

LAKE STATES ASPEN REPORT NO. 15

# ASPEN FOR CABIN LOGS

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## FOREWORD

During and since World War II, there has been increasing interest in aspen (Populus tremuloides) in the Lake States, its availability and supply, properties and uses, and management. Aspen is a tree of primary importance in 20 million acres or 40 percent of the total forest area of the three Lake States - Michigan, Minnesota, and Wisconsin.

At an informal meeting at Madison, Wisconsin, in January, 1947, forestry representatives of several federal, state, and industrial groups in the Lake States agreed that it would be desirable to bring up to date what is known on aspen and make it available to anyone interested. The job of preparing this information in the form of reports was assigned to each of the groups listed below. The reports will be duplicated as rapidly as completed, and the entire project should be finished by the end of 1947. Each report will concern one aspect of the subject. Copies will be available from the Lake States Forest Experiment Station or from each contributor.

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ASPEN FOR CABIN LOGS

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Introduction

A plentiful supply of pine and cedar logs provided the early settlers of this country with a cheap and durable material for the construction of their homes and farm buildings. Only the axe and the ingenuity of the pioneer were needed to erect a shelter against the elements of nature. Early in the 19th century, the circular saw came into use resulting in a change in building construction. The pine stands in New England and in the Lake States, considered inexhaustible in the 19th century, were converted to lumber to construct buildings necessary for the rapid development of the country. Log cabin construction continued on a very small scale but was largely confined to the inaccessible parts of the country where a cheap and plentiful supply of good building logs still existed. Today, with lumber and pulpwood prices the highest in the history of the country, aspen is about the only cheap and plentiful building log material in the northern Lake States.

Extent of Present Use

It is estimated that less than 10% of the log cabins in the Lake States are now constructed of aspen. In localized areas where there is a shortage of pine, spruce and balsam fir, the use of aspen as a cabin log material is increasing. In these areas, up to 25% of the log cabins constructed these past few years have been built with aspen.

Whole log and split log construction of the palisade type is most commonly used. The logs are usually eight feet long, with a minimum top diameter of six inches. Palisade type cabin logs are much easier to obtain than logs of longer length which are usually used in horizontal type construction. Practically any commercial aspen stand over 40 years of age will yield palisade type cabin logs, while only the better stands of mature aspen will yield satisfactory logs for horizontal type construction. The lower cost of logging the shorter lengths is also an item to consider. Short length cabin logs are easy to skid and haul and the logs can be secured from a smaller area than if longer logs are needed.

When small size aspen is used in palisade type of construction, whole logs are usually used. The sizes of the pieces vary from five to nine inches in diameter. Two edges of the logs are usually faced to provide for close matching and any cracks are chinked with cement, moss or other chinking material. Sometimes they are set together by use of a spline joint. The interior of the cabin may be left in a natural state if it is designed for summer use.



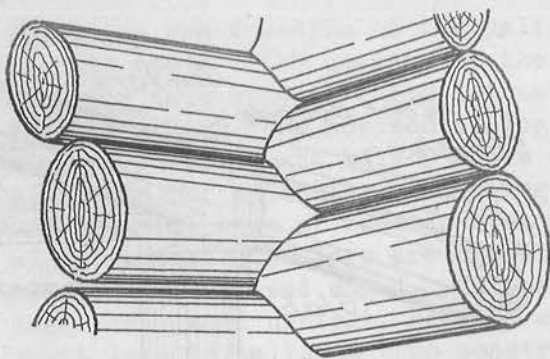
Split log construction of the palisade type is becoming quite popular in some areas. The quality of the structure and the ease and costs of securing this kind of cabin log material are the major factors responsible for the change from horizontal log construction. In the northern area where log cabins are built, there are numerous small portable mills available for splitting and edging the pieces. Generally, the split log palisade type of construction uses logs with a top diameter above eight inches. The logs are cut about eight feet in length and sawed in half lengthwise and edged. In the construction of the cabin, the half logs are placed upright, edge to edge. Figure 1 illustrates the use of short logs in palisade type construction and the pleasing appearance of the cabin when care is given to the selection of a building site.



