

June 6th, 2014

RE: ADDENDUM #3

Project Address – 513 Garden Street

Prepared by: Mark Shkolnikov

The following is a list of responses to RFI's received up until the end of Wednesday, June 4th, 2014

GENERAL:

1. **Besides the assumption of a July 1st start date, are there any schedule restraints or goals due to financing, city requirements, etc.?**

Response: No.

2. **Are there any expectations by the client to achieve a LEED standard? If so, would the team like that as an add-alternate? This will help us factor in the time requirements of staff and material choices.**

Response: No.

3. **When the client received the permit were there any stipulations placed on the team by the city regarding encroachment, traffic, etc.?**

Response: No.

4. **Are there any permits or fees to use city streets for blockage if we needed to close a lane?**

Response: At the discretion of the contractor. There should be plenty of open area in the parking lot and (e) metal shed for staging, etc.

5. **Did the city provide a total list of fees to the owner of all of the types that may be applied to this job?**

Response: No.

6. **Is there any public money involved in this project? Are there any labor affiliations that may need to be addressed by the construction team? Prevailing wage requirements?**

Response: No.

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7. **Are there existing approved color boards and finishes from the design team? Will the construction team need to provide any of this outside of submitting samples and swatches?**

Response: ABR did require a color board for Garden Street Elevation. Those colors / materials are indicated on Sheet A4.1. Nothing outside of samples and swatches.

8. **Does the owner pick up all fees for streets, water (temp meter and or final connection)?**

Response: The site already has water and owner will be picking up this fee.

9. **From a quick site visit, it looks like there is an encampment on the property. Will they be cleared out before construction starts? (they are located in the existing warehouse) If they are moving out will the construction team be able to utilize that as an office/warehouse?**

Response: The encampment will be cleared out before construction. The metal shed will be empty and welcome for your use as an office / warehouse.

10. **Are there any liquidated damages?**

Response: No.

11. **Sections 05510, 08510, 11450, and 11500 have no submittal requirements. Is this correct?**

Response: This was mislabeled. Please plan on providing submittals on all of these items.

12. **It is our understanding from working with City of Santa Barbara in the past that the city requires a permit fee that is not standard for Fire Sprinkler plan approval. It could be between \$1500 and \$3000. Is this fee the contractor's responsibility?**

Response: Correct – this is the contractor's responsibility.

ARCHITECTURAL:

1. **Please confirm the illuminated handrail is only at the larger catwalk, not the two smaller catwalks.**

Response: Confirmed. The illuminated handrail occurs only at East side of the larger catwalk (E3.3). The smaller catwalks do not have handrails.

2. **Fencing elevations on A7.1 and specification 05500 indicate P1000 & P1001 channel posts. The structural details 13/S3.0 and 16/S3.0 indicate a P5001 channel, which is a back to back channel like the P1001. The structural details also indicate double P5001 posts at some fence locations. Please advise which unistrut post to use.**

Response: Proceed with the layout and P5001 as specified by Structural.

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3. **Should the structural drawings govern, the P1047 Ushape which fastens the post to the rail (see A7.1) will not work with the double P5001 posts shown. Please advise.**

Response: Given the switch to the P5001 per response 2 above – rather than have the P1047 (U-shape) wrap the post and connect to the rail horizontally, as illustrated in the Architectural drawings, rotate the P1047 vertically and apply it so it wraps the rail on the backside and connects to the post(s). This will require lowering the top rail slightly so the U-shape can fasten to the post above and below the top rail.

4. **The bracket P2543 shown on A7.1/Detail 2B function is unclear. It appears to be at end of fence runs or returns. Please advise.**

Response: The Bracket is intended as an adjustable support for future shelving. Assume (1) per Perimeter Fence pier.

5. **Where do the butt splices occur at the P1000 railing along the fencing posts and how are they connected?**

Response: The splice can occur anywhere (it should not be visible behind the panel), but given the change per comment 3 above, it should not occur at the post. The steel panel will double as a connection.

6. **Glass Guardrail is indicated to be etched both sides on Detail 6/A8.7. Specification Section 08800 indicates the acid etching to be on one side. Please advise.**

Responses: Proceed with specification section 08800 – acid etching on one side only (glossy side in).

7. **Are there any details on how to connect the roof gutters to the new rainwater tanks? Is the intent to reuse the existing gutters or add new gutters? There are no details on the components that are typically included in getting the rainwater to the tanks. Is it the contractor's responsibility to provide this for the architects review?**

Responses: Details of this have not been drawn. It is our intent to reuse the (e) gutters. We anticipate standard rainwater, sheet-metal piping from the gutter directly to the cisterns – with a means of overflow.

STRUCTURAL

1. **S3.2/13. It is not clear to what extent this detail occurs. Can you please let us know the number of incidences?**

Responses: **Structural Engineer:** Detail 13/S-3.2 occurs at the intermediate stair landings between floors and has been called out accordingly. Final stair orientation shall be coordinated with the final architectural drawings.

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2. **S3.3/9. A 1” thick spacer is specified here. It is not clear whether this is continuous, or only at the locations where the glass railing is mounted. Please clarify.**

Responses: **Structural Engineer:** The callout in Detail 9/S-3.3 refers to an item per the architectural railing drawings that were current at the time of detailing. Contractor shall coordinate spacer necessity, location, and extent with the anchor bracket provider and final architectural drawings.

Architect: The spacers are located where the glass railing is mounted – they are not continuous. The spacer is to be hidden behind the mounting plate – (rather than bolting through the stucco) leaving an 1/8” gap behind the plate / separating it from the stucco.

3. **S3.3/18. The drawing shows a 2X1/4 plate welded here to support the grating. Is an angle an acceptable alternative?**

Responses: **Structural Engineer:** A 2”x2”x1/4” angle may be substituted in lieu of a 2”x1/4” plate shown in Detail 18/S-3.3 for the support of the walkway.

4. **A4.1, note 18. States that the catwalk is stainless steel. None of the steel specified in the structural drawings is noted as stainless. Which components are stainless and which are mild steel? The Project Manual notes it is to be from stainless steel, but does this include the 10X4X1/4 tubing and all of the fastening components?**

Responses: **Structural Engineer:** The stainless steel walkway, handrail, and glass rail connector material callouts are per the architect. No structural steel detailed or called out in the plans provided by us is stainless steel. (In addition to the galvanization required for exposed steel per our specifications, please plan to provide a zinc-rich primer and paint per the architect’s spec.)

5. **A8.4/3. This is a different detail than what prevails on S3.3. This appears to show the slotted angle mounted on the face of the deck where S3.3/9 should prevail. Please clarify.**

Responses: **Architect:** Proceed with the detail as drawn by the Structural Engineer.

6. **A8.9/2 shows a steel tube and labels it as a “control joint.” Is this preexisting on the property, or are there pieces of HSS that needs to be provided here? For this gate, we would recommend a heavier wall than what is shown.**

Responses: **Architect:** This is mislabeled. The Keynote should be #187 STL. TUBE (S.S.D.) – as labeled in the Vehicular Gate Elevation, 1/A8.9, and as specified on Structural S-2.0.

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7. **Does the glass railing system require stamped engineered drawings from the Contractor? Are there already supporting engineering calcs for the assemblies and glass call out as shown in the drawings?**

Response: The manufacturer provides the following engineering calcs:

<http://www.crl-arch.com/docs/esr-3269.pdf> (copy attached)

This info was requested by the city during the Permit process, and they reviewed and approved based on this information. I am not sure if additional drawings would be required. The structural engineers, Taylor Syfan, will be retained for CA work.

8. **Support frame (Note 187) at bay window shown on A8.8/Detail 6,7,8 refers to the structural drawings. I do not see a call out for this support frame on the structurals at the bay window. Please advise.**

Responses: Have the fabricator propose a frame size and we'll have this verified by the Structural Engineer during CA.

ELECTRICAL:

1. **The intercom shown on A4.1 does not indicate manufacturer or dwelling unit receiver information, nor is the system included in the electrical drawings other than the location of the intercom being referenced. Please clarify the system specifics and manufacturer.**

Response: At the time of permitting - the city itself could not find us an intercom that would meet their current ADA standards. As a placeholder, please use the following:

Manufacturer: Door King
Model: 1808-082 (phone entry system with small directory)

(See Cut Sheet attached)

2. **Electrical Sheet E2.1 indicates a gate motor connection. The gate is not shown to have a motor no the architecturals or specs. Please advise.**

Response: Correct - the current gate is not motorized – however, we would like to keep the option open for a future motorized gate.

3. **There is no specification for the communication/data shown in the Electrical Sheets. Data and tv port locations, and backboard are shown only. What is the scope of the communication work? Please advise.**

Response: I'll check in with the Electrical Engineer. Some specification is given under "Symbols" on E1.0. What additional info can we provide?

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4. **Is it the construction team's responsibility to install all electrical and structural infrastructure for the Solar Arrays? Notes on E2.3 show that PV Combiner box is to be coordinated with PV Installer, and it references details A and B on E2-4. There is no E2-4. There is also very minimal electrical direction for the PV over the existing warehouse building. What is the direction for all this?**

Response: Correct – contractor is responsible for install of PV electrical / structural infrastructure. We will be seeking a separate permit prior to the start of this work. Maximize PV over metal warehouse – as drawn on A2.3.

5. **The specs mention the PV system. Can references to the PV system should be deleted from the specs (05500 / SCOPE pg 6 and P.V.SUPPORTS pg 9) so there is no confusion about what is covered in the contract?**

Response: Yes, this portion should be deleted. Various components, such as the “Clamp SLR 100, SLR 150” may prove useful for attaching to the Unistrut.

6. **What is the structural system of the metal building's roof? Are there details for the connection of the PV Panels to the roof? What is the roof structure made of?**

Response: We do have some archived drawings of the metal building – which I've included as a separate PDF titled “100526 Existing PEMB Record Permit Drawings.pdf.” The accuracy and built conditions will have to be verified – but it should give you some idea of the structure.

