any half bats and header queen closers are placed on the inner face at least 4½-in. from the sides of the openings in order to prevent their displacement and to provide a strong support for the ends of the lintels (detailed in Fig. 12).

FOUNDATIONS

In its widest sense the term foundations may be defined as an expanded base of a wall or pier in addition to the ground or subsoil which supports it. The ground which receives the building is known as a natural foundation, and the extended bases which are constructed of brickwork, masonry or concrete are called artificial foundations.

An artificial foundation may consist of: (1) a concrete bed only (see A and D, Fig. 10), or (2) one or more courses of brickwork (see B, Fig. 10) or stonework (see Fig. 20) which are wider than the wall or pier they support and which are called *footings* or (3) a concrete bed together with footings (see Fig. 9 and C, E, F and G, Fig. 10).

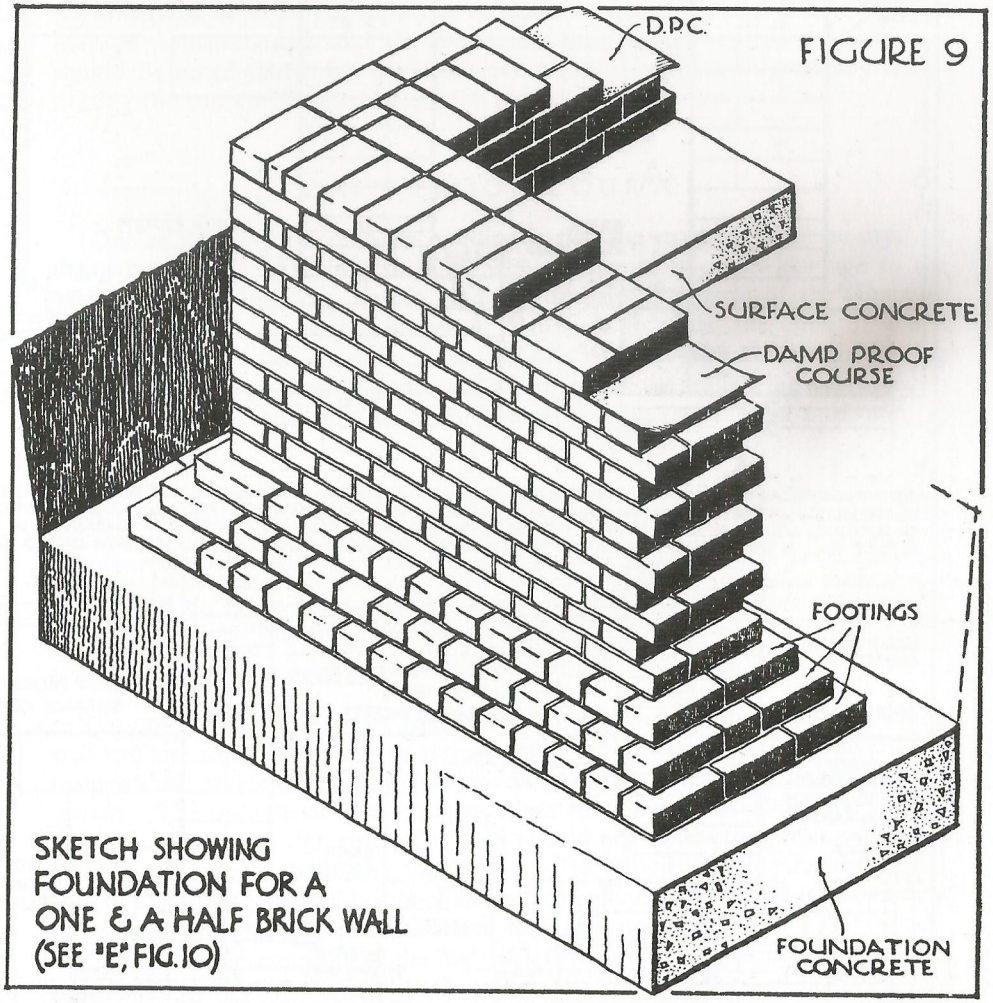
The object of a foundation is to distribute the weight to be carried over a sufficient area of bearing surface so as to prevent the subsoil from spreading and to avoid *unequal* settlement of the structure.

> Whilst slight settlement or subsidence of a building may, in some cases, be unavoidable, it is essential that any such subsidence shall be uniform. Unequal settlement is the usual cause of cracks and similar defects occurring in walls, floors, etc.
>
> The size and type of foundation depend upon the character of the subsoil and the weight which is transmitted to it. The bearing capacity of a soil means the maximum load per unit of area (usually in terms of tons per square foot) which the ground will support without displacement. As the nature of the soil varies considerably it follows that the capacity of the soil to support loads is also variable. This difference in the bearing capacity of soils may be experienced on a single building site, as frequently its character is not exactly the same throughout. Hence it is not always possible to adopt a uniform size of foundation for the whole building, even if the walls and piers may support equal loads.

The design of foundations to support heavy loads is beyond the scope of this volume and the following are typical details only. The requirements of many local authorities in respect to foundations (especially for small buildings which transmit relatively light loads) have been modified considerably within recent years. Briefly, the following are the requirements of the Model Bye-laws (1937), when the walls do not exceed 50-ft. in height and the bearing capacity of the ground is satisfactory :—

The foundation may consist of either :

(a) *Concrete* only (see A, Fig. 10). The width of the concrete bed must be at least 12-in. or twice the thickness of the wall (whichever is the greater), and the thickness of the concrete must be at least 9-in. or one and one-third the projection of the foundation from the base (whichever is the greater). The composition of the concrete must be not less than 112-lb. Portland cement to 15-cub. ft. of fine and coarse aggregate; this is equivalent to 1 part cement to 12 parts aggregate.[1] It is probable that this form will be adopted extensively in the future.



(b) *Brick Footings* only (see B, Fig. 10). The width of the bottom course of footings must be at least 12-in. or twice the thickness of the wall (whichever is the greater); the height of the footings must be at least 9-in. or one and one-third the projection of the lower footing course from the base (whichever is the

[1] Cement weighs 90-lb. per cub. ft., therefore the volume of 112-lb. cement is approximately 1¼-cub. ft. Note that the relative proportions of fine and coarse aggregate are not specified.