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The Lake Country Silo

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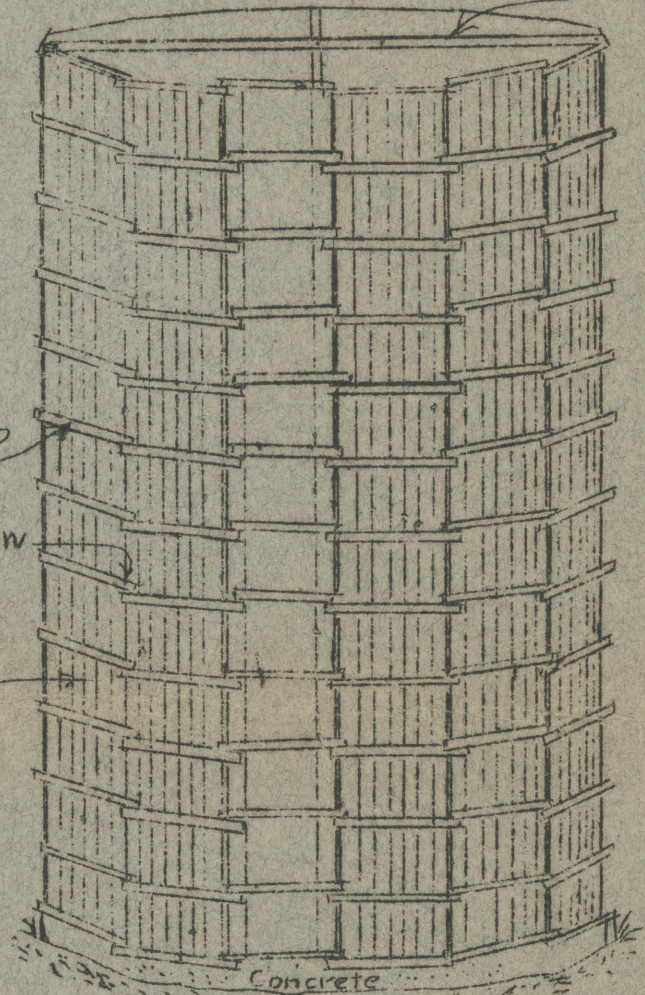
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THE LAKE COUNTY SILO

By - R. L. Patty and L. A. Eberlein.

EXTENSION SERVICE
SOUTH DAKOTA STATE COLLEGE
Brookings, S. D.
DEAN C. LARSEN, DIRECTOR.

2x6 Brace



2x4-Edge To Surface

Bolts-See Detail Below

8" Shiplap

THIS BOOK DOES NOT CIRCULATE

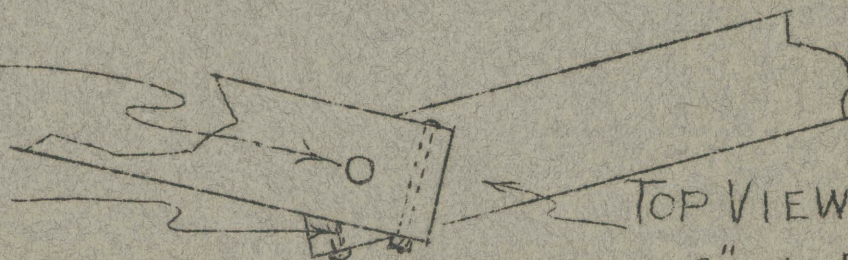
PANEL SILO 15 1/2 x 24
A Homemade Wood Silo.



EDGE VIEW OF JOINT

3/8" Bolt

1/4" Bolts



TOP VIEW OF JOINT

630.732
S087.18 SHOWING BOLTED JOINT OF 2x4 RIB.
24

THE LAKE COUNTY HOMEMADE PANEL SILO.

The homemade panel-silo plan shown in this circular is one that is quite popular in Lake County, South Dakota, and seems to have met with the approval of Lake County farmers. Some of the carpenters and lumbermen of that county have taken an interest in the construction of this silo, and the cost of it has been quite reasonable. The cost of it including the labor has ranged from 75 to 120 dollars, depending upon the diameter, height, and other special features. This does not include a roof or feed chute, although some of them had been provided with a chute.

