

ICC-ES Evaluation Report

ESR-3563

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This report also contains:


- FBC Supplement

Subject to renewal January 2025

- LABC Supplement

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<p>DIVISION: 05 00 00—METALS</p> <p>Section: 05 52 00—Metal Railings</p> <p>Section: 05 73 13—Glazed Decorative Metal Railings</p> <p>DIVISION: 08 00 00—OPENINGS</p> <p>Section: 08 81 00—Glass Glazing</p> <p>Section: 08 88 00—Special Function Glazing</p>	<p>REPORT HOLDER:</p> <p>GLASS VICE HOLDINGS USA LLC</p>	<p>EVALUATION SUBJECT:</p> <p>GLASS VICE GLASS PANEL RAILING AND GLASS BALUSTER SYSTEMS</p>	
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1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, 2015, 2012 and 2009 [International Building Code® \(IBC\)](#)
- 2021, 2018, 2015, 2012 and 2009 [International Residential Code® \(IRC\)](#)
- 2021 and 2018 [International Swimming Pool and Spa Code® \(ISPS\)](#)

For evaluation for compliance with codes adopted by Los Angeles Department of Building and Safety (LADBS), see [ESR-3563 LABC and LARC Supplement](#).

Properties evaluated:

- Structural
- Durability

2.0 USES

The Glass Vice Glass Panel Railing and Glass Baluster Systems described in this report are intended for interior and exterior use in residential, commercial and industrial applications for guards along balconies, porches, mezzanines, stairs and similar locations except where vehicle impact resistance is required. The system may also be used as a pool or spa barrier. The system is compatible with all construction types. Use in Wind-borne Debris Regions must be in accordance with Section 3.4 of this report.

The Glass Vice Glass Panel Railing and Glass Baluster Systems described in this report must be constructed using monolithic tempered or laminated tempered glass within the limitations specified in this report. See Section 4.1.5.1 in this report for limitations on the installation of laminated tempered glass.

The use of 9/16-inch (14.3 mm) and 5/8-inch (15.87 mm) laminated tempered glass panel and anchorage systems have not been evaluated for use as a guard or handrail system where the 50 plf (0.73 kN/m) loading

is required by 2021 IBC Section 1607.9.1 (2018, 2015 and 2012 IBC Section 1607.8.1; 2009 IBC Section 1607.7.1).

The system may be installed up to a total height of 42 inches (106.7 cm) without a top rail or handrail when $\frac{9}{16}$ -inch thick (14.3 mm) or $\frac{5}{8}$ -inch thick (15.87 mm) laminated tempered glass panels up to 41 inches (104.1 cm) in height with an interlayer meeting the requirements of Section 3.2.1 are used. Installation without a top rail complies with the Exceptions noted in IBC Section 2407.1.2 and 2021 and 2018 IRC Section R308.4.4.1. This use is limited to installations under the IRC or in one and two family dwellings under the IBC where the 50 plf (0.73 kN/m) live load is not applicable.

The system may also be installed without a top rail or handrail with monolithic or laminated glass panels when use as a spa or pool barrier and installed in accordance with Section 4.2.6. This use is limited to configurations in which the system is not required to function as a guard or handrail.

3.0 DESCRIPTION

3.1 General:

The Glass Vice Glass Panel Railing and Glass Baluster Systems allow for the construction of frameless glass balustrade guards, wind breaks and pool fences. The systems include the monolithic tempered glass (to be provided by others) or laminated tempered glass (to be provided by others), the railing, the glass clamp, the glass bracket and the fastening into the substrate. The Glass Vice system uses a proprietary glass clamp cast from Duplex 2205 (UNS S32205) or 316 stainless steel, complying with ASTM A890/A890M, to anchor and fully support $\frac{1}{2}$ -inch (12.7 mm) or $\frac{5}{8}$ -inch (15.87 mm) monolithic tempered glass or, $\frac{9}{16}$ -inch (14.3 mm) or $\frac{5}{8}$ -inch (15.87 mm) laminated tempered glass balustrades. Monolithic tempered glass installations may have a stainless steel handrail located between 34 and 42 inches (864 and 1067 mm) above floor surface as appropriate for the installation. A handrail or guard must be installed when the monolithic tempered glass balustrade is required for fall protection to comply with IBC 2407.1. The laminated tempered glass is limited to installations where a handrail or guard is not required as noted in Section 2.0 of this report. The balustrade system must be anchored into wood, concrete or steel substrates with a Glass Vice clamp and appropriate fasteners. The clamp is available in various configurations (See [Table 1](#) and [Figures 4](#) through [16](#) in this report) based on the substrate and location of attachment. The various clamps are supplied with the Glass Vice fasteners and must be used for the installation. The Glass Vice clamps are the same for all glass thicknesses with the bearing gasket thickness matched to the glass thickness. The glass moment strengths are indicated in [Tables 2](#) and [3](#) of this report for the specified glass type and thickness.

3.2 Material:

The glass must be fully tempered glass complying with ASTM C1048, ANSI Z97.1 and CPSC 16 CFR 1201 (procured separately). The minimum thickness of the tempered glass for each guard system is as required for the loading conditions; refer to [Tables 2](#) and [3](#) of this report.

The handrail is manufactured out of stainless steel material and is 1 $\frac{1}{2}$ -inch by 1-inch (38.1 mm by 25.4 mm) tube. The handrail must be connected to the glass balustrade with a proprietary bracket made from 316 stainless steel supplied by Glass Vice.

The handrail bracket consists of a bent $\frac{9}{16}$ -inch (14.3 mm) diameter 316 stainless steel bar with attached mounting flanges and a mounting plate on the opposite face of the glass connected together with one M8 by 20 mm countersunk stainless steel screw.

The Glass Vice glass clamp is composed of an adjustable clamping system which is made up of duplex 2205 or 316 stainless steel clamp, 8 mm diameter adjustable screws, 3 mm by 140 mm Polyethylene plastic strips, 8 mm by 8 mm by 140 mm stainless steel bars, and an 8 mm by 12 mm by 40 mm stainless steel bar at the bottom center of clamp cavity. The clamp is approximately 7 $\frac{1}{16}$ inches (179 mm) in height. The base is available in various configurations as described in this report, depending on the substrate, concrete, wood or steel substrate and the attachment to the surface or fascia.

Connection to the top of a concrete substrate uses two M10 stainless steel (SS) threaded rods, ISO 3506-1 Class A4, which must be installed into the concrete substrate with Hilti HIT-RE 500 V3 adhesive ([ESR-3814](#)). See [Figures 4](#) through [8](#) and [Figure 10](#), as applicable, in this report. Installation of the rods must comply with the installation details noted in [ESR-3814](#).

For top installation into wood, a stainless steel adaptor plate (American Baseplate SLDPRT) must be used for the base. The adaptor plate is 316 stainless steel, machined from 0.394-inch (10 mm) flat bar and anchored to the wood with four $\frac{3}{8}$ -inch (9.5 mm) SS lag screws, all fasteners are supplied with the clamp by Glass Vice.

For fascia mounting installation, the Glass Vice is available as an architectural clamp made of cast stainless steel with a stainless steel cover to conceal the two mounting bolts. The architectural clamp is available for use with concrete, wood and steel substrates for balustrades installed per the IBC and IRC. The architectural clamp consists of a tapered extension leg 6¹/₄ inches (159 mm) from the base for fascia mount. To mount to wood fascia, flat bar standoffs or threaded standoff nuts must be used with the two mounting bolts or screws, between the clamp leg extension and the fascia substrate as shown in [Figures 11, 12](#) and [16](#). To mount to metal or concrete substrates, flat bar standoffs or round standoffs of minimum 0.394 inch (10 mm) in diameter must be used with the two mounting bolts between the clamp leg extension and the fascia substrate as shown in [Figures 10](#) and [15](#).

3.2.1 Laminated Tempered Glass: The laminated tempered glass must be fully tempered laminated glass complying with ASTM C1172, ANSI Z97.1 and CPSC 16 CFR 1201 (glass procured separately--not supplied by Glass Vice). The fully laminated tempered glass used in the fabrication must comply with ASTM C1048. The interlayer must be 0.06-inch (1.54 mm) thick, and must have a minimum shear modulus of 1640 psi (11.3 MPa) for $T \leq 122^{\circ}\text{F}$ (50°C) and a minimum ultimate tensile strength of 5000 psi (34.5 MPa) for $T \leq 122^{\circ}\text{F}$ (50°C). The minimum glass thicknesses specified in ASTM C1036 and C1300 are modified as specified in this report. All glass edges must be polished.

3.2.1.1 The ⁹/₁₆-inch (14.3mm) laminated tempered glass must be made from ¹/₄-inch (6 mm) nominal tempered glass with a minimum true thickness of 0.225 inch (5.72 mm). The overall true thickness of the laminated tempered glass must be between 0.510-inch (12.95 mm) minimum and 0.560-inch (14.22 mm) maximum. Evidence of compliance with these requirements must be submitted to the code official.

3.2.1.2 The ⁵/₈-inch (15.87 mm) laminated tempered glass must be made from one ply of ¹/₄-inch (6 mm) nominal tempered glass with a minimum true thickness of 0.225 inch (5.72 mm) and ⁵/₁₆-inch (8 mm) nominal tempered glass. The overall true thickness of the laminated tempered glass must be between 0.577 inch (14.65 mm) minimum and 0.625 inch (15.87 mm) maximum. Evidence of compliance with these requirements must be submitted to the code official.

3.3 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 code official, when requested.

3.4 WINDBORNE DEBRIS REGIONS:

The system has been evaluated for use in windborne debris regions under the following conditions:

1. The system must be installed without a top rail or handrail at a total height of less than or equal to 42 inches (106.7 cm) with ⁹/₁₆-inch thick (14.3 mm) or ⁵/₈-inch thick (15.87 mm) laminated tempered glass panels up to 41 inches (104.1 cm) in height with an interlayer meeting the requirements of Section 3.2.1.
2. The system must be limited to installations in one and two family dwellings under the IBC where the 50 plf (0.73 kN/m) live load is not applicable or installations under the IRC.

4.0 DESIGN AND INSTALLATION

4.1 Design:

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

- 50 plf (0.73kN/m) live load on the top rail or handrail in any direction
- 200 lb (0.89kN) live load on the top rail or handrail in any direction
- 50 lb (0.22kN) live load on one square foot at any location perpendicular to the glass balustrade

Deflection of the top rail when subjected to a 200-pound (0.89kN) concentrated live load is less than 1 inch (25.4 mm) for the following system configurations:

- System height of 36 inches (91.4 cm) or less for ⁹/₁₆-inch-thick (14.3 mm) laminate glass panels.
- System height of 42-inches (106.7 cm) or less for ¹/₂-inch thick (12.7 mm) monolithic glass panels or ⁵/₈-inch thick (15.87 mm) laminate glass panels.
- System height of 48 inches (121.9 cm) or less for ⁵/₈-inch thick (15.87 mm) monolithic glass panels

Deflection of the top rail when subjected to a 50 plf (.73kN/m) live load is less than 1 inch (25.4mm) for the following system configurations:

- System height of 24-inches (61 cm) or less for 1/2-inch (12.7 mm) thick monolithic glass panels.
- System height of 42-inches (106.7 cm) or less for 5/8-inch thick (15.87 mm) monolithic glass panels.

Glass panel widths are limited to the maximum allowable width noted in [Table 5](#) when consideration of the 50 plf (0.73KN/m) live load is required.

The required wind load must be determined by a qualified design professional based on the project-specific conditions, taking into account the balustrade location on the structure, and must not exceed the values shown in [Tables 1, 2](#) and [3](#) of this report, as applicable. For installations in accordance with the one and two family dwellings under the IBC and installations in accordance with the IRC, the 50 plf (0.73 kN/m) top rail load is not applicable.

4.1.2 Monolithic Tempered Glass Balustrade System: The glass thickness, panel size and system height for the 1/2-inch (12.7 mm) and 5/8-inch (15.87 mm) monolithic tempered glass must be designed for the loading conditions, see [Table 2](#) in this report. The required spacing between the glass lites must be 25/32-inch (20 mm) minimum to 13/16-inch (30 mm) maximum for installation of the handrail brackets. A handrail or top rail must be installed with the monolithic tempered glass balustrade system unless installed as noted in Section 4.2.6 of this report.

4.1.3 Glass Vice Glass Clamp: The Glass Vice Glass Clamp and fasteners that are required for each mounting option are shown in [Table 1](#) of this report. The Glass Vice Glass Clamp must be installed in accordance with the manufacturer's published installation instructions and this report.

4.1.4 Holes and Notches for Monolithic Tempered Glass: Holes and notches must not be located within the first third of the balustrade height from the base. 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.

4.1.5 Laminated Tempered Glass:

4.1.5.1 Laminated Tempered Glass Loading: Installation of the laminated tempered glass with a required handrail or guard has not been evaluated. Therefore, installation of the laminated tempered glass is limited to locations where the design loading condition is either wind load alone or 200-pound (0.89 kN) concentrated load, and the 50 plf (0.73 kn/m) handrail load is not applicable. Maximum allowable wind loads are as indicated in [Table 3](#) of this report. Installation of laminated tempered glass with the handrail brackets is outside the scope of this report.

