DSA IR 16-4

FOLDING AND TELESCOPIC SEATING: 2022 CBC

Disciplines: Structural **History:** Issued 09/04/24 Under 2022 CBC

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 design and inspection requirements for indoor folding and telescopic seating on projects under DSA jurisdiction.

SCOPE

This IR is applicable to indoor folding and telescopic seating systems and their components. Such systems may be reviewed and approved by DSA as part of the project's primary construction documents, as a pre-check (PC) application per *Procedure (PR) 07-01: Pre-Check Approval*, or as a deferred submittal when permitted by DSA. This IR is not applicable to other structure types including exterior bleachers or grandstands. Refer to *IR 16-5: Bleachers and Grandstands*.

See the Glossary in IR 16-5 for definitions of terms used in this IR.

BACKGROUND

In accordance with California Building Code (CBC) Section 1030.1.1, bleachers, grandstands, and folding and telescopic seating shall comply with International Code Council (ICC) 300: Standard for Bleachers, Folding and Telescopic Seating, and Grandstands (ICC 300). ICC 300 defines additional loads, load combinations, and other structural design requirements specific to systems of these types but relies on the building code for other requirements. As such, these systems must also comply with the applicable requirements of the CBC and the American Society of Civil Engineers (ASCE) Standard 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7).

Prior to the 2022 CBC, DSA provided guidance on bleachers, grandstands, and folding and telescoping seating in a single document: IR 16-5. With the update of the IR for the 2022 CBC, this guidance is now being provided in two IR documents as follows:

- *IR 16-4: Folding and Telescopic Seating*
- *IR 16-5: Bleachers and Grandstands*

1. GENERAL

1.1 Design Professional

Seating systems shall be designed by a qualified design professional licensed in California. The design professional shall be a licensed architect or structural engineer, unless the system is approved as a deferred submittal, in which case a registered civil engineer is acceptable.

1.1.1 The responsible design professional shall prepare and submit construction documents along with supporting documents, such as calculations, to DSA for review and approval.

1.1.2 Documents shall bear the stamp and signature of the architect or engineer in accordance with *IR A-19: Design Professional Stamp (Seal) and Signature on Documents*.

1.1.3 The design professional in general responsible charge of the project may use construction documents prepared by the fabricator's engineer in accordance with *IR A-18: Use of Construction Documents Prepared by Other Design Professionals*.

1.2 Approval by Comparison

Project applicants may request DSA review and approve seating systems based on comparison with a similar system that was previously approved by DSA under a different application number. Approval by comparison is subject to the conditions and limitations of this section, and DSA reserves the authority to make the final determination of when review and approval based on comparison will be permitted.

1.2.1 The structural elements and connections (e.g., welds, bolts, etc.) must be the same or stronger than the previously approved comparison design. The length of structural elements must be the same or shorter than previously approved.

1.2.2 The spans of the structural system must be the same or less than the previously approved comparison design.

1.2.3 The design approved by comparison is also subject to the following additional limitations:

1.2.3.1 There are no conceptual changes to the configuration of the structural system.

1.2.3.2 There have been no changes in the CBC or DSA policy that would nullify the design.

1.2.3.3 The design loads are no greater than those used in the previously approved design as documented on the construction documents.

1.2.3.4 Material specifications (i.e., minimum material properties such yield strength, ultimate strength, etc.) are unchanged or greater.

1.2.4 Revisions and corrections may be required in the following cases:

1.2.4.1 Errors or omissions in the original design.

1.2.4.2 Changes in the CBC or DSA policy since the time the comparison design was approved.

1.3 Approval by Testing

When approved by DSA, load tests may be used to substantiate the structural capacity of a seating system or component (e.g., guardrail) and serve as the basis for approval in lieu of engineering analysis. Load tests to substantiate the primary structure or components may be permitted on a case-by-case basis.

1.3.1 Testing shall be performed by an independent laboratory accredited in accordance with ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories.

1.3.2 The test specimen must be an identical prototype of the design submitted for approval. The test specimen material must match the material specified on the project.

1.3.3 New testing will be required if the system or component design is changed relative to a previously tested specimen to the extent that cannot be verified by engineering analysis.

1.3.4 The testing procedure and acceptance criteria must be approved by DSA prior to performing the tests. When available, the test procedure and acceptance criteria shall be in accordance with a consensus standard. The test load shall be applied in four or more increments, with the load added by each step being approximately equal. The test apparatus shall apply the test load in a manner that avoids the following:

1.3.4.1 Stiffening the test specimen.

1.3.4.2 Arching of the test load.

1.3.4.3 Impact loading the test specimen.

1.3.5 The test load must be approved by DSA prior to performing the tests and shall not be less than twice the unfactored design load (e.g., *D*, *L*, Z, *E*, etc. as defined by the CBC, ASCE 7, and ICC 300). When the test endeavors to substantiate capacity under loads from multiple sources, DSA will make the final determination of the magnitude of the required test load.

