COFFMAN ENGINEERS

ENGINEERING JUDGMENTS

Commonly Asked Questions

This paper focuses on the application of Engineering Judgments on OSHPD projects, however, the fundamental principles of this paper can be applied across varying projects and jurisdictions. Always check with your respective Authority Having Jurisdiction when you may think an Engineering Judgment might be necessary for compliance.

Healthcare facilities in California often include a high degree of fire-resistance rated construction as part of a defend-in-place life safety strategy. When combined with complex building systems and innovative new technologies, providing tested fire-rated construction assemblies becomes increasingly difficult. This often results in the use of Engineering Judgments (EJs) to address construction conditions that deviate from tested and listed fire-resistant assemblies. EJs are most often used to save time and money for a project, while achieving the level of safety required by the building code.

While EJs can be useful for all building types and jurisdictions, this paper focuses on recent Office of Statewide Health Planning and Development (OSHPD) efforts to streamline the process. OSHPD has recently issued a Code Application Notice (CAN) 2-703.3 to establish guidelines for the preparation, submittal, and review of EJs submitted to their agency. This is intended to establish a standardized evaluation of EJ to create a benchmark for the technical development of this form of code compliance.

1 What is an Engineering Judgment (EJ)?

The prescriptive requirements of the building code include numerous methods of compliance for fire-resistance rated construction. While compliance is most often achieved through the use of a tested, listed assembly, the code also permits an "engineering analysis," whereby a qualified individual is permitted to submit technical justification that a proposed condition satisfies the level of safety intended by the code. This justification forms the basis for an Engineering Judgment, used to demonstrate that a proposed condition is considered to be code-compliant.

The building code also provides requirements for where fire-resistant assemblies must be constructed, as well as the test standards used to substantiate assembly performance. Assemblies that are tested in conformance with these standards are listed by approved agencies such as UL, ASTM, and NFPA, and considered to be suitable for the performance ratings specified in their listings, where the ratings are based on fire test results.

Examples of common fire-resistance rated building elements and applicable code sections and test standards are shown below.

Building Element	Applicable Code Section	Applicable Test Standard
Primary and secondary structural framing and wall and floor assemblies	CBC Table 601 & Table 602	ASTM E119 / UL 263
Penetrations through fire-resistance rated assemblies	CBC Section 714	ASTM E814 / UL 1479
Joints between fire-resistance rated assemblies	CBC Section 715	ASTM E1966 / UL 2079
Void between an exterior curtain wall and fire-resistance rated floor	CBC Section 715	ASTM E2307 / UL 2079

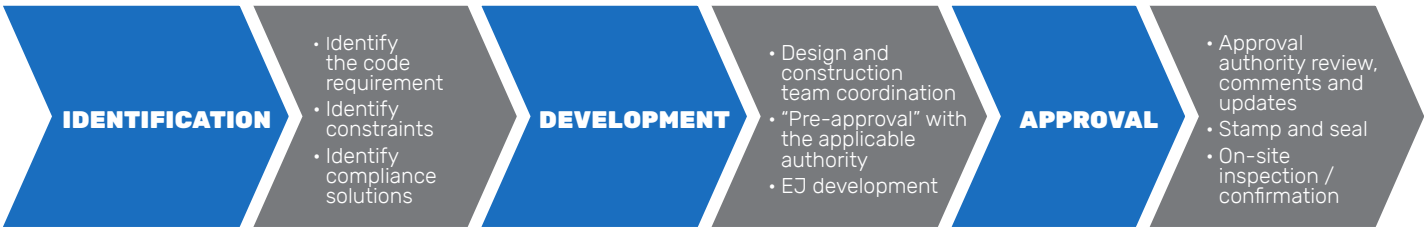
COMMONLY ASKED QUESTIONS continued...

Where listed assemblies are not available due to unique construction conditions or other constraints, an Engineering Judgment may be prepared to justify the proposed design will achieve an equivalent level of safety to that required by the applicable codes, if it were tested. The EJ is commonly developed in concert with, and sealed by, a licensed Fire Protection Engineer (FPE) to certify that the technical performance of the proposed assembly is considered to achieve the code requirements and intended level of safety.

The development of an Engineering Judgment includes:

- Identification of a listed fire-resistance assembly serving as a referenced design basis,
- Identification of how the proposed EJ design deviates from the listed reference assembly,
- Justification of the proposed EJ design through a comparative engineering analysis of other listed assemblies,
- Published literature on fire-resistance rated assemblies, and
- Fire protection engineering principles.