To connect the Panels to the roof – we propose the following (or arch't approved equal):

Manufacturer: Metal Roof Innovations

Model: S-5-PV

(See cut sheet attached)

PLUMBING

1. **On P1.0, under the Fixture Connection Schedule, L-1: The 8 lavs, lav faucets, and p-traps specified for the residence studios are from Signature Hardware and are all discontinued numbers.**

Responses: Please substitute with the following:

Manufacturer: Ikea

Sink: “Odensvik” #801.955.55

Faucet: “Dalskar” #302.400.46

Lav: “Godmorgon” #801.955.36

(See cut sheet(s) attached)

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2. **The Mechanical and Plumbing General Notes call for the contractor to be responsible for permits and fees. Is this the intent from the owner?**

Response: Correct. Contractor is responsible for M&P permits and fees.

3. **Plumbing General Note #21 refers to submitting the submittals to the City of Santa Barbara for another approval. Is this correct? Will the contractor also still be responsible for getting substitutions approved?**

Response: Will check with Plumbing Engineer – we do not anticipate additional approvals. Contractor will be responsible for getting substitutions approved.

END ADDENDUM #3

Please let me know if you have any questions or comments.

Thanks,
Mark

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Article Number: 801.955.55

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Wipe dry with a clean cloth.
Never use scouring powder, steel wool or a detergent that is calcium-dissolving, sour or contains alcohol or an abrasive.

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Height: 18 cm

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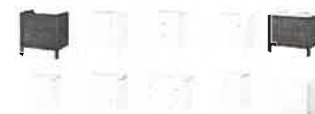
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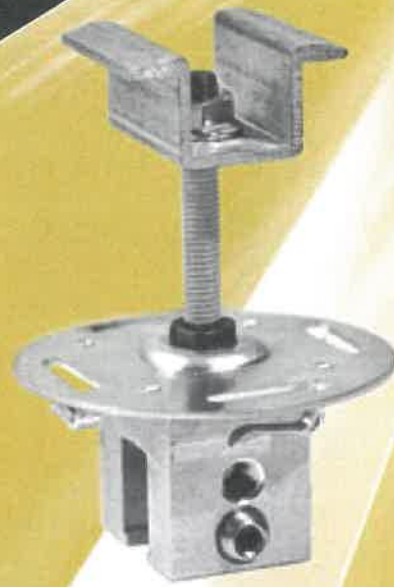
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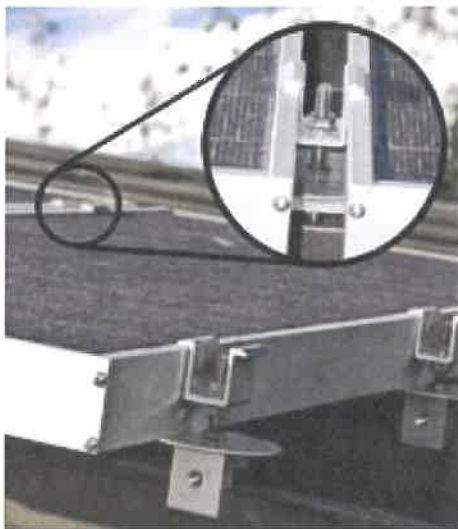
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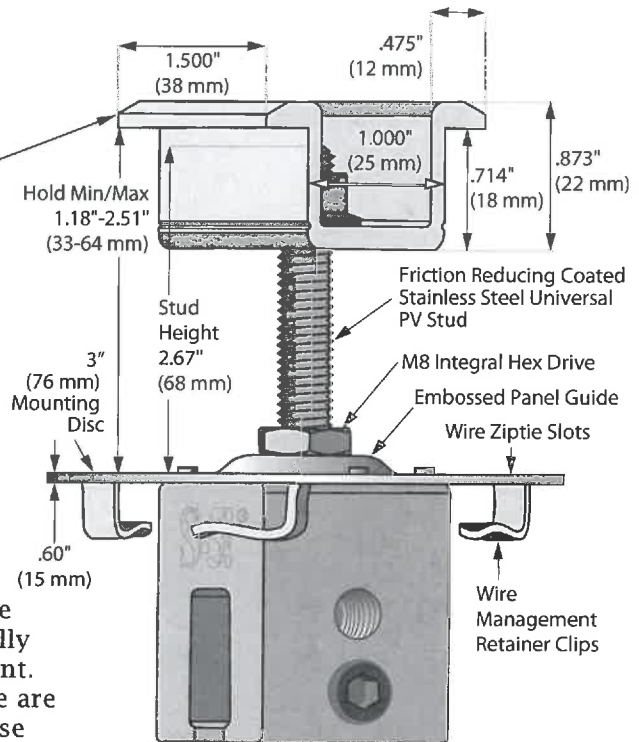
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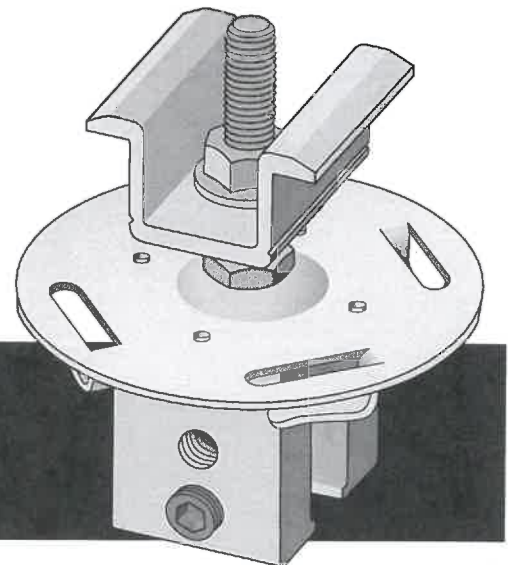
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Properties evaluated:

- Structural
- Durability

2.0 USES

The GRS Glass Rail System structural glass balustrades described in this report are intended for interior and exterior weather-exposed applications, and are suitable for use in most natural environments. The GRS system may be used for residential, commercial and industrial applications for guards along balconies, porches, mezzanines, stairs and similar locations except where vehicle impact resistance is required. The system is compatible with all construction types.

3.0 DESCRIPTION**3.1 General:**

The GRS Glass Rail System utilizes an extruded aluminum base shoe, complying with 6063-T52, to anchor and support fully tempered structural glass balustrades (¹/₂-inch

[12.7 mm], ⁵/₈-inch [15.9 mm], or ³/₄-inch [19.1 mm], depending on use) which support the selected top rail and/or handrail (various profiles are made of stainless steel complying with 304 or 316, brass complying with C26000, or aluminum complying with 6063-T6) to construct building guards. A complete GRS specification requires identification of the top rail (cap rail) profile and material; glass thickness with the maximum and minimum light widths; glazing system (either wet or a specific dry glazing method); base shoe; and anchorage to the supporting structure. When a handrail is used, the handrail profile, mounting bracket, and mounting bracket spacing must be specified. A complete installation requires either a top rail or a handrail. The base shoe may be installed with non-structural cladding of any compatible material bonded to it with adhesive. Figure 1 shows the typical guard elevation with the components. The complete GRS specifications must be noted on plans submitted to the building official for approval.

The profiles, section properties and strengths of the various base shoes are detailed in Section 4.2.3 of this report.

The profiles, section properties and strengths of the various top rails are detailed in Section 4.2.4.

The profiles, section properties and strengths of the various handrails are detailed in Section 4.2.7.

The glass must be Kind FT fully tempered glass conforming to the requirements of ANSI Z97.1-09, ASTM C 1048-04 and CPSC 16 CFR 1201. The fully tempered glass must have an average Modulus of Rupture $F_r \geq 24,000$ psi. Glass type, condition, class, form, quality and finish as defined in ASTM C1036 must meet these standards and the modulus of rupture.

3.2 Durability:

The materials incorporated in the system described in this report are inherently corrosion-resistant. The material type specified must be appropriate for the environment of the installation. Information verifying the durability must be submitted to the building official, when requested.

4.0 DESIGN AND INSTALLATION**4.1 General:**

Installation of the GRS glass balustrade guards must comply with the manufacturer's published instructions, this report and 2012 IBC Sections 1013 and 1607.8.1, 2009 IBC Section 1607.7.1, IBC Section 2407, or IRC Section R312, whichever is applicable. Handrails/grab rails must comply with 2012 IBC Section 1009.12 or 2012 IRC Section R311.7.8, 2009 IRC Section R311.7.7, or 2006 IRC Section R311.7.8, whichever is applicable. The

manufacturer's published installation instructions, called "GRS Glass Railing Dry Glaze Taper-Loc System for Tempered Glass Applications (AVD3919-2/11)," must be available at the jobsite at all times during installation. In the event of a conflict between this report and the manufacturer's instructions, this report governs.

4.2 Design:

4.2.1 Loading: The applicable project-specific loads must be identified. Minimum required loads are one of the following:

- 50 plf (0.73 kN/m) on the top rail in any direction
- 200 lbs (0.89 kN) on the top rail in any direction, and 50 lbs (0.22 kN) on one square foot at any location perpendicular to the glass balustrade
- The wind load on the full area of glass, in psf

Wind load must be determined by a qualified individual based on the project-specific conditions, taking into account the balustrade location on the structure. For installations in compliance with the IRC Section R312, the 50 plf (0.73 kN/m) top rail load is not applicable.

4.2.2 Glass: The glass thickness must be at least the thickness necessary to safely support the live loads and wind loads. The allowable glass loads are based on allowable glass edge stresses. Table 1 of this report provides allowable wind load in pounds per square foot for a given glass thickness, assuming the allowable stress noted in Section 4.2.2.1. Sandblasted glass must have a $3/4$ -inch nominal thickness, with the allowable loads based on a $1/2$ -inch (12.7 mm) thickness as noted in the tables of this report.

Minimum spacing between glass lights is $1/4$ inch (6.4 mm) for $1/2$ -inch- and $5/8$ -inch-thick (12.7 and 15.9 mm) glass lights, and $1/2$ inch (12.7 mm) for $3/4$ -inch-thick (19.1 mm) glass lites.