1.4 Accepted Fabrication Plants

Fabrication plants require DSA acceptance to be exempt from in-plant special inspection. To qualify for DSA acceptance the fabricator shall comply with this section.

1.4.1 The fabricator shall obtain and maintain plant accreditation from one of the following organizations:

1.4.1.1 International Accreditation Service (IAS).

1.4.1.2 American Welding Society (AWS) per AWS QC17: Specification for AWS Accreditation of Certified Welding Fabrications.

1.4.1.3 Canadian Welding Bureau (CWB) per CSA W47.1: Certification of companies for fusion welding of steel, Division 1.

1.4.2 In lieu of Section 1.4.1 above, DSA may accept accreditation by other nationally recognized evaluation services or accreditation bodies, equivalent to those listed above; however, DSA acceptance of this accreditation must be obtained prior to fabrication.

1.4.3 The fabrication plant shall have a minimum of five years of documented continuous experience in the fabrication of folding and telescopic seating.

1.4.4 Documentation showing evidence of valid accreditation and experience shall be submitted to DSA for initial acceptance and upon subsequent renewals. The required documentation shall be sent to DSA at the following address:

ATTN: Laboratory Evaluation and Acceptance (LEA) Program
DSA Headquarters
1102 Q Street, Suite 5100
Sacramento, CA 95811

1.4.5 Changes in a fabrication plant's accreditation status requires DSA acceptance prior to fabrication.

1.5 Relocation

DSA approval of non-PC project applications is for the specific location shown on the construction documents. Moving a seating system to a different location voids the original approval and requires submission of a new application for approval at the new site.

1.5.1 To be relocated, the original project must have been certified or the seating system must be rehabilitated to meet the provisions of the CBC and ICC 300 in accordance with this IR.

1.5.2 The relocated seating system shall comply with ICC 300 Section 505 and the fire and life safety and access compliance requirements of the current CBC.

1.5.3 The relocation project must demonstrate that the seismic load demand of the new site is less than or equal to the criteria used in the original design under the same code edition.

1.6 Existing Seating Systems

Existing seating systems shall comply with ICC 300 Chapter 5.

1.6.1 After installation, the school district is responsible to conduct annual inspections of the system as required by ICC 300 Section 105.2. The district shall maintain copies of all annual inspection reports and make them available to DSA upon request.

1.6.2 The school district is responsible to conduct annual inspections of existing seating systems as required by ICC 300 Section 501.2.

1.6.3 The school district is required to maintain and repair seating systems in accordance with ICC 300 Section 502.

1.6.4 Additions or alterations to a seating system require DSA approval. Similarly, reconstruction or rehabilitation of a seating system requires DSA approval.

2. STRUCTURAL DESIGN

The structural design of gravity and lateral force-resisting systems, members, and connections shall be in accordance with ICC 300 Section 303, the CBC, and this section.

2.1 Sway Loads

Seating systems and all supporting elements (e.g., connection to the floor and wall, wall element, etc.) shall be designed for sway loads per ICC 300 Section 303.4 and CBC Section 1607A.19.1.

2.2 Load Combinations

Load combinations shall be in accordance with CBC Section 1605A and ICC 300 Section 303.5 as modified by CBC Section 1605A.3.

2.2.1 Horizontal sway loads (Z) stipulated in ICC 300 need not be considered live loads (*L*) in the load combinations required by CBC Section 1605A.1 and defined in ASCE 7 Sections 2.3 and 2.4. While sway loads are defined as live loads in CBC Section 1607A.19 the specific reference to ICC 300 therein is interpreted to define sway loads as "*Z*" and separate from "*L*".

2.2.2 When considering the live load requirements of CBC Section 1607A.9.1, ASCE 7 Section 2.3.1, Combination #2 will control over ICC 300 Equation 3-4 and ASCE 7 Section 2.4.1, Combination #2 will control over ICC 300 Equation 3-8.

2.3 Seismic Loads: Seating Connected to Building Wall

Where the lateral support of indoor folding and telescopic seating is provided entirely, or in part, by attachment to the building wall and the weight of the seating is less than 25 percent of the effective seismic weight of the building (including the seating system), the provisions of this section shall apply. Where the weight of the seating system is greater than or equal to 25 percent of the effective seismic weight of the building (including the seating system), refer to ASCE 7 Section 15.3.2.

2.3.1 The seating structure shall be designed to resist seismic forces determined in accordance with ASCE 7 as described in this section.

2.3.1.1 In the transverse direction (i.e., perpendicular to the seating) seismic forces shall be determined in accordance with ASCE 7 Section 13.3.1 and commentary Section C13.3.1, which discusses elements with attachment points at multiple heights. The Fp/Wp coefficient shall be equal to the average of coefficients at the upper and lower anchorage heights calculated per Section 2.3.2.1 below.

