

January 1, 2025

TO: PARTIES INTERESTED IN DECK BOARD SPAN RATINGS AND GUARDRAIL SYSTEMS (GUARDS AND HANDRAILS)

SUBJECT: Proposed Revisions to the Acceptance Criteria for Deck Board Span Ratings and Guardrail Systems (Guards and Handrails), Subject AC174-0125-R1 (WU/AI)

Dear Colleague:

We are seeking your comments on proposed revisions to the subject acceptance criteria, as presented in the enclosed draft. The revisions, which are being posted on the ICC-ES web site for 30 days of public comment, may be summarized as follows:

ICC-ES proposes using test standard ASTM D7032 Section 5.4 instead of ASTM D7031 Section 5.10.2 for the Duration of Load test in AC174. 2024 IBC Section 2612 and 2024 IRC Section R507.2.2 require testing per ASTM D7032. Therefore, replacing the test standard will better align AC174 with the current codes. Since it is our understanding that testing per ASTM D7031 and the currently published language in AC174 is more stringent, current report holders will not be required to retest.

While the Evaluation Committee will be voting on the revised criteria during the 30day comment period, we will seriously consider all comments from the public and will pull the criteria back for reconsideration if public comments raise major issues. In that case, we would seek a new committee vote; further revise the draft and post it for a new round of public comments; or put the revised criteria on the agenda for a future Evaluation Committee hearing.

If they are of interest, please review the proposed revisions and send us your comments at the earliest opportunity.

To submit your comments, please use the form on the web site and attach any letters or other materials. If you would like an explanation of the "alternate criteria process," under which we are soliciting comments, this too is available on the ICC-ES web site.

Please do not try to communicate directly with any Evaluation Committee member about a criteria under consideration, as committee members cannot accept such communications. Thank you for your interest and your contributions. If you have any questions, please contact me at (800) 423-6587, extension 5699, or Alaina Ingram, E.I, at extension 5682. You may also reach us by e-mail at <u>es@icc-es.org</u>.

Yours very truly,

War Utang

Will Utsey, P.E. Director of Engineering, Evaluation Services

WU/AI/HA/Is

Encl.

cc: Evaluation Committee



PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR DECK BOARD SPAN RATINGS AND GUARDRAIL SYSTEMS (GUARDS AND HANDRAILS)

AC174

Proposed January 2025

Previously approved January 2012, July 2010, February 2008, February 2007, June 2006, February 2006, June 2005, February 2005, November 2001, April 2001

> (Previously editorially revised April 2024, April 2021, December 2014, February 2014, and December 2019)

PREFACE

Evaluation reports issued by ICC Evaluation Service, LLC (ICC-ES), are based upon performance features of the International family of codes, and may include other codes, as applicable.

For alternative materials, design and methods of construction and equipment, see Section 104.2.3 of the 2024 International Building Code[®] (IBC), Section R104.2.2 of the 2024 International Residential Code[®] (IRC), Section 104.11 of the 2021 IBC and earlier editions, and Section R104.11 of the 2021 IRC and earlier editions.

ICC-ES may consider alternate criteria for report approval, provided the report applicant submits data demonstrating that the alternate criteria are at least equivalent to the criteria set forth in this document, and otherwise demonstrate compliance with the performance features of the codes. ICC-ES retains the right to refuse to issue or renew any evaluation report, if the applicable product, material, or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or if malfunctioning is apt to cause injury or unreasonable damage.

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PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR DECK BOARD SPAN RATINGS AND GUARDRAIL SYSTEMS (GUARDS AND HANDRAILS) (AC174)

1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish the basis of evaluation of deck board span ratings and guardrail system performance (guards and handrails), in ICC Evaluation Service, LLC (ICC-ES), evaluation reports, under the 2024, 2021, 2018 and 2015 International Building Code® (IBC) and the 2024, 2021, 2018 and 2015 International Residential Code® (IRC). Bases of evaluation are 2024, 2021, 2018, and 2015 IBC Section 2612; 2024 IBC Section 104.2.3 (2021, 2018, and 2015 IBC Section 104.11); 2024, 2021, 2018, and 2015 IRC Section R507; and 2024 IRC Section 104.2.2 (2021, 2018, and 2015 IRC Section R104.11.1). The reason for development of this criteria is that the code does not address the use of materials identified in Section 1.2 of this criteria for use in deck board and guardrail applications.

