LOG & TIMBER HOMES COUNCIL
National Association of Home Builders
1201 15th Street
Washington, D.C 20005
1-800-368-5242, Ext. 8577
FAX: (202) 266-8141
www.loghomes.org

LOG TECH NOTE 02-02

Fasteners for Log Homes

When shopping for a log home producer, it may be difficult to choose a species, log style or corner style. There are different considerations for each product, but they will all include fasteners to connect logs. Each uses a different fastening system to attach their logs. Each has told you that theirs is better. Well, guess what? They all work. Buying from a Log & Timber Homes Council member company assures that each fastening system has been engineered and designed to ensure structurally sound home construction.

One may ask why the fastening system is so critical. There are many reasons why a company has selected their system and why a system is best for a particular log wall system. Factors include alignment of logs, management of settling due to seasoning and/or compression of sealants, length of logs, corner design, and others, not to mention resistance of lateral load to meet seismic and wind design/code criteria. It is very important that the log home manufacturer's specifications regarding both installation and fastener spacing be followed during construction. Spacing of fasteners will vary depending on the system used and the design of the building, and it is possible that attention must be paid to ensure that one fastener is properly spaced away from the one in the log below it.

The codes and standards governing wood construction specify requirements for installation of various fasteners (e.g., minimum length of fastener in the log holding the point, drilling lead holes, edge and end distances, etc.). These requirements are addressed when a fastening system is applied to the log wall system, with lead holes either pre-drilled by the manufacturer or by the builder at the jobsite.

Another specification to consider is the fastener coating. Nails, screws, and bolts are available in unfinished steel, oil-coated, galvanized, zinc-plated, or special paint coatings that are extremely durable. Protective coatings may be critical in logs with high tannin or moisture content.

Dowel-type fasteners offer differing structural capacities as well. Common nails, screws, and bolts (a.k.a., commodity fasteners) are fully described in the American Wood Council's *National Design Specification for Wood Construction* (NDS). Where design loads try to move logs horizontally, the strength of the steel (e.g., Fyb, bending yield strength) combines with the diameter to bear on the wood and resist those loads. Where tension loads are trying to lift logs up from one-another, threaded fasteners typically resist better than straight shanks. In the 1990's, proprietary fasteners evolved that are stronger despite their smaller diameter and use a threaded tip that does not comply with the NDS. Based on a rigid quality assurance program, these products are documented in evaluation reports – the report numbers are printed on the packaging.

Please check with the log home manufacturer for engineering and technical specifications. This information will be available in the company's construction manual and/or in the construction plan set. Most companies include the fasteners needed to build your home in the log home package.

SPIKES

Spikes are the largest of the nail category, usually 3/16" to 3/8" in diameter and lengths anywhere from 3" to 12". The shank may be smooth, spiral, or ring, providing differing resistance to withdrawal from the log. Most spikes are made of steel and hot-dip galvanized coatings are used for durability in the wood.

Once the primary fastener of choice by log builders, installing a spike takes the time to set and pound the tip 3-4" into the log below. Normally connecting only one component to another, spikes are spaced in alternating patterns in the wall, may be used to drive butt joints together, or are used to attach window/door bucks to the ends of the logs.

Driven into the log, the spike head is set below the log surface by using a ballpeen hammer or pieces of rebar so as not to hold up the next log in the wall.

DRIFT PINS

Drift pins are very similar to spikes except longer in length and often of greater diameter. Whereas the spike connects only one log to another (a.k.a. single shear), drift pins are used to connect multiple logs (a.k.a. double shear) or may be used for logs that have tall stack height.

Used in stacked log wall systems to resist lateral loads parallel to the axis of the log, pins are typically galvanized pipe or rebar that are modified to provide a tip. They are set in predrilled holes in the upper log(s) and driven to the NDS-specified minimum embedment into the log below. The top of the pin can be well below the surface of the top log, but it must be in the top half of that log. In high seismic areas, the pins can be as close as 8" on center but are typically placed on 4' centers and at each side of cut openings where they can also assist in preventing rollout.

WOOD DOWELS

Dowels, usually of hardwood (oak), may be used to peg a log wall to hold corners, limit twisting, or prevent logs from shifting out of alignment as the logs are set. Different types of wood pegs, pins, and dowels used for reinforcement are well established in our log building heritage.

Larger diameters provide greater bearing area to hold wood joints together. In timber framing, wood dowels are used to hold mortise and tenon joints together.

LOG TECH NOTE 02-02

LAG SCREWS/BOLTS

Where withdrawal from a connection is a concern, lag screws/bolts are an option. Like spikes, they will come in varying diameters; 3/8" is the most popular, but they are also available in ¼" up to 1-1/4" diameters. Lengths range from 1" to 12". The NDS specification for thread length is the minimum of 6" or ½ the length of the fastener +1/2", whichever is less. The tip is tapered with threads, and the head is of a larger diameter. Pan head lags are often referred to as screws while the hex head lag is a bolt. Washers are often used under the head to provide more surface to resist pull-through.

Lag screws are to be installed in pre-drilled holes in the logs (NDS). Counter-boring allows the lag head and washer (recommended) to be recessed below the surface of the log.

THROUGH BOLTS

Through bolts are exactly as it sounds -- a threaded rod that runs down through the entire wall system. Bolt diameters range from 1/2" to 1-1/2". For easier wall assembly, shorter lengths of bolt are typically joined with threaded couplings to attain the required wall height. The top of the bolt assembly is often threaded so that a washer and nut can be tightened down over the bolt and atop the last log course. The bolts are often located near the ends of walls, at openings, and otherwise commonly spaced from 4 to 8 feet on center. The logs are typically pre-drilled in compliance with the NDS.

Through bolts are an excellent choice when lateral forces from high wind or seismic conditions exist. These forces will create tension and compression in the log wall, and the bolt and larger steel plates top and bottom of the wall can offset that tension load.

There is a level of maintenance on the homeowners' part to tighten these bolts regularly during the first year or two in the home. Based on their experience with their log product, the log home manufacturer will determine how often this would need to be done. Used in conjunction with 1000# tension springs, through bolt systems aid in the settling of a log home and lessen the frequency for the homeowner to tighten the bolting system.

THREADED LOG HOME SCREW

Introduced to the log home industry in 1995, these screws use advanced technology to self-drill and countersink their head in order reduce installation time. Dense wood species may still require pre-drilling.

Although smaller in diameter than other fasteners, most are heat-treated for equal or greater strength. They are available in lengths from 2-1/2" to 16". Check information printed on the packaging or contact the screw manufacturer for all engineering and technical data.

The log home screw has evolved into a broad range of products for wood-to-wood connections. Their ease of use can now be found for log walls, roof truss hold downs, timber framing connections, and wherever framing needs to be temporarily braced.

By Bill Moffatt, Olympic Fasteners and Rob Pickett, RobPickett &Associates. Published by the Technical Committee of the Log & Timber Homes Council, Building Systems Councils, National Association of Home Builders, ©2003, June 2021.

LOG TECH NOTE 02-02