

Introduction

This publication is a practical guide for preserving historic log cabins. Most of the guide is devoted to explaining and showing the hands-on aspects of log cabin preservation, such as jacking and cribbing, notching and replacing logs, replacing purlins and rafters, patching, and chinking and daubing. The guide describes how to repair foundations, roofing, windows, doors, chimneys, and interiors. It addresses annual maintenance and appropriate tools. In short, it covers nearly every aspect of log cabin preservation and maintenance.

This guide also presents the history and styles of log cabins, explains how and why to perform condition and historic assessments, addresses the requirements for preserving historic structures, describes how to plan projects, and explains how to work safely, so that you understand why you should use the procedures and methods in the guide.

The information in this guide is not new, but most of it is no longer widely known. Although the primary mission of the U.S. Department of Agriculture, Forest Service, has remained much the same throughout its more than 100-year history, the work has changed dramatically. In the early days, each employee was expected to “be able to take care of himself and his horses in regions remote from settlement and supplies. He must be able to build trails and cabins and to pack in provisions without assistance.” Now, most employees are specialists who routinely deal with complex ecological or technical issues. Some still use pack horses and mules or build trails, but they don’t hand craft their own offices. Few employees thoroughly know the traditional craft of building with logs, and those who do take their skills and knowledge with them when they retire. The authors wrote and published this guide to keep the knowledge of historic log building methods and materials available.

For many people, the most important reason to retain and repair historic log cabins (figure 1) is that old cabins are interesting. These cabins are visible portrayals of America’s past—the materials and tools available at the time that each cabin was built, the skills of the people crafting the buildings, and the needs and purposes of the people who built them. Preserving historic log cabins enables us to touch a tangible piece of our history and to share it with future generations. [Appendix A—Preservation Reasons](#) provides more information about the benefits of preserving these cabins.



Figure 1—The Alta Ranger Station in the Bitterroot National Forest, built in 1899. This is the oldest surviving Forest Service building in the Northern Region and may be the oldest surviving log Forest Service building in the Nation constructed specifically for use by forest rangers.

Is your cabin eligible for or listed on the National Register of Historic Places? You need to know before you begin any preservation work so you can determine whether modification or repair work is appropriate. If you don't know the cabin's National Register status, ask your unit heritage staff; they have the information on file. If the cabin isn't owned by a Federal or State government agency, you should hire a professional to evaluate the cabin in the manner explained on the [National Register of Historic Places Program: Fundamentals web page](http://www.nps.gov/nr/national_register_fundamentals.htm) at <http://www.nps.gov/nr/national_register_fundamentals.htm>.

In the United States, "historic preservation" often is used as a general term for any work that maintains or restores the historic features of an old building. This use of the term is misleading. The U.S. Secretary of the Interior established four specific treatment approaches for historic buildings, as well as standards and guidelines for implementing the treatments. The treatments differ depending on the historic significance of the building, its current condition, and the goals for its future use. The four treatment approaches are preservation, rehabilitation, restoration, and reconstruction. [Appendix B—Preservation Requirements](#) briefly explains these four treatment approaches and the standards for achieving them.

The Forest Service is required by law to carefully care for the historic sites and structures, including log cabins, that the agency owns or funds. Although it is tempting to do whatever seems expedient to repair historic log cabins, Federal and State agencies must follow certain rules, laws, and requirements if the building is eligible for or listed on the National Register of Historic Places. Non-Federal or non-State groups and private individuals also must follow these rules, laws, and requirements during grant-in-aid projects assisted through the National Historic Preservation Fund or if they are using Federal or State funds on buildings that are eligible for or listed on the National Register of Historic Places. Even if you aren't required to comply with the mandates, you will find that they provide valuable guidance during your project. [Appendix A—Preservation Reasons](#), and [Appendix C—Preservation History](#), include information about rules, laws, and requirements.

This guide focuses on cabin **preservation**. The term preservation describes work performed to maintain and repair the form, materials, and features of a historic cabin as it has been occupied through time and to make the appropriate changes and alterations that will keep it useful. Preservation work does not include extensive renovation or major additions. Some upgrading of mechanical, electrical, and plumbing systems and other code-required work is appropriate.

Guiding Principles for Historic Preservation

The following seven principles summarize most of the rules, laws, and requirements for preserving log cabins:

1. Retain as much historic and existing fabric as possible.

“Fabric” is any part of the building’s physical structure, such as logs, glass, wallpaper, and decorative details.

2. Do not leave your imprint on the building.

Your job is to protect the historic design and construction of the building. Do not be tempted to improve the original aesthetics or fix original engineering mistakes in visible ways. For instance, if the original rafter ends extended beyond the roof eaves and have rotted, do not fix the rot problem by shortening the rafter ends.

3. Do not overcraft.

Your job is to repair or replace with the same level of craft—be it good or bad—that the historic builders used.

4. Use only sympathetic treatments.

Sometimes a modification may be necessary so that the structure meets current needs and code requirements. “Sympathetic” treatments use similar materials to the originals. For instance, T1-11 siding (plywood sheets grooved to imitate vertical shiplap siding) is not a sympathetic treatment for a log cabin repair.

5. Match the existing fabric and replace in kind.

Stick with the original design and materials. If the original cabin logs are cottonwood, replace them with cottonwood, even though cottonwood is not a durable material. Matching the existing fabric, which may or may not be original, is preferable to speculation. Always use hard evidence, such as existing material, ghosts of past construction, or historic photographs. Do not guess or rely on recollections of past residents or occupants unless no hard evidence exists. Recollections often are faulty. Likewise, although plans and drawings can give clues, builders rarely build exactly according to the plans, so plans and drawings probably are not completely reliable.

6. Make your work reversible, if possible.

Everyone occasionally makes mistakes that may someday need to be corrected.

7. Document all your work.

Assemble as-built plans or carpenter sketches, a written narrative, and detailed photographs to record the work that you completed. Include signboards (figure 2) in your photos, or label the photos in an electronic or physical album. Make an architectural artifacts box with labeled fragments of historic fabric (pieces of flooring or joists, roof shingles, plaster, wallpaper, etc.) that you replace (figure 3). Store the box somewhere in the building that is clean, dry, free of vermin, and out of the way of daily activity, such as the attic, the basement, or a closet. Note the existence and location of the box in the narrative.

