

04/20

# TECHNICAL BULLETIN 9

## DuraFuse Frames Code Approval IAPMO UES ER 610

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**Abstract:** Third-party code-approval reports are an important component of regulatory compliance in the construction industry, enabling innovation, problem solving and competitiveness. Their use is widespread in the realm of proprietary connection system and seismic technology, assuring compliance or equivalency with the governing building codes, such as IBC or CBC, or referenced standards, such as ANSI/AISC 341 or ANSI/AISC 360. DuraFuse Frames technology is covered by the IAPMO UES ER 610.

### Introduction

Innovation in construction industry is dynamic. Emergence of new building products and methods, including those in the realm of seismic design, is virtually an everyday occurrence. The consensus process governing implementation of such products and methods into building codes and referenced standards, however, takes many years within the current cyclical framework governing the development of building codes and design standards, such as ANSI/AISC 341, ANSI/AISC 358, ACI 318, etc.

To accommodate this process so as to enable innovation and economical alternatives, Sec. 104.11 of IBC and CBC provide a path for implementation of alternative construction methods, components or materials that they do not address either directly or through referenced standards, and they do not otherwise explicitly disqualify. IBC/CBC Sec. 104.11 states the following:

“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 the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than 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*.”

IBC/CBC Sec. 202 further defines “approved” as “acceptable to the building official.” A very common vehicle of achieving acceptance from the building official and utilizing the path of IBC/CBC Sec. 104.11 is to obtain an evaluation report (ER) from a third-party agency (Fig. 1). ER is also known as evaluation service report (ESR) or product evaluation report (PER), depending on the reviewing agency, often colloquially termed as “code approval.” Agencies issuing and maintaining ERs will commonly comply with the requirements of IBC/CBC Sec. 1703.1 relative to their ability to independently and competently assess a particular alternative, though it is the prerogative of the building official to deem an agency and the resulting evaluation report. Some of the third-party agencies commonly seen in the industry include, among others, IAPMO UES, ICC-ES, Intertek and UL.

### About IAPMO UES

DuraFuse Frames uses IAPMO UES as its third-party evaluation agency for its code approval IAPMO UES ER 610. IAPMO is a not-for-profit model code organization based in Ontario, California, with its history spanning back to 1926. Its subsidiary, Uniform Evaluation Service (UES) is an ANSI accredited entity, meeting the requirements of ISO/IEC 17065. Where the alternative covered by the ER is based on test data, IAPMO UES assures that

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the test results used to substantiate the code approval were generated in accordance with ISO/IEC 17025.

The resulting ER (Fig. 1) is a technical document outlining the scope of the proposed alternative, be it a product, material or a methodology with the statement of building codes and standards, along with the corresponding editions, for which the alternative was evaluated. Furthermore, an ER stipulates marking requirements (Fig. 2), identifies the product and the manufacturing facility, stipulates the required quality control measures, outlines responsibilities, and lists the sources of evidence upon which the approval is based. ER is developed on a previously developed evaluation criteria (EC), subject to public review and a stringent oversight by the Evaluation Services Committee (ECS) which is composed of Chief Building Officials and other external authorities with extensive inspection and technical experience. The approval of ER itself is subject to a detailed and stringent review by a technical committee and often by prominent external subject area experts.

## Highlights of DuraFuse Frames IAPMO UES ER 610

Updated to the current building codes covering all relevant jurisdiction, UES ER 610 is approved for the use in conjunction with 2018 IBC, 2019 CBC and 2020 LABC. Its use is commensurate with ANSI/AISC 341-10/16 as an approved alternative to the pre-qualified IMF/SMF listed in ANSI/AISC 358. UES ER 610 lists a number of important qualification limits, greatly expanding upon those characteristic for some of the traditional systems listed in ANSI/AISC 358, including SMF beam aspect ratio requirements, bracing requirements, and member compactness limits.

Enforcement agencies, product and service users and other interested parties with questions about IAPMO UES ER 610 may contact DuraFuse Frames, LLC, or IAPMO UES at 1 (909) 230-5533.