For compliance with the 2012 and 2009 International Building Code[®] (IBC) and 2012 and 2009 International Residential Code[®] (IRC), refer to a previous version of this criteria, dated January 2012, editorially revised April 2021 (available from ICC-ES upon request).

1.2 Scope: Evaluation of the deck boards in an ICC-ES evaluation report shall be restricted for use to exterior applications for residential and/or nonresidential buildings classified as Type V-B (IBC) and dwellings regulated by the IRC.

Evaluation of the guardrail systems (guards and handrails) in an ICC-ES evaluation report shall be restricted to exterior applications for residential and/or nonresidential buildings classified as Type V-B (IBC) and dwellings regulated by the IRC.

Exception: Use as guards is permitted under the IBC on buildings of other types of construction in applications where untreated wood is permitted by 2024 IBC Section 705.2.3.1 (2021, 2018 and 2015 IBC Section 1406.3).

Deck boards and guardrail systems (guards and handrails) covered by this acceptance criteria shall be of any shape and thickness (solid or non-solid). Deck boards and guardrails (guards and handrails) shall be manufactured from materials not prescribed by the applicable code, such as wood, steel, concrete, and aluminum, except that they are permitted to be reinforced with materials prescribed by the applicable code, such as steel or aluminum.

A deck board and a deck board used as a stair tread are assigned a span rating indicating the board's ability to comply with functions identified for its specific end use. A guardrail system (guard and handrail) is evaluated for its ability to meet minimum code requirements specified in 2024 and 2021 IBC Section 1607.9.1 (2018 and 2015 IBC Section 1607.8.1) and Section R301.5 of the IRC, as applicable.

Note: There is a general assumption in this criteria that the stair treads are produced from the same material as the deck boards. If this is not the case, the stair treads are required to comply with all the deck board requirements, except as noted.

1.3 Codes and Referenced Standards: Editions of the standards applicable to each code are summarized in Table 1.

1.3.1 2024, 2021, 2018, and 2015 *International Building Code*[®] (IBC), International Code Council.

1.3.2 2024, 2021, 2018, and 2015 *Residential Code*[®] (IRC), International Code Council.

1.3.3 ASTM D2017, Standard Test Method of Accelerated Laboratory Test of Natural Decay Resistance of Woods, ASTM International.

1.3.4 ASTM D7031, Standard Guide for Evaluating Mechanical and Physical Properties of Wood-Plastic Composite Products, ASTM International.

1.3.5 ASTM D7032, Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails), ASTM International.

1.3.6 ASTM E84, Test Methods for Surface Burning Characteristics of Building Materials, ASTM International.

1.4 ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference, ASTM International.

1.4.1 ISO 21930-2017, Sustainability in buildings and Civil Engineering Works – Core Rules for Environmental Product Declarations of Construction Products and Services, International Organization for Standardization (ISO).

1.5 Definitions:

1.5.1 Guard: A building component or a system of building components located at or near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to a lower level. Guards shall comply with IBC Section 1015 and 2024 IRC Section R321 (2021, 2018 and 2015 IRC Section R312), as applicable.

1.5.2 Guardrail System: A system of building components located near the open sides of elevated walking surfaces for the purpose of minimizing the possibility of an accidental fall from walking surface to the lower level.

1.5.3 Handrail: A horizontal or sloping rail intended for grasping by the hand for guidance or support. Handrails shall comply with IBC Section 1014 and 2024 IRC Sections R318.7.8, R318.8.3 and R320 (2021, 2018 and 2015 IRC Sections R311.7.8 and R311.8.3), as applicable.

