



## Code Compliance Research Report

## CCRR-0106

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### Additional Listee:

**LYF-TYM Building Products Co., Inc.**  
**1836 Equitable Place**  
**Charlotte, NC 28213**  
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### 1.0 Subject

#### Kroy Vinyl Railing Systems:

*Kroy Performance Vinyl Railing*

*Assurance Outdoor Solutions™*

*Kroy Express Outdoor Solutions™*

#### LYF-TYM Building Products Co., Inc.:

*Cameron Guardrail System*

*St. James Guardrail System*

See Table 6 for cross-reference of product names.

### 2.0 Research Scope

#### 2.1. Building Codes:

2012 International Building Code (IBC)

2012 International Residential Code (IRC)

2009 International Building Code (IBC)

2009 International Residential Code (IRC)

2010 Florida Building Code  
(*Excluding High Velocity Hurricane Zone*)

#### 2.2. Properties:

Structural Performance

Durability

Surface Burning

### 3.0 Description

3.1. General – Kroy Vinyl Railing Systems are guards under the definitions of the referenced codes intended for use on elevated walking

areas in buildings and walkways, including stairs and ramps, as required by the referenced codes.

3.2. Guard Assemblies – Kroy Vinyl Railing Systems are provided as level guards for level walking areas such as decks, balconies, and porches, and as sloped guards for open sides of stairways.

3.2.1. Level guards are provided with an overall installed height up to 42 inches and are provided in lengths up to 10 feet (120 inches). See Table 1.

3.2.2. Stair guards are provided with an overall installed height up to that corresponding to a 42 inch level rail and are provided in lengths up to 8 feet (96 inches) sloping length. See Table 1.

3.3. Materials and Processes – Railings are an assemblage of extruded and molded components utilizing Poly Vinyl Chloride (PVC) material and aluminum reinforcements. Vinyl components are produced in six colors: White, Sandstone, Khaki, Tan, Chestnut Brown, and Black. All systems consist of the following components:

3.3.1. The top and bottom rails are extruded PVC profiles of various styles. See Figure 1, Table 1, Table 2, and Table 3.

3.3.2. Balusters are extruded PVC profiles in various dimensions. Some extrusions are reshaped by a thermoform process to simulate a turned spindle design. See Figures 3 and 4 and Table 4 for styles.

3.3.3. An extruded aluminum (6105-T5 or 6005-T5) insert provides reinforcement for the top and bottom rails. Bottom rail reinforcement is utilized in all lengths of stair rails and in lengths of level rails exceeding 8 feet. See Figure 2, Table 2 and Table 3.

3.3.4. Top and bottom rails are connected to posts with molded plastic brackets that are secured to the supports with stainless steel screws. Screws are Hawk Fastener Corp. Square Drive Pan Head "Hi-Lo" thread Sharp Point 410 Stainless Steel. See Figures 5 and 6, Table 2, and Table 3 for brackets. See Table 7 for brackets and fasteners.

3.3.5. A 4-inch square extruded PVC post has a nominal wall thickness of 0.145 inch. See Figure 1.

3.4. Supports – Kroy Vinyl Railing Systems can be attached to conventional wood supports or a structural PVC post installed with a steel post mount tower. See Figure 10 and Table 5.

3.4.1. PVC post described in Section 3.3.5 can be installed with either the steel post mount tower or used as a non-structural cladding over conventional 4x4 wood posts.

3.4.2. Railing systems include one intermediate support located mid-span beneath the bottom rail. See Figure 9. Exceptions: The following do not require an intermediate support:

1. Rail systems with aluminum inserts in the bottom rail; and
2. Stair rail systems.

#### **4.0 Performance Characteristics**

4.1. Kroy Vinyl Railing Systems have demonstrated the capacity to resist the design loadings specified in Chapter 16 of the IBC 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 PVC materials used have a flame spread index not exceeding 200 when tested in accordance with ASTM E84.

#### **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.

5.1. Railing assemblies consist of top and bottom rails with pre-routed holes to receive balusters. Aluminum railing reinforcements are inserted in the rails during assembly as specified for the type and length of railing. See Table 2 and Table 3.

