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			<p>2022 CALIFORNIA CODES <i>CODE CYCLE</i></p>
			<p>01/02/2023 <i>EFFECTIVE DATE</i></p>
RESIDENTIAL GLASS GUARDRAIL REQUIREMENTS			

INTRODUCTION

The purpose of this handout is to clarify the use of glass handrails and guardrails. There are two types of designs that qualify as code compliant. They are the In-Fill type and the Baluster type. The 2022 California Building Code (CBC) Table 1607.1 (sections 1607A.8.1.1 and 2407), and 2022 California Residential Code (CRC) cover the requirements for glass guards (section R312) and handrails (section R311.7.8.).

GENERAL REQUIREMENTS

Glass used in guardrail and/or handrail construction shall be one of the following types:

- Single fully tempered glass.
- Laminated fully tempered glass.
- Laminated heat-strengthened glass.
- Glazing in railing infill panels shall be of an approved safety glazing material that conforms to the provisions of section 2406.1.1.
- For all glazing types, the minimum nominal thickness is 1/4".

Safety glazing installed in hazardous locations shall be identified by the manufacturer’s designation specifying who applied the designation and the glazing standard with which it complies. The designation shall be acid etched, sandblasted, ceramic fired, laser etched, embossed or of a type that once applied, cannot be removed without being destroyed. A label, as defined in CBC section 202 and meeting the requirements of this section, shall be permitted in lieu of the manufacturer’s designation. For other than tempered glass, the manufacturer’s designations are not required, provided the Building Official approves the use of a certificate, affidavit or other evidence confirming compliance.

POINT LOAD

Handrails and guards shall be designed to resist a point load of 50 pounds per lineal foot, applied in any direction to the top and to transfer this load through the supports to the structure. For other than single family dwellings, a safety factor of 4 is required for glass guard rails.

CONCENTRATED LOAD

Guards shall be designed to resist a concentrated load of 200 pounds. For one- and two-family dwellings, only the concentrated load shall be applied.

COMPONENT LOAD

Components including the intermediate rails (all except the handrail or top rail), balusters, and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot, including openings and space between rails.

SUPPORT

Each handrail or guard section shall be supported by a minimum of three (3) glass balusters or shall be otherwise supported to remain in place, should one baluster panel fail. Glass balusters shall not be installed without an attached handrail or guard (top rail). Design must detail and include all attachments, including the shoe, shoe attachment to deck or floor, top rail and top rail attachments, and the post and post attachments. Structural calculations are required for all guardrail systems.

Exception: The top rail shall not be required where the glass balusters are laminated glass with two or more plies of equal thickness and of the same glass type, when approved by the Building Official (CBC 2407.1.2). The panels shall be designed to withstand the loads specified in section 1607.8.

GLASS SUPPORTING THE TOP RAIL

When the top rail is supported by glass, the assembly shall be tested according to the impact requirements of section CBC 2407.1.2. The top rail shall remain in place after impact.

HEIGHT

All guardrails, both residential and commercial, shall be a minimum of 42" above the finished floor or deck. Guards on the open side of stairs shall have a height of not less than 34" measured vertically from a line connecting the leading edge of the treads. When the top rail also serves as the handrail on the open side of stairs, the top of the guard shall not be less than 34" and not more than 38" measured vertically from a line connecting the leading edge of the treads.

OPENINGS

The triangle opening at the open sides of a stair, formed by the riser, tread and bottom rail of a guard shall not allow the passage of a sphere 6" in diameter. Guards on the open side of stairs shall not have an opening, which will allow a sphere 4-3/8" in diameter.

PARKING GARAGES

Glazing materials shall not be installed in railings in parking garages except for pedestrian areas not exposed to impact from vehicles (CBC 2407.1.3).