1.5.4 Span Rating: An index number that identifies the test span used in all structural load testing, which is the maximum center-to-center support spacing for the specified end use, and allowable design capacity, in pounds per square foot (kN/m^2), determined in accordance with this acceptance criteria. For example, a deck span rating of 16/100 indicates the deck board has been evaluated for installation on floor joists spaced a maximum of 16 inches (406 mm) on center, and for supporting the load combinations required by the applicable code, which in this case cannot exceed 100 psf (4.79 kN/m²).

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1.5.5 Standard Terminology: Standard terminology for deck boards and guardrail systems (guards and handrails) given in Section 3.0 of ASTM D7032 is applicable to this acceptance criteria.

2.0 BASIC INFORMATION

2.1 General: The following information shall be submitted:

2.1.1 Product Description: Information concerning material specifications, thickness, size and the manufacturing process.

2.1.2 Installation Instructions: Installation details and limitations, fastening methods, joint treatments, and face treatments.

2.1.3 Packaging and Identification: The report shall indicate how the product will be identified. Identification shall be in accordance with the following:

2.1.3.1. Decking and guardrail assemblies shall be identified by a product label. Product identification shall be in accordance with the product identification provisions of the ICC-ES Rules of Procedure for Evaluation Reports. Labels shall identify the product, the manufacturer and the ICC-ES evaluation report number. In addition, decking and guardrail assemblies complying with the 2024, 2021, 2018 and 2015 IBC and the 2024, 2021, 2018 and 2015 IRC must include the performance level, or a reference to the evaluation report that includes the performance level, on the label. The performance level shall include the allowable span and allowable load for use as deck board or as a stair tread and the allowable span for handrail and guardrail assemblies.

2.1.3.2. Labels may be permanent or removable.

2.1.3.3. Labeling may be applied to the finished product or the product packaging.

2.1.3.3.1. When package labeling is used, packages must be labeled as sold, by the report holder or an approved fabricator/repackaging facility (see Section 6.1 of this criteria), and must be identifiable by the local building official.

2.1.3.3.2. When not labeling the entire assembly, individual components or their packaging may be labeled.

2.1.3.3.3. Other methods of product identification using the ICC-ES evaluation report number must be approved by ICC-ES.

2.1.4 Field Preparation: A description of the methods of field-cutting, application and finishing.

2.2 Testing Laboratories: Testing laboratories shall comply with Section 2.0 of the ICC-ES Acceptance Criteria for Test Reports (AC85) and Section 4.2 of the ICC-ES Rules of Procedure for Evaluation Reports.

2.3 Test Reports: Test reports shall comply with AC85.

2.4 Product Sampling: Products for testing shall be sampled in accordance with Section 3.1 of AC85. Products shall be sampled at the manufacturing site by an accredited inspection agency or testing laboratory acceptable to ICC-ES. Exceptions to sampling at the manufacturing site, such as at a warehouse or distribution center, require written consent by ICC-ES. The sampled product shall be

representative of the standard manufactured product for which the evaluation is sought.

Variations in color shall be considered in the evaluation of products establishing flexural properties under Section 3.4 and UV resistance under Section 3.7, unless data is submitted indicating there is no effect.

2.5 Qualification Test Plan: A qualification test plan shall be submitted to and approved by ICC-ES staff prior to conducting any testing.

3.0 TEST PERFORMANCE AND REQUIREMENTS

3.1 General: ASTM D7032 is used as a primary reference for this criteria except for slip resistance which is not addressed in this criteria.

3.2 Sample Size: The sample sizes for testing shall be determined in accordance with Section 4.2 of ASTM D7032 for deck boards and ASTM D7032 Sections 6.2 and 6.3 for guardrails.

3.3 Conditioning: Conditioning of test material shall be performed in accordance with Section 4.3 of ASTM D7032.

3.4 Deck Board Flexural Tests: All flexural tests shall be conducted in accordance with Section 4.4 of ASTM D7032, except that the constant strain rate shall be determined by using the "nonsimplified version" of the formula used to calculate strain rate and the appropriate geometric properties (stiffness) shall be utilized at the location where the failure occurs (positive and negative). A preliminary test would be required to determine which location is applicable.