In general, the silo is built in panels, with 12 or 14 sides, each panel being 3 feet and 6 inches wide and each panel making a side. If 14 panels are used, the diameter of the silo will be 15 feet 7 inches while if 12 panels are used the diameter will be 13 feet 4 inches. These figures will vary slightly with the amount of moisture in the 8-inch shiplap that is used to make up the panels for the silo sides. The shiplap should be neither too green nor too dry. The silo can be made any height but owners of them advise 24 feet or less for the height above the foundation. A continuous opening for the door is made from top to bottom by leaving out the four center boards in one panel. Barn battens are used over the vertical joints on the inside of the silo where the 14 panels join. The lumber is treated inside and out with a good preservative paint. Since the silo has no roof a heavy cross brace is provided across the top and the silo is guyed with No. 9 wires in the same way as other wood silos. Since the 2"x4" ribs around this silo are not quite strong enough to withstand the pressure at the bottom of a 24 foot silo, a few one-fourth inch round iron rod hoops are used near the bottom.

The materials required to build this silo are given on the last page. Roughly, it takes about 1800 board feet of lumber to build the 14 panel silo with a height of 24 feet. At the present prices (1932) this should cost around 75 dollars. The battens should cost \$4.50. There would be 60 pounds of steel at 5 cents a pound and the nails and turnbuckles would bring the total cost of materials up to around 85 dollars. This is the large sized silo.

The Foundation.

While all of these silos were not built with foundations under them, it is good practice to do so and will be economical in the end. It probably will pay to build a good concrete foundation and pit for them if they are located so this foundation can be used for a permanent silo later on. In this case the foundation should be built of the best kind of concrete and the pit should be seven feet deep. Seven feet is the best depth for a permanent silo pit because if it is deeper it is unhandy for getting the silage out, and if it is shallower it is wasteful. The pit under a permanent silo is the most economical part of the silo, providing it is not in a poorly drained location. The seven feet of depth in the pit of a silo has much greater capacity than the top seven feet and in addition is below the frost.

A great deal of trouble has been experienced in the past in having concrete silo foundations sholl off and crumble. This is because the mixture of cement, sand, and gravel is not right. This concrete should be mixed rich so that it will not absorb water if it is to stand up. The sand should be screened from the gravel and then the concrete mixed in the proportion of

one part of cement, two and one-half parts of sand, and four parts of gravel, (1-2 $\frac{1}{2}$ -4).

No South Dakota bank-run aggregate has this much coarse gravel in it, so it is necessary to get some additional coarse gravel to make up this mixture. No rocks larger than three inches in diameter should be used in this mixture. THE IMPORTANT THING IS NOT TO HAVE MORE THAN TWO AND ONE-HALF PARTS OF SAND TO ONE PART OF CEMENT. The foundation when mixed in this way need not be more than nine inches thick, but it must widen out at the bottom to almost twice this width in order to provide a footing. On a good foundation of this kind any type of permanent silo can be built later on. If no pit is provided for this silo it is still advisable to build a light foundation for it. This foundation should be built 18 inches below the ground and 12 inches above. Such a foundation not only adds several years to the life of the silo but helps in keeping down the work of rats. Rats are not only a nuisance through the feed they eat but their burrowing allows air to enter the silage and causes it to spoil.

To Build The Silo.

