



City of Imperial Beach, California

COMMUNITY DEVELOPMENT DEPARTMENT - BUILDING DIVISION

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RESIDENTIAL GLASS GUARDRAIL / HANDRAIL 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 2019 California Building Code (CBC) Table 1607.1 (sections 1607A.8.1.1 and 2407), and 2019 California Residential Code (CRC) cover the requirements for glass guards (section R312) and handrails (section R311.7.8.).

GENERAL REQUIREMENTS

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.

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

- 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.
- Single fully tempered glass allowed only when there is no walking surface below or the walking surface is fully protected from the risk of falling glass
- For all glazing types, the minimum nominal thickness is $\frac{3}{4}$ ".

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.

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. A safety factor of 4 shall be applied to the concentrated load to the top rail.

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. A safety factor of 4 shall be applied to the load on the infill components.

SUPPORT

Guards with structural glass baluster panels shall be installed with an attached top rail or handrail (Exception – refer to Baluster Guardrail System below). The top rail or handrail shall be supported by a minimum of three (3) glass baluster panels or shall be otherwise supported to remain in place should one baluster panel fail.

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

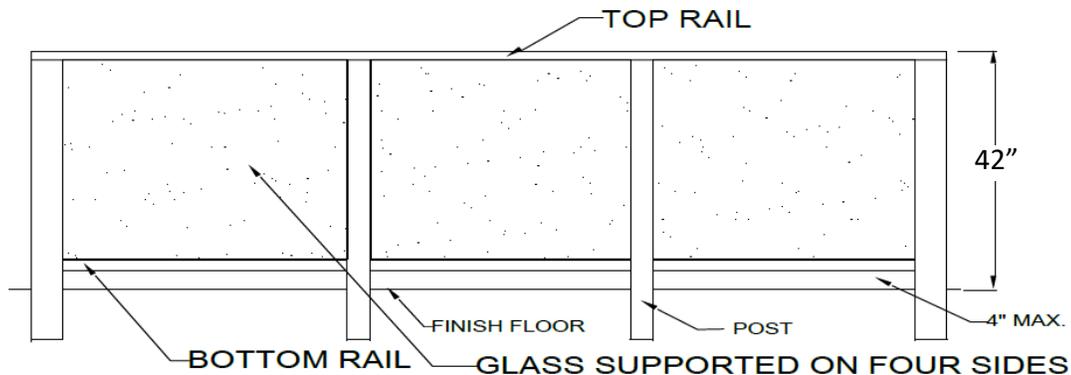
The following definitions apply to glass guardrails:

Balustrade	A system of uprights that support a rail
Guardrail	A railing located near open sided walking surfaces that minimizes falling to a lower level
Railing	A barrier made of rails and their supports
Top Rail	Uppermost rail of a railing system. For a stairway, this may be the handrail.
Handrail	A horizontal or sloping rail mounted parallel to a stair or landing that is intended for grasping by the hand for guidance and support. (Mounted 34"-38" above stairway nosing)
Post	Upright structural member that supports a top rail, handrail or in-fill panel
In-fill panel	Non-structural glass panel supported on all four sides and is part of the railing system
Shoe	Bottom supporting member of a baluster that anchors and supports a balustrade system

IN-FILL 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 pounds 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 $\frac{1}{4}$ " safety glass, supported to provide the concentrated load requirements of section 1607.8.1.



BALUSTER GUARDRAIL SYSTEM

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 2019 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).

Exception: An attached top rail or handrail is not required when the glass baluster panels are laminated glass with two or more glass plies of equal thickness and of the same glass type. The panels shall be tested to remain in place as a barrier following impact or glass breakage in accordance with ASTM E2353.

The design submittal shall detail shoe, top rail and wall connections and load calculations with a safety factor of 4 that complies with the concentrated load requirements of CBC section 1607.8.1.

