

# Chapter 5

## Mechanical Systems

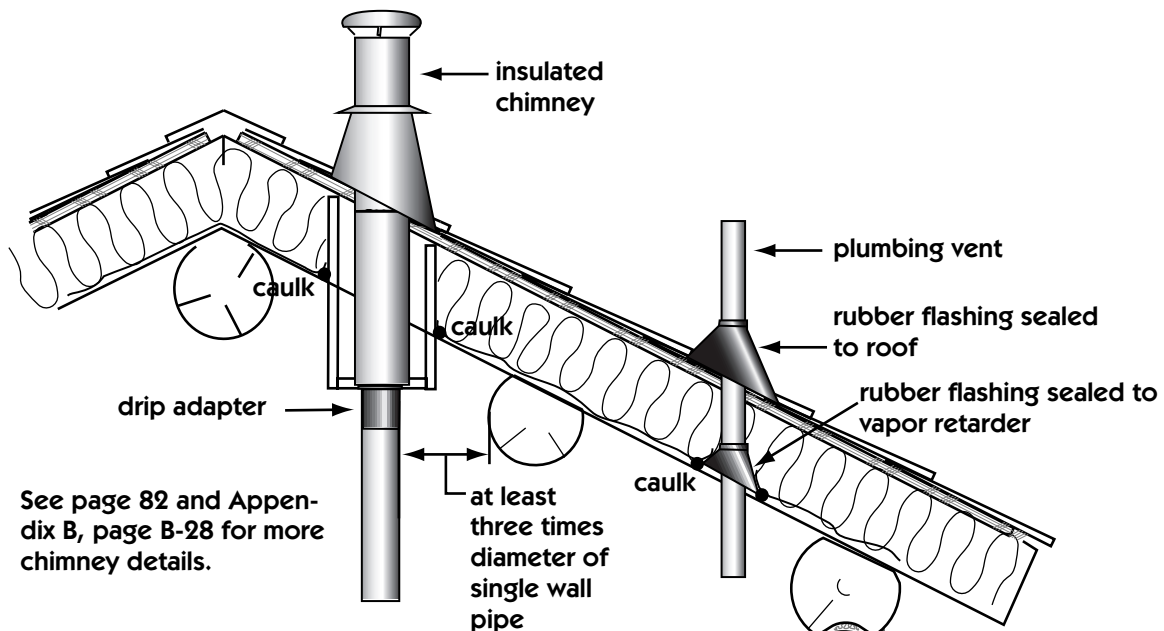
Mechanical, electrical, and plumbing systems must comply with all applicable national and local codes and regulations. Use low-flow shower and sink faucets and water-conserving toilets and install energy-efficient lighting and heating and balanced heat recovery ventilation. In most of Alaska you have to contend with below-freezing weather. Keep wet pipes out of the outside walls. All water entering and leaving the building must be kept from freezing and have a safe method of thawing if it does freeze.

