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Allowable Bearing Stress

The required bearing lengths for beams, columns, and joists to prevent crushing of the wood at bearing points is a commonly overlooked aspect of the design process. The following tables list the Allowable Bearing Stress (also called compression perpendicular to grain [$f_{c\perp}$]) for commonly used beam and plate members and allowable end grain stress for different column materials [$f_{c||}$] (*please note that the Allowable Stress-End Grain value for columns should not be used alone to size a column, things such as the length of the column and subsequent bracing, application of load, and other effects may reduce the allowable load for columns*). The second page provides an example on how to check to make sure there is adequate bearing area based on the member reaction.

Bearing Area = (Member Width) x (Actual Bearing Length)

Bearing Stress = Member Reaction / Bearing Area

Beam Products in Joist Orientation	Allowable Stress - $F_{c\perp}$ (psi)
2.2E Parallam® PSL (West)	625
2.0E Parallam® PSL (East)	750
1.3E TimberStrand® LSL	710
1.5E TimberStrand® LSL	860
1.55E TimberStrand® LSL	900
2.0E Microllam® LVL	750
1.8E Parallam® PSL(2)	545
Douglas Fir Glulam	650

Wall Plates in Plank Orientation	Allowable Stress - $F_{c\perp}$ (psi)
Southern Pine plate*	565
Douglas Fir plate*	625
Spruce-Pine-Fir (S-P-F) plate*	425
Hemlock Fir plate*	405
StrandGuard® TimberStrand® LSL plate	670
1.3E TimberStrand® LSL plate(3)	670
1.5E TimberStrand® LSL plate	750
1.55E TimberStrand® LSL plate	775

Column Products	Allowable Stress - End Grain $F_{c||}$ (psi)
Douglas Fir (4x4 and smaller)*	1350
Douglas Fir (5x5 and larger)*	700
Hemlock Fir (4x4 and smaller)*	1300
Hemlock Fir (5x5 and larger)*	575
SPF (4x4 and smaller)*	1150
SPF (5x5 and larger)*	500
Parallam® PSL (all grades) (1)	2500
TimberStrand® LSL (4)	1835

* #2 or better dimension lumber values based on 2024 NDS Supplement

(1) 1.8E grade shown, for other product grades, refer to ESR-1387
(2) 1.8E Parallam® PSL used in header orientation
(3) For TimberStrand® LSL labeled 'Rimboard', $F_{c\perp}$ = 635 psi in plank orientation
(4) 1.3E grade shown, for other product grades, refer to ESR-1387

Bearing Area = (Member Width) x (Actual Bearing Length)

Bearing Stress = Member Reaction / Bearing Area

Example

5¼" x 14" Parallam® PSL (West) on a 2x4 Hem-Fir plate
Beam reaction = 6,500 pounds

Look at the allowable bearing stress of both the Parallam® PSL beam and Hem-Fir plate and use the lesser of the 2 values as the controlling value (for this case it is the Hem-Fir plate at 405 psi).

Bearing area = 5¼" x 3½" = 18.38 in^2

Bearing stress = 6,500lbs / 18.38 in^2 = 354 psi
354 psi < 405 psi OK

If the bearing stress was greater than the allowable, one could look at a wider beam, bearing accessory (cap) or other means to increase bearing area to prevent crushing of the wood plate.