ICC EVALUATION SERVICE®

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July 1, 2024

TO: **PARTIES INTERESTED IN THE ACCEPTANCE CRITERIA FOR MECHANICAL ANCHORS IN CONCRETE ELEMENTS**

SUBJECT: Proposed Revisions to the Acceptance Criteria for Mechanical Anchors In Concrete Elements, Subject AC193-0724-R1 (HS/MC)

Dear Colleague:

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

The proposed revisions to the criteria are based on ICC-ES staff recommendations, and are intended to provide clarification to the language approved by the Evaluation Committee in December 2007. ICC-ES staff has required calculations for normalization and calculation of the characteristic capacities using the specific equations noted in the proposed revisions to Section 9.4 since the criteria was updated in 2007. This language change is a clarification to what ICC-ES has used in practice since the 2007 revisions were approved to calculate the normalized characteristic shear strength. Only the pages containing revisions are included in the attached.

While the Evaluation Committee will be voting on the revised criteria during the 30-day 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 3996, or Manuel Chan, P.E., S.E., Principal Structural Engineer, at extension 3288. You may also reach us by e-mail at es@icc-es.org.

Yours very truly,

Howard Silverman P.E.
Director Anchors and Fastening

HS/ls

Encl.

cc: Evaluation Committee

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PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR MECHANICAL ANCHORS IN CONCRETE ELEMENTS

AC193

Proposed July 2024

Previously revised October 2017, October 2015, June 2012, March 2012, October 2011, June 2011, October 2010, February 2010, October 2009, February 2009, May 2008, February 2008, December 2007, June 2007, October 2006, June 2006, October 2005, June 2005, February 2004, October 2003, June 2003, April 2002

(Previously editorially revised April 2024, December 2020, April 2018, April 2015, April 2014, May 2013)

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.

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

9.4 Service-condition shear test for single anchors without spacing and edge effects (Table 4.1a (Table 4.1), Test 14, Table 4.1b (Table 4.2), Test 17, and Table 4.1d (Table 4.3), Test 12)

(9.4.1) *Purpose*—This test is performed to evaluate the shear capacity of anchors. Perform shear tests in uncracked low-strength concrete with a drill bit diameter d_m for all anchor diameters at minimum embedment h_{ef}. At the option of the manufacturer, additional tests shall be permitted to be performed at deeper embedments. Normalize results in accordance with Appendix A1 Equation A1.2 for concrete failure modes or Equation A1.4 for steel failure modes, and calculate V_{sat} using Appendix A2 Equation A2.2 for all test failure modes. Normalized ~~C~~characteristic shear capacities V_{sat} obtained shall be reported in Tables 11.1, where the values are less than those obtained from ACI 318, Appendix D.6.1.2(b) Equation (D-20) [2009 IBC] or Equation (D-29) [2012 IBC],Section 17.5.1.2 Equation (17.5.1.2b) [ACI 318-14] or Section 17.7.1.2 Equation (17.7.1.2b) [ACI 318-19], as applicable.

Exception: For anchors qualified exclusively for redundant applications, refer to section 9.4.3

(9.4.2) For anchors evaluated according to Table 4.2 in cracked concrete, shear tests shall be performed in cracked concrete with a crack width of 0.012 in. (0.3 mm) with the load applied parallel to the crack. Normalize results in accordance with Appendix A1 Equation A1.2 for concrete failure modes or Equation A1.4 for steel failure modes, and calculate V_{sat} using Appendix A2 Equation A2.2 for all test failure modes. Normalized ~~C~~characteristic shear capacities V_{sat} obtained shall be reported in Table 11.2, where the values are less than those obtained from ACI 318, Appendix D.6.1.2 (b) Equation (D-20) [2009 IBC] or Equation (D-29) [2012 IBC], Section 17.5.1.2 Equation (17.5.1.2b) [ACI 318-14] or Section 17.7.1.2 Equation (17.7.1.2b) [ACI 318-19], as applicable.

Exception: For anchors qualified exclusively for redundant applications, refer to section 9.4.3

9.4.3 For anchors qualified exclusively for redundant applications, test according to Table 4.1d (Table 4.3), Test 12 in cracked concrete. Shear tests shall be performed in cracked concrete with a crack width of 0.008 in. (0.2 mm) with the load applied parallel to the crack. Characteristic shear capacities, V_{ra} obtained shall be reported in Table 5.5.2c (Table 11.3).

(9.5) Service-condition, simulated seismic tension tests (Table 4.2, Test 18)

(9.5.1) *Purpose*—These optional tests are intended to evaluate performance of anchors, subjected to seismic tension loads including effects of concrete cracking. If these seismic tests are performed, they shall only be acceptable as part of the total cracked concrete test program of Table 4.2.

9.5.2 Test each anchor diameter at embedments as specified in Table 4.1c (Table 5.7). Install the anchor in a closed crack in accordance with Section 5.4.1. If no torque is specified by the manufacturer, finger-tighten the anchor prior to testing. Test internally threaded anchors with the bolt specified by the manufacturer and report the bolt type in Table 5.5.2b (Table 11.2). Open the crack by Δw = 0.020 in. (0.5 mm) where Δw is additive to the initial (hairline) crack width. Subject the anchors to the sinusoidal tension loads specified in Table 9.5.2 (Table 9.1) and Fig. 9.5.2 (Fig. 9.1) with a cycling frequency between 0.1 and 2 Hz, whereby N_{eq}, N_m, and N_i are as follows:

$$N_{eq} = 0.5F_{u,test,3}\sqrt{\frac{f_{c,test,18}}{f_{c,test,3}}} \qquad \text{(9.5.2 (9-1))}$$

where:

$F_{u,test,3}$ = mean tension capacity in cracked concrete from reference tests (Table 4.1b (Table 4.2), Test 3);
$f_{c,test,18}$ = measured compressive strength of the concrete used for the simulated seismic tension tests (Table 4.1b (Table 4.2), Test 18);
$f_{c,test,3}$ = measured compressive strength of the concrete used for the reference tests (Table 4.1b (Table 4.2), Test 3).
N_m = 0.5 N_{eq}
N_i = (N_{eq} + N_m) / 2

(Record the crack width, anchor displacement and applied tension load in accordance with Section 5.4.3.)

Following completion of the simulated seismic-tension cycles, open the crack to a width not less than the crack opening width as measured at the end of the cyclic test and load the anchor in tension to failure. Record the maximum tension load (residual tension capacity), the corresponding displacement, and plot the load-displacement response. If the anchor fails before completing the number of cycles required in Table 9.5.2 (Table 9.1), record the number of cycles and load at failure.