5.2. Railings attached to wood supports with molded plastic brackets utilize stainless steel "Hi-Lo" wood screws for anchorage. 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. Bracket attachment shall be in accordance with Table 7.

5.3. The steel post mount tower shown in Figure 10 may be used for surface mount installations as permitted by Table 5. The steel post mount tower is attached to the supporting structure using four 3/8-inch diameter anchoring bolts with flat washers. The type and length of anchor bolts is dependent upon the material and condition of the supporting structure and is not within the scope of this report.

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

5.5. Compatibility of fasteners and other installation hardware with the supporting construction, including treated wood, is not within the scope of this report.

#### **6.0 Supporting Evidence**

6.1. Manufacturer's drawings and installation instructions.

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 January 1, 2012.

6.3. Reports of testing and engineering analysis demonstrating compliance with the performance requirements of ASTM D 7032-08, Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails).

6.4. Quality control manual in accordance with ICC-ES AC10, Acceptance Criteria for Quality Documentation, effective 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. Conventional wood guardrail supports 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.

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

7.3. The use of railing systems over 8 feet long shall be limited to exterior use as a guard system for balconies and porches for one- and two-family dwellings of Type V-B (IBC) construction and structures constructed in accordance with the IRC.

7.4. Kroy Vinyl Railing Systems are manufactured in Fair Bluff, North Carolina or York, Nebraska in accordance with the manufacturer's approved quality control system with inspections by Architectural Testing (IAS AA-676).

### 8.0 Identification

The vinyl guardrail assemblies produced by Ply Gem Fence | Railing and identified in this report shall be identified with labeling on the individual components or the packaging that includes the name and/or trademark of the manufacturer; the Architectural Testing Code Compliance Research Report mark and number (CCRR-0106); for rails over 8 feet long, the label shall include the phrase "For Use in One- and Two-Family Dwellings Only"; and the performance level and allowable span.

### 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.

9.3. Reference to the Architectural Testing internet web site address at [www.archtest.com](http://www.archtest.com) is recommended to ascertain the current version and status of this report.

**Table 1 – Maximum Railing System Size and Code Recognition**

Kroy Vinyl Railing Systems	Code Recognition Maximum Railing Size (Length x Height) <sup>1</sup>	
	IBC	IRC <sup>2</sup>
2" x 3-1/2" STD Rail	96" x 42" Level 87-1/2" x 42" Stair	120" x 42" Level 87-1/2" x 42" Stair
3-1/2" x 3-1/2" T-Rail	96" x 42" Level 87-1/2" x 42" Stair	120" x 42" Level 87-1/2" x 42" Stair

<sup>1</sup> Level railing lengths are clear distance between supports. Stair railing lengths are the sloping distance between supports. Railing height is installed height from walking surface to top of top rail. Minimum bottom rail clearance is 2-1/2".

<sup>2</sup> The use of these products shall be limited to exterior use as a guard system for balconies and porches for one- and two-family dwellings of Type V-B (IBC) construction and structures constructed in accordance with the IRC.

**Table 2 – Level Railing System Descriptions**

Kroy Vinyl Railing Systems	Level Railing System Components (See Table 4 for available balusters)	
	Rails	Brackets
2" x 3-1/2" STD Rail	Top: 2" x 3-1/2" STD Rail with Alum. "H" Channel Btm: 2" x 3-1/2" STD Rail (with Alum. "H" Channel in rail lengths exceeding 8 feet)	Top: OEM, MOD, or LMT Btm: OEM, MOD, or LMT
3-1/2" x 3-1/2" T-Rail	Top: T-Rail with Alum. "H" Channel Btm: 2x3-1/2" STD Rail (with Alum. "H" Channel in rail lengths exceeding 8 feet)	Top: OEM or LMT Btm: OEM, MOD, or LMT

**Table 3 – Stair Railing System Descriptions**

Kroy Vinyl Railing Systems	Stair Railing System Components (See Table 4 for available balusters)	
	Stair Rails	Stair Brackets
2" x 3-1/2" STD Rail	Top: 2" x 3-1/2" STD Rail with Alum. "H" Channel Btm: 2" x 3-1/2" STD Rail with Alum. "H" Channel	Top & Btm: OEM or LMT
3-1/2" x 3-1/2" T-Rail	Top: T-Rail with Alum. "H" Channel Btm: 2" x 3-1/2" STD Rail with Alum. "H" Channel	Top: T-Rail Stair Bracket or LMT Btm: OEM or LMT

