



To: ICC-ES Evaluation Committee
From: David Zhao, P.E., S.E.
Date: May 29, 2009
Subject: Proposed Acceptance Criteria for Steel Cable and Fitting Assemblies (SCFAs) for Seismic Sway Bracing of Nonstructural Components, Subject AC413-0609-R1 (DZ/PB)

MEMO

The following correspondence, responding to AC413-0609-R1, has been received and is posted on the ICC-ES web site:

1. Letter (Loos Comment 1 on AC413) prepared by Michael E. Werner, P.E., and Daniel C. Duggan, P.E., representing Loos & Co., Inc.; no date.
2. Letter (Loos Comment 2 on AC413) prepared by Michael E. Werner, P.E., and Daniel C. Duggan, P.E., representing Loos & Co., Inc.; no date.
3. Letter prepared by Mark Gilligan, S.E., and Bill Vaughan, S.E.; no date.

Based on information contained in these letters, ICC-ES staff proposes the following revisions to AC413-0609-R1, as shown in the attached document. The underlined text reflects changes to the previously proposed criteria posted on the ICC-ES website.

The following is a brief summary of changes by the ICC-ES staff:

1. Section 1.1 of the criteria has been revised to clarify the reason for development of this new criteria and to address the comments raised in the letter by Mark Gilligan, S.E., and Bill Vaughan, S.E.
2. Section 1.3.11 has been added to resolve the issue described in Loos comment 1 by Michael E. Werner, P.E., and Daniel C. Duggan, P.E.
3. A new Section 6.8 is proposed for AC413 to address the issue raised in our staff letter dated April 30, 2009, and the same issue raised in the letter by Mark Gilligan, S.E., and Bill Vaughan, S.E.
4. In regard to Loos comment 2, staff is not in favor of revising the proposed criteria for incorporation of this item. Staff is proposing to post this item on the ICC-ES website for public comment, and to revise the criteria at a later date if there is consensus on this issue.

PROPOSED ACCEPTANCE CRITERIA FOR STEEL CABLE AND FITTING ASSEMBLIES (SCFAs) FOR SEISMIC SWAY BRACING OF NONSTRUCTURAL COMPONENTS

AC413

Proposed April ~~May~~ 2009

PREFACE

Evaluation reports issued by ICC Evaluation Service, Inc. (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.

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 proposed in this document, and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria proposed in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise meet the applicable performance requirements 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 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 for purposes of issuing ICC-ES evaluation reports.

PROPOSED ACCEPTANCE CRITERIA FOR STEEL CABLE AND FITTING ASSEMBLIES (SCFAs) FOR SEISMIC SWAY BRACING OF NONSTRUCTURAL COMPONENTS

1 1.0 INTRODUCTION

2 1.1 **Purpose:** The purpose of this acceptance criteria is to establish requirements
3 for steel cable and fitting assemblies (SCFAs) used for seismic sway bracing of
4 nonstructural components to be recognized in an ICC Evaluation Service, Inc. (ICC-ES),
5 evaluation report under the 2006 *International Building Code*[®] (IBC). The basis of
6 recognition is IBC Section 104.11.

7 The reason for the development of this criteria is to provide guidelines for the
8 evaluation of cable-fitting assemblies including both intermediate and end fittings that
9 require testing to determine their structural capacities, and qualified steel cables that
10 include steel cables not recognized by the current code-referenced standards, since the
11 codes do not provide requirements for testing and determination of structural capacities,
12 reliability and serviceability of these products. This criteria also provides for establishing a
13 documented quality system relevant to the products described above.

14 1.2 **Scope:** This acceptance criteria applies to SCFAs that are the main
15 component of tension-only cable seismic sway bracing assemblies (CSSBAs) used to resist
16 only seismic forces and control seismic force–induced sway (displacements) of
17 nonstructural components only.

