DSA IR 24-2

WINDOW WALL SYSTEMS: 2025 CBC

Disciplines: All

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Division of the State Architect (DSA) documents referenced within this publication are available on the DSA Forms or DSA Publications webpages.

PURPOSE

This Interpretation of Regulations (IR) clarifies how to determine if window wall systems are subject to DSA structural safety review and clarifies the criteria and process under which the window wall system construction drawings will be reviewed and approved for projects under DSA jurisdiction.

SCOPE

This IR applies to window wall systems, which (as used in this IR) includes curtain wall systems, storefront systems, window systems, and other glass wall systems. Refer to the Glossary below for definitions of terms used in this IR. This IR does not apply to railing systems constructed of glass; refer to *IR 24-1: Glass Panel Railings*.

BACKGROUND

While other materials and specialty components are sometimes used, window wall systems are commonly composed of aluminum mullions (and other secondary support members) and glass glazing panels. Basic provisions for these materials are given in California Building Code (CBC) Chapters 20 and 24, respectively. Loading and performance requirements for window wall systems are established in American Society of Civil Engineers (ASCE) Standard 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7), including wind loads and seismic displacement demands.

1. GENERAL

All interior and exterior window wall systems shall be designed to comply with the CBC and the California Fire Code (CFC) as adopted by DSA and the State Fire Marshal. Additionally, all interior and exterior window wall systems shall be engineered to meet the provisions of this IR.

1.1 Systems Exempt from Structural Safety Review

Structural safety review and approval of window wall systems may be waived in accordance with this section.

1.1.1 The design of a window wall system is exempt from structural safety review when all of the following conditions are met:

1.1.1.1 All mullions, intermediate members, and other elements have spans less than or equal to 10 feet. This limit refers to the maximum distance each element spans between points of structural support. For example, a system composed of 10-foot-tall mullions spaced at 4-feet on center, spanning vertically and anchored to building structural framing at the head and sill would comply with this limit, even if the horizontal run of the window wall exceeds 10-feet. The span limit for interior glazed partitions may be increased to 12 feet.

1.1.1.2 The system is comprised of conventionally framed curtain walls, storefront systems, windows, and door panels without attached structures such as fins, sunshades, etc. Conventionally framed refers to vertical systems composed entirely of straight elements.

1.1.1.3 All mullions, intermediate members, and other elements are simple spans between support points. The system does not utilize continuous multiple spans or cantilevered elements.

1.1.1.4 The total length of each mullion does not exceed 10 feet, including slip joints.

1.1.1.5 The window wall system is not continuous between adjacent stories across floor or roof levels. Multi-story curtain walls are not exempt.

1.1.1.6 The system does not rely on in-plane panel distortion to comply with the seismic relative displacement requirements of ASCE 7 Section 13.5.9. Deflection compensating connections (e.g., slip tracks) are provided at the head of the system.

1.1.1.7 The system does not rely upon structural sealant glazing to resist code prescribed loads.

1.1.2 The 10-foot span limit described in Section 1.1.1.1 above does not apply to the building structure framing members that support the window wall system but are designed separately.

1.1.3 Exclusion of a window wall system from structural safety review and approval does not relieve the project design team of their duty to properly design the window wall system to comply with the CBC and the design requirements of Section 2 below.

1.1.4 The construction documents must detail and specify all connections of the window wall system to the supporting structure.

1.2 Systems Subject to Structural Safety Review

Structural safety review is required if any single element of the window wall system has a span exceeding the limit in Section 1.1.1.1 above or the system otherwise fails to comply with any condition defined in Section 1.1.1 above. When structural safety review is required, construction drawings shall include all window wall systems, regardless of span or orientation in the building.

1.2.1 The structural safety review requirement may be applied on a building-by-building basis. For example, a single project may consist of three new buildings in which Building A has one window wall with a 12-foot mullion span while all window wall systems in Buildings B and C comply with Section 1.1.1 above. In this case, construction drawings must be provided for all window wall systems in Building A (regardless of span or orientation in the building), but need not be submitted for those systems in Buildings B and C.

