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Energy Facts: Chimneys

Michigan State University

Cooperative Extension Service

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ENERGY FACTS

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CHIMNEYS

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Masonry Chimneys

Inspect a masonry chimney before use, whether installing a wood-burning appliance or using an existing set-up. A settled foundation, shifting and cracked mortar or flue liners, blockage, chemical deterioration or poor construction may cause defects. Unless you are familiar with chimney construction, you may be better off to hire a mason skilled in chimney work to make an inspection and do repairs. However, if you are a competent do-it-yourselfer, you can do your own inspection and repair work (Fig. 1). Before inspection, clean the chimney of soot and creosote as these can block defects from view.

The chimney should be free-standing, built on a level, solid footing with the foundation below the frost

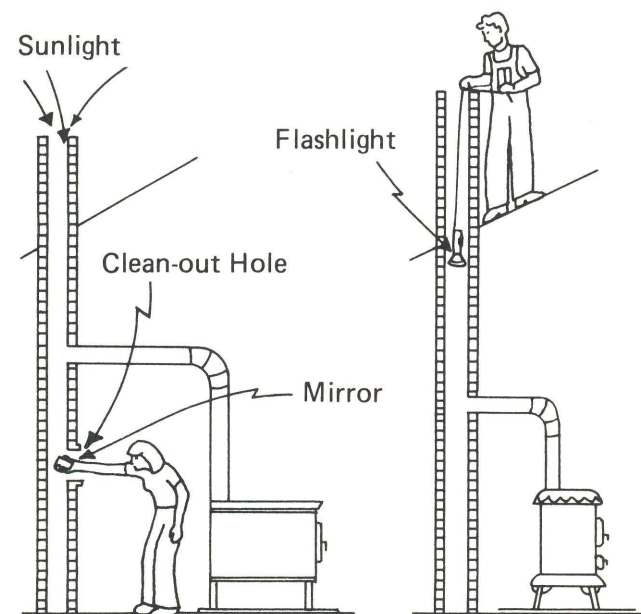


Fig. 1. The chimney may be inspected from the roof or, in some cases, a mirror can be used to look up through the chimney flue, provided the chimney is straight. If you use an air-tight stove, check the stove pipes once a month.

line. Some older buildings may have masonry chimneys supported by the building's frame or they may hang from the building's frame and be supported by wood planks. These older installations should not be trusted since settling and shifting of the building can cause cracks. Combustible framing within 2 inches of the chimney also can catch fire.

Masonry Chimney Inspection List

- Chimney top should extend at least 3 feet above the highest point where it passes through the roof and at least 2 feet higher than any portion of the building within 10 feet (Fig. 2). If roof is flat, the chimney should be at least 3 feet above the roof.
- Chimney should have an approved liner, preferably a fireproof clay liner. If it has no liner, installing one will be necessary to reduce the chance of chimney fire, protect masonry from water damage and add more life to the chimney. The lining should have a cross-sectional area at least as large as or preferably 25% larger than the stove pipe entering a chimney.

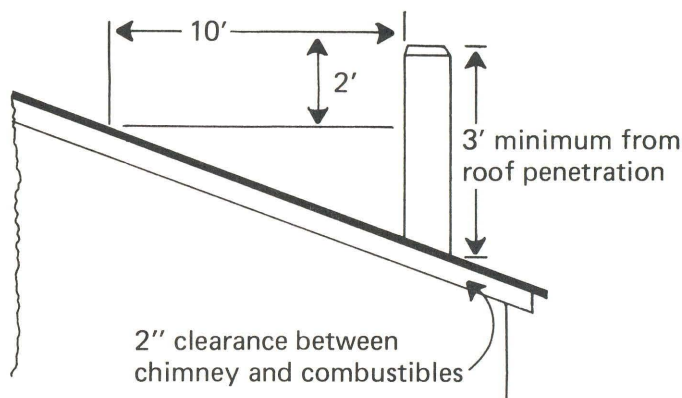


Fig. 2. To prevent downdrafts and fire from sparks, chimney height must be at least 2 feet above any roof surface within 10 feet horizontally.