DEFINITIONS

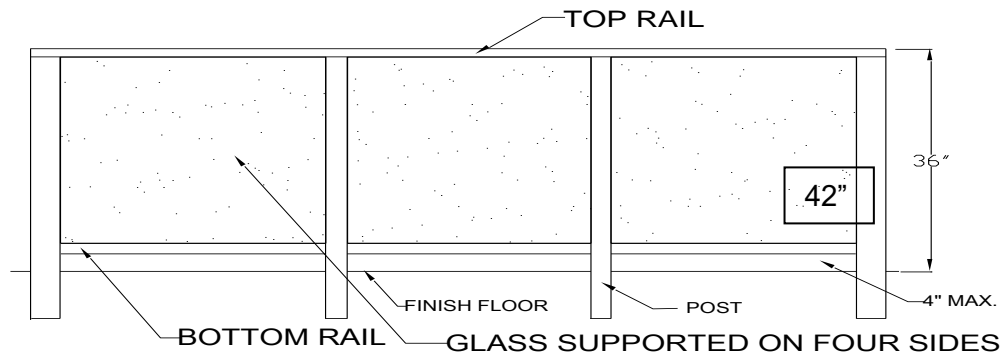
The following definitions apply to glass guardrails:

<i>Balustrade</i>	A system of uprights that support a rail.
<i>Guardrail</i>	A railing for guarding against danger.
<i>Railing</i>	A railing is a barrier made of rails and their supports.
<i>Top Rail</i>	The uppermost rail of a railing system. In a stair rail, this could be the handrail.
<i>Handrail</i>	A handrail is a narrow rail mounted parallel to a stair or landing that is used for grasping with the hand for support (Mounted 34 – 38" above the stair nose).
<i>Post</i>	An upright structural member that supports a top rail, handrail, or in-fill panel.
<i>In-fill panel</i>	A non-structural glass panel that is supported on all four sides and becomes part of the railing system.
<i>Shoe</i>	The bottom supporting member of a baluster that anchors and supports a balustrade system.

IN-FILL TYPE

This type of guardrail system relies on the post and rail structure for all support and the glazing in-fill is non-load bearing. This type is required where there are less than 3 structural glass panels to support the guardrail.

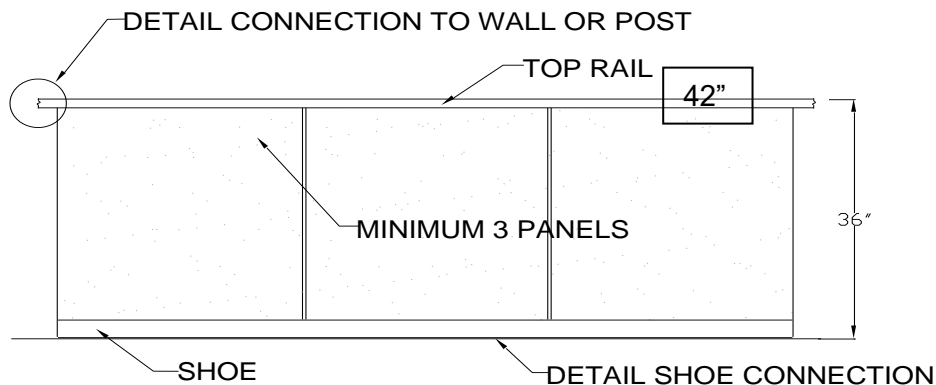
The design submittal shall include the post attachments and top rail load calculations adequate to support a point load of 50# per lineal foot applied in any direction to the top rail and transferred to the supporting structure. In-fill glazing shall be a minimum of ¼" safety glass, supported to provide the concentrated load requirements of section 1607A.8.1.



IN-FILL TYPE RESIDENTIAL GUARDRAIL

BALUSTER TYPE

Each handrail or guardrail section shall be supported by a minimum of three glass balusters or otherwise supported to remain in place, should one baluster panel fail, per the 2022 CBC section 2407.1.2. Glass balusters shall not be installed without a top rail or attached handrail except as specified by 2407.1.2 (*Exception*).



BALUSTER TYPE RESIDENTIAL GUARDRAIL