Construction of Farm Grain Storage
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Construction of Farm Grain Storages

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A well-constructed grain bin is necessary to maintain the quality and quantity of grain stored on the farm. A grain bin should —

1. Be under a tight roof,
2. Have damp-proof floors,
3. Protect against rats and mice,
4. Have all openings screened except the door, and
5. Provide ventilation for the bin.

PERMANENT STORAGE BUILDINGS

Walls constructed of studding covered with a single layer of drop siding or other dressed and matched lumber have not generally proven to be satisfactory, except for short-time storage. Preferred construction for wood frame buildings calls for two thicknesses of material outside the studs, with a layer of waterproof paper between—and no lining on the inside of the studs. (Fig. 1.) Sheathing must be well nailed.

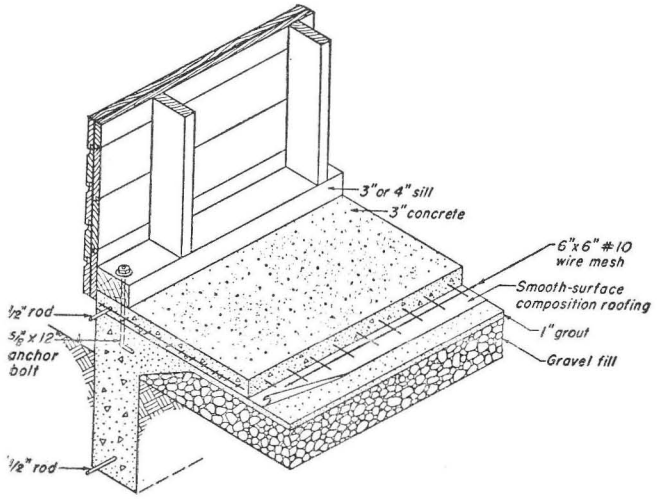

Fig. 1. Concrete floor and foundation for wood grain bin, showing composition roofing used as moisture barrier. Note anchor bolts, reinforcing rods, and wire mesh.

A single layer of exterior plywood or other wallboard of sufficient strength applied outside the studs is satisfactory if joists are made waterproof—lap horizontal joints 2 inches, or cover with metal flashing—calk and batten vertical joints.

Round steel cribs are satisfactory if they are put together tightly and placed on a good base. (Fig. 2.) The concrete base should not

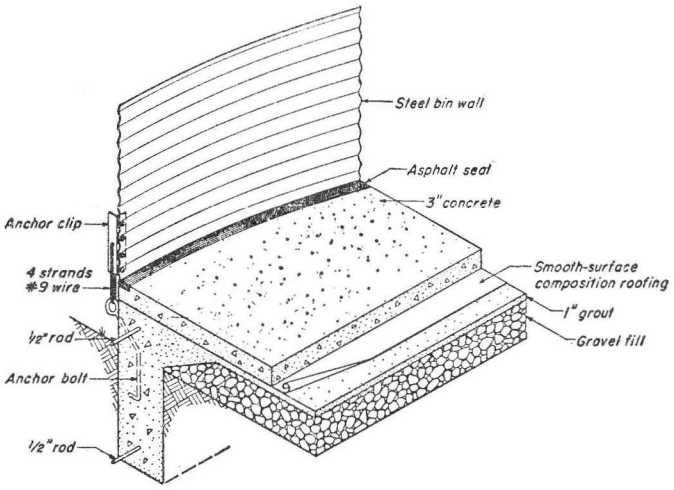

Fig. 2. Concrete floor and foundation for round steel crib for grain storage. Floor is an inch or more above the lower edge of the bin wall. Note moisture barrier, asphalt seal at wall, and how bin is anchored to the foundation.

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be larger than the steel crib, because water can collect on concrete outside of crib and seep under crib into grain.

Cement or cinder block walls of standard construction will not withstand the lateral pressure of grain.