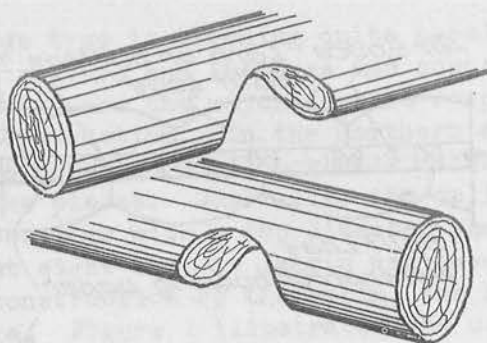
Figure 1. The use of short logs in palisade type construction. F-401013

The interior of the cabin may be finished by using waterproof building paper or some other form of insulation which is covered by the inside finishing material. A layer of split aspen logs, or plywood, makes a good finishing material.

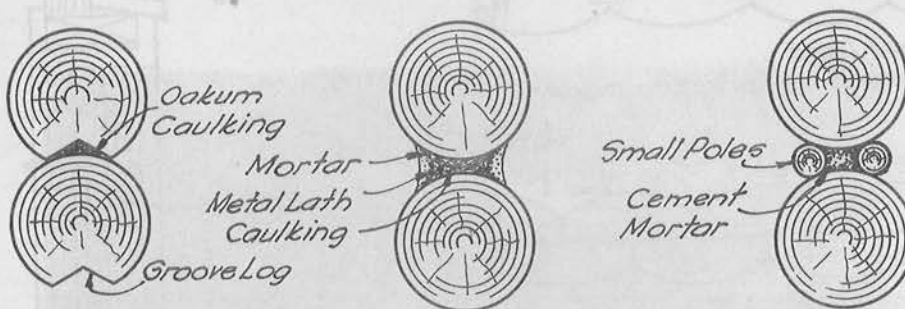
Another type of construction just coming into use is of the block type. Aspen blocks three to eight inches in diameter and six to eight inches in length are laid flat with the axis of the pole at right angles to the wall. The spaces in between the blocks are filled with cement mortar. It is believed, however, that the shrinking and swelling of the blocks may cause the mortar to crack.



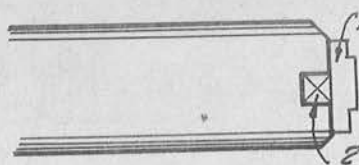
CORNER DETAIL



CUTTING DETAIL  
FOR CORNER



TYPES OF WALL CONSTRUCTION

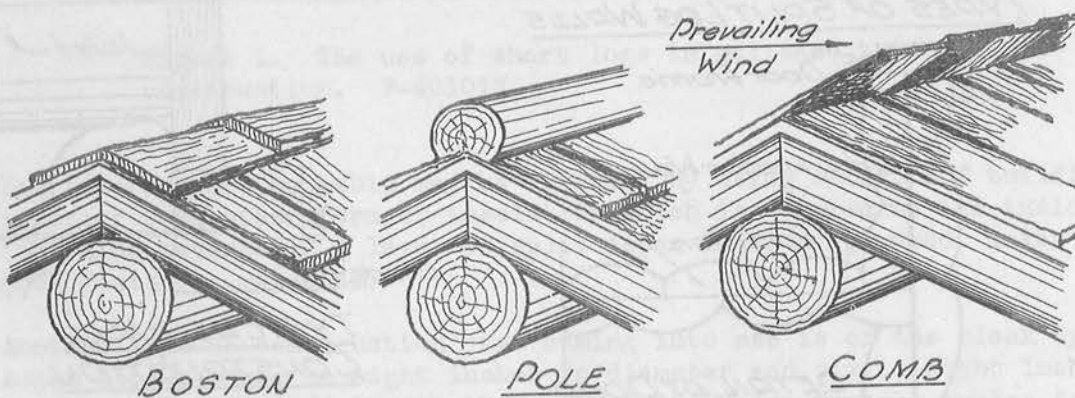


Note: Allow space at top of frame  
for radial shrinkage of 2% per  
log from green dimension.

2" x 2" slip strip

METHOD OF SETTING DOOR & WINDOW FRAMES

HORIZONTAL LOG CONSTRUCTION DETAILS



BOSTON

POLE

COMB

LOG CABIN RIDGE TREATMENT

FIG. 3

## Construction Details

Much information on construction details is available in architectural and structural engineering publications. Actually the fundamental details of log construction are relatively simple. The few most important details of log cabin construction are illustrated in Figures 2 and 3. Further information on log cabin designs and construction details can be obtained from U. S. Department of Agriculture, Miscellaneous Publication 579, "Building with Logs", University of Wisconsin Circular 158, "Log Buildings", Michigan State College Extension Bulletin 222, "Log Cabin Construction", and other publications listed under "Literature" at the end of this report.

