0 Conditions of Use

The guardrail 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. Guardrails 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. For use in jurisdictions that have adopted the 2012 IBC, the 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. For use in jurisdictions that have adopted the 2015 IBC, the guardrail systems recognized in this report and regulated by the IBC and IRC are limited to Type V-B construction as specified in the 2015 IBC Section 2612.5.

7.4. Conventional wood supports for guardrails 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.

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

7.6. 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.

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

7.8. 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.

7.9. The guardrail systems produced by *TimberTech*® and *AZEK* identified in this report have not been evaluated for use in areas subject to Formosan termite attack.

7.10. *TimberTech*® and *AZEK* guardrail systems are manufactured by TimberTech Limited in Wilmington, Ohio in accordance with the manufacturer's approved quality control system with inspections by Architectural Testing (IAS AA-676.)

8.0 Identification

The guardrail systems produced by *TimberTech*® and *AZEK* 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 and the manufacturer's address.

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

CPG Guard Systems	Type of System	Guard System Size (Length x Height)	
		IBC ⁽³⁾	IRC ⁽⁴⁾
TimberTech® RadianceRail® (With composite support rail)	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")
TimberTech® RadianceRail® (With aluminum support rail)	Level/In-Line Application ⁽¹⁾	114-1/2" x 42"	114-1/2" x (36" or 42")
	Stair Systems ⁽²⁾	116" x 42"	114-1/2" x (36" or 42")
RadianceRail® Express	Level/In-Line Application ⁽¹⁾	91-3/4" x 42"	91-3/4" x (36" or 42")
	Level/45° Application ⁽¹⁾	90" x 42"	90" x (36" or 42")
	Stair Systems ⁽²⁾	86-3/8" x 42"	86-3/8" x (36" or 42")
AZEK Trademark and AZEK Premier (With composite support rail)	Level/In-Line Application ⁽¹⁾	90-1/2" x 42"	90" x (36" or 42")
	Stair Systems ⁽²⁾	92" x 42"	91" x (36" or 42")
AZEK Reserve (With composite support rail)	Level/In-Line Application ⁽¹⁾	92" x 42"	92" x (36" or 42")
	Stair Systems ⁽²⁾	92" x 42"	92" x (36" or 42")
AZEK Trademark, AZEK Premier and, AZEK Reserve (With aluminum support rail)	Level/In-Line Application ⁽¹⁾	114-1/2" x 42"	114-1/2" x (36" or 42")
	Stair Systems ⁽²⁾	116" x 42"	114-1/2" 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 along the slope 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	Infill Options	Infill Fastening Description
TimberTech® RadianceRail® <i>AZEK Series (All)</i>	<u>Railings (Top and Bottom) are and assemblage of two components; A top or bottom rail profile with an inner support rail.</u> <u>Rail Profiles:</u> See Figures 1, 3, 4 & 5 for top and bottom rail profiles. <u>Support Rails:</u> A composite support rail is used for rail lengths up to 92" An Aluminum support rail is used for rail lengths exceeding 92"	Nominal 1.25" square Expanded cellular PVC core. See Figures 7 and 14	A solid PVC composite baluster with an expanded core with a drilled pilot hole at its center to provide a means for locating a fastener. Balusters are held-in-place with coated screws inserted through pre-drilled holes in the upper support and lower rail sections. For all balusters, 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.
	<u>Top Rail Assembly:</u> Top rail profile and support rails are fastened together with 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.	<i>Feeney® CableRail™</i> with <i>Quick-Connect®</i> fittings, and 3/4 inch sq. aluminum intermediate balusters. See Figure 15	Stainless steel cables are attached to each post sleeve with Quick-Connect® fittings (swivel fittings for stair). Cables are installed at 3" on center and 3-1/16" on center for level and stair rails, respectively. Intermediate, 3/4 inch square, 0.062 inch wall thickness, 6063-T6 aluminum balusters are spaced no greater than 30 inches on center along the length of the rail. Balusters are secured to the bottom rail with one #10-12 x 2" pan-head stainless steel screw and the top rail utilizing an intermediate base plate (attaches to the baluster with one #10-12 x 1" flat-head stainless steel screw and attaches to the top rail with two #10-12 x 1" flat-head stainless steel screws.
	<u>Bottom Rail Assembly:</u> The bottom rail includes two independent rails: a support rail and a bottom cap rail.	3/4 inch diameter or square hollow, aluminum balusters. See Figure 16	Aluminum balusters are attached to the top and bottom rails with #8 x 2" and #8 x 3" stainless steel (Series 300) pan head screws
TimberTech® RadianceRail® Express	Top and Bottom rails have co-extruded wood-plastic composite "breadloaf" profiles that consist of pre-routed holes to receive balusters.	Nominal 1.25" square, hollow, co-extruded PVC baluster. See Figure 18	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
TimberTech® RadianceRail® AZEK Series (All)		<u>Composite Support Rail:</u> CPG Four-Hole bracket (Figure 11) is attached to each end of the top and bottom support rail using four #8 x 0.75" coated steel pan-head screws. Exception: <i>TimberTech® RadianceRail®</i> Three-Hole bracket (Figure 10) attached with three #8 x 0.75" coated steel pan-head screws may be used for <i>TimberTech® RadianceRail®</i> only.	One #8 x 2" pan-head screw. See Figure 10 through Figure 17.	<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. <u>Metal-Reinforced Plastic Mounting Bracket to Posts:</u> Two #8 x 3" coated pan-head screws.
		<u>Aluminum Support Rail:</u> CPG Four-Hole bracket (Figure 11) is attached to each end of the top and bottom support rail using four #8 x 0.75" stainless steel (300 series) pan-head screws.		
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.	One #10 x 3" pan-head screw..	<u>Stainless Steel "L" Bracket to Posts:</u> Two #10 x 1-5/8" pan-head screws.
	Stair	<u>Acute Angle Bracket</u> , Figure : Two #10 x 1-5/8" pan-head screws <u>Obtuse Angel Bracket</u> , Figure : Two #10 x 1" pan-head screws		