In addition to providing the seven guiding principles that summarize rules, laws, and requirements, the author suggests an eighth guiding principle that provides philosophical guidance for the physical work necessary to accomplish effective and appropriate preservation work:

8. Marry the chain saw to the broadaxe.

It’s acceptable to use powertools for some work on your historic log cabin, unless the cabin is within a designated wilderness area. The trick is to use powertools when it speeds the work and handtools when it affects the appearance of the cabin. Whether you use handtools or powertools, craftsmanship is vital to preservation.



Figure 2—The photographer made and placed a signboard in this photo to show that the circular fragment is a 4-inch-diameter drain tile found during a restoration project on April 8, 1992, at the northwest corner of the Judith Guard Station (Lewis and Clark National Forest, Northern Region). Sign boards in photos, unlike other photo captions, can't be separated and lost from the photo.

Introduction



Figure 3—The restorers of the 1916 Paschoal Social Hall in Kalaupapa National Historical Park, Hawaii, created this architectural artifacts box in 1998 to safely store fragments of the historic materials they replaced.

Anatomy of a Log Cabin

The author uses certain technical construction terms consistently throughout this guide. Even if you have worked in building maintenance or construction for years, you may not be familiar with all the terms. Many once common techniques and terms are no longer common at all, and construction terms may have different meanings to people in different parts of the country.

The drawings of a log cabin (figure 4) and an ordinary early 20th-century house (figure 5 and table 1) illustrate the terms used in this guide to describe parts of buildings. You may want to bookmark this page so you can flip back to it whenever you encounter an unfamiliar term. [Appendix D—Glossary](#), lists and defines log cabin construction terms. You also may want to bookmark it.

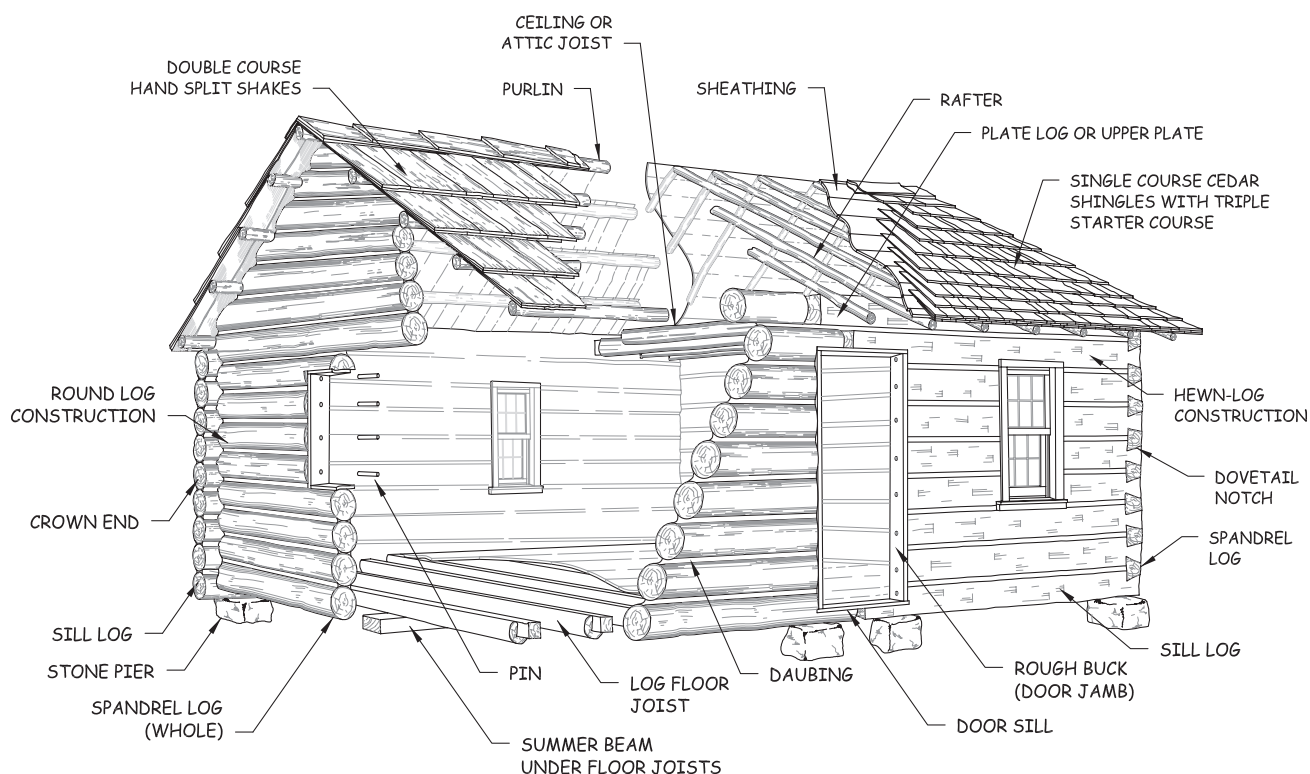


Figure 4—This detailed drawing shows all the common “parts” of a log cabin.

