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Structural Observation

*Confirming Your Intentions
and the Interpretation by
Others*

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There are three aspects of field Quality Assurance for construction projects: Inspection by the Building Official, Special Inspection by the owner's special inspection agency, and Structural Observation performed by the Engineer of Record (EOR) or his/her designee. All three of these functions are important and non-redundant. As the scale and complexity of a project increases, the more important it becomes that all three functions are provided.

By definition, the Building Official is charged with the administration and enforcement of the building code. As part of their responsibility, they will make various inspections related to foundations, floor slabs, and framing (usually wood) in addition to other non-structural inspections as defined in Chapter 1 Section 110 of the *International Building Code* (IBC). The Building Official's inspections are not for the purpose of counting reinforcing bars or

confirming weld sizes, but rather are more concerned about the overall compliance of the work

with, and as required by, the Building Code. Many Building Officials delegate or rely on other professionals (the EOR) and inspectors (the Special Inspector) to provide confirmation that the completed structure is in compliance with the building code and approved construction drawings.

Special Inspection is a detailed inspection of individual members, components, and framing systems assembled by the contractor using the approved construction drawings as a reference. The Special Inspector is a qualified person who has knowledge and expertise that will ensure that the constructed items conform to the construction drawings. The Special Inspector is limited to interpreting the drawings and is testing and inspecting only those items specified in the Statement of Special Inspections. Further, the Special Inspector provides detailed verification of the quality, quantity, and placement of critical structural elements such as structural materials, fasteners, reinforcement, welds, and more.

Structural Observation is defined in the IBC as the visual observation of the structural system by a Registered Design Professional (the EOR) for general conformance with the construction documents. More importantly, this is the opportunity for the EOR to determine

the conformance of the construction with the structural design intent, bridging the gap left between the Building Official's responsibility for conformance with the building code and the Special Inspectors more focused attention on the elements of the structure. The structural observer would be looking for continuity of load path, conformance to structural details, appropriate usage of typical details, and arrangement of reinforcing, anchors, and connections, all with the benefit of the understanding of the engineering behind the design.

The requirement for situational structural observation has been in the IBC from its inception, as well as in the previous model building codes. Section 1704.6 of the 2015 IBC code requires a registered design professional, typically the EOR or an appropriate designee, to perform structural observation only in high wind or seismic loading situations. Structural observation is not mandated by code for any other conditions regardless of structure size, height, use, or occupancy. For example, a high-rise building in New York City does not require structural observation, while it would be required for a two-story office building in San Francisco.

Many engineers believe that structural observation is warranted in many structures beyond those in high seismic or wind situations. Having the engineer who is familiar with the structural design look at the construction, in addition to the special inspectors, is beneficial for any structure, especially large, tall, high occupancy, or other important facilities. Many reputable engineering firms realize that it is in their best interest, as well as the owner's, to have a larger presence at the construction site. They promote the observation of the structure by their staff, regardless of the code requirements. The engineer who designed the structure can often find issues that may not be recognized by the contractor or the inspectors.

In 2016, the Structural Engineers Association of Northern California published *Guidelines for*



Special Inspection and Structural Observation in Accordance with the 2013 California Building Code. This document provides an excellent overview of both inspection and observation, and includes the following explanation:

Structural Observation focuses on the building's structural system, rather than on the use of particular materials or processes. It is typically performed by the engineer-of-record, is non-continuous, and uses visual means only to determine if the construction is in general conformance with the intent of the plans and specifications. In contrast, special inspections are comprehensive, systematic, and detailed, with a focus on materials, workmanship, and processes.

During the current code update cycle for the 2018 IBC, the Special Inspection and Quality Assurance Subcommittee of the Code Advisory Committee of NCSEA proposed a change to the Structural Observation requirements that would expand the types of projects that would require Structural Observation. The anticipated IBC 2018 code language is as follows:

1704.6.1 Structural observations for structures. *Structural observations shall be provided for those structures where one or more the following conditions exist:*

- 1) *The structure is classified as Risk Category IV.*
- 2) *The structure is a high-rise building.*
- 3) *When so designated by the registered design professional responsible for the structural design.*
- 4) *When such observation is specifically required by the building official.*

1704.6.2 Structural observations for seismic resistance. *Structural observations shall be provided for those structures assigned to Seismic Design Category D, E, or F where one or more of the following conditions exist:*

- 1) *The structure is classified as Risk Category III.*
- 2) *The structure is assigned to Seismic Design Category E, is classified as Risk Category I or II, and is greater than two stories above the grade plane.*

1704.6.3 Structural observations for wind resistance. *Structural observations shall be provided for those structures sited where V_{ult} is 130 mph or greater and where the structure is classified as Risk Category III.*

The key differences are as follows:

- Structural Observation was only required for high wind or seismic areas. Now all high-rise and Risk Category IV structures are required

to have Structural Observations anywhere in the country. High-rise buildings are defined as those buildings taller than 75 feet.

- Both the EOR and Building Official have the option to specify when Structural Observations are required.

The last point is significant. Previously, the EOR had limited control over when Structural Observations were required on a project. NCSEA worked with several Building Officials at the recent code hearings. Those individuals in the discussion agreed that the option for either the EOR or Building Official to specify Structural Observation was a good and necessary code provision. The structural panel at the code hearing agreed.

Structural Observations bridge an important gap between what the Building Official and the Special Inspector review. Even the best drawings can be misinterpreted and may not convey the importance or critical nature of a portion of the design. Structural Observations provide an opportunity for the EOR to confirm their design intentions and proper interpretations of the drawings. The EOR, using their best judgment, can now specify when to require Structural Observations. ■



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