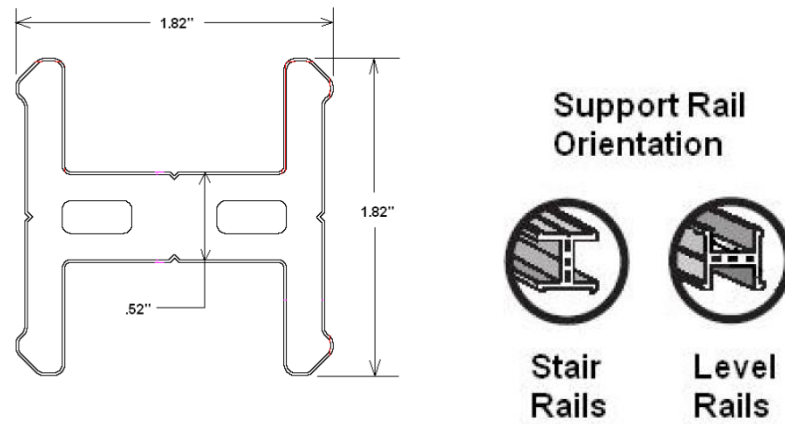


Figure 1 Support Rail

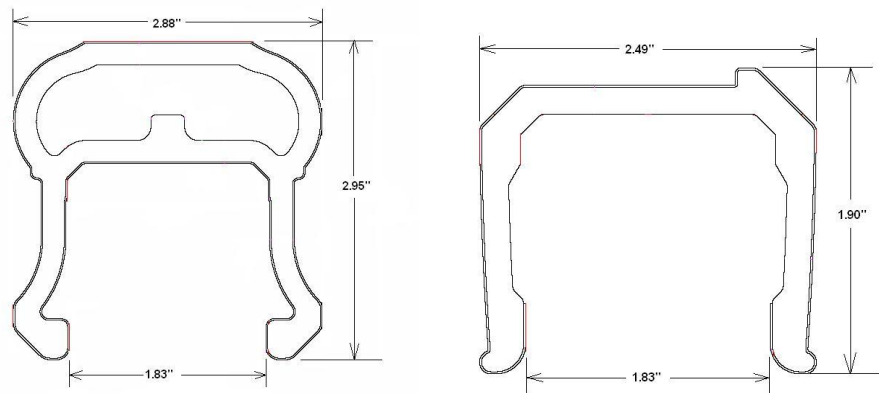


Figure 2 -RadianceRail®
 Top and Bottom Rail Profile

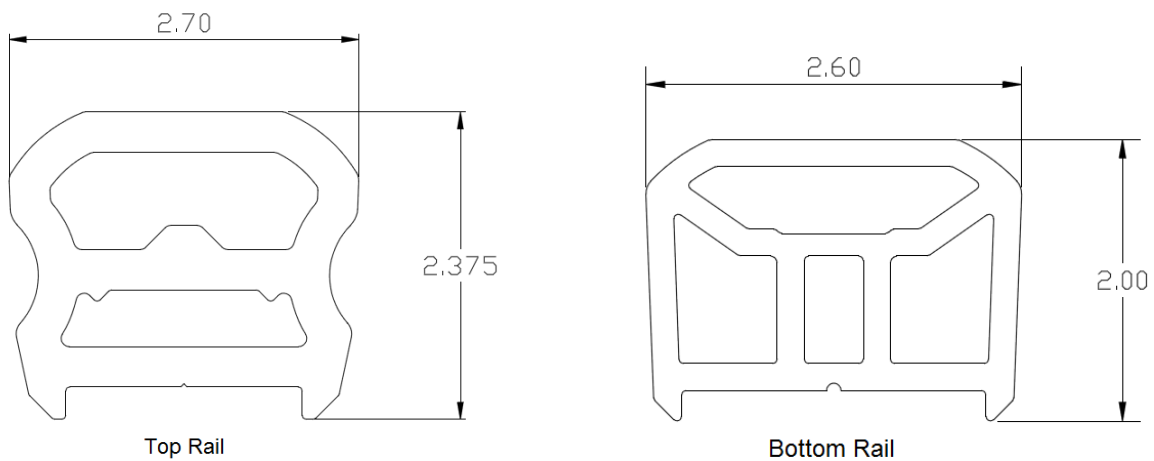


Figure 3 - RadianceRail® Express, Rail Profiles

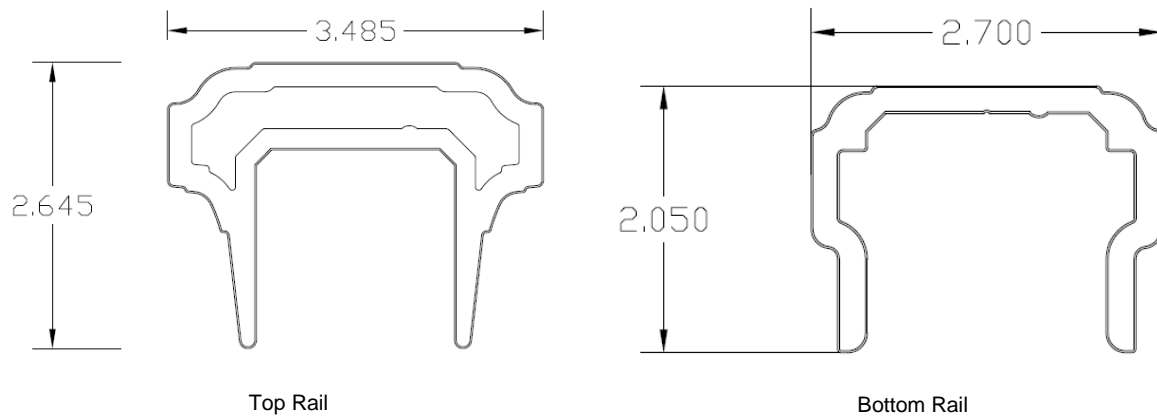