Anatomy of a Log Cabin

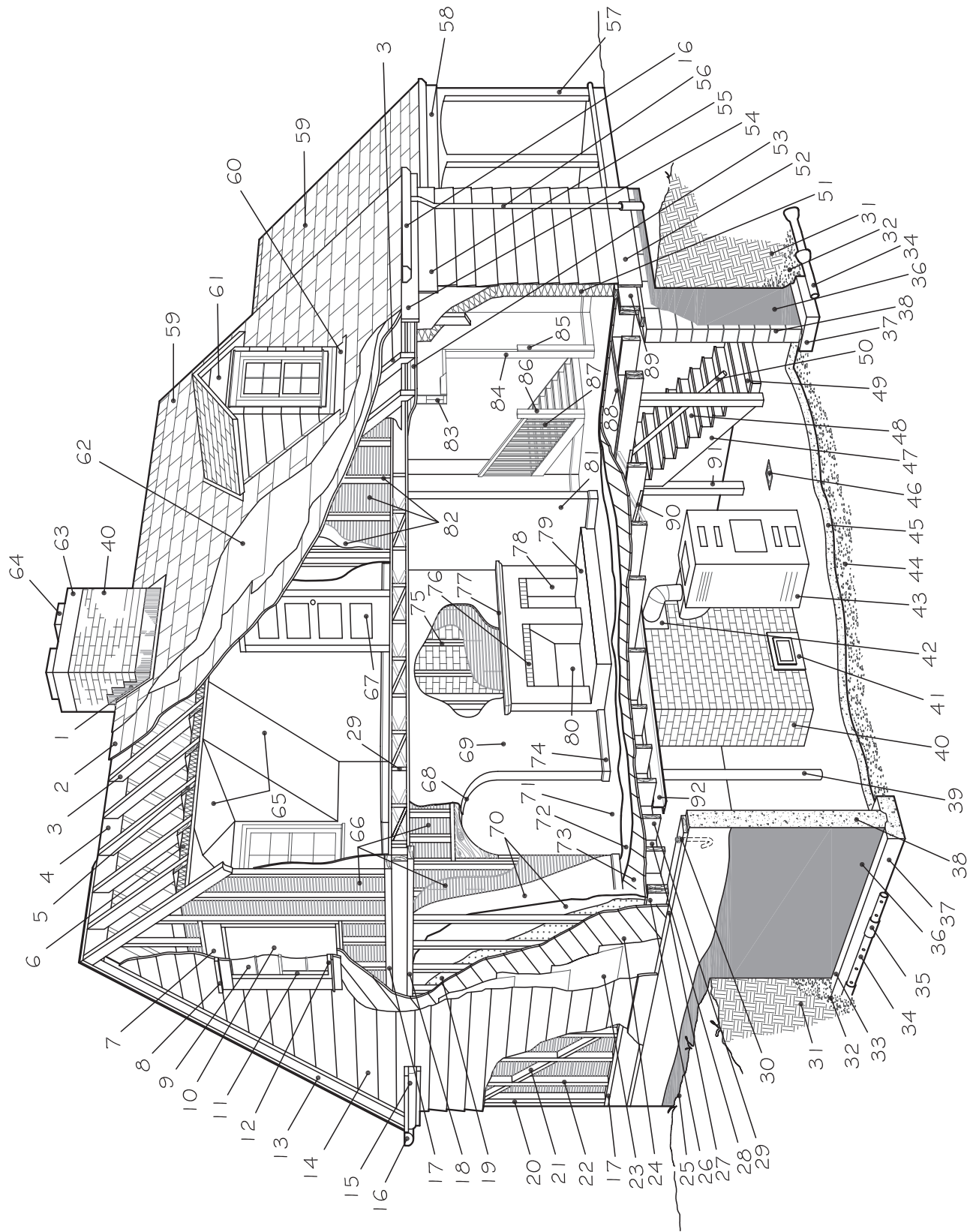


Figure 5—This detailed drawing shows all the common “parts” of a typical early 20th-century house. The numbers on the drawing correspond to the items listed in Table 1—House Parts Dictionary.

Dovetails and Broadaxes: Hands-On Log Cabin Preservation

Table 1—House Parts Dictionary.

Part Number	Item	Part Number	Item
1	counter flashing	47	stair stringer
2	roof sheathing	48	stair riser
3	rafters	49	stair tread
4	ridge board	50	stair rail or handrail
5	ceiling joist	51	wall insulation
6	ceiling insulation	52	weather board
7	window header	53	soffit
8	drip cap molding	54	fascia
9	glazing or window glass	55	frieze board
10	rough opening	56	down spout
11	window sash	57	porch post or column
12	windowsill	58	porch frieze board
13	gable rake molding or barge board	59	shingles
14	bevel siding	60	base flashing
15	cornice return	61	dormer
16	gutter	62	(asphalt felt) roofing paper or roofing felt
17	floor plate or bottom plate or sole plate	63	chimney cap
18	top plate	64	flue liner
19	drywall lath or gypsum lath	65	angled ceiling
20	corner studs	66	wood lath
21	diagonal bracing or wind bracing or shear bracing	67	passage door or interior door
22	wall studs	68	plaster arch
23	(asphalt felt) building paper	69	bearing wall
24	diagonal wall sheathing	70	plaster
25	grade line	71	finish flooring
26	double edge joist or rim joist	72	underlayment
27	sill plate	73	subfloor
28	solid blocking	74	base molding
29	floor joist	75	furring strips
30	anchor bolt	76	lintel
31	backfill	77	mantle
32	drain rock	78	wood box
33	foundation cove	79	hearth
34	drain tile or foundation drain	80	fire box or fireplace
35	joint cover	81	partition wall (full height, non load bearing)
36	waterproofing	82	(back of) knee wall
37	footing	83	header
38	foundation wall or stem wall	84	cased opening
39	pipe column	85	trim
40	chimney	86	newel post
41	ash pit cleanout	87	banister or baluster
42	thimble	88	joist trimmer or joist header
43	furnace	89	rim joist or band joist
44	aggregate fill or base	90	cross bridging or cross bracing
45	floor slab	91	post or column
46	floor drain	92	steel beam

A Brief History of Log Construction

Not all log buildings are log cabins. Some log structures, including many built in the 20th century, are more polished, larger, or more elaborate than a log cabin. A log cabin is a simple one- or one-and-a-half-story structure (figure 6), usually having a somewhat rough appearance. Although techniques explained in this guide may be similar to those used for other log structures, this guide concentrates on log cabin preservation.

Many Americans view log cabins nostalgically as the traditional American pioneer home, representing cultural characteristics such as wholesomeness, humility, and honesty. People have held this viewpoint since at least 1840, when the supporters of presidential candidate William Henry Harrison adopted the log cabin as a campaign symbol.

American settlers didn't invent log cabin construction, and the first English and Spanish colonists didn't construct buildings using logs. Northern and Eastern Europeans have used stacked log construction since at least 800 B.C. In the early

1600s, Finnish and Swedish settlers brought the stacked log construction technique with them from Scandinavia to what is now Delaware and Pennsylvania. Because much of the American frontier was well endowed with trees but not with sawmills, and log buildings could be handcrafted relatively quickly using axes and crosscut saws, settlers adopted this style of construction widely and passed it along to others.