4.1.5.2 Laminated Glass Baluster System: The glass thickness, panel size and system height must be as indicated in [Tables 3](#) and [4](#) of this report. The required spacing between the glass lites is 25/32 inch (20 mm) minimum to 13/16 inch (30 mm) maximum for installation of the H-bracket (see [Figure 19](#) in this report). When required to support the 200 lb (0.89 kN) concentrated load, the adjacent lites must be connected together with the supplied H-bracket installed within 4 inches (102 mm) from the top edge of the glass. Corner lites must be connected together with the supplied corner H-bracket. The end lites must be attached to a supporting structure or post capable of supporting 200 pounds (0.89kN) using the supplied terminal bracket (see [Figure 18](#) in this report). The connection between glass lites is not required when designed for wind load only and a 2-inch (51 mm) minimum gap between lites is maintained.

4.1.5.3 Mixed Panel Widths: Glass panels of different widths are permitted with the allowable wind load based on the longest glass panel or for the specific wind load on each panel.

4.1.5.4 Holes and Notches: Holes and notches in the laminated tempered glass are outside the scope of this report.

4.2 Installation:

4.2.1 General: Installation of the Glass Vice glass panel railing and guards must comply with the manufacturer's published instructions, this report and 2021 IBC Sections 1015 and 1607.9.1; 2018 and 2015 IBC Sections 1015 and 1607.8.1; 2012 IBC Sections 1013 and 1607.8.1; or 2009 IBC Sections 1013 and 1607.7.1, as applicable. Handrails must comply with 2021, 2018 and 2015 IBC Section 1014; 2012 and 2009 IBC Section 1012; or 2021, 2018, 2015, 2012 and 2009 IRC Section R311.7.8, as applicable. Glass lite dimensions for the monolithic tempered glass must be within the limits shown in [Figure 1](#) of this report for 1/2-inch (12.7 mm) glass and [Figure 2](#) of this report for 5/8-inch (15.87 mm) glass.

4.2.2 Installation of Glass Vice Clamp to Concrete:

4.2.2.1 Concrete strength, condition and minimum dimensions must be as indicated in [Table 1](#) of this report for the specific mounting option. For cracked concrete condition, the mounting option used must be indicated as cracked concrete in [Table 1](#) of this report. Uncracked concrete condition may use any of the concrete mounting options in [Table 1](#) of this report.

4.2.2.2 Surface Mounting: The Glass Vice clamps must be located as shown in [Figure 1](#) of this report. Before attachment of any of the interchangeable bases, a layer of protective lanolin must be applied between the Glass Vice glass clamp and the base.

4.2.2.3 Two holes must be drilled into concrete for the installation of the glass vice clamp. The center line of each hole must not be closer than 2.36 inches (60 mm) from the edge of the slab and no less than 5⁵/₈ inch (143 mm) from the slab end. The holes must be between 12 mm (¹⁵/₃₂ inch) and 20 mm (²⁵/₃₂ inch) in diameter and drilled to the required depth based on the installation option. After cleaning the holes, each hole must be filled with Hilti-HIT-RE 500 V3 adhesive. Installation must be into dry holes only and for use in temperature range A (130°F short-term maximum and 110°F maximum long-term temperature). Hole cleaning and adhesive installation must comply with the manufacturer's published installation instructions and [ESR-3814](#). Mounting options 1a-e in [Table 1](#) of this report which do not involve installation of nuts on the inserted rod. Special inspection is required for installation of adhesive anchors, as noted in [ESR-3814](#).

4.2.2.4 Fascia Mounting: When fascia mounted to a slab edge, beam, wall or similar item the minimum concrete slab face thickness must be at least 7¹/₈ inches (181 mm) and width perpendicular to the face must be at least 8³/₄ inches (222 mm). Clamps must be a minimum of 5⁵/₈ inches (143 mm) from the outside slab corner. The Architectural Bracket must be used and the clamp nuts for the 10M SS threaded rods insert must be tightened to 10 lb-ft torque (reduced torque installation). Special inspection is required for installation of adhesive anchors, as noted in [ESR-3814](#).

4.2.3 Installation of Glass Vice Clamp to Wood: Wood may have a moisture content over 19 percent at the time of fabrication and in service and must be a species and grade with specific gravity greater than 0.43 or 0.50 as specified for the mounting option. Supporting wood structure must be constructed to support the imposed moments from the Glass Vice Clamps. In lieu of calculating the imposed loads, the structure may be designed for the mounting option to resist the moment strength shown in [Table 2](#) of this report, plus dead load.

4.2.4 Installation of Glass Vice Clamp to Steel: Supporting steel member must be constructed to support the imposed moments from the Glass Vice Clamps. In lieu of calculating the imposed loads, the member may be designed for the mounting option to resist the moment strength shown in [Table 1](#) of this report, plus dead load.

4.2.5 Handrail Installation (monolithic tempered glass): Where required to provide fall protection, along stairs or other locations requiring an installed handrail, the handrail must be installed at the required height.

4.2.5.1 Handrails must be supported using the proprietary stainless steel clamp bracket assembly, shown in [Figures 1](#) and [2](#) of this report, installed at the joints between the glass lites and at the ends as shown in [Figure 17](#) of this report. At the balustrade end, the handrail must be attached to a structure, free standing wall or post of sufficient strength, able to support 200 lbs (0.89 kN) concentrated horizontal shear load, using the termination brackets in [Figure 17](#) and screws (not included), of a type appropriate for the supporting material.

4.2.5.2 Handrails must be installed no higher from the bottom of the glass to the top of the handrail than:

42 inches (1067 mm) for ⁵/₈-inch (15.87 mm) glass in any occupancy requiring 50 plf (0.73 kN/m) live load.

48 inches (1219 mm) for ⁵/₈-inch (15.87 mm) glass in occupancy R3 (IRC) and one and two family dwellings under the IBC where the 50 plf (0.73 kN/m) live load is not applicable.

23 inches (584 mm) for ¹/₂-inch (12.7 mm) glass in any occupancy requiring 50 plf (0.73 kN/m) live load.

41 inches (1041 mm) for ¹/₂-inch (12.7 mm) glass in occupancy R3 (IRC) and one and two family dwellings under the IBC where the 50 plf (0.73 kN/m) live load is not applicable.

4.2.5.3 Handrail brackets are designed for use with a square, rectangular or flat bottom cross section with minimum ¹/₈-inch (41 mm) width complying with the dimensional and structural requirements of 2021, 2018 and 2015 IBC Section 1014 (2012 and 2009 IBC Section 1012), IRC R311.7.8.3.

4.2.6 Pool or Spa Barrier Applications: When installed as a pool or spa barrier in compliance with 2021 or 2018 ISPS Section 305 and 2015, 2012, and 2009 IBC Section 3109.4.1, the top of glass must be a minimum of 48 inches (1219 mm) above grade on the side facing away from the pool. Minimum glass thickness shall be ⁵/₈ inch (15.87 mm) nominal, monolithic or laminated, tempered glass. Maximum lite width must comply with the allowable width shown in [Figure 3](#) of this report and for the mounting option used for the design wind loads

per [Tables 2](#) and [3](#) of this report, as applicable. Where a handrail is required, the monolithic glass panels must be limited to the widths outlined in [Table 5](#), and the handrail must be installed on the pool side at 34 inches (864 mm) to 42 inches (1067 mm) above the walking surface. Where a handrail or guard is not installed, the glass joints must be connected together with glass H brackets at 42 inches (1067 mm) above the walking surface. Refer to [Figure 3](#) of this report.

For installations with a handrail at a height of up to 42 inches (1067 mm), system deflection for a 50 plf (0.73KN/m) live load applied to the handrail is less than one inch (25.4 mm). A 50 plf (0.73KN/m) live load applied to the top of the panel results in a deflection of 1.2 inches (30.5 mm).

5.0 CONDITIONS OF USE:

The Glass Vice Glass Panel Railing and Glass Baluster Systems 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 subjected to vehicle impacts.
- 5.2 Installation must comply with this report and the manufacturer's published installation instructions. When the manufacturer's instructions are in conflict with this report, this report shall govern.
- 5.3 The systems described in this report must not be used in Wind-borne Debris Regions. Use of The Glass Vice glass panel railing and glass baluster systems in Wind-borne Debris Regions is outside the scope of this report.
- 5.4 All glass must be fully tempered, fabricated, and inspected in accordance with ASTM C1048. Laminated tempered glass must also comply with ASTM C1172. The glass fabricator must provide certification of compliance with Section 2407.1 of the IBC and ASTM C1048. Glass must be procured directly from a qualified glass fabricator and is not produced or supplied by Glass Vice USA LLC.
- 5.5 The supporting structure must be designed and constructed to support the loads imposed by the glass balustrade system in accordance with the applicable code. The anchorage of the panel railing and glass baluster system to the supporting structure must be as specified in this report. Drawings and design details for the Glass Vice system must be included on the construction plans submitted to the code 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 constructed.
- 5.6 Monolithic fully tempered glass is permitted to be used in handrails and guardrails where there is not a walking surface beneath them or the walking surface is permanently protected from the risk of falling glass, as noted under the exception in Section 2407.1 of the 2021, 2018 and 2015 IBC.
- 5.7 Installation of the laminated tempered glass with a handrail is outside the scope of this report. See the last paragraph of Section 2.0 and Section 4.1.5.1 of this report for additional details and limitations.
- 5.8 The Glass Vice Panel Railing and Balustrade Systems including anchorage components (except for the glass) are supplied by Glass Vice USA LLC.
- 5.9 Use of the system as a grab bar is outside of the scope of this report.

6.0 EVIDENCE SUBMITTED

Data in accordance with the [ICC-ES Acceptance Criteria for Glass Railing and Balustrade Systems \(AC439\)](#), approved April 2019 (editorially revised August 2020).

7.0 IDENTIFICATION

- 7.1 The Glass Vice Panel Railing and Glass Baluster Systems described in this report are identified by a stamp on the packaging bearing the manufacturer's name (Glass Vice) product description or part number, and the ICC-ES evaluation report number (ESR-3563).
- 7.2 The report holder's contact information is the following:

GLASS VICE HOLDINGS USA LLC
14035 KIRKHAM WAY, SUITE 106
POWAY, CALIFORNIA 92064
(858) 539-6250
www.glassvice.com

TABLE 1—GLASS VICE SYSTEMS AND CONFIGURATIONS

System Mounting Option Number and Figure	Type	Glass Clamp Material Specification	Substrate	Mounting Option Allowable Moment Strength M_{all} (in-lb)	Anchorage to Substrate Refer to attached Figures
1a Figure 4	Direct Fix Vice	Glass Vice (Duplex 2205 or 316 SS)	Concrete - cracked $f_c \geq 2,500$ psi	2,166	10M SS threaded rods with 4" embedment set Hilti HIT-RE 500 V3 per ESR-3814
1b Figure 5	Direct Fix Vice	Glass Vice (Duplex 2205 or 316 SS)	Concrete - uncracked $f_c \geq 2,500$ psi	2,963	10M SS threaded rods with 4" embedment set Hilti HIT-RE 500 V3 per ESR-3814
1c Figure 6	Direct Fix Vice	Glass Vice (Duplex 2205 or 316 SS)	Concrete - cracked $f_c \geq 2,500$ psi	4,686	10M SS threaded rods with 5" embedment set Hilti HIT-RE 500 V3 per ESR-3814
1d Figure 7	Direct Fix Vice	Glass Vice (Duplex 2205 or 316 SS)	Concrete - uncracked $f_c \geq 2,500$ psi	4,686	10M SS threaded rods with 5" embedment set Hilti HIT-RE 500 V3 per ESR-3814
1e Figure 8	Direct Fix Vice	Glass Vice (Duplex 2205 or 316 SS)	Concrete – cracked or uncracked $f_c \geq 2,500$ psi	6,902	10M SS threaded rods with 7-1/4" embedment set HIT-RE 500 V3 per ESR-3814
2 Figure 9	Adaptor base plate	Glass Vice (Duplex 2205 or 316 SS)	Wood, G ≥ 0.43 Any MC	4,569	M10 x 140mm (5.5") SS lag screws
3Aa Figure 10	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Concrete - cracked $f_c \geq 3,000$ psi	4,932	10M SS threaded rods with 7-1/2" embedment set Hilti HIT-RE 500 V3 per ESR-3814 1.77" top edge distance.
3Ab Figure 10	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Concrete - cracked $f_c \geq 3,000$ psi	5,421	10M SS threaded rods with 7-1/2" embedment set Hilti HIT-RE 500 V3 per ESR-3814 2.165" top edge distance
3Ac Figure 10	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Concrete - uncracked $f_c \geq 3,000$ psi	4,932	10M SS threaded rods with 7-1/2" embedment set Hilti HIT-RE 500 V3 per ESR-3814 1.77" top edge distance
3B Figure 11	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Wood, Hem-Fir, DFL, SP, SCL Any MC	10,450	10M SS bolts through wood beam with 3"x3/8"x5 1/4" flat bar.
3Ca Figure 12	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Wood, DFL, SP, SCL Any MC	4,569	10mm SS Lag screws with 5.209" minimum embedment to primary member with 3"x3/8"x5 1/4" flat bar
3Cb Figure 12	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Wood, Hem-Fir Any MC	4,569	10mm SS Lag screws with 5.76" minimum embedment to primary member with 3"x3/8"x5 1/4" flat bar
3Cc Figure 12	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Wood, DFL, SP, SCL MC $\leq 19\%$	4,569	10mm SS Lag screws with 3.65" minimum embedment to primary member with 3"x3/8"x5 1/4" flat bar
3Cd Figure 12	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Wood, Hem-Fir MC $\leq 19\%$	4,569	10mm SS Lag screws with 4.03" minimum embedment to primary member with 3"x3/8"x5 1/4" flat bar
4 Figure 13	Direct Fix Vice	Glass Vice Duplex (2205 or 316 SS)	Steel or aluminum Designed for loads	8,994	M10 SS bolt ASTM F738M or equivalent strength with washer and nut, length as required
5 Figure 14	S Bracket	Glass Vice (Duplex 2205 or 316 SS)	Steel or aluminum Designed for loads	8,994	M10 SS bolt ASTM F738M or equivalent strength with washer and nut, length as required
6 Figure 15	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Steel or aluminum Designed for loads	11,045	M10 SS bolt ASTM F738M or equivalent strength with washer and nut, length as required.