**Table 4 – Balusters**

Available Baluster Styles	
1-3/8" Square PVC Picket	1-3/8" Colonial Spindle

**Table 5 – Post Mounts**

Post Mounting System	Code Recognition Maximum Supported Railing Length and Height	
	IBC	IRC <sup>2</sup>
Steel Post Mount Tower (See13)	96" Length 42" Height	120" Length 42" Height

<sup>1</sup> Railing lengths are clear distance between supports. Railing height is installed height from walking surface to top of top rail. Minimum bottom rail clearance is 2-1/2".

<sup>2</sup> The use of these products shall be limited to exterior use as a guard system for balconies and porches for one- and two-family dwellings of Type V-B (IBC) construction and structures constructed in accordance with the IRC.

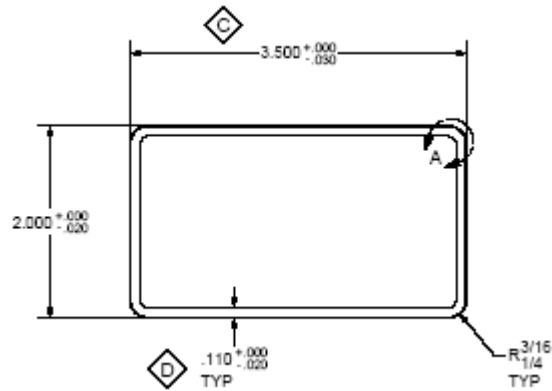
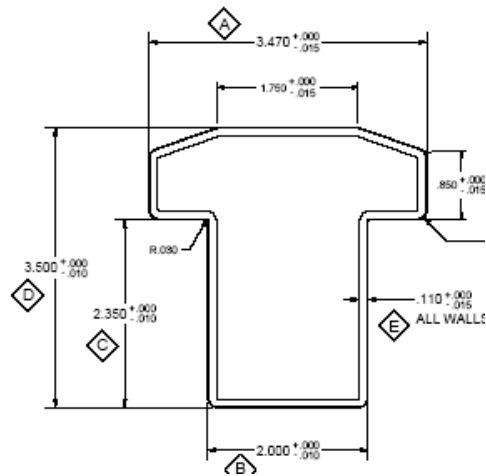
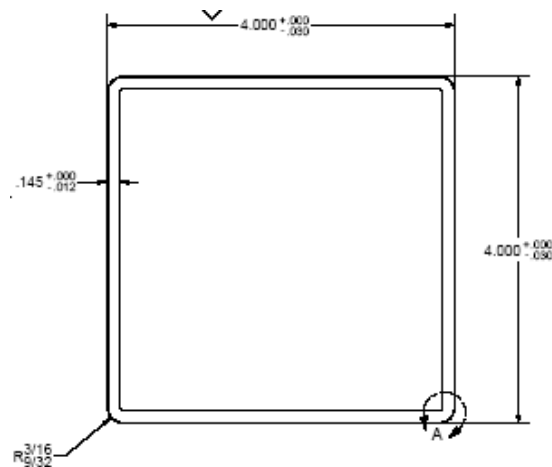
**Table 6 – Alternate Railing System Identifications<sup>1</sup>**