### Chimneys and Vents

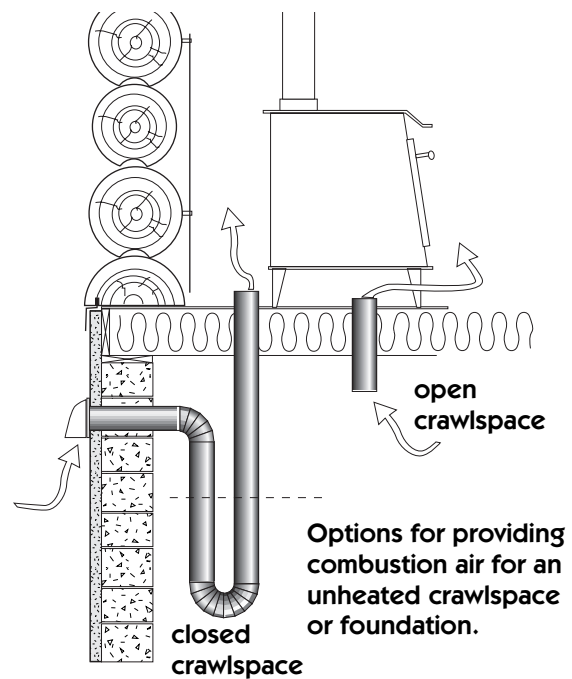
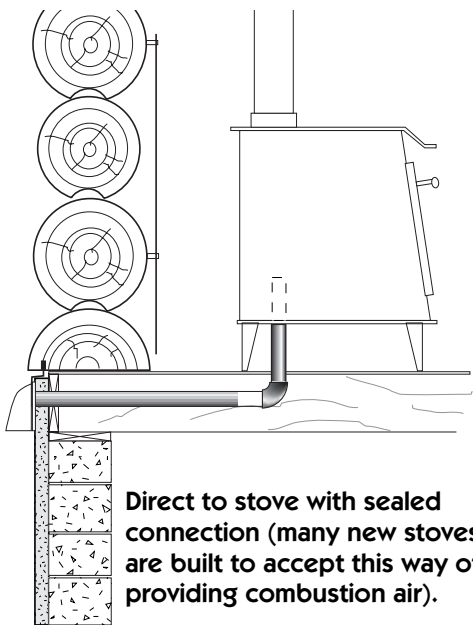
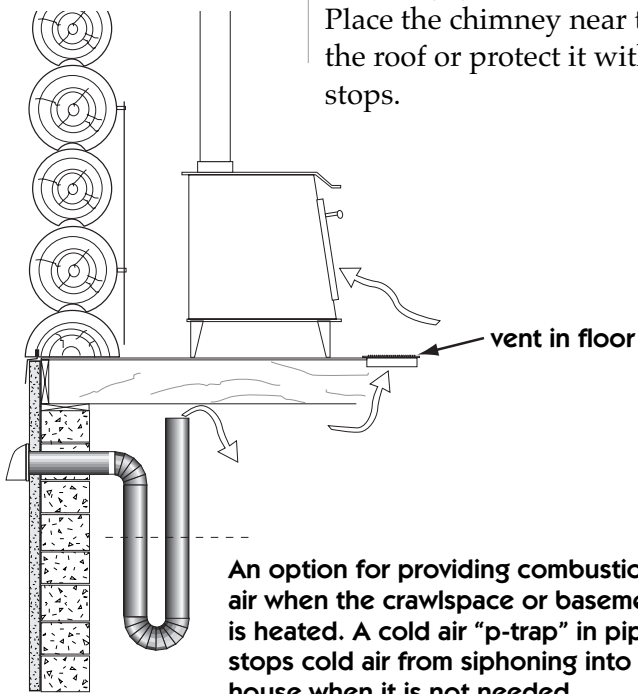
Any properly sized conventional heating system will heat a log home. However, a few precautions must be taken to maintain an airtight and watertight seal around

penetrations through the ceiling and roof. All chimneys and plumbing vents that pass through the roof system must be designed to accommodate settlement. Flashing and counter flashing and step flashing around chimneys should be extra tall. Two tight-fitting rubber flashings or EPDM flashings should be installed over every plumbing vent. The first rubber flashing should be sealed to the polyethylene vapor retarder where the pipe passes through the ceiling, and the second flashing should be sealed to the roofing material.

Do not allow any connection between a masonry fireplace and logs. Take care when designing the layout of the roof system to avoid hitting the ridgepole or purlins and floor support beams with the chimney. Ideally, chimney runs are straight and short.



Maintain a minimum 2 inches clearance between an insulated chimney and combustible materials. Single-wall chimneys should be at least three times their diameter away from unprotected combustible materials. Be aware of the possibility of snow sliding on a metal roof and taking the chimney with it or bending it flat against the roof. This could result in a buildup of deadly gases inside the home. Place the chimney near the peak of the roof or protect it with snow stops.