1.2.2 The term construction drawings (as used in this IR) refers to plans, elevations, details, specifications, etc. that illustrate the full construction of the window wall system. See Section 3 below for additional information. Thus defined, window wall construction drawings may be presented and obtain DSA approval by either of the following methods:

1.2.2.1 Inclusion in the broader construction documents for the project as coordinated and submitted in the initial application to DSA by the design professional in general responsible charge. Refer to *IR A-18: Use of Construction Documents Prepared by Other Professionals* for related information.

1.2.2.2 As a deferred submittal. Refer to *Procedure (PR) 18-04: Electronic Plan Review for Design Professionals*, Section 5 for additional information.

1.2.3 For each building on the project, the method of window wall construction drawing submission and approval shall be entirely in accordance with either Section 1.2.2.1 or Section 1.2.2.2 above. Submission by different methods for different window wall systems of the same building is not permitted.

1.2.4 If the deferred submittal method is used, structural safety plan review will not require connection details of the system to the building structure on the project construction documents. However, if such details are shown on both the approved project construction documents and

the deferred submittal, the details on the deferred submittal will take precedence.

2. STRUCTURAL DESIGN

In accordance with Section 1 above, all window wall systems shall be designed to comply with the requirements of the CBC and ASCE 7.

2.1 Wind Loads

Wind loads shall be in accordance with CBC Section 1609A and ASCE 7 Chapters 26 and 30.

2.1.1 The basic design wind speed shall be determined per CBC Section 1609A.3. If the project is located in a special wind region, the wind speed shall be determined by the local jurisdiction.

2.1.2 The exposure category shall be determined in accordance with CBC Section 1609A.4 and ASCE 7 Section 26.7. When exposure categories cannot be clearly differentiated for a site, then the methods outlined in ASCE 7 commentary Section C26.7 shall be used to make the final determination. In accordance with ASCE 7 Section 26.7.4.4, the design wind pressures for components and cladding shall be based on the exposure category resulting in the highest wind loads for any direction at the site.

2.2 Deflection

The deflection of window wall framing and glazing shall not exceed the limits summarized below when subjected to the load combinations for allowable stress design per ASCE 7 Section 2.4 or CBC Section 1605A.2.

2.2.1 The out-of-plane deflection limit for window wall framing supporting glass shall comply with CBC Section 1604A.3.7 as follows:

2.2.1.1 Member span (L) less than or equal to 13’-6”: L/175.

2.2.1.2 Member span (L) greater than 13’-6”: L/240 + ¼”.

2.2.2 The out-of-plane deflection limit for window wall framing supporting individual panes of glass shall comply with CBC Section 2403.3 as follows:

2.2.2.1 Glass edge length (L_{GE}) less than or equal to 13’-6”: L_{GE}/175.

2.2.2.2 Glass edge length (L_{GE}) greater than 13’-6”: L_{GE}/240 + ¼”.

2.2.3 In accordance with the recommendations in American Architectural Manufacturers Association (AAMA) Technical Information Report (TIR) A11: Maximum Allowable Deflection of Framing Systems for Building Cladding Components at Design Wind Loads, Section 4.0 the deflection acceptance criteria for window wall framing with spans greater than 40-feet shall be established on a case-by-case basis.

2.2.4 If an exterior window wall system’s compliance with the specified deflection limits is substantiated by testing, it shall comply with CBC Section 1709A.5.

2.2.5 The out-of-plane deflection limit for glazing shall not exceed L_G/60 where “L_G” is the shortest span of the glazing.

2.2.6 To avoid creating a pinching hazard, the out-of-plane deflection limit for interior glazing adjacent to a walking surface, with two adjacent unsupported glass edges, shall comply with CBC Section 2403.4 and IR 24-1 Section 1.3.3.