PATH TO COMPLIANCE



2 In which situations might an EJ be required?

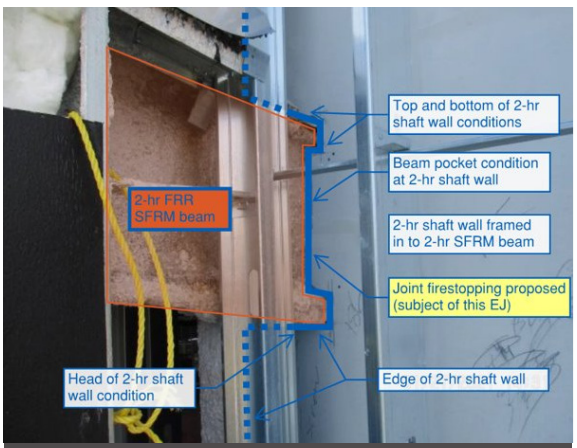
An EJ may be required under a number of conditions in which a listed assembly is not available or feasible. Some common situations include the following:

- Where aspects of the building design deviate from traditional construction methods and materials.
- Field conditions prohibit installation of the assembly in conformance with all parts of its listing.
- Challenges in the field lead to installations that do not match the originally intended system.
- The design uses new and innovative materials or assemblies.
- Unique conditions where there are no listed systems available.

Common of a building where EJs could be necessary include:

- Fire-resistance rated structural elements.
- Fire-resistance rated wall assemblies and horizontal assemblies.
- Penetrations through fire-resistance rated walls by ducts, conduit, pipes, structural elements, etc.
- Joints between fire-resistance rated construction, including the following joints: wall-to-wall, head-of-wall, bottom-of-wall, wall-to-column, floor-to-floor, etc.
- Edge-of-slab conditions at the intersection of an exterior curtain wall and floor assembly.
- Exterior wall assemblies that must comply with NFPA 285.
- Terminations of fire-resistance rated walls at an exterior curtain wall.

Where tested, listed assemblies are available for a specific condition, OSHPD has traditionally prohibited substitution of an EJ detail for an available listed assembly. Where a UL-listed firestopping assembly exists for a specific condition and uses the firestopping materials from a certain manufacturer, OSHPD traditionally does not permit substitution of the firestopping material from a different manufacturer, even when submitted as an Engineering Judgment.



Example of a condition where an EJ was required.

COMMONLY ASKED QUESTIONS continued...

3 At which point during a project are EJs prepared?

The code does not explicitly specify when EJs shall be developed and submitted. EJs are commonly developed during the construction phase when unique conditions for fire-resistant rated construction are identified by the IOR and OSHPD FLSO.

However, EJs provide the greatest value to a project when they are pursued as part of the permit-review process. This requires that practical difficulties for explicit compliance are identified in advance, often as part of design and construction reviews with the architect, contractor, and fire protection engineering for the project.

When approved EJ conditions arise in the field, the Contractor can proceed with installation of the approved EJ detail without interruption. This prevents costly delays where conditions might have to be vetted and resolved with the OSHPD FLSO, IOR, and project team prior to commencing with the work.

4 Which ratings need to be addressed in the EJ?

Code-compliance ratings for fire-resistant joint and penetration firestop systems are driven by the type of fire-resistant assembly the joint or penetration system is a part of. Common ratings used to evaluate assembly performance include the following:

F-ratings: An F-rating corresponds to the ability of a fire-resistant joint assembly or through-penetration firestop system to resist the passage of fire. F-ratings are required for penetration firestop systems, fire-resistant joint systems, and edge of slab conditions.

T-ratings: A T-rating corresponds to the ability of penetration firestop system to resist temperature transmission from the fire exposed side of the assembly to the unexposed side of the assembly. T-ratings are required by the building code for most floor penetrations, where the penetration is not contained within a wall cavity either above or below the floor assembly. This is intended to prevent excessive temperature increase on a surface that could impact life safety, such as a walking surface.

L-ratings: An L-rating corresponds to the ability of an assembly to limit air leakage. L-ratings are required for penetrations and joints of smoke barriers. In hospitals, floor assemblies are also defined as smoke barriers to limit the spread of smoke and hot gasses. Accordingly, edge of slab conditions, joints, and penetrations of the floor assembly also require an L-rating.

M-ratings: An M-rating corresponds to the ability of an assembly to accommodate movement, oftentimes due to the potential for seismic activity. An M-rating may be relevant in regions such as Southern California, a high-seismic zone where facilities such as hospitals require a high level of operational-resiliency in a post-earthquake event. An M-rating provides quantifiable metrics that establishes deflection limits for which the assembly is considered to maintain the required level of fire performance.