## Combustion Air

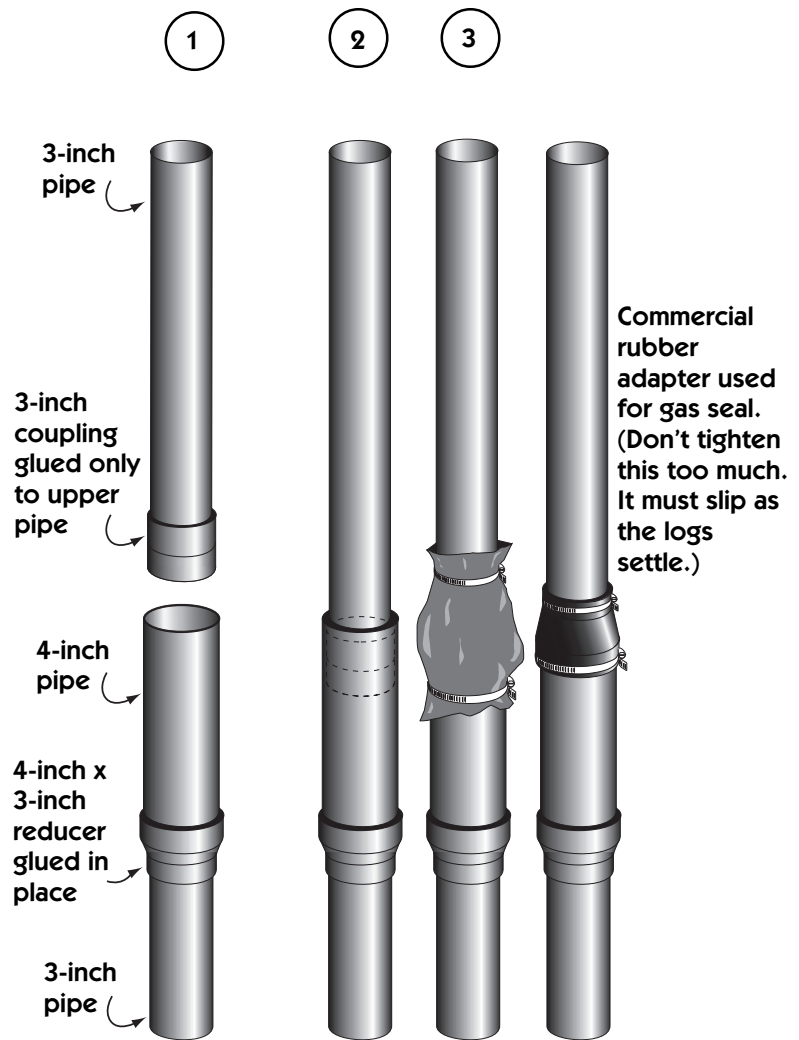
Fireplaces and wood stoves should have outside combustion air ducted directly to the fire box. Furnaces and boilers must be provided with combustion air per code and manufacturer's instructions. Keep in mind that in an airtight structure, you have to provide combustion air equal to the amount of air passing through the heating system and out the chimney. Combustion air should not be confused with make-up air. Combustion air is designed to supply only the air required by the furnace or stove. It should not provide make-up air for exhaust-only ventilation systems such as bath fans or a range hood or a clothes dryer. These exhaust appliances require their own source of air independent of the heating equipment. Don't let your wood stove or fireplace become the source of make-up air for exhaust appliances. This may result in backdrafting the products of combustion into the

house, causing potentially deadly carbon monoxide to be drawn into the home.

## Plumbing

All plumbing between floor levels in a log house, such as to an upstairs bathroom, must be designed to accommodate settlement. Keep all plumbing runs out of the log walls. Consolidate all plumbing into a so-called “wet section” of the home, especially if it is more than one story. Frame double walls or extra-thick plumbing walls with the upstairs bathrooms stacked directly over lower-floor bathrooms.