4.2.2.1 Glass Stress: Glass lights serve as balusters to support the top rail or grab rail and form the guard infill. Allowable glass bending stress is the modulus of rupture used for the designs noted in this report divided by a factor of 4 [24,000/4 = 6,000 psi (41.3 MPa)]. Tension bending stress is based on the minimum glass thickness, except for wind loads. A wind load stress in accordance with ASTM E1300 was used in development of this report.

4.2.2.2 Holes and Notches: Holes and notches must not be located within the first third of the balustrade height from the base shoe. Holes and notches must conform to ASTM C1048. Holes or notches located within the first third of the balustrade height from the base shoe are outside the scope of this report.

4.2.3 Base Shoes:

The appropriate base shoe must be selected based on glass thickness, installation method and loading. Figure 2 shows the base shoe options. Tables 2a through 2g provide the allowable wind loads for the base shoes, glass thickness and anchorages. The base shoe must be installed in accordance with the manufacturer's published installation instructions and this report. The end anchor must be installed within 12 inches (305 mm) of the end of the base shoe and no less than $1\frac{1}{2}$ inches (38 mm) from the centerline of the anchor. A minimum of two anchors are required for any base shoe section.

4.2.3.1 Steel Substrate: The base shoe is attached to a structural steel member with a minimum thickness of $1/4$ inch (6.4 mm) using $1/2$ -by- $3/4$ -inch (12.7 by 19.1 mm), ASTM F-837 Alloy Group 1 (any condition), stainless steel, socket head cap screws installed into tapped holes. When installation is in a through-bolt condition, the cap screw

length must be increased to a length sufficient to permit proper installation with full engagement of the nut. When installation is to weld blocks, drainage blocks or solid shims more than 2 inches (51 mm) long by the full base shoe width at each anchor, no reduction in allowable wind loads is required.

4.2.3.1.1 Surface-mounted to Steel: The allowable wind loads must be as shown in Table 2a. Guard height (Hg) is from bottom of base shoe to top of guard. An appropriate top rail or grab rail must be used.

4.2.3.1.2 Fascia-mounted to Steel: The allowable wind loads must be as shown in Table 2b (heights from top of base shoe to top of guard).

4.2.3.2 Concrete Substrate: The base shoe is attached to a concrete member with a minimum thickness of 5 inches and minimum compression strength of 3,000 psi (20.6 MPa), and in an uncracked condition. The attachment is made using either a $3/8$ -inch-diameter-by-4-inch screw-in Hilti HUS-EZ (KH-EZ) anchor in accordance with [ESR-3027](#), or a Hilti HSL-3 M8 x $3\frac{3}{4}$ -inch (95 mm) anchor in accordance with [ESR-1545](#). Minimum spacing between anchors is 6 inches (152 mm). For 12-inch-on-center (305 mm) anchor spacing, anchor locations may be moved to avoid reinforcement, provided the same number of anchors is provided and no two anchors are closer than 6 inches (152 mm) center-to-center.

4.2.3.2.1 Concrete Strength: The allowable wind load (W') for concrete strengths between 3000 psi (20.6 MPa) and 5,000 psi (34.4 MPa) may be adjusted by applying the adjustment factor in the following equation:

$$c_w = \sqrt{f'_c/3000}$$

$$W' = c_w * W$$

where W is allowable wind load from the tables

f'_c = specified concrete compressive strength, in psi

4.2.3.2.2 Sand-lightweight Concrete: When installation is into sand-lightweight concrete, the allowable wind loads from the tables in this report must be reduced by a factor of 0.6.

4.2.3.2.3 Adjusted Wind Load: For a 42-inch (1067 mm) guard height, the allowable wind load from the tables in this report must be greater than 26 psf (1.25 kN/m²) in order for the guard anchorage to be able to support the 50 plf (0.73 kN/m) live load. When typical anchor spacing is 12 inches (305 mm) on center, additional anchors may be added to the base shoe (for 10-foot (304 mm) base shoes or shorter lengths) as follows to provide a 26 psf (1.25 kN/m²) allowable wind load and a 50 plf (0.73 kN/m) top rail live load:

- 26.0 psf $\geq W' > 23.6$ psf, add one anchor
- 23.6 psf $\geq W' > 21.7$ psf, add two anchors
- psf $\geq W' > 20.0$ psf, add three anchors

For SI: 1 psf = 0.0479 kN/m²

Added anchors must be distributed to divide the base shoe into approximately equal segments.

4.2.3.2.4 Surface-mounted: When edge distance is equal to or greater than 3.75 inches (95 mm) (concrete edge parallel to the anchor and to the centerline of the anchor), the allowable wind loads must be as provided in Table 2c for the guard height (Hg) from bottom of the base shoe. For edge distances less than 3.75 inches (95 mm), required for the full anchor strength, the allowable wind load must be as provided in Table 2d. Linear interpolation between Tables 2c and 2d is permitted for edge distances from 1.75 inches to 3.75 inches.

4.2.3.2.4.1 When installation is to drainage blocks or solid shims, 2 inches long by the full base shoe width at each anchor, the allowable wind loads must be as provided in Table 2e.

4.2.3.2.5 Fascia-mounted: When fascia-mounted to a slab edge, beam, wall or similar item, the minimum concrete thickness must be 6 inches (152 mm). The top and bottom of the base shoe must not extend past the concrete edge. The allowable wind load must be as determined using Table 2f, where guard height is total height above the top of the base shoe. Applicable adjustment factors from Sections 4.2.3.2.1 and 4.2.3.2.2 must be applied. Minimum wind loads must be verified in accordance with Section 4.2.3.2.3

4.2.3.2.5.1 Fascia-mounted over Drainage Blocks: When installation is with aluminum drainage blocks 2 inches (51 mm) wide by 4 inches (102 mm) deep at each anchor, the allowable wind load must be reduced by multiplying by 0.95 as shown in the following equation:

$$W' = 0.95W$$

4.2.3.3 Wood Substrate: Wood must have a moisture content under 19 percent at the time of fabrication and be a species and grade with specific gravity $G \geq 0.49$. For exterior locations all base shoes, fasteners must be stainless steel (304 or 316). Fasteners must be tightened so that the base shoe is in tight contact with the supporting wood.

4.2.3.3.1 Surface-mounted: All base shoes are similar and interchangeable.

4.2.3.3.1.1 Exterior: Direct surface mounting to wood in exterior locations is prohibited. When surface-mounted, the base shoe must be attached to steel or aluminum brackets attached to the wood structure. Refer to Figure 3 for the aluminum bracket, and to Figure 4 for the steel bracket. Allowable wind load for these options are:

36-inch guard height, $W = 46.7$ psf (2.24 kN/m²)

42-inch guard height, $W = 34.3$ psf (1.64 kN/m²)

The wind load when the attachment uses a continuous angle with #14x3-inch (76 mm) wood screws at 3 inches (76 mm) on center, is:

42-inch guard height, $W = 68.8$ psf (3.289 kN/m²)

4.2.3.3.1.2 Interior: Base shoes surface-mounted directly to wood with a specific gravity $G \geq 0.49$ and a compressive strength perpendicular to the grain ≥ 625 psi (4.1 MPa), are limited to locations where the supporting wood is at or below the in-service moisture content of 15 percent and will not be subject to wetting. The base shoe must be anchored with $\frac{3}{8}$ -inch-by-5-inch (9.5 mm by 127 mm) lag screws. The B5L base shoe must not be used for surface mounting to wood when guard height exceeds 24 inches.

4.2.3.3.1.2.1 One- and Two-family Dwellings and IRC Applications [(200 pounds (0.89 kN) Top Rail Live Load Only)]: When installed in private residences, the anchors must be installed at 12 inches (305 mm) on center or less. For a 36-inch (914 mm) guard height, the minimum number of anchors is four; and for a 42-inch (1067 mm) guard height, the minimum number of anchors is five.

4.2.3.3.1.2.2 Other Locations [(50 plf (0.73 kN/m) Top Rail Live Load)]: When installed in applications where the 50 plf (0.73 kN/m) live load is applicable in accordance with 2012 IBC Section 1607.8.1 or 2009 and 2006 IBC Section 1607.7.1, the anchors must be installed at 6 inches (152 mm) on center or less. The minimum number of anchors in any guard segment is five.

4.2.3.3.2 Fascia-mounted: The base shoes must be attached with $\frac{1}{2}$ -inch-by-4-inch (12.7 mm by 102 mm) lag screws installed directly to the structural wood member. The top of the base shoe must be flush with or below the top of the beam corner radius and the beam must extend below the bottom of the base shoe. The allowable wind load must be as determined in accordance with Table 2g. Linear interpolation for other heights or anchor spacing is allowable.

4.2.4 Top Rails: A top rail is required for a code-compliant guard installation. The term "cap rail" denotes the same thing as "top rail" and the two may be used interchangeably. The top rail is installed in accordance with the details provided in the manufacturer's installation details referenced in Section 4.1 of this report.

4.2.4.1 Support: The top rail must be installed so as to remain in place in the event of the failure of any one glass light. This requires the use of a minimum of three glass lights or a combination of other top rail supports and glass lights totaling three, minimum. Figure 5 illustrates the top rail support conditions. The top rail end condition (Figure 6) must be checked to verify that the rail will remain in place in the event of failure of the end glass light. End support must be designed when required for a code-compliant installation. The stabilizing end cap shown in Figure 14 is an acceptable method of end support.

4.2.4.2 Top Rail Profiles: The top rail profiles are shown in Figure 7. The allowable glass light widths for the top rail profiles are given in Table 3, based on live loads of 50 plf (0.073 kN/m) uniform load or 200 pounds (0.89 kN) concentrated load, whichever is critical. Glass light widths must be less than or equal to the maximum widths shown in Table 3. If the end light width exceeds the value shown in Table 3, the top rail must be attached to a wall or post. The end light must be at least as wide as the minimum light width indicated in Table 1 for the specified glass thickness and guard height.

