Log Home Basics

Log homes may be site-built or pre-cut in a factory for delivery to the site. Some log home manufacturers can also customize their designs. Before designing or purchasing a manufactured log home, you need to consider the following for energy efficiency:

The R-Value of Wood

In a log home, the wood helps provide some insulation. Wood's thermal resistance or resistance to heat flow is measured by its R-value. The higher the R-value, the more thermal resistance.

The R-value for wood ranges between 1.41 per inch (2.54 cm) for most softwoods and 0.71 for most hardwoods. Ignoring the benefits of the thermal mass, a 6-inch (15.24 cm) thick log wall would have a clear-wall (a wall without windows or doors) R-value of just over 8.

Compared to a conventional wood stud wall [31 D2 inches (8.89 cm) insulation, sheathing, wallboard, a total of about R-14] the log wall is apparently a far inferior insulation system. Based only on this, log walls do not satisfy most building code energy standards. However, to what extent a log building interacts with its surroundings depends greatly on the climate. Because of the logs heat storage capability, its large mass may cause the walls to behave considerably better in some climates than in others. Logs act like "thermal batteries" and can, under the right circumstances, store heat during the day and gradually release it at night. This generally increases the apparent R-value of a log by 0.1 per inch of thickness in mild, sunny climates that have a substantial temperature swing from day to night. Such climates generally exist in the Earth's temperate zones between the 15th and 40th parallels.

Minimizing Air Leakage in Log Homes

Log homes are susceptible to developing air leaks. Air-dried logs are still about 15–20% water when the house is assembled or constructed. As the logs dry over the next few years, the logs shrink. The contraction and expansion of the logs open gaps between the logs, creating air leaks, which cause drafts and high heating requirements. To minimize air leakage, logs should be seasoned (dried in a protected space) for at least six months before construction begins. These are the best woods to use to avoid this problem, in order of effectiveness:

- Cedar
- Spruce
- Pine
- Fir
- Larch

Since most manufacturers and experienced builders know of these shrinkage and resulting air leakage problems, many will kiln dry the logs prior to finish shaping and installation. Some also recommend using plastic gaskets and caulking compounds to seal gaps. These seals require regular inspection and resealing when necessary.

Controlling Moisture in Log Homes

Since trees absorb large amounts of water as they grow, the tree cells are also able to absorb water very readily after the wood has dried. For this reason, a log home is very hydroscopic—it can absorb water quickly. This promotes wood rot and insect infestation. It is strongly recommended that you protect the logs from any contact with any water or moisture. One moisture control method is to use only waterproofed and insecticide-treated logs. Reapply these treatments every few years for the life of the house. Generous roof overhangs, properly sized gutters and downspouts, and drainage plains around the house are also critical for moisture control.

Building Energy Code Compliance for Log Homes

Because log homes don't have conventional wood-stud walls and insulation, they often don't satisfy most building code energy standards—usually those involving required insulation R-values.

However, several states—including Pennsylvania, Maine, and South Carolina—have exempted log-walled homes from normal energy compliance regulations. Others, such as Washington, have approved "prescriptive packages" for various sizes of logs, but these may or may not make sense in terms of energy efficiency. The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) 90.2 standard contains a thermal mass provision that may make it easier to get approval in those states that base their codes on this standard. To find out the log building code standards for your state, contact your city or county building code officials. Your state energy office may be able to provide information on energy codes recommended or enforced in your state.

Building & Restoration of Log Cabins

Foundation

The foundation of a log cabin is made of stone pillars. The stones provide a sturdy base to support the cabin and act as a barrier between the cabin and the earth. The stones may settle over time and the foundation is carefully examined for damage or wear and subsequently repaired during restoration.

Wall Construction

The walls are made of logs, placed either vertically or horizontally, depending on the style and size of the cabin. The logs are notched at the corners to allow them to fit together. Corner notching is a notable characteristic of log cabin construction because it provides stability by locking the log ends in place, enabling the logs to fit together in a secure manner. Many different methods of corner notching exist, ranging from simple "saddle" notching to the common "V" notching or "steeple" notching, which get their name from the shape of the notch cut into the wood. These notching methods are marked by a cut into the wood that allows another cut piece of wood to fit together like a puzzle piece. Another commonly used technique, "square" notching, differs in that the logs are secured with the addition of pegs or spikes.

The number of logs used per wall varies with the size of the cabin. The spaces between logs are usually filled with a combination of materials in a process known as "chinking" and "daubing." This process seals the exterior walls, protecting them from weather and animal damage.

Roof

Log cabin roofs are often gabled and are comprised of hand-split, wood shingles. The roofs often develop damage and leaks over the years and are commonly included in restoration.

Doors

Many log cabins have both a front and rear door. Due to the many times the doors are opened and closed over the years, the doors are often not in good working order and require repair during restoration. Both doors on the cabin can be comprised of boards that are hand-dressed, open inward and are fastened to the log structure with pegs.

Windows

The cabin features two windows, located on either side of the chimney. The windows hold glass panes, which most likely need to be replaced during the restoration of the cabin.

Chimney

The cabin has a chimney that sank and deteriorated into many different pieces over the years. The chimney was rebuilt during cabin restoration.

Definitions:

Handcrafted log home
A home that is constructed of logs that is individually fit together.

Milled log home
Constructed of machine-lathed logs, and is also used to describe a log home built from a kit.

Insulated log home
Constructed with half-logs attached to a standard 2x6 frame structure.

Chinking
The mixture used to fill the gaps between logs - can be natural materials or synthetic.

Shrinking
The normal loss of diameter in logs as they lose moisture.

Settlement
The downward movement of log courses as the logs shrinks.

Checking
The natural cracking of logs as they shrink.

Butt joints
Occur when two logs are placed end-to-end.

Log course
One layer of logs placed atop the entire foundation of the home.

Log wall exterior

The inspector shall inspect exterior surfaces of log walls, when such surfaces are visible, looking for:

- Presence of mold, mildew or fungus
- Cracks located at tops of logs and facing up
- Discoloration, graying, bleaching or staining of logs
- Loose or missing caulking
- Separation of joints
- Condition of chinking, to include cracking, tears, holes, or separation of log courses
- Condition of log ends

Log wall interior

The inspector shall inspect interior surfaces of log walls, when such surfaces are visible, looking for:

- Separation between logs, including light or air penetration from outdoors
- Separation between exterior log wall and interior partition walls
- Separation between log walls and interior ceilings

Other exterior concerns

In addition to the items specified in NACHI Standards of Practice 2.1 and 2.2, the inspector shall inspect:

- Downspout extensions
- Grading and water flow away from log walls
- Vertical support posts under and on all porches

Other interior concerns

In addition to the items specified in NACHI Standards of Practice 2.4 and 2.6, the inspector shall inspect:

- Slip joints, adjustable sleeves, looped water supply lines, flexible hose sections, and flexible ductwork that are visible as part of the standard heating and plumbing inspections.

Exclusions

The inspector is not required to:

- Inspect or predict the condition of the interiors of logs
- Predict the life expectancy of logs
- Climb onto log walls. However, the inspector may inspect log walls by use of a ladder, if this procedure may be done safely and without damaging the walls.
- Inspect components of the porch support system, or of the plumbing or heating systems, that are not readily visible and accessible.