

SECTION 3

EXTENT OF DAMAGE

Buildings in Cairo and the surrounding area have been divided into two categories: (1) Nonengineered buildings, and (2) Engineered buildings. Performance, damage, and description of each type of these buildings are discussed in this chapter.

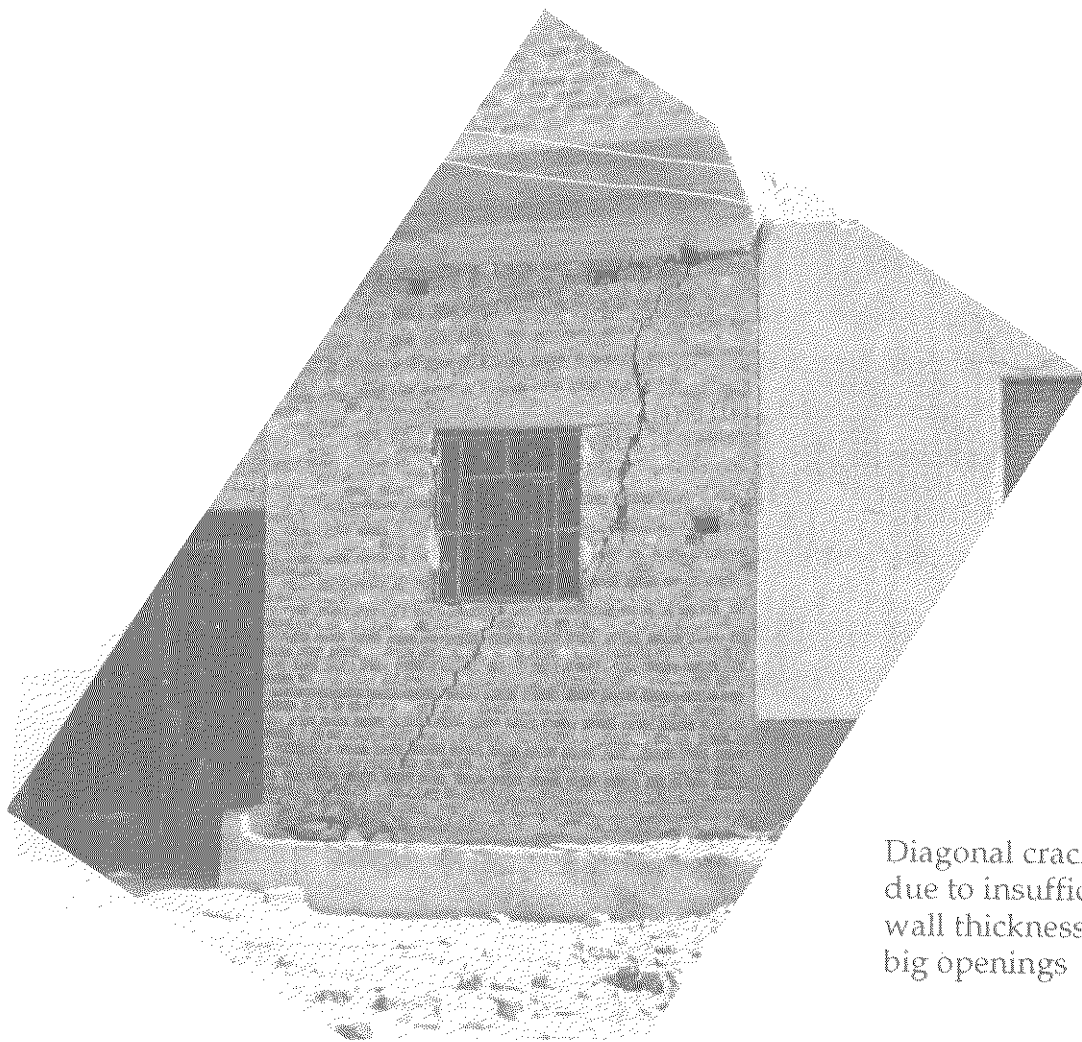
3.1 Nonengineered Buildings

This category of buildings has no seismic resistance and it includes: (a) Unreinforced masonry buildings (brick or stone) with flexible diaphragms (usually wood) or with rigid diaphragms (usually concrete or steel), and (b) adobe type buildings with wood diaphragms.

Unreinforced Masonry (URM) Buildings. In Egypt, buildings with walls of brick and stone masonry have long been regarded as solid construction, providing weather and fire resistance, an attractive appearance, and a general feeling of permanence and solidity. As a result, these materials abound in low- and mid-rise construction throughout older sections of Cairo and the surrounding area.

No surprises were observed in the Oct. 12 event, regarding URM building performance. Numerous collapses and severe damage occurred to such structures throughout the affected area, especially in soft-soil areas (Figure 3-1). Older URM buildings were generally the most damaged structures throughout the area. These buildings were responsible for the great majority of life loss associated with this earthquake. A reported 349 old URM buildings collapsed, and about 7,800 URM buildings were damaged. An estimated 500,000 URM buildings in Egypt are still in use today.

URM buildings experience different types of damage including: (1) Diagonal cracks due to insufficient wall thickness and the presence of big openings (Figure 3-1a), (2) Lack of lateral support resulted in serious damage or collapse of walls or parapets (Figure 3-1), (3) Lack of adequate anchorage in the wall diaphragm connection resulted in horizontal cracks between the wall and



Diagonal cracks
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Figure 3-1a: Damage to unreinforced masonry buildings.