## Supply of Aspen

Aspen occupies a larger area in the Lake States than any other forest type. Recent estimates by the Lake States Forest Experiment Station show about 20 million acres of aspen type within the three Lake States. Minnesota, with 7,500,000 acres, leads in aspen type acreage, with Michigan and Wisconsin dividing the remaining area about equally. This large acreage of aspen type contains an estimated merchantable volume of  $6\frac{1}{2}$  billion board feet in trees over nine inches in diameter at breast height.

With this large acreage and volume of aspen, cabin log material is in abundant supply in each of the three Lake States. It is estimated that at least 25% of the board foot volume is suitable for cabin logs. This supply is within reach of every cabin builder, as aspen is well distributed throughout the northern half of the Lake States.

## Specifications.

Cabin log material should be fairly uniform in diameter and the logs should have a minimum of taper. The choice of species is important. When durable species are available at a reasonable cost, they should be used in preference to a less durable wood. Red pine and cedar have an excellent reputation as cabin log material. Aspen logs, made durable by a preservative treatment, or when used without treatment away from the ground, have also proven to be entirely suitable for cabin construction. In the purchase or cutting of aspen cabin logs, specifications concerning size of logs, quality, time of cutting, peeling and seasoning, are very important.

## Size of Logs

The diameters of aspen cabin logs vary from five to twelve inches, with logs in the six to nine inch diameter range most commonly used. Lengths vary from 8 to 36 feet. The shorter lengths for fill-in between wall openings can be salvaged from logs which do not meet specifications. The palisade type of construction utilizes 8-foot lengths with longer lengths being used in horizontal log construction. It is difficult to find aspen trees which are clear and straight without defects which will yield the

longer length cabin logs. Actually, lengths in excess of 20 feet are seldom necessary, as the length of the rooms is rarely more than 20 feet. Splicing of logs is possible but spliced logs weaken the building and detract from its appearance. Buildings should be designed so as to eliminate the need for logs in excess of 20 feet in length. Because of the difficulty of handling long logs and finding trees which will yield such logs, the trend has been toward palisade type construction.

### Quality

Aspen logs should be reasonably straight, free from rot, surface scars, bird pecks and discoloration. Sweep should not exceed two inches per eight foot section. Rot is especially objectionable as it weakens the log and may serve as a means of access for insects and a place for moisture to collect thereby stimulating further decay. Uniform diameters of logs with a minimum taper are preferred.

### Time to Cut

Fall and winter are the best times to cut aspen for cabin log material. Aspen cut in spring and early summer peels very easily, but during this time of the year conditions are favorable for attacks by insects and decay organisms. Fall and winter cut logs have time to dry sufficiently by summer so that they are less subject to insect and disease attacks. Logs cut in the spring and summer check quite badly due to rapid surface drying.

### Peeling

Peeling of aspen logs is recommended for all kinds of structures as the wood deteriorates quite rapidly if the bark is not removed. Aspen logs should be peeled as soon after cutting as possible. This is especially important if the logs are cut in the spring or early summer because of almost certain damage from bark beetles if the bark is not removed. While fall and winter cut aspen does not peel as readily as spring or summer cut aspen, the extra cost of peeling is offset by the resistance to insect and disease attack. Peeling of fall and winter cut aspen requires the use of a draw knife or similar tool and streaks of the inner portion of the bark adhere to the logs. When the logs are to be treated with a preservative, bark streaks are objectionable. Bark prevents penetration of preservatives and in time falls off the log exposing untreated wood.

### Seasoning

Aspen logs should be well seasoned before they are used. As soon as logs are cut and peeled, they should be piled on skids spaced about six feet apart. The skids should be at least 10 inches in diameter so that air circulation under the pile will be possible. Stickers should also be placed between each layer of logs to insure plenty of air circulation within the deck. The proper seasoning period will depend on weather conditions and will range between three and six months. The builder should

allow plenty of time for seasoning in order to reduce shrinking and checking to a minimum after the cabin has been built. Excessive shrinking and checking causes cracks and ill fitting joints, which detract from the serviceability and appearance of the cabin.

