

Fig. 4.9 Narrow strip foundation to 280 mm cavity brick wall.

run of the most heavily loaded wall of a two-storey dwelling house is about 50 kN, which gives a bearing pressure of little more than 110 kN/m² for the 450 mm wide foundation. For this value, the factor of safety on the ultimate bearing capacity of a stiff clay or a dense sand may be 6 or more. Thus the maximum safe bearing capacity of soils of good supporting values is not utilized, and in these soils it may be advantageous to adopt a narrow strip foundation as illustrated in Fig. 4.9.

BS 8103 requires a minimum depth below ground level of 1.0 m for clay sites (see Section 3.1.1). Elsewhere a minimum of 0.45 m is recommended for protection against the effects of frost heave with the possibility of an increased depth in upland areas and other areas known to be subjected to long periods of frost. A depth greater than 0.45 m may be needed if the foundation is located near a service trench (see Fig. 4.8(b)).

Narrow strip (trench fill) foundations The essential feature of the narrow strip foundation is that the trench is too narrow to be dug by labourers working in the trench. It depends for its success on the ability of a mechanical excavator, such as a light tractor-mounted back-acter with a narrow bucket to dig the trench, which must be self-supporting until it can be backfilled with concrete. Either hand or mechanical excavation will be ineffective if the ground contains many large stones or thick roots. Also deep narrow strip foundations cannot economically be used in very soft clays or water-bearing sands which

require support by close-sheeting.

Although the narrow strip foundation is widely used in clays which are affected by swelling and shrinkage due to seasonal moisture content changes, this type is vulnerable to damage where the clay has been desiccated by vegetation to depths of more than about 1.2 m (see Section 3.1.2). Uplift of these foundations causing hogging of the superstructure can result from adhesion of the clay to the sides of the deep strip, particularly where the excavator has produced a trench wider at the top than at the bottom. Lateral movement resulting in vertical cracks in the foundation walls and lower parts of the superstructure can be caused by horizontal swelling of the mass of clay enclosed by the walls. Vertical slabs of polystyrene are sometimes used on the inside faces of trench fill foundations to relieve horizontal swelling pressures, but polystyrene, unless of a special low density, has an appreciable degree of stiffness and the pressures transmitted to the foundations can cause cracking of an unreinforced section. Volclay (bentonite-filled slabs) and Clayboard (cellular cardboard) are suitable alternatives provided that precautions are taken in the latter material against premature collapse due to wetting. The conventional strip foundation, where the soil is loosely backfilled against the deep footing walls, is less vulnerable in this type of damage.

Care is necessary to obtain accuracy in setting out and subsequent construction of narrow strip foundations and the superimposed walls. Typically the guideline for the excavator operator is a line of cement or lime dust roughly strewn on a string-line. An inexperienced operator may cut the trench 50 or 75 mm off the true centre line, so that when the brick footing courses are laid these will be eccentric to the foundation with a risk of shearing at the edge (Fig. 4.10(a)). A more serious situation, known to have occurred, is the case where the concrete placed in a trench incorrectly excavated is allowed to spill over the edges of the trench to make up low-lying ground. Then if the brickwork is also incorrectly set out in the opposite direction from the foundation the bricklayer may be unaware of the error with the result that the wall is built partly over a thin layer of concrete (Fig. 4.10(b)).

Stepped foundations When building on sloping ground, strip foundations need not necessarily be at the same level throughout the building. It is permissible to step the foundations as shown in Fig. 4.11. Similarly, if strip foundations are taken below a surface layer of filling or weak soil on to the underlying bearing stratum, the levels of the foundation can be stepped, as required, to follow any undulations in the bearing stratum. The requirements of BS 8103 are shown in Fig. 4.12(a) and (b). The steps should not be of greater height than the