Figure 4 – AZEK Premier Rail Profiles

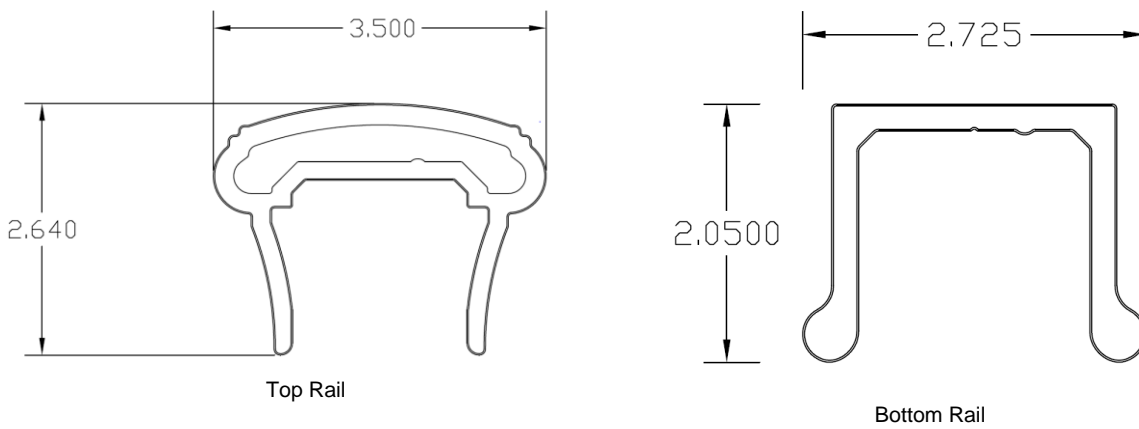


Figure 5: AZEK Trademark Rail Profiles

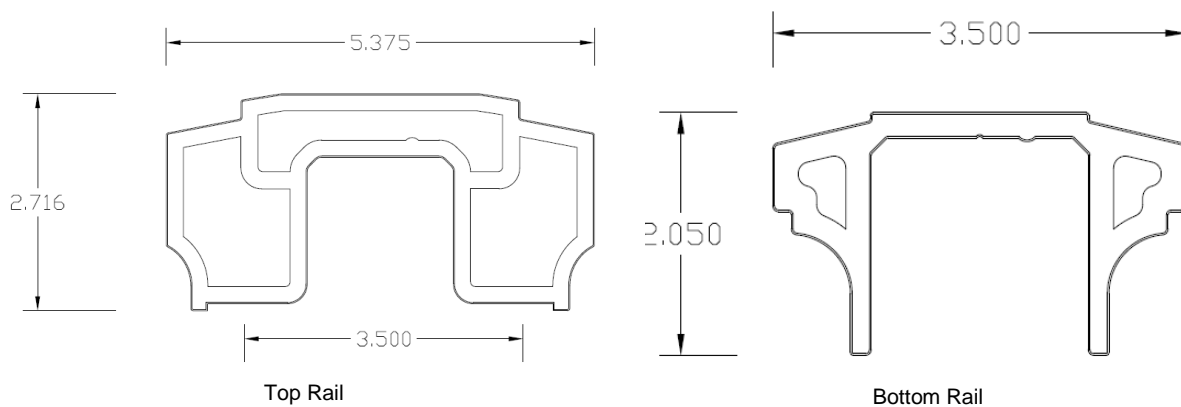
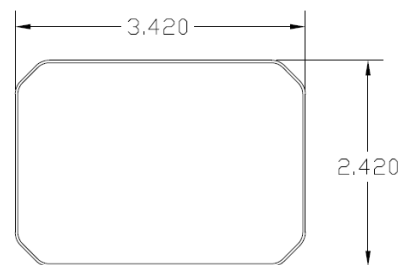
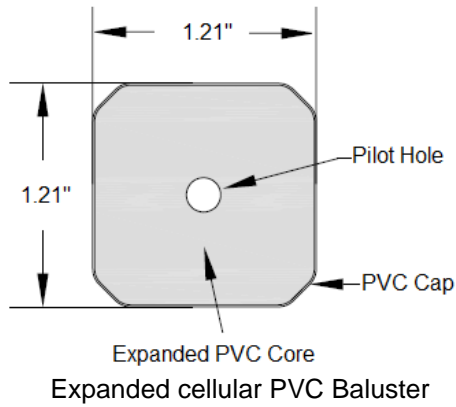
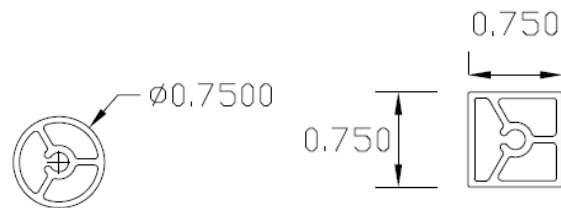