#### Durability of Aspen as a Cabin Log Material

Decay resistance of native species of wood lies in the heartwood. Sapwood of practically all species has low resistance to decay and consequently is not durable when exposed to conditions favoring decay organisms. The best measurement of durability of wood is, therefore, based on the ability of the heartwood to resist decay. The following table classifies the most common native species in eastern United States as to durability.

Table #1

Durable	Intermediate Durability	Low Durability	
Eastern red cedar	Red pine	Ash	Spruce
Northern white cedar	Tamarack	Beech	Balsam Fir
Chestnut	Red Oak	Birch	Aspen
Black locust	White pine	Hemlock	Basswood
Black walnut	Jack pine	Hickory	Cottonwood
White oak		Maple	Yellow poplar
			Elm

Aspen is classed as wood of low durability and should not be placed close to the ground without a preservative treatment to prevent decay. Foundations of stone or masonry should extend about two feet above the ground line and the ground should slope gradually away from the building for drainage. Storm water must not be allowed to accumulate around the foundation. Wide eaves and down spouts are important so that water is directed away from the building and not allowed to drop and splash the logs near the ground. In the construction of the building, extreme care should be taken to insure close fitting joints (Fig. 4) throughout so that moisture cannot accumulate in cracks and crevices and stimulate decay.



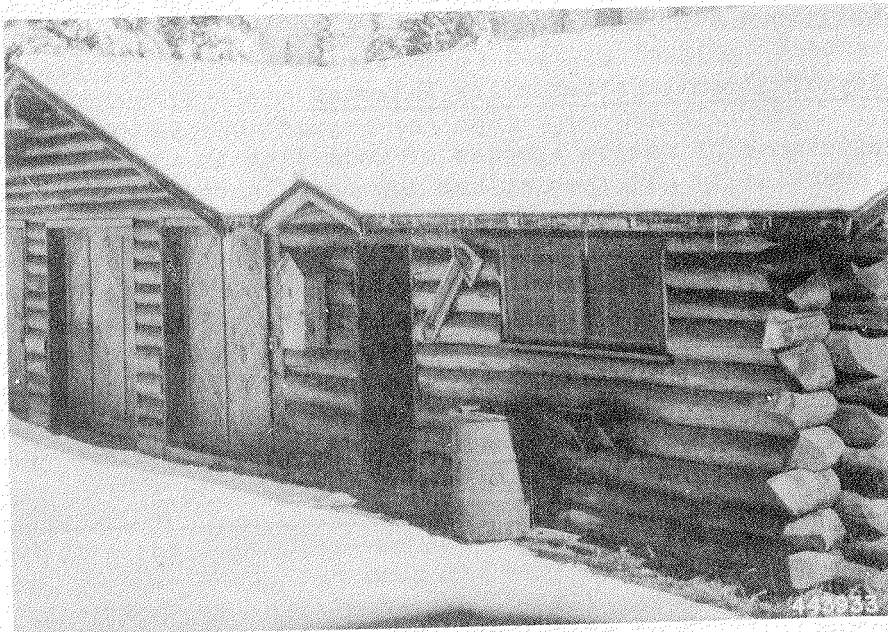


Figure 4. Halfway Ranger Station garage built with aspen logs showing tight fitting joints and corner construction. F-443933

Most log cabins if properly constructed and maintained will have a satisfactory life without preservative treatment. However, when aspen logs are used it is recommended that a preservative treatment be given those logs in close proximity to the ground. This preservative treatment should be applied to the logs before the structure is erected in order to secure maximum effectiveness.

There are many preservatives which are effective in preventing decay. Some are objectionable for specific uses because of their color and odor. Coal tar creosote is the most widely used wood preservative, but its use in preserving cabin logs is limited because of its color and odor. However, it can be used for preserving logs resting on and just above the foundation, foundation timbers and elsewhere in the structure where color and odor are not objectionable. Certain advantages such as toxicity to wood-destroying fungi and insects, ease of application, and its general availability and relatively low cost, should be weighed against the disadvantages of creosote for preserving cabin logs.

When a light colored and odorless preservative is desired, zinc chloride, chromated zinc chloride and some of the chlorinated phenols should be considered. The chlorinated phenols are being used more extensively each year and are excellent preservatives for cabin logs. Zinc chloride

and chromated zinc chloride are water-soluble wood preservatives and likewise are being used extensively in the United States.

Zinc chloride is relatively cheap, light colored, odorless, and wood treated with this preservative will take and hold paint well. Its chief disadvantage, however, is its solubility in water.