During the 1600s and 1700s, European immigrants from Switzerland, Germany, and Ukraine brought their own log construction techniques to America. Settlers used logs to build houses, businesses, schools, churches, barns, and other structures as they pioneered in forested areas. In the Mississippi Valley, French fur traders and settlers introduced vertical log construction during the 1600s. In parts of California and in Alaska, Russian traders and colonists built log buildings during the late 1700s and early 1800s. Hispanic influences are apparent in many historic log structures in the Southwestern States.



Figure 6—The Jubilee Guard Station is a one-and-a-half-story log cabin built in 1905 in the Escalante District of the Dixie National Forest, Intermountain Region. Located at an elevation of 9,800 feet on the Aquarius Plateau in southern Utah, it's one of the oldest remaining guard stations in the State.

As populations became denser and industry developed during the mid-1800s, nailed-together, balloon-frame construction using dimensioned lumber replaced log construction and also traditional mortise-and-tenon joinery in most of the country. During this time, people often viewed log structures as temporary first homes to be replaced with respectable frame or masonry buildings as soon as the homeowners could afford them.

In the late 1800s and early 1900s, rustic-style, architect-designed log buildings became fashionable for the often luxurious vacation retreats of wealthy Americans in the Adirondack Mountains region and near western public lands (figure 7). The Old Faithful Inn at Yellowstone National Park (figure 8), built in 1903, is often considered the pinnacle of this log-lodge style—which is a far cry from a log cabin. In the late 1890s, the American Craftsman building style developed as

part of the Arts and Crafts movement. People considered this style's emphasis on natural materials more compatible with forested settings than other styles. Many State park, national park, and Forest Service buildings constructed during the 1930s and 1940s adopted log construction with American Craftsman details. The Civilian Conservation Corps built many of these log buildings.

Today, log construction remains popular, particularly in the West where it is viewed as appropriate to the natural setting and a fitting architectural style for those who consider themselves the inheritors of the spirit of rugged independence exemplified by American pioneers. Few people today build their own new log structures using just an axe and crosscut saw. Now, contractors use powertools, sophisticated jigs, and cranes to hoist the logs into place.

Figure 7—Craftsmen constructed this spacious summer home within the Boise National Forest, Intermountain Region, in 1938.





Figure 8— Architect Robert Reamer designed the Old Faithful Inn in Yellowstone National Park with elaborate log and stone detailing. The inn has been carefully maintained to preserve its original character for more than 100 years.

Building With Logs in the Forest Service

Building With Logs in the Forest Service

Log buildings have been constructed by and on behalf of the Forest Service since the earliest days of the agency, especially in the West. In the first few years after Congress established the Forest Service, a new ranger might be expected to construct a cabin that would serve him and his family as both a dwelling and an office in a location that would provide relatively easy access to the lands the ranger was responsible for managing. Later, the agency developed standard plans for ranger station buildings that could be modified to suit local conditions. The Forest Service sometimes hired local builders to help construct those buildings. During the Great Depression, the Civilian Conservation Corps constructed a number of buildings for the Forest Service, sometimes using standardized regional plans.

By the early 1940s, W. Ellis Groben, the Chief Architect of the Forest Service, and Clyde P. Fickes, a structural engineer in the Northern Region Regional Office, determined that detailing effective log construction practices would be beneficial to the Forest Service. They wrote “[Building with Logs](#)” in 1944. In 1945, the Forest Service published it as “USDA Forest Service, Miscellaneous Publication No. 579.” This publication is available at http://www.fs.fed.us/eng/facilities/documents/build_with_logs.pdf.

Styles: Not All Log Buildings Are Created Equal

People tend to prefer doing things as they always have, unless they have a good reason to change. When immigrants came to America, they brought their cultural traditions and their construction techniques. In many cases, building types and styles developed in the “old country” worked fine in the New World. In other cases, they really didn’t make sense in the new climate, nor were the same building materials available. People sometimes retained traditional building shapes but used whatever materials were available. Climate sometimes encouraged them to change the shapes of their buildings, but they kept familiar details. Other times, they adopted both materials and forms that others had used successfully in the area. Because of this mix of construction traditions, climates, and available materials in America, variations multiplied, even in simple building forms such as log cabins.

For example, foundations for historic log cabins vary from nothing at all to full concrete footings and stem walls. Cabins constructed without foundations usually had dirt floors; the builders intended them as temporary shelters. More common

were log pilings or log sleepers that supported sill logs and floor joists. Most builders set log cabins on stone piers or a continuous course of mortared (figure 9) or dry-laid stones. They sometimes filled the spaces between supporting piers with mortared or dry-laid stones (figure 10). They varied the height of the foundation walls or piers, depending on the climate. People in the South often used fairly tall piers under cabins to allow air to circulate. Concrete foundations and basements under log cabins didn’t become common until the early 1900s, but people did dig root cellars under some earlier cabins.

Most log cabins are one of four basic cabin plans, or a variation thereof. The most common plan is the single pen (figure 11), a rectangular or square cabin with a door under the roof eaves. People often added porches to provide protection for the door and outdoor living space. The saddlebag (figure 12) or double pen plan is two side-by-side single pens that usually share a central chimney. Saddlebag buildings frequently grew from single pen cabins when the owners added a second



Figure 9—The Ranger’s House at the Crandall Ranger Station (Shoshone National Forest, Rocky Mountain Region), built in 1935, has a mortared stone foundation.



Figure 10—The people who restored this pre-1914 storage cabin at the Stolle Meadows Guard Station (Boise National Forest, Intermountain Region) carefully replaced the dry-laid stones between the rock corner piers after they replaced the sill and spandrel logs.

Styles: Not All Log Buildings Are Created Equal

pen onto the chimney-end wall. The dogtrot cabin (figure 13) is made of two separate cabins joined by a central open-air passageway under a continuous roof. It is commonly considered a southern-style cabin because the open middle provides shade for outdoor activities and encourages air movement that cools the structure. Examples of this floor plan are scattered throughout the country. The Rocky Mountain-style cabin (figure 14) probably evolved as a response to the heavy snowfall in the Rockies. Rocky Mountain cabins have a door in the gable end. The door is usually sheltered from sliding snow by an extension of the cabin roof that forms a porch.