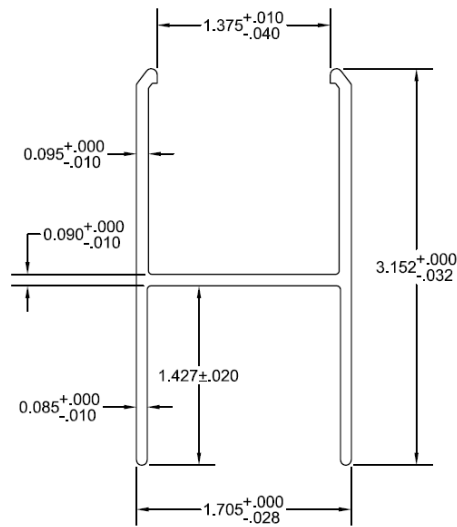
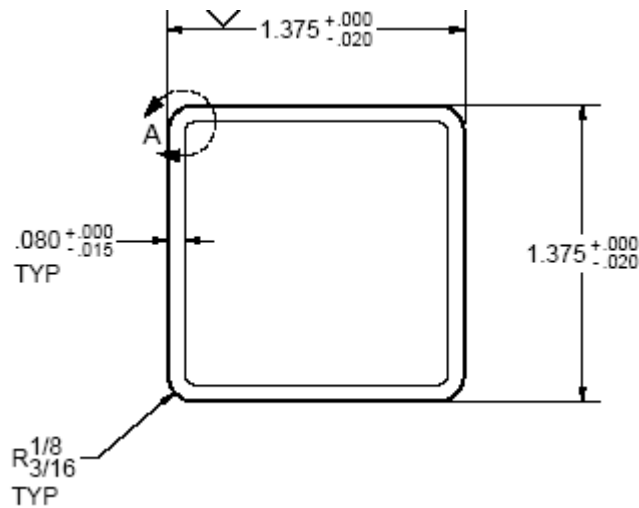
Kroy Performance Vinyl Railing	Assurance Outdoor Solutions™	Kroy Express Outdoor Solutions™	LYF-TYM Building Products Co., Inc.
2" x 3-1/2" Open STD	2" x 3-1/2" Standard Rail Kit	2" x 3-1/2" Standard Rail Kit	Cameron Guardrail System
3-1/2" x 3-1/2" T-Rail	3-1/2" x 3-1/2" T-Rail Kit	3-1/2" x 3-1/2" T-Rail Kit	St. James Guardrail System

<sup>1</sup> Each row represents an identical railing system and its identification under the product series name given in the column heading.

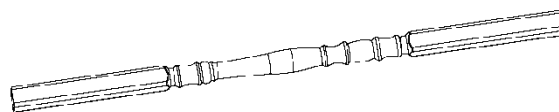
**Table 7 – Rail Bracket Fastening Schedule**

<b>Rail – Bracket Combination</b>	<b>Bracket to Post Fastener</b>	<b>Rail to Bracket Fastener</b>
2" x 3-1/2" STD Rail with OEM Bracket	(4) #12 x 1-1/4" Stainless Steel Screws	(2) #8 x 3/4" Self-tapping screws
2" x 3-1/2" STD Rail with LMT Bracket	(4) #10 x 1-1/4" Pan-head, Plated Steel Screws	(2) #10 x 1" Pan-head, Plated Steel Screws
2" x 3-1/2" STD Rail with MOD Bracket	(6) #12 x 1-1/4" Stainless Steel Screws	(2) #8 x 3/4" Self-tapping screws
3-1/2" x 3-1/2" T-Rail with OEM Bracket	(4) #12 x 1-1/4" Stainless Steel Screws	(2) #8 x 3/4" Self-tapping screws
3-1/2" x 3-1/2" T-Rail with LMT Bracket	(6) #10 x 1-1/4" Pan-head, Plated Steel Screws	(2) #10 x 1" Pan-head, Plated Steel Screws
3-1/2" x 3-1/2" T-Rail with LMT Stair Bracket	(6) #10 x 1-1/4" Pan-head, Plated Steel Screws	(2) #10 x 1" Pan-head, Plated Steel Screws
3-1/2" x 3-1/2" T-Rail with T-Rail Stair Bracket	(2) #10 x 4" Stainless Steel Screws	(2) #8 x 3/4" Self-tapping screws


