Structural Insulated Panels - Repair Considerations

Structural insulated panels (SIPs) are engineered building products consisting of a rigid foam core adhered to wood structural panel skins (Figure 1), typically oriented strand board (OSB). The panels are manufactured in a factory, shipped to the job site, and connected in the field to form all or part of the walls, floors, and roofs of a building. An alternative to conventional wood frame construction, SIP construction is promoted for its energy efficiency, airtightness, and efficient use of building materials. As a prefabricated panelized building product, SIPs are touted for their manufactured quality, speed of erection, and potential construction cost savings.

In conventionally framed wood construction, the primary gravity load-carrying members are sawn lumber studs, joists, and beams. The exterior sheathing transfers the applied loads to and serves as bracing for the lumber. SIPs intentionally eliminate the lumber for thermal efficiency. The gravity load is instead carried by the two OSB skins. The adhered foam core braces each skin, preventing buckling, and allows the panel to function as a composite member. For both transverse and axial loads, SIPs are intended to be uniformly loaded. Where concentrated loads occur, supplemental lumber framing is typically provided.

The structural function of the OSB skins significantly changes renovation and remediation strategies for SIP construction compared to conventionally framed wood construction. The OSB cannot simply be removed as it directly carries the load. Remember, there are typically no studs in SIP construction. Deterioration or damage to the OSB skins or to the bond between the OSB and the foam core will directly reduce the wall/roof/floor strength and stiffness (Figure 2). Potential causes of damage are moisture exposure, insects, or physical causes, such as impact or overloading.

Damaged SIPs should be evaluated by a structural engineer. The evaluation will include a visual examination to assess the extent of the damage. Visual observations may need to be supplemented with boring or probing to assess the depth of the damage. If the damage is superficial, no structural repairs are likely to be necessary. If the damage is structural, a review of the available load paths is necessary. Small localized damage may not need to be repaired if the load can redistribute or arch around the damaged area. Less contained damage will likely require repairs to or replacement of the affected SIPs and may necessitate temporary shoring. Repairs typically include the addition of sawn lumber, which may reduce the SIPs’ thermal efficiency.

SIP construction has many advantages, such as energy efficiency; however, repairs or renovations to SIPs require careful evaluation.

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