FAQ 10.011

Nailing with 10d Nails

Q I am a special inspector for a testing and inspection agency. I was on a construction site performing a shear wall nailing inspection and called out a non-conformance due to the nail length. The plans specified 10d common nails, which I had always understood to be 3 inches long. However, the contractor was using gun nails that were only 2-3/8 inches long. The shank diameter was correct at 0.148 inches. When the engineer was contacted he responded that these nails were acceptable since he only required 1-5/8 inches of penetration into the framing, and with the 1/2-inch plywood structural sheathing, the penetration would be achieved. That was ok with me, it was his call, but he acted like this was something I was expected to know. The plans said nothing about the required penetration – is this something the special inspector is supposed to know?

Response Submitted by Art Dell, PE

A You are absolutely correct about the 10d nail. ASTM F1667, which is cited in the California Building Code (CBC) as the standard for nails and staples, identifies the 10d common nail as 3 inches long. The fastening schedule (Table 2304.10.1) in the current 2019 CBC also refers to the 10d common as 3” x 0.148”, and the nailed shear wall and diaphragm capacity tables in the CBC up to and including the 2010 CBC specifically call out the 10d nail the same way. Those tables are now only in SDPWS, the Special Design Provisions for Wind and Seismic, of the American Wood Council’s National Design Specification. The nail dimensions are no longer shown in each line of the tables, but Table A1 of Appendix A of SDPWS again defines the 10d nail as 3 inches long, with a shank diameter of 0.148”, and a head diameter of 0.312”.

So if the plans call out 10d nails, that is what should have been provided, and what you should have been looking for.

The Contractor should have submitted an RFI in order to get the engineer’s written approval in advance for the use of short nails.

It is true however, that the full shear design value for a plywood shear wall or diaphragm can be achieved with less penetration that that provided by a full length nail. The tables in SDPWS specifically require only 1-1/2 inches of penetration into the joist or stud for a 10d nail. Higher lateral design values are not provided for penetrations greater than this minimum.

That does not necessarily mean that the use of full-length common nails vs. shorter nails that satisfy the SDPWS minimum penetration requirement will result in equivalent shear wall and diaphragm performance.

In my experience, the standard of practice in the area is to specify and permit the use of short nails. However, it is not entirely clear that the intent of the building code provisions is that shorter nails are permissible. These issues have been the subject of debate (see e.g, Warren, W., “What is a 10d Common Nail?” in Structure Magazine, April 2016).

As an inspector, you should inspect to what the approved construction documents show, and if the engineer intends to allow 10d nails that are shorter than 3 inches, that should be clearly indicated on the plans.

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