



# MINIMIZING BUCKLING OF WOOD STRUCTURAL PANELS IN HIGH RISK APPLICATIONS

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Buckling of wood structural panel sheathing such as plywood and oriented strand board (OSB) occasionally results when high moisture conditions cause the panels to expand. Although structural properties are not affected, the waviness affects the appearance and may cause concerns about serviceability. Builders can significantly reduce the potential for buckling by understanding the factors that contribute to buckling risk and by providing for the natural increase in panel dimensions that results from moisture exposure.

The tendency of expansion to cause buckling is related to mechanical and physical properties of the panel, natural variability of wood, and installation techniques. Mechanical properties such as panel stiffness are important for resisting the stresses that develop as the panel tries to expand. The physical properties of the panel such as the orientation of veneers or strands will influence the panel's dimensional response to moisture conditions. Installation practices such as panel edge spacing are important to minimize the build-up of stresses that can cause

buckling. The APA literature referenced at the end of this Technical Note provides basic installation recommendations.

Laboratory and field experience indicate that certain types of installation involve increased buckling risks that merit special attention. When one or more of the following factors are present, additional techniques should be considered to help assure best performance:

- Shear wall or diaphragm applications with panels applied parallel to supports and edge nail spacing 4 inches o.c. or closer
- Use of 3-ply plywood panels with the face grain parallel to supports (i.e., walls)
- Use of oversized panels which are larger than 4 ft x 8 ft

These applications can be high risk because the tight nailing schedule reduces the effectiveness of the panel edge gap in absorbing the panel expansion; the low panel stiffness direction spans between the supports; and/or the oversize panel dimension allows panel expansion to build up over a longer length.

For these applications, the following techniques help offset the increased buckling risk:

**Panel Edge Spacing.** Additional attention to edge spacing is required due to the increased buckling risk. Normal edge spacing recommendations for sheathing, 1/8" gap at edges and ends, may be insufficient. For example, for oversized panels, consider increasing the panel gaps at edges (length parallel to strength axis marked on the panel) to 1/4". This can be accomplished by either increasing the framing module, or by specifying a special size cut from the panel manufacturer. Such special cut panels are denoted with edge gapping recommendations on the panels. In applications where high density nailing schedules are followed, such as diaphragms, edge gapping will not be effective.

APA's recommendations for spacing are designed to mitigate panel buckling. After panel installation, the panel gap will naturally close as a result of panel expansion due to moisture absorption. The absence of a gap during later inspection may be indicative of gap closure, rather than an absence of a gap during installation. Whether or not a gap is present immediately prior to roofing, if the deck flatness is acceptable, APA would generally recommend that roofing proceed.

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**Panel Nailing.** To allow for expansion of panels if subjected to jobsite wetting, the following nailing sequence should be considered where nail spacing 4 inches o.c. or closer is specified:

- Temporarily nail panels with a nail spacing of 12 inches o.c. at ends, edges and intermediate supports (rather than at the specified shear wall or diaphragm schedule) during the framing phase of construction. For temporary nailing, use nail size specified. With this lighter nailing schedule, resultant panel expansion is more readily absorbed by the panel edge gaps.

Complete final nailing immediately prior to covering with siding or roofing or after panels have been acclimated to jobsite moisture conditions.

#### References:

- Design/Construction Guide  
*Residential & Commercial*, Form E30
- Design/Construction Guide  
*Nonresidential Roof Systems*, Form A310
- Technical Note  
*Buckling of Structural Panel Sheathing*,  
Form D481
- Technical Note  
*Jumbo Panels for Nonresidential Roofs*,  
Form W220

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