



Fig. 1.1 Typical wall arrangements in masonry buildings.

effective day-lighting. If a deeper block with a service core is required, a somewhat more complex system of cross-walls set parallel to both major axes of the building may be used, as in Fig. 1.1(c).

All kinds of hybrids between cellular and cross-wall arrangements are possible, and these are included under the heading 'complex', a typical example being shown in Fig. 1.1(d).

Considerable attention has been devoted in recent years to the necessity for ensuring the 'robustness' of buildings. This has arisen from a number of building failures in which, although the individual members have been adequate in terms of resisting their normal service loads, the building as a whole has still suffered severe damage from abnormal loading, resulting for example from a gas explosion or from vehicle impact. It is impossible to quantify loads of this kind, and what is required is to construct buildings in such a way that an incident of this category does not result in catastrophic collapse, out of proportion to the initial forces. Meeting this requirement begins with the selection of wall layout since some arrangements are inherently more resistant to abnormal forces than others. This point is illustrated in Fig. 1.2: a building consisting only of floor slabs and cross-walls (Fig. 1.2(a)) is obviously unstable and liable to collapse under the influence of small lateral forces acting parallel to its longer axis. This particular weakness could be removed by incorporating a lift shaft or stair well to provide resistance in the weak direction, as in Fig. 1.2(b). However, the flank or gable walls are still vulnerable, for example to vehicle impact, and limited damage to this wall on the lowermost storey would result in the collapse of a large section of the building.

A building having a wall layout as in Fig. 1.2(c) on the other hand is clearly much more resistant to all kinds of disturbing forces, having a high degree of lateral stability, and is unlikely to suffer extensive damage from failure of any particular wall.

Robustness is not, however, purely a matter of wall layout. Thus a floor system consisting of unconnected precast planks will be much less resistant to damage than one which has cast-*in-situ* concrete floors with two-way reinforcement. Similarly, the detailing of elements and their connections is of great importance. For example, adequate bearing of beams and slabs on walls is essential in a gravity structure to prevent possible failure not only from local over-stressing but also from relative movement between walls and other elements. Such movement could result from foundation settlement, thermal or moisture movements. An extreme case occurs in seismic areas where positive tying together of walls and floors is essential.

The above discussion relates to multi-storey, loadbearing masonry buildings, but similar considerations apply to low-rise buildings where there is the same requirement for essentially robust construction.