

EVALUATION SERVICE REPORT (ESR)

SUBJECT: GLASS RAILING SQUARE SURFACE MOUNT POST FOR HANDRAIL SYSTEMS
SKU: GLS.SQU.SUR.HND

1.0 Identification

This report evaluates the Inline Design square stainless steel surface-mount post system used for supporting glass infill panels in guardrail applications.

2.0 Applicable Codes

This product has been evaluated for compliance with the following model building codes:

- 2021 & 2018 International Building Code (IBC)
- 2021 & 2018 International Residential Code (IRC)
- ASTM E2358-17: Standard Test Method for Determining Load Resistance of Glass Railings and Balustrade Systems

3.0 Product Description

- Post Type: Surface-mount square post with welded base plate
- Material: Type 316 stainless steel conforming to ASTM A554 (for welded tubing) and ASTM A240 (for plate components)
- Post Dimensions: 40mm x 40mm (1.57" x 1.57"), 2.6mm wall thickness
- Post Height: 42.5" above finished floor
- Base Plate: 80mm x 80mm x 6mm thick
- Glass Type: 9/16" laminated tempered glass (1/4" glass plies with Sentry Glas+™ 0.06" interlayer)
- Glass Panel Height: 37"
- Glass Panel Width: Up to 45" max
- Post center to center width up to 48" max
- Anchorage: Four Hilti HAS-R 3/8" x 5-1/8" 316 stainless steel anchor rods (Part No. 2045001) installed with Hilti HIT-HY 200-R V3 adhesive, embedded a minimum of 4" into concrete with a compressive strength of at least 4,000 psi, per manufacturer's technical data and applicable evaluation reports.

4.0 Performance Characteristics**4.1 Load Testing**

- 200 lbf Concentrated Load: Applied horizontally & vertically to the top of the handrail across 12" segment – PASSED
- 50 lbf Infill Load: Applied over a 12" x 12" glass area – PASSED
- 50 plf Uniform Load: Distributed along the top rail (simulated) – PASSED

4.2 Structural Safety

- Factor of Safety (FoS) for Stainless Steel Components: 2.5 under IBC Section 1607.8 and ASTM E2358-17.
- Factor of Safety (FoS) for Laminated Glass Infill Panels: 3.0 per ASTM E2358-17 Section 7.5.2.
- Maximum von Mises Stress: 240 MPa (under 600 MPa yield for cold-rolled SS316, 87 ksi, FoS = 2.5).
- Maximum von Mises Stress: 130 MPa (under 400 MPa yield for hot-rolled or cast SS316, 58 ksi, FoS = 2.5).
- Deflection Limits: Within IRC/IBC thresholds (L/240 or 0.5").

4.3 Glass Compliance

- Laminated tempered glass complies with ASTM C1172, CPSC 16 CFR 1201, and ANSI Z97.1 Category II
- Interlayer is ionoplast (SentryGlas or equivalent), non-PVB, with minimum shear modulus $G > 11 \text{ MPa}$

5.0 Conditions of Use

- Product must be installed per Inline Design specifications
- Glass must be supported at both vertical edges by posts or structural walls
- The top rail must be secured at both ends to a post or structural wall to ensure stability and load path continuity
- Handrail must be terminated at structural elements (posts or adjacent walls) to meet IRC/IBC stability requirements
- Maximum center-to-center post spacing shall not exceed 48" unless additional structural justification is provided
- Anchorage shall be into concrete with compressive strength $\geq 4,000 \text{ psi}$
- No substitution of glass type or interlayer without reevaluation
- All M8x1.25mm holes used by the glass clamps are flow drilled
- Handrail to be welded to handrail bracket saddles

6.0 Basis of Evaluation

Finite Element Analysis (FEA) conducted.

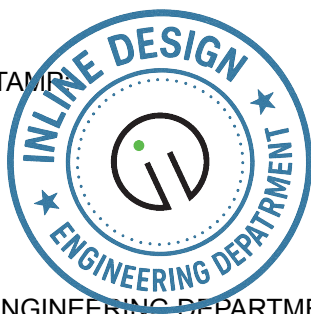
Evaluation in accordance with:

- ASTM E2358-17
- IBC 2018 & 2021 Section 1607.8 (Guard Loads)
- IRC 2018 & 2021 Table R301.5 (Minimum Uniformly Distributed Live Loads)

7.0 Findings

Based on the results of structural analysis and glass performance review, the Inline Design GLS.SQU.SUR.HND.42" stainless steel surface post glass railing system is found to comply with the structural requirements of the IBC, IRC, and ASTM E2358 for guardrail systems when installed as described in this report.

