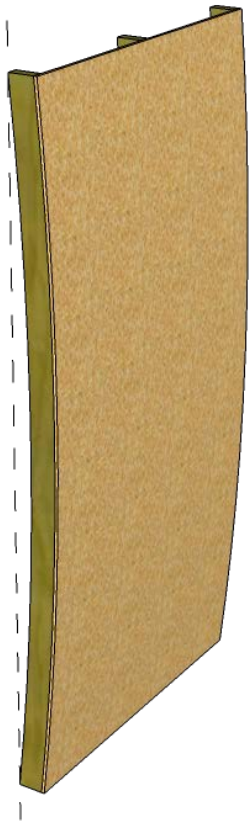
Preventing Wood Wall System Buckling

What is buckling?

Buckling of wood framing systems is evidenced by movement in stud framing, wood structural sheathing, or both, during construction or after construction is complete. Wall system buckling usually results from exposure to increased moisture causing the wood components (i.e., studs, wood panels, etc.) to move differently. When one component expands and another connected component does not, unintended, out-of-plane movements can occur. This out-of-plane movement is typically called wall system buckling. Wood structural panels can grow across or along the face of the panel. This increase in dimension, known as linear-expansion, may cause the panel to buckle, twist, or otherwise warp. Although usually not a structural concern, panel buckling may cause waviness or a non-uniform appearance in the finished exterior cladding system.



Why does it occur?

Wood wall system movement typically coincides with a change in moisture levels. Wood will naturally gain and lose moisture in response to the changing ambient moisture conditions around it. The amount of moisture in wood as a result of its surroundings is known as Equilibrium Moisture Content (EMC). Moisture content of wood structural panels is usually around 3-8% at the time of manufacture, but will reach an EMC of 6-14% as a result of increased relative humidity in a dry, protected structure. Likewise, wood framing members will reach an EMC of approximately 10-18% in a dry, protected structure. Moisture content of wood can be even greater when exposed to liquid water.

Other factors that can contribute to wall system buckling include: wall height, framing type (2x4 or 2x6 studs), stud spacing, and fastener spacing along the panel edges and in the field of the panels. In general, relatively tall, 2x4 walls with 24” o.c. stud spacing will tend to move more than a similar wall framed with 2x6 studs spaced at 16” o.c. The proper combination of wall heights and stud sizes and spacings are critical to minimizing wall system movements.

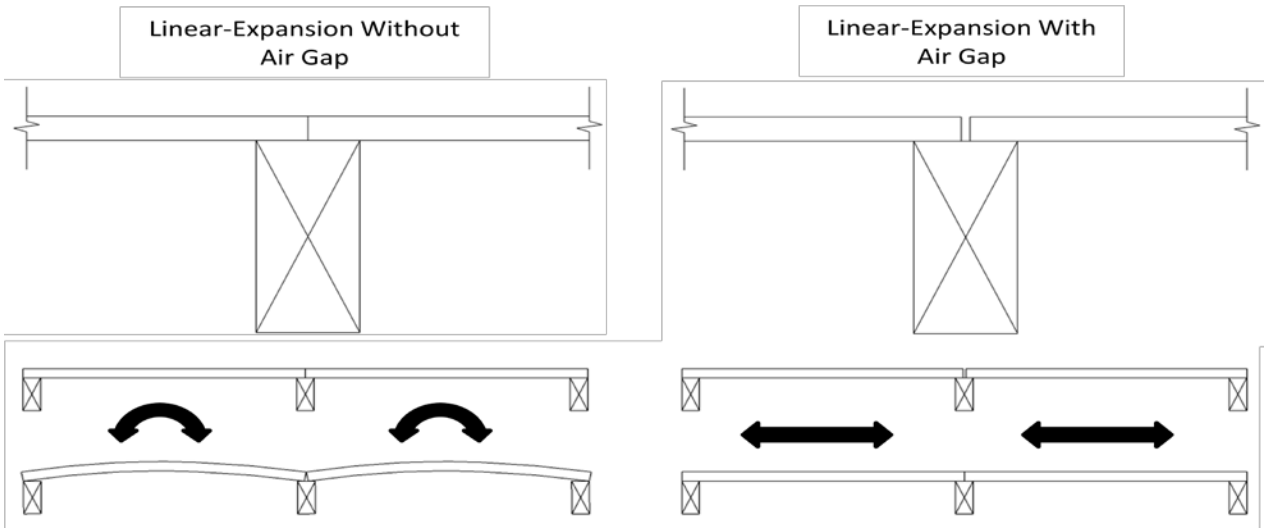
Dimensional changes in an unrestrained 48”x 96” wood structural panel can be as much as 1/8” across or along the face when moisture content changes are significant. Dimensional changes in long length structural panels (such as 4’x9’ or 4’x10’) could potentially be even greater.

Prevention

One way to prevent or minimize the amount of buckling that can occur in a wall system, is to utilize properly sized and spaced wall studs. This proper sizing is based, in part, on the intended finished claddings, the wall height, and the design loads that could be introduced to the wall system. Undersized wall studs can deflect in unexpected patterns.

Another way to prevent wood wall system buckling is to orient the wood structural panels with the long dimension of the panel perpendicular to the stud framing rather than vertical or along the length of the stud framing. The perpendicular orientation of the panel to the stud framing leverages a more optimal combination of stud stiffness and panel growth characteristics.

Industry standards recommend incorporating a 1/8" gap between panels during installation. This gap allows room for the panel to expand. Without this space, the panels may not have room to expand in the plane of the panel (parallel to the wall or roof line), and therefore must expand inward or outward of the wall framing.



Equally essential in preventing wall system buckling is managing moisture exposure. Providing adequate air flow to wood framing members will help ensure that the farming members have the ability to dry out. Exterior cladding systems are the first line of defense against bulk water intrusion, however pressure-driven water (as by wind) can find its way through seams in the cladding system. Incorporating an air gap (often called back venting) between the exterior cladding and the face of the wood structural panels will allow for more efficient drying, minimizing water retention in the panel. Back venting may also be helpful in protecting against panel growth when using reservoir cladding type exterior finishes. Reservoir claddings are porous materials such as stone, stucco, or fiber-cement board that can store large amounts of water. Reservoir claddings can transfer water directly (if adjacent) or indirectly through inward vapor drive. Back venting can help prevent direct water transfer and promote drying of the wood structural panels.

Ensuring adequate air flow and ventilation of unconditioned attic spaces are vital in preventing wood framing and wood structural panel growth in roof applications. Keep soffits and ridge vents clear of debris, and make sure all ventilation ducts from the interior of the building are exhausted out of the structure and not into the attic space.

Please visit zipsystem.com or contact our technical department at 800-933-9220 Ext 2716 or at techquestions@huber.com with any questions or comments.