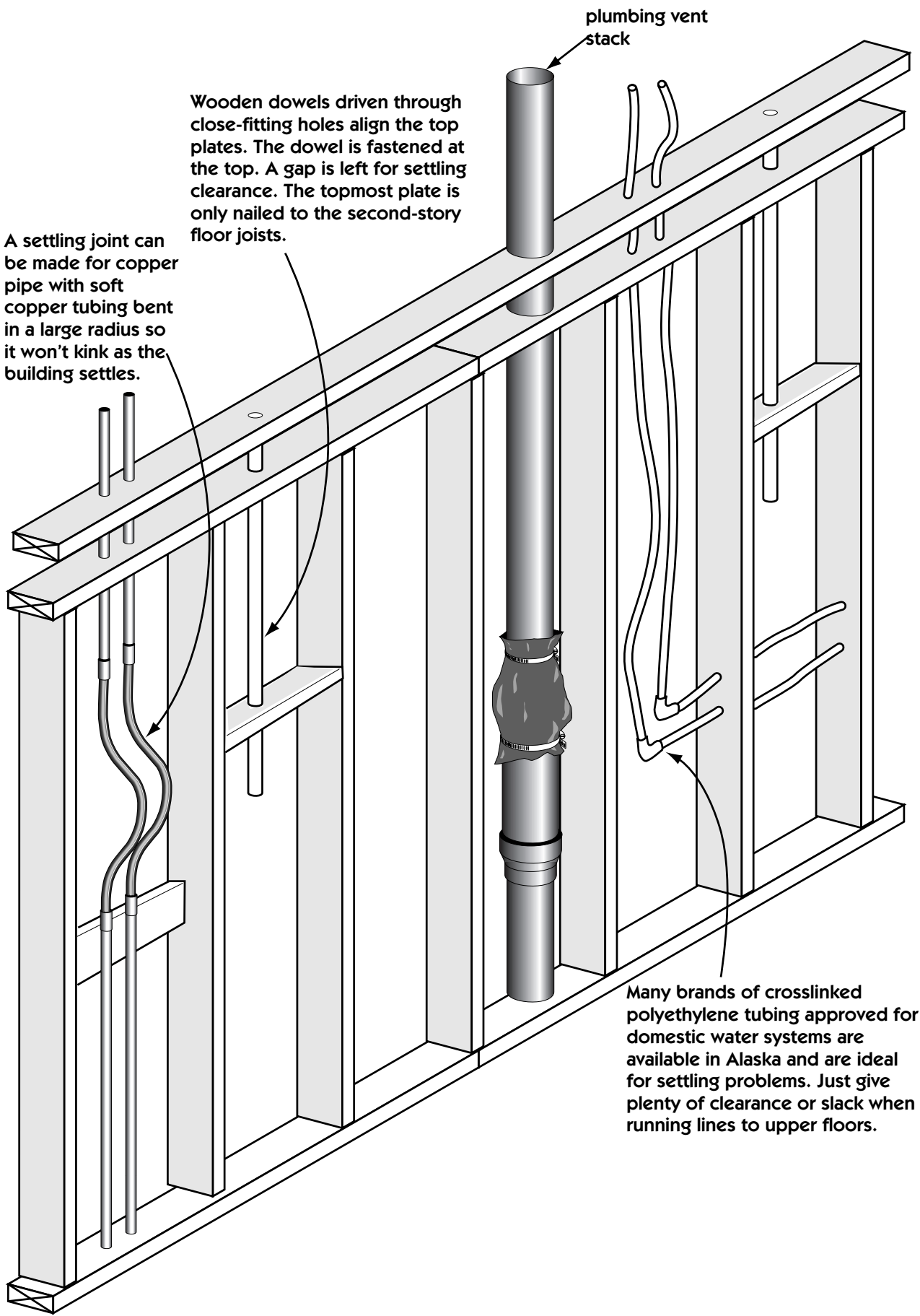
Use a combination of slip joints and flashings for drain, waste, and vent pipes. Water supply lines can be entirely of flexible cross-linked polyethylene piping such as Wirsbo, or a settlement section of soft copper pipe can be used in combination with hard copper pipe. Hydronic heating runs should be fitted with flexible tubing wherever they change from horizontal to vertical, such as when the hot water supply and return pipes run between floors of a multi-story log structure. Provide an access panel for maintenance purposes.



A site-built expansion/settling joint can be made from standard ABS pipe and fittings.

1. Prefit a coupling to fit inside the 4-inch pipe by sanding or filing it until it slips in snugly. Glue only to upper 3-inch pipe.
2. Assemble this with a waterproof grease.
3. A gas seal can be made from a long-lasting rubber sheet and stainless-steel hose clamps (some types of rubber are destroyed quickly by organic vapors. A fuel-proof rubber should work well here).

See Appendix B, page B-27.



plumbing vent stack

Wooden dowels driven through close-fitting holes align the top plates. The dowel is fastened at the top. A gap is left for settling clearance. The topmost plate is only nailed to the second-story floor joists.