The two-span test method defined in Annex 1 of ASTM D7032 shall also be permitted for flexural testing of deck boards and deck boards used as stair treads. Also, see Section 4.1.5 in this criteria.

Data resulting from testing shall be used to determine a span rating, which shall identify the maximum center-tocenter spacing (inches or mm) of the joists and the allowable load capacity of the deck boards (psf or kN/m²).

3.5 Guardrail System (Guard and Handrail) Performance Rating: Structural load testing in accordance with Section 5.0 of this acceptance criteria is required to establish a guardrail system (guard and handrail) performance rating based on code-prescribed load requirements specified in 2024 and 2021 IBC Section 1607.9.1 (2018 and 2015 IBC Section 1607.8.1) and IRC Table R301.5, as applicable.

3.6 Temperature and Moisture Effects: To establish the effect of temperature and moisture on materials used to fabricate deck boards and components of guardrail systems, all tests shall be conducted in accordance with Section 4.5 of ASTM D7032. Moisture effect testing is not required for deck boards and components of guardrail systems (guards and handrails) manufactured with materials that do not absorb water.

3.7 Ultraviolet (UV) Resistance: The resistance to UV exposure of materials used to fabricate deck boards and components of guardrail systems (guards and handrails) shall be evaluated in accordance with Section 4.6 of ASTM D7032, except that adjustment factors for stiffness also shall be considered. Alternatively, evaluation is permitted to be conducted in accordance with ASTM D2565 Cycle 1.

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3.8 Freeze-Thaw Resistance: The resistance to freeze-thaw cycles of materials used to fabricate deck boards and components of guardrail systems (guards and handrails) shall be evaluated in accordance with Section 4.7 of ASTM D7032.

3.9 Termite and Decay Resistance: For deck board and guardrail systems (guards and handrails) fabricated with wood or other cellulosic materials, termite and decay resistance shall be determined in accordance with Section 4.8 of ASTM D7032. The sampling requirements for ASTM D2017 shall be modified to require six specimens for each of the two fungi tested. When Formosan termites are not considered among the species tested it will be stated in the evaluation report that they have not been evaluated (see Section 7.8). Such components shall be listed as "equivalent to preservative-treated or naturally durable wood for termite resistance" in the evaluation report.

Termite and decay resistance is not required for deck boards and components of guardrail systems (guards and handrails) that do not contain wood or cellulosic material. Termite and decay resistance is also not required when limited to installation in locations where termite and decay resistance is not required by the IBC and IRC.

3.10 Flame Spread: The flame-spread rating of materials used to fabricate deck boards and components of guardrail systems (guards and handrails) shall be determined by testing in accordance with Section 4.9 of ASTM D7032. Alternatively, any other approved test procedure is permitted to be used for determining a flame-spread rating of the materials that will give comparable results to tests conducted in accordance with ASTM E84.

3.11 Duration of Load: The duration of load effect shall be considered for deck boards. Testing shall be conducted in accordance with Section <u>5.4</u> 5.10.2 of ASTM <u>D7032</u> D7031. A minimum of <u>3</u> 15 specimens shall be loaded to a minimum of two times the expected span load, increased by the applicable adjustment factors from Sections 3.7 and 3.8 of this criteria. Tests only need to be conducted on a worst-case (e.g., deck product size, span and load rating that indicates the highest flexural stress in the deck board). Condition of acceptance is zero failures and no evidence of tertiary creep (i.e., increasing creep rate).

Exception: In lieu of testing for duration of load as noted above, a comprehensive duration of load study could be considered.

4.0 DECK BOARD PERFORMANCE REQUIREMENTS

4.1 Deck boards and deck boards used as stair treads shall meet all requirements as specified in Sections 5.1 through 5.5 of ASTM D7032, except for the following:

4.1.1 When a stair tread performance rating is desired, ASTM D7032 shall be followed with the following exception: the maximum deflection shall be $^{1}/_{8}$ inch (3.2 mm) at 300 pounds, plus adjustments for end use, as stated in Section 5.1.2 of ASTM D7032.