- Chimney flue should not be obstructed by soot deposits, creosote coating, bird nests, leaves, etc.
- All other flue inlets except the one in use should be completely sealed. They can be sealed by inserting a piece of clay liner into the hole and filling the inlet with masonry material equal to the chimney thickness. Snap-on metal covers (pie plates) should not be used since they can be blown off during a chimney fire and increase the possibility of spreading the fire into the house. If a wood stove is connected to a fireplace chimney, seal the chimney below the point of entry of the stove pipe (see note).
- Using a flashlight, check the inside of the flue for damage or missing masonry. Use a mirror at the bottom or better yet lower the light slowly down the flue.
- See that the chimney is in good repair with no loose bricks, or masonry cracks, etc. Poke a screwdriver into joints. If the masonry or brick crumbles, it needs to be repaired. Check the chimney cap to see that it is intact and the mortar on the top of the chimney is not rotten. If it is, replace the top few feet of the chimney.
- Check that joints in adjacent flue liners are not side by side. The flue joints should be staggered.
- Check for moisture damage below the roof line. Black streaks on the outside show smoke leaks or moisture damage.
- Make sure that TV and CB antennas are not attached to a masonry chimney. Wind can cause antennas to vibrate, weakening mortar joints and possibly causing cracks and leaks in the chimney. Cracks and leaks both reduce the effectiveness of a chimney and increase the fire hazard.
- If you find no damage by this inspection, as a final check for the chimney light a small, smoky fire in the fireplace or at the bottom of the chimney. While the fire is burning, block the top of the flue and search for escaping smoke, especially in the attic and near the roof line.

If your chimney requires minor repair, remove the crumbling mortar with a cold chisel until there is a hole or groove about an inch deep. Then fill with chimney mortar. You can buy this mortar already mixed or make your own from 1 part Portland Cement, 1 part hydrated lime and 3 parts mortar sand. This mix holds up best to the wide range of temperature in a chimney.

NOTE: If you plan to connect a stove pipe into a fireplace only during the heating season, then use the fireplace during the rest of the year, the recommended procedure is to run a stove pipe through the fireplace opening up into the chimney above the damper. Make sure the area around the damper is sealed (Fig. 3). Smoke fed into a cold firebox will quickly condense its creosote on walls and flue. Thus a chimney fire is very likely when the fireplace is first used after disconnecting the stove. See CIS No. 520, "Installation of Wood Stoves in Fireplaces."

Adding a clay liner to a chimney can be difficult and a mason should be consulted. Adding a liner may be impossible in some old, odd-shaped or crooked chimneys. Masonry must be sound before adding a liner. A galvanized pipe liner is easiest to install but will only last about 3 years. However, this is safer than no liner at all. A stainless steel liner will last considerably longer. Make sure that the liner is large enough for the appliance that is to be connected to it — at least as large or 25% larger than the circumference of stove pipe.

Add a galvanized or stainless steel liner by enlarging the chimney inlet to allow an elbow section to pass from the chimney into the stove room. Straighten the elbow to make it easier. Then from the roof, lower the elbow section attached to a straight section of pipe down the flue (use sheet metal screws to fasten the sections tightly) keeping at least a foot of pipe above the chimney so that the liner extends well above the roof line. The liner can be insulated by pouring mica pellets around it from the top.

Installing Stove Pipe to A Masonry Chimney Wall

Install the stove pipe so it enters the masonry chimney horizontally. The stove pipe should have a maximum length of 75% of the vertical height of the chimney or 10 feet, whichever is less. The shorter the pipe

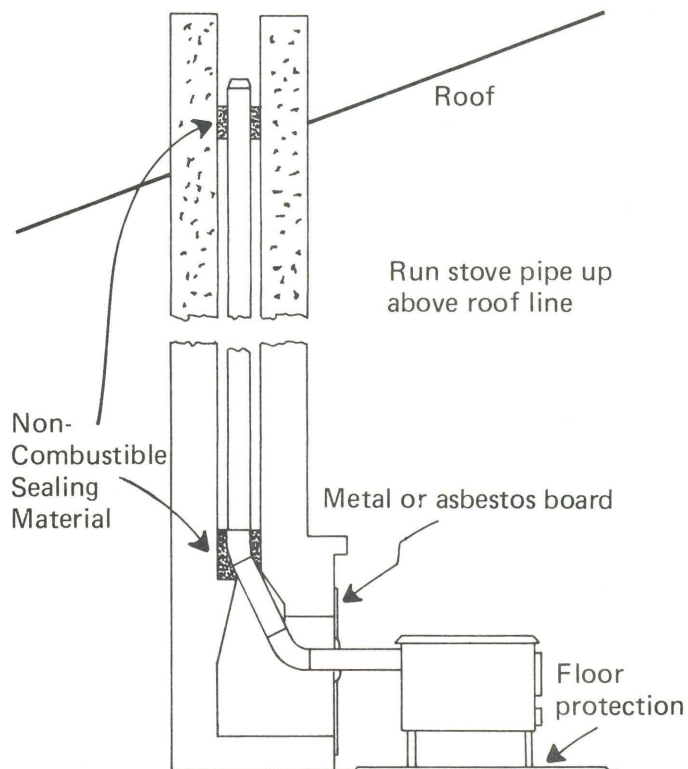


Fig. 3. When attaching a small stove to a fireplace, run the stove pipe up into the chimney above the damper. Extend the stove pipe above the roof line if there is no flue liner or if the flue is very large. Use fiberglass or rock wool for sealing.