**EVALUATION REPORT**

Originally Issued: 03/18/2019    Revised: 05/05/2020    Valid Through: 03/31/2021

Number: **610**

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**DuraFuse Frames Technology**

CSI Section:  
 05 12 00 Structural Steel Framing

**1.0 RECOGNITION**

The DuraFuse Frames Technology recognized in this report has been evaluated for use as beam-to-column connections with Special Moment Frames (SMF) and Intermediate Moment Frames (IMF). The structural performance of the DuraFuse Frames Technology complies with the intent of the provisions of the following codes and regulations:

- 2018, 2015, and 2012 International Building Code® (IBC)
- 2019 California Building Code (CBC) – Attached Supplement
- 2020 Los Angeles Building Code (LABC) – Attached Supplement

**2.0 LIMITATIONS**

Use of DuraFuse Frames Technology recognized in this report is subject to the following limitations:

**2.1** All connections and details of DuraFuse Frames shall be designed by a registered design professional working on behalf of DuraFuse Frames and the design documents shall be submitted to a project registered design professional (engineer of record) for acceptance and to the building official for approval as described in Section 3.2.10 of this report.

**2.2** Structural design drawings and specifications, shop drawings, and erection drawings shall comply with Section 1603 of the 2018, 2015, and 2012 IBC, Sections A4 and I1 of AISC 341-10 or AISC 341-16 and Section A4 of AISC 360-10 or AISC 360-16.

**2.3** Fabrication of the DuraFuse Frames assemblies shall comply with Section 3.3 of this report and with approved construction drawings specified by DuraFuse Frames, LLC, as “DuraFuse General Notes”, and shall be performed on the premises of a fabricator registered and approved by the building official in accordance with Section 1704.2.5.1 of the 2018 IBC (1704.2.5.1 of the 2015 IBC; 1704.2.5.2 of the 2012 IBC) or as specified in Section 3.1 of this report.

**2.4** Erection shall comply with Section 3.4 of this report and the approved construction drawings prepared by a registered design professional and specified by DuraFuse Frames, LLC as “DuraFuse General Notes”.

**2.5** Quality control and quality assurance shall comply with Section 3.5 of this report and approved construction drawings specified by DuraFuse Frames, LLC as “DuraFuse General Notes”.

**3.0 PRODUCT USE**

**3.1 General:** DuraFuse Frames Technology complies with Chapter 22 of the 2018, 2015, and 2012 IBC and Sections E2, E3, and K2 of AISC 341-10 and AISC 341-16. The DuraFuse Frames connection is prequalified for use in Special Moment Frame (SMF) and Intermediate Moment Frame (IMF) systems within the limits stated in Sections 3.2.2 through 3.2.8 of this report.

With DuraFuse Frames Technology, the beam is connected to the column via plates and bars. The column has cover plates on each side that are fillet welded to the column flanges (Figure 1 of this report). Four bars that extend past the face of the column are fillet welded to the column cover plates. The column has a shear tab, with horizontal slotted holes, that is fillet welded to the column face. The beam web, with standard holes, is attached to the shear tab with tensioned bolts. The beam flanges are attached to the bars via top plates and a base plate (Figure 1 of this report). The beam flanges and bars have standard holes, while the top and bottom plates have oversized holes. The bottom plate functions as a structural fuse, and is proportioned such that certain regions of the plate experience shear yielding when the connection is subjected to severe earthquake loading. The bottom plate is bolted in place, so that it could be removed and replaced following a severe earthquake. The top plates are intended to experience minimal yielding, such that they would not require repair following a severe earthquake. The various plates and bars in the connection are proportioned such that yielding does not occur in the column or beam.

Figure 2(a)-(c) illustrates the connection geometry for biaxial configurations with built-up flanged cruciform sections. Figure 2(d)-(f) illustrates the connection geometry for biaxial configurations with HSS or built-up box columns. HSS or box columns may be filled with concrete if needed.

**3.2 Design:**

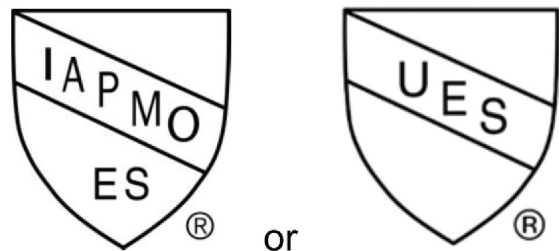
**3.2.1 General:** The design of the structural steel seismic force-resisting systems shall comply with Chapter 22 of the 2018, 2015, or 2012 IBC. The SMF or IMF shall be designed and detailed in accordance with the specific

The product described in this Uniform Evaluation Service (UES) Report has been evaluated as an alternative material, design or method of construction in order to satisfy and comply with the intent of the provisions of the code, as noted in this report, and for all other applicable codes in quality, strength, effectiveness, the resistance, durability and safety, as applicable, in accordance with IBC Section 104.11. This document shall only be reproduced in its entirety.

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Fig. 1 DuraFuse Frames Evaluations Report (IAPMO UES ER 610)



## IAPMO UES ER-610

Fig. 2 IAPMO UES ER Product Marking

