

Trench Silos *and* How to Make Them



Building a Trench Silo

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ERNEST E. SCHOLL, Director

OKLAHOMA AGRICULTURAL AND
MECHANICAL COLLEGE AND
UNITED STATES DEPARTMENT OF
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TRENCH SILOS AND HOW TO MAKE THEM

W. H. McPHETERS
Extension Agricultural Engineer

It is possible for the farmer of small means, and even for the tenant farmer, to have a trench silo. Since a large percentage of Oklahoma farms are operated by tenants and there are many owners who cannot afford to have an expensive silo, the trench silo certainly has a place. It is not, however, the purpose of this circular to advocate the trench silo in preference to other types.

A trench silo made properly gives satisfactory results. It can be made for a very low cash outlay, even where permanent walls are put in. The trench silo is not new; it has been used in several of the European countries, in various forms, for many years. It was introduced into the middle western part of the United States as early as 1923, probably earlier. Since that time it has grown rapidly in popularity. The trench silo is a cheap and satisfactory method of storing feed during any season, and particularly during dry seasons when forage crops are threatened by drouth. The following features or advantages may be of interest to many farmers who are seeking a method of storing feed cheaply.

IMPORTANT FEATURES OF A TRENCH SILO

A trench silo can be built at a low cash cost, with farm labor.

A trench silo can be built for emergencies on short notice, at no cost except labor.

A trench silo may be made any desired size and the capacity increased later by increasing the length.

A trench silo is fire and wind proof.

A trench silo can be filled at a low cost.

The ensilage is easy to remove.

A trench silo can be made and used a year or so as a temporary trench, and permanent walls put in later.

A trench silo preserves ensilage well and serves the same purpose as an expensive silo.

SIZE AND CAPACITY

It is not possible to give the capacity of the trench silo as accurately as it is for the upright silo because of the various methods used in packing. Bulletins from several states show variations from 30 to 45 pounds per cubic foot. For the average trench silo, however, an average weight of 35 pounds is found to be about correct and may be used as a basis for figuring the capacity of a trench silo.

To find the capacity of a trench silo, take the dimensions in feet and follow the steps given here: (See Fig. 1.)

1. Add the width at the top to the width at the bottom and divide by 2; the answer will be the average width.
2. Multiply the average width by the depth and multiply this result by the length; the answer will be the capacity of the silo in cubic feet.
3. To convert this to tons, divide by 57, since 57 cubic feet of silage will weigh about a ton, at the rate of 35 pounds per cubic foot.

Example—A silo 10 feet wide at the top, 6 feet wide at the bottom, 8 feet deep and 60 feet long. How many tons of silage will it hold? To work this out, take steps outlined above.

1. Width at top, 10 feet, plus width at bottom, 6 feet, equals 16 feet; divide this by 2, and this equals 8 feet, the average width.
2. Multiply the average width, 8 feet, by the depth, 8 feet, which equals 64, and multiply by the length, 60 feet, and this equals 3,840 cubic feet of silage.
3. To convert this to tons, divide 3,840 by 57, and this equals 67.3 tons, which the silo will hold.

In order to know how large a silo to make, remember that it takes a maximum of about 35 pounds, or one cubic foot, of silage per cow per day. In the above example there are 3,840 cubic feet. This would last 15 cows 256 days. We find this by dividing 3,840 cubic feet by 15. Table I gives capacities per foot of length of silos of various dimensions.

TABLE I

DIMENSIONS OF SILO		CAPACITY PER FOOT LENGTH		
Width at Bottom	Width at Top	Depth	Cubic Feet	Tons
4'	8'	8'	48	.85
6'	10'	8'	64	1.1
8'	12'	8'	80	1.4
10'	14'	8'	96	1.7

It is generally not good practice to make the silo more than 8 feet wide at the bottom and 12 feet wide at the top. For small herds it would be better to make it 10 feet wide at the top and 6 feet wide at the bottom. Eight feet deep is about the limit in depth in most silos; however, the deeper the better. If a silo is made wide, there is more chance of spoilage; therefore, it is better to keep the trench narrow and increase the capacity by increasing the length. Of course, for very large herds 10 feet at the bottom and 14 feet at the top may be used. For very small herds, 4 feet at the bottom and 8 feet at the top should be used as widths.