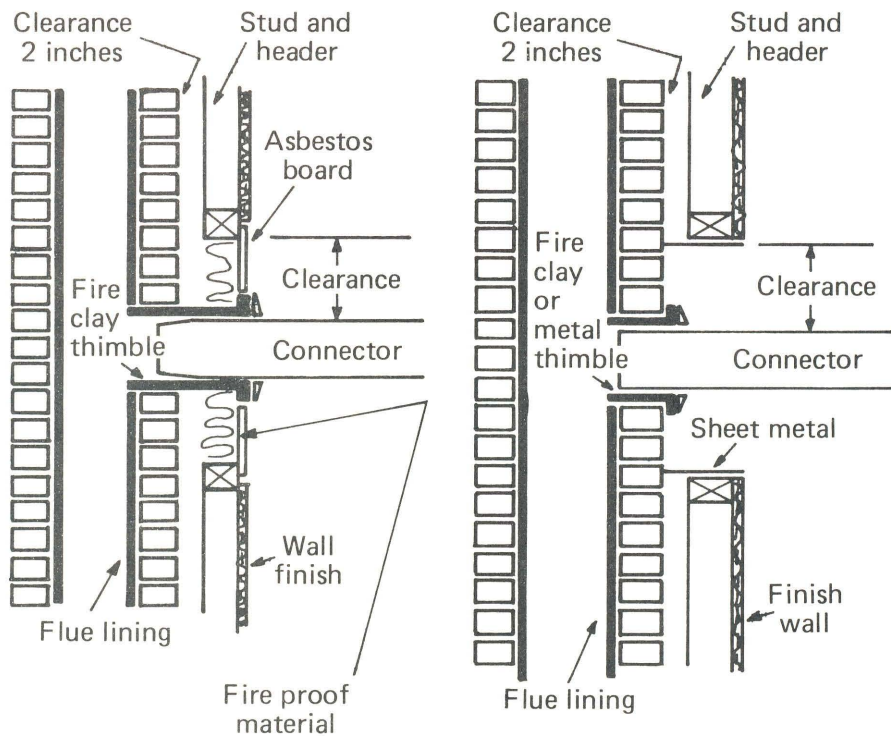


Fig. 4. Two methods of connecting a chimney connector to a chimney flue where the connector must pass through a combustible partition wall. Instead of asbestos board shown, sheet metal may be used, or a metal lath and plaster finish may be applied at that area. Use 24 gauge or heavier metal. Clearance needed is 3 times the diameter of stove pipe.

the better. The stove pipe should be the same diameter as the pipe boot at the stove. The stove pipe should rise $\frac{1}{4}$ inch per linear foot toward the chimney so that it enters the chimney at a higher point than the stove outlet. It should be installed flush with and not extend into the flue lining (Fig. 4). The wall at the chimney connection must be protected in one of the following ways:

1. If no thimble is used the stove pipe must be securely fastened to the chimney with a high temperature cement. Combustible material within 18 inches of this pipe must be removed. For a 6-inch diameter pipe, this requires a 42-inch diameter hole ($18 + 6 + 18$) in a combustible wall. The hole may be closed in or covered with non-combustible materials such as masonry, asbestos millboard or sheet metal.
2. Use a metal thimble or a burned fire-clay thimble and surround it with at least 8 inches of fireproofing material such as fiberglass insulation or brick. Cover the opening with non-combustible materials such as asbestos millboard or metal. Leave a small gap between the thimble and the covering material to allow either the house or chimney to settle slightly and not crack the thimble. The gap can be covered with a stove pipe flange.
3. Install an insulated ALL FUEL chimney pipe as a thimble. Then only a 2 inch clearance between the chimney and combustible materials is required. Cover the gap between the wall and the stove pipe with a stove pipe flange.

In some instances creosote may run down toward the fireplace into the sealing material or past the damper and accumulate in the original fireplace opening (Fig. 5). Check frequently for creosote accumulation. You may need to replace periodically the material used to create the seal.