18 The following items are beyond the scope of this criteria: (1) attachments described in
19 Section 1.4.1 with the exception of end loops or wrapping of the SCFAs which are required
20 to be qualified according to this criteria; (2) the effects of elevated temperatures on the

21 performance of SCFAs; (3) the effects of fatigue on the performance of SCFAs; (4) use with
22 vibrating equipment unless dynamic loading on cable stresses, fatigue, and deflections of
23 the SCFAs is considered by the registered design professional for the specific applications;
24 (5) protection against sharp resonant motions of nonstructural components, or shock
25 loading; (6) outdoor applications and necessary corrosion protection; (7) special
26 certification requirements for designated seismic systems required by Sections 13.2.2,
27 13.2.5 and 13.2.6 of ASCE 7; and (8) use as rigid seismic sway bracings resisting tension
28 and compression forces.

29 **1.3 Codes and Referenced Standards:**

30 **1.3.1** 2006 *International Building Code*[®] (IBC), International Code Council.

31 **1.3.2** ASCE/SEI 7-05, Minimum Design Loads for Buildings and Other
32 Structures, Including Supplement No. 1, American Society of Civil Engineers.

33 **1.3.3** ASCE 19-96, Structural Applications of Steel Cables for Buildings,
34 American Society of Civil Engineers.

35 **1.3.4** Wire Rope Users Manual, 1993, Third edition, Wire Rope Technical
36 Board.

37 **1.3.5** ASTM A 510-07, Standard Specification for General Requirements for
38 Wire Rods and Coarse Round Wire, Carbon Steel, ASTM International.

39 **1.3.6** ASTM A 603-98 (2003), Standard Specification for Zinc-Coated Steel
40 Structural Wire Rope, ASTM International.

41 **1.3.7** ASTM A 931-08, Standard Test Method for Tension Testing of Wire
42 Ropes and Strand, ASTM International.

43 **1.3.8** ASTM A 1007-02, Standard Specification for Carbon Steel Wire for
44 Wire Rope, ASTM International.

45 **1.3.9** ASTM A 1023/A 1023M-07, Standard Specification for Stranded
46 Carbon Steel Wire Ropes for General Purposes, ASTM International.

47 **1.3.10** ASTM E 8-08, Standard Test Method for Tension Testing of Metallic
48 Materials, ASTM International.

49 **1.3.11** NFPA 13-02, Installation of Sprinkler Systems, National Fire
50 Protection Association.

51 **1.4** **Definitions:** Definitions in the IBC, ASCE 7 and ASCE 19 apply to this
52 criteria. In addition, the following definitions apply:

53 **1.4.1 Attachments:** Attachments as defined in Section 11.2 of ASCE 7,
54 amended as follows: Attachments of CSSBAs consist of end loops or wrapping of the cable
55 of the SCFAs qualified according to this criteria, and anchor bolts and mechanical fasteners
56 used to connect fittings to the nonstructural components or their supports.

57 **1.4.2 Confirmatory Test:** Testing of materials to establish conformance with
58 the requirements set forth in the codes and referenced standards.

59 **1.4.3 Fitting:** A structural steel device, bracket, or proprietary part
60 intentionally configured and designed for SCFAs. In this criteria, fittings are considered part
61 of the “supports” and are distinct from the “attachments.”

62 **1.4.4 Nonstructural Component:** A part or element of an architectural,
63 electrical or mechanical system that is permanently attached to the supporting structures.

64 The design of the component’s supports and attachments is required to comply with
65 Chapter 13 of ASCE 7.

66 **1.4.5 Qualification Test:** Testing of components and assemblies of SCFAs
67 to establish the structural performance of specific SCFAs for recognition in an ICC-ES
68 evaluation report.

69 **1.4.6 Seismic Sway Bracings:** The supports defined in this criteria which
70 transmit the seismic loads induced by the nonstructural components to the supporting
71 structures.

72 **1.4.7 Steel Cable and Fitting Assembly (SCFA):** A cable seismic sway
73 brace assembly, consisting of steel cable(s) and their corresponding fittings that are
74 considered part of the supports, as defined in Section 11.2 of ASCE 7 and Section 1.4.10
75 of this criteria, which resists tension forces only.

76 **1.4.8 Cable Seismic Sway Bracing Assembly (CSSBA):** A cable seismic
77 sway bracing assembly (SCFA) and its end attachments, as defined in Sections 1.4.7 and
78 1.4.1 of this criteria, respectively.

79 **1.4.9 Specified Nominal Cable Strength:** The minimum breaking strength
80 or minimum breaking force of a cable, as defined in Section 1.2 of ASCE 19 and the
81 applicable referenced standard, such as ASTM A 1023.