System Mounting Option Number and Figure	Type	Glass Clamp Material Specification	Substrate	Mounting Option Allowable Moment Strength M_{al} (in-lb)	Anchorage to Substrate Refer to attached Figures
3Da Figure 16	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Wood, DFL, SP, SCL MC ≤ 19%	6,265	10mm SS Hanger Lag Screw with 3.5" minimum embedment to primary member with 10mm x 25mm diameter SS threaded standoff nut.
3Db Figure 16	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Wood, DFL, SP, SCL Any MC	6,265	10mm SS Hanger Lag Screw with 5" minimum embedment to primary member with 10mm x 25mm diameter SS threaded standoff nut.
3Dc Figure 16	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Hem-Fir and PT Wood MC ≤ 19%	6,265	10mm SS Hanger Lag Screw with 4.39" minimum embedment to primary member with 10mm x 25mm diameter SS threaded standoff nut.
3Dd Figure 16	Architectural Bracket	Glass Vice (Duplex 2205 or 316 SS)	Hem-Fir and PT Wood Any MC	6,265	10mm SS Hanger Lag Screw with 6.27" minimum embedment to primary member with 10mm x 25mm diameter SS threaded standoff nut.

SI: 1 psi = 0.006897 MPa; 1 inch = 25.4 mm

TABLE 2—EQUATIONS FOR CALCULATION OF (ASD) ALLOWABLE WIND LOADS¹

Eq. 1 – Allowable Wind Load (w) Load For Mounting Option ²	$w = \frac{M_{al}}{3.3BH^2}$
Eq. 2 – Allowable Wind Load (w) for 1/2-inch monolithic glass ³	$w = \frac{310}{h^2}$
Eq. 3 – Allowable Wind Load (w) for 5/8-inch monolithic glass ³	$w = \frac{498.79}{h^2}$

SI: 1 inch = 25.4 mm; 1 foot = 304.8mm; 1 plf = .0146kN/m; 1 psf = 0.0479 kN/m²

- The systems allowable wind load must be the lesser of the allowable wind load for the selected mounting option calculated using equation 1 or the allowable wind load for the glass using equation 2, equation 3, or [Table 3](#), as applicable.
- M_{al} = Mounting Option Allowable Moment Strength from [Table 1](#)
 B = overall width of glass panel in feet. For systems requiring consideration of the 50plf load, refer to [Table 5](#) for limitations on glass panel width. For systems that do not require consideration of the 50plf load:
 For 1/2-inch glass: 2.50 feet ≤ B ≤ 6.00 feet
 For 5/8-inch glass: 2.50 feet ≤ B ≤ 6.5625 feet
 H = For surface mounted option: height from top of deck to top of glass in feet
 H = For fascia mounted option: height from bottom of mounting clamp to top of glass in feet
 w = ASD allowable wind load (psf). For LRFD strength design multiply wind load by 1.6.
- h = glass height in feet
 w = allowable wind load (psf) for ASD. For strength design multiply wind load by 1.6

TABLE 3—(ASD) ALLOWABLE WIND LOAD FOR LAMINATED TEMPERED GLASS PANELS

Glass Panel Width (inches)	Allowable wind load ($w_{9/16}$) for 9/16-inch panel 35 inches in height (psf) ^{1,2,4,5}	Allowable wind load ($w_{5/8}$) for 5/8-inch panel 41 inches in height (psf) ^{1,3,4,5,6}	Allowable wind load ($w_{5/8}$) for 5/8-inch panel 47 inches in height (psf) ^{1,3,4,5,6}
36	62.9	59.3	45.1
48	46.3	43.7	33.3
60	40.6	38.3	29.1
72	32.2	30.4	23.1

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

- Linear interpolation for glass panel heights and widths between those shown is permitted.
- Wind load for glass panel height less than 35 inches : $W = w_{9/16} \times (2.9167/h)^2$.
 Where h is the glass panel height in feet and $W_{9/16}$ = Allowable wind load for 9/16" laminated tempered glass. The minimum panel height must be limited to the minimum height outlined in [Table 4](#).
- Wind load for glass height less than 41 inches : $W = W_{5/8} \times (3.4167/h)^2$.
 Where h is the panel height in feet and $W_{5/8}$ = Allowable wind load for 5/8" laminated tempered glass. The minimum panel height must be limited to the minimum height outlined in [Table 4](#).
- Wind load is limited to the lesser of the glass strength from [Table 3](#) or the Clamp strength calculated using equation 1 in [Table 2](#) of this report.
- w = ASD allowable wind load (psf) . For LRFD strength design multiply wind load by 1.6.
- 5/8-inch thick laminated glass panels must meet the parameters outlined in Section 3.2.1.2.

TABLE 4—GLASS PANEL SIZES FOR LAMINATED TEMPERED GLASS

Glass Thickness	Min Panel Width (inches)	Max Panel Width (Inches)	Max Panel Height (Inches)	Min Panel Height (inches)
9/16 inch (14.3mm)	36	72	35	12
5/8 inch (15.87mm)	36	72	41 ¹	12

SI: 1 inch = 25.4 mm

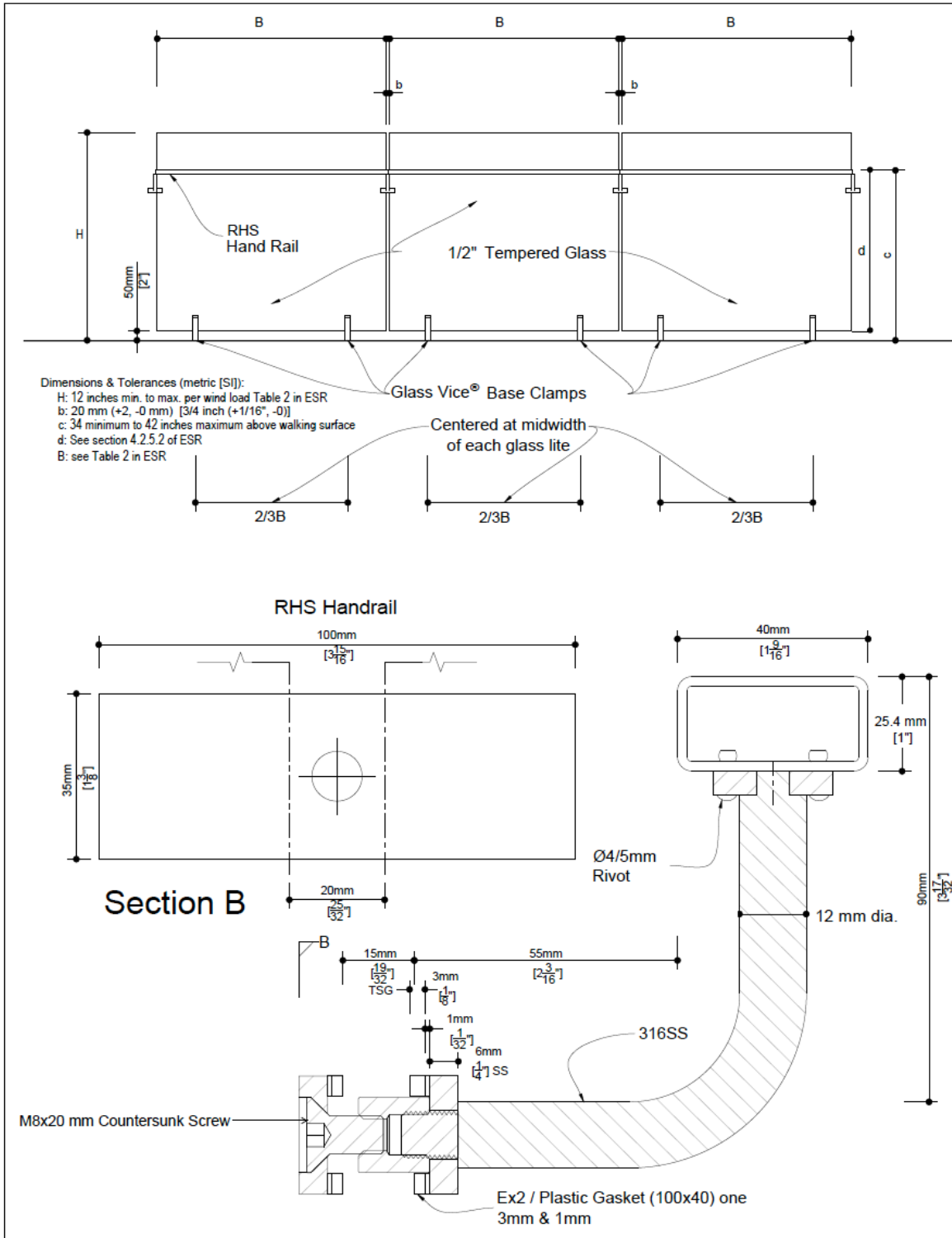
1. Panel height of 47-inches (119.4 cm) is permitted when the system is installed in accordance with Section 4.2.6 of this report.

TABLE 5—EQUATIONS FOR CALCULATION OF MAXIMUM PANEL WIDTH FOR LIVE LOAD OF 50 PLF⁴

Eq. 4 – Maximum Panel Width for 1/2-inch Monolithic Glass ^{1,2}	$B = \frac{M_{al}}{50}$
Eq. 5 – Maximum Panel Width for 5/8-inch Monolithic Glass ^{1,3}	$B = \frac{M_{al}}{87.5}$

SI: 1 inch = 25.4mm; 1 ft = 305mm; 1 lb = 4.45N;

1. M_{al} = Mounting Option Allowable Moment Strength from [Table 1](#) (in-lb)
B = overall width of glass panel in inches
2. For 1/2-inch thick glass: 2.50 feet ≤ B ≤ 6.00 feet : Panel height is limited to a maximum of 23-inches (58.4 cm) for 1/2-inch (12.7 mm) thick monolithic glass.
3. For 5/8-inch thick glass: 2.50 feet ≤ B ≤ 5.00 feet : Panel height is limited to a maximum of 41-inches (104.1 cm) for 5/8-inch (15.5 mm) thick monolithic glass when the system must act as a guard.
4. Equations are limited to use with monolithic glass panels. Use of laminated glass panels in areas requiring consideration of a 50plf live load is outside of the scope of this report.



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All dimensions in millimetres
 www.glassvice.com
 Phone +64 9 414 6565
 info@glassvice.com

Date: July, 2014
 Scale: Scale 1:1;nts

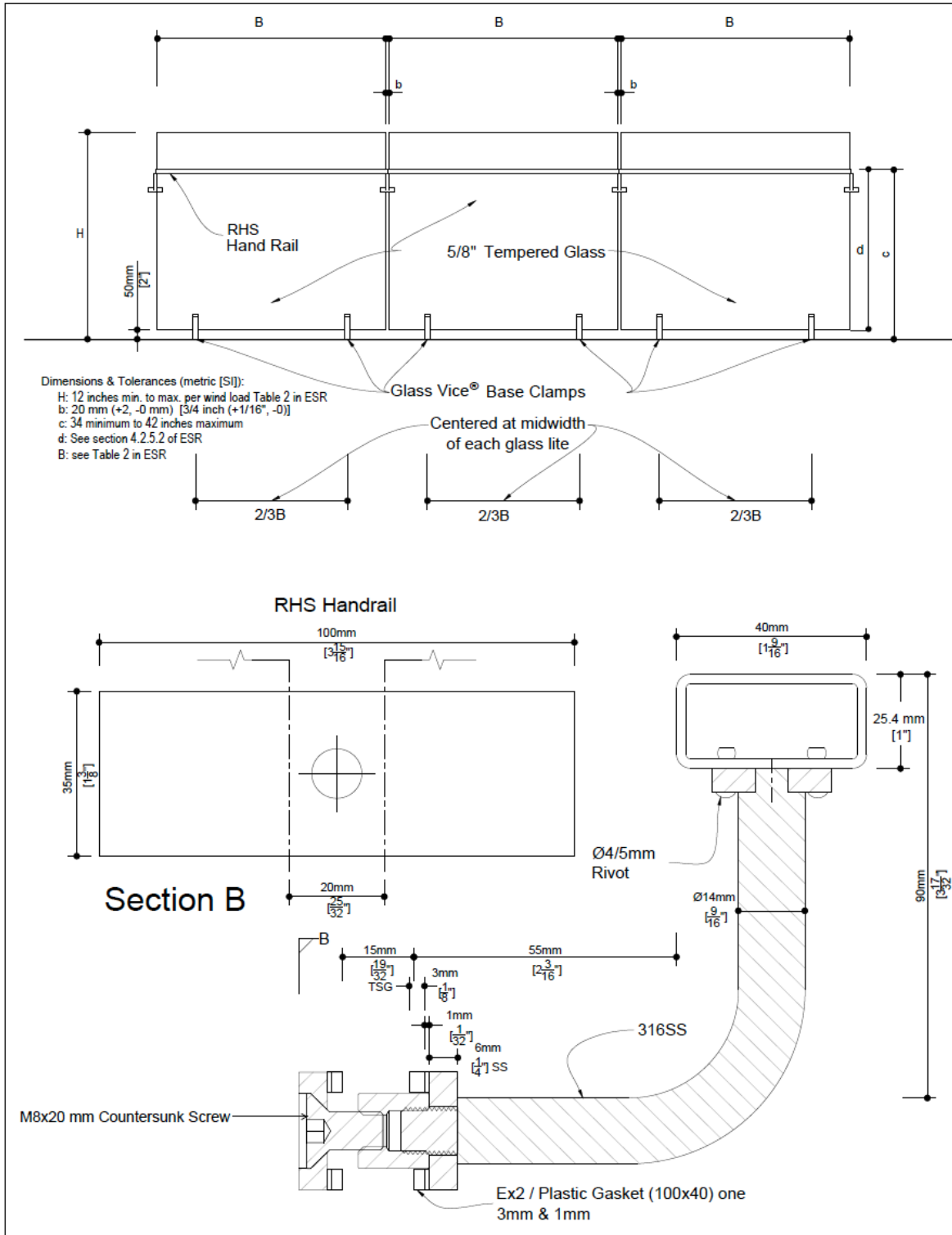


Glass Vice System for 1/2" Tempered Glass

Quick Code:

US01

FIGURE 1



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All dimensions in millimetres



Glass Vice System for 5/8" Tempered Glass

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 Scale: Scale 1:1,nts

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Quick Code:

US01

FIGURE 2

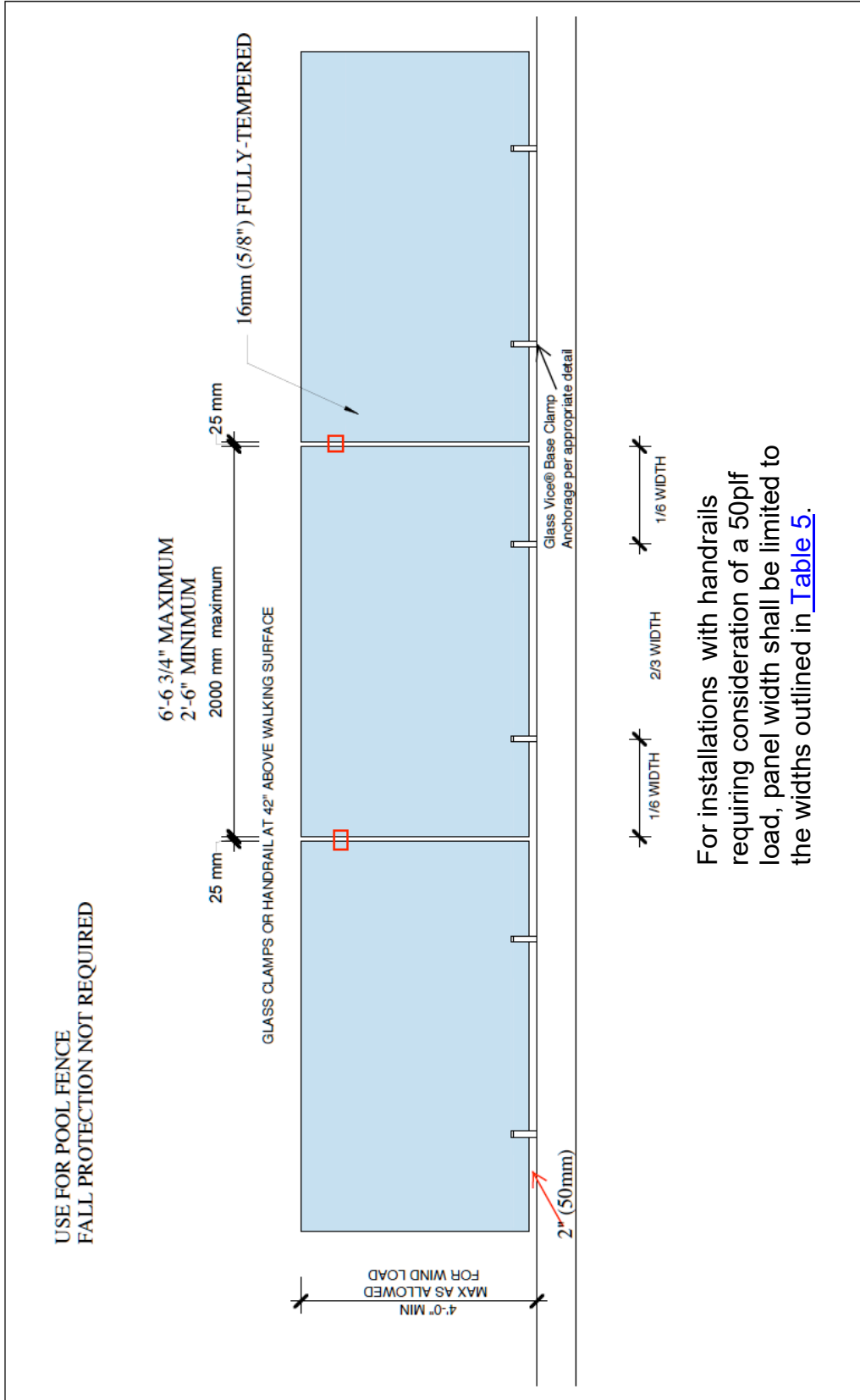


FIGURE 3

For installations with handrails requiring consideration of a 50plf load, panel width shall be limited to the widths outlined in [Table 5](#).

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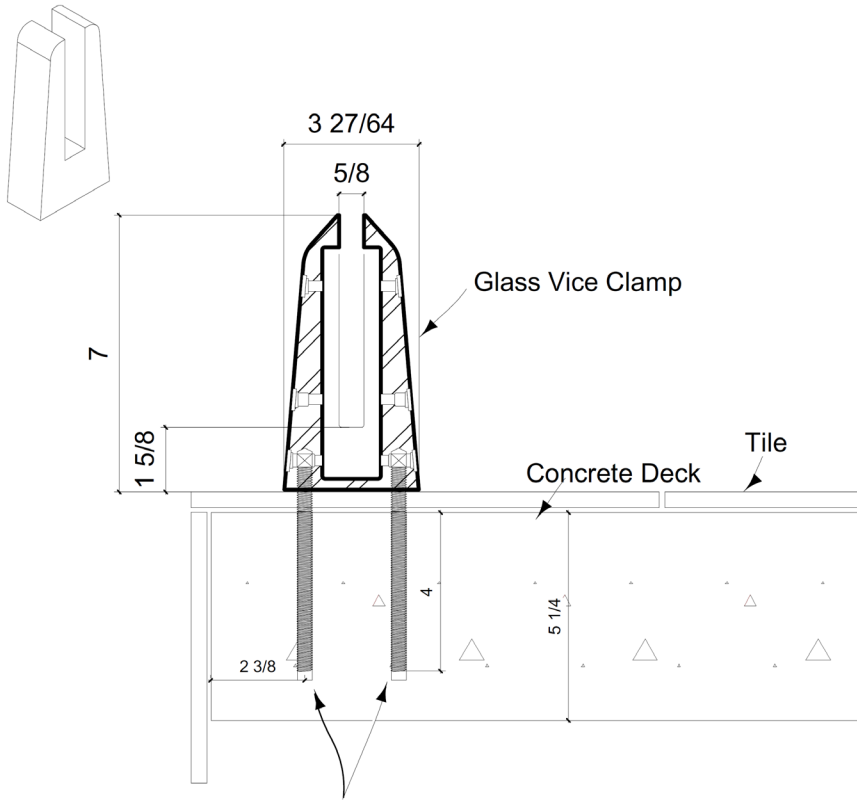
Glass Vice
 Direct Fix Bracket
 Frameless



Date: June 2015
 Scale: Scale 1:25

Quick Code:

DF-A



10M SS threaded rods inserted 4" into 15/32" to 25/32" diam x 4-1/4" deep holes and anchored with Hilti HIT-RE 500-V3

5 1/4" minimum concrete depth

$f'_c \geq 2,500$ psi
cracked condition

Anchor Strength:
 $\phi M_n = 3,466$ in-lb
 $M_a = 2,166$ in-lb

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All dimensions in inches



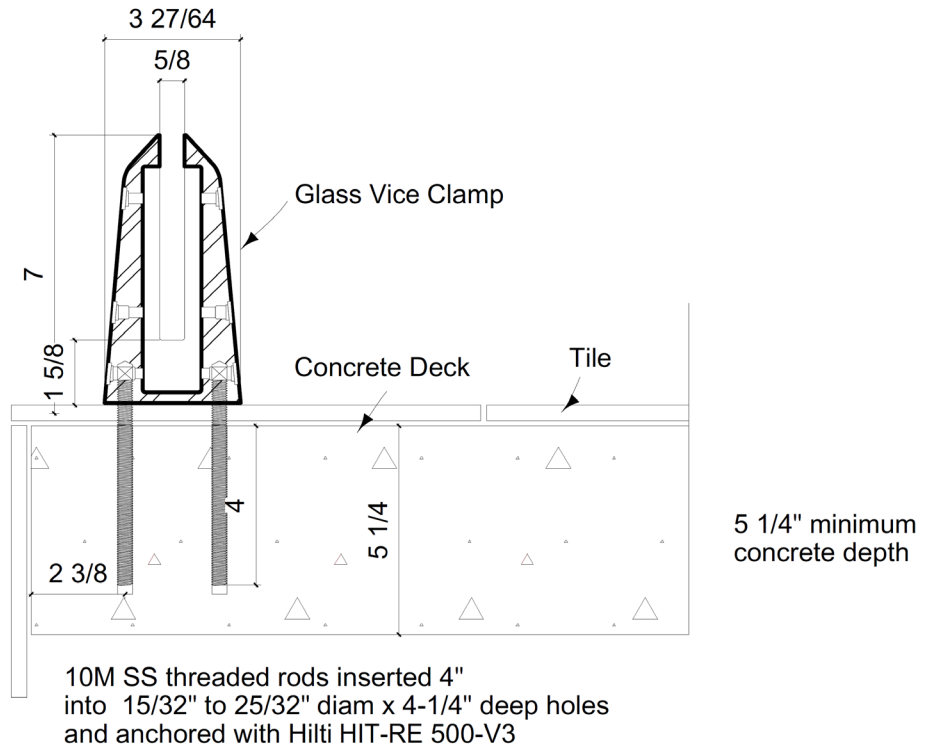
Glass Vice (option 1a)

Direct Fix - Fixing Detail
Minimum Embedment - Cracked Concrete

Date: Mar 2020
Scale 1:5

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FIGURE 4



$f'_c \geq 2,500$ psi
uncracked condition

Anchor Strength:
 $\phi M_n = 4,741$ in-lb
 $M_a = 2,963$ in-lb

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All dimensions in inches



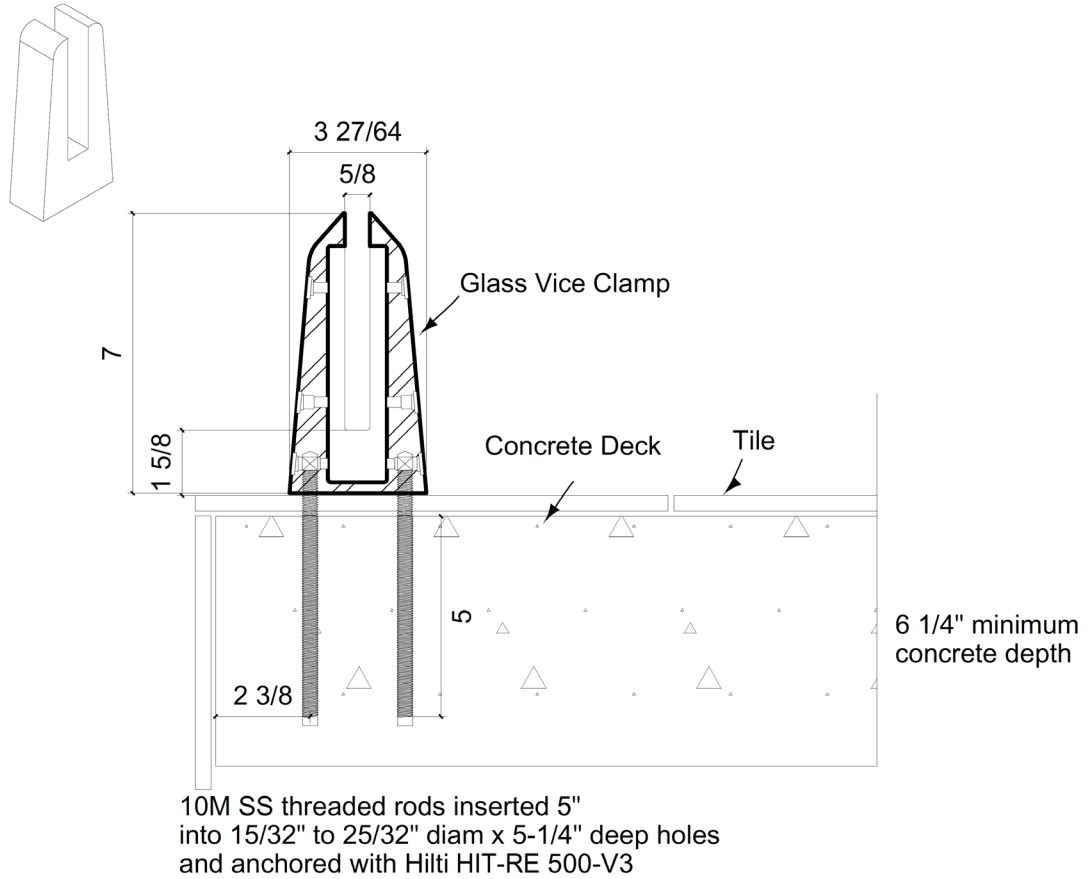
Glass Vice (option 1b)

