

.4S243 Kiln Drying*

SMALL SAWMILL IMPROVEMENT
PRACTICAL POINTERS TO FIELD AGENCIESA BOILERLESS KILN

Several of the softwoods and a few of the less refractory hardwoods in thicknesses of 1 inch and perhaps greater can be satisfactorily dried by means of an inexpensive home-made kiln constructed as follows:

Firebox.--A section of discarded smoke stack, supported by piers of stone or brick, or laid in a shallow trench, comprises the firebox. The rear end of the stack should be walled with brick, rock, or a metal plate. An outlet large enough to take a large-sized stove pipe should be made on the upper side of the stack near the walled end.

Lumber Pile Foundations.--Foundations are built to hold one stack of lumber on each side of the firebox allowing a one-foot space between each foundation and the firebox. Each foundation has four supports. Each support consists of a sill sunk slightly below the ground line, two concrete-block uprights, and a cap. The caps should be aligned to support the lumber evenly. Solid supports built by piling up timbers should not be used.

Building.--A building is placed about the firebox and lumber piles. (Fig. 1, A) The back, sides, and middle panel of the front have sheathing on both sides of the studs so that the walls can be filled with sawdust. Detachable door panels are made of a double layer of boards with tar paper between. The roof consists of panels made of a single layer of boards supported by two rafters, each braced at mid-point by a 2-inch iron pipe, attached at the front to studs and at the back to the studs of the back wall. The roof panels are laid, not nailed, across the two rafters so that their ends overlap the inside layer of wall sheathing, but do not reach the outside layer. Strips of tar paper are laid, not nailed, over the roof panels and about four inches of sawdust is placed on top of the paper; plenty of sawdust should be placed at the junction of the roof and side walls. The outside layer of the walls is carried six inches above the inside one in order to keep the sawdust from blowing off the roof. The roof is not put on the building until the lumber has been piled within, and it is removed before taking out the charge. In removing, the sawdust is swept to the rear-most panel, the tar paper rolled back to it, and the exposed panels piled on top.

The built-in panel at the front is nailed from center to center of two studs and carried down to within four feet of the ground. The detachable panels are set in place on each side of the built-in panel. The firebox projects about two feet outside the built-in panel. A smoke pipe is connected to the rear of the firebox after the building is erected. An angled elbow brings the smoke pipe out the front built-in panel about two feet below the roof and directly over the firebox. A length of iron pipe extending through the built-in panel and resting against the back wall directly above and parallel to the stove pipe serves as a support to which the stove pipe is wired.

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†Maintained at Madison, Wisconsin in cooperation with the University of Wisconsin.

*See outline in Small Sawmill Improvement Working Plan, March 1930, for explanation of indexing system proposed.

Fire Safeguards.--This kiln is capable of generating high temperatures, and unless safeguards are taken it will catch fire. It should be located at a safe distance from lumber piles and buildings. The sills of the pile supports should be covered with dirt. The ends of the caps in the foundations abutting the firebox should be insulated with asbestos paper protected by tin shields. (Fig. 1, B.) In addition, corrugated galvanized iron sheathing should be put along each lumber pile on the sides exposed to the firebox. By securing the metal sheathing to the pipe supporting the rafters and to inch pipe or angle iron at each end of the pile an effective baffle is obtained. (Fig. 1, A.) The baffle should not extend below or above the piled lumber, and a 6-inch space between the ends of each baffle and the front and back walls should be left for air passage. An 8-foot length of corrugated galvanized iron is placed at the back of the firebox in order to protect the rear wall. The front wall around and over the firebox needs special safeguards. One way is to wall around the firebox where it passes through the front with concrete blocks to a height of at least two feet above the firebox (fig. 1, C). The junction of this wall should not be tight against the firebox. A metal collar should be placed around the smoke pipe allowing about a 2-inch space between collar and pipe, and centered in a 2'x2' tin sheet in lieu of wall boards. The smoke pipe should extend at least six feet beyond the kiln, and a spark arrester should be placed around the outlet (fig. 1, D).