4.2.4.3 Stainless Steel End Post: Where the glass end light exceeds the allowable end light width shown in Table 3, the top rail must be supported at the end by means of a post or wall attachment. A stainless steel post inserted in the base shoe and top rail may be used, as shown in Figure 6. The post minimum width for a maximum glass height of 42 inches (1067 mm) must be as shown in Table 4. Posts may either match glass thickness or fit tightly into the base shoe.

4.2.5 Taper-Loc® X Dry Glazed System:

4.2.5.1 Description: This is a dry glazing system where the glass is clamped inside the base shoe by the Taper-Loc® Shoe Setting Plate (an L-shaped piece on the back side) and the Taper-Loc® Shim Plates (front side), as illustrated in Figure 8. The glass is locked in place by the compressive forces created by the Taper-Loc® shim plates being compressed together by the installation tool. Use of the calibrated installation tool assures that the proper compressive forces are developed. The Taper-Loc® system is compatible with all base shoes except for the B5L, which is too shallow for the tapers.

4.2.5.2 Use: The appropriate Taper-Loc® set must be used for the specified base shoe and glass thickness, and installed in accordance to the manufacturer's printed instructions using the calibrated installation tool. Figure 8 shows the applicable dimensions. The spacing of the Taper-Loc® sets must be as noted in Figure 8.

4.2.6 Wet Glazing: Glass may be wet glazed into any of the base shoes using a pourable grout that is compatible with aluminum and glass (see Figure 9).

4.2.6.1 Installation: Minimum grout compressive strength must exceed 1,500 psi (10.3 Mpa) at 24 hours, and 4,000 psi (27.6 MPa) at 28 days. The grout must be mixed, placed and cured in accordance with the grout manufacturer's instructions. Wet glazing grout must be continuous in the base shoe, filling all voids, and extend to the roll-in rubber glazing channel in the base shoe.

4.2.7 Handrails:

4.2.7.1 Use: Handrails are required along ramps and stairs in accordance with 2012 IBC Section 1009.15, 2009 IBC Section 1009.12, 2006 IBC Section 1009.10, 2012 IRC Section 1010.9, or 2009 and 2006 IRC Section 1010.8, as applicable; and the handrail must meet the requirements of IBC Section 1012, or 2012 IRC Sections R311.7.8 and R311.8.3, 2009 IRC Sections R311.7.7 and R311.8.3, or 2006 IRC Sections R311.5.6 and R311.6 (2006), whichever is applicable.

4.2.7.2 Brackets: The handrails may use any of the brackets or combination of brackets shown in this report. C.R. Laurence brackets covered by this report are HR2S, HR2D, HR3E, HR2F, HR15G, and HR2J (see Figure 11).

4.2.7.3 Handrail: The handrails may use any of the rails noted below:

- 1¹/₄-inch Schedule 40 pipe - steel, stainless steel or aluminum
- 1¹/₂-inch Schedule 40 pipe - steel, stainless steel or aluminum
- 1¹/₂-inch OD by 1¹/₈-inch tube - stainless steel or aluminum
- 1¹/₂-inch OD by 0.05-inch tube - stainless steel
- 2-inch OD by 0.05-inch tube - stainless steel

4.2.7.4 Installation: Handrails may be installed to glass balustrade guards using the through-glass mounting brackets shown in this report (see Figure 11). The brackets must be installed in accordance with the manufacturer's instructions. The glass holes must comply with Section 4.2.2.2 of this report.

4.2.7.5 Support: The handrail must be installed so as to remain in place in the event of the failure of any one glass light. This requires the use of a minimum of three glass lights or a combination of other handrail supports and glass lights totaling three, minimum, similar to the top rail support illustrated in Figure 5. The handrail end condition must be checked to verify that the rail will remain in place in the event of failure of the end glass light. End support must be designed when required for a code-compliant installation.

4.2.7.6 Spacing: The bracket spacing must be within the limits shown in Table 5, with dimensions as defined in Figure 10.

4.2.7.7 Attachment: The handrail, when supported by the glass balustrade, must be attached to one of the brackets noted in this report, in accordance with the detail shown in Figure 12, and to the glass as shown in Figure 13. Alternative attachment must be designed to safely support the loads as given in 2012 IBC Section 1607.8.1 or 2009 and 2006 IBC Section 1607.7.1, whichever is applicable. The stabilizing end cap shown in Figure 14 may be used to attach the handrail or top rail to a wall or perpendicular post face.

5.0 CONDITIONS OF USE

The C.R. Laurence Glass Rail 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 The product is limited to installation where it is not subject to vehicle impacts.

5.2 Installation must comply with this report, the manufacturer's published installation instructions, and Sections 1012, 1013 and 2407 of the IBC or Sections R311 and R312 of the IRC, whichever is applicable. When the manufacturer's instructions conflict with this report, this report governs.

5.3 The supporting structure must be designed and constructed to support the loads imposed by the GRS guards in accordance with the applicable code. The anchorage to the frame must be as specified in this report or designed to provide the required strength for the specified balustrade height and imposed loads. Drawings and design details for the GRS system, using the information noted in this report, must be included on construction plans submitted to the building official for approval. The drawings and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.4 When use is in exterior locations, the wind loads on the GRS guards must not exceed the values noted in this report. For glass heights other than those noted in this report, the allowable wind loads must not exceed the value calculated by the following equation:

$$W = \frac{(M_{gmax}/2.5)}{(0.55 \cdot H^2)}$$

where:

H = glass height above supports, in feet

$M_{gmax}/2.5 = 352$ ft-lb for 1¹/₂-inch fully tempered glass

566.4 ft-lb for 5¹/₈-inch fully tempered glass

827.2 ft-lb for 3¹/₄-inch fully tempered glass

For SI: 1 ft – 1 lbf = 1.356 N-m

5.5 When installed where exposed to moisture, the base shoe anchors must be of a material intended for the use and identified by the manufacturer as acceptable for exterior applications. When installed in a corrosive environment, such as one where there is exposure to salt water or pool water, the anchors must be 316 stainless steel.

5.6 All metals in contact with aluminum must be either an alloy approved for direct aluminum contact, or isolated from the aluminum by an approved coating.

5.7 The GRS systems described in this report must not be used in Wind-Borne Debris Regions.

5.8 A proper top rail or handrail must be installed in accordance with the manufacturer's instructions and this report when guards are required by Section 1013 of the IBC or Section 312 of the IRC, as applicable.

5.9 All glass must be fully tempered, fabricated, and inspected in accordance with ASTM C1048, and the glass fabricator must provide certification of compliance with ASTM C1058 for fully tempered glass. Glass must be procured directly from a qualified glass fabricator and is not produced or supplied by C.R. Laurence Co., Inc.

5.10 The CRL GRS™ and Taper-Loc® components, except for the glass, are supplied by C.R. Laurence Co., Inc., of Los Angeles, California.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Glass Railing and Balustrade Systems (AC439).

6.2 Manufacturer's published installation instructions.

6.3 GRS engineering analysis reports:

6.3.1 GRS – Glass Rail System Wet Glazed or Taper-Loc® System Dry-Glazed Base Shoes, dated April 13, 2012.

6.3.2 GRS – Glass Rail System – Top Rails and Handrails, dated April 13, 2012.

7.0 IDENTIFICATION

The CRL GRS™ and Taper-Loc® guard system components described in this report are identified by a stamp on the packaging bearing the manufacturer's name (C.R. Laurence Co., Inc., sometimes abbreviated as CRL); product description and/or part number; and the ICC-ES evaluation report number (ESR-3269).

TABLE 1

ALLOWABLE LOADS ON GLASS ⁴		
Glass thickness ¹ (inches)	Allowable wind load 36-inch Guard Height ² (psf)	42-inch Guard Height ³ (psf)
1/2"	71.1 psf	52.2 psf
5/8"	114.4 psf	84.1 psf
3/4"	167.1 psf	122.8 psf

For SI: 1 inch = 25.4 mm; 1 psf = 0.0479 kN/m².

MINIMUM GLASS LITE WIDTH ⁵		
Glass thickness ¹ (inch)	36-inch Guard Height ²	42-inch Guard Height ³
1/2-inch	2 foot 6-inches	2 foot- 10.5-inches
5/8-inch	1 foot 7-inches	1 foot 10-inches
3/4-inch	1 foot 0-inches	1 foot – 3-inches

For SI: 1 inch = 25.4 mm; 1 foot = 305 mm; 1 psf = 0.0479 kN/m².

¹Nominal glass thickness shown, minimum thickness: 0.469" for 1/2-inch; 0.595" for 5/8-inch and 0.719" for 3/4-inch.

²Glass height above top of base shoe = 32-inches

³Glass height above top of base shoe = 38-inches

⁴The allowable wind loads may be adjusted for other lite heights by:

$$W = \frac{W_{42} \cdot 42^2}{H_g^2}$$

where H_g = total guard height measured from bottom of base shoe to top of cap rail in inches.
W₄₂ = Allowable load at 42-inch guard height.

⁵The minimum glass lite width is permitted to be provided the 6-inches top rail/guardrail is continuous across the total glass width of 1.5 times the minimum width or attached to additional supports at rail ends.

TABLE 2A—SURFACE-MOUNTED SHOE

Surface mounted to steel with 1/2-inch cap screws @ 12-inches on center ¹ :		
Total guard height (Hg) from bottom of base shoe		
1/2-inch cap screw to steel Base Shoe	36-inch Height Allowable wind load*	42-inch Height
B5A, B5G, B5S, B5T	75.3 psf	55.3 psf
B5L	67.7 psf	49.8 psf
B6S	78.9 psf	58.0 psf
B7S	82.8 psf	60.9 psf
Surface mounted to steel with 1/2-inch cap screws @ 6-inch on center:		
1/2-inch cap screw to steel Base Shoe	36-inch Height Allowable wind load*	42-inch Height
B5A, B5G, B5S, B5T	150.0 psf	110.2 psf
B5L	134.5 psf	98.8 psf
B6S	157.2 psf	115.5 psf
B7S	165.1 psf	121.3 psf

For SI: 1 inch = 25.4 mm; 1 psf = 0.0479 kN/m².