2.3 Story Drift

The inelastic seismic story drift of the building shall be accommodated in the exterior and interior wall systems of buildings in accordance with ASCE 7 Chapter 13. If this drift, or a portion thereof, is required to be accommodated within the window wall system by in-plane panel

distortion, then the glazing systems shall be designed to accommodate the seismic relative displacement requirements of ASCE 7 Section 13.5.9.

2.3.1 If a slip track connection or another sliding mechanism outside the window wall system is used to accommodate the seismic displacement demand, then the inelastic seismic drift need not be accommodated in the glazing.

2.3.2 The means by which the seismic displacement demand is accommodated by the window wall system must be compatible with the adjacent and abutting wall systems that may deform in a different manner. For example, if a metal stud wall system is designed to accommodate the seismic relative displacement with horizontal slip tracks and the adjacent and abutting window wall system is designed to distort to accommodate the displacement, then the interface between the two systems must be detailed so the disparate mechanisms of each system is not impeded.

2.4 Fasteners

The load-resisting capacity of fasteners used in the window wall system shall be based upon one of the following acceptable means:

2.4.1 Evaluation report in accordance with *IR A-5: Acceptance of Products, Materials, and Evaluation Reports.*

2.4.2 Consensus design standard such as The Aluminum Association's Aluminum Design Manual (ADM) or AAMA TIR A9: Design Guide for Metal Cladding Fasteners.

2.4.3 Substantiating data from prior tests performed by a third-party laboratory in accordance with an appropriate ASTM standard, reviewed and approved by DSA in accordance with *PR 18-01: Request for Alternate Design, Materials, and Methods of Construction*. The third-party laboratory shall be independent and accredited per ISO/IEC 17065: Conformity assessment—Requirements for bodies certifying products, processing and services.

2.5 Steel Reinforced Aluminum Mullions

When aluminum mullions are reinforced with internal steel members (e.g., channels, plates, etc.), the design shall comply with this section.

2.5.1 The design of the reinforced mullion shall be based on one of the following:

2.5.1.1 The nested members act and resist load independently. The applied wind load is distributed to each member according to the relative stiffness (EI) of its section.

2.5.1.2 The nested members act as a composite section resisting the prescribed wind load together. Mechanical fasteners shall be provided and designed to transfer the required shear flow (i.e., VQ/I) between the two members.

2.5.2 The aluminum member and the steel reinforcement shall be designed to comply with the ADM and the American Institute of Steel Construction (AISC) Specification for Structural Steel Buildings (AISC 360) or the American Iron and Steel Institute (AISI) Standard S100: North American Specification for the Design of Cold-Formed Steel Structural Members (AISI S100), respectively.

2.5.2.1 Unless substantiated by rational analysis or full-scale testing, the design shall assume the aluminum mullion alone does not provide lateral torsional bracing of the steel reinforcement except at each location where transverse (i.e., horizontal) members brace the reinforced mullion.

2.5.2.2 Local buckling of the steel reinforcement shall not be assumed to be restrained by the aluminum section alone.

2.5.3 Dissimilar metals shall not be in contact with each other unless means to prevent

galvanic corrosion are included in the design. The application of a zinc rich primer is one acceptable means of preventing galvanic corrosion.