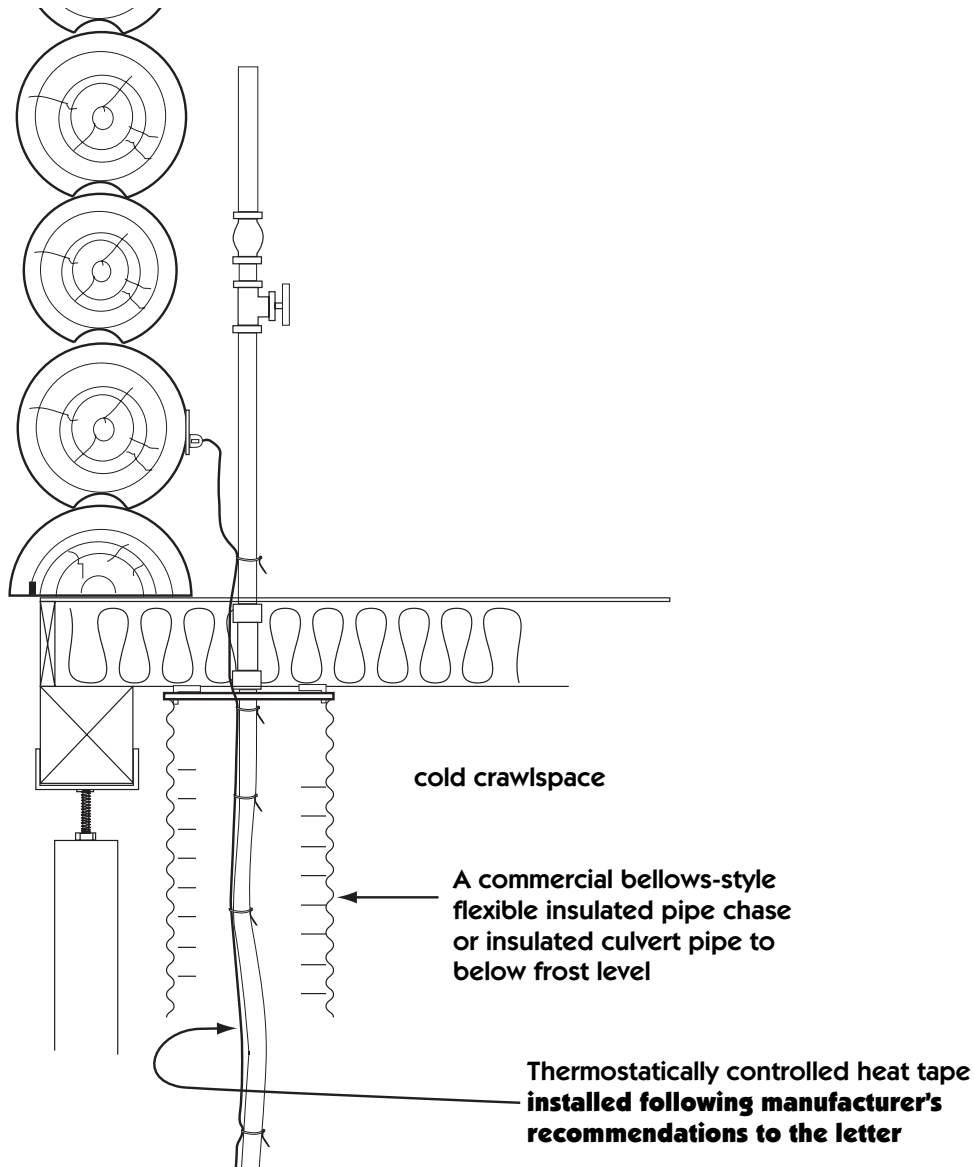
A settling joint can be made for copper pipe with soft copper tubing bent in a large radius so it won't kink as the building settles.

Many brands of crosslinked polyethylene tubing approved for domestic water systems are available in Alaska and are ideal for settling problems. Just give plenty of clearance or slack when running lines to upper floors.

## Arctic Utility Chase

Water supply lines and drain lines leading to or from a house constructed on an unheated foundation system must be enclosed in an insulated utility chase to keep the water from freezing. Heat tapes are

often installed to keep the pipes from freezing or to thaw them if they do freeze. Follow manufacturer's instructions to the letter when installing an electrical thawing system. Many houses have been burned to the ground because of incorrectly installed heat tape!



Arctic utilities run under the house through the crawlspace

## Early Utilities

Inventory included a cot from Sears, Roebuck, a clothesline, and a “honeybucket” toilet fashioned from a Chevron Pearl kerosene can with a graceful whittled willow handle for carrying.

The state-operated school with its adjoining apartment sat high on a hill outside the village and was complete with a generator. Often I’d envied the electric lights in that “ivory tower” but now I found that, for all their modern conveniences, the teachers envied me. They didn’t like living apart from the village. It was a long walk for friends to visit and they would have preferred to live within the community. They’d tried unsuccessfully to buy David’s sod house and hoped by summer to be rid of their electric lights and the problems that went with them.