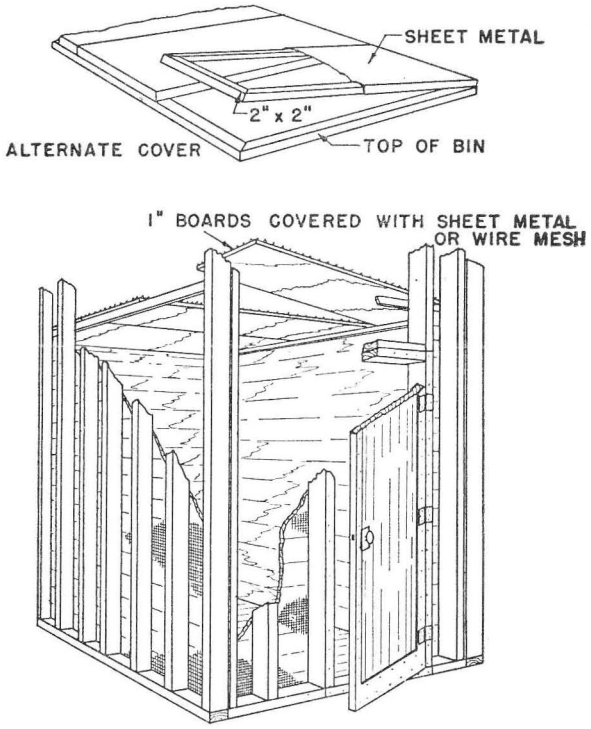

Fig. 3. Inside grain bin, covered at the top to prevent contamination by birds, rats and mice, or other animals.

A forced-air system for removing from 1-5 percent of moisture from grain can be installed in most grain bins. In general, it is best to limit the depth of grain on a drying system to 5 feet. Three to five cubic feet of air per minute should be supplied for each bushel of grain in storage. Select a fan that has been designed specifically for crop drying, and will supply air against two inches or more of static pressure (resistance to airflow).

Farmers Bulletin No. 2009 called "Storage of Small Grains and Shelled Corn on the Farm" published by the U.S.D.A. is an excellent reference for construction and storage details.

The illustrated catalog "Grain Storage Building Plans" by the Midwest Plan Service shows granaries with from 300 to 10,000 bushel capacities. The plans illustrated are available from the Agricultural Engineering Department of Michigan State College.

TABLE 1—Stud spacing for bins holding small grains.

Size of Studs (in inches)	Spacing center to center	Length of Stud	Depth of Grain
	inches	*feet*	*feet*
2 x 4	24	8	5
2 x 4	16	8	6
2 x 4	12	8	7½
2 x 6	24	8	8
2 x 6	16	10	9
2 x 6	24	10	9

Extension Bulletin 316, "Drying Grain with Forced Air," contains information on grain drying equipment and the construction and operation of grain drying systems.

The above bulletins are available from the office of the County Agricultural Agent.

INSIDE STORAGE BINS

Inside bins may be constructed as permanent or semi-permanent storage. Figure 3 shows a bin that would qualify as permanent storage.

Woven wire screen (hardware cloth), ½-inch mesh or smaller, is used between the studs and siding to prevent rats and mice from entering the bins.

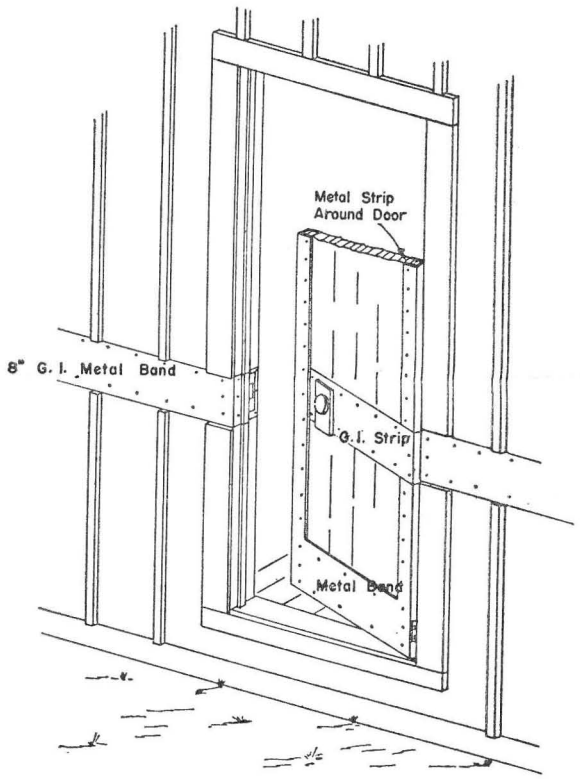

Fig. 4. Rat-proofed door for inside grain bin. U-shaped metal strip around edge of door prevents rats from gnawing entrance holes; 8-inch metal band along the wall prevents them from climbing sidewall.

Figure 4 shows a door protected against rodents. Door edges should be covered with metal applied as a U-shaped strip around the door. An 8-inch band of galvanized sheet metal applied over the siding 2 feet or more above the ground will prevent rats from climbing up side-walls.

One-inch tongue-and-groove material or ¾-inch plywood is suitable for bin walls and floor.

Spacing for bin studs is shown in Table 1. Studs must be well fastened to sole plate. Sole plate must be well fastened to the floor.