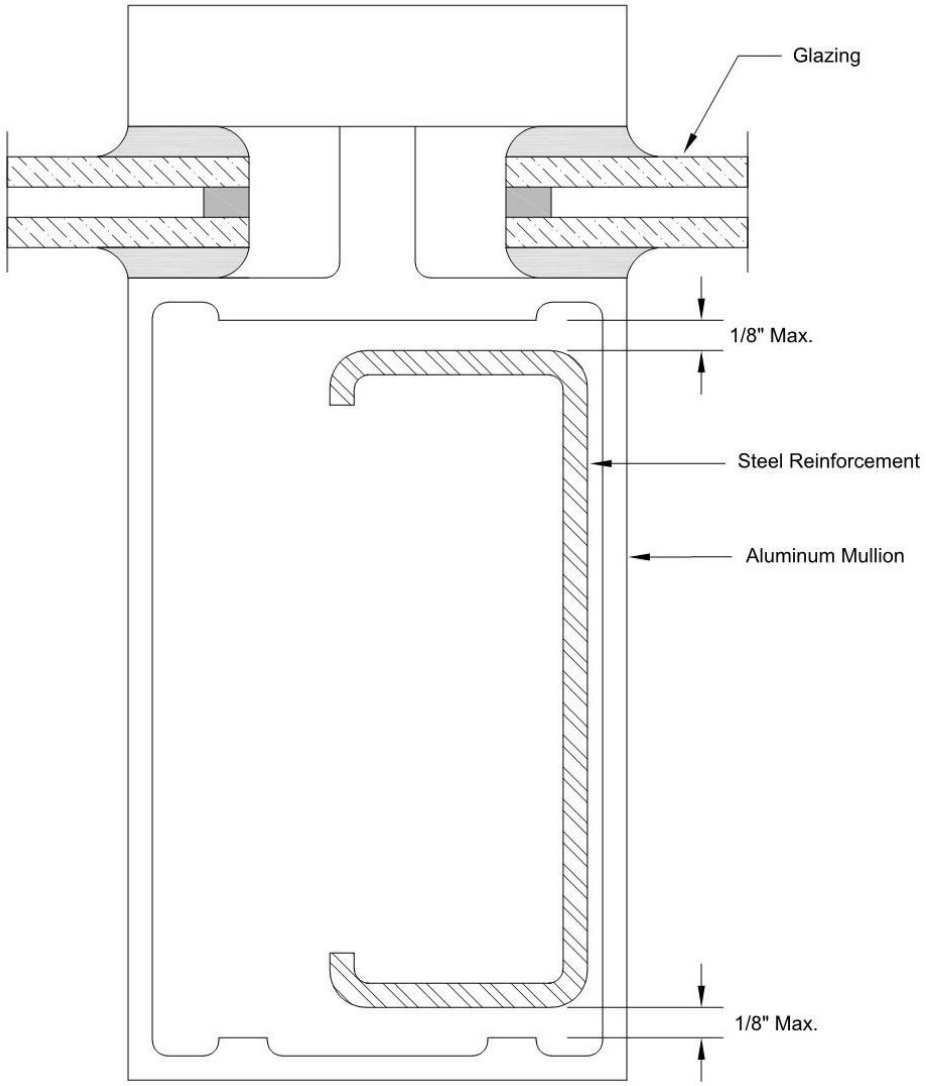

Figure 2.5: Steel Reinforced Mullion

2.5.4 A two-staged deflection analysis is required unless one of the following conditions is met:

2.5.4.1 Steel reinforcement is placed inside the aluminum mullion with a tight fit. In consideration of dimensional tolerances permitted in the fabrication of aluminum and steel members, shims are commonly used to achieve a tight fit. If discontinuous shims are installed at regular intervals and the dimensional difference between the specified members complies with Figure 2.5 above, the design is considered a tight fit.

2.5.4.2 The design complies with Section 2.5.1.2 above.

2.5.5 Designs with steel reinforced aluminum mullions over a partial span length shall also comply with the following requirements. Steel reinforcement terminating more than a mullion depth from the point of the aluminum mullion support are considered a partial span length.

2.5.5.1 At least one mechanical fastener shall be provided to hold the reinforcing steel in position vertically (i.e., supporting the weight of the reinforcement).

2.5.5.2 Structural analysis and calculations shall demonstrate that the reinforced and unreinforced mullion sections have adequate strength and stiffness to resist the code prescribed loads, and the deflection calculations must account for the change in stiffness over the length of the member.

2.5.5.3 In lieu of analysis and calculations per Section 2.5.5.2 above, testing may be performed in accordance with AAMA 450: Performance Rating Method for Mulled Combination Assemblies, Composite Units, and Other Mulled Fenestration Systems. The testing need not be project-specific but must be consistent with the design and detailing of the subject project, as determined by DSA.