Figure 6: AZEK Reserve Rail Profiles

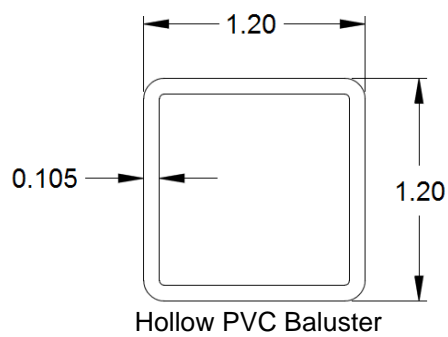


Expanded cellular PVC Bauster



Aluminum Balusters

Figure 7 - *RadianceRail*® Premier, Trademark, and Reserve Baluster Profiles



Hollow PVC Baluster

Figure 8 - *RadianceRail*® Express Baluster Profile

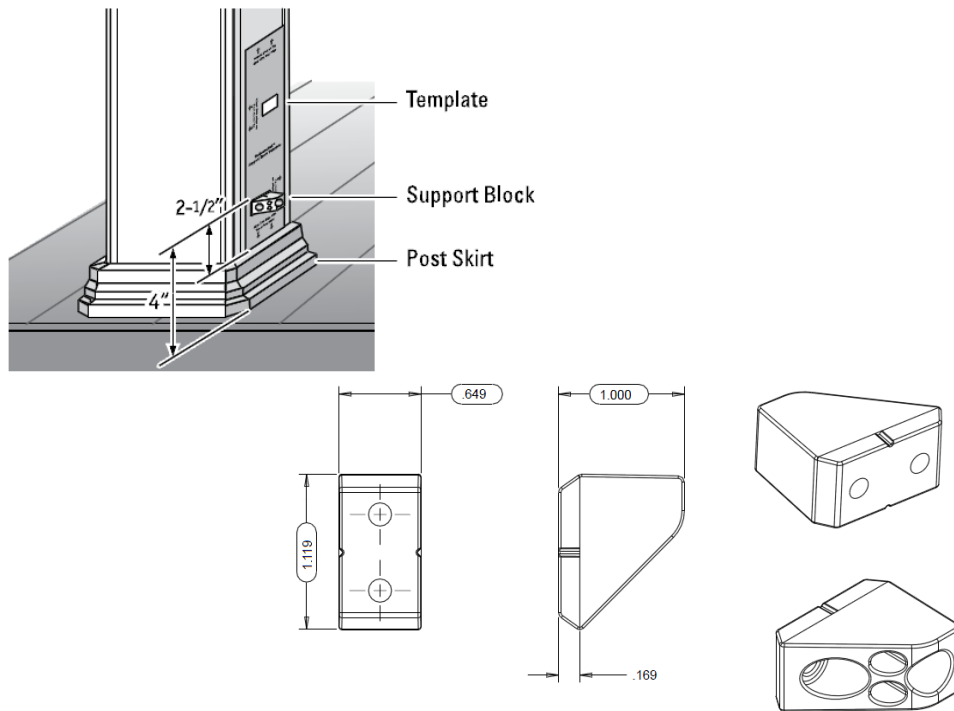


Figure 9 - RadianceRail® Support Block

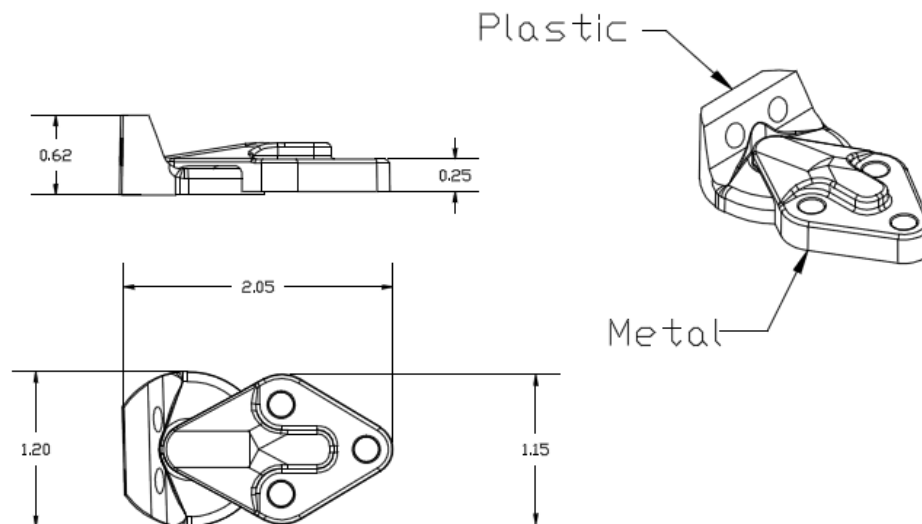


Figure 10 - TimberTech® RadianceRail® Three-Hole Bracket
(Limited to rail lengths up to 91")

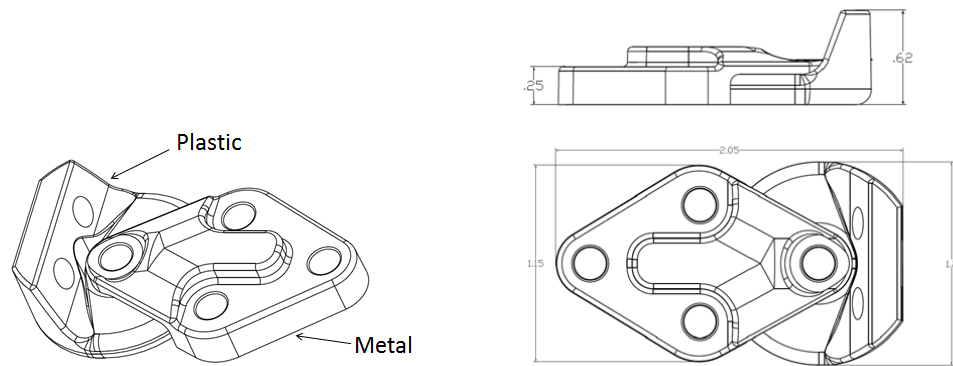


Figure 11 – CPG Four-Hole Bracket
TimberTech® RadianceRail® and AZEK Series (All)

