# Calculating Concrete for Pole Anchorages and Piers

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Previous research at this Station established the design for concrete pads and encasements for properly anchoring poles in a pole-frame structure under Oklahoma conditions. Since calculation of the concrete required for pole anchorages is time consuming, further research was devoted to developing a rapid method of computing the amount of concrete needed. The graph on page 4 provides such a method.

## Type of Anchorage to Which Graph Applies

The earlier research on type of anchorage* revealed that poles with concrete footing pads 6 to 8 inches thick and 12 inches in diameter, placed in the bottom of the holes dug for setting 5- and 6-inch top poles, settled only one-third as much as poles without such pads. A concrete encasement of the lower one-third of the below-ground portion of the pole gave much higher resistance to pull-out or uplift forces such as occur in a windstorm. Such anchorages developed pull-out resistance of over 7,500 pounds with less than 7/8 of an inch upward movement of the poles. Under the same conditions, poles with only tamped earth encasements moved twelve times further under one-fourth the load.

Concrete encasements were found to stablilize poles against horizontal or side forces due to windstorms. A concrete encasement around a pole reduced side movement to two-third or less of the amount that occurred with poles in holes with only tamped earth back-fill.

Research results indicated that a pole anchorage installed in the following manner was adequate for vertical and horizontal loads for which pole structures in Oklahoma are normally designed.

A hole at least 12 inches and preferably 16 inches in diameter and 4½ to 5 feet deep is dug to receive the pole. Then about six inches of fairly stiff concrete is placed in the bottom of the hole to serve as a footing pad for the pole. A ring of welded wire mesh reinforcing around that portion of the pole encased in concrete helps to prevent the encasement breaking away from the pole. The pole is placed on the

*See Nelson, Gordon L., George W. A. Mahoney and Jack I. Fryrear, "Stability of poles under tilting moments. Pa:t I." *Agricultural Engineering,* 39(3):166-170 and 172 (March, 1958).

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fresh concrete pad, carefully plumbed and aligned, and temporarily braced to hold it in its final position. Concrete is placed around the pole for at least one-third of the depth, and preferably the entire depth. The fresh concrete is thoroughly worked into the space around the pole to eliminate voids between the reinforcing and the pole or the sides of the hole and the pole.

## Use of Graph

## Calculating Concrete for Footing Pads

If a concrete footing pad is to be used, one must know the diameter of the hole and the thickness or depth of the pad to be cast in the bottom of the hole.

To figure the amount of concrete needed for a footing pad, assume you have a 12-inch diameter hole and wish to cast a 6-inch concrete pad in the bottom of the hole. From zero on the "A" scale, draw a line through twelve inches (diameter of hole) on the "B" scale, extend the line to cross the (pivot line), Scale "C". Draw a second line from the point of intersection of the first line and the "C" scale, through ½ (depth of concrete in hole—feet) on the "D" scale, extend this line to intersect the "E" scale. Read on the "E" scale (0.015 cubic yards) the amount of concrete needed for one hole. Multiply this amount (0.015 cu. yds.) by the total number of holes for the required amount of concrete needed.

## Calculating Concrete for Pole Encasements

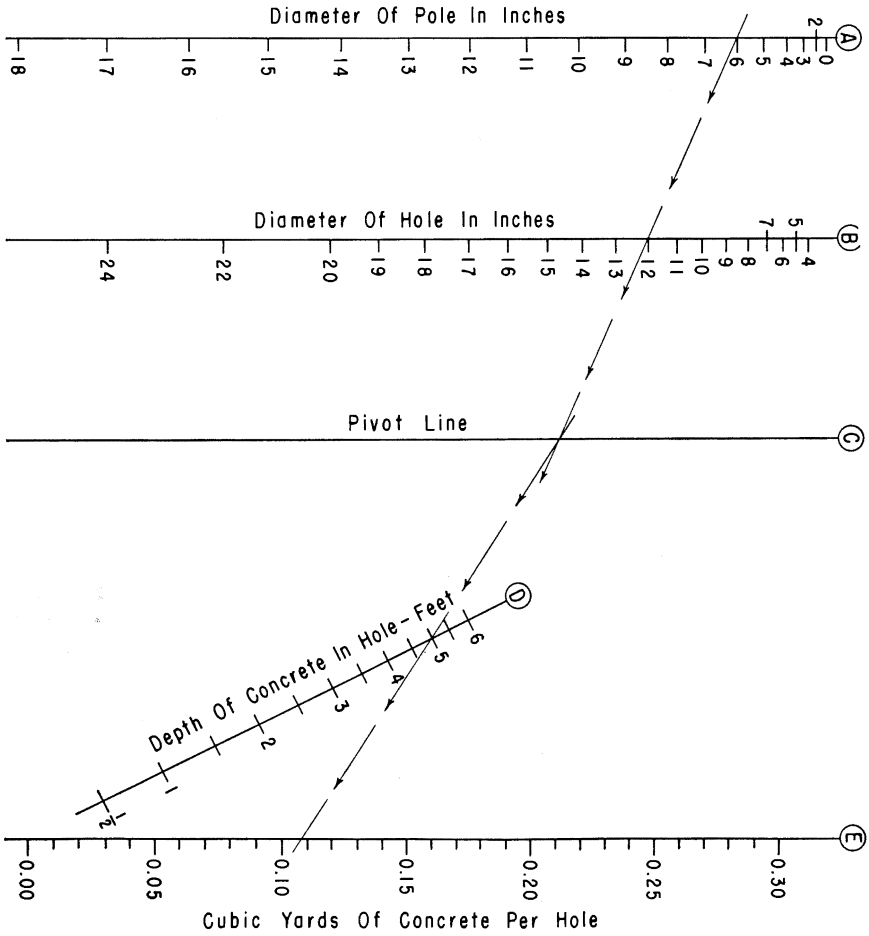
To figure the amount of concrete for encasement of the pole, assume you have a six inch butt diameter pole and you wish to set it to a depth of five feet in the ground in a twelve inch diameter hole. From six inches on the "A" scale, draw a line through twelve inches on the "B" scale, extend this line to cross the (pivot line) "C" scale. Draw a second line from this intersection point on the "C" scale through five feet on the "D" scale and extend this line to intersect the "E" scale. Read on the "E" scale (0.107 cubic yards) the amount of concrete needed for one pole. Multiply this amount (0.107 cu. yds.) by the total number of poles for the required amount of concrete needed.

## Calculating Concrete for Piers

The chart can also be used for figuring the amount of concrete for piers in a pier and grade beam type of foundation construction. For figuring concrete piers, start from zero on the "A" scale and draw a line through the "B" scale, (diameter of hole in inches), and extend

the line to cross the pivot line, "C" scale (depth of concrete in hole-feet) and extend this line to cross the "E" scale. Read on the "E" scale the amount of concrete needed for each hole. Multiply this amount by the total number of holes for the required amount of concrete needed.

## CALCULATING CONCRETE FOR POLE ANCHORAGES AND PIERS

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