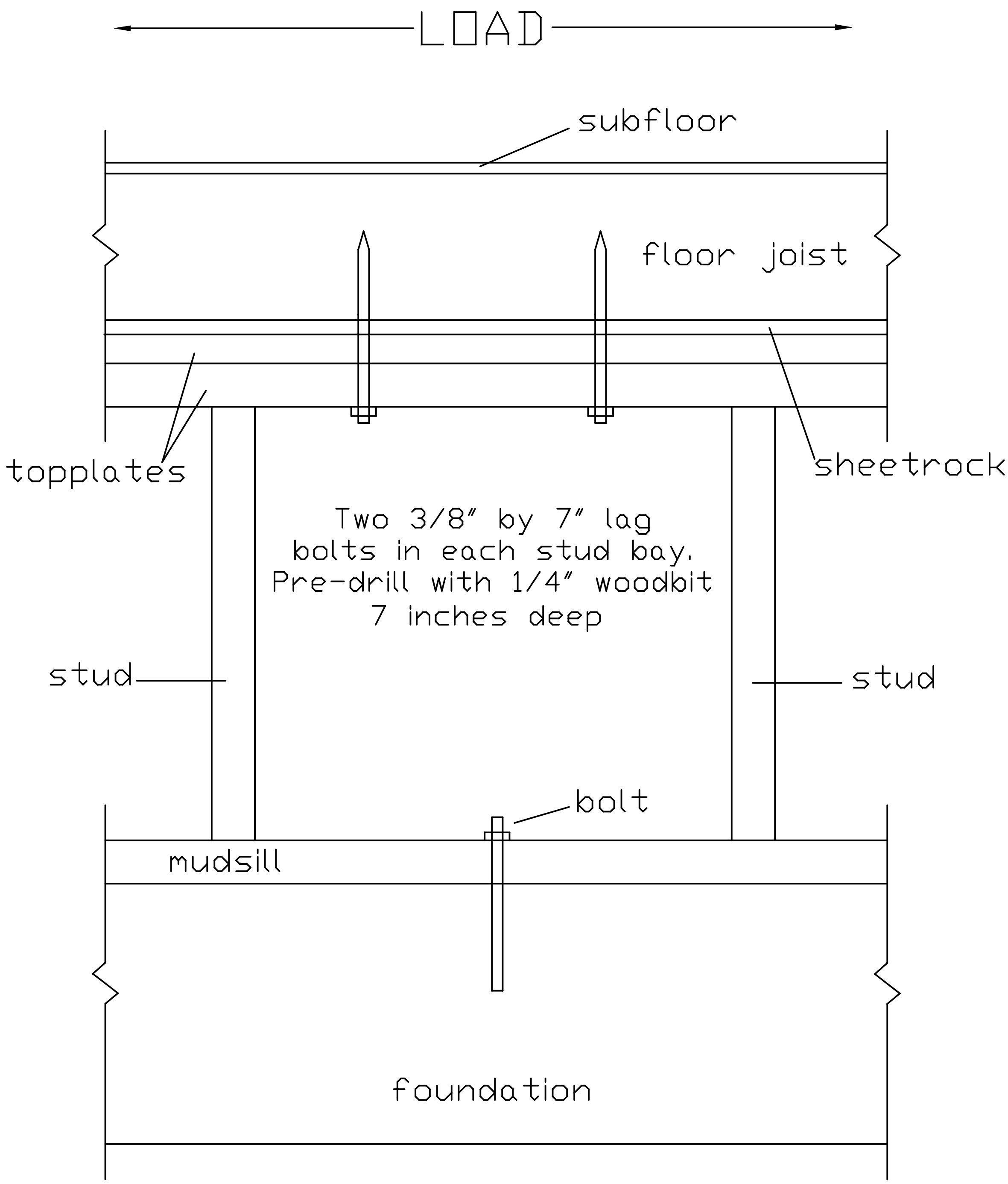