Builders constructed all these cabin types in various sizes, with or without inside walls that defined separate rooms. People sometimes built larger cabins with central chimneys dividing the two main rooms; but, because cabins usually were small, most people put their fireplaces or wood stoves on one end wall. As the owners' fortunes improved, they sometimes added end or ell additions (figure 15), full or partial second floors, exterior siding, or plaster on the interior walls and ceilings.

Figure 11—These drawings show two typical single pen cabin plans. The fireplace or wood stove typically is on a gable end. The door is on the side under the eaves or under a side porch.

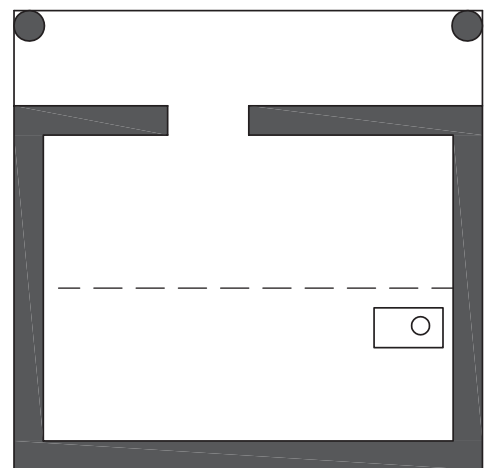
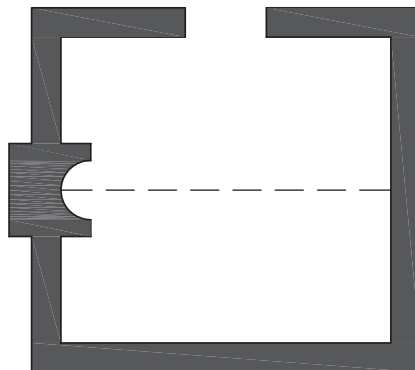


Figure 12—A typical plan for a saddlebag or double pen cabin with two fireplaces served by a central chimney.

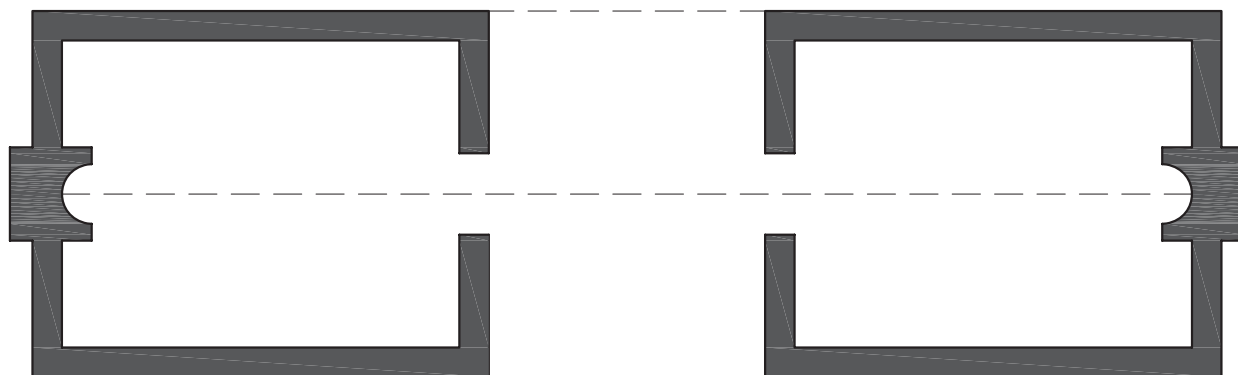
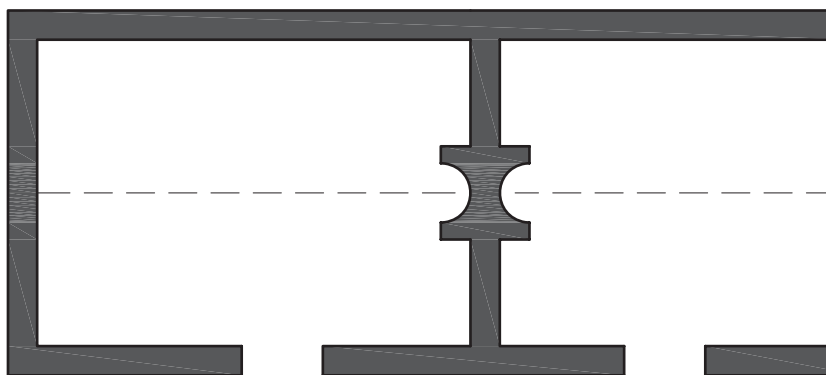


Figure 13—A typical plan for a dogtrot-style cabin. The doors open onto a covered breezeway between the two single pen cabins, and fireplaces are located at each end.

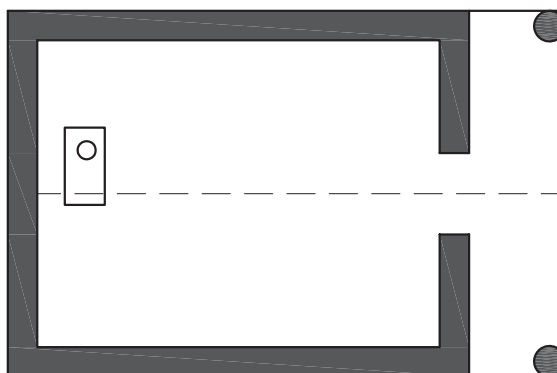


Figure 14—A typical plan for a Rocky Mountain-style log cabin. The door opens onto a covered porch on the gable end.



Figure 15—The builders enlarged Checkerboard Ranger Station (now within the Helena Ranger District) of the Helena National Forest, Northern Region, by adding a two-story log wing with a roof running perpendicular to the original log building.

Styles: Not All Log Buildings Are Created Equal

Farmers and settlers tended to construct log cabins from the most durable tree species they could find in a handy diameter. They frequently used chestnut and white oak trees in the East and Midwest; cedar in the Pacific Northwest; and ponderosa pine, Douglas-fir, or larch in the Rocky Mountains. These species provided relatively long, straight, rot-resistant logs. Sometimes they used less durable but lighter species for the upper log courses because these courses didn't need to be as rot resistant. During the Gold Rush era in the interior West, miners constructed cabins of whatever wood they could find; even cottonwood, which isn't very durable. The miners didn't intend to stay long.

