

sides for a few feet. This will reduce frost penetration and make it possible to place footings on an unfrozen base. The straw is removed immediately before placing the concrete for the footings and replaced as soon as the concrete is placed to ensure proper curing of the concrete. On a rock base, heating with steam before the footing concrete is placed will provide better curing conditions for the concrete.

Sides of excavations and embankments having a south or southwest exposure are subject to cycles of freezing and thawing with consequent sloughing and caving in. Straw placed against these sides and covered with tarpaulins will usually stop this action, and make work on the footings and foundation walls easier.

Thawing operations may be necessary where excavations must be made at the height of the cold weather.

Where frost has penetrated deep into the soil, fires can be used to thaw the ground. For sewers and water-mains this may be done by spreading approximately 1 foot of hay or straw covered with 3 inches of slack coal. When a good tight job of spreading the coal over the straw is accomplished, the ground will be thawed to a depth of as much as 3 feet by one burn. Wood scraps and petroleum products can also be set afire. Flame throwers are beginning to make an appearance for thawing small sections at a time.

Steam is sometimes used by one of the following methods:

- (1) thin coils laid on the frozen surface;
- (2) steam jets keeping water warm in a pit;
- (3) steam points melting their way into the frost crust.

The last-mentioned method has proved to be the most effective means of thawing with steam.

Foundations

Concreting against frozen ground is poor practice. Excavations should be made just before placing concrete, or so protected that the bottom and sides do not freeze. The same applies for trenches for sewers and drains.