Shear walls

BY ROB YAGID

Not every house needs to have shear walls integrated into the framing, but many do. In earthquake country, for example, shear walls help to strengthen houses so that they’re far less likely to move under the severe lateral forces of a seismic event. Shear walls not only help to prevent catastrophic collapse, but they also help to prevent smaller-scale damage like cracked drywall and fractured tile. Shear walls play the same role in houses in high-wind zones. No matter the source of the force exerted on a house—atmospheric or tectonic—shear walls are simply designed to protect the home and its occupants.

On pp. 51-55 of this issue, structural engineer Thor Matteson, author of Wood-Framed Shear Wall Construction: An Illustrated Guide, explains how to complete a basic seismic retrofit to protect a house during an earthquake. A key component of seismic-retrofit work is the integration of site-built shear walls into the framing.

To be able to construct a shear wall so that it performs properly and offers maximum strength, you need to know how it works.

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**LATERAL**
The primary lateral force from an earthquake or high-wind event causes simultaneous uplift, compression, and sliding forces.

**UPLIFT**
Lateral forces try to roll the wall off the foundation, creating uplift on one end of the wall assembly.

**COMPRESSION**
As one end of the wall is experiencing uplift, the opposite end is under compression. These loads alternate as the building shakes back and forth.

**SLIDING RESISTANCE**
The few anchor bolts that are present try to counteract the lateral force, which tries to slide the wall off the foundation, but the bolts are ineffective.

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To increase the stiffness of the wall assembly and to hold the shear wall together, 1/2-in. plywood should extend from the top of the top plate to the bottom of the bottom plate.

Full round-head nails attach plywood to studs. Studies show that nails set flush to plywood surfaces perform far better than countersunk nails. Never use screws, which are more brittle than nails.

Edge nails placed every 3 in. should not be driven within 1/4 in. of the edge of the plywood.

Anchor bolts set with 3-in. by 3-in. washer plates keep first-floor walls from sliding off the foundation.

The sill plates and foundation walls must be in solid condition to support the shear wall when under compression.