Builders usually constructed cabins with round logs, but sometimes they hewed logs to provide fairly flat exterior and interior wall surfaces. They usually removed the bark before stacking the logs, but they sometimes left the bark in place, especially on temporary structures. Where they could locate large-diameter logs, builders sometimes sawed them lengthwise into two halves so that a single log could provide two wall courses, with the flat side facing the interior or exterior.

To secure the stacked logs, builders used a variety of corner notching and other fastening systems. Common notching techniques included: saddle notching (figure 16), "V" or steep-le notching (figure 17), half-dovetail notching (figure 18), and full-dovetail notching (figure 19). Among these notching techniques, saddle notching requires the least time and skill to accomplish. Full-dovetail notching creates the most secure corner, but also requires the most time and skill. Square notching (figure 20) must be secured with pegs or spikes because the log ends don't interlock. Other corner fastening methods, such as step and lock (figure 21), corner posts (figure 22) without or with tenons (figure 23), and "hog trough" boards nailed to the ends of stacked logs (figure 24) were less common. Log cabin builders sometimes held each successive course of logs together with metal spikes or wooden dowels. If the builders used spikes or dowels, they usually drove them through near the middle of the wall, although some builders drove connecting spikes along the full length of the wall. An extended log end or "crown" sometimes protruded beyond the corner notches of cabins built during the period when the American Craftsman style was popular.

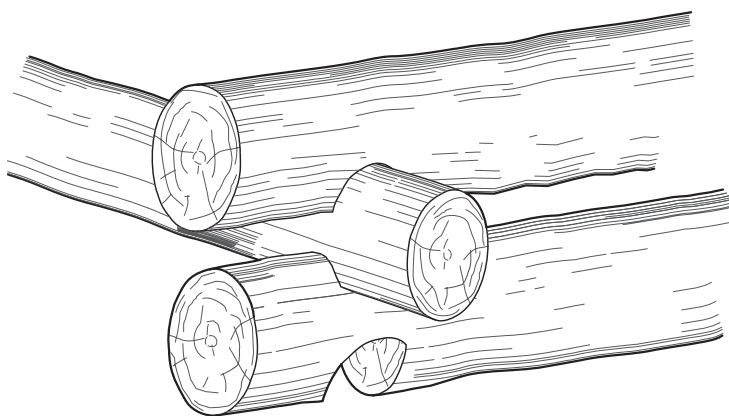


Figure 16—This drawing shows a saddle notch and how the notch locks the logs together.

Figure 17—This drawing shows a “V” or steeple notch and how the notch locks the logs together.

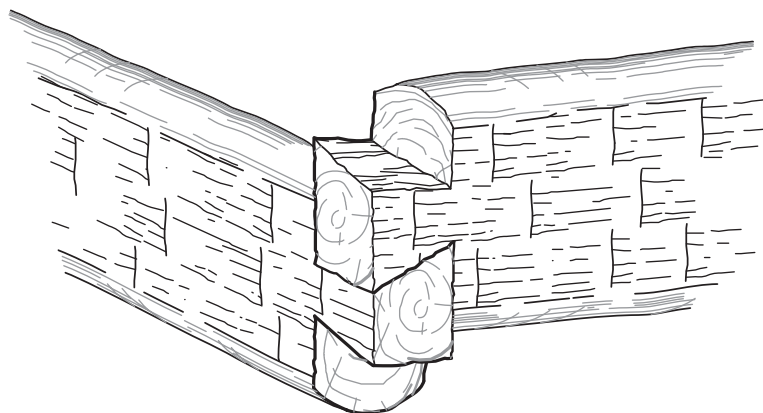
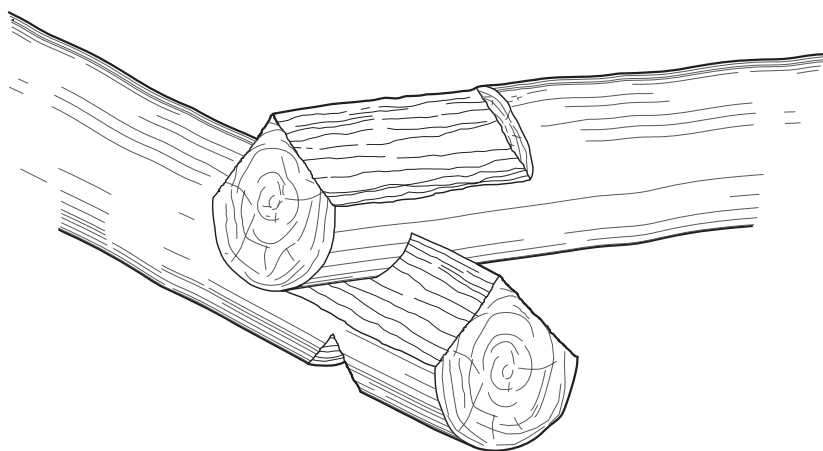
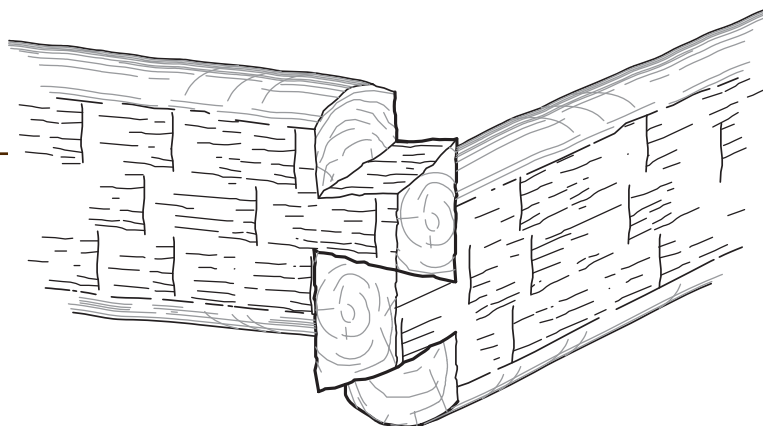


Figure 18—This drawing shows a half-dovetail notch and how the notch locks the logs together.

Figure 19—This drawing shows a full-dovetail notch and how the notch locks the logs together.



