L-2237

Texas Agricultural Extension Service

People Helping People

Log Home Construction & Maintenance

Texas Agricultural Extension Service • Zerle L. Carpenter, Director • The Texas A&M University System • College Station, Texas

*Charles L. Stayton, James V. Robinson and Philip J. Hamman**

Log homes are becoming popular again in the South. In the late 1800's more than 50 percent of all dwellings were constructed of logs. But by the mid-1930's wood siding homes had become the norm, with less than 1 percent of new homes constructed of logs. Wood siding homes usually were better constructed because they were built to be permanent rather than temporary.

Today, home builders are discovering that log homes can provide attractive, long-lasting shelter, but that they also can have insect, wood rot and exterior finishing problems if improperly constructed and maintained. Also, heating and cooling costs can be higher for log homes as compared to conventional homes. To be assured of satisfaction with the final product, potential log home owners should be aware of possible problems so that they can be prevented.

Proper construction techn
caused by checking and s

ENERGY EFFICIENCY

Energy efficiency depends upon using thick logs with airtight construction. How thick the logs need to be is debatable. Wood has an average R-value of about 1.25 per inch. Theoretically, if a log home is to match the energy efficiency of a conventional home with a wall R-value of 12, logs need to be about 9½ inches thick. Research suggests that this theoretical log size can be reduced to about 8 inches because of the log wall mass. However, actual comparisons in East Texas are showing that machined log walls 5½ inches thick provide energy efficiency equal to or better than conventional 2 × 4 stud wall construction.

If the above data remain consistent, log thickness beyond 5½ inches may not be economical. Increasing log size from 5½ to 7½ inches adds about $2,300 to the cost of a 2,000-square-foot home. If the same $2,300 were invested at 7 percent annual compound interest for 7 years, the increased log size would have to reduce monthly heating and cooling costs by $44 to equal the investment return.

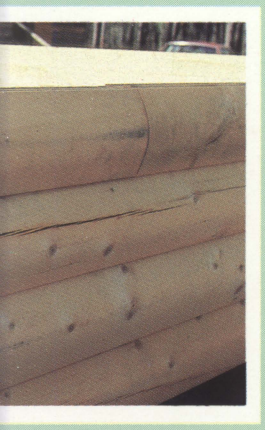
Extreme climates may require a minimum log size of 7½ inches or larger. More data on comparisons by geographical areas are needed to establish minimum log sizes. It is becoming obvious, however, that properly built log homes are certainly equal to conventionally built homes, even when conventional homes have polyethylene film barriers to reduce air turnover rates. The National Bureau of Standards' recent study clearly shows this.

Proper construction is critical for log home energy efficiency just as it is for conventional homes. Two common construction errors may account for some of the poor energy performance which commonly occurs with log homes. Most of the energy loss in a home is through the ceiling, not the walls. Log homes without conventional roof systems may not have adequate attic space to allow for proper insulation. And incorrect construction, with green logs, can create tremendous air turnover rates.

Airtight construction is best achieved and maintained by using machined logs rather than natural, round ones. Machined logs make possible tighter joints between logs and between log ends and doors and windows. Tighter joints are more easily sealed against air leakage, thus reducing the air turnover rate and heating and cooling costs. A highly elastic, tightly bonding caulking, such as polyurethane, is the best choice for sealing joints because logs will continue to shrink and swell. It is important to periodically check all sealed joints for air leakage and to reseal any reopened joints.

---

*Respectively, Extension wood products specialist, Extension entomologist and Extension urban entomologist, The Texas A&M University System.



n help prevent problems

PREVENTING WOOD ROT AND INSECT DAMAGE

Proper building practices and good log quality control must be adhered to in order to prevent wood rot and insect damage. These problems can lead to costly repairs for the homeowner.

Proper Building Practices

A log home must be designed and constructed to prevent both rain and ground moisture accumulation and excessive shrinkage. Logs should be dry (below 20 percent moisture content) before building begins. Wood shrinks as it dries, causing cracking, splitting and warping. An 8-foot-high wall built with fresh-cut logs can settle 3 to 4 inches because of shrinkage. Unless a log home is designed to allow for such shrinkage, structural failure and rain and air seepage can occur. Structural failures lead to costly repairs; air seepage increases energy costs; and rain seepage causes wood decay.

Moisture problems that cause log decay are related to careless workmanship and poor design and maintenance. They usually can be eliminated by properly designing and constructing the foundation, walls and roof.

Good drainage is essential to a dry foundation and must be considered in the initial planning. The building site should be graded or ditched so rainwater drains away from the home.

Stone and concrete foundations or piers that keep untreated logs 12 to 18 inches above the ground are highly recommended. The crawl space created by foundations or piers should be properly ventilated and screened to keep out animals. Open crawl spaces or those enclosed with screen or latticework usually are adequately ventilated. Solid foundation walls should have properly sized vents to allow adequate air circulation in the crawl space.