82 **1.4.10 Supports:** As defined in Section 11.2 of ASCE 7, with following
83 amendment: In this criteria, supports include steel cable assemblies (steel cables and the
84 corresponding fittings) that act as seismic sway bracings.

85 **2.0 BASIC INFORMATION**

86 **2.1 General:** The following information shall be submitted:

87 **2.1.1 Product Description:** A detailed description of the SCFAs, including
88 information concerning material specifications, configurations, dimensions, the

89 manufacturing process, and restrictions or limitations on use. Information shall be provided
90 on, but shall not be limited to, the following items:

91 **2.1.1.1 Steel Cables (Wire Strands and Wire Ropes, as Applicable):**

92 Referenced specifications, classifications, constructions, grades, sizes, wire finishes, core
93 types, directions and types of rope lays, minimum breaking forces (strengths), minimum
94 specified prestretching forces, and minimum specified values of modulus of elasticity.

95 **2.1.1.2 Fittings:** Referenced specifications, grades and designations of
96 steel, shapes and dimensions, and tolerances; sectional properties when applicable;
97 mechanical properties, including yield and tensile strength, area reduction and elongation;
98 manufacturing process or source; and shop and field installation requirements.

99 **2.1.1.3 Installation Applications:** Detailed drawings of unique
100 applications of SCFAs for each end use condition, where a specific combination of cable,
101 fitting(s) and end attachment(s) constitutes a unique installation application.

102 **2.1.2 Packaging and Identification:** A description of the method of
103 packaging and field identification of all components of the SCFAs. Field identification
104 provisions shall include the name of the report holder, permanent color cable coating to
105 identify cable strength, the ICC-ES evaluation report number, and the name or logo of the
106 inspection agency.

107 **2.1.3 Installation Instructions:** Instructions shall include the following
108 items:

109 **2.1.3.1** A description of how SCFAs are installed at the project site,
110 including product handling and storage; procedures for field fabrication of crimped
111 connectors of looped or wrapped rope cable end attachments; procedures for performance

112 (strength and stiffness) verification; and cutting or other field modifications to the shipped
113 assembly components.

114 **2.1.3.2** Procedures for quality control (special inspection) at project
115 sites during installation and fabrication of crimped connectors of looped or wrapped end
116 attachments.

117 **2.2 Testing Laboratories:** Testing laboratories shall comply with Section 2.0 of
118 the ICC-ES Acceptance Criteria for Test Reports (AC85) and Section 4.2 of the ICC-ES
119 Rules of Procedure for Evaluation Reports.

120 **2.3 Test Reports:** Test reports shall comply with AC85. Detailed descriptions of
121 the test plan, including test procedures and conditions of acceptance, shall be provided in
122 the test report.

123 **2.4 Product Sampling:** Sampling of the SCFAs for tests under this criteria shall
124 comply with Section 3.1 of AC85. The fabrication of the test assemblies described in
125 Section 3.4 shall be witnessed by or verified by the testing laboratory.

126 **3.0 TEST AND PERFORMANCE REQUIREMENTS**

127 **3.1 Wire Rope (Confirmatory Test):**

128 **3.1.1 Tension Test:** The purpose of this test is to verify the mechanical
129 properties including minimum breaking strength, modulus of elasticity, elongation, stiffness
130 and load-displacement characteristics of wire ropes; and to demonstrate that wire ropes
131 comply with the requirements set forth in ASCE 19 and applicable referenced standards.
132 The test shall be conducted in accordance with Section 3.1.2. The conditions of acceptance
133 are specified in Section 3.1.3.

134 **3.1.2 Test Procedure:** The test shall be conducted in accordance with
135 ASTM A 931. Test provisions for modulus of elasticity, specified in ASTM A 931, shall be
136 modified as necessary to comply with ASCE 19 and to account for prestretching forces
137 specified by the manufacturer. Sample size shall be a minimum of three specimens for
138 each rope size of each rope construction.