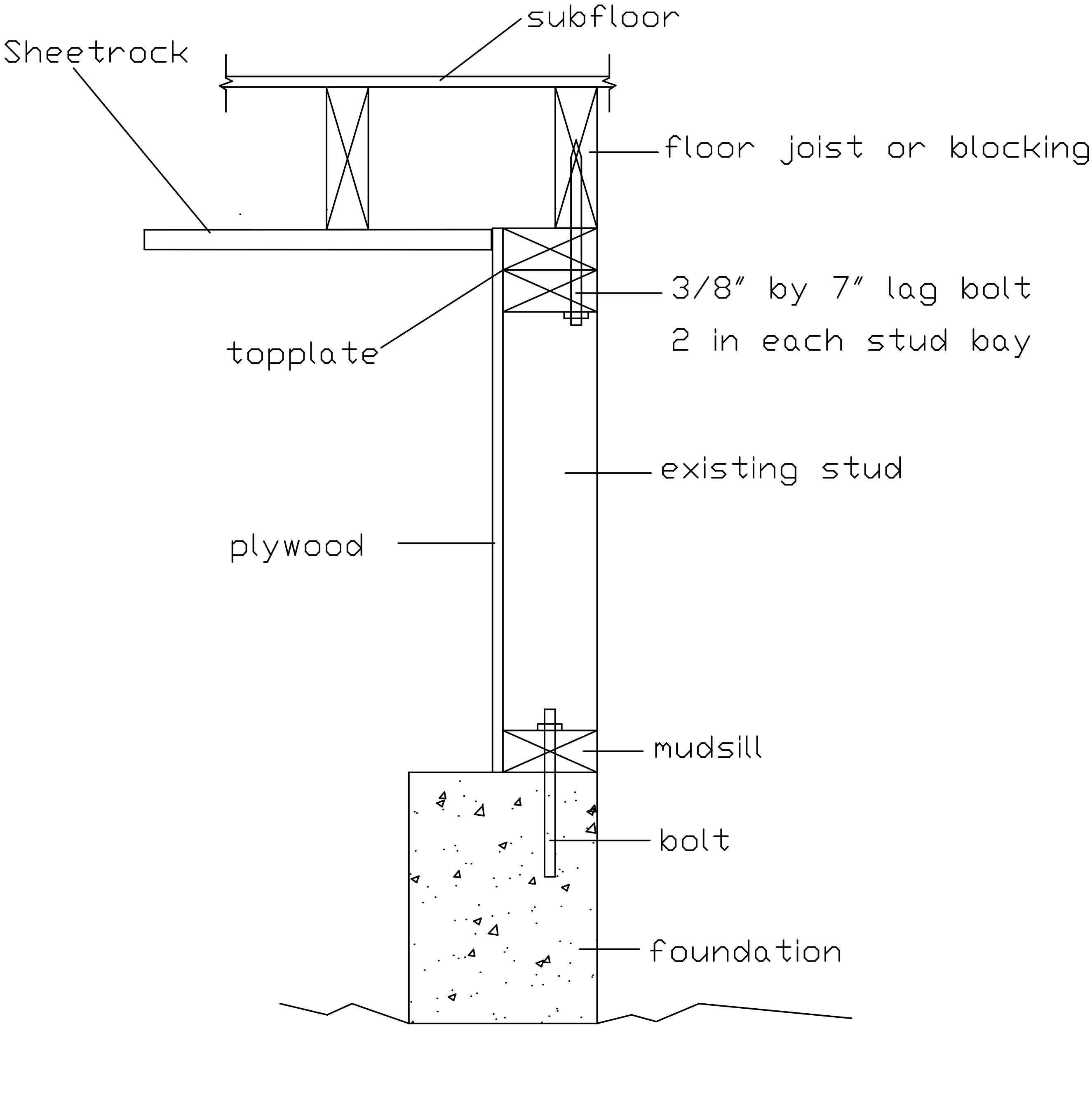


