

## GLASS PANEL RAILINGS

# IR 24-1

### References:

California Code of Regulations (CCR) Title 24, Part 2: California Building Code (CBC)  
2001 (CBC, Section 2406.6, Table 16A-B  
2007/2010 CBC, Sections 2407, 2403.2, 1607A.7, 1607.7\*, and 2406.1.1

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Discipline: Structural

This Interpretation of Regulations (IR) is intended for use by the Division of the State Architect (DSA) staff, and as a resource for design professionals, to promote more uniform statewide criteria for plan review and construction inspection of projects within the jurisdiction of DSA which includes State of California public elementary and secondary schools (grades K-12 and community colleges), and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

This IR is reviewed on a regular basis and is subject to revision at any time. Please check the DSA web site for currently effective IRs. Only IRs listed in the document at <http://www.dgs.ca.gov/dsa/Resources/IRManual.aspx> at the time of plan submittal to DSA are considered applicable.

\* Indicates alternative 2010 CBC sections that may be used by community colleges, per 2010 CBC, Section 1.9.2.2.

**Purpose:** This Interpretation of Regulations (IR) clarifies Division of the State Architect (DSA) requirements for glass panel railings, which are described in Section 1, to be accepted for use in the construction of projects under DSA jurisdiction. In this IR, the DSA provides three options for meeting the materials requirements for these panels:

- Design Option – As described in Section 2.
- Testing Option – As described in Section 3, allows testing by a DSA approved testing laboratory.
- Evaluation Report Option – As described in Section 4, provides for accepting an evaluation report by a certified product evaluation organization, per IR A-5.

**1. General:** Glass panel railing refers to a railing assembly, consisting of glass panels cantilevered from a base and capped with a continuous rail at the top. The system shall be designed so that the top rail remains in place in the event of failure of an individual glass panel. In general, glass panel railings shall be designed and constructed in accordance with 2007/2010 CBC Section 2407 (Section 2406.6 in 2001 CBC).

**Note:** The 2010 CBC does not require a continuous rail at the top if certain requirements are met per the Exceptions in Section 2407.1.2.

Glazing in railing panels shall be an approved safety glazing material that conforms to 2007/2010 California Building Code (CBC) Sections 2406.1.1 and 2407.1 (Section 2406.6 in the 2001 CBC).

Glass panel railings shall **not** be used in locations where they may be subject to vehicle impact, in accordance with 2007/2010 CBC Section 2407.1.3 (Section 2406.6 in the 2001 CBC).

**2. Design Option:** Glass panel railing system shall be designed for all the applicable loads that are combined in accordance with 2007/2010 CBC Section 1605A, 1605\* (2001 CBC Section 1612A). The glass elements of the handrail assembly and the connections thereto shall be designed for a safety factor of four (4). Glass panel railing with valid evaluation report listing mechanical properties for design, such as yield stress, Young modulus of elasticity, allowable stress, nominal strength, etc., may be acceptable if the evaluation report complies with the requirements of the CBC and [IR A-5](#).

- 2.1 Live Loads:** The required vertical and horizontal live loads for glass panel railings are prescribed in 2007/2010 CBC, Section 1607A.7.1, 1607.7.1\*, for uniform load and Section 1607A.7.1.1, 1607.1.1\*, for concentrated load (Table 16A-B in the 2001 CBC).
- 2.2 Wind Loads:** For exterior installations, wind loads per 2007/2010 CBC Section 1609A, 1609\* (Division III in 2001 CBC), shall be included in the required load combinations in Section 2 above.
- 2.3 Deflection Criteria:** The larger deflections at the top rail from either the horizontal live loads per Section 2.1 or any applicable wind loads per Section 2.2 above shall be the lesser of  $\frac{3}{4}$ " or  $h/90$  for cantilever elements, and  $h/175$  for simple span elements, where  $h$  is the distance from the floor level to the top of the rail. (Reference 2007/2010 CBC Section 2403.3). Applied loads shall be allowable stress design loads.

**3. Test Option:** In lieu of the Design Option in Section 2 above, glass panel railings may be accepted by test. Tests may be conducted in the field or in the laboratory on exact duplicate mock ups as evidence of acceptability of each railing configuration or design.

All tests are to be performed by a DSA approved testing laboratory. Tests are to be observed and results recorded in a report signed by a California registered civil or structural engineer (per 2007/2010 CBC, Section 2403.2).

**3.1 Test Protocol:** An acceptable test for the entire completed glass railing assembly shall meet the following minimum criteria:

**3.1.1 Strength Test.** Apply test live loads at right angles to the top rail. In exterior installations, include the wind loads where they occur.

- For glass elements, test for four (4) times the horizontal loads, per Section 2 above, based on allowable stress design load combinations.
- For non-glass elements, apply 2.5 times the horizontal loads, per Section 2 above, based on allowable stress design load combinations.
- Alternatively, glass and non-glass elements may be tested together using the test loads for glass elements.

**3.1.2 Deflection Test.** Apply test live loads at right angles to the top rail. In exterior installations, include the wind loads where they occur.

- Required test load is either one (1) times the horizontal live load, per Section 2.1 above, or one (1) times any applicable wind loads per Section 2.2 above, whichever produces the most severe effect.
- The measured deflections shall meet the criteria in Section 2.3 above.

**3.1.3** Top rail shall recover to the original position upon release of the test loadings.

**3.1.4** At least one test shall be performed for each railing configuration or design.

**3.1.5** Testing procedures for glass panel railings are to be indicated in the DSA approved construction documents and on the Statement of Structural Tests and Special Inspections ([DSA-103](#)).

**4.0 Evaluation Report Option:** The DSA will accept a qualified evaluation report issued by a certified product evaluation organization if the report meets the requirements of DSA Interpretation of Regulation IR A-5 and states that the product complies with International Code Council Evaluation Service (ICC-ES) Acceptance Criteria AC439. In addition, the deflection criteria in Section 2.3 above shall be met.