The panels for this silo are built on the ground and raised into place by means of a rope and pulley. Two holes are bored in the top of each panel for this purpose. A pole tripod may be necessary for the pulley if no support is close by. Each panel is made of six 8" shiplap boards planed on both sides. The panels should be creosote treated on both sides before they are raised. For a 24' silo a 16' and an 8' board would be used with the joints broken alternately. The shiplap is nailed to the edge of the 2"x4" cleats. The cleats are 4 feet long and are longer than the width of the panel so that each end of them sticks over three inches. From the figure on the cover it will be noticed that the 2"x4" cleats on one panel comes just above the cleats on the two adjacent panels and vice versa. This brings the ends of the cleats one on top of the other where they can be bored and bolted together. It is probably safest to bore the hole in the top cleat only, before the panels are raised and fitted together unless an experienced workman is doing the work. The bolts should not be smaller than three-eighths inch. The lower holes can be bored from the ladder and then they are sure to fit. In order to keep the 2"x4" cleats from splitting out at the ends, one-fourth inch bolts are put through each end of each one throughout the entire silo. These bolts are put in one inch from the end before the panels are built. When the panels are set up and all bolted together, the 2"x4" cleats make a continuous rib around the silo as shown in the figure. Since these must fit closely for bolting, it is necessary to measure the location of the 2"x4" cleats very accurately as the panels are being made. On one panel they will be nailed to come on top and on the next they will be nailed to come underneath. A pattern with slots spaced to drop the strips into, for each panel as it is being laid out for nailing, would probably save time in the long run. It would also be more accurate.

Two 8d box nails are used at each nailing strip. The number of 2"x4" cleats on each panel, and hence the number of "ribs" around the outside of the silo will vary with the height. For the 24 foot height 11 ribs are used including the top and bottom ones. They should start at 24" on center at the bottom and the distance between ribs can be increased by one inch as they go up. This comes out about right but would be too much figuring if a pattern is not built before hand. As an alternative, the first three spaces from the bottom toward the top could be spaced 24" on center and the next seven spacings could be made

30 inches. On the inside of the silo and where the panels join, three inch barn battens should be used to cover the joint. These battens will last longer if they are nailed on one side only.

Braces Across Top.

Since this silo has no roof, it is important to have it braced each way across the top and the braces should be bolted together where they cross in the center. They should also be bolted at each end to the top rib. These braces will be in the way as the top few foot of silage is being packed in the silo but it is advisable to have them. They can be taken off while filling the silo at the top and replaced again. "Two by six" braces are used.

Steel Hoops.

Since the 2"x4" ribs are not quite strong enough to hold the pressure of the silage at filling time, it is necessary to use at least 4 steel hoops of one-fourth inch round mild steel near the bottom. One of these hoops should go around the bottom space close to the second rib and one on every second space above until the four hoops are used. These hoops should be cut and threaded to fit into a turnbuckle for drawing them up. The turnbuckles are bought for 25 cents at almost any hardware store. Twisted strands of No. 9 wire might substitute for these.

Guy Wires.

After the silo is completely set up it should be fastened in place at the bottom by pouring a small block of cement mortar on top of the foundation and outside the bottom rib in at least four places around the silo. A block two inches high and a foot long at each side will hold the bottom in place. The top should be guyed to any convenient tree or barn with No. 9 smooth wire, the same as for any wooden silo.

The Doors.

The door opening for this silo is made by simply leaving out the four inside boards from the door panel. This makes an opening about 28" wide. The ribs will then extend across this opening, of course. Doors can be made for these openings as elaborate as will suit the builder. It must be remembered that the heavy pressure of the silage comes against these doors, however. They must be fit so as to take this pressure.

MATERIAL FOR 14 PANEL SILO

15'-7" diameter X 24' high
(Capacity about 69 tons without pit.)
130 pcs. 8" shiplap (selected)
40 " 2"x4" - 16' long
21 " 3" barn battens - 16' long
310 bolts & washers $\frac{1}{4}$ "x4"
160 " " $\frac{3}{8}$ "x3 $\frac{3}{4}$ "
4 pcs. 49'x $\frac{1}{4}$ " round mild steel
rods (for hoops)
25 pounds 8d box nails

MATERIAL FOR 12 PANEL SILO

13'-4" diameter X 24' high
(Capacity about 52 tons without pit.)
110 pcs. 8" shiplap- planed both sides
35 " 2"x4" - 16' long
18 " Barn battens - 16' long
270 bolts & washers $\frac{1}{4}$ "x4"
140 " " $\frac{3}{8}$ "x3 $\frac{3}{4}$ "
4 pcs. 42'x $\frac{1}{4}$ " round mild steel
rods (for hoops)
4 turnbuckles for $\frac{1}{4}$ " rod
20 pounds 8d box nails