

Reason:

The “Alternate materials, design and methods of construction and equipment” under Section 104.11 of the building code has been slightly revised 4 times since introduced in the 1927 UBC and then more substantively revised in the 2015 IBC and IRC where a last sentence to 104.11 was added stating “Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved.” This code change proposal represents a second substantial change to 104.11 under the “duties and power of the building official.”

No two jurisdictions in the United States interpret and use the alternate materials, design and methods of construction and equipment section of the code in quite the same way. Various jurisdictions believe in a high level of scrutiny on materials or assemblies which manifests into government agencies, extra tests, and fees. Others will accept reports provided by third party report providers such as ICC-ES, IAPMO UES, and others. Lastly, some do not require materials or assemblies reports at all and believe that the engineer is ultimately responsible and thus do not exercise their authority to review the materials or assemblies. The only universal issue among all building officials is that they have limited resources posing challenges to fully and properly evaluating materials or assemblies as the code requires and intends.

Advocates of proprietary materials or assemblies understand the requirements in each code and approval process and, when successful, navigate the process to properly meet code intent and build industry confidence in their product or system. Third party reviewers are often driven by their desire to give each product or system a fair and thorough evaluation and regularly produce reports which help to safe guard public safety. This is a process which has been time tested, and proves to provide a reasonable balance of innovation and public safety.

Several recent changes have created a need to respond immediately in order to keep the process moving forward as intended. As the referenced standards continue to be more detailed and onerous for materials or assemblies in high seismic zones, and since the IBC is now adopted throughout the US, different acceptance standards are appropriate. As the building code and the referenced standards expand and become more complex each cycle, the necessary time and expertise to evaluate materials or assemblies greatly increases. The financial pressures on governments continue to allow for less and less time for review thus providing a significant challenge to exercise the powers provided to them under the code. The competition between third party reviewing agencies in an open market may breed various concerning issues such as cutting corners to reduce review schedule, more reliance on advocate’s data, unclear and unpublished acceptance criteria, and an acceptance criteria based on individual opinion versus vetted consensus opinion. Please see SEAOC Blue Book article “An Evaluation of Current practices Related to the Development and Implementation of Acceptance Criteria and Product Evaluation Reports, October 2011” for further background information.

The solution to these issues is not easy to formulate and even more difficult to put into code language. However, the following tenants will help to guide the code change proposal below.

Comment [TVD1]: Change to Inductive reasoning and put the best reason first. The history is not a reason, only context.

Building officials need a code tool to push back on structural systems that come in as alternates but lack testing or consensus outside the proponent.

Comment [TVD2]: What changes
Comment [TVD3]: Why immediately? Its not evident from the points made below.

Comment [TVD4]: Coupled with increased regulatory burdens
Comment [TVD5]: Is this directed at 3rd party plan review? In this case, its usually the other way around with complaints that the consultant is paid by the correction.

Comment [TVD6]: What issues? Its not clear

1) Develop a process in which the building official has a choice and is guided when to provide approval based on methods similar to what is currently in place or when to require a more "rigorous" path of approval.

Comment [SJ7]: As written below, the building official does not have much choice.

2) Subject matter experts shall be available and routinely called upon to provide input and product, system or design methodology evaluation. This is to provide the building official the sorely required resource support in evaluation given the ever changing codes and referenced standards.

3) When the more "rigorous" path of approval is triggered, the burden of review on the building official will be less.

Comment [SJ8]: However, the process of managing peer reviews and the attendant contracts is not a picnic—and who pays for the peer reviews and how is a big question.

4) Provide a minimum set of standards for those entities who wish to provide product, system, or design methodology evaluation services which will result in a clear, consistent and transparent process enforceable by law which shall provide the proper balance of innovation and public safety.

Code change:

104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material 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 Section 101.3, 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. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved.

For an alternative:

1: the building official shall have the authority to require a project specific *peer review*, a research report, or an evaluation report by an *evaluation report provider* for products and systems in the gravity load path or lateral load path in Seismic Design Category A through B.

2: the building official shall require either a project specific *peer review* or an evaluation report by an *evaluation report provider* for products or systems in lateral load path for Seismic Design Category C through F.

104.11.1 Research reports. Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved sources*.

104.11.2 Evaluation reports. Supporting data shall consist of an evaluation report which shall be written by an *evaluation report provider* and submitted to the *building official* in support of materials or assemblies not specifically provided for in this code. A peer review shall be performed to review the acceptance criteria and evaluation report. The *acceptance criteria and evaluation report* used on the project shall be retained by the *building official* for the period required for retention of public records.