In feeding, the silo is opened at one end, exposing a vertical "face" of ensilage. Another good reason thus appears for making the trench narrow and increasing capacity of the silo, if necessary, by extending the length. This is because it is necessary to remove and feed the ensilage from the entire opened face of the silo each day after the silo is opened, in order to prevent spoilage of the exposed ensilage. Depending on temperature, three or four inches of ensilage should be removed daily.

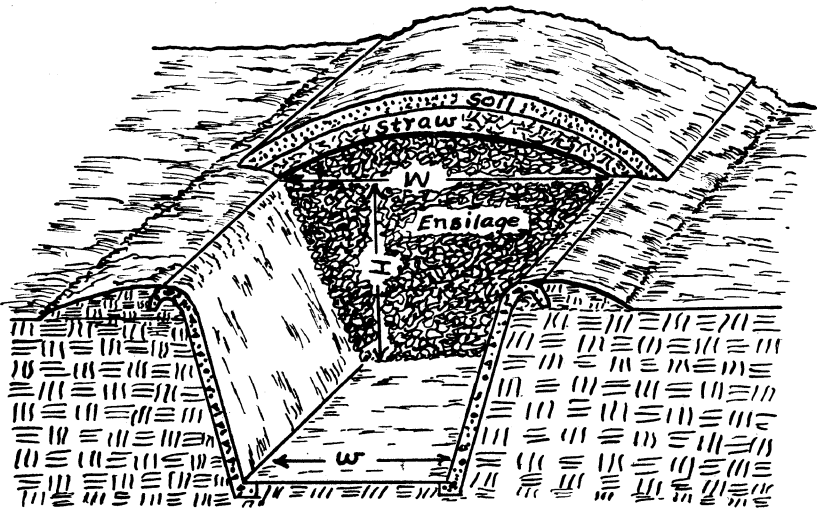


Fig. 1.—Cross-section of a trench silo, showing the concrete lining, foundation and method of covering the ensilage.

CHOOSING THE LOCATION

It is not always possible to locate a trench silo exactly where the farmer desires to have it; however, many times it

can be so located. The ideal place to make a trench silo is to dig back into a bank so as to afford natural drainage from the lower end. When the silo is made along the side of a slope it is possible many times to use a tile drain from the bottom to lower level. With either of these conditions, it is possible to build the trench silo even where land is of such a nature that it will not absorb water. Where the land is nearly level it is necessary that it be of a more porous or absorptive nature, because there is no way of putting in a drain. Many times, however, the silo may be put partly underground and partly above as will be discussed later.

A farmer is fortunate who has a location such that a track with a carrier can be put up to take the ensilage directly into the barn; however, it may be brought into the barn in a small cart made for the purpose when the silo is near the barn. For beef cattle feeding, a wagon can be backed into one end of the silo and the ensilage hauled to the feed racks.

DIGGING THE TRENCH

The first thing to do is to stake out the four corners, using the dimensions for the size of silo desired. Allow for sloping ends if the land is level, because the sloping ends will not hold as much silage per foot length as the main part of the silo.

Plow the area, but not quite to the full width, because there must be a small strip allowed on each side for truing up the walls with a spade. The dirt can then be removed with a slip or fresno. When one layer has been removed, proceed with another layer, and so on until the desired depth is reached, each layer becoming a little less in width to allow for the sloping sides. The silo should be about four feet narrower at the bottom than at the top. With a little care the slope can be kept even on both sides so as to make a neat job.

It is necessary to have a place to put the dirt removed from the pit. It is also necessary to keep the surface water out of the silo. Therefore, the earth removed from the trench may be put on both sides, thus raising the level about 18 inches or two feet. This reduces the depth of digging. The earth removed and put on the banks should be well tamped. (See Fig. 1.)