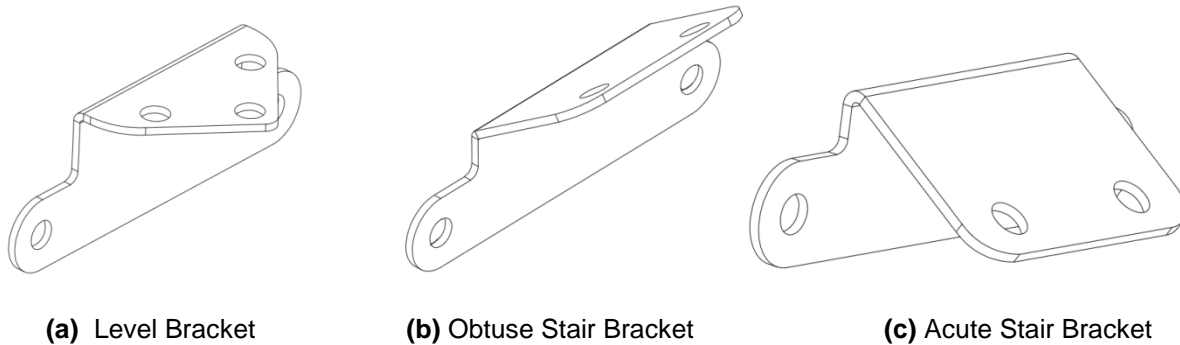


Figure 12 - RadianceRail® Express Brackets

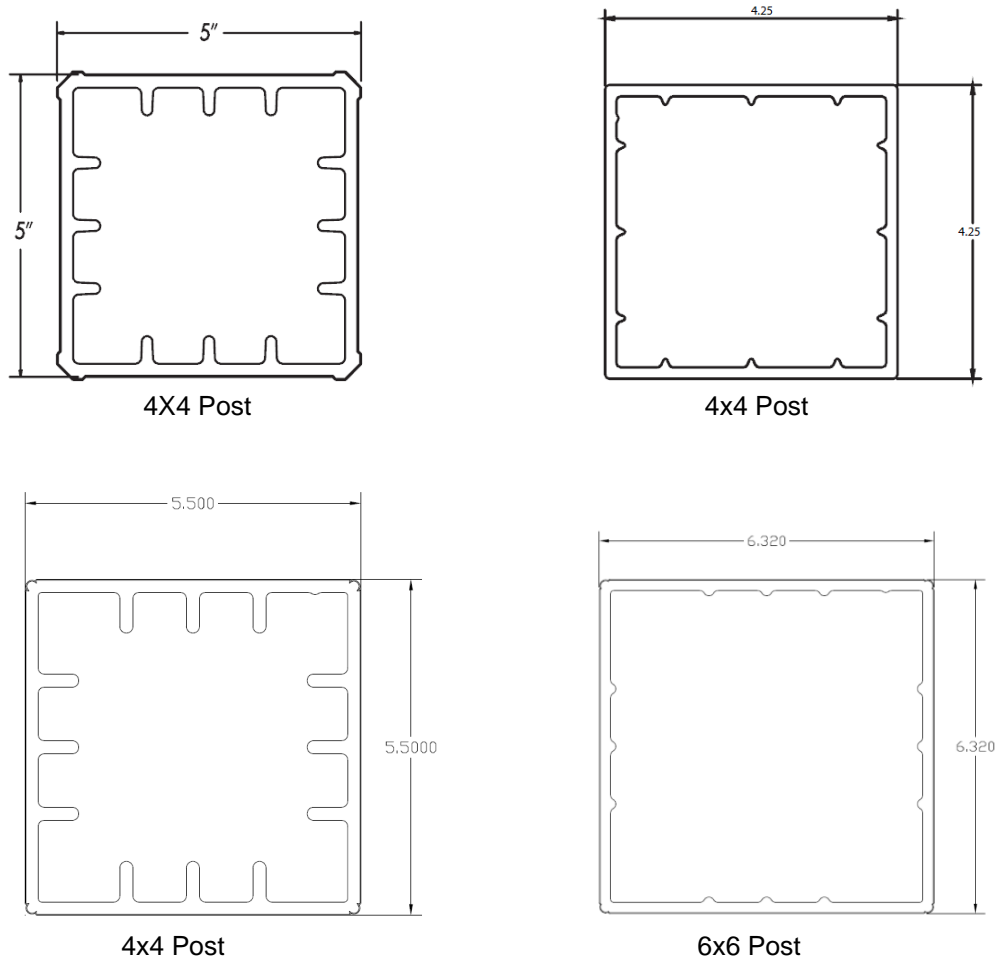


Figure 13- Post Sleeve Profiles for 4x4 or 6x6 Wood Posts

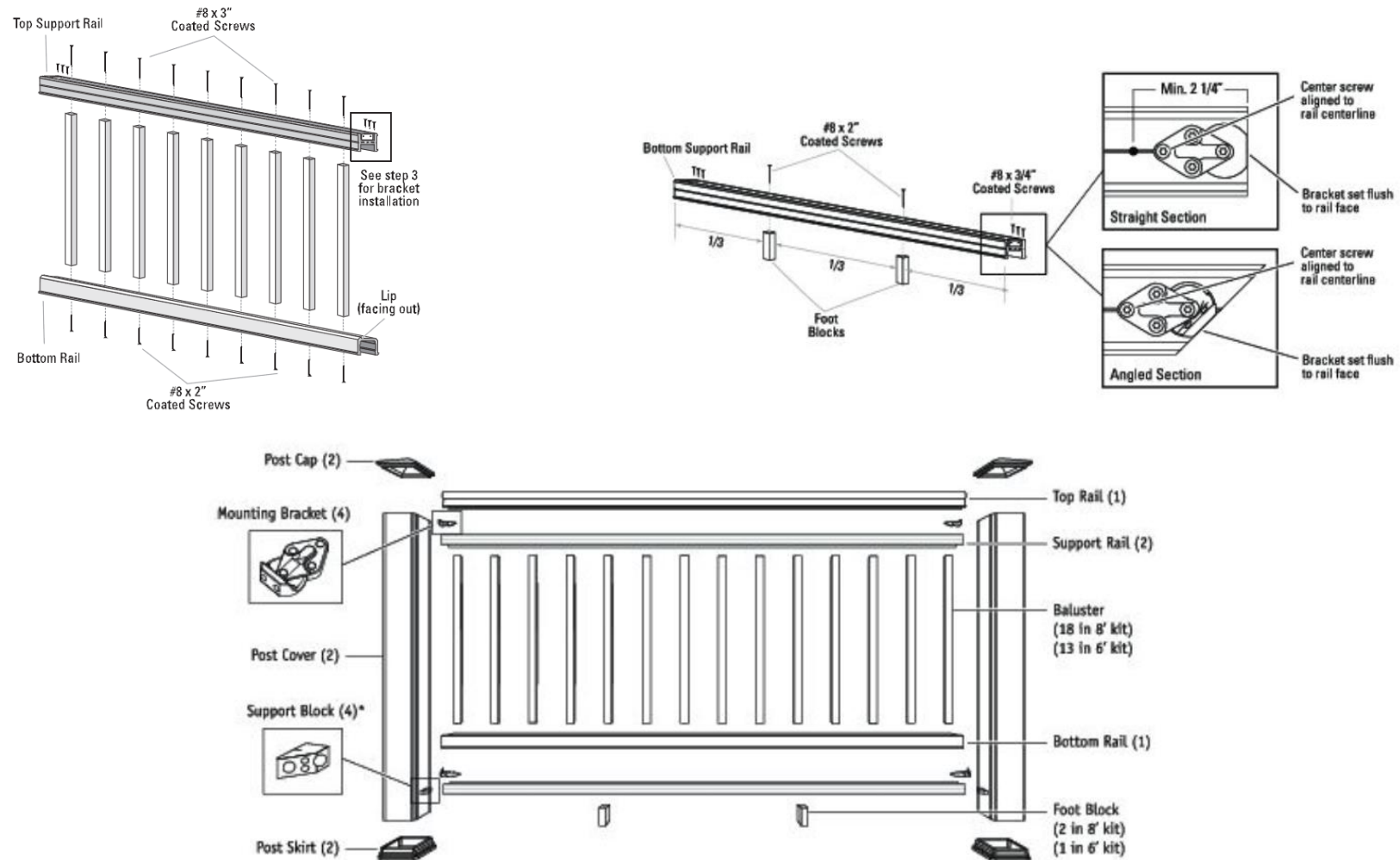


Figure 14 – TimberTech® RadianceRail® and AZEK Trademark, Premier, and Reserve
Level Assembly with Expanded Cellular PVC Balusters