Lag Bolts - Front View

Shear transfer ties using 3/8" by 7" lag bolts when sheetrock prevents use of framing anchors



Lag Bolts - Side View

Shear transfer tie using
1/2" x 7" lag bolt.

NOTES

1. To insure that lag bolts are installed in the center of the joist or joist blocking, holes for lag bolts to be drilled into wood by using a jig made of 2 inch steel or aluminum round stock 3 inches long with a ¼ inch hole drilled through the center. Jig to be placed against the exterior siding of the wall and the lead hole drilled up through the top plates and into the joist or blocking. If the framing is nominal lumber a 1 ½ inch by 3 inch jig is to be used.

2. The lag screw shall be lubricated with soap at the time of installation to prevent damage to the lag bolt.

3. If it is found that top plate framing is not damaged when installing the lag bolt into a ¼ inch hole, the clearance hole for the lag bolt shank may be the same as the lead hole for the joist or joist blocking.

4. Lags to be installed into the pre-drilled holes either by hand or with an electric impact wrench. Stop tightening once the head of the lag bolt touches the lower framing member to prevent snapping off lag bolt.

5. On longitudinal walls lag bolts shall be installed no closer than 3 inches from the end of each stud bay to maintain correct edge distances from ends of joist blocking.

Lag Bolt Capacities in Douglas Fir Top Plate to Joist or Joist Blocking Connections

3/8 by 7” lag bolt shear capacities based on 1997 UBC, Section 2316 Table 2.3.2, and 2005 NDS, Section 11.3

Design Constants Douglas Fir-Larch G=0.50 Table 11.3.2A

Section 11.1.3.2 Lead holes for lag screws loaded laterally and in withdrawal shall be bored as follows to avoid splitting of the wood.

a) The clearance hole for the shank shall have the same diameter as the shank and the same depth of penetration as the length of the unthreaded portion.
b) The lead hole for the threaded portion shall have a diameter equal to 40% to 70% of the shank diameter in wood with G less than 0.5.

Section 11.1.3.5 No reduction to reference design values is anticipated if soap or other lubricant is used on the lag screw or in the lead holes to facilitate insertion and to prevent damage to the lag screw.

D=Diameter of Lag Bolt. 1D=3/8 of an inch.

Section 11.1.3.6 Minimum penetration (not including the length of the taper) of the lag screw into the main member for single shear connectors shall be 4D.

Section 11.1.3.7 Edge distances, end distance, and fastener spacing shall not be less than the requirements in Tables 11.5.1A through E.

Table 11.5.1A Edge Distance Requirement Parallel to Grain: 1.5D

Table 11.5.1B End Distance Requirement Parallel to Grain, Tension (fastener bearing toward member end) for softwoods: 7D

Table 11.5.1C Spacing Requirements for Fasteners in a Row Parallel to Grain: 4D

Connection adjustment factors:
Duration: $C_D = 1.6$ 1997 UBC Table 2.3.2, Footnote 1

Lag bolts installed with more than 4 diameters penetration, more than 7 diameters from end of main member, and more than 1.5 bolt diameters from edge and no more than 4 bolt diameters aparts.

Allowable load in lag bolt parallel to grain 322 pounds, Mode IV.

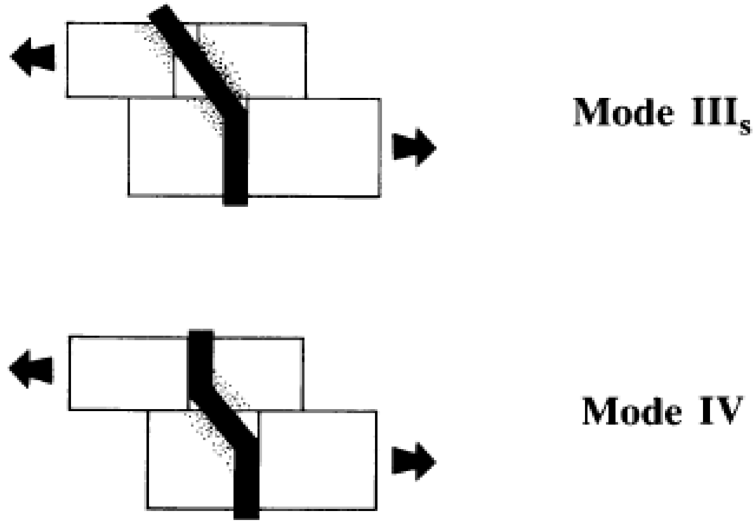


Figure I1 (Non Mandatory) Connection Yield Modes)