Vent openings within 10 feet of the corners usually give the best cross ventilation. The size and number of openings should be based on soil moisture, atmospheric humidity and air movement. In general, the total area of all ventilation openings should be equivalent to 1/150 of the ground area beneath the dwelling. Keep shrubbery far enough away from foundation walls that it will not restrict air movement through ventilator openings. If the crawl space under the building is frequently damp, the soil should be covered with heavy-grade polyethylene plastic sheeting (at least 6 millimeters thick) so that soil moisture will not evaporate and condense on the wood subflooring and log walls. The soil should be treated for subterranean termites before the plastic ground cover is put down.

Untreated logs placed on slab-on-ground foundations are highly susceptible to decay without proper slab design and log maintenance. The slab top should be no less than 6 inches (preferably 8 inches) above the ground to maintain the required minimum 6 inches above ground for the first log. Logs should be treated periodically with a total wood preservative. (Preservatives are discussed under exterior log finishing.) A vapor barrier, consisting of a heavy-grade polyethylene plastic sheet with a minimum rating of ½-perm, should be used under the concrete slab. Joints should be lapped at least 4 inches and sealed. Logs placed on slab foundations also can be protected by covered porches. However, when exposed logs are closer than 6 inches to the ground, the first three bottom logs should be pressure treated with chromated copper arsenate (CCA).

It is necessary to provide adequa and the first log.

Log cabin wall, window and door frames must be carefully constructed to avoid forming crevices where water can accumulate and soak into the wood. Fittings should be made tight and protected by polyurethane caulking. Rainwater does not normally cause serious decay damage if it can quickly run off. But water trapped in joints, crevices or cracks can cause decay. During construction, major cracks or checks in logs should be turned downward or caulked so that they will not trap water. Joints between logs also must be caulked.

Proper roof construction helps prevent wood decay in walls, foundations, doors and windows. The roof overhang should not be less than 18 inches (preferably 24 inches) for

a one-story home and 24 inches (preferably 36 inches) for a two-story. Wider overhangs are particularly desirable in areas of higher rainfall, such as along the Gulf Coast. The greater the roof pitch and overhang, the farther away from the structure the rainwater is projected, thus protecting the walls from wetting. Roof-supporting logs, timbers or sawn lumber should not extend beyond the eaves where they can become wet and are quickly attacked by wood decay.

Termite protection is best achieved by treating the soil around both sides of foundation walls, around piers and utility entrances, and under the foundation slab prior to or during construction. An EPA-registered termiticide should be used. Both slab-on-ground and pier and beam foundations require this soil treatment. Consult with qualified pest control operators who supply termite treatment services. For more information, your county Extension agent can supply publications on subterranean termites and on selecting a termite control service.

Log Quality Control

In order to produce good quality logs, the effects of insects and decay-causing fungi must be minimized during log harvesting, drying, machining, transit and construction. Many problems with decay and insects can be eliminated by using logs soon after they are cut and by protecting them during seasoning and storage. Logs should be removed from the woods immediately and debarked. In a southern climate, dead timber used for logs should be harvested no later than 3 to 4 months after trees die. Extensive damage from decay and insects can occur while the tree is standing, and salvaged logs should be inspected carefully for borer activity as they are peeled. Insect and decay problems are less likely to occur if healthy trees and logs are cut in late fall or winter and used promptly.

Leaving the bark on logs restricts drying and preservative treatments and attracts some insects. Sawyers, metallic borers and ambrosia beetles can attack log bark and sapwood immediately after trees are cut. However, old house borers and powderpost beetles prefer debarked logs. Treating logs with preservatives immediately after debarking and prior to drying will help prevent attack by these insects. Preservative treatment involves dipping the logs in copper-8-quinolinolate or zinc naphthenate solutions and storing them 18 inches off the ground, preferably under a roof, to air dry. This treatment will protect the logs from some insects and stain fungi while drying, but does not provide permanent protection. Logs stored for drying during warm weather should be sprayed with an EPA-registered insecticide containing lindane or chlorpyrifos to prevent infestation by certain wood-boring insects. Logs also can be kiln dried after debarking rather than air dried. High kiln temperatures usually kill any insect larvae and decay fungi present. Whether logs are air or kiln dried, their final moisture content should be below 20 percent to prevent wood decay.

Pressure preservative treatment of logs after they are dried and machined protects them completely from decay and insect damage during transit, storage, construction and thereafter. The recommended preservative for treating both interior and exterior wood is CCA. CCA treatment colors logs grayish green, but this can be masked by applying pigmented wood preservatives.

earance between the ground

Logs that are not pressure preservative treated should receive another dipping in copper-8-quinolinolate or zinc naphthenate after machining. This provides some protection from decay and insects during transit, storage and construction. After construction, the exterior log surfaces must be sprayed or brushed periodically with a wood preservative that contains an effective water repellent. Logs should be inspected annually, and any new, large checks or cracks should be caulked with a polyurethane caulking compound.