Avoid Double Venting A Chimney

If you plan to use an existing chimney, avoid venting more than one heating device into one flue. Double venting is not recommended by most wood heating ex-

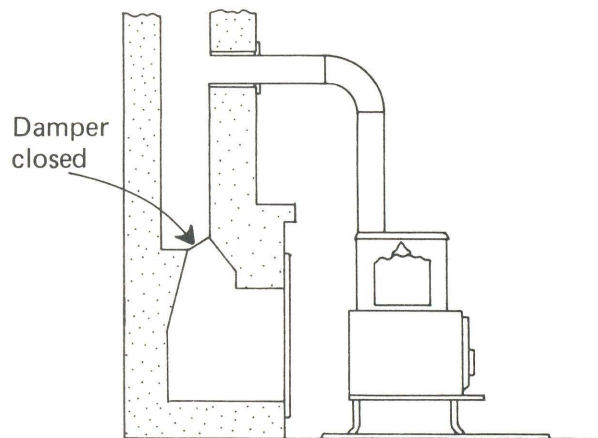


Fig. 5. Check the damper area frequently for creosote accumulation.

perts. Although installation is quicker and costs less, the dangers and disadvantages of double venting are great.

Most chimneys are not large enough to handle double venting. You need to increase the flue area by 50% for each additional device attached to the flue. Few chimneys have this capacity.

If two devices are vented to one chimney, the chimney must be rated for the larger of the two. Some chimneys, especially those designed for natural gas furnaces, can't withstand high temperatures and may melt if a solid fuel is burned. Most of today's chimneys won't stand up to the beating they would take from burning wood. Also, double venting increases creosote problems by preventing the chimney from reaching the high stack temperatures needed to keep creosote from condensing.

With double venting, either or both of the heaters could vent improperly. Flue gases could then back up into the second device and explode, or the poisonous fumes (carbon monoxide) could seep into the house. A venting problem is particularly dangerous when dealing with a natural fuel device such as a gas furnace. A backdraft could blow sparks out of the furnace and around the room. Likewise, controlling a chimney fire would be impossible since the flue opening to an oil or gas furnace cannot be closed.

New Masonry Chimney Considerations

If a new masonry chimney is to be built, brick and mortar should be used in lieu of concrete and cinder block. Round tile liners should be used because they produce less resistance than square liners to escaping flue gases.

Locating a masonry chimney inside a house can make beneficial use of the radiant heat given off during heating. A masonry chimney located inside a house adds heat to the house and tends to remain warmer, thus creating less opportunity for creosote to condense on the chimney walls.

Prefabricated Metal Chimneys

Prefabricated chimneys are easier to erect than masonry ones. Tests of the National Bureau of Stan-

Triple-wall Chimney
(cutaway)

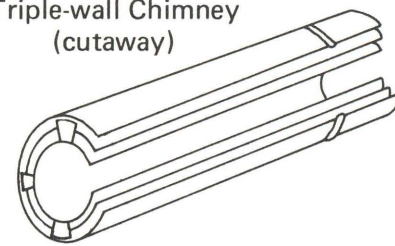


Fig. 6. Triple-wall chimney cutaway.

dards have shown that metal and masonry chimneys differ little with respect to draft when used under similar conditions. Metal prefabricated chimneys must be U.L. listed "All Fuel" since others are not insulated or vented enough for wood burning. Wood stove flue gases get hot enough to melt the aluminum alloy used in chimneys designed for gas appliances.

There are two types of approved metal prefabricated chimneys — insulated chimneys and triple-wall chimneys.

Insulated prefabricated chimneys are made of a stainless steel outer casing, 1 inch of insulation (metalvent or metalbestos) and a stainless steel liner. Some triple-wall chimneys (thermal syphon) are constructed so that the outside air passes down between the outer walls of the triple-wall chimney and up along the interior wall (Fig. 6). The movement of air cools the chimney. Some tests indicate that these three wall chimneys may occasionally cool the interior of the surface too much, causing creosote to condense. These triple-wall chimneys are not recommended for air-tight stoves because they may dissipate too much heat. Air insulated (sealed end) triple-wall chimneys do not pose this type of problem.

For Additional Reading

Burning Wood NE-191, NRAES, Riley-Robb Hall, Cornell University, Ithaca, NY 14853

The Wood Burners Encyclopedia by Jay W. Sheldon and A.W. Shapiro. 1976. Vermont Crossroads Press, Waitsfield, VT 05673

Fireplaces and Chimneys. 1971. Farmers Bulletin No. 1889, USDA, Superintendent of Documents, Washington, DC 20402