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EP
no.80*

U.S. GOVERNMENT PRINTING OFFICE: 1942

on Pamphlet 80

Revised June 1942

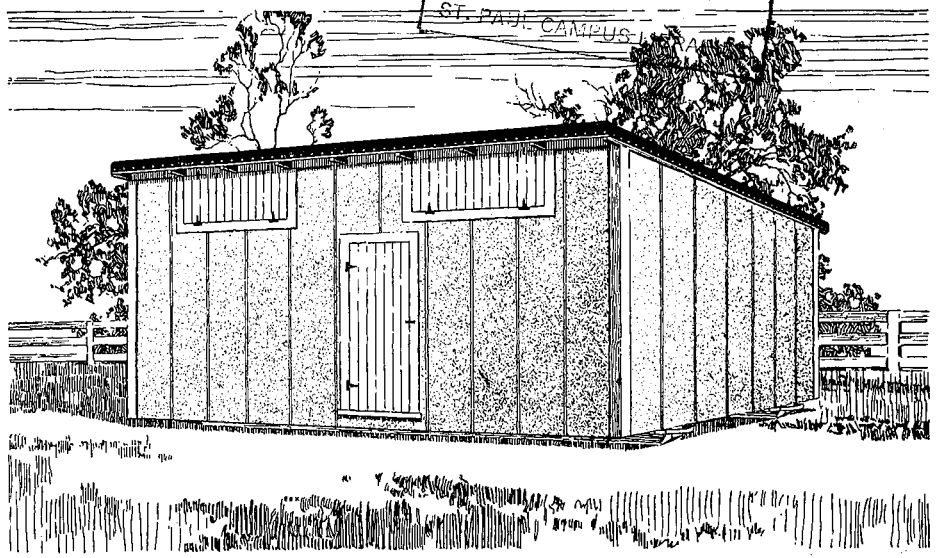
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Storing the 1942 Wheat Crop

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SEP 17 1976

ST. PAUL CAMPUS



A 1000 BUSHEL MOVABLE GRAIN BIN, WHICH MEETS AAA STORAGE REQUIREMENTS

OVER THREE FOURTHS of all warehouse, elevator, and other grain storage space off farms is already filled in Minnesota, and the amount of wheat stored on farms is considerably larger than it was at this time last year. Last year the terminal elevators and warehouses were able to move some wheat to eastern storage, but this is not possible in 1942. On February 16 only about 19 million bushels of terminal elevator and warehouse storage space was available in Minnesota while the average yearly sale of all grain from Minnesota farms alone has been nearly 100 million bushels for the last few years. Farmers' reports, in a survey made in February by the County and State AAA,

indicate about 25 million bushels of additional storage space will be needed in Minnesota.

This means that farmers who depend on selling grain direct from the threshing machine or upon storage off the farm may be caught with no place to move their grain. This situation can best be met by farmers providing necessary storage for their grain right on their own farms. The type of storage to provide will depend upon each particular farm situation as well as the kind of building materials available. In addition there is at present a \$1000 limitation, without special permit, for all new farm construction on any farm for any 12 months' period of time.

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PLAN FOR STORAGE NOW

1. Repair any existing building space that might provide good storage.
2. Then, if possible, provide for either:

Permanent storage space. considering, of course, the possibility of future use in the ever-normal-granary program, or

Movable grain bins which not only will meet the construction requirements of the AAA for sealing and the 7 cents per bushel storage allowance but also can be used for other purposes when not needed for storage.

3. As the last resort, provide simple temporary storage which will help preserve the wheat from the ground moisture and the weather.

Regardless of what type of storage is to be provided on the farm, plan now for its construction. If it is put off until harvest, there may be neither materials nor labor to get it built in time.

Any granary for wheat or other grains should be built to:

1. Resist both the outward and downward pressure of the wheat.
2. Protect the wheat against rain, sifting snow, and ground water.
3. Protect against birds, poultry, rats, and vermin.
4. Require forcible breaking in order to be entered when sealed.
5. Fill and empty easily.
6. Resist wind destruction, especially when empty.

The capacity in bushels of a grain bin can be figured by multiplying the number of cubic feet by .8. Never store wheat with more than 13½ per cent moisture content in a tight bin. If wheat of higher moisture content must be stored, use a ventilated bin. As soon as the moisture content has been reduced sufficiently, move wheat to a tight bin or make ventilated bin tight to prevent wheat from reabsorbing moisture in damp weather.