5 What information is required as part of the EJ?

OSHPD CAN 2-703.3 requires all EJs to be in a narrative format that clearly describes the following:

- Reason for the EJ
- All aspects of the design, including but not limited to:
  - The F-, T-, and L-ratings required,
  - A complete description of all critical elements of the fire-resistive system configuration, and
  - Any non-standard conditions.
- Clear directions for installation of the recommended system and fire-resistive design(s) that the EJ is based on.
- Detailed drawings to clearly illustrate the assembly and where it occurs.
- The EJ shall clearly state the recommended system is an EJ and is NOT a listed system.

COMMONLY ASKED QUESTIONS continued...

- The EJ shall indicate project information, including:
  - Facility name,
  - Address,
  - Title of project, and
  - OSHPD project number.
- The EJ shall indicate contact information, including:
  - Issuer's name,
  - Title,
  - Address,
  - Telephone number, and
  - Signature.

6 Is an Alternate Means of Compliance (AMC) required when submitting EJs?

OSHPD CAN 2-703.3 indicates that AMC's are required where the EJ does not utilize an engineering analysis based on a comparison with the fire-resistance ratings in ASTM E119 / UL 263 (CBC 703.3 Item 4), the required test standard for structural framing elements such as walls, floors, and columns.

Accordingly, an AMC is considered to be required for fire-resistance rated elements that are not in compliance with ASTM E119 / UL 263. This most often includes fire-resistive joint, penetration, and edge-of-slab assemblies, which are tested to ASTM 1966 / UL 2079, ASTM E814 / UL 1479 and ASTM E2307, respectively.

7 How many EJs and/or AMCs are required?

The number of EJs required for a building may vary based on the needs and conditions of the specific project, often related to the size and complexity of a project. OSHPD CAN 2-703.3 requires that EJs be developed for a single specific condition and configuration, and shall not be used on a project-by-project basis. While many projects utilize tens of EJs during the design phases, Coffman has worked on hospital projects with more than 60 EJs that were developed, reviewed and approved prior to construction, to streamline the installation and inspection process.

Additionally, Coffman have also supported hospital projects that did not pursue EJs in the design phase and decided to deal with unique conditions as they arose during the construction phase. In many cases, the general contractor, installing contractor, firestopping manufacturer, and fire protection engineer drive the process with respect to the quantity, timing, and type of EJs requested on a particular job.

The number of AMCs that are required is determined with OSHPD. Generally, OSHPD requires each EJ for non-building elements to be submitted under a unique AMC. Where a project may have a significant number of EJs and the EJs can be grouped together into categories, the project team can collaborate with OSHPD to group multiple EJs together as part of the same AMC.

Examples of EJ-grouped categories include the following:

- Wall membrane penetration firestopping,
- Wall through-penetration firestopping,
- Head-of-wall conditions,
- Wall terminations at an exterior curtain wall, and
- Edge of slab conditions.

7 Who can prepare EJs?

OSHPD CAN 2-703.3 specifies that EJs can be prepared by the following parties:

- A firestop manufacturer's qualified technical personnel,
- A registered Professional Engineer or Fire Protection Engineer in coordination with the manufacturer, or

COMMONLY ASKED QUESTIONS continued...

- An independent testing agency that provides listing services for firestop systems.

The EJ preparer should be knowledgeable regarding the elements of the construction to be protected, probable behavior of that construction, and the recommended system protecting it.

Coffman Engineers has extensive experience in evaluating and preparing Engineering Judgments for fire-resistance rated construction. Our specialized fire protection engineers have unique insights into structural framing and assembly performance. They provide valuable contributions that build confidence for the design team and approval authorities alike.

Given our strong relationship with OSHPD and long history of delivering successful EJs, Coffman is positioned to contribute schedule and cost-savings and alleviate approval risks and delays for a wide variety of projects.

For more information or to speak to a Coffman engineer, contact Steven Dannaway, PE, or Robert Gerard, PE. You can also visit our website at www.coffman.com.

CONTACT US

STEVEN DANNAWAY, PE
Operations Manager, DBIA

steven.dannaway@coffman.com

Coffman Engineers
626 Wilshire Boulevard, Suite 1010
Los Angeles, CA 90017

(818) 698-8448

ROBERT GERARD, PE
Senior Engineer, Fire Protection Engineering

robert.gerard@coffman.com

Coffman Engineers
1455 Frazee Road, Suite 600
San Diego, CA 92108

(619) 232-4673