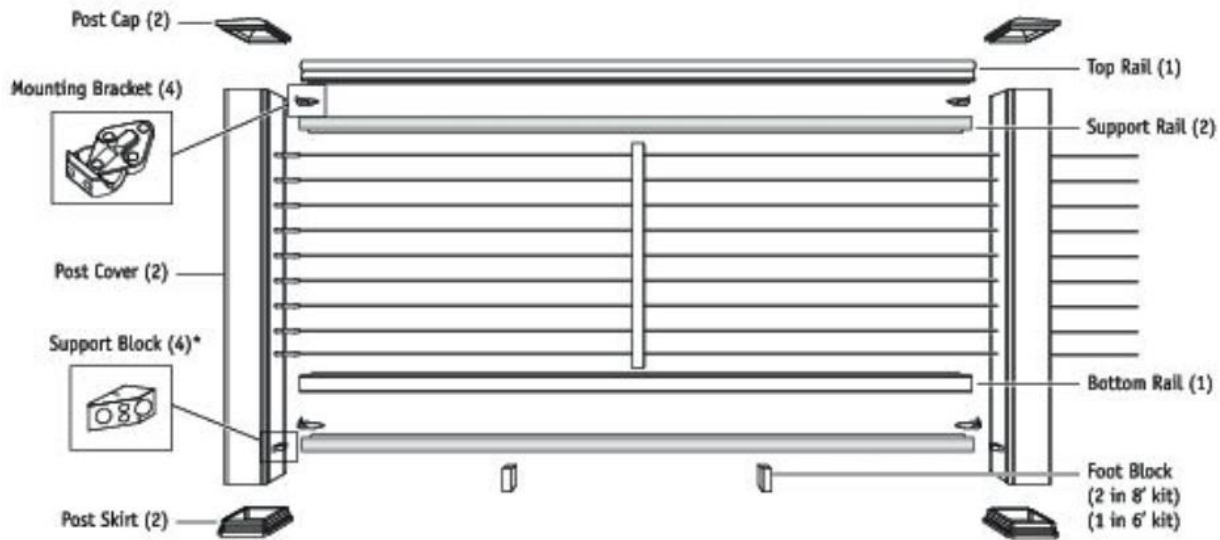


Figure 15 – TimberTech® RadianceRail® and AZEK Trademark, Premier, and Reserve Level Assembly with Feeney® CableRail™

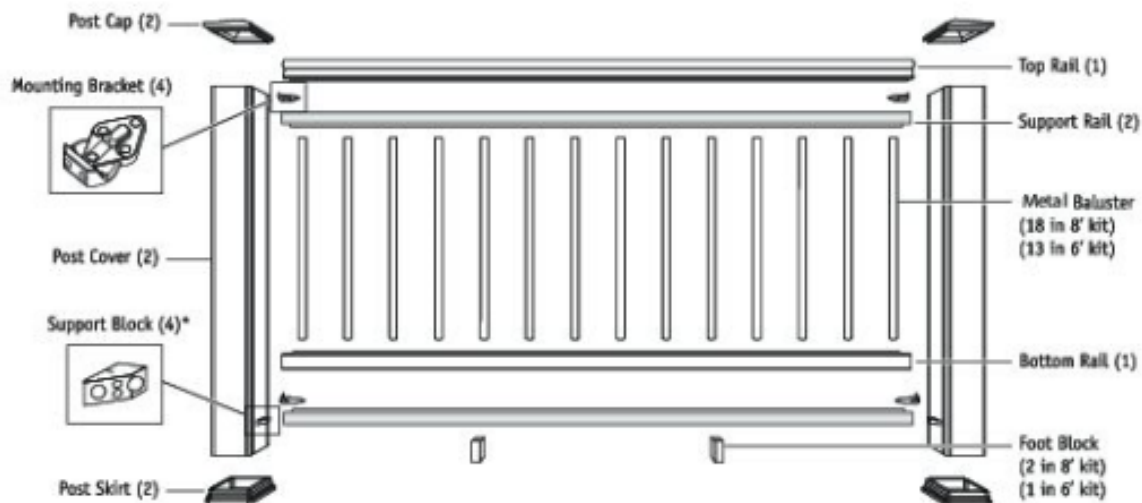


Figure 16 – TimberTech® RadianceRail® and AZEK Trademark, Premier, and Reserve Level Assembly with Aluminum Balusters