from *And the Land Provides*, by Lael Morgan, 1974

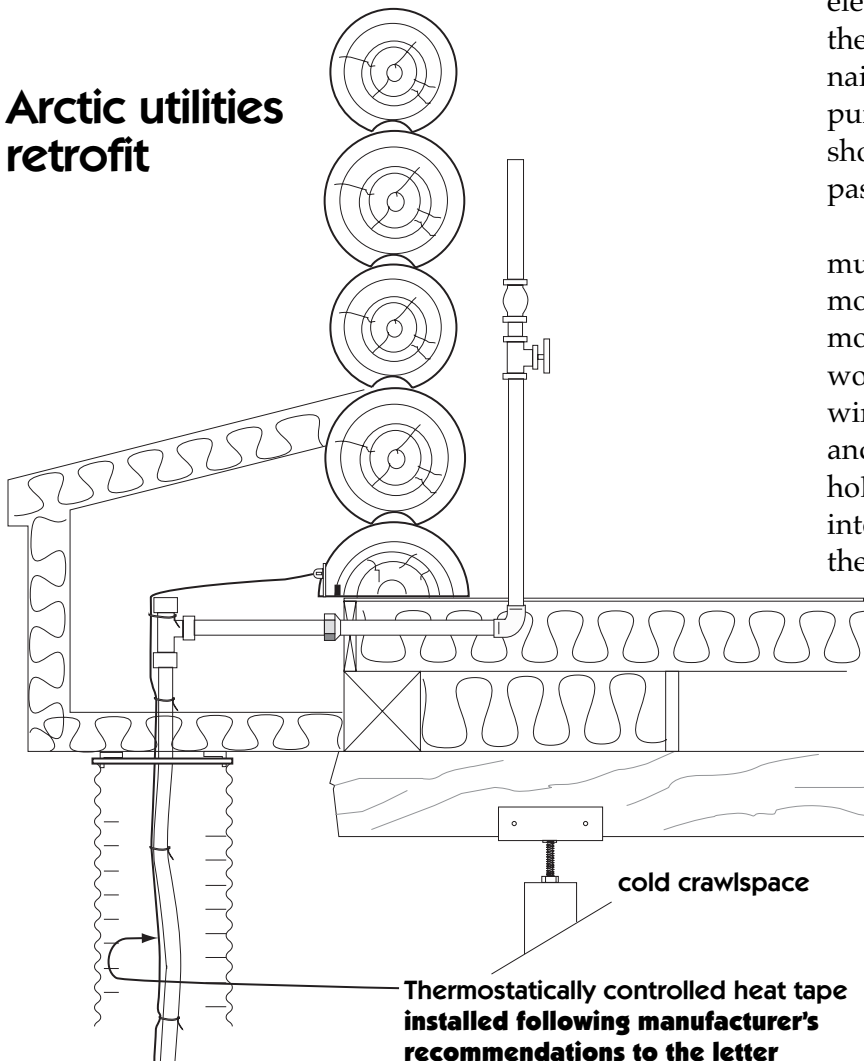
## Electrical

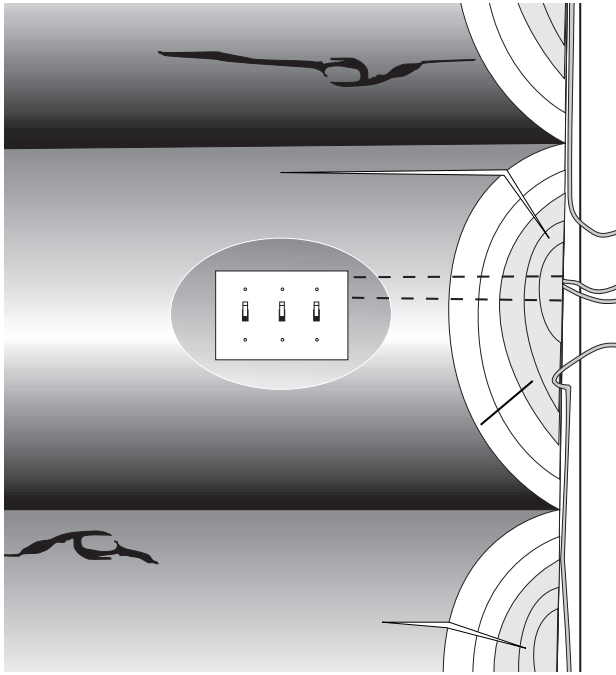
Logs are usually predrilled vertically to hide and protect wiring. Do not use rigid conduit inside a log wall because settling logs could break it. Switches and outlet boxes are usually mortised in so that the cover plate is flush with a flat surface planed on the log face. (See Appendix B, page B-26.)

Wiring must accommodate settling. Before rigidly attaching the service entrance vertically onto the side of a log structure, be aware that the logs must be allowed to settle without the weight of the logs bearing down on the conduit passing horizontally through the log wall. It may be necessary to run electrical wiring in the roof cavity if the finished ceiling boards are nailed on top of the ridgepole and purlins. All ceiling penetrations should be caulked where the wire passes through the vapor retarder.