It is unwise to attempt to erect any large stationary granary without carefully prepared plans. The most common mistakes are faulty foundations, insufficient bracing or tying, and improper protection from moisture or rodents. Extension Pamphlet 83 con-

tains a list of farm building plans and can be obtained from your county agent's office or the Bulletin Room, University Farm, St. Paul.

REPAIR EXISTING SPACE

Often old storage units can be repaired for less than it costs to build a new storage bin. Sometimes old bins may be moved and placed on a newly built foundation with a concrete floor replacing the rotted wood floor and floor joists. It is important to protect any granary from rats. The best protection is to have a good concrete foundation with the floor well off the ground. With a wood floor close to the ground, it may be necessary to place a ¼-inch mesh hardware cloth over the entire floor and to run it up 2 or 3 feet either on the inside or outside of the building.

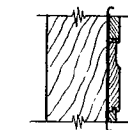
PERMANENT GRANARY

THE GRANARY shown in figure 1, with a concrete floor and with the driveway filled, can hold approximately 4000 bushels. The material cost will be about \$500. With the present \$1000 restriction for new farm buildings it would seem unwise to plan for a larger permanent granary without a permit.

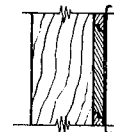
Figure 1 shows an alternate concrete floor or wood floor construction. With the concrete floor construction it shows a somewhat special but simple method of beveling the concrete foundation wall which, with the aid of a strap iron anchor, will hold the 2"x8" studding spaced 2 feet o.c. without the use of a sill. A little fine sand and cement mortar placed on the concrete just before the stud is put in place will make for even bearing between the end of the stud and the concrete. With the method of construction as shown in the plan, steel reinforcing is necessary. However, reinforcing rods will be almost impossible to secure for the duration. Figure 2 shows a method and type of concrete floor and foundation construction that will be satisfactory if good concrete, as indicated, is used. The method of construction illustrated should be followed closely to

BILL OF MATERIAL 2500-BUSHEL MOVABLE BIN

For Concrete Floor Construction (Fig. 2)			For Either Type Construction		
	Pieces	Size	Pieces	Size	
Sills	6	2"x 8"—16'	Studding, gable end, and driveway	10	2"x 4"—10'
Studding	40	2"x 8"—12'	Rafters	28	2"x 4"—10'
Corner studding	16	2"x 6"—12'	Plate	12	2"x 6"—16'
Foundation and floor			Plate	4	2"x 6"—10'
Concrete	15 cu. yds.		Door headers	2	4"x 6"—8'
OR			Cross ties	7	1"x10"—18'
Cement	87 sacks		Cross ties	6	1"x10"—16'
Sand	8½ cu. yds.		Blocks	5	2"x 4"—12'
Gravel	12 cu. yds.		Sheathing (shiplap)	91	1"x 8"—16'
			Sheathing (shiplap)	41	1"x 8"—18'
			Siding (beveled)	1200 b.f.	1"x 6"
			Building paper	1000 sq. ft.	
			Roof boards	68	1"x 6"—14'
			Shingles	5½ squares	
			Doors		
			Boards (shiplap)	180 b.f.	1"x 8"
			Car siding	22	1"x 6"—10'
			Corner boards	8	1"x 4"—12'
			Cornice	4	1"x 6"—10'
			Ridge roll	30 ft.	
			Anchor bolts	24	¾"x10"
			Paint, nails, and door hardware	not included.	
			Total lumber for special concrete floor construction	5,181 F.B.M.	
			Total lumber for wood floor construction	6,903 F.B.M.	



Reinforced kraft paper on studding; 6-inch drop siding.



Shiplap, D&M, or ¾-inch three-ply plywood sheathing; 45-pound asphalt roll roofing; vertical batten 18 inches o.c. (to protect roofing).



Shiplap, D&M, or plywood sheathing; building paper; beveled siding or shingles.

FIG. 3. TYPES OF GRANARY WALLS

MOVABLE GRAIN BIN

A MOVABLE 1000-bushel grain bin (Fig. 4) is easily and cheaply constructed. About 1800 board feet of lumber are required. The total cost of materials would be around \$125. This bin can be easily converted into a poultry brooder house or a range

shelter, a hog farrowing house, a feed house, or it can be used for seed grain storage. As a grain bin it can be pulled up beside the threshing machine or into the field being harvested with the combine. Thus, in a busy season of the year the labor of hauling grain is almost entirely eliminated. To build a 1200-bushel bin, which will hold a carload of grain, make bin 18 feet long.