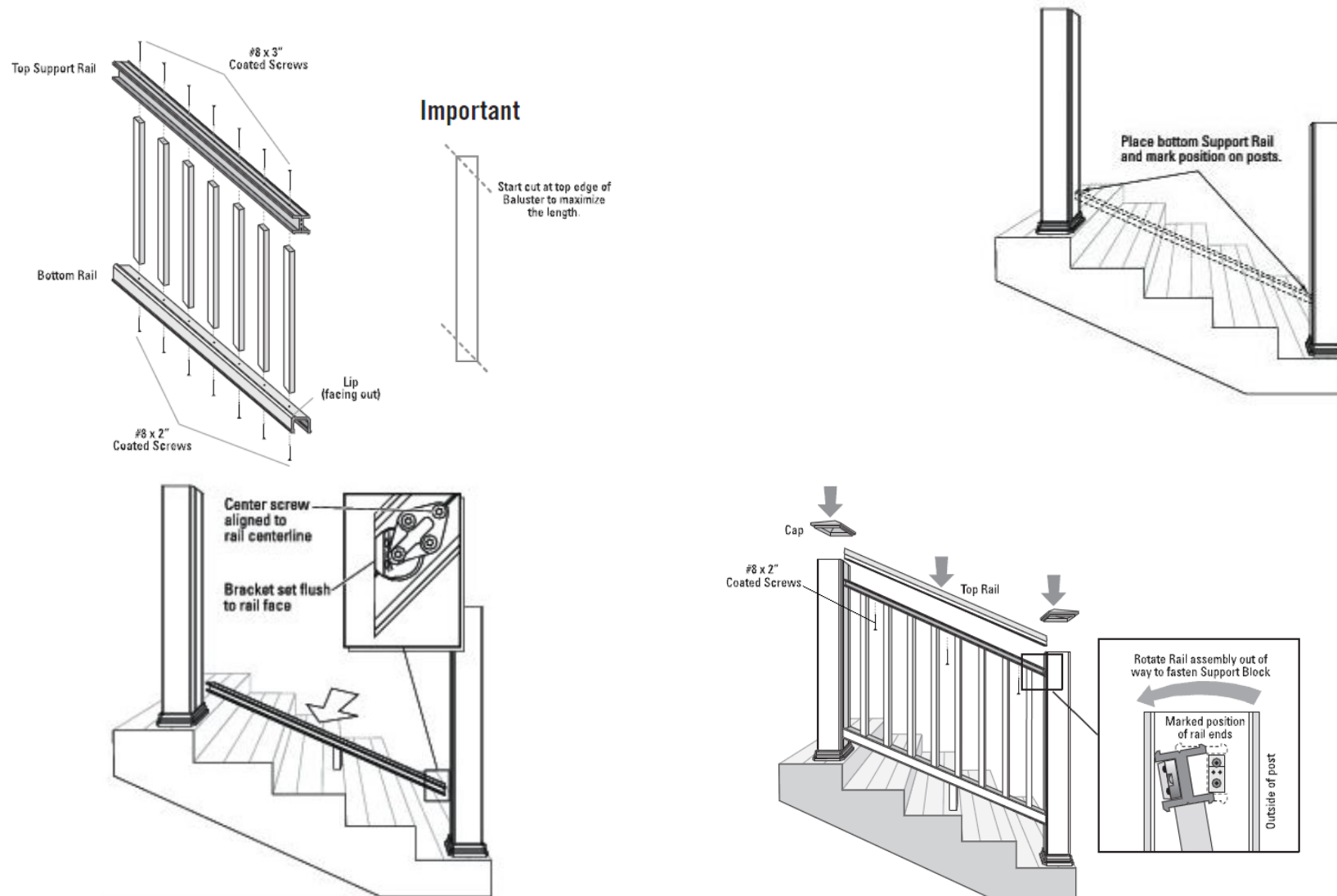


Figure 17 - TimberTech® RadianceRail® and AZEK Trademark, Premier, and Reserve Typical Stair Assembly