¹Allowable wind load may be limited by glass strength. See Table 1 in this report.

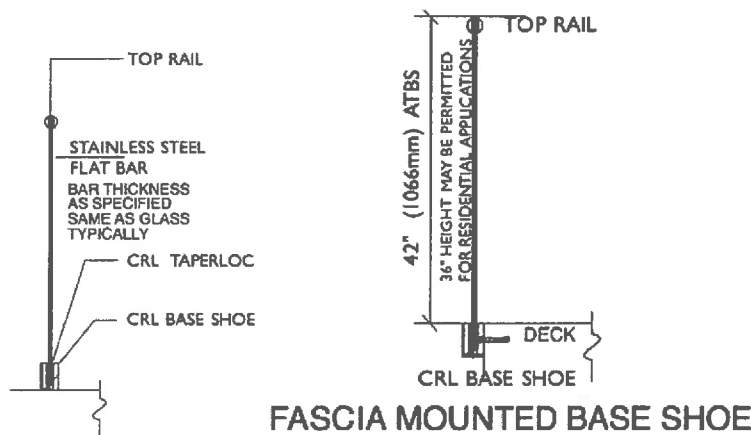


TABLE 2B—FASCIA-MOUNTED SHOE

Fascia mounted to steel with 1/2-inch cap screws @ 12-inches on-center ¹ :		
Total Guard Height above top of base shoe		
1/2-inch cap screw to steel Base Shoe	36-inch Height Allowable wind load*	42-inch Height
B5A, B5G, B5S	68.7 psf	51.2 psf
B5L	47.5 psf	35.3 psf
B6S	68.7 psf	51.2 psf
B7S	68.7 psf	51.2 psf
Fascia mounted to steel with 1/2-inch cap screws @ 6-inch on-center:		
1/2-inch cap screw to steel Base Shoe	36-inch Height Allowable wind load*	42-inch Height
B5A, B5G, B5S	138.2 psf	103.0 psf
B5L	95.6 psf	71.2 psf
B6S	138.2 psf	103.0 psf
B7S	138.2 psf	103.0 psf

For SI: 1 inch = 25.4 mm; 1 psf = 0.0479 kN/m².

¹Allowable wind load may be limited by glass strength. See Table 1 in this report.

TABLE 2C—ANCHORAGE TO CONCRETE

For anchorage to concrete Surface Mounted: 3/8-inch diameter x 4-inch Hilti HUS-EZ (KH-EZ) in accordance with ESR-3027 or Hilti HSL-3 M8 x 3 3/4-inches anchor in accordance with ESR-1545. $f_c = 3,000 \text{ psi}^B$ (20.6 MPa) ² embed depth = 2.5-inches (63.7 mm) effective depth		
Concrete anchors ≥ 3.75 inches edge distance ^{1,2,3,4} Anchor spacing to concrete 12-inches O.C.		
Total Guard Height (Hg) Base Shoe	36-inches Allowable wind load	42-inches Allowable wind load
B5G, B5S, B5T	42.7 psf	31.4 psf
B5A	41.2 psf	30.3 psf
B5L	39.0 psf	28.6 psf
B6S	45.6 psf	33.5 psf
B7S	47.9 psf	35.2 psf
Anchor spacing to concrete 6-inches O.C.		
Total Guard Height (Hg)	36-inches	42-inches
B5G, B5S, B5T 68.6 psf	68.6 psf	50.4 psf
B5A	66.9 psf	49.2 psf
B5L	61.5 psf	45.2 psf
B6S	73.2 psf	53.8 psf
B7S	75.7 psf	55.6 psf

For SI: 1 inch = 25.4 mm; 1 psf = 0.0479 kN/m². See footnotes at the end of Table 2d.

TABLE 2D—ANCHORAGE TO CONCRETE

Surface Mounted Base Shoes: Concrete anchors 2.35-inches edge distance ^{1,2,3,4} Anchor spacing to concrete 12-inches on-center		
Total Guard Height (Hg) Base Shoe	36-inches Allowable wind load	42-inches Allowable wind load
B5G, B5S, B5T	35.5 psf	26.1 psf
B5A	34.0 psf	25.0 psf ^a
B5L (3.047-inches min edge dist)	35.4 psf	26.0 psf ^a
B6S	37.2 psf	27.3 psf
B7S	39.1 psf	28.7 psf
^a Doesn't meet 50 plf live load on top rail required by Section 1607.8.1 of the IBC. See section 4.2.1 of this report.		
Concrete anchors 1.75-inches edge distance Anchor spacing to concrete 6-inches on-center		
Total Guard Height (Hg)	36-inches	42-inches
B5G, B5S, B5T	50.8 psf	37.3 psf
B5A	49.9 psf	36.6 psf
B5L	45.6 psf	33.5 psf
B6S	53.3 psf	53.3 psf
B7S	56.0 psf	41.1 psf
B7S 2.35-inches edge distance	61.9 psf	45.5 psf

For SI: 1 inch = 25.4 mm; 1 psf = 0.0479 kN/m².

- ¹Linear interpolation between guard heights, anchor spacing and edge distances is permitted.
- ²Adjustment for concrete strength other than $f_c = 3,000 \text{ psi}$, see section 4.2.3.2.1 of this report.
- ³Adjustment for sand light-weight concrete: $W = 0.6^*W$
- ⁴Allowable wind load maybe limited by glass strength. See Table 1 in this report.

TABLE 2E

SURFACE MOUNTED WITH DRAIN BLOCKS ON CONCRETE^{1,2,3,4}			
Concrete anchors ≥ 3.75-inches edge distance			
Anchor spacing to concrete		12-inches on-center	
Total Guard Height (Hg)		36-inches	42-inches
Base Shoe		Allowable wind load	Allowable wind load
B5G, B5S, B5T		41.2 psf	30.2 psf
B5A		41.2 psf	30.2 psf
B5L		37.0 psf	27.2 psf
B6S		44.0 psf	32.3 psf
B7S		50.5 psf	37.1 psf
Anchor spacing to concrete		6-inches on-center	
Total Guard Height (Hg)		36-inches	42-inches
B5G, B5S, B5T		66.9 psf	49.2 psf
B5A		66.9 psf	49.2 psf
B5L		60.2 psf	44.2 psf
B6S		71.2 psf	52.3 psf
B7S		74.6 psf	54.8 psf
Concrete anchors 2.35-inches edge distance^{1,2,3}			
Anchor spacing to concrete		12-inches on-center	
Total Guard Height (Hg)		36-inches	42-inches
Base Shoe		Allowable wind load	Allowable wind load
B5G, B5S, B5T		34.0 psf	25.0 psf ^a
B5A		34.0 psf	25.0 psf ^a
B5L (3.047-inches min edge dist)		30.6 psf	26.9 psf
B6S		36.2 psf	26.6 psf
B7S		41.6 psf	30.5 psf
^a Doesn't meet 50 plf live load on top rail add extra anchor per 10 feet (3048 mm) length			
Concrete anchors 2.35-inches edge distance			
Anchor spacing to concrete		6-inches on-center	
Total Guard Height (Hg)		36-inches	42-inches
B5G, B5S, B5T		55.0 psf	40.4 psf
B5A		55.0 psf	40.4 psf
B5L		49.5 psf	36.4 psf
B6S		58.4 psf	42.9 psf
B7S		61.2 psf	45.0 psf

For SI: 1 inch = 25.4 mm; 1 psf = 0.0479 kN/m².

¹Linear interpolation between guard heights, anchor spacing and edge distances is permitted.

²Adjustment for concrete strength other than f_c = 3,000 psi. See Section 4.2.3.2.1

³Adjustment for sand light-weight concrete:

$$W = 0.6 * W$$

⁴Allowable wind load may be limited by glass strength. See Table 1 in this report.

TABLE 2F—FASCIA MOUNTED WITH DRAIN BLOCKS (CONCRETE SUBSTRATE)

Fascia Mounted			
Concrete anchors edge distance ≥ 1/2 base shoe height			
ATBS = Above Top of Base Shoe to top of guard.			
Anchor spacing to concrete		12-inch on-center	
Total Guard Height ATBS		36-inch	42-inch
Base Shoe		Allowable wind load	Allowable wind load
B5A, B5G, B5S		49.7 psf	37.0 psf
B5L		42.0 psf	31.2 psf
B6S		49.7 psf	37.0 psf
B7S		49.7 psf	37.0 psf
Anchor spacing to concrete		6-inches on-center	
Total Guard Height ATBS		36-inches	42-inches
B5A, B5G, B5S		77.1 psf	57.5 psf
B5L		51.0 psf	37.9
B6S		77.1 psf	57.5 psf
B7S		77.1 psf	57.5 psf

For SI: 1 inch = 25.4 mm; 1 psf = 0.0479 kN/m².

TABLE 2G—FACIA MOUNTED OVER DRAIN BLOCKS (WOOD SUBSTRATE)

Fascia Mounted		
To wood with 1/2-inch lag screws with 2.37" minimum embedment to wood G ≥ 0.49		
Anchor spacing 12-inch on center Interior or Dry locations mc ≤ 19%		
ATBS = Above Top of Base Shoe to top of guard.		
Total Guard Height ATBS	36-inches	42-inches
Base Shoe	Allowable wind load	Allowable wind load
B5A, B5G, B5S	48.7 psf	36.3 psf
B5L	41.4 psf	30.8
B6S	48.7 psf	36.3 psf
B7S	48.7 psf	36.3 psf
Anchor spacing 6-inch on-center.		
Total Guard Height ATBS	36-inches	42-inches
B5A, B5G, B5S	92.6 psf	69.0 psf
B5L	77.8 psf	57.9 psf
B6S	92.6 psf	69.0 psf
B7S	92.6 psf	69.0 psf
Anchor spacing 12-inch on-center. Exterior or wet locations where mc ≥ 19%		
Total Guard Height ATBS	36-inches	42-inches
Base Shoe	Allowable wind load	Allowable wind load
B5A, B5G, B5S	34.5 psf	25.7 psf*
B5L	29.4 psf	21.9*
B6S	34.5 psf	25.7 psf*
B7S	34.5 psf	25.7 psf*
*Does not meet 50 plf live load on top rail required by Section 1607.8.1 (2012) or 1607.7.1 (2009 and 2006) of the IBC. See Section 4.2.1 of this report.		
Anchor spacing to 6-inches on-center.		
Total Guard Height ATBS	36-inches	42-inches
B5A, B5G, B5S	66.9 psf	49.9 psf
B5L	56.8 psf	42.2 psf
B6S	66.9 psf	49.9 psf
B7S	66.9 psf	49.9 psf

For SI: 1 inch = 25.4 mm; 1 psf = 0.0479 kN/m².