When the desired depth is reached, the sides should be trued up with a spade and grubbing hoe. (See Fig. 2.) Of course, if there are extra men, this truing may be carried along at the time the work is being done with the slip and fresno.

If the silo is to be used temporarily, that is, without putting in a permanent wall, the width should be six or eight inches less than the desired width, to allow for truing up a year or so later before putting in a permanent wall.



Fig. 2.—Plow and fresno or slip scraper are used to dig the trench; grubbing hoe and spade are used to true up and smooth the sides.

TYPES OF WALLS FOR TRENCH SILOS

A trench silo may be lined with concrete, or walled up with rock and plastered. Clay, brick, or concrete brick may be used where rock is not available. The above are classed as the more permanent linings. Sometimes temporary linings are used, such as tar paper or creosoted lumber. It is doubtful whether these temporary methods are any better than the smooth dirt wall, and they are, of course, more costly.

There is no need of a floor in a trench silo where it is well drained or where moisture is readily absorbed, but where the land is of a wet nature it is advisable to put in a concrete bottom with a drain tile under it to take out any water seepage.

CONCRETE LINING

Probably the cheapest and best lining for a trench silo is concrete reinforced with a double layer of heavy hog wire. The method of constructing is as follows:

After the walls are trued up (Fig. 2), dig a foundation on each side against the wall about six inches deep and six or eight inches wide. (See Fig. 1.) Then cut strips of hog wire long enough to extend from the foundation to at least 12 inches above the top of the wall. The wire should be bent so it will reinforce the foundation and bend over the top so as to make a rolled edge. (See Frontispiece.) This rolled edge should hook into the bank to keep any surface water from running back of the wall.

Tie these strips of wire together in a few places with bailing wire or stovepipe wire. After all the vertical strips of wire are on, stretch horizontal strips of hog wire on each side. This makes a double layer of hog wire. These strips of wire should

also be tied together. It may be necessary to drive pegs into the wall and tack the wire to them in places where the wire does not lie fairly close to the wall. This is necessary to keep the wire from projecting through the thin three-inch concrete wall.

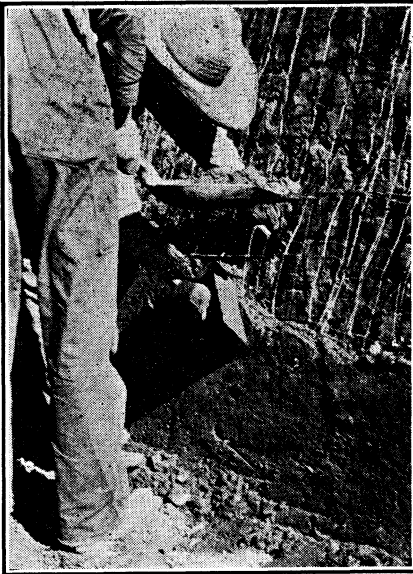


Fig. 3.—This close-up view shows how the concrete is put in place with a shovel and trowel, with hogwire used as reinforcing.

The concrete may be mixed outside of the trench, either by hand or with a mixer, and hauled on a sled into the silo and put onto the walls as shown in frontispiece. The man with the shovel puts the concrete just above the trowel. The man with the trowel pulls the wire slightly upward into the concrete with one hand, and presses the concrete against the wall with a plasterer's trowel with the other hand (See Fig 3.) Three inches of concrete are about all that will lie against the wall with

this steep slope. It is well to carry it up in layers of about a foot in width, so that one layer has time to solidify before putting on the next layer. (See Fig. 3.) If too high a layer is put on at one time it is likely to slip.

After the wall is completed in this manner, put on a finish coating of plaster to make it smooth. (See Fig. 4.) This should be one-half to three-fourths inch thick, and put on with the trowel.



Fig. 4.—The wall is smoothly plastered after the three-inch reinforced wall is built.

