

#### 4. Typical failures, typical design mistakes

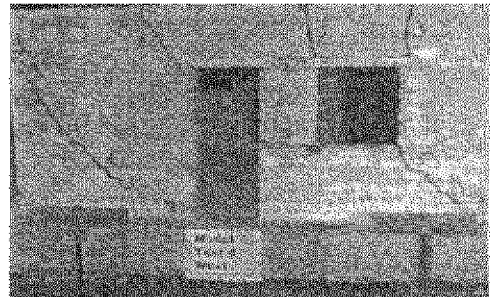
Typical failures, which occurred with simulated seismic movements on models in the scale of 1:5 are to be seen in Figs. 4-1 to 4-3. The most significant are:

- diagonal cracks lead from the edges of windows to the bottom of the wall,
- the lintel often destabilizes the walls, especially if it is not long enough and does not have sufficient bond with the wall,
- if the wall between window and door or between opening and corner is not long enough, it might break,
- if the wall has no ring beam at the top it breaks easily when suffering perpendicular loads which produce bending.

The houses shown in Fig. 4-4 seem to be well designed with the stabilizing buttresses at the corner. But without a ring beam they do not have sufficient stability against seismic shocks, as Fig. 4-5 and 4-6 show.

The 10 main structural mistakes which might lead to a collapse within an earthquake are explained in Fig. 4-7

4-1



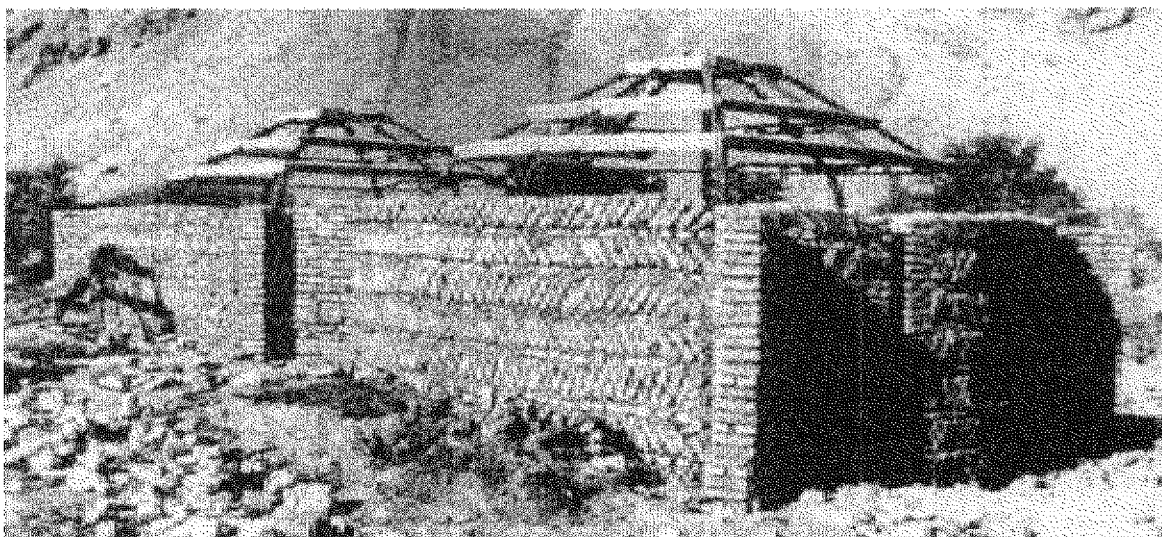
4-2



4-3



4-1 to 4-3 Typical failures caused by seismic movements (Tolles et al. 2000)



4-4 Earthquake-proof houses, Afghanistan (Sibtain 1982)