2.6 Thermal Breaks in Aluminum Extrusions

When thermal barriers separate two individual aluminum extrusions which are intended to act compositely, they shall meet the requirements of this section. Alternatively, DSA will accept compliance with AAMA TIR A8: Structural Performance of Composite Thermal Barrier Framing Systems as the basis for approval of window wall systems with thermal barriers.

2.6.1 The thermal material shall be a high-strength polyurethane with the following minimum properties:

2.6.1.1 Ultimate tensile strength: 4,500 pounds per square inch (psi).

2.6.1.2 Modulus of elasticity: 240,000 psi.

2.6.2 For both pour-and-debridge systems and thermal strut systems, the window mullion design for deflection shall comply with one of the following:

2.6.2.1 Effective moment of inertia taken as 85% of the gross moment of inertia of the full aluminum section.

2.6.2.2 Effective moment of inertia in accordance with AAMA TIR A8 Section 7.5.

2.6.3 For both pour-and-debridge systems and thermal strut systems, the design of the head, sill, and jamb sections shall comply with both of the following:

2.6.3.1 The mullion reaction may be resisted by a 12-inch length of the supporting section centered upon the mullion.

2.6.3.2 The combined tension and flexural stress in the polyurethane shall not exceed 900 psi.

2.7 Structural Sealant Glazing (SSG)

Structural sealant glazing (SSG) systems shall comply with CBC Section 2410.

2.7.1 Where the Exception of CBC Section 2410.1.2 is invoked, the average of the clearances (i.e., gaps represented by the c_1 or c_2 value) for the two sides with SSG shall be taken as zero for the determination of D_{clear} used in Equation 13.5-3 of ASCE 7. When the SSG occurs on the vertical glass edges, the equation for D_{clear} given in ASCE 7 must be algebraically manipulated to the following: $D_{clear} = 2c_1 + 2c_2\left(\frac{h_p}{b_p}\right)$

2.7.2 If any glass panel does not bear on a horizontal mullion (in either a SSG or mechanically captured condition), the system shall be considered an alternative system and comply with Section 2.8 below.

2.8 Other Glass Systems

Systems utilizing glass as structural members (e.g., glass fins, glass channels), point-supported glass, and other glass applications not addressed in the CBC, shall be submitted as an alternative material and method of construction in accordance with California Administrative Code (CAC) Section 4-304 and CBC Section 104.2.3. The proposed acceptance criteria shall

include, but is not limited to, the analysis and design approach, material design values, design standards (e.g., Australian Code AS 1288: Glass in buildings – Selection and installation, ASTM E1300: Practice for Determining Load Resistance of Glass in Buildings, etc.), testing, and inspection requirements.

3. CONSTRUCTION DRAWINGS

As described in Section 1.2.2 above, window wall construction drawings can be either included in the original project construction documents or processed as a separate deferred submittal.

3.1 Project Construction Documents

Window wall construction drawings incorporated into the project construction documents shall be stamped and signed by the design professional in responsible charge in accordance with *IR A-19: Design Professional Stamp (Seal) and Signature on Documents*.

3.1.1 For window wall systems exempt from structural safety review per Section 1.1 above, all perimeter connections of the system to the building structure shall be detailed on the construction documents. Attachment of the window wall system at the sill, head, and jambs to the building structure (e.g. metal stud framing, floor or roof slab, structural steel, etc.) shall be detailed.

3.1.2 In addition to the connections described in Section 3.1.1 above, for window wall systems subject to structural safety review. the construction documents shall include plans, elevations, details, specifications, etc. necessary to construct the system with the content described in Section 3.3 below.

3.2 Deferred Submittal

Window wall construction drawings submitted and approved via the deferred submittal process shall be stamped and signed in accordance with CAC Section 4-317(g) Item 3 and IR A-18 Section 2.3.

