
GLASS PANEL RAILINGS: 2022 CBC

Disciplines: Structural, Fire and Life Safety**History:** Revised 06/14/23 Under 2022 CBC
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Division of the State Architect (DSA) documents referenced within this publication are available on the [DSA Forms](#) or [DSA Publications](#) webpage.

PURPOSE

This Interpretation of Regulations (IR) clarifies requirements for glass panel railings for use on construction projects under DSA jurisdiction.

SCOPE

This IR is applicable to the design and construction of glass panel railings. Glass panel railing refers to a railing assembly, consisting of glass panels cantilevered from a base with or without a continuous rail at the top. This IR defines three compliance options for glass panel railings as follows: design method (refer to Section 2 below), test method (refer to Section 3 below), or evaluation report validation (refer to Section 4 below).

BACKGROUND

California Building Code (CBC) Section 2407 addresses glass used in handrails and guards including material properties and other requirements. CBC Section 1607A.9 defines live load requirements for handrails and guards. When used in exterior applications, glass panel railings are also subject to wind loads prescribed by CBC Section 1609A and American Society of Civil Engineers Standard 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7).

1. GENERAL

Glass panel railings shall be designed and constructed in accordance with CBC Section 2407. The system shall be designed so that the top rail remains in place in the event of failure of an individual glass panel. The CBC does not require a continuous rail at the top if certain requirements are met per the exceptions in CBC Section 2407.1.2.

1.1 Material

Glazing in railing panels shall be an approved safety glazing material that conforms to CBC Sections 2406.1.1 and 2407.1.

1.2 Design Loads

Glass panel railing systems shall be designed for all the applicable loads combined in accordance with CBC Section 1605A.

1.2.1 The required vertical and horizontal live loads for glass panel railings are prescribed in CBC Section 1607A.9.1 including distributed and concentrated loads.

1.2.2 For exterior installations, the design shall account for wind loads as required by CBC Section 1609A and ASCE 7.

1.3 Deflection Criteria

The deflection at the top rail resulting from the horizontal loads per Section 1.2 above shall not exceed the following limits when combined in accordance with the allowable stress design load combinations. Refer to CBC Section 2403.3.

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1.3.1 Cantilever elements:

1.3.1.1 Length (L) no more than 13'-6": L/90.

1.3.1.2 Length (L) greater than 13'-6": L/120 + 1/8-inch.

1.3.2 Simple span elements:

1.3.2.1 Length (L) no more than 13'-6": L/175.

1.3.2.2 Length (L) greater than 13'-6": L/240 + 1/4-inch.

1.4 Location

Glass panel railings shall not be used in locations where they may be subject to vehicle impact, in accordance CBC Section 2407.1.3.

2. DESIGN METHOD

The glass elements of the handrail assembly and the connections thereto shall be designed for a safety factor of four in accordance with CBC Section 2407.1.1. Compliance with the latest version of the Engineering Structural Glass Design Guide published by the National Council of Structural Engineers Association (NCSEA) is an acceptable means of substantiating the structural adequacy of glass panel railings. Mechanical properties of the glass upon which the design is based, such as modulus of rupture, modulus of elasticity, allowable stress, etc. shall be specified on the construction documents.

3. TEST METHOD

Glass panel railings may be accepted based on adequate performance under load testing. Tests may be conducted in the field or in the laboratory. Mock-ups tested as evidence of acceptability shall be exact duplicates of each unique railing configuration.

3.1 Test Protocol

All tests shall be performed by a DSA-accepted testing laboratory. Tests shall be observed, and results recorded in a report signed by a California registered civil or structural engineer per CBC Section 2403.2. The test program shall be defined on the construction documents per Section 3.4 below and include tests for both strength per Section 3.2 below and serviceability per Section 3.3 below.

3.2 Strength Test

Test loads shall be applied horizontally and perpendicular to the top rail as follows:

3.2.1 Glass elements shall be subjected to a test load equal to four (4.0) times the maximum horizontal force per Section 1.2 above based on allowable stress design load combinations.

3.2.2 Non-glass elements shall be subjected to a test load equal to two and one-half (2.5) times the maximum horizontal force per Section 1.2 above based on allowable stress design load combinations.

3.2.3 Alternately, glass and non-glass elements may be tested together using the test loads required by Section 3.2.1 above.

3.2.4 Acceptance criteria for the tested glass panel railing includes the following:

3.2.4.1 No damage is observed in the glass or non-glass elements, including cracking, yielding, fracturing, fastener loosening, etc.

3.2.4.2 No permanent or residual deformation is observed in the system. The top rail shall recover to its original position upon release of the test load.

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3.3 Deflection Test

Test loads shall be applied horizontally and perpendicular to the top rail as follows:

3.3.1 The system shall be subjected to a test load equal to the maximum horizontal force per Section 1.2 above based on allowable stress design load combinations.

3.3.2 Deflections measured under the load applied per Section 3.3.1 above shall comply with the criteria defined in Section 1.3 above.

3.4 Construction Documents

Construction drawings shall clearly identify the quantity and types of glass panel railings to be tested. At least one set of tests (i.e., strength and deflection) shall be performed for each unique railing configuration.

3.4.1 Drawings shall identify the locations of in-situ glass panel railings to be tested or for which an equivalent mock-up is to be made for testing purposes.

3.4.2 Drawings shall clearly define the magnitude, location, direction, rate, and duration of loads to be applied in accordance with Sections 3.2 and 3.3 above.

3.4.3 Testing requirements for glass panel railings shall also be indicated on the form *DSA-103: List of Required Structural Tests and Special Inspections*.

4. EVALUATION REPORT VALIDATION

DSA will accept a qualified evaluation report issued by a certified product evaluation organization complying with the requirements of *IR A-5: Acceptance of Products, Materials, and Evaluation Reports*. An acceptable report will state that the product complies with International Code Council Evaluation Service (ICC-ES) Acceptance Criteria AC439. In addition to the evaluation report, structural calculations shall demonstrate compliance with the deflection criteria in Section 1.3 above.

REFERENCES

2022 California Code of Regulations (CCR) Title 24

Part 2: California Building Code (CBC), Sections 1605A, 1607A.9, 1609A, 2403.2, 2403.3, 2406.1.1, 2407, 2407.1.1, 2407.1.2, and 2407.1.3.

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