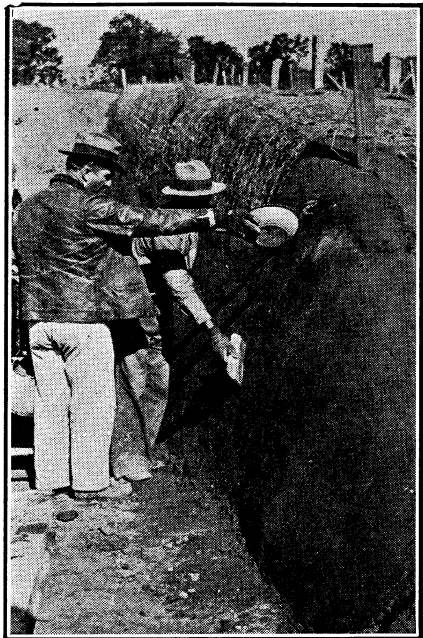


Fig. 5.—A finish of cement-and-water paint is applied just after the plaster coat is finished but before it has set.

For the first, or three-inch, coat of concrete, use a mix of one part cement, three parts sand, and two or three parts crushed rock or gravel. This should be of a jelly-like consistency so it will stick to the wire reinforcing. Do not use more

than seven gallons of water to the sack of cement—six is better. For the finish, or plaster coat, use one part of cement to three parts of sand, put on with trowel.

Just after the plaster coat is on and before it hardens—that is, in a few hours—take a paint brush or whisk broom and paint with a coat of cement paint made by mixing cement and water to a thick creamy mixture. (See Fig. 5.) Keep the walls wet down for several days while curing.

ROCK AND BRICK LINING

The wall linings for the trench silo may be laid up of rock, where rock is plentiful, and then plastered on the inside to make them smooth. Around brick yards, brick culls or second-hand brick may used and plastered similarly to the rock. It is also possible to make concrete brick. In each case the mortar should be of cement, rather than lime. Of course some lime should be used to make it work well. Use one part cement to about $3\frac{1}{2}$ or 4 parts of sand, and add not more than one-fifth as much lime as cement. In order to have a strong wall, mortar should extend against the clay wall, so that the rock or brick are completely imbedded.



Fig. 6.—This is the finished concrete-wall trench silo.

The concrete wall with the hog wire reinforcing is probably the strongest and cheapest, unless rock or brick are very cheap. (See Figs. 1 and 6.)

MASONRY WALLS ABOVE OR PARTLY ABOVE GROUND

Where digging is extremely difficult or the land is of a seepy nature, the trench silo may be built partly or entirely above level. (See Fig. 7.) This would, of course, necessitate a strong, heavy wall. It is also possible to strengthen the walls by putting pilasters every six to ten feet apart on the outside. The walls of this type of silo may serve also for the back walls of two sheds, one on either side. (See Fig. 7.) For example, one side may serve as the dairy barn and the other for young stock or as a machinery shed. The silo walls may extend to a height of eight feet above the bottom of the silo, and the space between the walls and the roof of the shed may be left open. This space may be covered with siding, if desired, particularly if there is to be no roof over the silo. This space will serve as extra height to allow for settling of the ensilage.