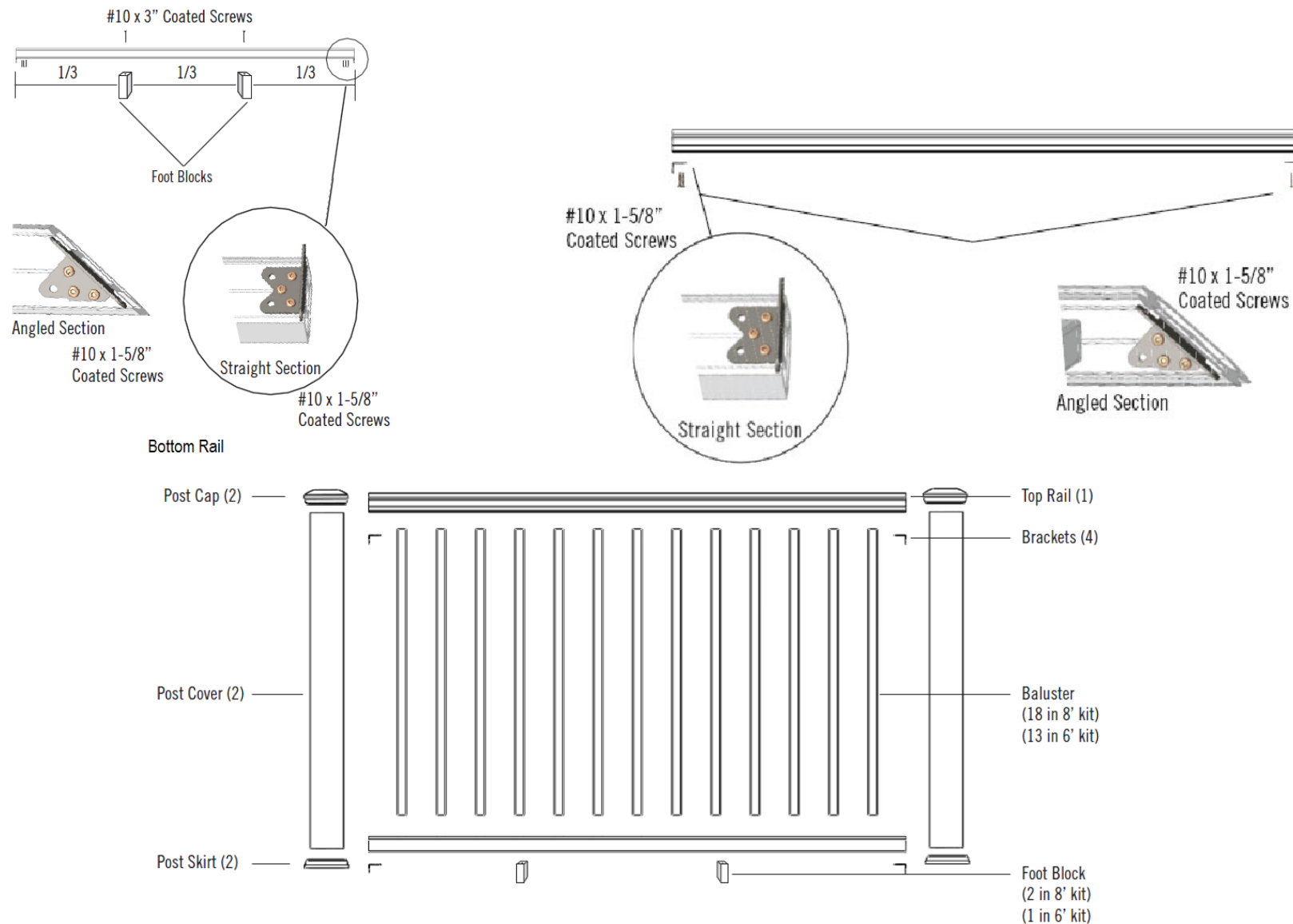


Figure 18 - RadianceRail® Express Typical Level Assembly

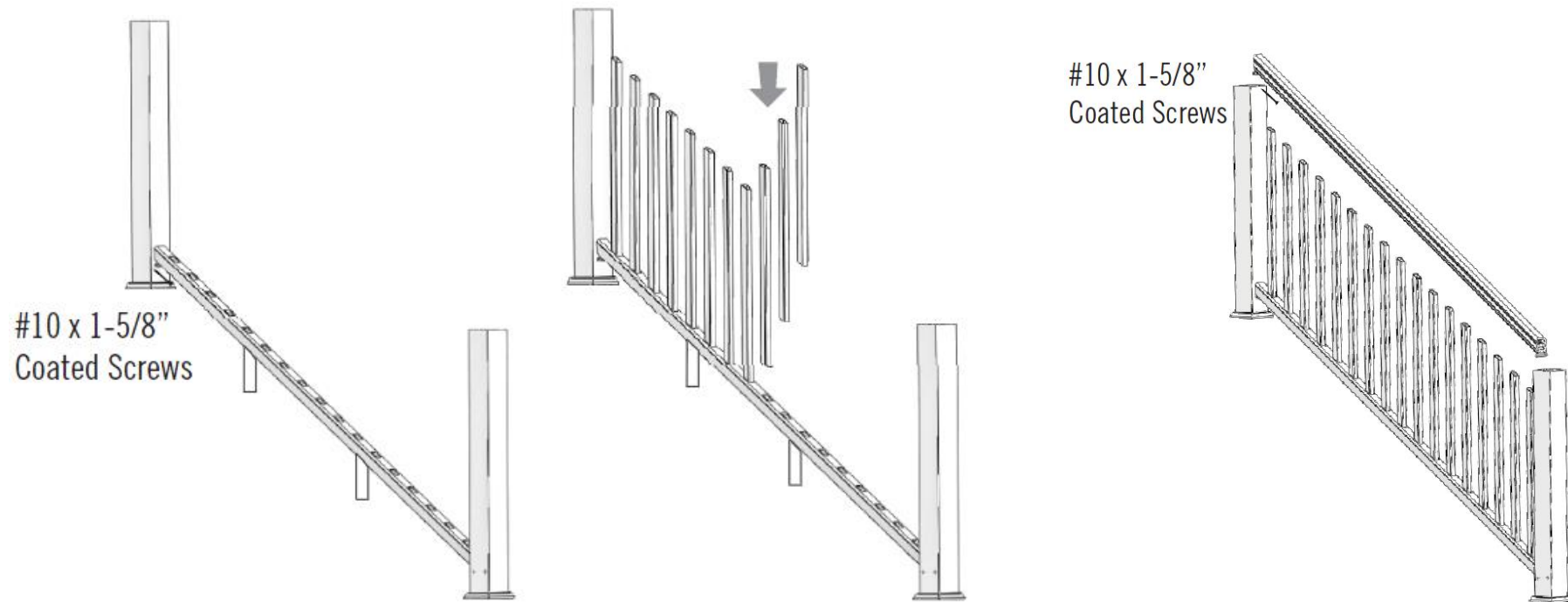


Figure 19 - RadianceRail® Express Typical Stair Assembly