There are several non-pressure processes used in the application of preservatives. These processes are all less effective than pressure treatment and should be used only when it is impractical to use pressure treatment. The "hot-and-cold-bath" treatment is the most commonly used non-pressure process and is the most effective. The wood is placed in an open tank with the preservative and heated for several hours at a temperature of about 230 degrees Fahrenheit, then removed from the hot preservative and placed in a cold bath for several hours. Coal tar creosote is the preservative most commonly used in the hot-and-cold bath process, but zinc chloride may also be used if care is taken to keep the solution at uniform strength.

The steeping process is another non-pressure method used to a considerable extent in Europe. The process is simple and consists of placing the material in a tank of preservative solution allowing it to soak for about a week. A longer soaking time results in better absorptions. Mercuric chloride is most commonly used but zinc chloride, chromated zinc chloride, sodium flouride and other water soluble salts can be used. Mercuric chloride can be used only in concrete or wooden tanks because of its corrosiveness. Extreme care should be used in handling the preservative because of its high toxicity to humans.

The simplest and one quite commonly used in preserving cabin logs is the brush treatment. This is the least effective method, but if properly applied will materially reduce the possibility of decay. Creosote and similar oils are used and should be applied hot for best results. Care should be taken to see that the entire log is covered and all cracks should be filled with the preservative. At least two coats should be applied, the subsequent coat after the previous one has dried. Brush treatment using zinc chloride or other soluble salts is not recommended.

Most cabins are given an exterior and interior finish. Various mixtures of linseed oil and varnish have been used with good results. One mixture recommended is 25% varnish and 75% linseed oil for exterior finish. Raw linseed oil, coal tar creosote or any dark finishing stain are satisfactory for exterior finishing. Experience has shown, however, that frequent applications, at least one every two years, is needed for best results. The use of cabin log paint has become prevalent during the past few years. The paint is yellow-brown in color and after a year or so of weathering gives the impression of a natural log surface.

The average life of any log cabin depends to a considerable extent on location and workmanship of construction. A well constructed aspen log cabin located on a well aerated site will outlast a poorly constructed pine or tamarack cabin located on a low moist site.

The U. S. Forest Service has used aspen in the construction of a number of cabins with marked success. A ranger station was constructed on the Superior National Forest in 1916, using the palisade type of construction. It was torn down in 1934 and the logs were still well preserved. Other buildings have been constructed since and many are over 10 years old with no evidence of deterioration. The Halfway Ranger Station on the Superior National Forest constructed of aspen logs in 1934 (Fig. 5) and in good condition illustrates a type of building erected by the U. S. Forest Service.



Figure 5. Halfway Ranger Station office constructed of aspen logs showing entrance construction, windows, roof drain and corner construction. F-443936

It is believed that aspen structures will last as long as spruce, balsam fir, pine or hemlock, if care is taken in the construction and preservative treatment is given to the logs likely to be exposed to excessive moisture.

#### Comparative Cost of Aspen with Other Woods

Aspen is the cheapest cabin log material found in the Lake States. Not too many years ago aspen was considered a weed species because no market existed for its products. Large quantities of high grade material rotted on the stump. Today a market exists and large quantities are used for pulpwood and lumber, but the price for stumpage is still considerably less than the price received for pine, spruce, balsam fir, cedar or hard-

woods, such as maple, birch, oak and basswood. Aspen stumpage in the Lake States averages about \$5.00 per M in contrast to \$10.00 to \$25.00 per M for coniferous species most commonly used in cabin construction. Pine and spruce are in most demand and because of quality and the limited supply command the highest prices.

#### Future Outlook

The use of aspen as a cabin log material has increased during the past 10 years. This use should continue to increase. The extent of the increase will depend on how well research agencies and educational institutions keep the consuming public informed on factors influencing the use of this wood. In the past, many people considered aspen to be unsatisfactory for cabin construction because poor construction methods had given the wood a poor reputation. Even today aspen is considered by many people as a weed species and suitable only for low grade pulpwood and lumber. This poor reputation is gradually being overcome by the increasing consumption of aspen for lumber and products made from lumber as well as by a better understanding of the wood's shortcomings and how to reduce or eliminate these shortcomings. Aspen, properly used, has proven to be a good cabin log material. This fact alone will have a marked effect on the future use of aspen for cabin construction.

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