139 **3.1.3 Conditions of Acceptance:** Each test specimen shall satisfy the
140 following requirements: The actual (measured) breaking force obtained shall be equal to or
141 greater than the minimum specified breaking strength required by the applicable referenced
142 standard, such as ASTM A 603 or A 1023; the measured modulus of elasticity shall meet
143 the minimum specified modulus of elasticity required by Section 4.2 of ASCE 19 and the
144 applicable reference standard, such as ASTM A 603; no wire slippage shall occur in the
145 end anchorages to the test apparatus; and no wire break shall occur within one rope
146 diameter of the anchorages to the test apparatus. If any of the specimens does not comply
147 with above conditions of acceptance, the wire ropes shall be considered unqualified.

148 **3.2 Steel Wire (Confirmatory Test):**

149 **3.2.1 Tension Test:** The purpose of this test is to verify the tensile
150 properties of steel wires used to manufacture steel cables, including tensile strength, stress
151 at 0.7 percent extension under load, and total elongation (including construction extension,
152 elastic extension and the permanent extension); and to demonstrate that the wires comply
153 with the requirements set forth in ASCE 19 and applicable referenced standards. The test
154 shall be conducted in accordance with Section 3.2.1.1. The conditions of acceptance are
155 specified in Section 3.2.1.2.

156 **3.2.1.1 Test Procedure:** The test shall be conducted in accordance
157 with Section 6.2 of ASTM A 603, or Section 8 of ASTM A 1007 for wires in cables having a
158 diameter of less than $\frac{3}{8}$ inch (9.5 mm). The sample size shall be a minimum of three
159 specimens for each wire size of each cable construction.

160 **3.2.1.2 Conditions of Acceptance:** Each test specimen shall conform
161 to the mechanical properties (tensile strength, stress at 0.7 percent extension under load
162 and total elongation) specified in Table 6 of ASTM A 603 and Section 11 of ASTM A 603, or
163 Section 8 of ASTM A 1007 for wires in cables having a diameter of less than $\frac{3}{8}$ inch (9.5
164 mm). If any of the test specimens does not comply with the conditions of acceptance set
165 forth in this section, the steel wire shall be considered unqualified.

166 **3.2.2 Wrap Tests:** The wrap tests shall be required for all metallic coated
167 steel wires. The purpose of these tests is to verify that the metallic coated steel wires
168 conform to steel ductility and coating adherence requirements set forth in Section 4.0 of
169 ASCE 19 and applicable referenced standards. The tests shall be conducted in accordance
170 with Section 3.2.2.1. The conditions of acceptance are specified in Section 3.2.2.2.

171 **3.2.2.1 Test Procedures:** The test for steel ductility shall be conducted
172 in accordance with Section 6.5 of ASTM A 603, or Section 10.1 of ASTM A 1007 for wires
173 in cables having a diameter of less than $\frac{3}{8}$ inch (9.5 mm). Testing for adherence of coating
174 shall be conducted in accordance with Section 6.7 of ASTM A 603, or Section 10.2 of
175 ASTM A 1007 for wires in cables having a diameter less than $\frac{3}{8}$ inch (9.5 mm). Sample
176 size shall be a minimum of three specimens for each wire size of each cable construction
177 for ductility testing and for adherence testing.

178 **3.2.2.2 Conditions of Acceptance:** Each test specimen for steel
179 ductility testing shall satisfy the requirements set forth in Section 6.5 of ASTM A 603, or
180 Section 10.1 of ASTM A 1007 for wires in cables less than $\frac{3}{8}$ inch (9.5 mm) in diameter.
181 Each test specimen for the adherence of coating test shall satisfy the requirements set forth
182 in Section 6.7 of ASTM A 603, or Section 10.2 of ASTM A 1007 for wires in cables less
183 than $\frac{3}{8}$ inch (9.5 mm) in diameter. If any of the metallic coated steel wire test specimens do
184 not comply with the conditions set forth in this section, the metallic coated steel wire shall
185 be considered unqualified.

186 **3.2.3 Metallic Coating Test:** The metallic coating test shall be required for
187 all metallic coated steel wires. The purpose of this test is to demonstrate that the metallic
188 coated steel wires comply with the protective coating requirements set forth in Sections 4.0
189 and 6.0 of ASCE 19 and applicable referenced standards. The test shall be conducted in
190 accordance with Section 3.2.3.1. The conditions of acceptance are specified in Section
191 3.2.3.2.