The allowable wind loads may be adjusted for other light heights by equation 3:

$$W = \frac{W_{42} \cdot 42^2}{H_G^2} \quad \text{Eq. 3}$$

where H_G = glass height measured from top of base shoe to top of top rail in inches.

TABLE 3—ALLOWABLE GLASS LIGHT WIDTHS

Profile	Material	Max width (inches)	End lite width (inches)
GR15	Stainless	55	17
GR15	Brass	43	9
GRS/GRSC15	Stainless	73	15
GR16	Stainless	72	21
GR19	Aluminum	84	21
GR20	Stainless	96	33
GR20	Brass	96	20
GRS/GRSC20	Stainless	96	30
GR25	Stainless	96	58
GR25	Brass	96	32
GR25	Aluminum	96	40
GRS25	Stainless	96	30
GR30	Stainless	96	72
GR30	Brass	96	50
GR30	Aluminum	96	63
GR35	Stainless	96	72
GR35	Brass	96	56
GR35	Aluminum	96	85
GR40	Stainless	96	72
GR40	Brass	96	42
GR207	Stainless	96	34
GR257	Stainless	96	56
GR257	Brass	96	29
GR307	Stainless	98	69
GR307	Brass	96	37
GR307M	Aluminum	96	64
GROV4	Aluminum	96	60
WCR20	Wood	40	11
WCR25	Wood	83	21
WCR30	Wood	96	36
GRLC10	Stainless	83	24
GRL10	Stainless	81	24

For SI: 1 inch = 25.4 mm.

TABLE 4—PLATE POST SIZES

Plate Thickness (inches)	Minimum Width (inches)	Base shoes
1/2	9	B5 series
5/8	5.75	B6 series
3/4	4	B7 series
1	2.25	B5 series
1.125	1.81	B6 series
1.25	1.437	B7 series

For SI: 1 inch = 25.4 mm.

TABLE 5—BRACKET SPACING¹

Handrail	Material ²	L2 in	Le in
1 1/4-inch Sched 40	St or SS	96	24
1 1/4-inch Sched 40	6063-T6 Al	84	21
1 1/2-inch Sched 40	St or SS	115	34
1 1/2-inch Sched 40	6063-T6 Al	96	29
1 1/2-inch x 1/8-inch Tube	SS	102	27
1 1/2-inch x 1/8-inch Tube	6063-T6 Al	62	15
1 1/2-inch x 0.05-inch Tube	SS	50	12
2" x 0.05-inch Tube	SS	92	22

For SI: 1 inch = 25.4 mm.

¹See Figure 10 for additional details.

²St = A53 Steel, SS = 304 or 316 Stainless Steel

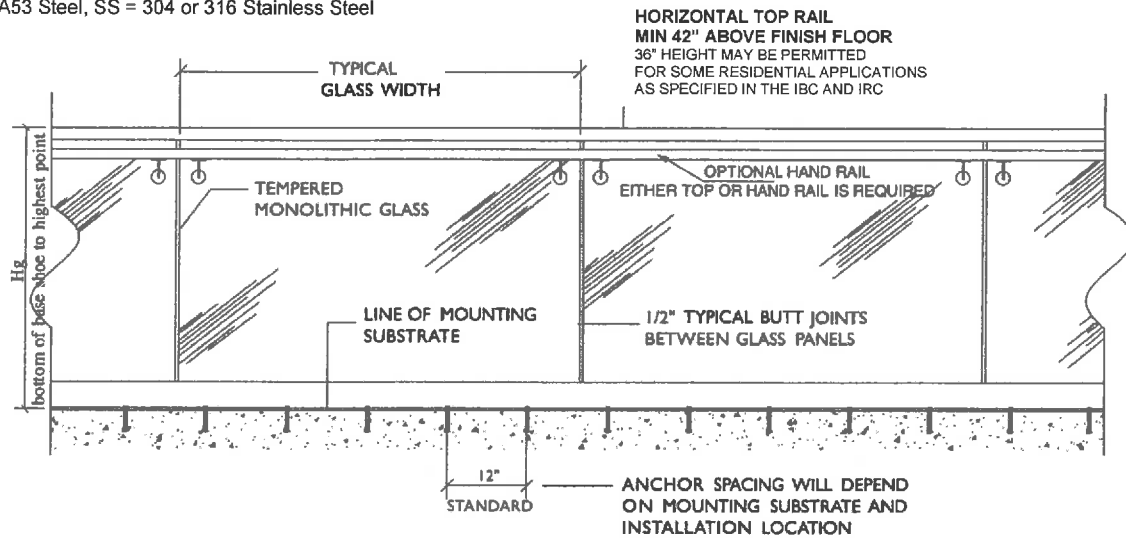
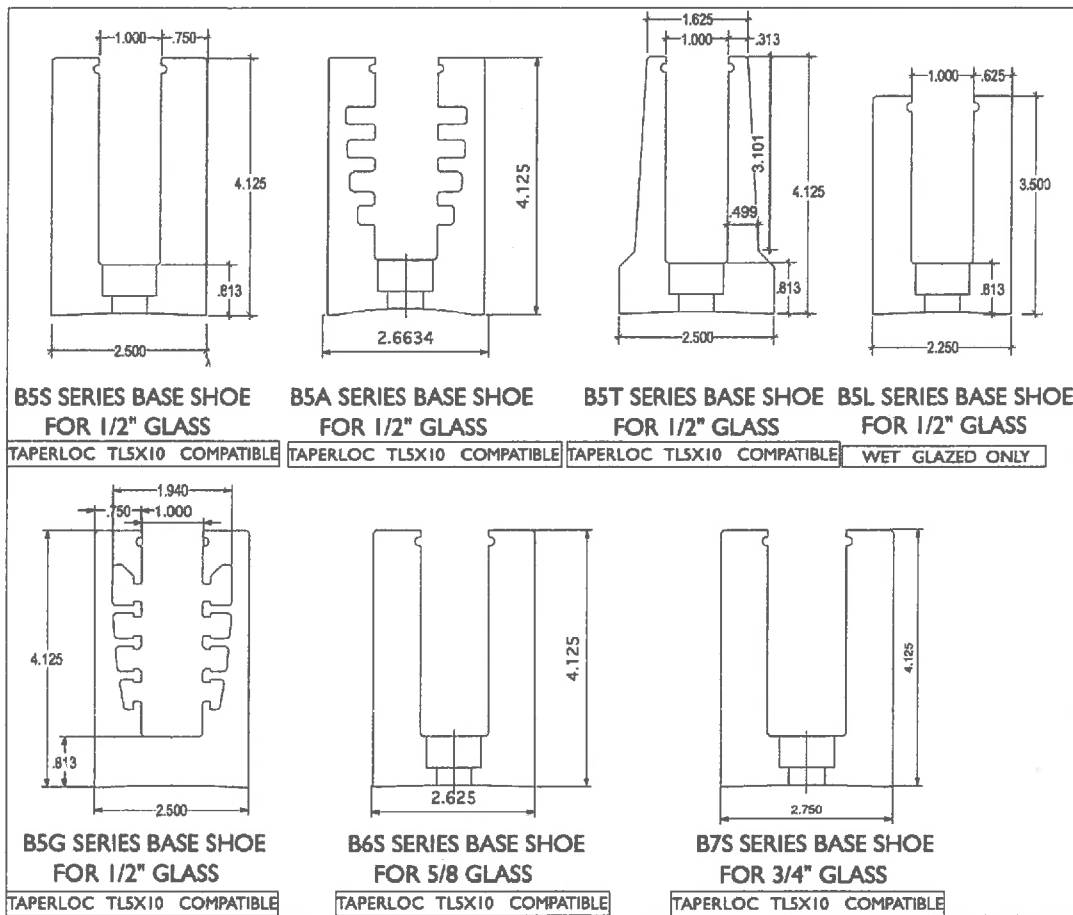


FIGURE 1—TYPICAL GLASS RAILING ELEVATION



For SI: 1 inch = 25.4 mm.