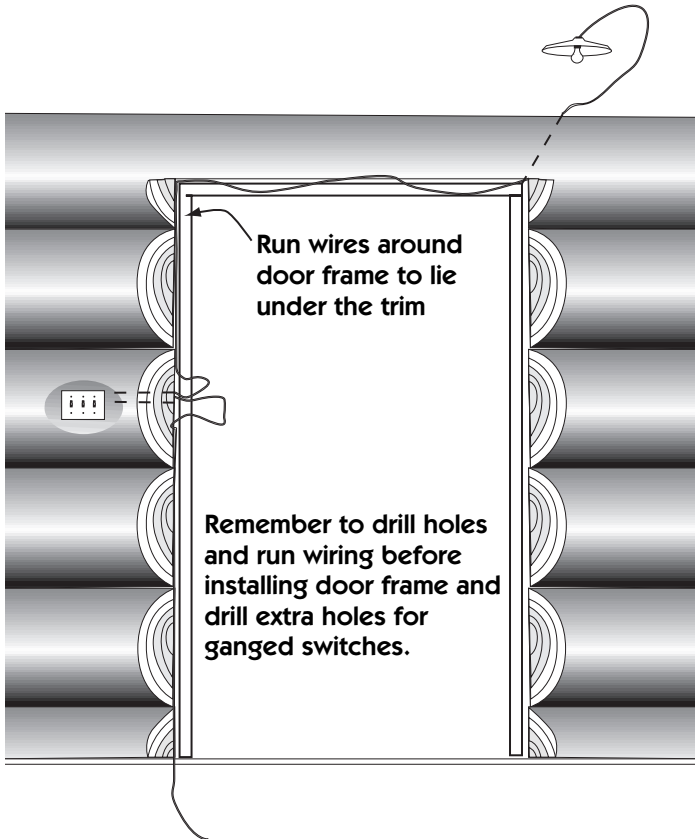
If you don’t plan ahead and must surface wire, there is a wire-mold conduit system available at most electrical stores that has a wood tone finish. Much of the wiring can be run in the floor cavity and brought up through predrilled holes in the bottom logs or fitted into custom-built wooden chases at the base of the log walls.

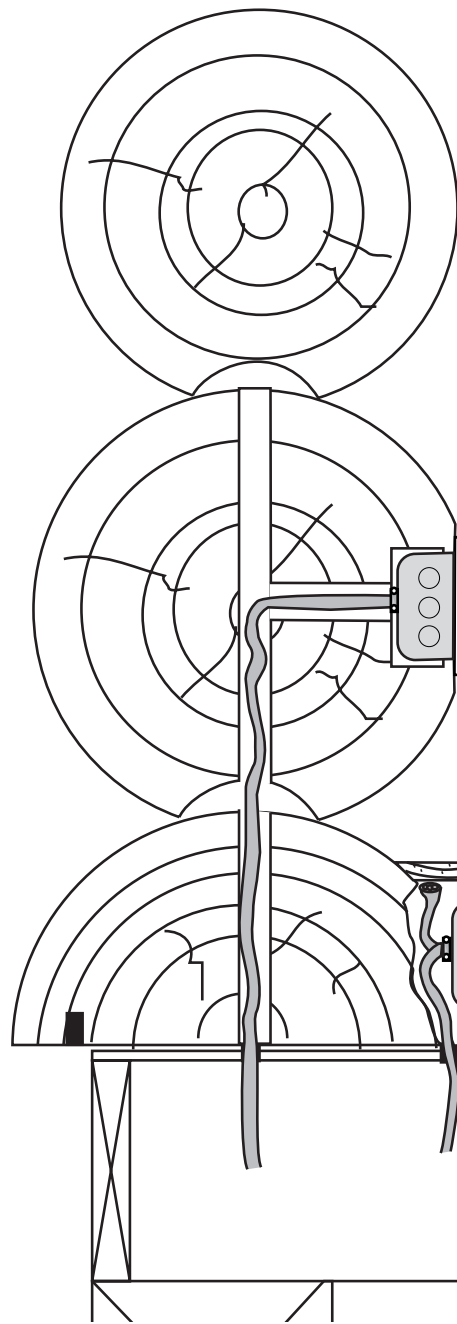
## Arctic utilities retrofit





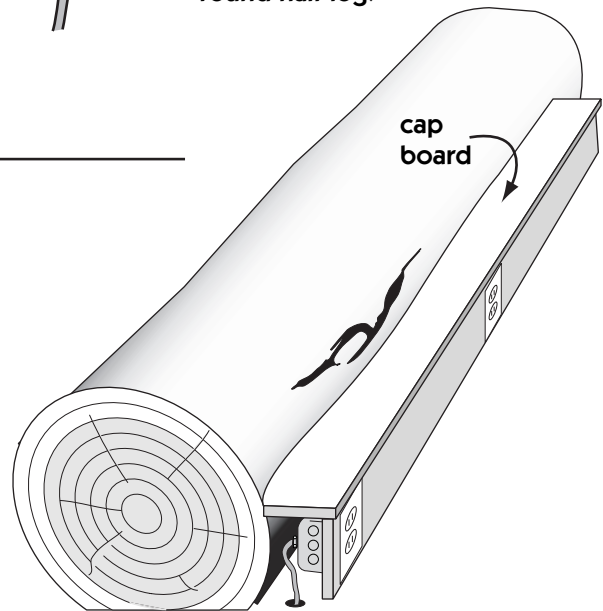
A nicely carved flat spot or scarf is a good way to fit the switch plate cover against the walls. Wiring to switches is often run behind the door spline. Leave slack in the wire for settling.