3.2.1 Unless otherwise approved by DSA during plan review and delineated accordingly on the construction documents, window wall systems shall be included in a single deferred submittal package. If the building design employs multiple types of window wall systems whose deferred design will be performed by separate specialty contractors, the design professional in general responsible charge, with DSA approval per CAC Section 4-317(g), must list these as separate deferred submittals on the construction documents.

3.2.2 In accordance with CAC Section 4-317(g), Item 2, the construction documents shall define the design criteria and all building design information necessary to accurately design the window wall systems including, but not limited to, the following:

3.2.2.1 Wind load criteria per CBC Section 1603A.1.4.

3.2.2.2 Seismic load criteria per CBC Section 1603A.1.5.

3.2.2.3 Inelastic seismic drift demand on the window wall systems.

3.2.2.4 Drift compensating mechanism of all wall systems adjacent to and abutting the window wall systems.

3.2.2.5 Details of the building conditions at the perimeter of the window wall systems.

3.2.2.6 Deflection limits of the building structure members supporting the window wall systems.

3.2.3 In accordance with CAC Section 4-317(g), Item 4, fabrication of the window wall systems shall not begin until the deferred submittal is approved by DSA.

3.2.4 When approved, DSA will stamp all drawing sheets of the deferred submittal.

3.3 Content Requirements

Window wall system construction drawings shall include the following:

3.3.1 Layout of all window wall systems.

3.3.2 Layout of all attachment locations and type. The drawings shall clearly indicate the difference between connection points intended as gravity support only, lateral support only, both gravity and lateral support, or other applicable connection types.

3.3.3 Complete dimensions and thicknesses of all window wall framing elements and components and their computed section properties (i.e., cross-sectional area, moment of inertia, and section moduli). Wall framing elements include, but are not limited to, vertical mullions and horizontal members. Components include, but are not limited to, jambs, sills, anchors (e.g., “F” anchors, “T” anchors, etc.), shear blocks, closure covers, and steel reinforcing channels.

3.3.4 Material properties for all window wall elements, components, and fasteners.

3.3.4.1 Aluminum extrusions specified by alloy number.

3.3.4.2 Steel members defined by ASTM material specification including grade or minimum yield and tensile strength.

3.3.4.3 Proprietary fasteners specified by name, size, manufacturer, and evaluation report number complying with IR A-5.

3.3.5 Complete construction details for the connections of sills and headers to mullions and mullion connections to the building structure.

3.3.6 Details illustrating and validating how in-plane inelastic seismic drift demand is accommodated by the window wall system or its connection to the building structure.

3.4 Structural Safety Plan Review

When required per Section 1.1.2 above, structural safety review of the window wall system construction drawings will be performed as described in this section.

3.4.1 Review will focus on those systems with spans greater than 10 feet or otherwise exceeding the conditions of Section 1.1.1 above.

3.4.2 Review of those systems meeting the conditions of Section 1.1.1 above will be cursory in nature and only require corrections in the cases of obvious omissions or inadequacies.

3.4.3 Review will confirm the following aspects of the system have been justified by structural analysis and are specified in sufficient detail on the drawings:

3.4.3.1 Mullion design.

3.4.3.2 Connections of mullions and other members within the system.

3.4.3.3 Connections of the system to the building structure.

3.4.3.4 Deflections and adequate stiffness under code prescribed wind loads.

3.4.3.5 Accommodation of in-plane inelastic seismic drift demand.

3.4.3.6 Accommodation of live load deflection of the building structure.

3.4.3.7 Accommodation of thermal expansion demand.

3.4.4 When the gap between two connected parts is less than or equal to ½ inch, the fasteners or anchors need only be checked for shear (and tension when applicable). When the gap exceeds ½ inch, the fasteners or anchors must be checked for both shear and bending (and tension when applicable). This requirement applies to connected parts within the window wall

system and parts of the window wall connected to the building structure.

