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SEAoSC LIGHT-FRAMING CONSTRUCTION COMMITTEE STRUCTURAL ENGINEERS ASSOCIATION OF SOUTHERN CALIFORNIA SEISMOLOGY OPINION

DATE: March 21, 2008

Continuity of Plywood Diaphragm Sheathing in 2 hr and 3hr Fire Walls:

Opinion: The continuity of plywood diaphragm sheathing should be maintained across the air gap commonly encountered in double stud Firewalls of 2 or 3 hour construction. The intent is to ensure that structural continuity is not significantly reduced in the roof and floor diaphragms.

Commentary:

This opinion is prepared to address the issue of diaphragm continuity as it relates to recent changes in 2007 CBC and 2006 IBC model code. Specifically the outgoing UBC provisions for Area-Separation walls have more or less been replaced by the Fire wall provisions of the IBC. Such walls are encountered in light-frame multifamily or mixed-use construction and are often constructed as a double studwall when occurring at partywall locations. The double stud walls are typically separated by an airspace of a one to four inches.

The IBC has introduced language [IBC 705.4] that states fire walls must have “sufficient structural stability” under fire conditions to allow collapse of either side. Previous commentary to the UBC topic of Area Separation Walls has included the intent for structural stability, however such language was not codified prior to the IBC became the model code. Past California practice has been to provide a continuous plywood diaphragm at Area Separation Walls in wood-framed buildings. In contrast, the 2006 IBC Commentary has included suggested roof and floor construction details of a 2 hour fire wall using the double studwall, with a tight-fitting fire-rated material occupying the air gap.

With respect to our colleagues in the field of Fire-Protection Engineering, we suggest that fire-related compartmentalization can occur without removing the important structural continuity achieved by maintaining continuous diaphragms. Firewall stability during fire events can be promoted by ensuring the floor joists are not lapped over the air gap and by detailing straps and other common connectors to occur at the bottom of the floor ceiling assembly so as to allow joists to rotate should a collapse occur on either side of the fire wall. Shearwalls should also occur locally on either side of the wall to support the diaphragm.

It is the opinion of the SEAoSC Light-Frame committee that discontinuing the sheathing across the partywall air gap will create an undesirable and unnecessary weakness in the structure. In addition, there may be a conflict with the intent of ASCE 07 sections 11.7.3 and 12.3.1 which call for interconnection of all parts of the structure to form a continuous load path. Furthermore, the discontinuity may also promote building pounding or damage to the fire-resistive materials, since adjacent sides of the building would be allowed to move out of phase to earthquake motion. As building heights increase and more fire walls presumably are included, the significance of these concerns increase. For all these reasons diaphragm continuity is strongly promoted by our committee.