Framing—Each framing unit consisting of a rafter, front and back studding, and floor joist is fastened together with four lap joints. Nine such framing units spaced 2 feet o.c. are required for a 16-foot bin. A convenient method of construction is to lay out framing units on a level surface, fastening all four joints while in this position.

If standard length lumber is used, neither the joists nor the rafters have to be sawed and each pair of 8- and 10-foot studs can be cut from one 2"x6"—18', by sawing it in two at a slope of 1 to 5. It is very important to fasten the lap joint of the joists and studding securely because of the great outward and downward pressure at these joints. In addition the bin can be greatly strengthened against the outward pressure by the use of 1"x8"

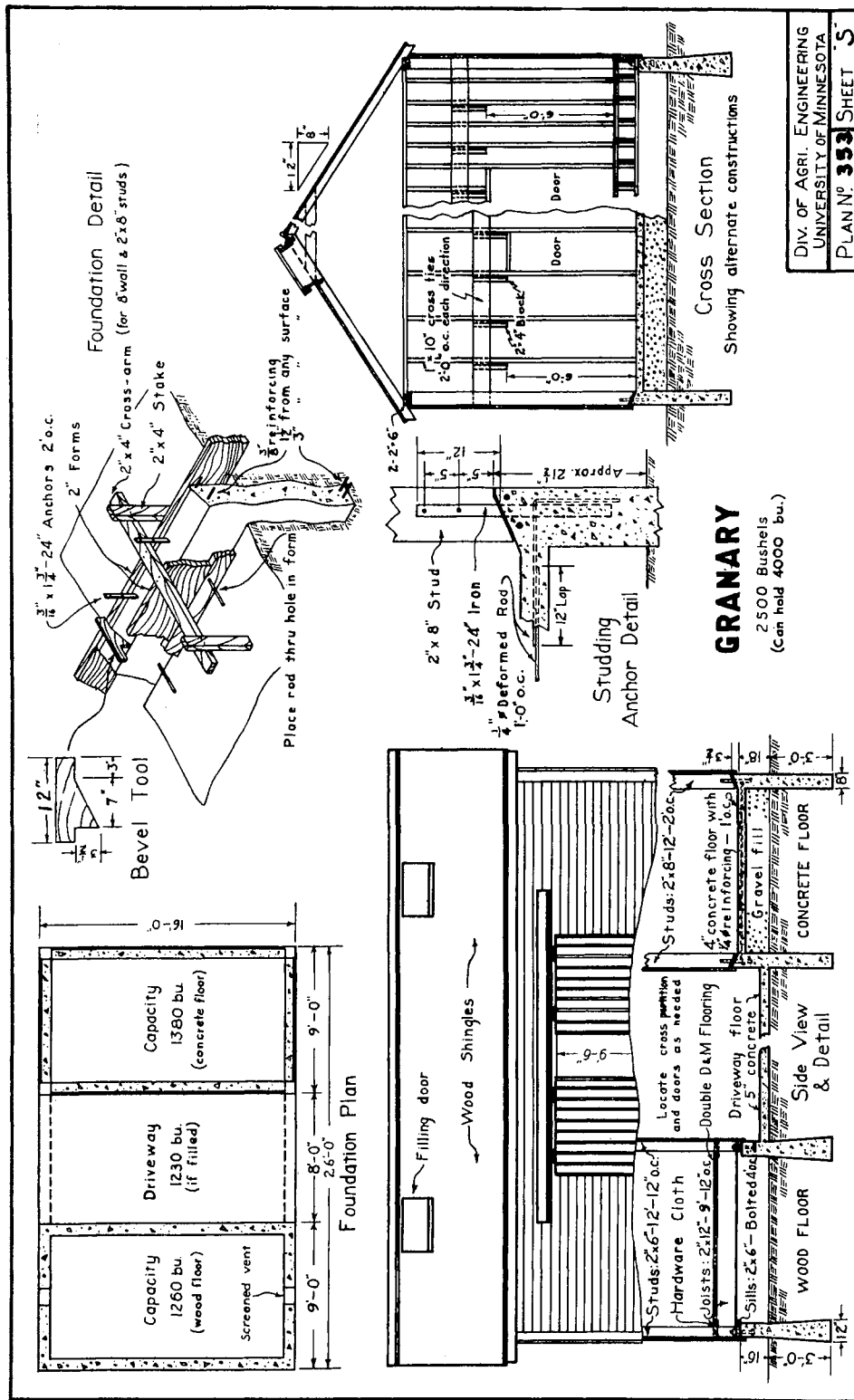


FIG. 1. A 2500-BUSHEL PERMANENT GRANARY

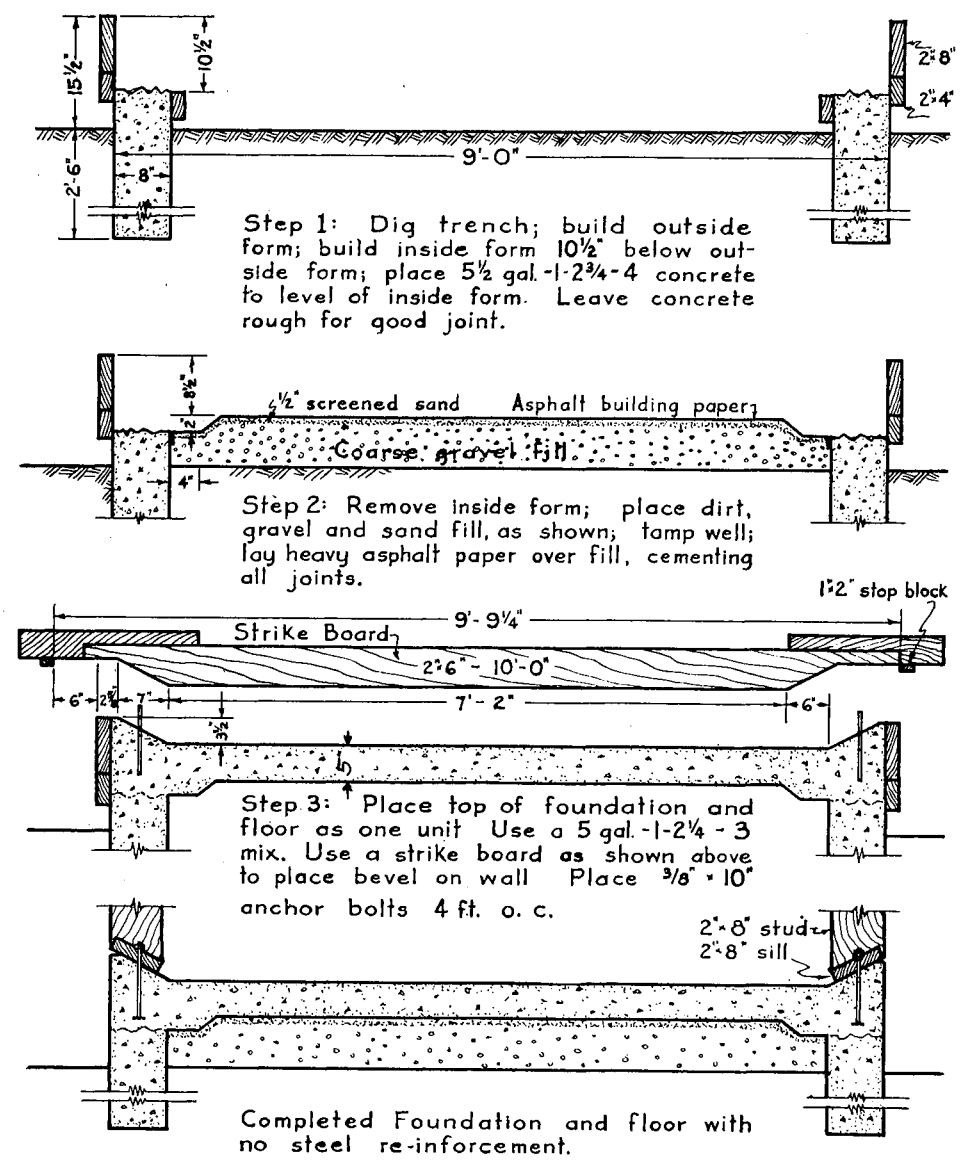


FIG. 2. CONCRETE FLOOR AND FOUNDATION

prevent future cracking of concrete. To assure a dry concrete floor, it is important that a tight asphalt layer be placed over the gravel fill before the floor is poured.