Plan ahead; drill holes for plenty of wires and outlets while building or reassembling walls.

A site-built raceway or chase for wires. The cap board is scribed to fit the first round half log.

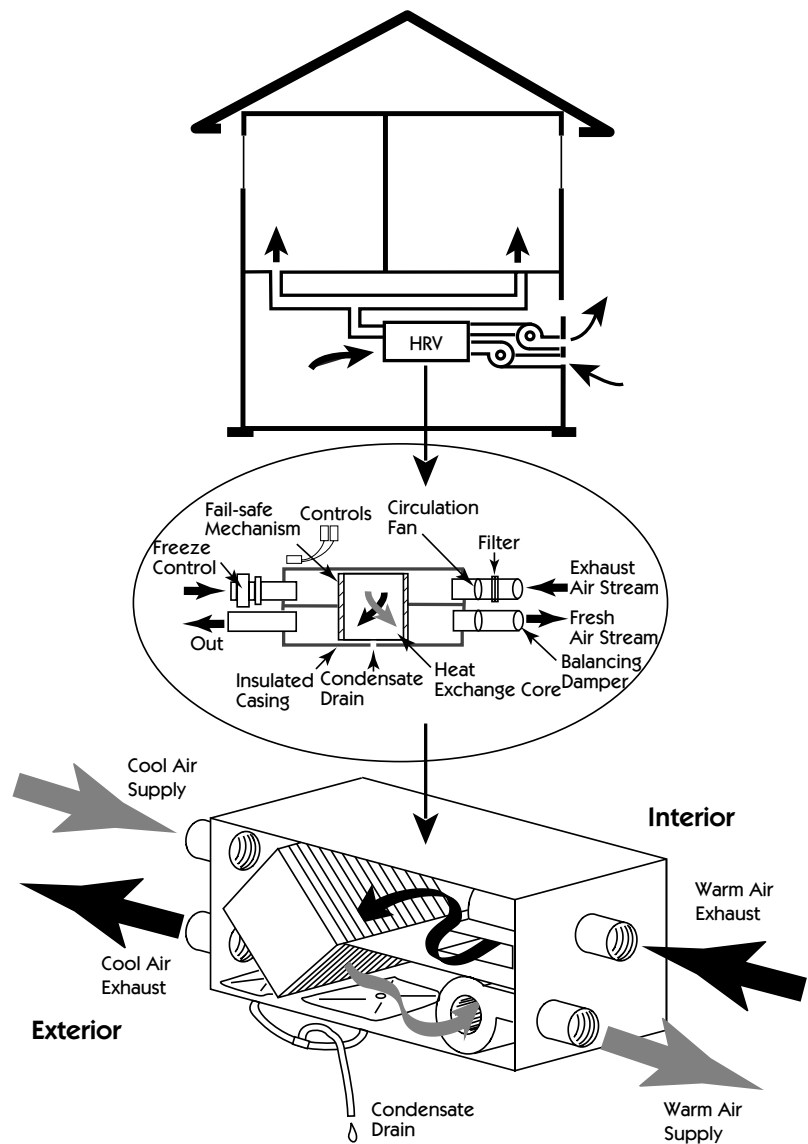




## Ventilation

Now that you have constructed a tight log structure with all penetrations sealed against the flow of heat, air, and moisture, you must complete the equation and ventilate right (see Appendix A, page A-11).

The very best ventilation strategy for an airtight structure in Alaska that has a dependable source of reasonably priced electricity is to install a heat recovery ventilation system (HRV). The next best choice is to install a variable-speed controlled range hood in the kitchen, ducted to the exterior, and ultra-quiet bathroom fans, also ducted out, designed to run continuously but controlled with a dehumidistat or a push-button timer. Make-up air must be provided to avoid depressurizing the house and backdrafting heating appliances and to avoid sucking in soil gases, including moisture, radon, or mold and mildew spores. If you are building off the electrical grid, employ passive warm air rising strategies of low entry ports and high exhaust ports. This will not comply with BEES but will help ventilate the house when wind and temperature conditions allow.



**A typical heat recovery ventilation installation. Install according to manufacturer's instructions.**