Operation of Kiln.--In loading the kiln six green 2- by 4-inch by 16-foot pieces are placed across the four foundation supports to provide a base for stickers, care being taken to space the pieces so that tiers of boards rather than flues are directly over them. Six stickers to the course are then placed at each end and at regular intervals across these pieces.

For successful operation the lumber should be box piled, that is, 16-foot boards should be placed on the outside tiers and shorter lengths on the inside tiers, alternately placing the ends of the shorter lengths flush with the front and the back of the pile. In the next course, insofar as possible, the short boards should be put flush with that end of the pile not reached by the short boards in the same tier of the course below. The tiers should be carried one directly above another, and a spacing not less than 4 inches to 12 inches of boards should be allowed between tiers. This method of piling results in vertical flues that allow a free downward flow of air from the top to the bottom of the pile. The stickers should be aligned directly over the corresponding stickers in the course below. The pile should be carried straight up to within a foot of the roof. The piling described here should give a space of six inches or more between the side walls and piles. A duplicate pile is put up on the other side of the firebox.

Approximately 5,000 heartwood stickers should be sawed out, since they may be used repeatedly. In tearing down a pile the stickers for the upper half of the pile are placed across the two roof rafters.

When loaded, roofed, and front closed, a fire is started and kept day and night until the lumber is dry. A sheet iron plate is placed over the front end of the firebox to serve as a fire door and to control the draft to some degree. A damper in the smoke pipe outside the kiln offers more complete control. As

the charge dries, the sawdust joint at roof and walls is apt to open. More sawdust must be placed in the settled sections.

The progress of drying can be determined roughly by holding the hand at the crack at the juncture of the side wall and front where the hot air is pouring out. As long as the fingers feel moist after a minute's exposure the lumber is losing moisture rapidly. As the charge approaches a dry condition the air moisture drops, the temperature increases, and it then becomes advisable to carry only a moderately hot fire.

The small-mill operator ordinarily dries his entire cut, consequently he needs a battery of these kilns. The capacity of the kiln described here is about 7,000 board feet. A mill cutting 7,000 board feet per day and using a four-day drying schedule would require five or six such kilns. The structure shown in figure 1 necessitates that lumber be piled in and out for each charge. Where production warrants, these kilns can be modified to handle trucks.

Bill of Material

Heater.--1/4-inch sheet iron firebox, 2 feet in diameter, 18 feet long; 30 feet of 12-inch stove pipe, 2 angled elbows (45° adjustable), a damper and flue collar. A sheet of tin 24" x 24". A spark arrester 1/8" mesh screen. Twenty-six feet of 1-1/2" pipe and one tee.

Fire Safeguards.--34 concrete blocks 8"x8"x16". A piece of tin 18" x 36", one 24" x 24", and 8 pieces 20" x 20". Twelve sheets of corrugated iron approximating 36" x 8' each. Eight pieces asbestos paper 20" x 20".

Foundations.--Eight 2" x 12" x 6' sills. Forty-eight 8" x 8" x 8" concrete blocks. Eight 7" x 9" x 6' caps.

Walls.--Three 2" x 6" x 18' sills. Two 2" x 6" x 7' sills. One 4" x 4" x 4'-4" sill. Three 2" x 4" x 18' and two 2" x 4" x 7' sill caps. Sixteen 2" x 4" x 13' studs, three 2" x 4" x 4'. Two 4" x 4" x 9' studs. Two 4" x 4" x 6'-8" front joists over doors. Two 4" x 6" x 18' rafters. Inch sheathing all widths as follows: 1,430 board feet 18-foot lengths for two sides and back walls, 210 board feet 13' 6" lengths vertically in doors, 80 board feet 4-foot lengths horizontally in built-in front panel, 216 board feet 7' 6" lengths horizontally in doors, 325 board feet 17' 6" roofing.

Miscellaneous.--625 square feet tar paper. Sawdust. 5,000 stickers 1-1/2" x 1" x 6-1/2'. Wire. Nails. Two iron pipes each 2" in diameter, 13' long. Four pipes 1" in diameter, 13' long.

Contributed by C. J. Telford,
Small-Mill Specialist,
Forest Products Laboratory,
Revised Aug. 1943.