Direct Fix - Fixing Detail
Minimum Embedment - Uncracked Concrete

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Scale 1:5

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FIGURE 5



$f'c \geq 2,500$ psi
cracked condition

Anchor Strength:
 $\phi M_n = 7,498$ in-lb
 $M_a = 4,686$ in-lb

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All dimensions in inches

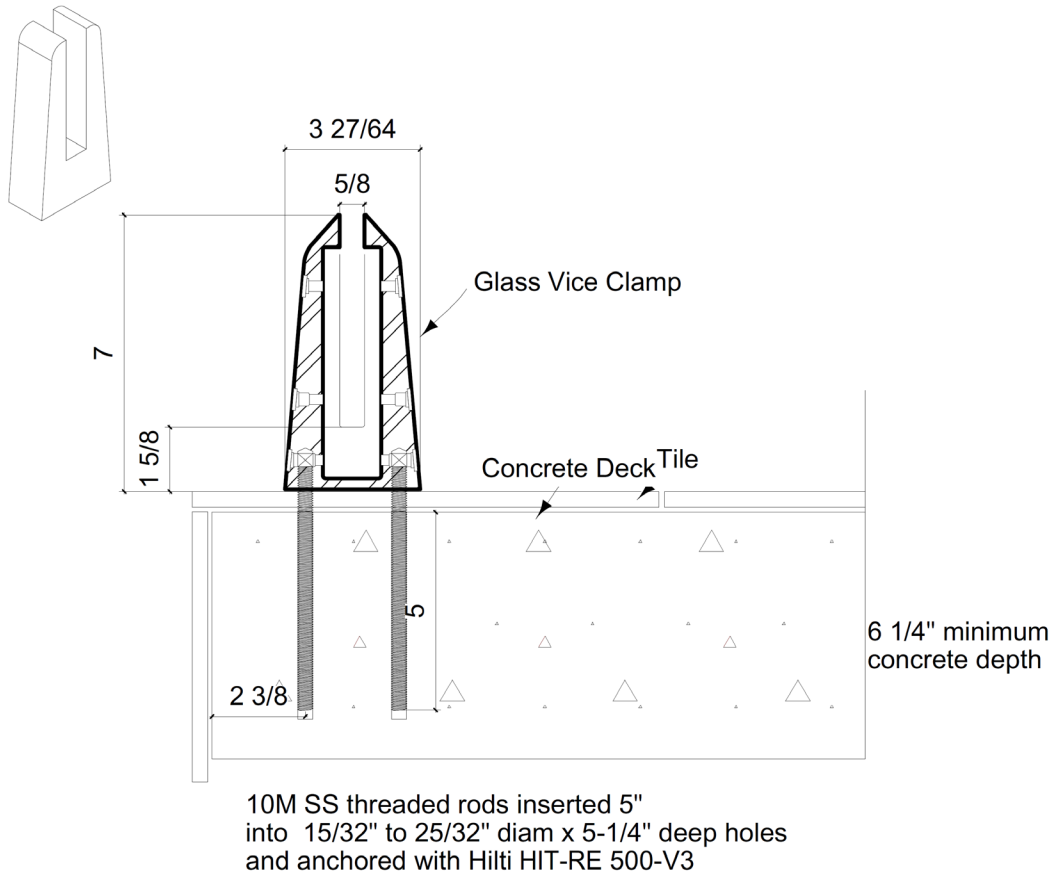


Glass Vice (option 1c)

Direct Fix - Fixing Detail
Standard Embedment - Uncracked Concrete

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FIGURE 6



$f'_c \geq 2,500$ psi
 uncracked condition

Anchor Strength:
 $\phi M_n = 7,498$ in-lb
 $M_a = 4,686$ in-lb

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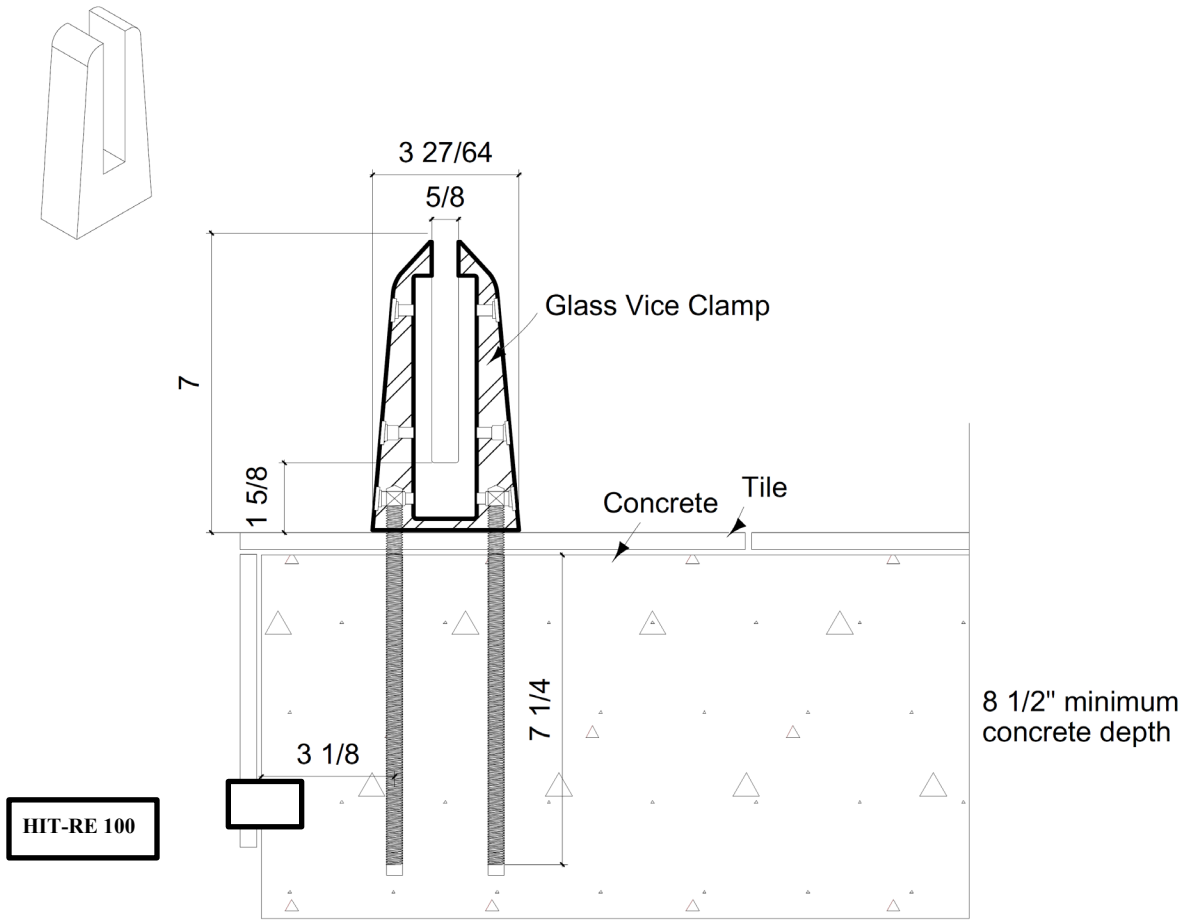
All dimensions in inches



Glass Vice (option 1d)
 Direct Fix - Fixing Detail
 Standard Embedment - Uncracked Concrete

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 usainfo@glassvice.com

FIGURE 7



10M SS threaded rods inserted 7-1/4" into 15/32" to 25/32" diam x 7-1/2" deep holes and anchored with Hilti HIT-RE 500-V3

$f'_c \geq 2,500$ psi cracked or uncracked condition

Anchor Strength:
 $\phi M_n = 11,043$ in-lb
 $M_a = 6,902$ in-lb

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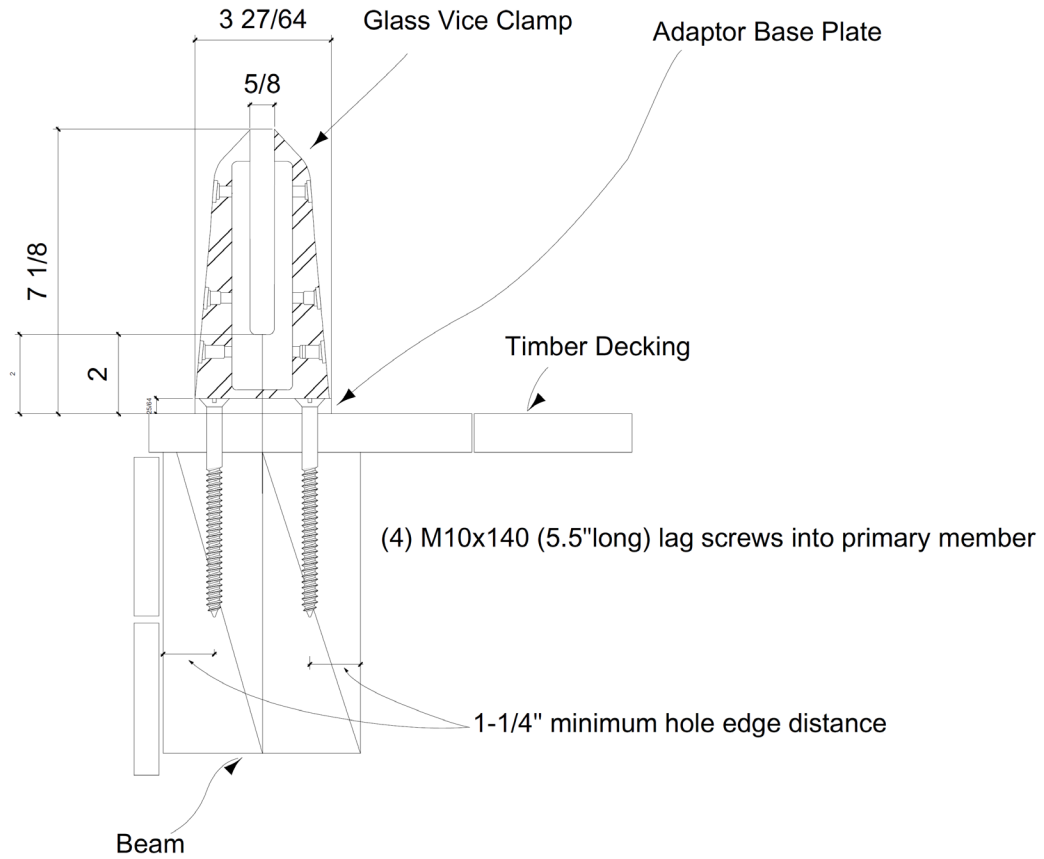
All dimensions in inches



Glass Vice (option 1e)
 Direct Fix - Fixing Detail
 Standard Embedment - Uncracked/Cracked Concrete

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FIGURE 8



Anchorage Strength
 $M_a = 4,569$ in-lb

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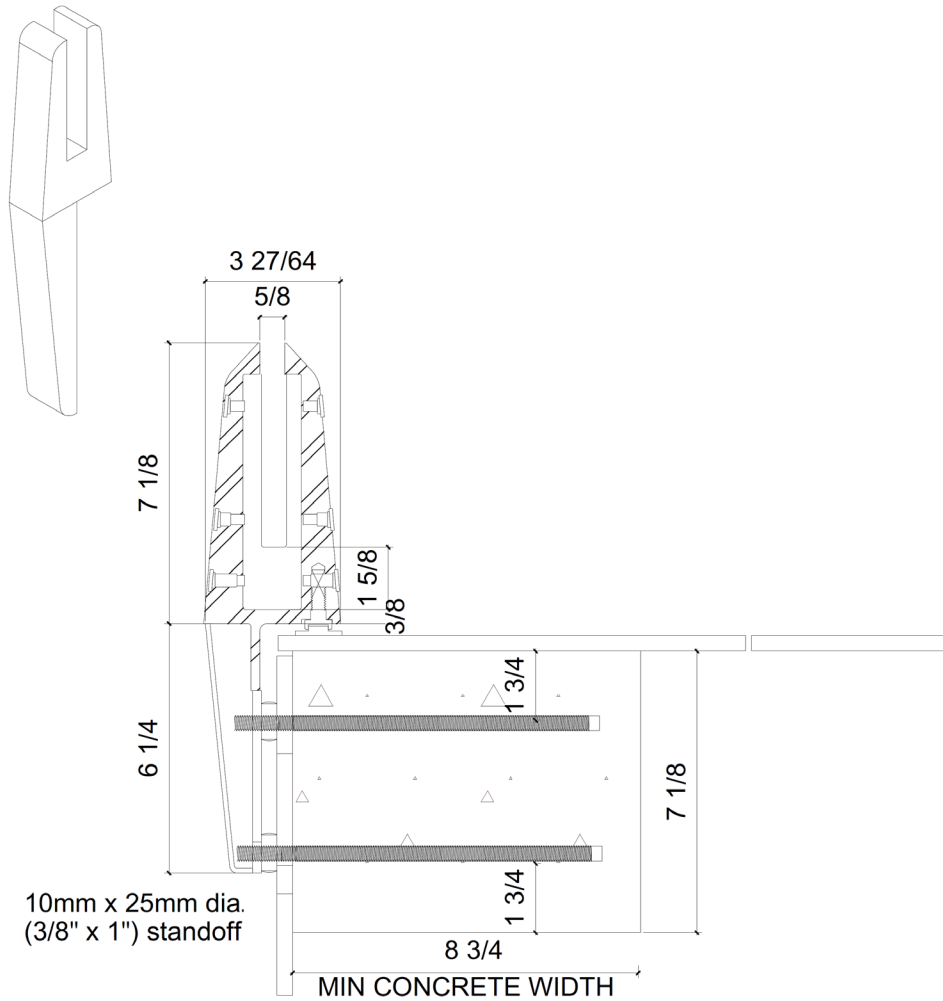
All dimensions in inches



