

ACCEPTANCE CRITERIA FOR HORIZONTAL DIAPHRAGMS CONSISTING OF WOOD STRUCTURAL PANEL SHEATHING ATTACHED TO COLD-FORMED STEEL FRAMING

AC262

Approved October 2004

Effective November 1, 2004

(Editorially revised September 2010)

Previously approved June 2004

PREFACE

Evaluation reports issued by ICC Evaluation Service, LLC, (ICC-ES), are based upon performance features of the International family of codes and other widely adopted code families, including the Uniform Codes, the BOCA National Codes, and the SBCCI Standard Codes. Section 104.11 of the *International Building Code*® reads as follows:

The provisions of this code are not intended to prevent the installation of any materials or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

Similar provisions are contained in the Uniform Codes, the National Codes, and the Standard Codes.

This acceptance criteria has been issued to provide all interested parties with guidelines for demonstrating compliance with performance features of the applicable code(s) referenced in the acceptance criteria. The criteria was developed and adopted following public hearings conducted by the ICC-ES Evaluation Committee, and is effective on the date shown above. All reports issued or reissued on or after the effective date must comply with this criteria, while reports issued prior to this date may be in compliance with this criteria or with the previous edition. If the criteria is an updated version from the previous edition, a solid vertical line (|) in the margin within the criteria indicates a technical change, addition, or deletion from the previous edition. A deletion indicator (→) is provided in the margin where a paragraph has been deleted if the deletion involved a technical change. This criteria may be further revised as the need dictates.

ICC-ES may consider alternate criteria, provided the report applicant submits valid 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. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria set forth in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria 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 an evaluation report, if the product, material, or type 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 unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

Acceptance criteria are developed for use solely by ICC-ES for purposes of issuing ICC-ES evaluation reports.

ACCEPTANCE CRITERIA FOR HORIZONTAL DIAPHRAGMS CONSISTING OF WOOD STRUCTURAL PANEL SHEATHING ATTACHED TO COLD-FORMED STEEL FRAMING (AC262)

1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for wood structural panel-sheathed, steel-framed, horizontal diaphragm assemblies resisting wind or seismic loads to be recognized in an ICC Evaluation Service, LLC, (ICC-ES), evaluation report under the 2006 *International Building Code*[®] (IBC) and the 1997 *Uniform Building Code*[™] (UBC). Bases of recognition are IBC Section 104.11 and UBC Section 104.2.8.

1.2 Scope: This criteria provides a basis for evaluating horizontal diaphragm assemblies that resist wind or seismic loads. The diaphragm assemblies consist of wood structural panel sheathing that is mechanically attached to cold-formed steel framing. Mechanical attachment is limited to tapping screw fasteners or power-driven fasteners.

1.3 Codes and Reference Standards:

1.3.1 2006 *International Building Code*[®] (IBC), International Code Council.

1.3.2 1997 *Uniform Building Code*[™] (UBC).

1.3.3 AISI Cold Formed Steel Design Manual, 2002 edition, American Iron and Steel Institute.

1.3.4 AISI/COS/NASPEC 2001, AISI Standard/North American Specification for the Design of Cold-Formed Steel Structural Members, 2001 Edition including 2004 Supplement, American Iron and Steel Institute.

1.3.5 ANSI/AF&PA NDS-05, National Design Specification[®] (NDS[®]) for Wood Construction with 2005 Supplement, American Forest and Paper Association.

1.3.6 ANSI/NFoPA NDS-1991, National Design Specification for Wood Construction, revised 1991 edition (NDS-91), National Forest Products Association.

1.3.7 ASTM A 370-03a, Standard Test Method for Steel Sheets, ASTM International.

1.3.8 ASTM D 1761-88 (2000)^{e01}, Standard Test Methods for Mechanical Fasteners in Wood, ASTM International.

1.3.9 U.S. DOC PS-1-95, Construction and Industrial Plywood, United States Department of Commerce, National Institute of Standards and Technology.

1.3.10 U.S. DOC PS-2-92, Performance Standard for Wood-based Structural-use Panels, United States Department of Commerce, National Institute of Standards and Technology.

2.0 BASIC INFORMATION

2.1 Diaphragm Assembly Description: The description shall include all of the components used in the diaphragm assembly.

2.1.1 Fasteners: The following information shall be provided for the fasteners:

2.1.1.1 Generic or trade name.

2.1.1.2 Manufacturer's catalog number.

2.1.1.3 Fastener head diameter and thickness.

2.1.1.4 Nominal fastener or shank diameter.

2.1.1.5 Fastener shank length.

2.1.1.6 Permitted manufacturing tolerances.

2.1.1.7 Washer size and thickness, if used.

2.1.1.8 Alignment tips, if used.

2.1.1.9 For tapping screw fasteners, thread type and pattern.

2.1.1.10 For power-driven fasteners, shank treatment and fastener protective coating. If the shank is knurled, the knurl pattern shall be described.

2.1.1.11 Fastener material specifications, including physical properties, i.e., tensile strength, hardness and protective coatings.

2.1.1.12 Appropriate national standard for the materials. Reports of physical properties shall be submitted for the fastener material. The reports shall be generated by a mill or independent testing laboratory, and shall verify compliance of the fastener material with the appropriate national standard. Where the actual material strength exceeds the specified strength, test results shall be adjusted by the ratio, F_u (specified)/ F_u (actual), when failure is attributed to the subject fastener.