ENGINEERING STAMP



INLINE DESIGN ENGINEERING DEPARTMENT PROFESSIONAL ENGINEER

REPORT: ESR-GLS-SQU-SUR-HND-IBC-IRC-ASTM.1.0 ISSUED

BY: INLINE DESIGN ENGINEERING DEPARTMENT 6335 1ST AVE SOUTH UNIT MAIN, SEATTLE, WA 98108

DATE: APRIL 28 2025

This evaluation is subject to revisions as additional compliance testing (e.g., FBC, HVHZ, missile impact) is conducted.

APPENDIX A: Supplemental Anchorage for Wood Substrates

1.0 Scope This appendix supplements the original ESR-GLS-SQU-SUR-HND-IBC-IRC-ASTM.1.0 evaluation report. It outlines the approved fastening methods for securing the Inline Design GLS.SQU.SUR.HND surface-mount square post to structural wood framing to meet the 200 lbf concentrated load and 50 plf uniform load requirements.

2.0 General Requirements

- **Substrate:** Fasteners must be anchored into solid structural wood framing (e.g., Douglas Fir-Larch, Southern Yellow Pine, or wood species with a specific gravity G greater or equal to 0.49).
- **Decking Excluded:** Posts must **never** be secured solely to deck boards (e.g., 5/4" wood, composite, or PVC decking). Fasteners must pass through the decking and fully engage the underlying structural framing.
- **Base Plate:** The 80mm x 80mm x 6mm thick base plate utilizes four anchor holes. All four holes must be utilized for structural integrity.

3.0 Approved Fastening Methods

Option A: Through-Bolting (Strongly Recommended for IBC/IRC Compliance) Due to the leverage generated at the 42.5" post height, through-bolting provides the safest and most reliable pull-out resistance.

- **Fastener:** 3/8" diameter Type 316 Stainless Steel Hex Head Bolts or Carriage Bolts (matching the 3/8" diameter of the concrete anchors evaluated in the main report).
- **Length:** Substrate thickness + Decking thickness + 1" minimum.
- **Hardware:** Each bolt must be secured with a 3/8" Type 316 SS heavy-duty fender washer (minimum 1.25" outer diameter) and a Type 316 SS nylon-insert lock nut on the underside of the framing.

Option B: Lag Screws (Conditional Use)

If access to the underside of the framing is impossible, lag screws may be used *only* if embedded entirely into solid, structural timber (such as a solid 4x8 edge beam or densely blocked joists).

- **Fastener:** 3/8" diameter Type 316 Stainless Steel Hex Head Lag Screws.
- **Embedment:** Screws must achieve a minimum of 4" of embedment into solid structural framing (matching the 4" embedment depth required for the concrete anchors). This means a 5" or 6" lag screw is typically required to account for the thickness of the base plate and the decking material.
- **Pilot Holes:** Proper pilot holes must be drilled to prevent splitting the structural wood, sized according to the wood species' specific gravity.