Glass Vice (Option 2)
 Adaptor Base Plate Detail
 Decking Over Wood Framing - Lag Screws

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 usainfo@glassvice.com

FIGURE 9



10M SS threaded rods inserted
 7-1/2" into 15/32" to 25/32" diam X 7-3/4" deep holes
 and anchored with Hilti HIT-RE 500-V3

Option 3Aa Cracked conc. w/ 1-3/4" min edge dist	Anchorage Strength: $M_n = 7,891$ in-lb $M_a = 4,932$ in-lb
3Ab Cracked conc. w/ 2-3/16" min edge dist	$M_n = 8,674$ in-lb $M_a = 5,421$ in-lb
3Ac Uncracked conc. w/ 1-3/4" min edge dist	$M_n = 7,891$ in-lb $M_a = 4,932$ in-lb

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All dimensions in inches



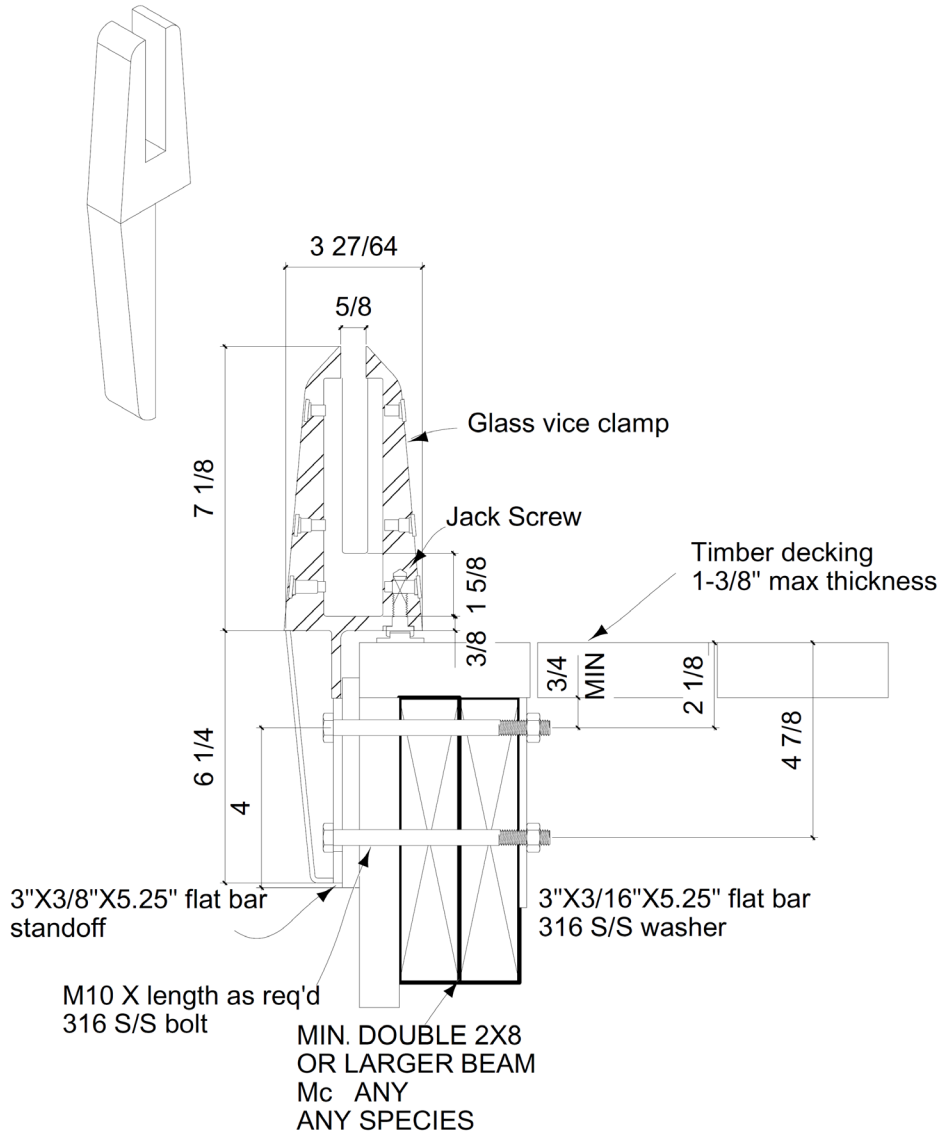
Glass Vice (option 3A)

Architectural Bracket Fixing Detail
 Bracket Detail - Concrete

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FIGURE 10



Anchorage strength:
 $M_a = 10,450$ in-lb

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All dimensions in inches



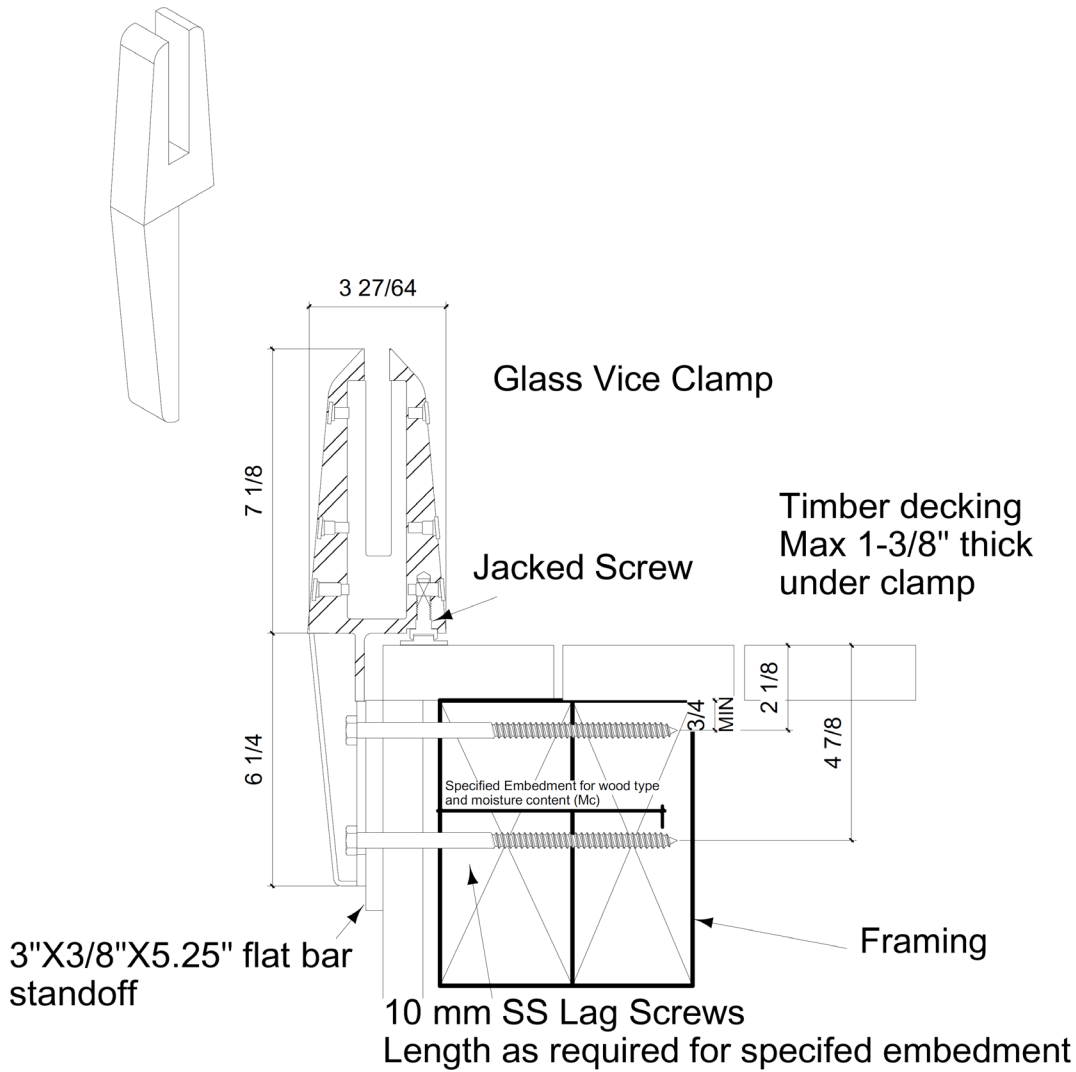
Glass Vice (option 3B)

Architectural Bracket - Fixing Detail
 Timber Deck Bolts

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 Scale 1:5

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FIGURE 11



3Ca 5.209" Embedment for (DFL/SP/SCL)	Any MC	$M_a = 4,569$ in-lb
3Cb 5.76" Embedment for Hem-Fir	Any MC	$M_a = 4,569$ in-lb
3Cc 3.65" Embedment for (DFL/SP/SCL)	$MC \leq 19\%$	$M_a = 4,569$ in-lb
3Cd 4.03" Embedment for Hem-Fir	$MC \leq 19\%$	$M_a = 4,569$ in-lb

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All dimensions in inches



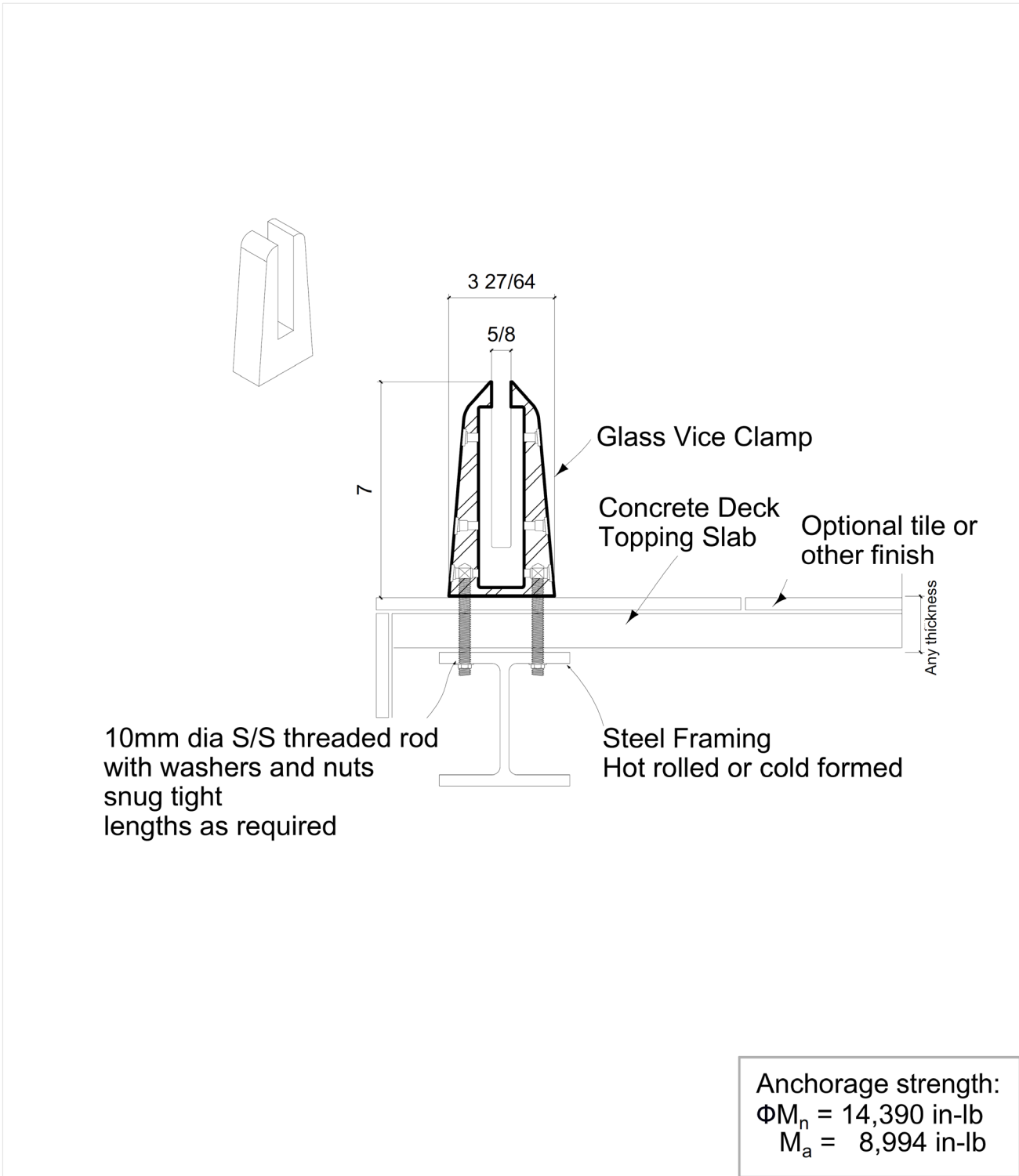
Glass Vice (option 3C)