2.1.2 Steel Framing: The following information shall be provided for the steel framing:

2.1.2.1 Dimensional drawings and details noting framing depth, flange width and uncoated base metal thickness.

2.1.2.2 Appropriate national standard for the steel used in testing. Reports of physical properties shall be submitted for the steel material. These reports shall be generated by a mill or independent testing laboratory, and shall verify compliance of the fastener material with the appropriate national standard. Where the actual material strength exceeds the specified strength, test results shall be adjusted by the ratio, F_y (specified)/ F_y (actual), when failure is attributed to the subject steel.

2.1.3 Wood Structural Panel Sheathing:

Sheathing shall be identified as to the thickness, type, grade, span rating, specific gravity and moisture content. The wood structural panel sheathing shall comply with a current evaluation report, a national product standard (PS-1 or PS-2), UBC Standard 23-2 or 23-3, or otherwise be justified to the satisfaction of ICC-ES. The material shall be clearly identified to determine compliance. Verification of compliance, in the form of test reports, shall be provided. Where

ACCEPTANCE CRITERIA FOR HORIZONTAL DIAPHRAGMS CONSISTING OF WOOD STRUCTURAL PANEL SHEATHING ATTACHED TO COLD-FORMED STEEL FRAMING (AC262)

measured strength properties and dimensions exceed specified values, adjustment of design values based on ratios of test values to specified values shall be considered.

2.1.4 Installation Instructions: Dimensioned, scaled drawings and installation details, noting installation limitations and the sizes and locations of fasteners.

2.1.5 Packaging and Identification: A description of the method of packaging and field identification of the fastener. Identification provisions shall include the evaluation report number and, if applicable, the name or logo of the inspection agency.

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: Sampling of the fasteners for tests under this criteria shall comply with Section 3.2 of AC85.

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 Fasteners:

3.1.1 Tapping Screw Fasteners: Tapping screw fasteners used in the test assemblies shall comply with the ICC-ES Acceptance Criteria for Tapping Screw Fasteners (AC118).

3.1.2 Power-driven Fasteners: Power-driven fasteners used in the test assemblies shall be consistent with the specifications provided by the evaluation report applicant under Section 2.1.1 of this criteria.

3.2 Steel: Steel used in the test assemblies shall comply with the appropriate standard for the quality of steel specified and for which recognition is sought. Compliance is determined by test reports submitted by the mill or a recognized independent testing agency. Where the number of steel coupon specimens is not noted in the specific standard, a minimum of three steel coupon specimens shall be tested to show compliance with the appropriate standard and to determine the minimum uncoated steel thickness and strength. Steel tension tests and elongation calculations shall be performed in accordance with ASTM A 370.

3.3 Diaphragm Testing: Diaphragm testing shall be performed in accordance with the Cantilever Test Method for Cold-formed Steel Diaphragms in Part VIII of the AISI Cold-Formed Steel Design Manual, to determine the nominal shear strength and shear stiffness of the assembly/assemblies for which recognition is sought.

Prior to testing's being performed, the means of determining the expected maximum diaphragm assembly load (see Section 4.0 of the Cantilever Test

Method for Cold-formed Steel Diaphragms) shall be submitted to ICC-ES for review. As an option, the results of the lateral strength testing may be used to determine the expected maximum diaphragm assembly load.

Lateral Strength Testing: Testing shall be performed to determine maximum lateral strength of the combinations of sheathing thickness(es) and maximum metal thickness, and fastener type and fastener size for which recognition is sought; and of the combinations of metal thickness(es) and maximum sheathing thickness, and fastener type and fastener size for which recognition is sought. Lateral strength testing of the sheathing-to-steel connection shall be performed in accordance with ASTM D 1761, on a minimum of 10 assemblies per combination of metal gage, sheathing type (plywood or OSB), sheathing thickness, sheathing grade, and fastener type and fastener size. The load applied to the connection, as well as the slip, shall be measured. Allowable lateral loads shall be calculated in accordance with NDS-91 or NDS-05, as applicable, and diaphragm assembly maximum nominal loads shall be derived.

3.4 Analysis: Analyses of diaphragm assembly test results shall be provided to determine/verify the following:

3.4.1 The equation used to determine diaphragm deflection.

3.4.2 The nominal shear values, in pounds per linear foot, as defined in Section D5 of AISI/COS/NASPEC 2001, for the diaphragm assembly/assemblies (blocked and unblocked) to be recognized. Each combination of fastener, sheathing type and thickness, and metal gage shall be addressed.

3.4.3 The diaphragm nominal load capacity does not exceed the fastener capacity.

3.4.4 The diaphragm nominal load capacity, based on the fastener capacities, does not exceed the shear capacity of the sheathing.

3.4.5 Factors of safety and resistance factors for diaphragms shall be in accordance with Table D5 of Supplement 4004 to the AISI/COS/NASPEC 2001.

3.4.6 The minimum edge and end distances of the fasteners installed in the sheathing and in the steel framing.

4.0 QUALITY CONTROL

4.1 Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted. The quality control program shall verify continued fastener compliance with fastener specifications noted in Section 2.1.1 of this criteria.

4.2 Third-party follow-up inspections are not required under this acceptance criteria.

5.0 EVALUATION REPORT RECOGNITION

ACCEPTANCE CRITERIA FOR HORIZONTAL DIAPHRAGMS CONSISTING OF WOOD STRUCTURAL PANEL SHEATHING ATTACHED TO COLD-FORMED STEEL FRAMING (AC262)

The evaluation report shall include the following:

1. Basic information required by Section 2.1 of this criteria, including assembly and component description, installation procedures, and packaging and identification.

2. K values for determination of e_n .

3. Allowable diaphragm shear loads for each assembly configuration, based on analysis of data as described in Section 3.4. ■