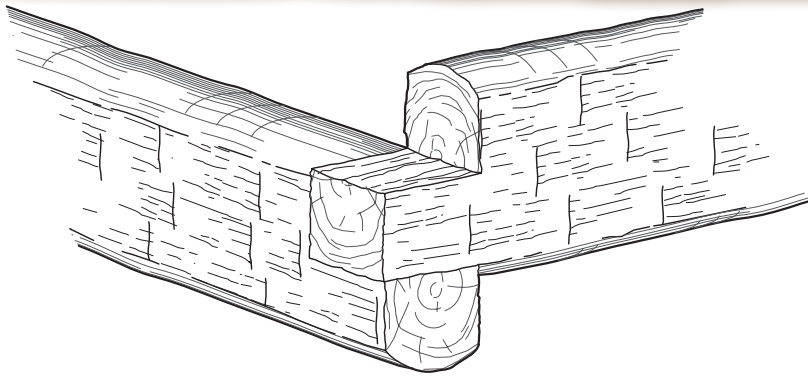


Figure 20—These two drawings show two square notching methods and why this notch doesn't lock logs together but must be pinned to create a sturdy corner.

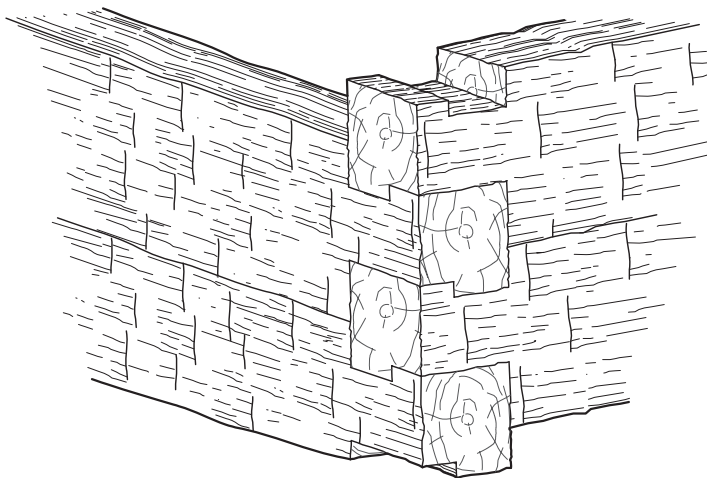
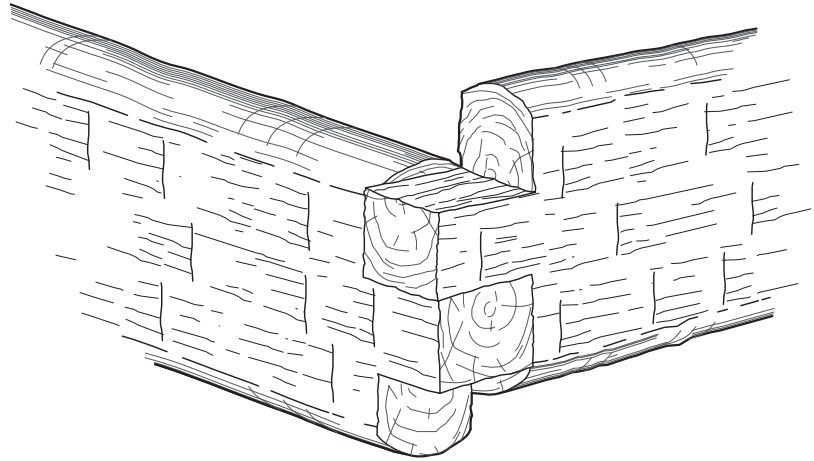


Figure 21—This drawing shows a step and lock notch and how the notch partially locks the logs together.

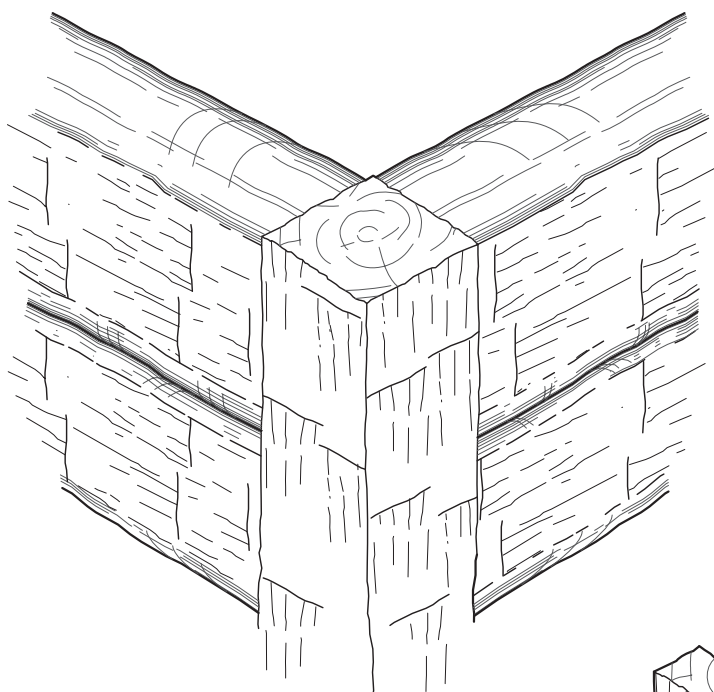
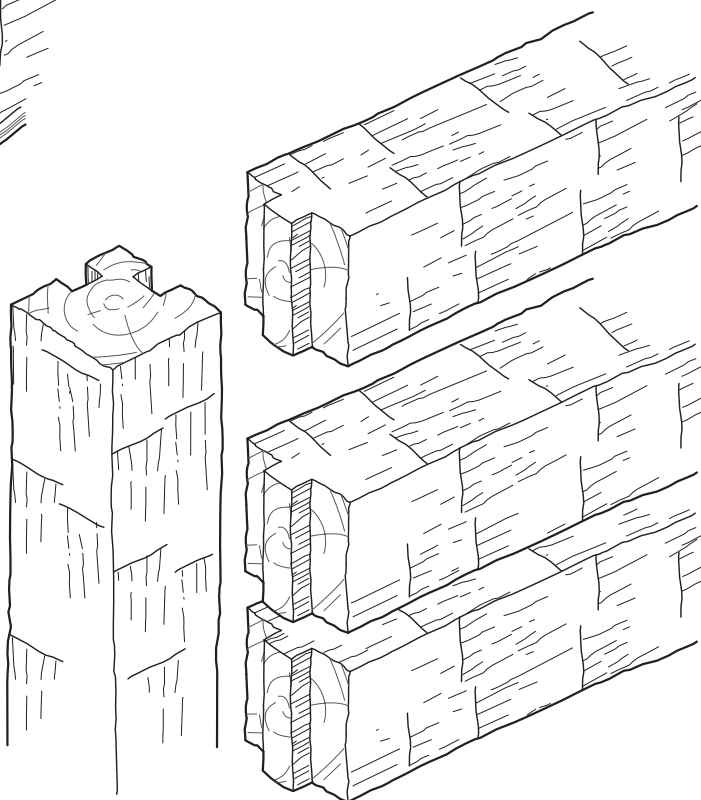


Figure 22—This drawing shows how logs abut a corner post.