Figure 3 shows different types of granary wall construction all of which will last many years and keep driving rain from penetrating the walls. An inexpensive type of construction is a lightweight asphalt roll roofing over the sheathing. Roll roofing should be placed vertically and protected with

vertical wood batten, spaced not over 18 inches o.c. If single thickness drop siding is used, a reinforced asphalted kraft paper placed over the studs before the siding is applied will be worth its cost in additional protection and should remain there for many years. Any drop siding must be kept well painted to help prevent penetration of driving rains. The most satisfactory construction for a permanent granary is a siding placed over a sheathing with a building paper in between.

cross ties spaced 4 feet o.c. Bolting the cross ties to the studs will make them easily removable. Nailing 2"x6" studs to the 2"x8" joists at the lap joints probably will be satisfactory if enough 16 d. nails are used and no splitting occurs. A 1/2-inch bolt would be stronger. However, bolts do not develop their maximum strength when they are placed too near the end of the wood. The use of a dry powder casein glue that requires only cold water for mixing provides a practical and inexpensive method of producing very strong lap joints. To produce a good glued joint, the two surfaces must be smooth and parallel in each direction and the lumber should be well seasoned. One 1/2-inch bolt with large washers will hold the joint while glue is setting and may be left there. Follow manufacturers' instructions.

Skids—The two 6"x6" skids are placed exactly 20 inches from the side of the building to support the load with the minimum size of the floor joists. Be sure to bolt the clevises on the skids before the bin is built as it is very difficult to put them on afterward. Place a 2"x4" flatwise between the skids and nail it to the lower edge of a joist near each end of the bin to prevent any side slippage of the skids.

Floor—A single thickness D&M (dressed and matched) flooring will keep down cost and weight. The lumber should be well seasoned to prevent cracks from shrinkage. To keep rats from gnawing holes through the floor, place a 12-inch strip of sheet iron or 1/4-inch hardware cloth on the joists over the skids before the flooring is laid. This is the only place where rats can sit conveniently to gnaw if the bin is well-supported off the ground. Tacking 1"x2" blocks to the studs where there is no other support for the flooring will eliminate cracks due to shrinking or poor fitting of the flooring around the studs. Placing 2"x4" headers between the studs and over the floor will make a tight corner between the side walls and floor.

Walls—To use shiplap or other low cost lumber that may not offer sufficient protection against driving rain, a roll roofing should be applied vertically with wood cleats or battens placed not over 18 inches o.c. to prevent tearing.

With studding 2 feet apart it is important that siding be nailed well. Use at least three 10 d. common or three 8 d. cement coated nails for each 8-inch board or two for each 6-inch board.

Roof—The shed type roof shown in figure 4 makes for simpler, less expensive, and stronger construction than does the gable type roof because the rafters also serve as a tie to hold the top ends of the studding together. A roof hatch is also eliminated. However, as shown, the roof is of such low pitch that galvanized sheet iron or roll roofing should be used. To make for a more durable roll-roofing covering use only the best quality asphalt roofing. In localities where it is extremely windy, split the 36-inch width in two, making 18-inch strips. Lap these strips at least 2 inches, nailing well with galvanized roll-roofing nails and cementing laps with plastic roofing cement. If wood shingles are used, make front studding 12 feet long to give roof a greater slope. The 12-foot rafter will still be long enough.

BILL OF MATERIAL 1000-Bushel Movable Bin

LUMBER		
	Pieces	Size
Skids	2	6"x6"—16'
Joists	9	2"x8"—10'
Studding	16	2"x6"—18'
Door framing	2	2"x6"—10'
Rafters	9	2"x6"—12'
Headers and blocks	6	2"x4"—14'
Floor and doors (D&M)	26	1"x6"—16'
Side sheathing and roof boards (shiplap)	52	1"x8"—16'
End sheathing (shiplap)	31	1"x8"—10'
Floor blocks	2	1"x2"—10'
Fascia	2	1"x4"—16'
Corner flashing	4	1"x4"—18'
Battens	288	linear feet
TOTAL LUMBER		1743 F.B.M.
Roll roofing (75-pound)		2 1/4 rolls
Roll roofing (45-pound)		5 rolls