Connection Calculator

American Forest & Paper Association
American Wood Council
Engineered and Traditional Wood Products

Connection Type	Lateral loading
Fastener Type	Lag Screw
Loading Scenario	Single Shear
Submit Initial Values	

Main Member Type	Douglas Fir-Larch	
Main Member Thickness	5.5 in.	
Main Member: Angle of Load to Grain	0	
Side Member Type	Douglas Fir-Larch	
Side Member Thickness	-- Other (in inches) --	4.0
Side Member: Angle of Load to Grain	0	
Washer Thickness	0 in.	
Nominal Diameter	3/8 in.	
Length	7 in.	
Load Duration Factor	C_D = 1.6	
Wet Service Factor	C_M = 1.0	
End Grain Factor	C_eg = 1.0	
Temperature Factor	C_t = 1.0	

Connection Yield Modes

Im	1651 lbs.
Is	2374 lbs.
II	952 lbs.
IIIm	713 lbs.
IIIs	1007 lbs.
IV	322 lbs.
Adjusted ASD Capacity	**322 lbs.**

- Lag Screw bending yield strength of 45000 psi is assumed.
- The Adjusted ASD Capacity is only applicable for lag screws with adequate end distance, edge distance and spacing per NDS chapter 11.

particular design prepared from this on-line Connection Calculator. Those using this on-line Connection Calculator assume all liability from its use.</SPAN< p>

The Connection Calculator was designed and created by Cameron Knudson, Michael Dodson and David Pollock at Washington State University. Support for development of the Connection Calculator was provided by AF&PA's American Wood Council.

For the people who are new to the Connection Calulator.

(We had a lot of discussion about whether the Calculator was based on Dr or D)

The on-line Connection Calculator that we developed for AF&PA **always uses the root diameter** (D_r) for calculating lateral design values (Z) for lag screw and wood screw connections. This may occasionally be overly-conservative (i.e.- when the special provisions of NDS 11.3.6.2 apply). If an engineer wants to take credit for the nominal diameter (instead of the root diameter) per NDS 11.3.6.2, then s/he would need to perform separate calculations to come up with a higher Z value.

Hope this is helpful.

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National Design Specification® (NDS®) for Wood Construction

The American Wood Council of the American Forest & Paper Association wrote this document. It was first published in 1944 and the most recent edition was published in 2005.

It is developed via the American National Standards Institute consensus procedures and is a standard where as stated in the Foreword: "the most reliable data available from laboratory tests and experience with structures in service have been carefully analyzed and evaluated for the purpose of providing, in convenient form, a national standard of practice." It defines itself as ”the method to be followed in structural design.”

This document is primarily of use in seismic retrofit work because it addresses connection devices and methods not found in the Simpson Strong-Tie Catalog._ Chapters 2,8,9,11, and 12 are the most useful ones for the designer to be familiar with. These chapters come under the headings "Design Values for Structural Members", "Bolts", "Lag Screws", "Wood Screws", and "Nails and Spikes." For example, if the designer wants to know how far from the edge he can place a bolt from the end of the mudsill this information can be found on page 76 of the 2005 NDS. The shear values for nails found in the chapter on "Nails and Spikes" is much more complete than the one found NER-272.

This document also contains engineering formulas that are used by engineers when they come up against a wood frame connection that is not listed in a table. The use of these formulas should be left to people who know how to use them. The values listed in the NDS are recognized by the 1997 Uniform Building Code via the reference found in Chapter 23 of that code. {The 1997 UBC actually references the older 1991 NDS}

It is important for users to understand that the information found in this document should be considered a “published” and therefore legitimate value. Published values are either values found in tables in the NDS or are values that have been “calculated” using the tables in the NDS and modified through the use of engineering formulas.