

# Chapter 1 Introduction

## Introduction

The Alaska Log Building Construction Guide is written to help log builders, owner-builders, contractors, architects, engineers, and building manufacturers build log homes that meet the State of Alaska Building Energy Efficiency Standards (BEES) (see Appendix A).

This book contains useful information for anyone interested in building or renovating energy-efficient, quality log structures in Alaska. A number of basic procedures and techniques are described in detail to help even the novice log builder get started building his or her first log project. Building an energy-efficient log home requires the highest level of craftsmanship to meet modern standards of airtightness, indoor air quality, safety, comfort, and durability.

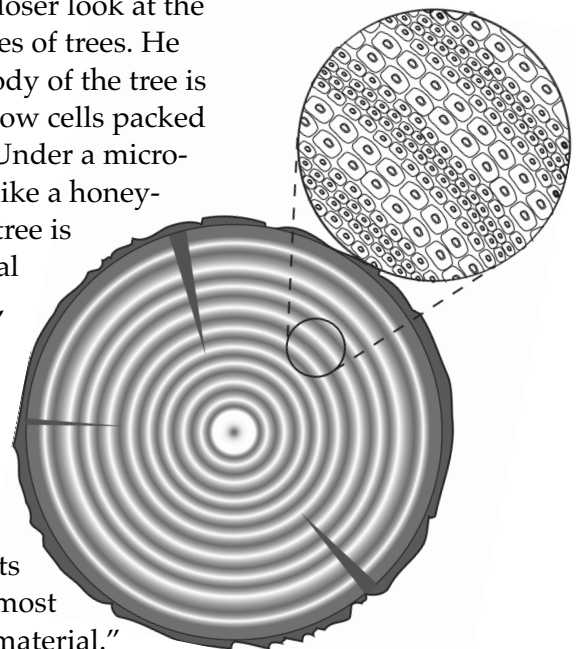
## Disclaimer

Alaska Housing Finance Corporation, its agents, and the authors of this book assume no responsibility for the use of information in this book by anyone. All design details, methods of construction, and structural systems should be checked out by a professional to assure compliance with codes and regulations. This book is not intended to supersede either local or national building codes.

## Energy-efficient Log Homes

From the south slope of the Brooks Range, which more or less defines the northern limit of the boreal forest, to the rain forests of the southern panhandle, Alaska is blessed with an abundance of trees suitable for building log homes. The romantic image of a log cabin in the woods is slowly being replaced with log homes hand-crafted from massive logs up to two feet in diameter and fitted so tightly that even after several years of settlement and shrinking, you can't easily slide a knife blade between the logs.

In the introduction to the eighth edition of *Building With Logs*, author and noted Canadian log builder and teacher B. Allan Mackie invites the reader to take a closer look at the physical properties of trees. He notes that "the body of the tree is composed of hollow cells packed tightly together. Under a microscope, they look like a honeycomb. When the tree is felled and the vital fluids have dried, these tiny air pockets seal, becoming an almost perfectly insulated building material. . . . The tree as it exists naturally is an almost perfect building material."



Cross section of a tree in magnification.