- Comment [TVD9]:** What if criteria was already developed by a consensus per 11.1 above?
- Comment [SJ10]:** This is going to be a problem for many building officials, and there is likely to be significant push back.
- Comment [SJ11]:** Not necessary. This is covered by other laws.

104.11.3 Tests. Whenever there is insufficient evidence of compliance with the provisions of this code, or evidence that a material, *design* or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials, *design* or methods, the *building official* shall have the authority to require tests as evidence of compliance to be made at no expense to the jurisdiction. Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the *building official* shall approve the testing procedures. Tests shall be performed by an *approved agency*. Reports of such tests shall be retained by the *building official* for the period required for retention of public records.

Section 202: DEFINITIONS

[A] ACCEPTANCE CRITERIA. An agreed upon written set of conditions or characteristics that must be present in order for an alternative material, design or method to pass evaluation and become *approved*.

[A] APPROVED. Acceptable to the *building official* or authority of jurisdiction.

[A] APPROVED AGENCY. An established and recognized agency regularly engaged in conducting test or furnishing inspection, or evaluation services, when such agency has been *approved*.

APPROVED SOURCE. An independent person, firm or *corporation*, *approved* by the *building official*, who is competent and experienced in the application of engineering principals to materials, methods or systems of analyses.

[A] EVALUATION REPORT PROVIDER. An *approved agency* regularly engaged in evaluating materials or assemblies in accordance with the code and referenced standards, when such agency has been *approved*. The agency shall:

- a) Use a public and transparent consensus process to develop acceptance criteria with a minimum of a 30 calendar day public comment period.
- b) Maintain data confidentiality and provide impartiality and confidence during the evaluation report development process.
- c) Publically available test set up and procedures used to evaluate alternative solution.
- d) Employ subject matter experts whom are qualified to provide code intended evaluation
- e) Provide and maintain access to the complete final evaluation of the supporting data as compared to the acceptance criteria

- f) Ensure results are comparable and reproducible.
- g) Establish protocols for resolving complaints, surveillance and non-conformity.

PEER REVIEW. Peer review shall consist of an independent team of subject-matter-experts regarding the product or system for which they are providing a review. The team shall be approved by the *building official* and consist of registered design professionals in the appropriate disciplines and others recognized as industry experts.

Commentary:

104.11

An alternative Seismic Force-Resisting System is one which is not specifically defined in Table 12.2-1 of ASCE 7 and may also involve an alternate design method. For Seismic Design Categories A and B, the process is essentially unchanged from previous provisions with the exception that introduction of an Evaluation Report is added as an option. For remaining categories, the proponent is required to have either a project specific peer review or have an Evaluation Report. This is to ensure that subject matter experts, which may not be available to the building official, are involved in the vetting an alternate component or system in these higher regions of seismicity.

104.11.2 Use of an alternative seismic force-resisting system other than prescribed by this code or the referenced standards should be accepted only when tests do not result in an increase in the conditional probability of collapse given MCE_R ground shaking. The effect of the use of the alternative system should further consider the following: effects of differences in hysteretic characteristics of both the code prescribed and alternative system, demonstrated by laboratory testing; the type of failure of the alternative system; uncertainties associated with laboratory test data for the code prescribed and alternative system; the repeatability of laboratory test results in production of alternative systems; and the statistical adequacy of the available laboratory testing database.

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[A] APPROVED AGENCY. Approval of an inspection agency should be based on fulfilling requirements similar to ISO 17020, a testing company should be based on fulfilling requirements similar to ISO 17025, and a evaluation provider should be based on fulfilling requirements similar to ISO 17065. Agencies should also comply with requirements similar to Section 1703, where applicable. Compliance can be shown through accreditation by accreditation body operating in accordance with ISO 17011

Comment [SJ12]: Remove requirements from the definition. The requirements can be written into Chapter 1 text.

Comment [SJ13]: Remove requirements from the definition. The requirements can be written into Chapter 1 text. Note that as written, this will be viewed as very restrictive requirement ("and...industry experts.")

Comment [SJ14]: The I-Codes do not deal with commentary in the same way as other standards such as ASCE 7. The commentary is not part of the approval/governmental consensus process. These comments can be written into the reason statement for the code change, possibly with a suggestion that they appear in the IBC Commentary, but that's something ICC Staff decides.