Figure 23—This drawing shows how log tenons fit into a mortised corner post.



Styles: Not All Log Buildings Are Created Equal

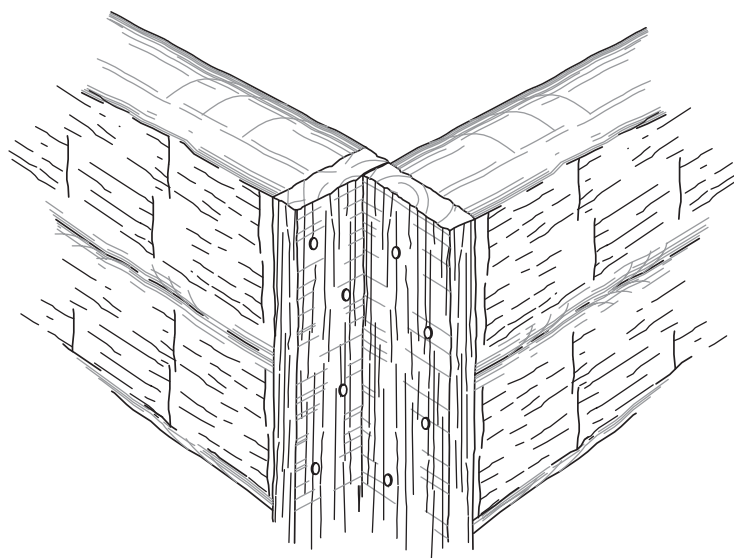


Figure 24—This drawing shows “hog trough” boards nailed to stacked logs to create a corner.

Sometimes builders carefully hewed logs flat between courses or coped (scribed and shaped) (figure 25) them to fit together so that little or no gap existed between the stacked logs, achieving a nearly weather-tight wall without chinking and daubing. Creating this tight fit with handtools required a lot of time and skill.

Log cabin builders usually chinked and daubed cabin walls to keep weather out. Chinking is material used to fill the horizontal spaces between logs. Chinking typically consisted of whatever builders could find nearby and could

conveniently stuff into the spaces between logs. Chinking often consisted of wood or stone slabs packed with moss, oakum, clay, or dung.

Daubing is the finish layer that usually looks like dried mud or mortar, typically consisting of a sand, clay, and lime mixture. After 1900, builders sometimes added Portland cement to daubing mixes. They often sloped daubing (figure 26) to protect the tops of logs and to shed rain. Sometimes builders used tightly fitted quarter poles or narrow wood strips instead of, or in addition to, daubing. Even when builders hewed

Styles: Not All Log Buildings Are Created Equal



Figure 25—The builders coped the logs of this D-1 type lookout so that they fit tightly. This lookout was relocated to the Northern Region's Aerial Fire Depot and Smokejumper Center as part of an interpretive display.



Figure 26—The builders sloped this unusually white daubing to protect the tops of the logs. A narrow wood strip provides a solid lower edge for the daubing.

logs flat between courses or coped them, they frequently used chinking and daubing to provide additional weather resistance.

Builders sometimes covered log cabins with shingles, sawn-wood siding (figure 27), stucco, or whitewash to provide a more finished and prosperous appearance and to help protect the logs from weather and insects. Sometimes they applied this outer finish immediately after they built the cabin and sometimes they applied it later.

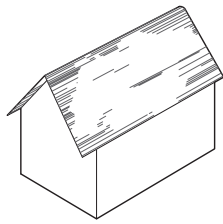
Although simple gable roofs framed with purlins or rafters are most common for log cabins, builders used a variety of styles (figure 28). While they mostly used wood shingles or shakes for roof materials, they sometimes used other materials, including sod (figure 29).

[Appendix E—Log Building Origins and Styles](#) provides more detailed information about log building plans, logs, joining, weatherproofing, roofs, foundations, and chimneys.

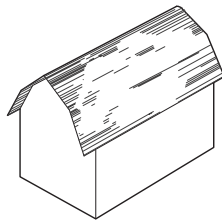


Figure 27—This log cabin in Frisco, CO, has clapboard siding on the front.

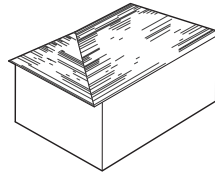
Styles: Not All Log Buildings Are Created Equal



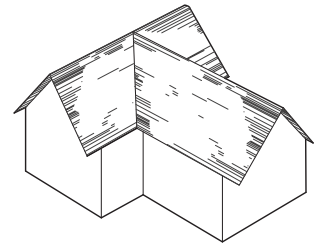
GABLE



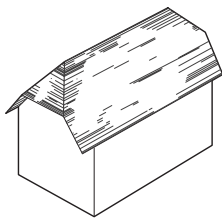
GAMBREL



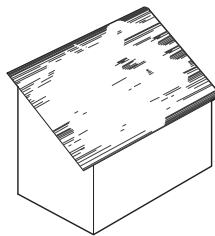
HIP



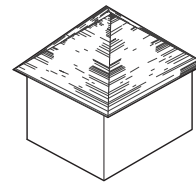
CROSS GABLE



JERKIN HEAD OR CLIPPED GABLE



SHED



PYRAMID

Figure 28—This series of labeled drawings shows common roof styles for log buildings.

Styles: Not All Log Buildings Are Created Equal



Figure 29—These historic log jail buildings at Bannack State Park in Montana have sod roofs.