Architectural Bracket Fixing Detail
Timber Deck - Lag Screws

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FIGURE 12



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All dimensions in inches



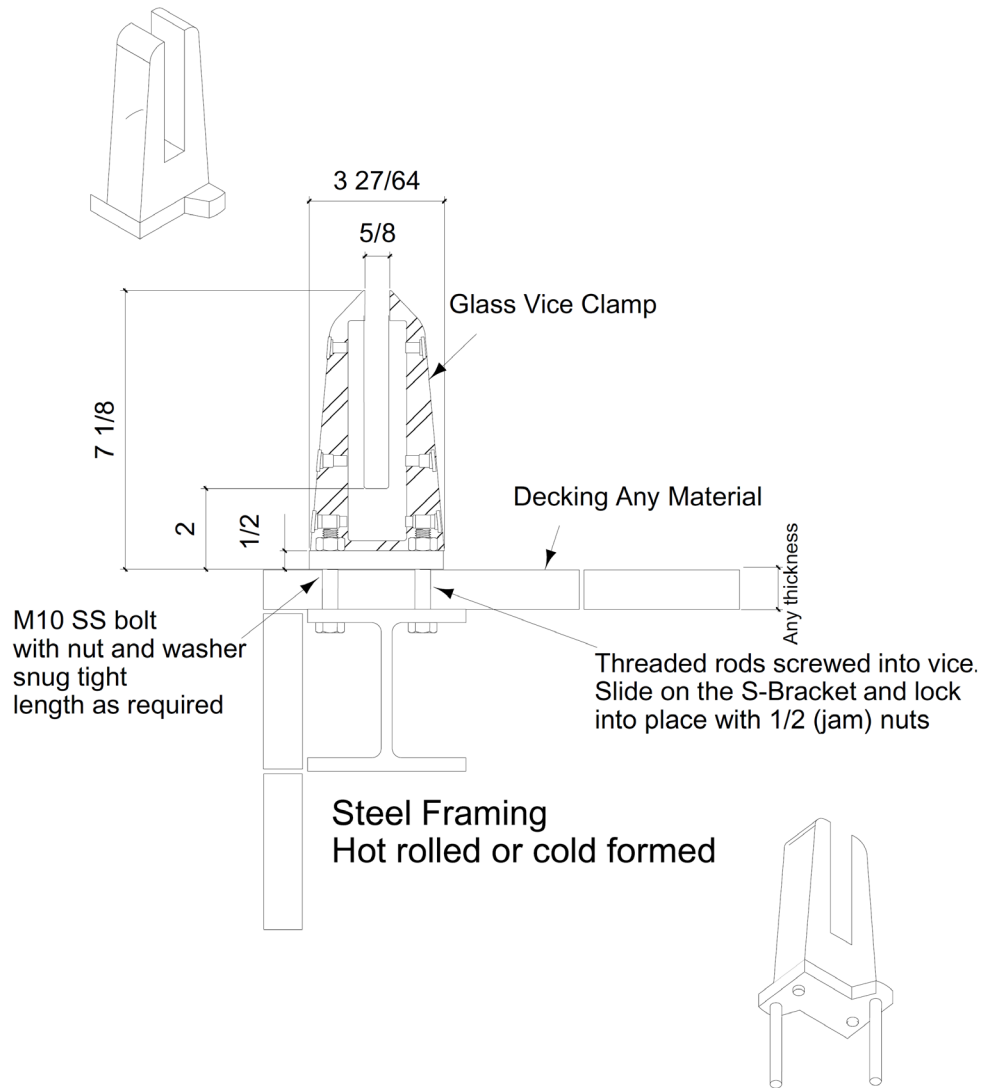
Glass Vice (option 4)

Direct Fix - Fixing Detail
Concrete On Steel Framing

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Scale 1:5

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FIGURE 13



Anchorage strength:
 $\Phi M_n = 14,390 \text{ in-lb}$
 $M_a = 8,994 \text{ in-lb}$

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All dimensions in inches



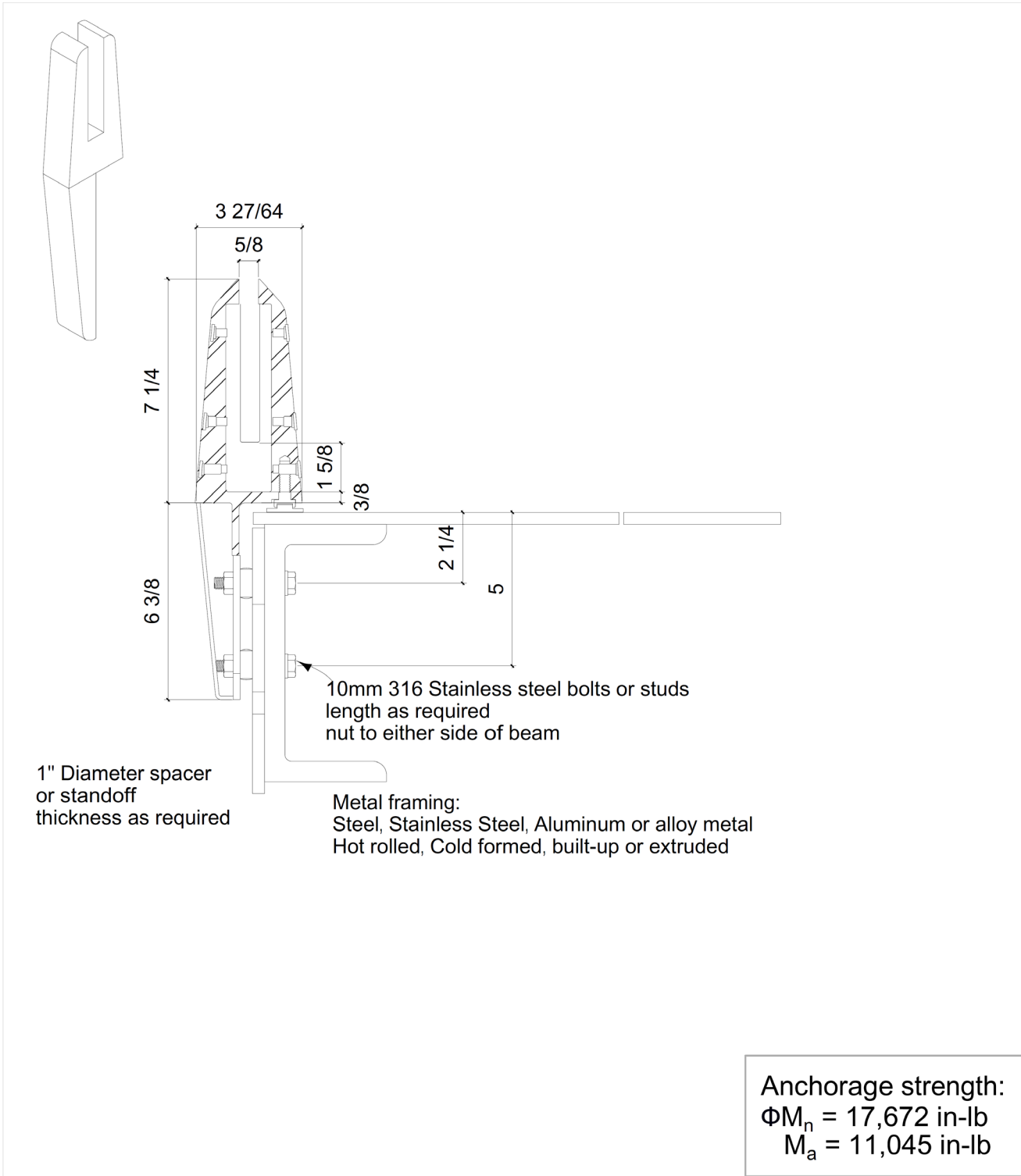
Glass Vice (option 5)

S Bracket Fixing Detail
 Decking On Steel Framing

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FIGURE 14



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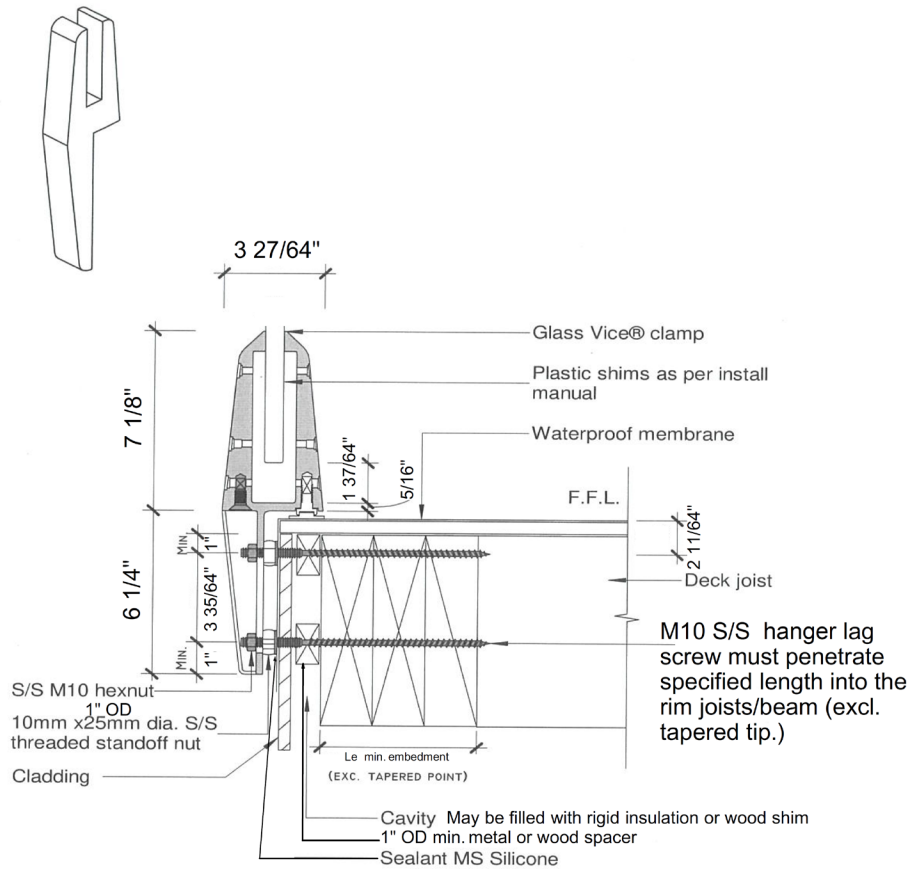
All dimensions in inches



Glass Vice (option 6)
 Architectural Bracket Fixing Detail
 Bracket Detail - Steel

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 usainfo@glassvice.com

FIGURE 15



3Da 3.50" Embedment for (DFL/SP/SCL)
 3Db 5.0" Embedment for (DFL/SP/SCL)

MC ≤ 19%
 Any MC

M_a = 6,265 in-lb
 M_a = 6,265 in-lb

3Dc 4.39" Embedment for Hem-Fir and PT
 3Dd 6.27" Embedment for Hem-Fir, and PT

MC ≤ 19%
 Any MC

M_a = 6,265 in-lb
 M_a = 6,265 in-lb

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cad_details.rvt
 All dimensions in millimetres



Glass Vice® Option 3D
 Architectural Bracket Fixing Detail
 Sheet Cladding

Date: June 2020
 Scale: As indicated
 CAD Based Details
 Quick Code:

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 Phone (760) 740-2338
usainfo@glassvice.com

