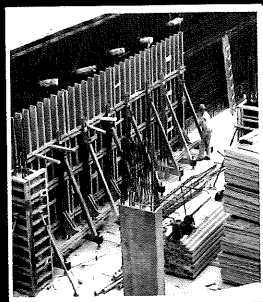


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UNDERPINNING PIERS

This method is the one most frequently used in the foundation industry. If the water table is above the level to which the new underpinning has to be extended, a dewatering system must be installed before the start of the underpinning operation, so that all the pits can be sunk in the dry. If the excavation must be performed partially in the wet, this not only makes the work more costly but also makes loss of ground unavoidable. The piers may be continuous for the full length of an exterior wall, or an intermittent system of piers may be used. The building loads are transferred onto the piers by means of "drypack," a mixture of sand and Portland cement with very little water that is rammed into the space between the existing wall or column footing and the hardened concrete underpinning pier, placed from within the approach pit. This method is more completely described subsequently.

Procedures

When it is decided to sink underpinning piers under a structure, the following procedures should be followed as illustrated in Fig. 11.7:

1. General excavation to within 6 in (15 cm) above the bottom of the existing wall or column footings.
2. An approach pit is excavated and supported by 2- by 8-in (5- by 20-cm) dressed lumber. Minimum size of the approach pit is 3 by 4 ft (90 by 120 cm) to allow a laborer room to excavate and install the pit boards.
3. The normal depth of an approach pit is 4 ft (120 cm) except where clearance requirements warrant deeper pits.
4. After the approach pit is completed, the excavation is extended under the wall or column footing while horizontal wood sheeting is placed.
5. The underpinning pit can now be extended downward to its proper depth by carefully excavating and sheeting of the shaft to the proper elevation.
6. Inserts are installed for an inclined bracing or tieback system.
7. All loose masonry and dirt are removed from the bottom of the existing wall or column footing.
8. Formwork is installed in the approach pit to facilitate the placement of the concrete up to within 3 in (7.5 cm) of the bottom of the existing footing.
9. Drypack, a damp mixture of Portland cement and mason sand, is installed between the bottom of the existing footing and top of the new concrete, not less than 12 h after the concrete is placed. Due to the rather dry mixture and the total overall thickness of the drypack layer (3 to 5 in), no noticeable shrinkage will take place during the curing process. The use of nonshrink cement in the mix is unnecessary.
10. Alternative to drypack. Instead of leaving a gap for drypacking between the underpinning concrete and the footing to be underpinned, the concrete may be placed with a "lip" [carried to an elevation of 2 ft (60 cm), higher than the footing bottom], which places underpinning concrete under sufficient pressure to eliminate the need for drypack. This requires careful design of the concrete mix, using superplasticizer to make the mix flowable, and minimizing curing and drying shrinkage of the concrete. The lip should be removed the day after placement, while the concrete is still green and has not reached strength that will make removal difficult.