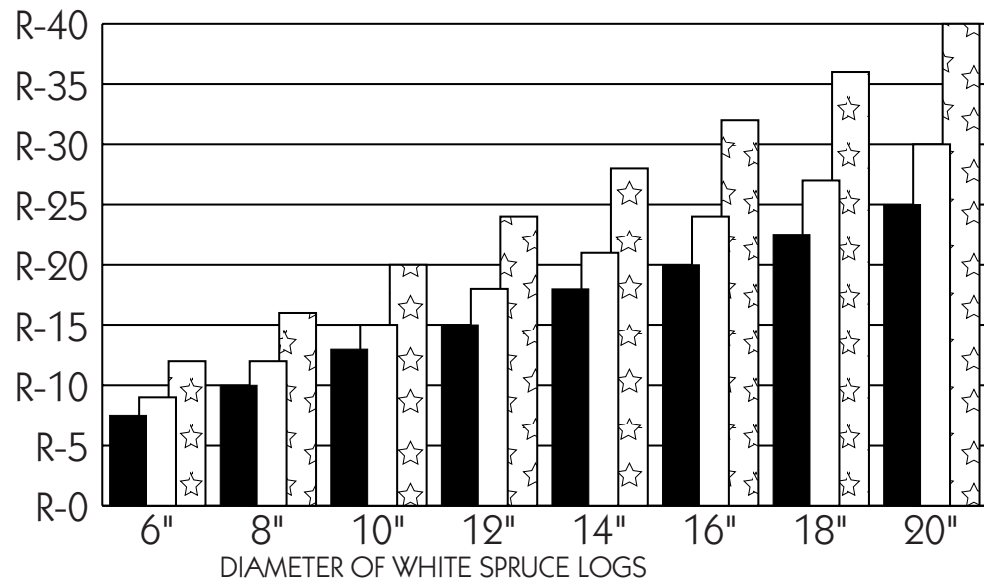
## Big Logs

In the case of massive logs, R-value, the resistance to heat flow, is not the only property relating to energy use. Logs with a good southern exposure will store heat from the sun during the day and slowly release that heat at night. The cycle repeats until fall when you have to start adding heat from your wood stove or furnace. One or two short, hot firings a day of a good airtight wood stove during the winter heating season will heat a well-built modern log home. The objective is to keep the mass of the logs from cooling to below a thermostat setting for the fossil-fuel-fired furnace or boiler.

As you travel north in Alaska, the trees tend to get smaller and

eventually reach a lower limit to the diameter of logs that will meet the prescriptive R-value requirements of State of Alaska Building Energy Efficiency Standards. For example, if the logs average less than 13" in diameter in southeast Alaska, the builder will have to increase the efficiency levels of other components of the building system and use the building budget method of compliance, which requires a HOT-2000 or AkWarm computer energy use calculation, or the energy rated method to comply with BEES (See Appendix A).

AkWarm is an energy analysis software program used by the Alaska Housing Finance Corporation (AHFC) to perform energy ratings on proposed house plans or on old and new houses. Hot 2000 is



- 12% MOISTURE = APPROX. R-1.25 PER INCH
- 8% MOISTURE = APPROX. R-1.50 PER INCH \*
- ☆ 4% MOISTURE = APPROX. R-2.00 PER INCH \*

\* extrapolated from Carlson, *Building a Log House in Alaska* (see Appendix D, References and Bibliography)

an energy analysis software program that was developed for the Canadian R-2000 Program and is also used by the Alaska Craftsman Home Program to qualify a home for meeting their standards of energy efficiency.

Alaska white spruce has a thermal resistance of about R-1.25 per inch at 12% moisture content. Oven dry white spruce has a thermal resistance of 1.47 to 2.04 per inch. Log walls in the interior of Alaska may have a higher R-value because of the extreme dryness of the air during prolonged subzero weather (Carlson, *Building a Log House in Alaska*—see Appendix D).

AkWarm assigns default R-values for logs that do not exactly match the numbers listed above. The default R-value per inch in AkWarm steadily decreases as the size of the logs increases. AkWarm assumes R-values as in Table 1 below.

Since the moisture content of logs varies, AkWarm does not consider moisture content in assigning these default numbers. If your logs are especially dry, your energy rater might be able to override the default R-values and input slightly higher R-values.

## Small Logs

As we noted above, small diameter logs and 6-inch and 8-inch three-sided logs will not comply with the prescriptive standard unless they are furred in (or out) and insulated and vapor barriered like a frame wall. Unless you are just building a simple cabin, 6 or 8-inch three-sided logs usually just end up being very heavy and expensive siding. If you are building a house to meet BEES, three-sided logs may be a poor choice of materials. It might be better to mill the trees into framing materials or post and beam components and log siding or bevel siding.

It is, however, quite possible to use the building budget method or the energy rated method to score enough points to qualify a 6-inch or 8-inch log wall for four-star-plus and five-star ratings. (See Appendix C, *Sample Energy Ratings for Log Homes*.) This can be accomplished with a thoughtful application of insulation to the foundation or floor and a highly insulated roof, energy efficient windows oriented to the sun, and efficient space heating. The logs must be especially air tight and the ventilation system must comply with section 2.5 of BEES (Appendix A).

Table 1

Log Size	R-value per inch	R-value Assumed by AkWarm
6-inch	R-1.27	R-7.6
8-inch	R-1.23	R-9.85
10-inch	R-1.21	R-12.1
12-inch	R-1.2	R-14.35
14-inch	R-1.19	R-16.6
16-inch	R-1.18	R-18.85
18-inch	R-1.17	R-21.1
20-inch	R-1.17	R-23.35