FIGURE 16

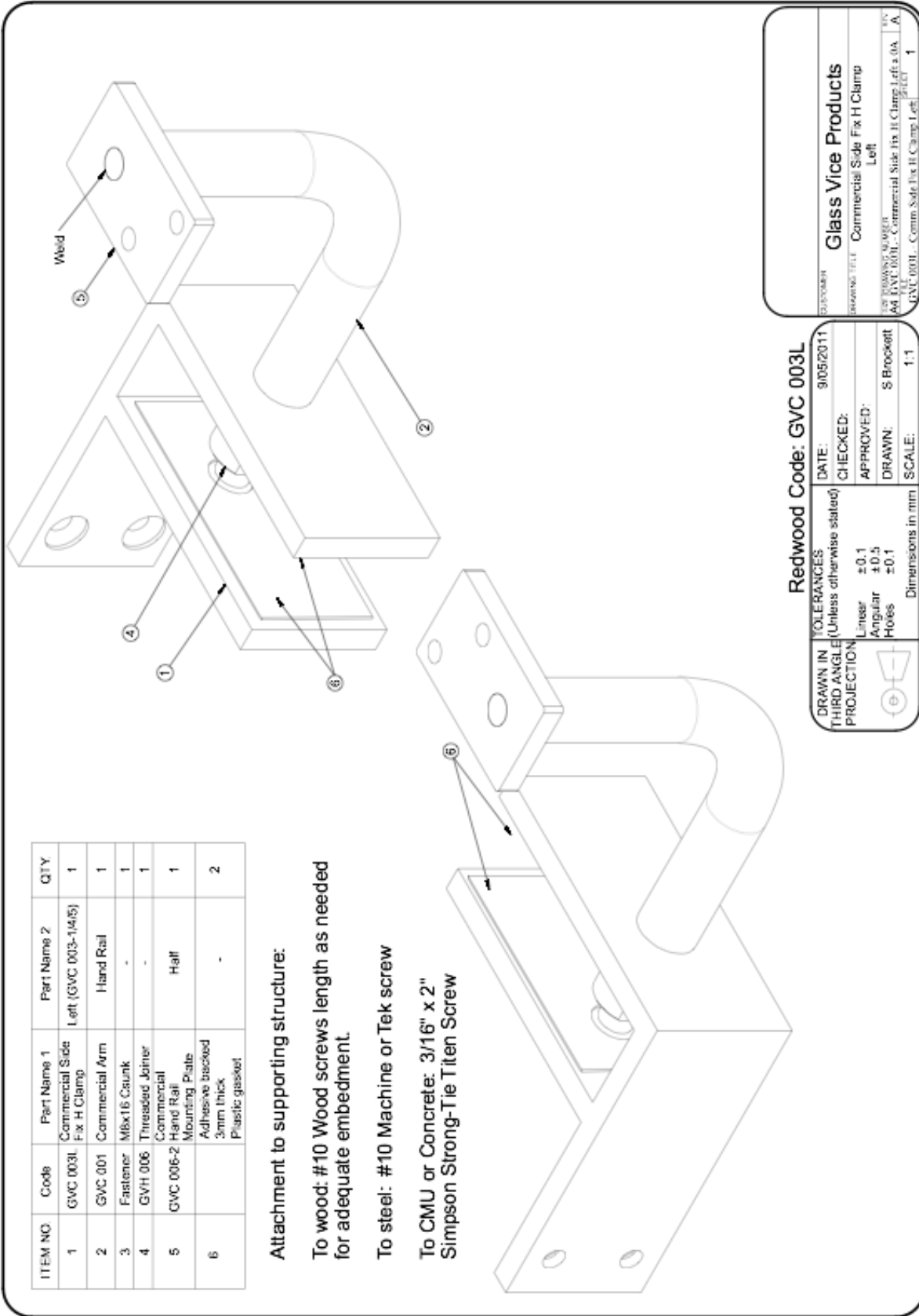


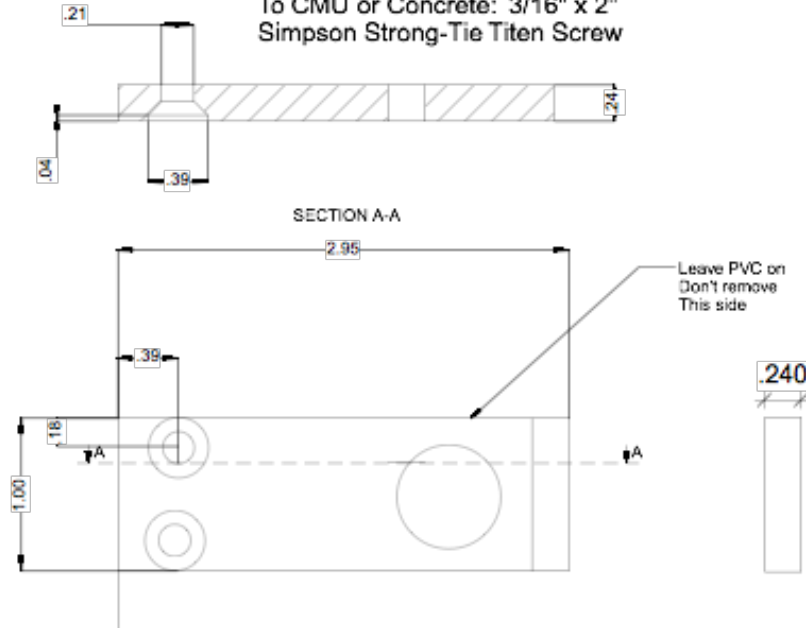
FIGURE 17—HANDRAIL TERMINATION BRACKET

Attachment to supporting structure:

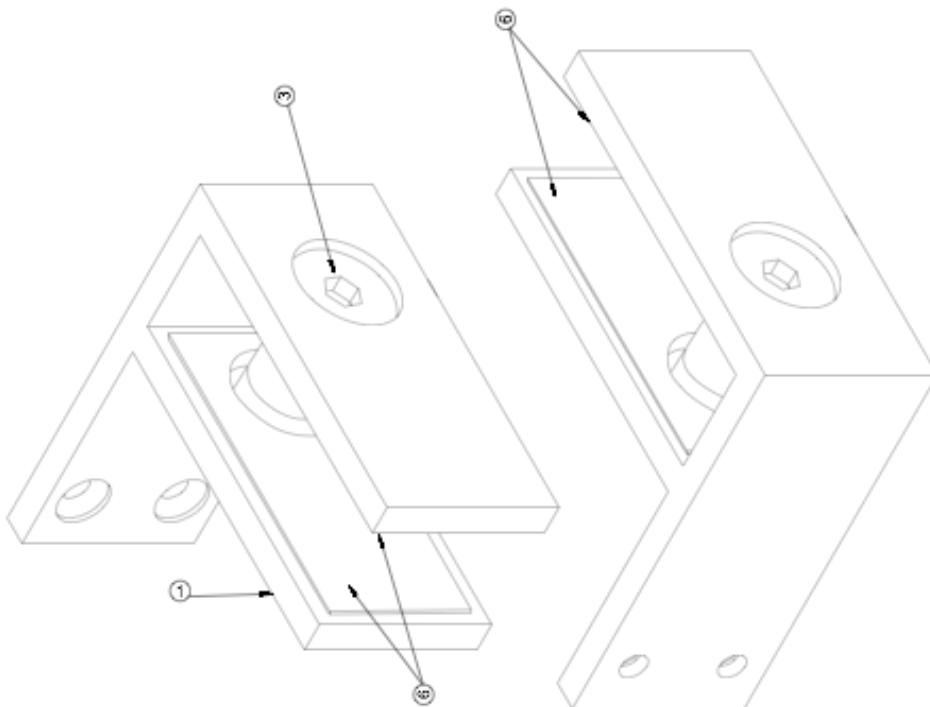
To wood: #10 Wood screws length as needed for adequate embedment.

To steel: #10 Machine or Tek screw

To CMU or Concrete: 3/16" x 2" Simpson Strong-Tie Titen Screw



ITEM NO	Code	Part Name 1	Part Name 2	QTY
1	GVC 003L	Commercial Side Fix H Clamp	Left (GVC 003-1/4/5)	1
3	Fastener	M8x16 CSunk	-	1
6		Adhesive backed 3mm thick Plastic gasket	-	2



Redwood Code: GVC 003L

DATE:	9/05/2011
CHECKED:	
APPROVED:	
DRAWN:	S Brockert
SCALE:	1:1

DRAWN IN THIRD ANGLE PROJECTION	TOLERANCES (Unless otherwise stated)
Linear	±0.1
Angular	±0.5
Holes	±0.1
	Dimensions in mm

COMPANY:	Glass Vice Products
DRAWING TITLE:	Commercial Side Fix H Clamp Left
REV:	01/15/2008 - ADDED DRAWING NUMBER
REV:	04/11/2008 - COMMERCIAL SIDE FIX H CLAMP LEFT A
REV:	02/01/2011 - COMMERCIAL SIDE FIX H CLAMP LEFT

FIGURE 18—TERMINATION BRACKET WITHOUT HANDRAIL

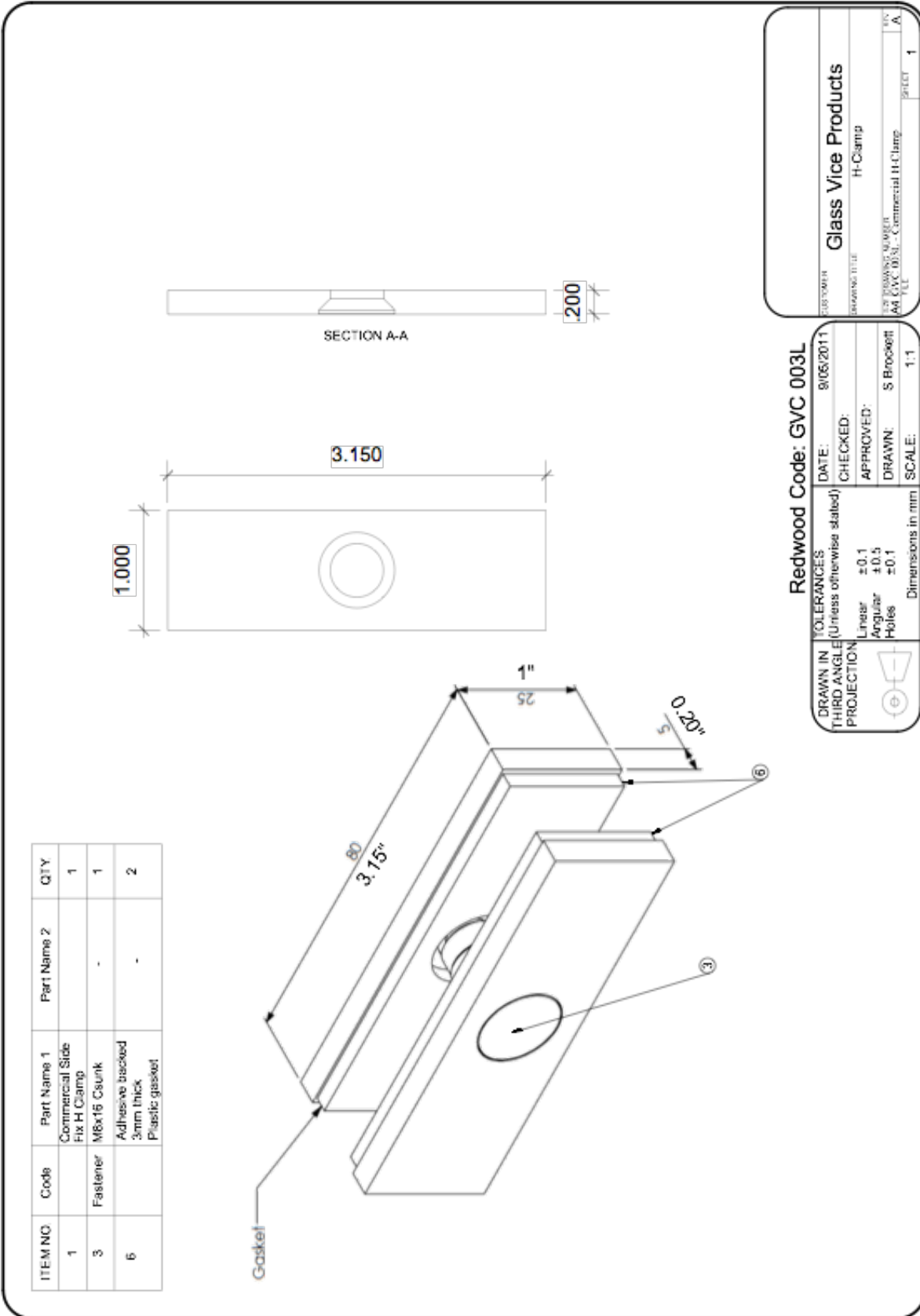


FIGURE 19-H-BRACKET

DIVISION: 05 00 00—METALS

Section: 05 52 00—Metal Railings

Section: 05 73 13—Glazed Decorative Metal Railings

DIVISION: 08 00 00—OPENINGS

Section: 08 81 00—Glass Glazing

Section: 08 88 00—Special Function Glazing

REPORT HOLDER:

GLASS VICE HOLDINGS USA LLC

EVALUATION SUBJECT:

GLASS VICE GLASS PANEL RAILING AND GLASS BALUSTER SYSTEMS

1.0 REPORT PURPOSE AND SCOPE**Purpose:**

The purpose of this evaluation report supplement is to indicate that Glass Vice Glass Panel Railing and Glass Baluster Systems, described in ICC-ES evaluation report [ESR-3563](#), have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2020 *City of Los Angeles Building Code* (LABC)
- 2020 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Glass Vice Glass Panel Railing and Glass Baluster Systems, described in Sections 2.0 through 7.0 of the evaluation report [ESR-3563](#), comply with the LABC Chapter 24, and the LARC, and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Glass Vice Glass Panel Railing and Glass Baluster Systems described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report [ESR-3563](#).
- The design, installation, conditions of use and identification of the Glass Vice Glass Panel Railing and Glass Baluster Systems are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report [ESR-3563](#).
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This supplement expires concurrently with the evaluation report, reissued February 2024.

DIVISION: 05 00 00—METALS

Section: 05 52 00—Metal Railings

Section: 05 73 13—Glazed Decorative Metal Railings

DIVISION: 08 00 00—OPENINGS

Section: 08 81 00—Glass Glazing

Section: 08 88 00—Special Function Glazing

REPORT HOLDER:

GLASS VICE HOLDINGS USA LLC

EVALUATION SUBJECT:

GLASS VICE GLASS PANEL RAILING AND GLASS BALUSTER SYSTEMS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Glass Vice Glass Panel Railing and Glass Baluster Systems, described in ICC-ES evaluation report ESR-3563, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2020 and 2023 *Florida Building Code—Building*
- 2020 and 2023 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Glass Vice Glass Panel Railing and Glass Baluster Systems, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-3563, comply with the 2020 and 2023 *Florida Building Code—Building* and the 2020 and 2023 *Florida Building Code—Residential*. The design requirements must be determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable. The installation requirements noted in ICC-ES evaluation report ESR-3563 for the 2018 and 2021 *International Building Code*® meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable.

Use of the Glass Vice Glass Panel Railing and Glass Baluster Systems has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* or the *Florida Building Code—Residential* with the following conditions:

1. The system must be installed without a top rail or handrail at a total height of less than or equal to 42 inches (106.7 cm) with 9/16-inch thick (14.3 mm) or 5/8-inch thick (15.87 mm) laminated tempered glass panels up to 41 inches (104.1 cm) in height with an interlayer meeting the requirements of Section 3.2.1 of ESR-3563.
2. The system must be limited to installations in one and two family dwellings under the *Florida Building Code—Building* where the 50 plf (0.73 kN/m) live load is not applicable or the *Florida Building Code—Residential*.

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report, reissued February 2024.