



Revision Date	02/25/2026
Code/Section	2024 IBC Section 2302.1; 2024 IRC Section R507; 2024 AWC NDS Sections 11.1.2, 12.1.4, 12.2.1, 12.2.5, 12.4.1, and Table 12J and 12K
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Purpose and scope:

To describe the plan review and inspection policy for the design and installation of lag screws, also called lag bolts, for use in structural applications.

This policy does not apply to proprietary screws that do not require pilot holes.

Design and Installation Policy:

Lag screws used in structural applications, shall conform to the following:

1. The construction drawings shall include the following installation information required by NDS Section 12.1.4:
 - The lead hole diameter for the threaded portion pilot hole.
 - The clearance hole diameter and length for the shank pilot hole.
 - The statement: "The threaded portion of the lag screw shall be inserted in its lead hole by turning with a wrench, not by driving with a hammer."

Note: See Figure 1 on the next page for the two pilot holes. Pilot holes are required for all lag screws unless they are loaded both primarily in withdrawal and are 3/8" diameter or less.

2. Where a non-prescriptive use, structural calculations shall take into account the design criteria found in the NDS, specifically including:
 - The withdrawal resistance shall be based on the length of the threaded portion penetrating the main member, excluding the tapered tip length;
 - The withdrawal resistance shall take into account fastener head pull-through;
 - NDS table 12J and 12K shear values shall be reduced for penetration less than 8D;
 - Combined lateral and withdrawal loading;
 - Local stress failures at connections including net section rupture, row tear-out, and group tear-out capacity. Appendix E methods are acceptable. Less comprehensive methods are not.

Example statement on drawings:

The ___" diameter x ___" long lag screws require a ___" long by ___" diameter first pilot hole and a ___" long by ___" diameter second pilot hole. The threaded portion of the lag screw shall be inserted in its lead hole by turning with a wrench, not by driving with a hammer.

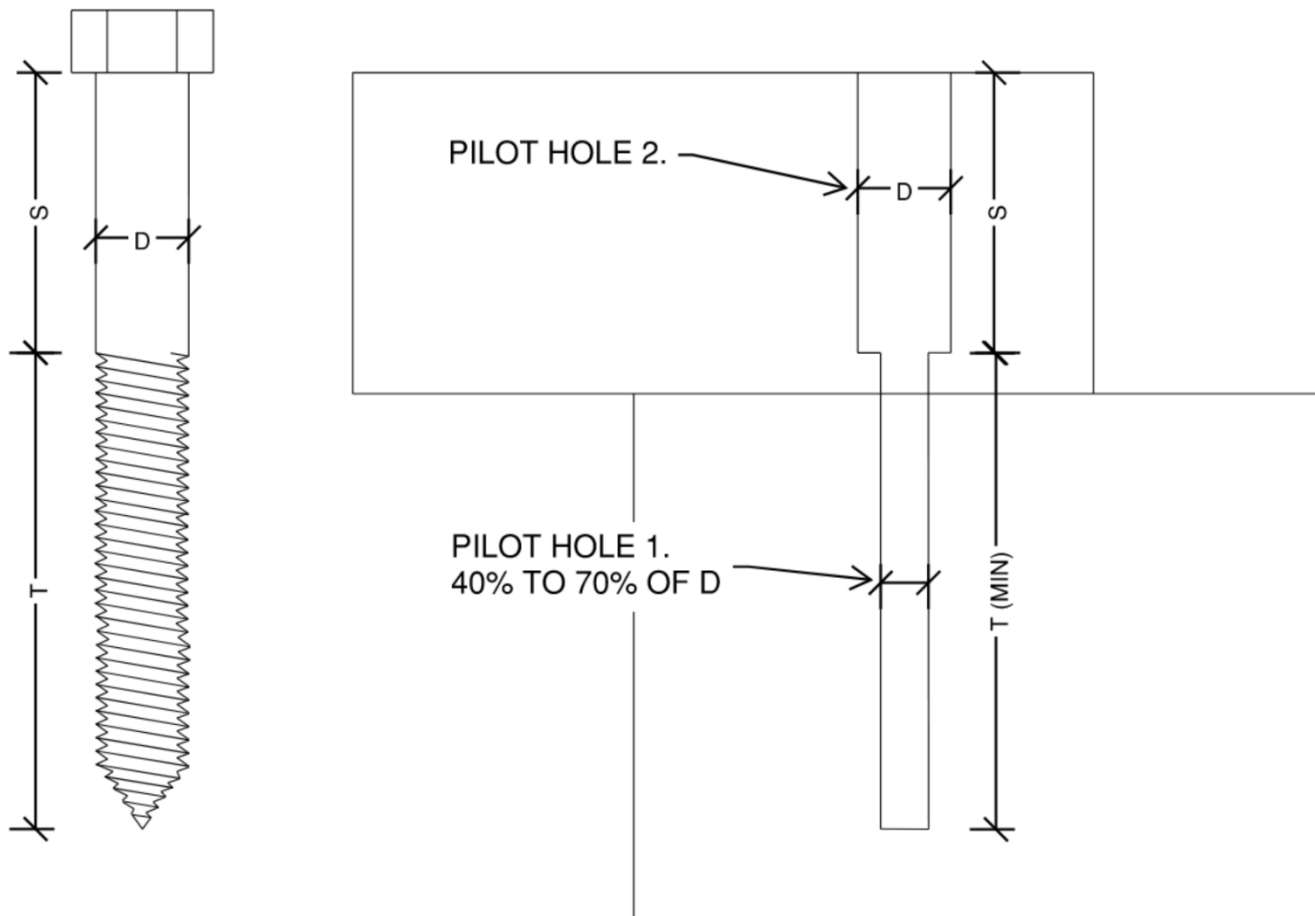


Figure 1 – Lag screw dimensions compared to the two required pilot hole dimensions

Rationale and Reference:

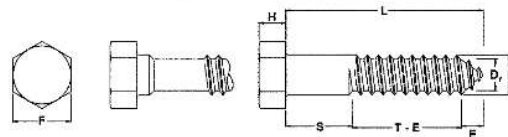
Lag screws have been observed to cause failures by inducing splitting where incorrect installation procedures are used. It is very difficult to verify correct installation. Lag screws are typically used in connections where very little redundancy exists, and as such an individual fastener failure can readily lead to global failure.