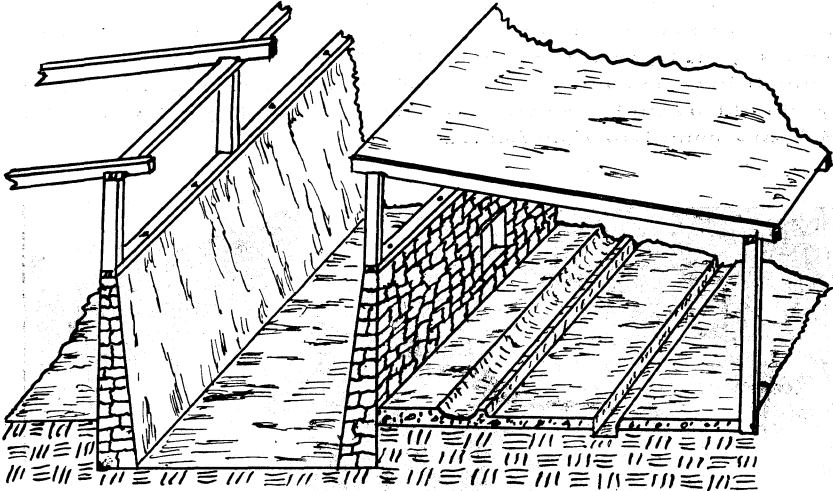


Fig. 7.—This drawing suggests a method of constructing a trench silo of rock partly or entirely above ground. The walls may be used in connection with sheds for cattle, machinery or other purposes.

The ensilage may be thrown from the silo through doors put in the side wall, or over the wall, to the feed alley in the dairy barn.

The silo may be left open or a series of light sections of roof hinged to the shed roof so they may be laid back on the shed roof while filling the silo. Should there be slight leaks, no particular harm will result.

For a silo 8 feet deep, the walls should be about 16 inches thick at the base, tapering off to about 6 or 8 inches thick at the top. The outside of the wall should be vertical, giving all the slope to the inside of the wall, so that the ensilage on settling, will wedge tightly against the walls. The insides of the walls should be plastered with cement plaster.

There will be a little more difficulty in filling this type of silo than the regular trench silo. The ensilage cutter may be placed in one of the sheds and the ensilage blown over the wall, or one may use some more suitable method.

HARVESTING OF ENSILAGE

The method of harvesting depends somewhat on the equipment one has and the tonnage of ensilage to be harvested. Where one has only a small silo to fill and has no special equipment, it might be well to harvest the corn, grain sorghum, or whatever the crop is by hand. It is possible, however, to make a sled for a cost of \$3 to \$5. The Extension Service has a small circular, "Homemade Equipment for Cutting and Hauling Ensilage Corn." For large fields the corn harvester is an excellent method and very desirable where one can afford it.

Loading silage on wagons is a laborious job. An excellent and efficient method is to build a low trailer, using wheels from an old automobile. The circular mentioned above also tells how to construct this low trailer.

FILLING THE SILO

The trench silo may be filled with any regular ensilage cutter of the blower type; however, less power will be needed, due to the fact that the ensilage does not have to be blown to the height that is necessary with an upright silo. It is possible to fix up an old ensilage cutter so that it will be satisfactory for a trench silo although it may not be satisfactory for the upright silo. It is also possible to make a homemade chopper.

There is a large ensilage harvester on the market, which harvests the corn and cuts the ensilage at the same time, the ensilage being blown into a wagon. It is then hauled to the trench silo and dumped. This, of course, is for the large dairyman or cattle feeder.

In filling the silo, it is wise to keep the ensilage evenly spread over the silo and thoroughly tramped. Do not pile it up in heaps and expect to get a good job of packing. It is much better to have a man in the silo with a fork to keep it spread

out. The packing may be done by boys riding back and forth on horses, or a tractor may be used if both ends are open so that the tractor can go back and forth through the silo.

Water should be added to the ensilage as it is being put into the silo, the amount depending on the dryness of the roughage being put in. The dry earth wall will take a lot of moisture out of the ensilage. Under this condition, add extra water around the wall. U. S. D. A. Farmers' Bulletin No. 578, "The Making and Feeding of Silage," is available through the Extension Service, Oklahoma A. and M. College. The silo should be filled full and rounded up to a height of about two feet so that after settling it will be full.

Cover the ensilage with wet chaff, hay, or straw as soon after filling as possible. There should be 16 to 18 inches of this, wet down. It should be packed down every few days, for a week or more, as the ensilage tends to settle away from the covering. Ridge the covering at the top to give good runoff in heavy rains or melting snows. It is well to put about 6 inches or more of dirt on top of the straw covering.