Grain is a concentrated load. One foot of grain is approximately equal to the weight of seven feet of hay over the same floor area.

Table 2 shows the depth of grain that can be carried by different size joist.

Provide a screened opening approximately 6 inches wide around top of bin for ventilation.

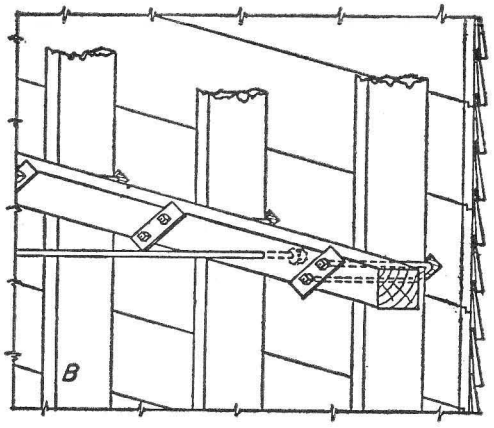

Fig. 5. Cross-bracing with ½-inch rod ties. The 4 x 4's are bolted to the studding with U-bolts.

Grain must be protected against moisture. Small leaks in the roof can cause severe damage to grain stored in tight bins. All leaks should be repaired.

TABLE 2—Grain depths carried by different sizes of joists—24-inch spacing. (Grain can be twice as deep if joists are spaced only 12 inches apart.)

Size of Joist (inches)	Depth of Grain for — 6-foot joist	8-foot joist	10-foot joist	12-foot joist
	Joists Supported at Ends Only			
2 x 6	3½ ft.	—	—	—
2 x 8	5	3½ ft.	—	—
2 x 10	6	4½	3½ ft.	—
2 x 12	7½	5½	4½	3½ ft.
	Joists Supported at Each End and at Center			
2 x 4	3½ ft.	—	—	—
2 x 6	6	4½ ft.	3½ ft.	3 ft.
2 x 8	8	6	4½	4
2 x 10	10	7½	6	5
2 x 12	12	9	7	6

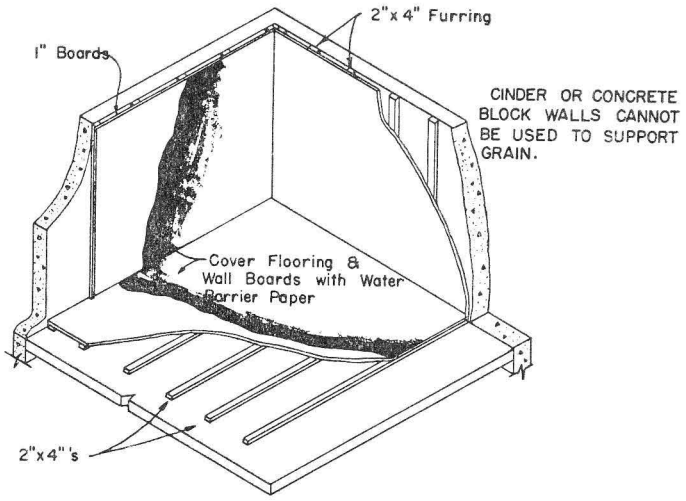

Fig. 6. Damp-proof floor for utility buildings converted for temporary grain storage.

Concrete floors can give trouble due to dampness if not properly constructed. Fig. 1 shows approved floor construction.

If existing walls such as garage walls or old bin walls are used to hold grain, such walls can be strengthened by ½-inch rod ties as shown in Fig. 5 (opposite), spaced 4 to 6 feet apart in bin.

If the grain bin is to be built in a building such as a garage or tool shed having a damp concrete floor or a dirt floor, a built-in floor as shown in Fig. 6 can be used.

TEMPORARY STORAGE

Most farms have an area that could be used for temporary storage. Temporary storage should maintain the quality and quantity of wheat reasonably well for a short-time—up to 90 days.

The garage, tool shed, brooder house, hog house, box stall or barn floor can be turned into a temporary storage. Figure 6 shows how to build up a damp-proof floor by laying one inch lumber on 2 x 4's laid flat, using 16" on-center spacing and covering the lumber with heavy asphalt paper or roll roofing.

The walls of a garage, tool shed, or brooder house are, in general, not strong enough to withstand the lateral pressure of wheat without additional bracing. Additional studding can be used along the side walls and cross-bracing, as is shown in Fig. 5, can be used at the bottom and near the top of the storage building. Studs should be well-fastened to the sole plate and the sole plate, in turn, must be well fastened to the floor. (Fig. 1.)