HARDWARE		
Amount	Kind	
Hardware cloth	32 square feet	1/4-inch mesh
T Hinges	3 pair	6-inch
Hinge hasps	3	3-inch
Nails	16 d., 10 d., 8 d.	
Nails		Gal. roofing
Casein glue	1/2 pound	
Clevis	3/16"x1 1/4"—12'	Strap iron
Bolts	8—1/2"x6 1/2"	Machine

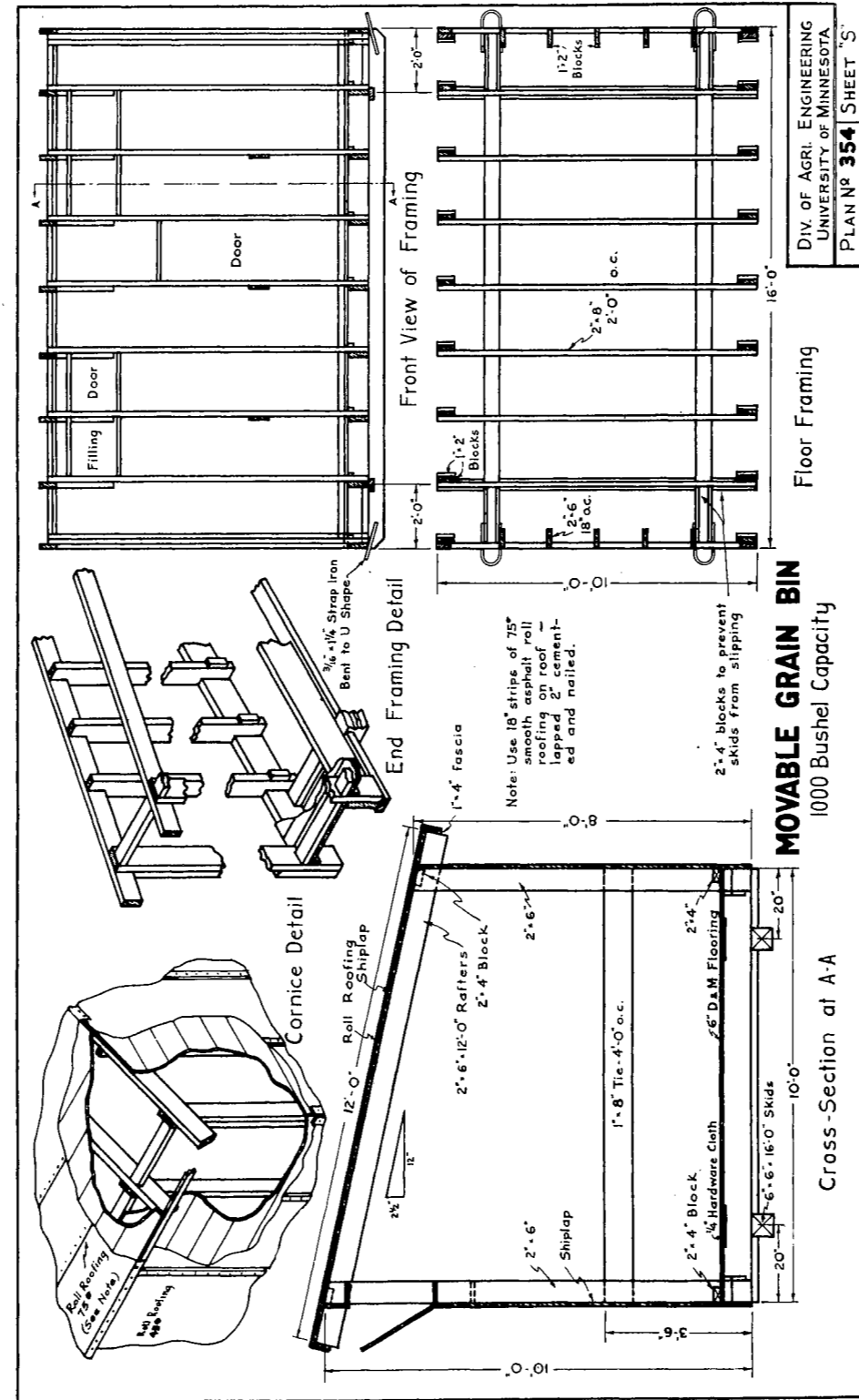


FIG. 4. THE 1000-BUSHEL MOVABLE GRAIN BIN

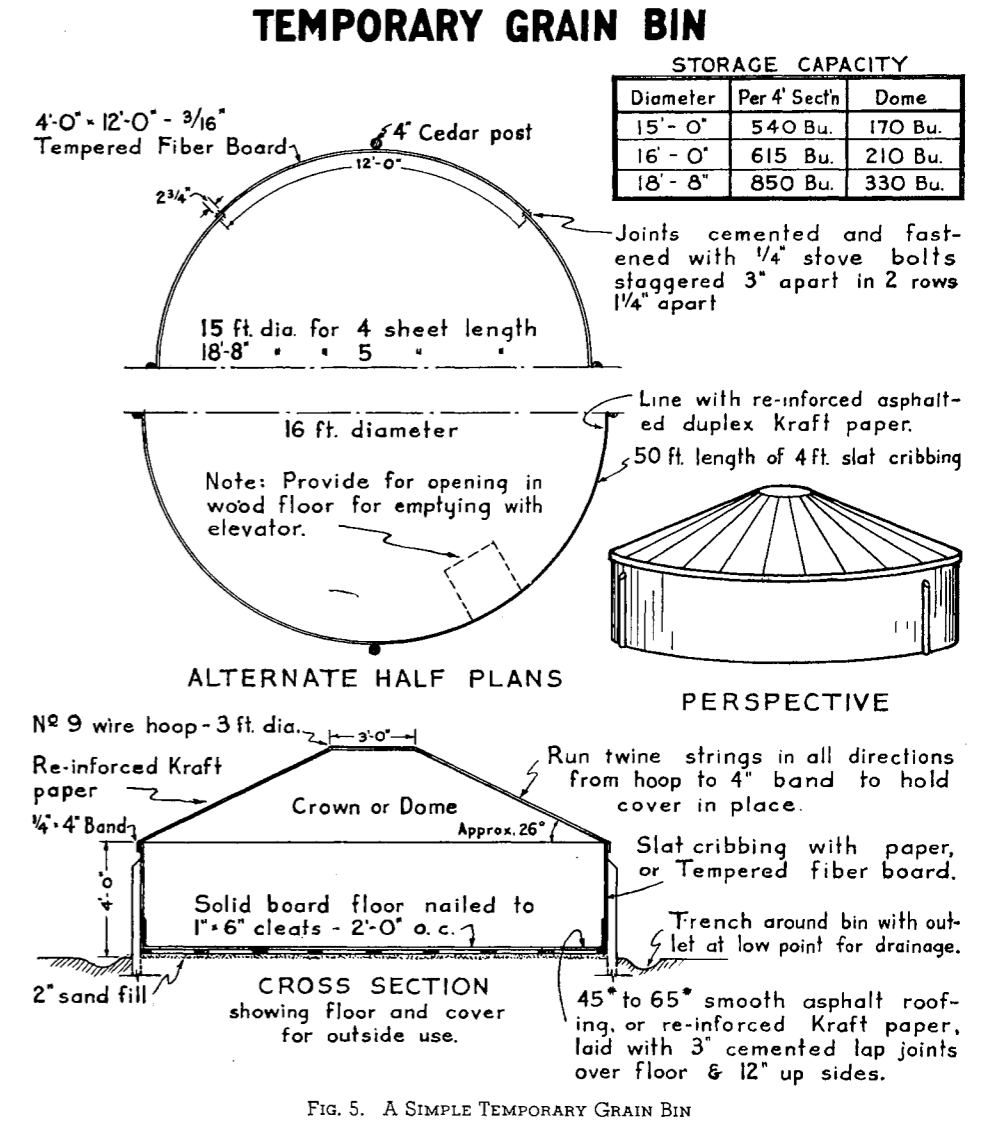


FIG. 5. A SIMPLE TEMPORARY GRAIN BIN

A VERY SIMPLE type of temporary grain storage construction is shown in figure 5. This construction is to be highly recommended in preference to putting the grain on the ground. To increase its height from 4 to 8 feet and still permit settling without buckling of the walls, the second section should be placed inside the first and in no way be rigidly fastened to it. However, the joints should be fixed to shed water. This type of construction

will provide excellent temporary storage under an already existing roof, such as the large machine shed or pen type barn. When built in the open, it should be on high ground and have 2 or 3 inches of gravel fill under the floor and a trench around the outside for drainage. Straw has been used where reinforced asphalt paper is not available for lining the snow fence type of wall and for covering the crown.