Exterior Log Finishing*

Most people who purchase or build log homes want them to continue to look just like they did when first built. Unfortunately, this will not happen without continual maintenance. An important part of maintenance is the application of a finish to exterior logs.

*Finish information recommendations are based on tests performed primarily in East Texas. The opinions given should in no way be interpreted as an official endorsement by the Texas Agricultural Extension Service or the Texas Forest Service, both of the Texas A&M University System.

(CCA pressure-treated logs can be finished after they have weathered for 6 months in an exposed location or 1 year in a protected location such as under a covered porch.)

The finish should protect against weathering (sunlight and rain), decay and mildew. (CCA treatment protects logs from decay, but not mildew.) The finish also must contain a pigment if the homeowner wishes to maintain the original wood color or mask the greenish color of CCA treatment.

Weathering tests conducted by the Texas Forest Service's Forest Products Laboratory show that most wood stains, water repellents and preservatives last only 7 to 18 months before mildew or weathering begins. Most log home owners report that they are refinishing annually to maintain the original wood color.

Continual maintenance is essential in order to prevent problems caused by weathering, mildew and wood decay.

One product tested in Texas and Missouri has proved effective in controlling both weathering and mildew. It is TWP (Total Wood Preservative). TWP contains both a fungicide and a mildewcide, as well as a pigment, resin, ultraviolet light absorber and water repellent. The TWP finish lasts about 5 years and may be the best way of maintaining an attractive natural wood look.

Seal Treat II is another product which gives a long-lasting finish. However, it is only available in a clear, ready-to-use solution and is not effective in maintaining the original color of wood. Wood treated with Seal Treat II weathers to a pleasing ash-white color. This product controls mildew well.

Sikkens, a product which must be applied in multiple coats, has shown acceptable results for shorter periods of time. It tends to break down under ultraviolet light within 2 to 3 years, and does not protect against mildew for very long in hot, humid climates. Although the initial cost of Sikkens is high when compared to other products, its coverage rate tends to compensate for the cost difference.

Controlling Decay and Insects in Existing Log Homes

Owners of log homes often experience wood decay and insect problems. The most common insect problems are caused by beetles which attack the wood within days after trees are felled or as logs are dried, machined or transported. These beetles include: the metallic wood-boring beetles sometimes referred to as flatheaded borers; long-horned wood-boring beetles or roundheaded borers; ambrosia beetles and pin-hole borers; and powderpost beetles and old house borers.

The beetle larvae most often found in homes constructed of softwood logs are metallic wood-boring beetles. The adults lay eggs in bark cracks and crevices of unseasoned logs. The larvae feed deeper into logs as the wood gets drier, and emerge as adults within 1 to 5 years after house construction. The 1/4-inch to 3/8-inch oval holes they leave upon emerging can trap water in the insect tunnels, causing decay. These emergence holes should be sealed with polyurethane caulking. No treatment for these beetles is required.

Powderpost beetles and old house borers infest wood after debarking and during seasoning, storage, transit or construction. The adults emerge 3 or more years later and can then reinfest the wood. Therefore, emerging beetles must be identified so that appropriate control methods can be used. These methods include spraying or injecting the logs with an EPA-registered insecticide or, in certain cases, fumigating logs under a gas-tight tarpaulin. Both of these control methods will require the services of a certified pest control operator.

Subterranean termites can pose a serious threat to log homes; that is why homeowners are strongly advised to have the soil properly treated prior to or during construction. If termites attack logs after the home is built, the damage can result in substantial labor and repair costs. Also, it is much more expensive and difficult to treat the

soil under an existing slab. The log home should be inspected annually for any sign of termite damage, and the damage controlled before it becomes extensive.

For more information on insects which attack wood, obtain Extension publications on subterranean and drywood termites, wood destroying beetles, carpenter ants and carpenter bees from your county Extension agent.

Most structural damage to log homes is caused by wood decay rather than by insects. Wood decay is caused by excess moisture, and can be prevented by protecting wood from moisture. CCA pressure-treated wood must be used to replace any rotting wood.

The authors express their appreciation to Sam Satterwhite of Satterwhite Log Homes, Longview, Texas, for providing financial support to print this publication, and to Dr. Harry B. Moore, Extension Entomologist, North Carolina State University, for his contributions in reviewing this publication.

Cover photo courtesy of Satterwhite Log Homes, Longview, Texas.

Issued in furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Zerle L. Carpenter, Director, Texas Agricultural Extension Service, The Texas A&M University System.

5M—4-87, New

H&HF 2; ENTO 3