4.1.2 The sample size shall be a minimum of 28 for establishing the baseline flexural properties of the deck boards and deck boards used as stair treads.

4.1.3 The unadjusted allowable load for strength determination, noted in Section 5.3 of ASTM D7032, shall apply, except for the following: the lesser of: (a) the average

ultimate load divided by 2.5, or (b) the nonparametric 5th percentile ultimate load divided by 2.1.

4.1.4 Mechanical fastener tests shall be conducted in accordance with Section 5.5 of ASTM D7032. Proprietary fastener systems may be evaluated in accordance with ASTM E330 with a safety factor of 3.0 in lieu of Section 5.5.

4.1.5 Two-Span Adjustment: As noted in Section 5.3.3 of ASTM D7032, for stair treads only, when flexural testing is conducted to failure using a simple-span condition per ASTM D7032, and the failure mode is flexure (e.g., not a crushing failure at a load point or support), two-span adjustments for flexural strength and stiffness shall be permitted. For flexural strength (MOR or moment capacity) the increase is 23 percent, and for flexural stiffness (MOE or EI) the increase is 39 percent.

Note: When using this section, consideration shall be given to the allowable load assigned to the interior support, due to the possibility of a higher load being assumed, which could cause local crushing.

5.0 GUARDRAIL SYSTEM (GUARD AND HANDRAIL) PERFORMANCE REQUIREMENTS

5.1 Guardrail System Test Requirements: Testing of guardrail systems (guards and handrails) shall be performed in accordance with Section 6.1, 6.2, and 6.3 of ASTM D7032, except for the following:

Note: The post connection load testing described in Section 6.2.4 of ASTM D7032 is the minimum requirement. Testing at higher loads for the post connections may be required depending on the tributary loads resulting from Section 6.2.3 of ASTM D7032. Also, Section 6.2.1 assumes a two end post condition. Consideration needs to be given to the uniform load multiplied by the post spacing.

5.2 Assembly Fastener Testing (Guardrail): When the guardrail system is to be installed with top rails in a corner/angled condition, determination of the connection capacity shall be established when tested in accordance with Section 5.5 of ASTM D7032.

Guardrail Engineering Analysis Option: The allowable design stress for each component of the guardrail system shall be determined in accordance with the principles used for the deck board adjusted allowable stress derivation shown in this criteria. For components with similar cross sections, engineering stress analysis shall be permitted to be used to compute the capacity of untested profiles. Such engineering stress analysis shall be supplemented by minimal component testing (minimum of three test replications) to verify that the average capacity is being accurately predicted by the calculations. Additionally, the allowable design capacity of each connection shall be determined in accordance with applicable standards. The condition of acceptance of a given guardrail system shall be that the design capacity meets or exceeds the codeprescribed capacity for all components and connections. The guardrail engineering analysis option may be used in lieu of the guardrail testing criteria noted in Sections 5.1 -5.3 of this criteria, subject to the following:

5.3.1 An engineering analysis plan covering the items noted in Sections 5.3 and 5.3.2 shall be submitted to the ICC-ES staff for review, prior to the commencement of any testing or formal submittal.

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5.3.2 The following additional items shall be considered in the engineering analysis

local buckling

• specific test protocol standards to be used in developing the connection capacities

• unbraced length effects

6.0 QUALITY CONTROL

6.1 Deck boards and guardrail systems (guards and handrails) shall be manufactured under an approved quality control program with inspections by ICC-ES or by a properly accredited inspection agency that has a contractual relationship with ICC-ES. If any fabrication and/or repackaging is performed by anyone other than the report holder, that fabricator and/or packaging facility must be under an approved quality control program with inspections by ICC-ES or by a properly accredited inspection systems by ICC-ES or by a properly accredited inspection agency that has a contractual relationship with ICC-ES.

6.2 Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted.