An easily constructed self-containing grain bin is shown in Fig. 7. By placing this bin on an existing floor, storage can be provided for approximately 20 to 25 cents per bushel. For temporary storage, use 15-pound asphalt paper—for longer storage, use 30-pound asphalt paper or roll roofing. Use 3 sixpenny nails to fasten plywood to 2 x 6's. Make walls in sections on floor—raise sections in place—fit snugly and bolt. For semi-permanent storage, cover with chicken wire and asphalt paper.

Wheat is a concentrated load—one foot of wheat is approximately equal in weight to seven feet of hay.

Wheat should be protected against rain and snow. A small amount of water can result in serious damage to the wheat.

Wheat must be 14 percent moisture or below to maintain quality in storage. Take a sample to the elevator and have it tested.

There should be an air space between the wheat and any covering. It is desirable to provide for cross-ventilation.

One bushel of wheat by volume equals approximately 1.25 cubic feet. To determine the volume of bin needed, multiply the number of bushels to be stored by 1.25. To determine the number of bushels of grain a bin will hold, find the cubic feet in bin by multiplying width times length times height. Divide number of cubic feet by 1.25 to get number of bushels.

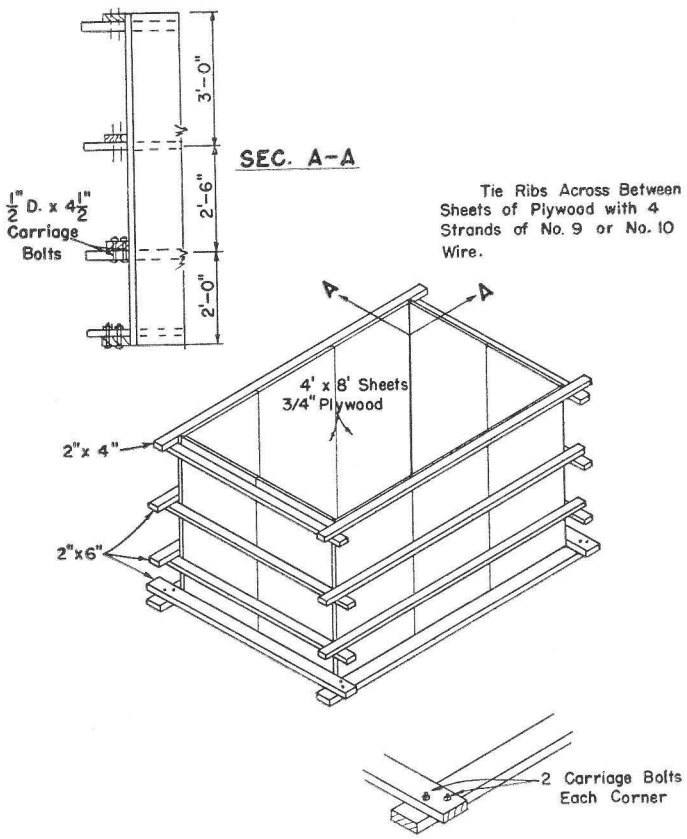

Fig. 7. Self-containing grain bin for quick construction.

EAR CORN STORAGE

While there are many similarities in the construction of storages for ear corn and grain, corn differs from other grain crops in being nearly always too damp to store in a tight bin when harvested. Corn requires further curing after harvest.

The natural movement of air through corn cribs up to 5 feet will provide that curing satisfactorily. Such cribs should be located in the open to take advantage of all natural air movement. For cribs wider than 5 feet, some type of forced-air system becomes necessary.

The use of a forced-air drying system will permit the storage of high-moisture ear corn in buildings up to 25 feet in width. A forced-air drying system should provide 5 to 10 cubic feet of air per minute for each bushel of ear corn in storage.

The recommended construction for concrete floors in an ear corn storage is the same as that shown in Fig. 1. However, single-thickness crib siding should be used for the walls.

One foot of corn over a floor area is equal in weight to approximately 4 feet of hay. One bushel of ear corn (2 baskets) occupies 2½ (2.5) cubic feet of storage space.

The grain depths given in Table 1 can also be used to determine how deep *ear corn* can be stored on different sizes of joists, by following this simple formula. Take the allowable depth given for wheat in Table 1, and multiply by 2.

For fuller information on construction and ventilation of corn cribs, obtain Farmers' Bulletin No. 2010 by the U.S.D.A.—"Storage of Ear Corn on the Farm."

Extension Bulletin 316, "Drying Grain with Forced Air"—previously referred to—also gives specific information on the type of structures and drying systems best suited for storing high-moisture corn.

(Figs. 1, 2 and 5—and the data for Tables 1 and 2—are from U.S.D.A. Farmers' Bulletin 2009.)