4. FIRE AND LIFE SAFETY

Window wall systems shall comply with all applicable fire and life safety portions of the codes and standards adopted by DSA and the State Fire Marshal. The project construction documents shall include, but may not be limited to, the information required by this section, regardless of whether the construction documents are submitted per Section 1.2.2.1 or 1.2.2.2 above.

4.1 Egress Requirements

When a window wall is part of an egress system, its construction documents shall demonstrate compliance with code requirements pertaining to the following:

4.1.1 Corridor continuity.

4.1.2 Protection of openings.

4.1.3 Egress illumination.

4.1.4 Panic hardware.

4.2 Safety Glazing

Where required per CBC Section 2406, safety glazing shall comply with that section, and the construction documents shall specify the following:

4.2.1 Locations requiring safety glazing (e.g., within doors, adjacent to doors, adjacent to walking surfaces, etc.).

4.2.2 Impact resistance classification.

4.2.3 Impact testing of glazing to the required standard: Consumer Protection Safety Commission (CPSC) or American National Standards Institute (ANSI).

4.2.4 Prohibition of wire glass not meeting CPSC safety glazing requirements.

4.3 Fire Protection Rated and Fire Resistance Rated Glazing

Window wall system construction documents shall specify the following:

4.3.1 Fire rated glazing where required.

4.3.2 Glazing type (i.e., fire-protection-rated glazing or fire-resistance-rated glazing) required for the application.

4.3.3 Glazing fire rating period (minutes).

4.3.4 Hose stream test certification of glazing.

4.4 Fire Assemblies

Window wall system construction documents shall include the following requirements:

4.4.1 The gap between the floor and the curtain wall shall be completely filled with an approved fire resistive material/assembly to form both a heat and smoke barrier. The fire resistive material/assembly shall have a fire-resistance-rating that meets or exceeds the rating of the adjacent floor assembly. In addition, the gap shall be protected with a cover capable of supporting the normal occupant live load or shall be protected with guards and railing, etc., to prevent occupants from imposing loads on the gap.

4.4.2 Fire rated safety glazing shall meet the minimum adopted CBC and CFC requirements and standards.

4.4.3 Doors in rated glazing assemblies shall meet the minimum adopted CBC and CFC

requirements and standards.

5. ACCESS COMPLIANCE

Window wall systems shall comply with all applicable access compliance portions of the codes and standards adopted by DSA. The project construction documents shall address all access compliance provisions triggered by the scope of work regardless of whether the construction documents are exempt from structural review according to Section 1.1 above.

Replacement of a window wall system is an alteration, as defined in CBC Chapter 2. Alterations are required to include accessibility improvements per Section 11B-202.4, unless the required elements already meet the technical provisions as stated in Exception 2.

REFERENCES:

2025 California Code of Regulations (CCR) Title 24
- Part 1: California Administrative Code (CAC), Sections 4-304, 4-317(g).
- Part 2: California Building Code (CBC), Chapters 20 and 24, Sections 104.2.3, 1603A.1.4, 1603A.1.5, 1604A.3.7, 1605A.2, 1609A, 1609A.3, 1609A.4, 1709A.5, 2403.3, 2403.4, 2406, 2410, 2410.1.2.
- Part 9: California Fire Code (CFC).

WINDOW WALL SYSTEMS: 2025 CBC

GLOSSARY

Curtain Wall

A curtain wall is a non-load-bearing wall system in which the vertical framing members of the system run past intermediate floors. The system is typically located at the exterior of the building and is anchored to the building through its vertical framing members.

Glazed Partition

An interior glazed assembly that typically spans vertically, located between floors, and is supported by the primary structure, intermediate structural members within the partition system, or a combination thereof.

Span

The clear distance between supports parallel to the direction of the window wall framing members. The window wall framing members are typically, but not necessarily, oriented to span in the vertical direction.

Storefront

A storefront is a system of doors and windows in which vertical framing members typically run between the top of the floor and the structure above. The system is typically anchored to the building at the perimeter.

Window

A window is an operable or non-operable assembly that is installed in a framed opening.