**2" x 3.5" STD Rail**

**3.5" x 3.5" T-Rail**

**4" Square STD Post**
**Figure 1 – PVC Profile Drawings**


**Figure 2– Aluminum "H" Channel Insert**


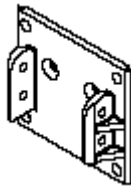
1.375" x 1.375" Picket

**Figure 3 – PVC Picket Profile**


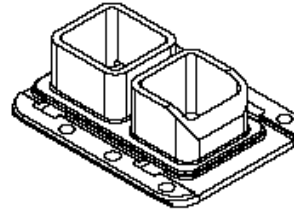
1-3/8" Colonial Spindle

**Figure 4 – PVC Spindle**

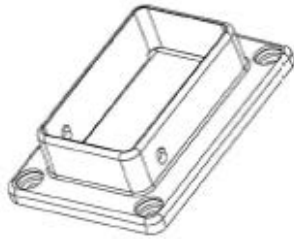




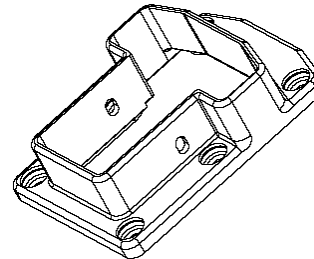
**2" x 3.5" OEM Base**



**2" x 3.5" MOD Base**

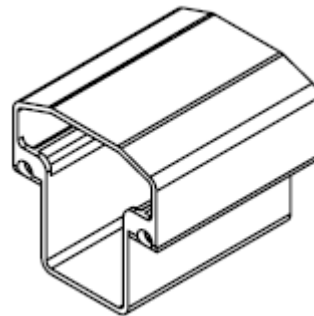


**LMT 2" x 3.5" Bracket**



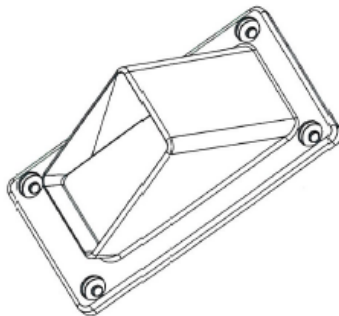
**LMT T-Rail**

**Figure 5 – Molded Plastic Straight Rail Brackets**

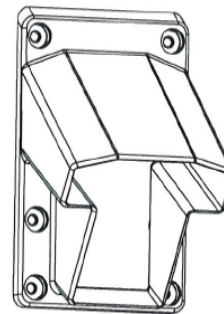


**T-Rail Stair Bracket <sup>(1)</sup>**

<sup>(1)</sup> Note: T-Rail stair brackets are field cut for a flush fit to the supporting surface with an angle corresponding to the stair slope. The cut end shall be limited to providing the required angle and shall not reduce the overall length of the bracket.