4.0 Structural Blocking Requirements

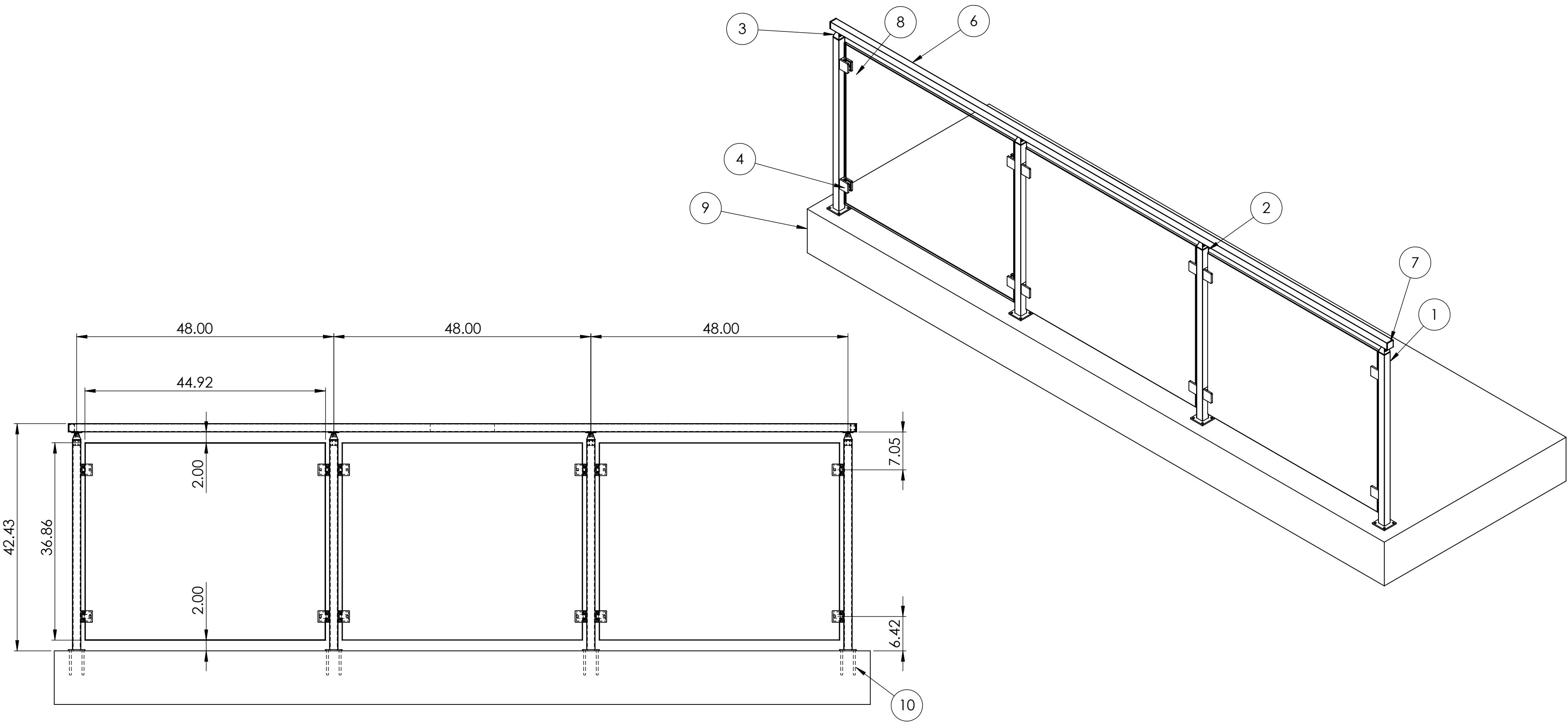
Standard 2x8 or 2x10 rim joists will twist under the load of a glass railing system. Regardless of whether Option A or Option B is used, the wood framing directly beneath the post must be reinforced.

- A minimum of 4x4 or double-2x solid wood blocking must be installed securely between the joists directly beneath the post mounting location.
- Blocking must be fastened to the adjacent joists using structural wood screws or appropriate framing hardware to ensure load path continuity to the main deck structure.

5.0 Conditions of Use

- All deflection limits ($L/240$ or 0.5") and safety factors (2.5 for stainless steel, 3.0 for glass) established in the primary report remain applicable.
- As with the concrete installation, maximum center-to-center post spacing shall not exceed 48".
- Installers must consult with a licensed local structural engineer to verify that the existing wood deck framing is adequate to support the moment loads generated by the guardrail system.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	MATERIAL	MANUFACTURER
1	GLS.SQU.SUR.HND.42.END	SQUARE END POST WITH WELDED FLANGE 1.57" x 0.102"	2	SS AISI 316	INLINE DESIGN
2	GLS.SQU.SUR.HND.42.MID	SQUARE MIDDLE POST WITH WELDED FLANGE 1.57" x 0.102"	2	SS AISI 316	INLINE DESIGN
3	HBS.PYR.260	HANDRAIL BRACKET PYRAMID FOR SQUARE POST	4	SS AISI 316	INLINE DESIGN
4	GCL.SQU.FLT	GLASS CLAMP SQUARE STAINLESS STEEL FLAT MOUNT	12	SS AISI 316	INLINE DESIGN
5	RUB.SQU.916	GLASS CLAMP RUBBER INLAY	24	RUBBER (EDPM) 80° A	INLINE DESIGN
6	TBE.SQU.157.12.26M	SQUARE HANDRAIL TUBE 1.57" x 0.102" x 12'	1	SS AISI 316	INLINE DESIGN
7	EC.SQU.026	SQUARE END CAP	2	SS AISI 316	INLINE DESIGN
8	Glass^GLS.SQU.SUR.HND	9/16" LAMINATED TEMPERED GLASS (1/4" GLASS PLIES WITH SENTRY GLAS+™ 0.06" INTERLAYER)	3	GLASS	
9	Concrete^GLS.SQU.SUR.HND	CONCRETE WITH COMPRESSIVE STRENGTH ≥ 4,000 PSI	1	CONCRETE	
10	2045001 + HIT-HY 200-R V3	HAS-R 316 SS ANCHOR ROD + HILTI HIT-HY 200-R V3 ADHESIVE	16	SS AISI 316	HILTI



TYPICAL EXTERIOR ELEVATION



GLASS RAILING SQUARE SURFACE MOUNT POST FOR HANDRAIL

SKU: GLS.SQU.SUR.HND
UNITS: INCHES