192 **3.2.3.1 Test Procedure:** The test shall be conducted in accordance
193 with Section 7 of ASTM A 603, or Section 11 of ASTM A 1007 for wires in cables less than
194 $\frac{3}{8}$ inch in (9.5 mm) diameter. The minimum weight of coating shall conform to Table 7 of
195 ASTM A 603, or Table 3 or 4 of ASTM A 1023 for wires in cables less than $\frac{3}{8}$ inch (9.5
196 mm) in diameter. Sample size shall be a minimum of three specimens for each wire size of
197 each cable construction.

198 **3.2.3.2 Conditions of Acceptance:** Each test specimen shall satisfy
199 the requirements set forth in Sections 6.6 and 6.8 and Table 7 of ASTM A 603, or Table 3
200 or 4 of ASTM A 1023 for wires in cables less than $\frac{3}{8}$ inch (9.5 mm) in diameter. If any of

201 the metallic coated steel wire test specimens do not comply with the conditions set forth in
202 this section, the metallic coated steel wire shall be considered unqualified.

203 **3.2.4 Chemical Composition Test:** The chemical composition test shall be
204 required for wires in cables less than $\frac{3}{8}$ inch (9.5 mm) in diameter complying with ASTM A
205 1007. Test shall be conducted in accordance with Section 6.3 of ASTM A 1007. Sample
206 size shall be a minimum of three specimens for each wire size of each cable construction.
207 Each test specimen shall satisfy the requirements set forth in Table 3 of ASTM A 510 as
208 specified in Section 6.3 of ASTM A 1007.

209 **3.2.5 Wire Diameter:** The steel wire diameter shall be measured for wires in
210 cables less than $\frac{3}{8}$ inch (9.5 mm) in diameter in accordance with Section 7.1 of ASTM A
211 1007. Sample size shall be a minimum of three specimens for each wire size of each cable
212 construction. Each test specimen shall satisfy the requirements set forth in Section 7.2 of
213 ASTM A 1007.

214 **3.2.6 Torsion Test:** The torsion test shall be required for steel wires in
215 cables less than $\frac{3}{8}$ inch (9.5 mm) in diameter complying with ASTM A 1007. Torsional tests
216 shall be conducted in accordance with Section 9 of ASTM A 1007, and sample size shall be
217 a minimum of three specimens for each wire size of each cable construction. Each test
218 specimen shall satisfy the requirements set forth in Table 3 and Section 9.2 of ASTM A
219 1007.

220 **3.3 Fittings (Confirmatory Test):**

221 **3.3.1 Strength Test:** The purpose of this test is to verify the mechanical
222 properties of the fittings sought for recognition in an ICC-ES evaluation report, such as yield
223 strength, ultimate tensile strength, elongation, area reduction, and modulus of elasticity;

224 and to demonstrate that the fittings comply with requirements set forth in ASCE 19, and
225 applicable referenced standards. The test shall be conducted in accordance with Section
226 3.3.2. The conditions of acceptance are specified in Section 3.3.3.

227 **3.3.2 Test Procedure:** The proposed test procedure shall be based upon a
228 nationally recognized standard, such as ASTM E 8, and with necessary modification, so as
229 to simulate the intended fitting applications and to comply with ASCE 19. Sample size shall
230 be a minimum of five specimens for each fitting application, with consideration of factors
231 that influence performance. Fitting application factors that influence the load-carrying
232 capacity include the type or kind of fitting; mechanical properties; sizes/dimensions and
233 orientation of the fitting with respect to cable assembly; characteristics of interaction among
234 fittings, steel cables and attachments; and the method of fitting installation. Each
235 combination of these factors must be tested separately, unless the critical combination in a
236 proposed grouping can be established by tests. The report applicant shall submit the
237 proposed test procedure (including modifications for the intended applications) to the ICC-
238 ES for approval prior to the tests being conducted.

239 **3.3.3 Conditions of Acceptance:** Each tested fitting specimen shall
240 develop an ultimate tensile strength of at least 110 percent of the specified nominal cable
241 tensile strength, and the computed average stresses across the fitting body shall be less
242 than the yield stress of the fitting body under a static tension force equal to the specified
243 nominal strength of the cable to which the fitting is to be attached. If any of the specimens
244 does not comply with above conditions of acceptance, the fitting shall be considered
245 unqualified.