FIGURE 2—BASE SHOES

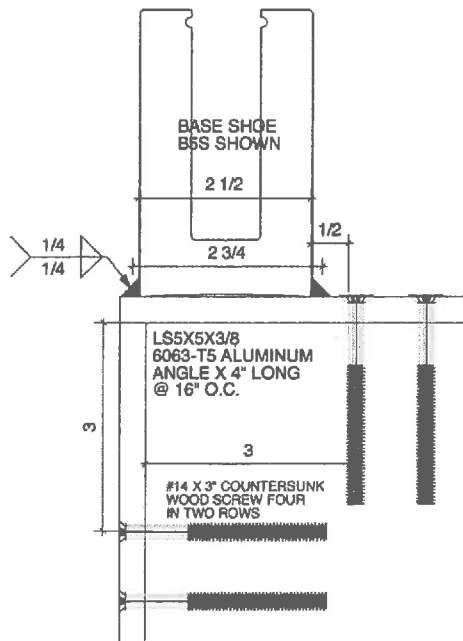


FIGURE 3—ALUMINUM BRACKET TO WOOD
(Dimensions are in inches; 1 inch = 25.4 mm)

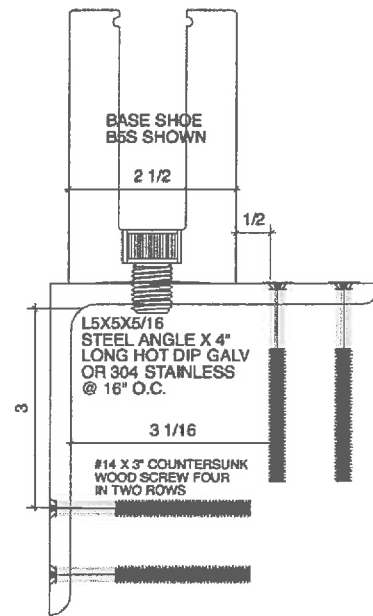


FIGURE 4—STEEL BRACKET TO WOOD
(Dimensions are in inches; 1 inch = 25.4 mm)

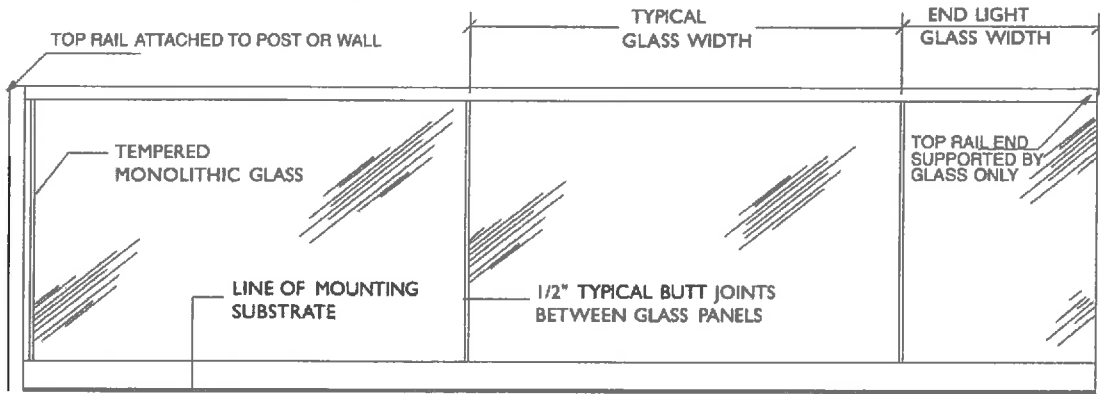


FIGURE 5—TOP RAIL SUPPORT OPTIONS

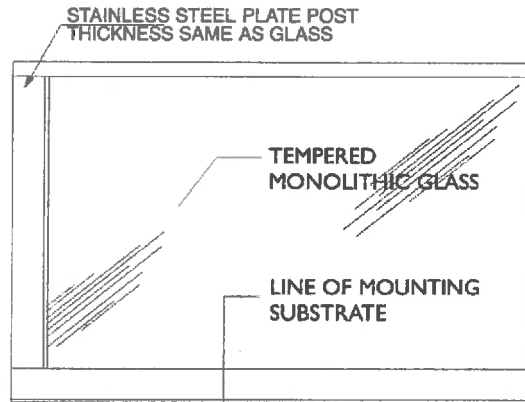
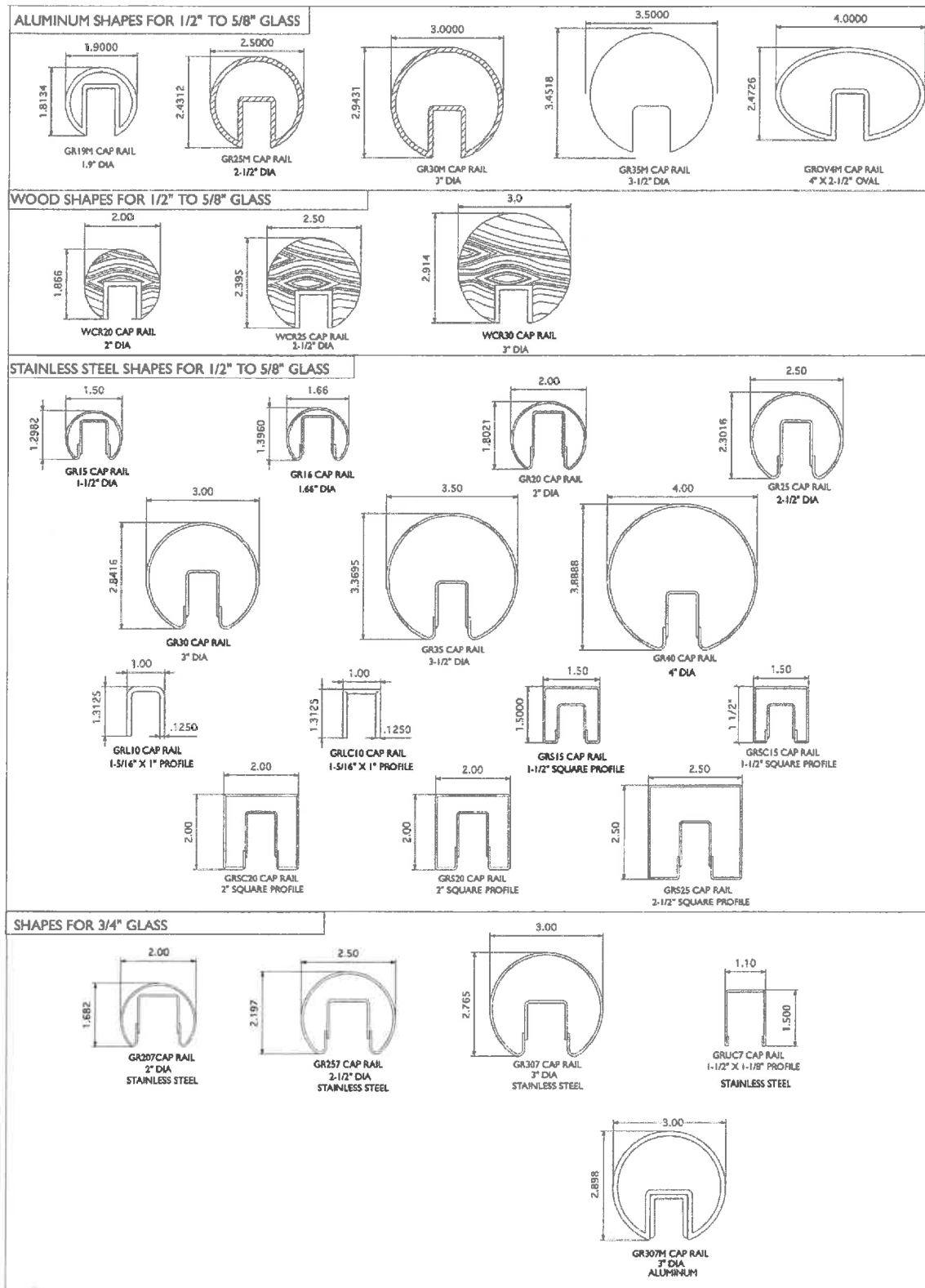
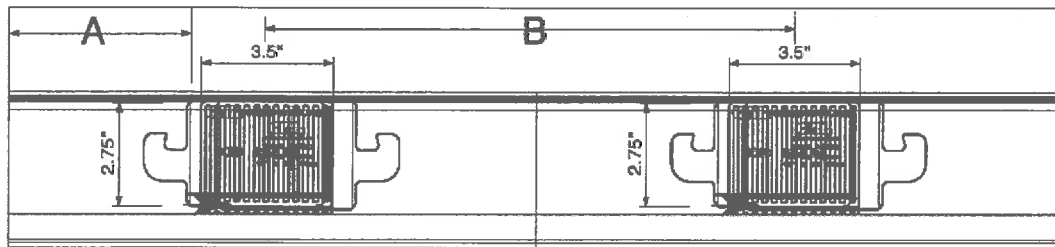
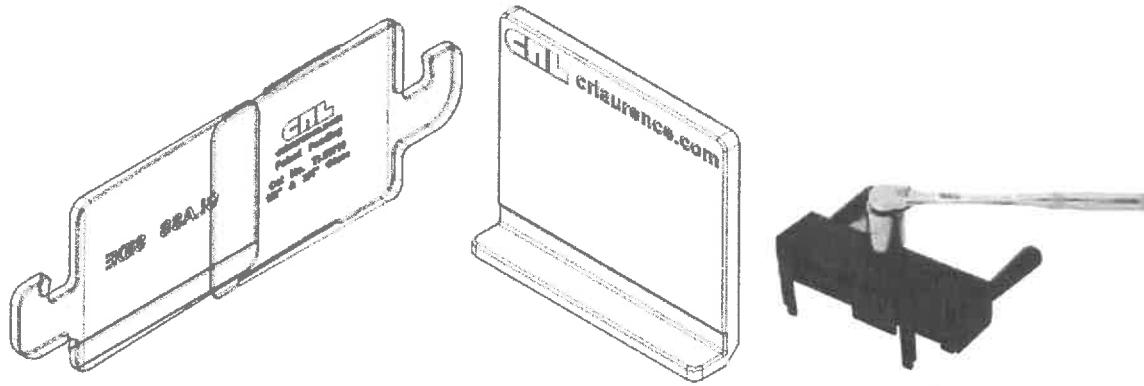


FIGURE 6—TOP RAIL SUPPORTED BY END PLATE POST



For SI: 1 inch = 25.4 mm.
Dimensions are in inches.