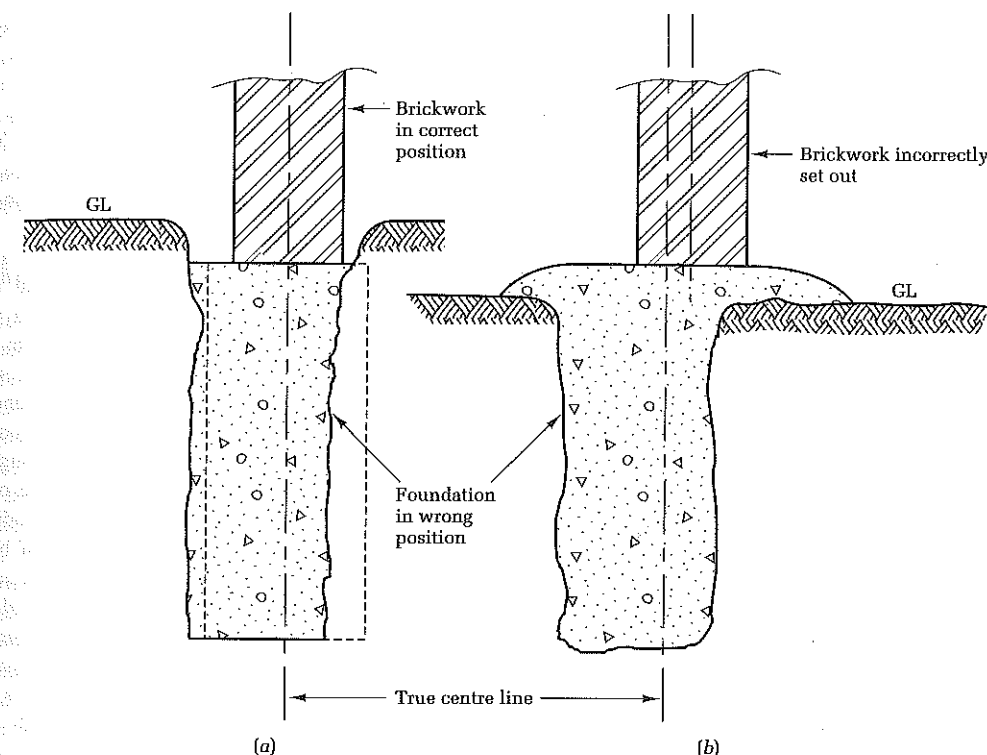


Fig. 4.10 Incorrect setting out and construction of narrow strip foundations.

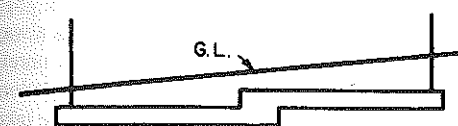


Fig. 4.11 Foundations stepped on sloping ground.

thickness of the foundations unless special precautions are taken. Heights of steps in deep trench fill foundations (Fig. 4.12(b)), require special consideration and it might be advisable to introduce reinforcing bars to prevent cracking at the steps.

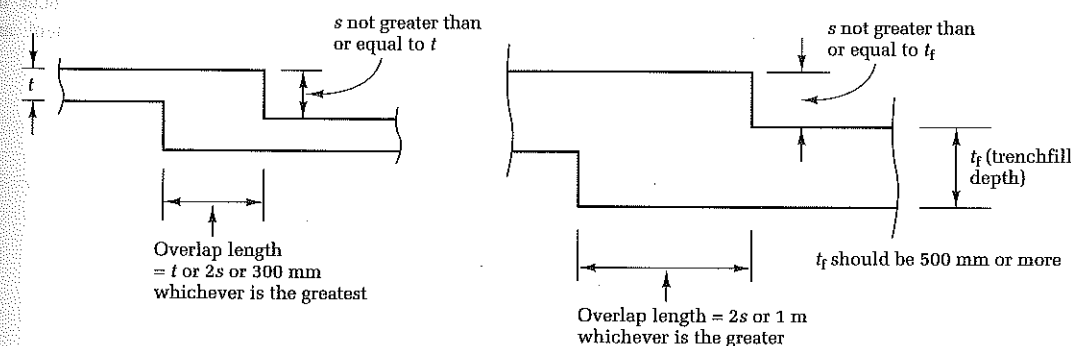


Fig. 4.12 Requirements for overlapping stepped foundations. (a) Conventional strip. (b) Narrow strip (trench fill).