246 **3.4 SCFA (Qualification Test):**

247 **3.4.1 Tension Test:** The purpose of this test is to verify the structural
248 performance (strength and stiffness) of the steel cable and factory-attached fitting assembly
249 (SCFA); and to demonstrate that the SCFA complies with requirements set forth in ASCE
250 19, including Sections 3, 4, 5, 7 and 8, and applicable referenced standards. The test shall
251 be conducted in accordance with Section 3.4.2. The conditions of acceptance are specified
252 in Section 3.4.3.

253 **3.4.2 Test Procedure:** The proposed test procedure shall be based upon a
254 nationally recognized standard, such as ASTM E 8, and with necessary modifications, so
255 as to simulate the intended applications of each SCFA and to comply with ASCE 19. There
256 shall be a minimum of three specimens for each SCFA application, with consideration of
257 factors that influence performance, including different combinations of fittings, cables and
258 end loops or wrapping. Additional performance factors include extreme values of cable
259 sizes, orientation of the SCFAs with respect to the supporting structure and the braced
260 nonstructural component, and characteristics of interaction among fittings and steel cables
261 and end loops or wrapping. To simulate the typical field applications, the angle of the
262 connection of the test specimens (SCFAs) shall be varied at 30, 45, 60 and 90 degrees
263 from the vertical. The report applicant shall submit a test proposal to ICC-ES for approval
264 prior to testing. The proposal shall detail the test procedures, test specimen configurations,
265 and sample size of the SCFA test specimens.

266 **3.4.3 Conditions of Acceptance:** Each test specimen shall satisfy the
267 following requirements: The actual (measured) breaking force obtained shall be equal to or
268 greater than the specified minimum breaking force (specified nominal strength) of the
269 cable; break shall only occur within the cable; break shall not occur in the intermediate or

270 end fittings, nor in the cable end loops or wrapping. If any of the specimens does not
271 comply with the above conditions of acceptance, the corresponding test configuration of the
272 SCFA shall be considered unqualified.

273 **4.0 STRUCTURAL DESIGN**

274 **4.1 Design Strength:** The design strength of an SCFA, qualified in accordance
275 with Section 3.0 of this criteria, is equal to the design strength of the steel cable, defined in
276 Section 3.2 of ASCE 19, which is based on the specified nominal cable strength, defined in
277 Section 1.4.9 of this criteria. The horizontal component of the design strength of an SCFA
278 is equal to the design strength of the SCFA multiplied by the sine of the angle between the
279 cable longitudinal axis and the vertical direction. The structural design of SCFAs is based
280 upon load and resistance factor design (LRFD) identified in Sections 3.1 and 3.2 of ASCE
281 19 and Section 1602.1 of the IBC. Section 2207.2 of the IBC modifies the design
282 requirements set forth in Section 3.2 of the ASCE 19. The design and evaluation of
283 supports and attachments for nonstructural components shall comply with Chapter 13 of
284 ASCE 7 and shall consider their flexibility as well as their strength.

285 **4.2 Stiffness:** The stiffness of each SCFA shall be determined based upon test
286 data described in Section 3.0, and shall be included in the evaluation report as required by
287 Section 13.6.2 of the ASCE 7 for determining the component fundamental period and by
288 Section 13.2.4 of the ASCE 7 for flexibility of the CSSBAs.

289 **5.0 QUALITY CONTROL**

290 **5.1** Each component and the factory-fabricated assembly of the SCFAs shall be
291 manufactured under an approved quality control program with inspections by an inspection
292 agency accredited by the International Accreditation Service (IAS) or otherwise acceptable

293 to ICC-ES, with the exception that field fabrication such as field-cutting and crimping shall
294 be subject to special inspection as required by Sections 1704.13, 1705 and 1707 of the IBC
295 for field-fabricated components of all types of seismic bracing.