FIGURE 7—TOP RAIL PROFILES



For 1/2-inch Fully Tempered Glass maximum glass light height = 42-inch:
 Edge Distance: 2-inches $\leq A \leq 8\frac{5}{8}$ -inches; 51 mm $\leq A \leq 219$ mm
 Center to center spacing: 7-inches $\leq B \leq 14$ -inches: 178 mm $\leq B \leq 356$ mm

Panel Width/Required quantity of Taper-Loc® Plates:

6-inches to 14-inches (152 to 356 mm)	1 TL Plate
14-inches to 28-inches (356 to 711 mm)	2 TL Plates
28-inches to 42-inches (711 to 1,067 mm)	3 TL Plates
42-inches to 56-inches (1,067 to 1,422 mm)	4 TL Plates
56-inches to 70-inches (1,422 to 1,778 mm)	5 TL Plates
70-inches to 84-inches (1,778 to 2,134 mm)	6 TL Plates
84-inches to 96-inches (2,134 to 2,438 mm)	7 TL Plates

Adjustments to spacing:

1. For glass light heights over 42-inches A_{max} and B_{max} must be reduced proportionally.

$$A_{max} = 8\frac{5}{8} * (42/h)$$

$$B_{max} = 14 * (42/h)$$

h = glass height

2. For glass light heights under 42-inches A_{max} and B_{max} must not be increased.

3. A_{min} and B_{min} are for ease of installation and can be further reduced as long as proper installation is achieved.

4. For glass thicknesses greater than 1/2" A_{max} and B_{max} may be increased as follows:

5/8-inch Glass
 Edge Distance: 2-inches $\leq A \leq 13.5$ "
 Center to center spacing: 7" $\leq B \leq 21$ "

3/4-inch Glass
 Edge Distance: 2-inches $\leq A \leq 19$ "

Center to center spacing: 7" $\leq B \leq 31$ "

For SI: 1 inch = 25.4 mm.

FIGURE 8—TAPER-LOC® SHOE SETTING PLATE

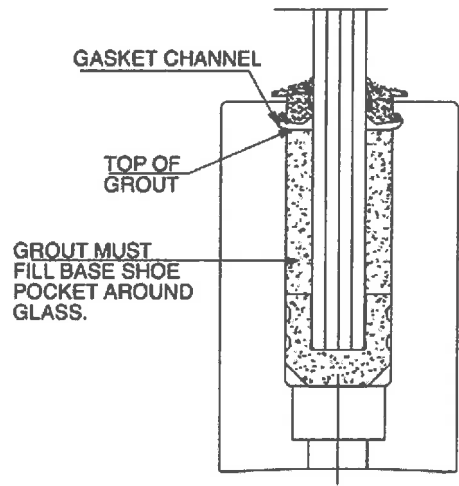


FIGURE 9—WET GLAZING

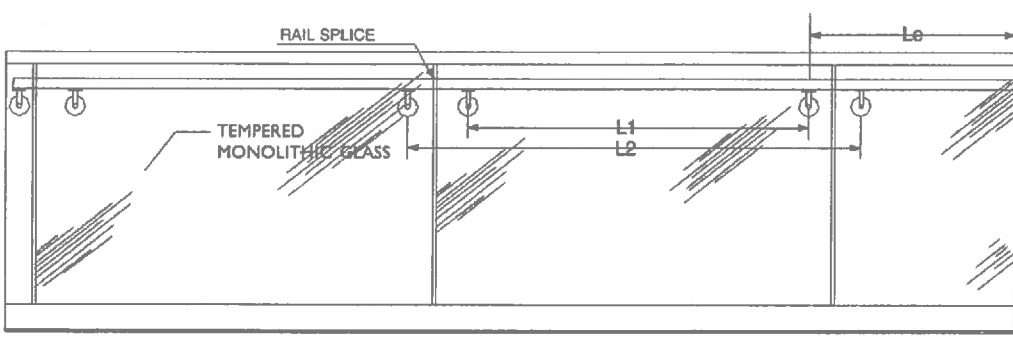


FIGURE 10—TOP RAIL SUPPORT OPTIONS

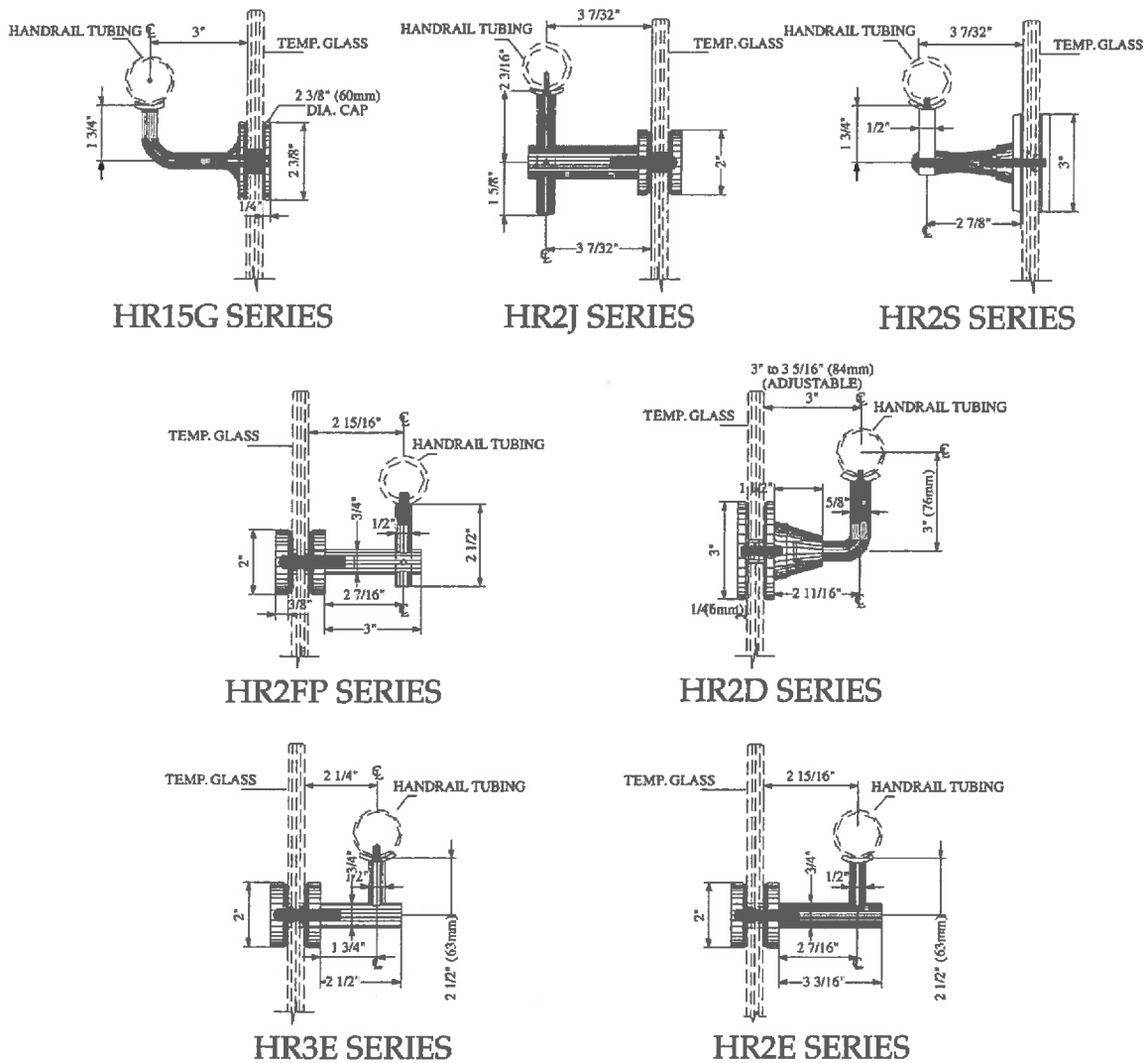


FIGURE 11—HANDRAIL BRACKETS

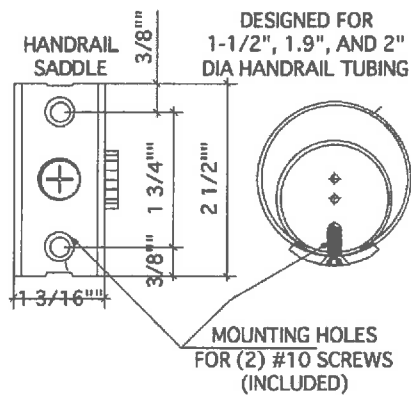


FIGURE 12—HANDRAIL ATTACHMENT

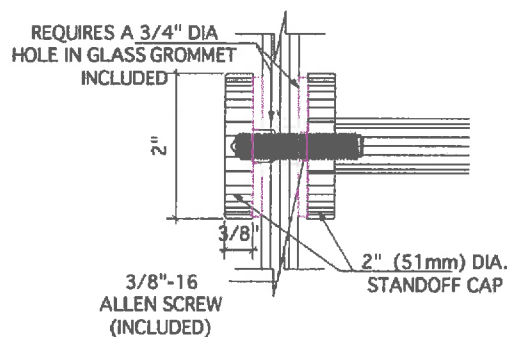


FIGURE 13—HANDRAIL ATTACHMENT TO GLASS

STABILIZING END CAP MATCHED TO TOP RAIL OR HAND RAIL

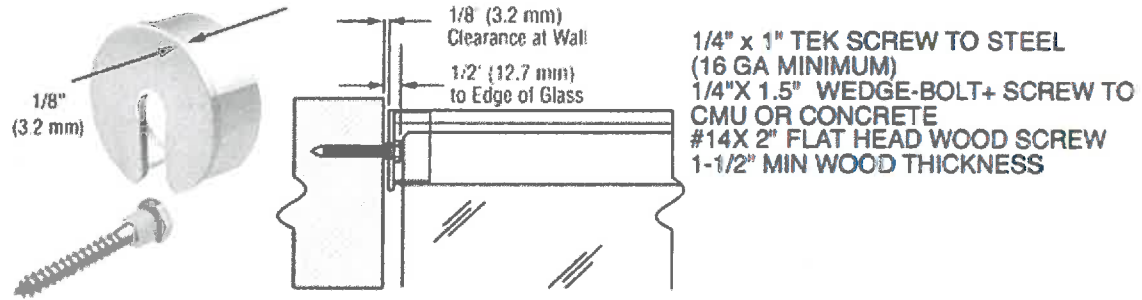


FIGURE 14—STABILIZING END CAP