the centroidal axes of adjacent columns (Fig. 6.3(c)). The axial and shear deformations of beams and columns may be neglected or may be included if the structure is analysed by using any standard computer program which takes these deformations into account.

6.3.4 Wide column frame

The wide column frame is a further refinement of the equivalent frame method. The structure is idealized as in the equivalent frame method except that the interconnecting members are assumed to be of infinite rigidity for part of their length, i.e. from the centroidal axes of the columns to the opening as in Fig. 6.3(d). The system can be analysed by using a standard computer program or by conventional analysis which may or may not take into consideration the axial and shear deformation of the beams and columns.

6.3.5 Continuum

In this method, the discrete system of connecting slabs or beams is replaced by an equivalent shear medium (Fig. 6.3(e)) which is assumed continuous over the full height of the walls, and a point of contra-flexure is taken at the centre of the medium. Axial deformation of the medium and shear deformations of the walls are neglected.

Basically, the various continuum theories put forward for the analysis of a coupled shear wall are the same except for the choice of the redundant function. Readers interested are advised to consult the specialized literature for the derivation of the theory (e.g. Coull and Stafford-Smith, 1967).

6.3.6 Finite element analysis

In finite element analysis the structure is divided into a finite number of small triangular or rectangular elements (Fig. 6.3(f)), which are assumed to be connected only at their nodes. Application of the equations of equilibrium of the forces acting at these nodal points leads to a number of simultaneous equations which can be solved with the aid of a computer. The method provides a very powerful analytical tool, and suitable computer programs are readily available which can deal with any type of complex structure. However, this may prove to be a costly exercise in practical design situations.

6.3.7 Selection of analytical method

Although these methods are used in practice for analysis and design of rows of plane walls connected by slabs or beams, the analysis of a

complex three-dimensional multi-storey structure presents an even more difficult problem. Furthermore, it has been observed experimentally that the results of these methods of analysis are not necessarily consistent with the behaviour of actual brick or block shear wall structures even in simple two-dimensional cases. The difference between the experimental and theoretical results may be due to the assumptions regarding interactions between the elements, which in a practical structure may not be valid because of the method of construction and the jointing materials.

To investigate the behaviour of a three-dimensional brickwork structure and the validity of the various analytical methods, a full-scale test building was built (Fig. 6.4) in a disused quarry, and lateral loads

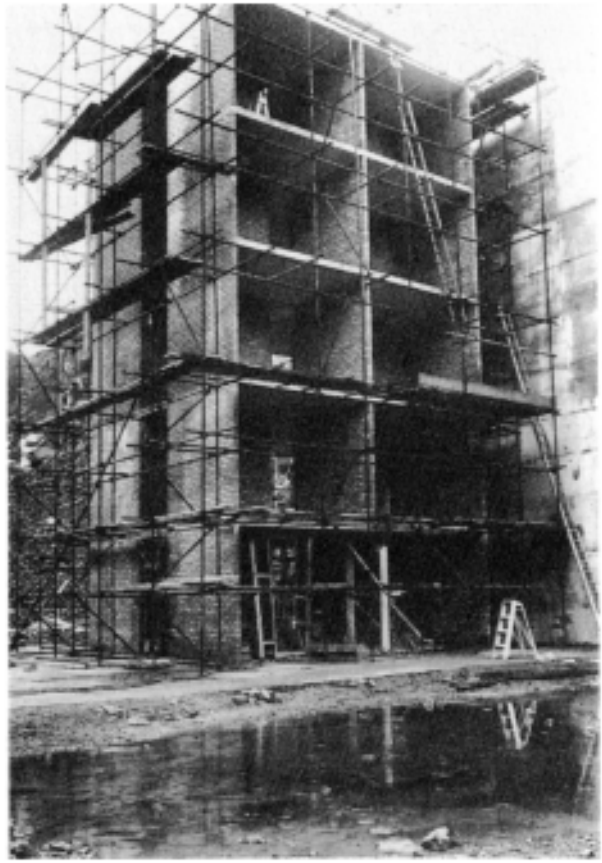

Fig. 6.4 (a) Test structure.