The building code does not forbid the use of lag screws, but it does discourage their use in some situations. As such, designers should consider this before choosing to design critical connections with lag screws. Exterior locations in Phoenix are subject to large wood moisture losses due to Phoenix's low average ambient moisture which leads to wood shrinkage.

The NDS commentary states that "Because of the greater possibility of splitting when subject to lateral load, it has been recommended that insertion of lag screws in end grain surfaces be avoided."

Table L2 – Standard Hex Lag Screws¹

D = diameter, in.
D_r = root diameter, in.
S = unthreaded body length, in.
T = minimum thread length², in.



E = length of tapered tip, in.
L = lag screw length, in.
N = number of threads/inch
F = width of head across flats, in.
H = height of head, in.

Length, L		Diameter, D										
		1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4
	D _r	0.173	0.227	0.265	0.328	0.371	0.471	0.579	0.683	0.780	0.887	1.012
	E	5/32	3/16	7/32	9/32	5/16	13/32	1/2	19/32	11/16	25/32	7/8
	H	11/64	7/32	1/4	19/64	11/32	27/64	1/2	37/64	43/64	3/4	27/32
	F	7/16	1/2	9/16	5/8	3/4	15/16	1-1/8	1-5/16	1-1/2	1-11/16	1-7/8
	N	10	9	7	7	6	5	4-1/2	4	3-1/2	3-1/4	3-1/4
1	S	1/4	1/4	1/4	1/4	1/4						
	T	3/4	3/4	3/4	3/4	3/4						
	T-E	19/32	9/16	17/32	15/32	7/16						
1-1/2	S	1/4	1/4	1/4	1/4	1/4						
	T	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4						
	T-E	1-3/32	1-1/16	1-1/32	31/32	15/16						
2	S	1/2	1/2	1/2	1/2	1/2						
	T	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2						
	T-E	1-11/32	1-5/16	1-9/32	1-7/32	1-3/16	1-3/32					
2-1/2	S	3/4	3/4	3/4	3/4	3/4						
	T	1-3/4	1-3/4	1-3/4	1-3/4	1-3/4						
	T-E	1-19/32	1-9/16	1-17/32	1-15/32	1-7/16	1-11/32					
3	S	1	1	1	1	1						
	T	2	2	2	2	2						
	T-E	1-27/32	1-13/16	1-25/32	1-23/32	1-11/16	1-19/32	1-1/2	1-13/32	1-5/16		
4	S	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2						
	T	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2						
	T-E	2-11/32	2-5/16	2-9/32	2-7/32	2-3/16	2-3/32	2	1-29/32	1-13/16	1-23/32	1-5/8
5	S	2	2	2	2	2						
	T	3	3	3	3	3						
	T-E	2-27/32	2-13/16	2-25/32	2-23/32	2-11/16	2-19/32	2-1/2	2-13/32	2-5/16	2-7/32	2-1/8
6	S	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2						
	T	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2						
	T-E	3-11/32	3-5/16	3-9/32	3-7/32	3-3/16	3-3/32	3	2-29/32	2-13/16	2-23/32	2-5/8
7	S	3	3	3	3	3						
	T	4	4	4	4	4						
	T-E	3-27/32	3-13/16	3-25/32	3-23/32	3-11/16	3-19/32	3-1/2	3-13/32	3-5/16	3-7/32	3-1/8
8	S	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2						
	T	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2						
	T-E	4-11/32	4-5/16	4-9/32	4-7/32	4-3/16	4-3/32	4	3-29/32	3-13/16	3-23/32	3-5/8
9	S	4	4	4	4	4						
	T	5	5	5	5	5						
	T-E	4-27/32	4-13/16	4-25/32	4-23/32	4-11/16	4-19/32	4-1/2	4-13/32	4-5/16	4-7/32	4-1/8
10	S	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2						
	T	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2						
	T-E	5-11/32	5-5/16	5-9/32	5-7/32	5-3/16	5-3/32	5	4-29/32	4-13/16	4-23/32	4-5/8
11	S	5	5	5	5	5						
	T	6	6	6	6	6						
	T-E	5-27/32	5-13/16	5-25/32	5-23/32	5-11/16	5-19/32	5-1/2	5-13/32	5-5/16	5-7/32	5-1/8
12	S	6	6	6	6	6						
	T	6	6	6	6	6						
	T-E	5-27/32	5-13/16	5-25/32	5-23/32	5-11/16	5-19/32	5-1/2	5-13/32	5-5/16	5-7/32	5-1/8

¹ Tolerances are specified in ANSI/ASME B18.2.1. Full-body diameter and reduced body diameter lag screws are shown. For reduced body diameter lag screws, the unthreaded body diameter may be reduced to approximately the root diameter, D_r.

² Minimum thread length (T) for lag screw lengths (L) is 6 or 1/2 the lag screw length plus 0.5, whichever is less. Thread lengths may exceed these minimums up to the full lag screw length (L).