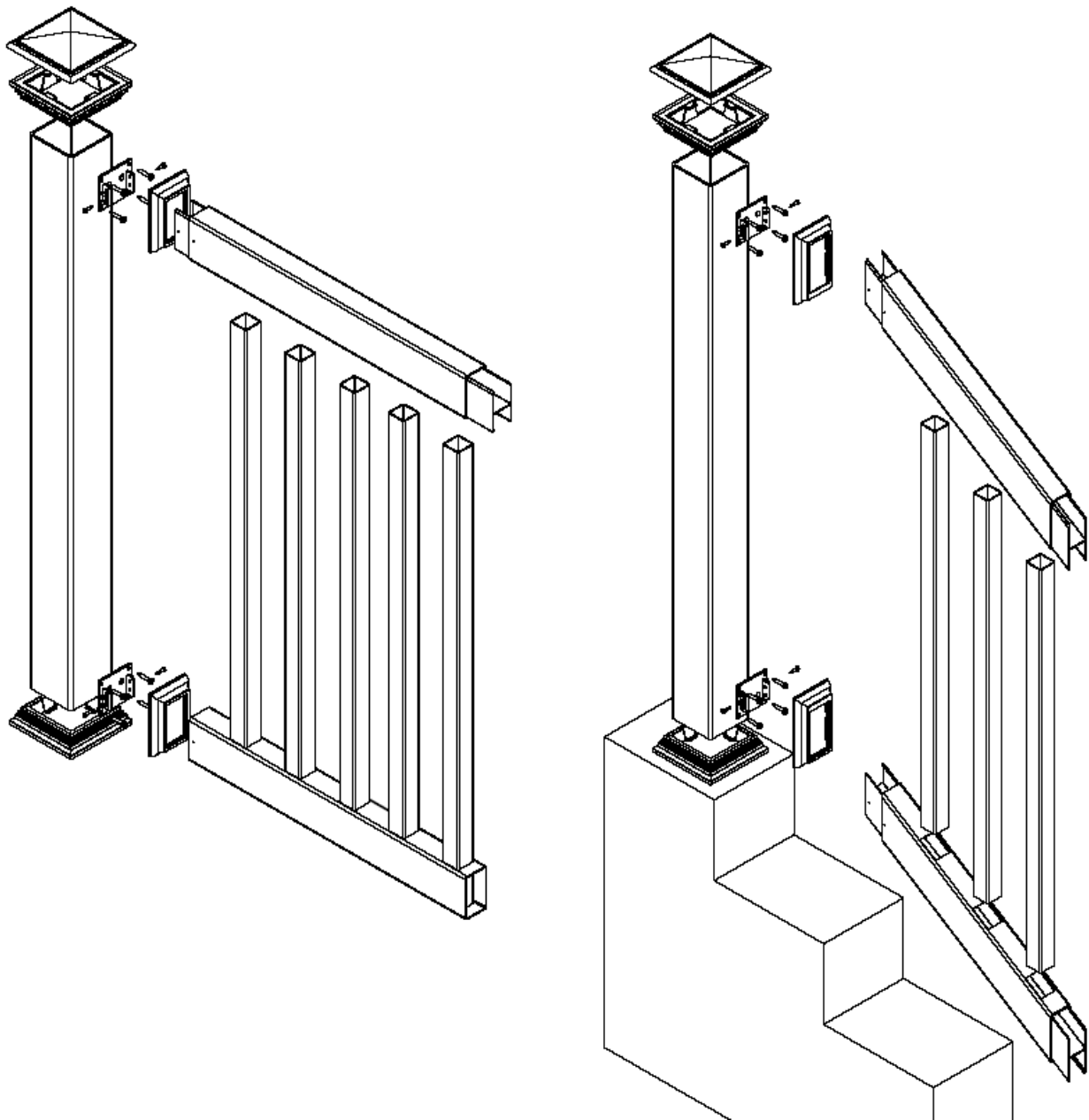


**LMT 2 x 3.5 Stair Bracket**



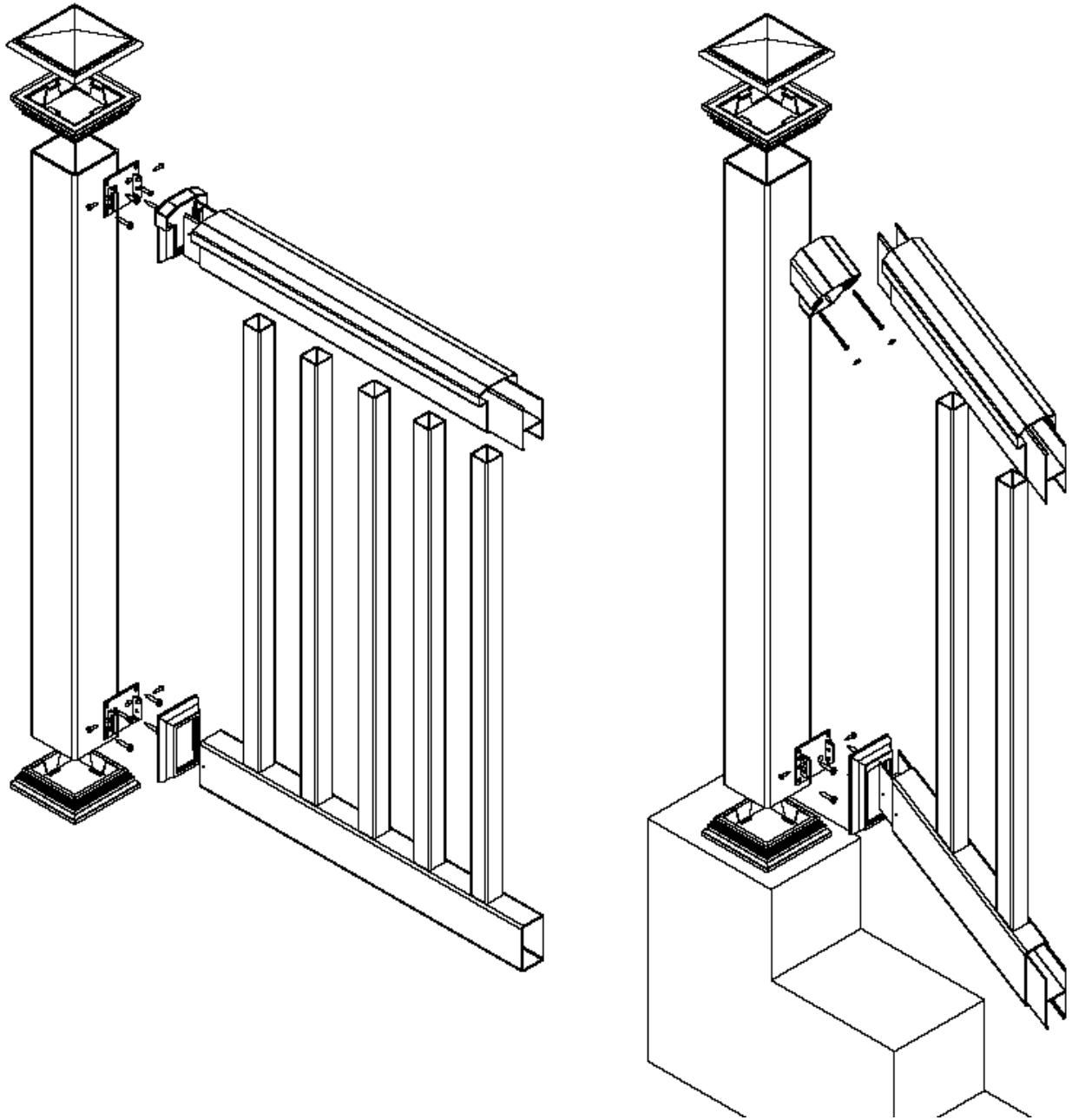
**LMT T-Rail Stair Bracket**

**Figure 6 – Molded Plastic Stair Rail Brackets**



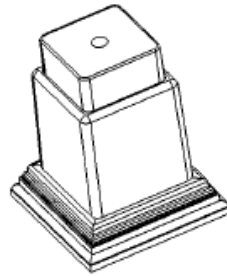
**Figure 7 – 2" x 3-1/2" STD Rail (Level and Stair)**

Bottom rail reinforcement not shown for level rail. See Table 2 for requirement.



**Figure 8 – 3-1/2" x 3-1/2" T-Rail (Level and Stair)**

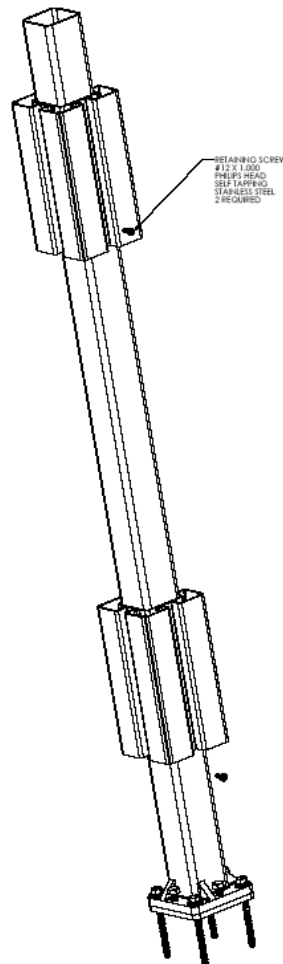
Bottom rail reinforcement not shown for level rail. See Table 2 for requirement.



#12 x 1.0" Phillips head, self tapping, stainless steel retaining screw (typ. top and bot.)

LMT Foot Block

**Figure 9– Bottom Rail Intermediate Support (Foot Block)**



**Figure 10– Steel Post Mount Tower**

Note: Anchorage and supporting structure are not within the scope of this report and must be designed and constructed in accordance with Chapter 16 of the IBC.

1. Minimum anchorage is (4) 3/8" bolts. Length and type as appropriate for the type and condition of the supporting structure.
2. Molded PVC Guide Blocks are located at top and bottom rail bracket connection.