6.3 The quality documentation shall contain a process evaluation technique and a procedure for re-evaluation of compliance with the provisions of this criteria when a significant change in the product occurs. Examples of items that shall be considered for inclusion in the quality documentation are as follows:

6.3.1 **Process Evaluation Techniques:**

6.3.1.1. Threshold levels shall be the same as performance values determined during the qualification testing. Quality control testing shall be performed as specified in the quality control manual. Explanations shall be provided for target quality control values established based on an analysis of qualification test data and load span ratings noted in the evaluation report. These targets shall also consider potential sources of production variability (batches, manufacturing lines, etc.).

6.3.1.2. The quality control procedures may be based on the methodology specified in *MIL-STD-1916, April, 1996, DOD Preferred Methods for Acceptance of Product*, Department of Defense.

6.3.2 Formulation and Manufacturing Change: ICC-ES will be notified in writing if there is a significant change in the product, manufacturing procedures or quality system documentation from what was evaluated upon issuance of the evaluation report. A significant change is one that may reduce the performance of the product as it pertains to applicable test standards or acceptance criteria.

7.0 EVALUATION REPORT

7.1 For products evaluated as deck boards and deck boards evaluated as stair treads, the evaluation report shall contain the maximum allowable span determined by the procedures described in this acceptance criteria. For products evaluated as a guardrail system (guard and handrail), the report shall specify the maximum allowable center-to-center post spacing as determined by the procedures described in this acceptance criteria. In cases where the top rail (guard) is to be installed with supporting

construction other than posts, the report shall specify the maximum length of the rail.

7.2 For products evaluated as deck boards or stair treads, the report shall contain the following statement: Deck boards used as stair treads shall be installed in a minimum of a two-span condition.

7.3 The report shall contain the range of temperatures utilized in the testing performed in accordance with Section 3.6 of this acceptance criteria.

7.4 The report shall contain the following statement: Compatibility of the supporting construction materials with all fasteners, metal post mount components, and other hardware components is subject to approval by the code official.

7.5 The report shall contain a complete description of the fasteners and attachment methods of a guardrail system (guard and handrail). The report shall contain the following statement: Only those types of fasteners and fastening methods described in this report have been evaluated for the installation of the [product name(s)]; other methods of attachment are outside the scope of this report.

7.6 When guards are evaluated for use with one- and two-family dwellings only under the IBC and IRC, as provided in Section 6.2.1.1 of ASTM D7032, the following shall occur:

7.6.1 The report shall include the following statement: The use of this product shall be limited to exterior use as a guard system for balconies and porches for one- and twofamily dwellings of Type V-B (IBC) construction and structures constructed in accordance with the IRC.

7.6.2 The Identification section of the report shall include the following statement: The label shall also include the phrase "For Use in One- and Two-Family Dwellings Only."

7.7 The evaluation report shall state the type of handrail (i.e., Type I or Type II).

7.8 The evaluation report shall state that the deck board or guardrail system has not been evaluated for use in areas subject to Formosan termite attack, unless data in accordance with Section 3.9, showing resistance to Formosan termites, is submitted.

7.9 The evaluation report shall state compliance with ASTM D7032, except for slip resistance and termite and decay resistance (if applicable).

7.10 If termite and decay resistance is not shown, then the report shall state that installation is limited to locations where termite and decay resistance is not required by the IBC and IRC.

8.0 ENVIRONMENTAL PRODUCT DECLARATION (Optional):

8.1 Environmental impacts shall be assessed via an Environmental Product Declaration (EPD) based on a Life Cycle Assessment (LCA). The LCA and EPD shall be conducted in accordance with ISO 21930 and the appropriate Product Category Rule(s) for the product type.

STANDARD	2015 IBC/IRC	2018 IBC/IRC	2021 IBC/IRC	2024 IBC/IRC
ASTM D2017	-05	-05	-05	-05
ASTM D7031	-04	-04	-11(2019)	-11(2019)
ASTM D7032	-10a	-14	-17	-21
ASTM E84	-13a	-16	-18b	-21a
ASTM E330	-02	-14	-14	-14(2021)

TABLE 1 – CROSS REFERENCE OF STANDARD EDITIONS USED FOR EVALUATION