The primary issue that must be considered is out-of-plane bending when some or all of a wall girder is exposed to wind pressure (see Figure 1). A firm understanding of how a wall performs is the most direct approach to exploring wall girder viability and limitations. The building code is used for this study since it details minimum and maximum requirements for wall construction, including minimum sheathing and stud framing that must be used.

The building code recognizes the United States Department of Commerce PS 1-95 “Construction and Industrial Plywood” and PS 2-92 “Performance Standard for Wood-based Structural-use Panels” for design values of structural wood panels. Structural panel grading agencies like APA, TECO and PSI use a span rating to indicate performance for a particular structural panel when used as roof or floor sheathing. The span rating consists of two numbers separated by a slash, such as 32/16. The left number indicates the maximum roof support spacing in inches when the panel is used on a roof, whereas the number to the right of the slash is the maximum spacing for floor supports. A typical example of Figure 2 is a bonus room over a garage. This application is intended to be used for a wall girder where sheathing attachment is not critical and design loads are generally the vertical or uplift loads easily applied by most truss design software.

**General Guideline 1:** Limit Wall Girders to Interior Applications.

**General Guideline 2:** Use solid sawn framing in those regions exposed to wind. The girder truss in Figure 3 is completely protected by the roof envelope with wall studs framed along the top chord. The wall studs are installed to meet building code requirements and the girder truss can be a minimum two-ply.

**Question**

What are some guidelines to use when deciding to use wall girders?

**Answer**

Use these general guidelines when deciding to use wall girders.
The wall sole plate performs this function when a wall is constructed above a wall girder. Also, nails may be inadvertently driven between the plies when perpendicular framing is toe-nailed to the top edge of the top chord of a multi-ply truss. Attaching a cover plate or attaching structural framing to the girder truss with pre-fabricated metal tie-downs eliminates this possibility.

General Guideline 3: Solid sawn cover plates may be fastened to the girder truss top and bottom chord. Individual girder plies perform as a unit when fastened per the requirements detailed in the National Design Specification for Wood Construction (NDS). Insufficient field nailing may be required, depending on girder depth, for sheet rock attachment.

Technical Q&A

Metal straps may be required to prevent the top chord from buckling toward the inside. A through providing lateral resistance to the top chord through the roof diaphragm is part of building design, the truss technician needs to be aware that lateral forces applied to the wall cause the girder truss to move laterally, which must be resisted. Additionally, furring may be required, depending on girder depth, for sheet rock attachment to the inside.

General Guideline 3: Solid sawn cover plates may be fastened to the girder truss top and bottom chord. Individual girder plies perform as a unit when fastened per the requirements detailed in the National Design Specification for Wood Construction (NDS). Insufficient field nailing generally does not become obvious because structural sheathing across the chords assist in tying these members together and pre-fabricated metal hangers provide a sufficient concentration of fasteners. Wall girders do not have this redundancy, especially along the top chord, which may be supporting trusses at intervals of 24” or more on center. The simple solution is to install a wood cover plate that ties the plies together to function as a unit.

The wall sole plate performs this function when a wall is constructed above a wall girder. Also, nails may be inadvertently driven between the plies when perpendicular framing is toe-nailed to the top edge of the top chord of a multi-ply truss. Attaching a cover plate or attaching structural framing to the girder truss with pre-fabricated metal tie-downs eliminates this possibility.

General Guideline 3: Solid sawn cover plates may be fastened to the girder truss top and bottom chord.

2. Exposed wall girders must be a minimum of two plies with a “T” or “I” brace fastened to each web to resist the applied lateral wind pressures.

3. Any interior wall girders must be furred for sheet rock attachment.

4. The truss industry promotes the design of components for the loads specified. Replacing a beam and wall studs with a wall girder requires a thorough analysis of the applied lateral loads by a Building Designer who then needs to work with the truss designer to ensure that all required loads are properly applied to the wall girder and the resulting flow of loads through the wall girder are transferred down to the foundation. The loads to be applied and the permanent bracing of the wall girder are typically outside the scope of work of the truss technician and truss design engineer. If this analysis is not conducted properly, the component manufacturer may find greater trust performance risk.

Wall girders can provide a very sound structural engineering alternative to framing situations that would be difficult to handle with any other method. Each case should be thoroughly analyzed to determine the best and most economical structural solution, balancing truss design with prescriptive framing practices in the building code. No matter what approach is used, it must account for all the applied loads (gravity and lateral), connections and permanent bracing. This generally requires working closely with the Building Designer to ensure that sound field performance is achieved. This is particularly true with exterior wall girders exposed to wind loads. SB C

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