296 **5.2** Quality documentation complying with ICC-ES Acceptance Criteria for Quality
297 Documentation (AC10) shall be submitted for each manufacturing facility. The quality
298 documentation shall include procedures for ensuring performance characteristics of the
299 critical features of SCFAs, such as the tolerance for physical, chemical and mechanical
300 properties, acceptance test standards, fabrication geometrical tolerance, tools and gauges
301 for shop and field installations, shop and field installation instructions, and other aspects of
302 the controls on the production.

303 **6.0 EVALUATION REPORT RECOGNITION**

304 The following information shall be included in the evaluation report:

305 **6.1** Information described in Section 2.1.

306 **6.2** Structural design provisions described in Section 4.0.

307 **6.3 Seismic Design Criteria:**

308 **6.3.1 General Criteria:** The seismic design of CSSBAs must comply with
309 Sections 13.1 and 13.2 of ASCE 7, with the exception of Section 13.2.2, which is not within
310 of the scope of this criteria.

311 **6.3.2 Seismic Design Force:** The structural design must comply with
312 Section 13.3.1 of ASCE 7 for seismic design force requirements, including both horizontal
313 and vertical (upward and downward) seismic force components.

314 **6.3.3 Seismic Relative Displacement:** The structural design must comply
315 with Section 13.3.2 of ASCE 7 for seismic relative displacement requirements, as
316 applicable.

317 **6.3.4 Design Strength of a CSSBA:** The design strength of a CSSBA must
318 be the least of the following: (1) the design strength of the steel cable and fitting assembly
319 (SCFA), determined according to Section 4.1; (2) the design strength of its end
320 attachments and the design strength of the supporting structure, which are project-specific
321 and shall be designed by a registered design professional; or, when applicable, (3) the end
322 loops or wrapping, determined in accordance with Section 3.4.

323 **6.3.5 Requirements for Attachments:** The attachments, described in
324 Section 1.4.1, must comply with Section 13.4 of ASCE 7 and Section 6.3.4 of this criteria.
325 Consideration must be given to prying effects resulting from fitting geometry.

326 **6.3.6 Requirements for Nonstructural Components:** The architectural
327 components must comply with Section 13.5 of ASCE 7. The mechanical and electrical
328 components must comply with Section 13.6 of ASCE 7.

329 **6.3.7 Resistance to Vertical Earthquake-induced Forces:** The resistance
330 to net upward vertical earthquake-induced forces, if applicable, must be provided by
331 compression members that resist vertical (upward) movement, and that are designed in
332 accordance with applicable code and standards.

333 **6.4** The evaluation report must include a statement requiring special inspections as
334 noted in Sections 1704.13, 1705 and 1707 of the IBC, for field fabrication such as field-
335 cutting and crimping of all SCFAs.

336 **6.5** There must be a statement that the SCFAs are limited to resisting seismic
337 forces and controlling seismic force-induced sway (displacements) of nonstructural
338 components only.

339 **6.6** There must be a statement that when used as tension-only sway bracing for
340 fire protection automatic sprinkler system installed in accordance with IBC Section 903 and
341 NFPA 13, as referenced in Sections 13.6.8.2 and 13.6.8.3 of the ASCE 7, the SCFAs must
342 comply with the requirements set forth in Section 9.3.5.2.2 of NFPA 13.

343 **6.7** There must be a statement that the following items are beyond the scope of the
344 evaluation report: (1) attachments described in Section 1.4.1, with the exception of end
345 loops or wrapping of the SCFAs which are required to be qualified according to this criteria;
346 (2) the effects of elevated temperatures on the performance of SCFAs; (3) the effects of
347 fatigue on the performance of SCFAs; (4) use with vibrating equipment unless dynamic
348 loading on calculated stresses, fatigue, and deflections of the SCFAs are considered by the
349 registered design professional for the specific applications; (5) protection against sharp
350 resonant motions of nonstructural components, or shock loading; (6) outdoor applications
351 and necessary corrosion protections; (7) special certification requirements for designated
352 seismic systems required by Sections 13.2.2, 13.2.5 and 13.2.6 of ASCE 7; and (8) use as
353 rigid seismic sway bracings resisting tension and compression forces.

354 **6.8** Installation instructions shall state that the dead load of the nonstructural
355 components shall be supported independently of the SCFAs, and that the SCFAs shall only
356 be hand-tightened sufficiently to remove slack.■