2.3.1.2 In the longitudinal direction (i.e., parallel to the seating) seismic forces shall be determined in accordance with ASCE 7 Table 15.4-2: Seismic Coefficients for Nonbuilding Structures Not Similar to Buildings using a seismic response factor R = 1.25 for "All other self-supporting structures…". All prescriptive requirements and limitations, including the height limit (h_n) apply. The importance factor (I_e) shall be per ASCE 7 Table 1.5-2.

2.3.2 The supports and attachments shall be designed to resist seismic forces determined in accordance with ASCE 7 Section 13.3.1 as described in this section.

2.3.2.1 In the transverse direction the following coefficients apply: $a_p = 1.0$ and $R_p = 2.5$.

2.3.2.2 In the longitudinal direction the following coefficients apply: $a_p = 2.5$ and $R_p = 2.5$. The required seismic force shall not be less than that required by Section 2.3.1.2 above.

2.3.2.3 Height "z" is the elevation of the point of attachment, whether to the floor or wall, with respect to the base of the building. For PC applications, it is recommended that the ratio "z/h" be taken as equal to or greater than 0.80 for the upper anchorage and equal to or greater than 0.15 for the lower anchorage.

2.3.2.4 When required for anchorage to concrete or masonry per ASCE 7 Section 13.3.1.1, the overstrength factor (Ω_0) shall be equal to 2.0.

2.4 Seismic Loads: Seating Connected to Floor Only

Where the lateral support of indoor folding and telescopic seating is provided entirely by attachment to the building floor, the provisions of this section shall apply. Seismic forces applied in both the transverse (i.e., perpendicular to the seating) and longitudinal (i.e., parallel to the seating) directions shall be determined in accordance with ASCE 7.

2.4.1 The seismic force shall be determined in accordance with ASCE 7 Table 15.4-2 using a seismic response factor R = 1.25 for "All other self-supporting structures…". All prescriptive requirements and limitations including height limit (h_n) apply. The importance factor (I_e) shall be per ASCE 7 Table 1.5-2.

2.4.2 The seismic force shall not be less than that determined in accordance with ASCE 7 Equation 13.3-1, using coefficients as follows: $a_p = 2.5$ and $R_p = 2.5$. Height "z" shall be taken as the floor elevation where the seating structure is located.

3. TESTING AND INSPECTION

Testing and inspection requirements are summarized in this section. Refer to *PR 13-01: Construction Oversight Process* for additional requirements applicable to special inspection, material testing, and the test laboratory, including verified report submittal requirements.

3.1 Fabrication Inspection

Special inspection is not required for fabrication performed on the premises of a shop accepted by DSA per Section 1.4 above. At the completion of fabrication, the fabricator's engineer shall submit a form *DSA 130: Certificate of Compliance – Accepted Folding and Telescopic Seating Fabricator* and all supporting documentation indicated therein to the school district, project inspector, architect or engineer in general responsible charge, and DSA. Fabrication in shops without DSA acceptance per Section 1.4 above is subject to in-plant special inspection in accordance with IR 16-5 Section 3.1.

3.2 Material Testing

If any material testing is required, such as for unidentifiable steel, it must be performed by a testing laboratory employed by the school district and acceptable to DSA. A list of acceptable testing laboratories can be found on the DSA website. For remotely located fabricators, refer to *IR A-15: Testing and Inspection of Remotely Fabricated Structural Elements*.

Test reports shall be submitted by the laboratory in accordance with the requirements of the California Administrative Code (CAC), and a final verified report (i.e., form *DSA 291: Laboratory of Record Verified Report*) shall be submitted at the conclusion of the fabrication.

3.3 Field Inspection

When the seating system is delivered to the job site, field inspection shall be performed in accordance with this section. Installation of the seating system shall not commence until the project inspector has received the form DSA 130 (or all in-plant special inspection documents for shops without DSA acceptance) in accordance with Section 3.1 above.

3.3.1 The project inspector is responsible for field inspection including, but not limited to, the following actions:

3.3.1.1 Verify all required documents per Section 3.1 and 3.2 above are submitted by the fabricator.

3.3.1.2 Review the documents submitted by the fabricator for compliance with the DSA approved construction documents.

3.3.1.3 Inspect the seating system for compliance with the approved construction documents. Identify any defects and, if appropriate, issue a form *DSA 154: Notice of Deviations/Resolution of Deviations*.

3.3.1.4 Inspect the field installation, including site assembly.

3.3.2 If field welding is performed, an AWS-certified welding inspector or senior welding inspector shall inspect the welding in accordance with the CBC and *IR 17-3: Structural Welding Inspection*. The welding inspector shall provide detailed daily inspection reports per *IR 17-12: Special Inspection Reporting Requirements*.

REFERENCES:

2022 California Code of Regulations (CCR) Title 24
Part 1: California Administrative Code (CAC)
Part 2: California Building Code (CBC), Sections 1030, 1605A, 1607A.