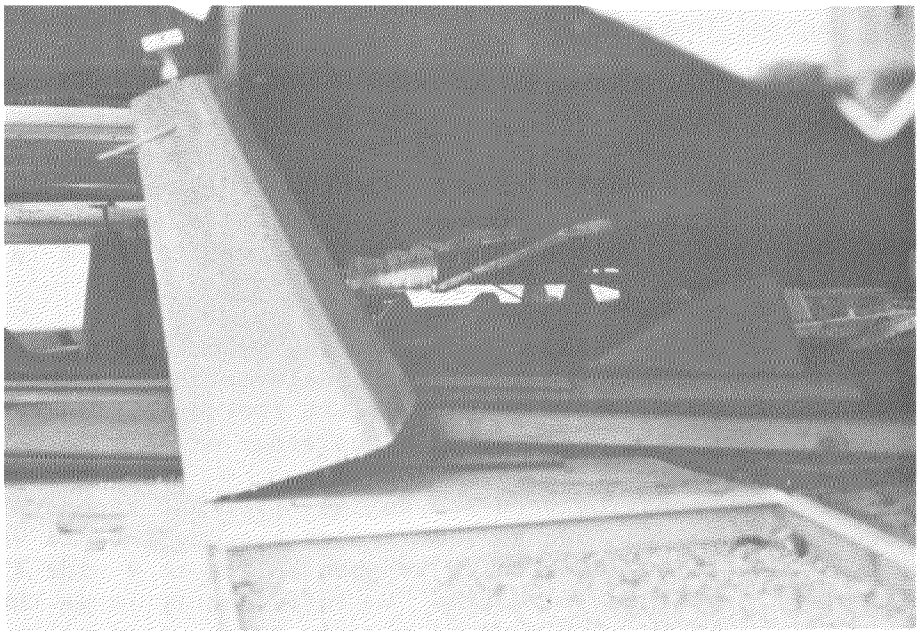

Fig. 7.58 View of overturned concrete piers under a mobile home which fell from its foundation.

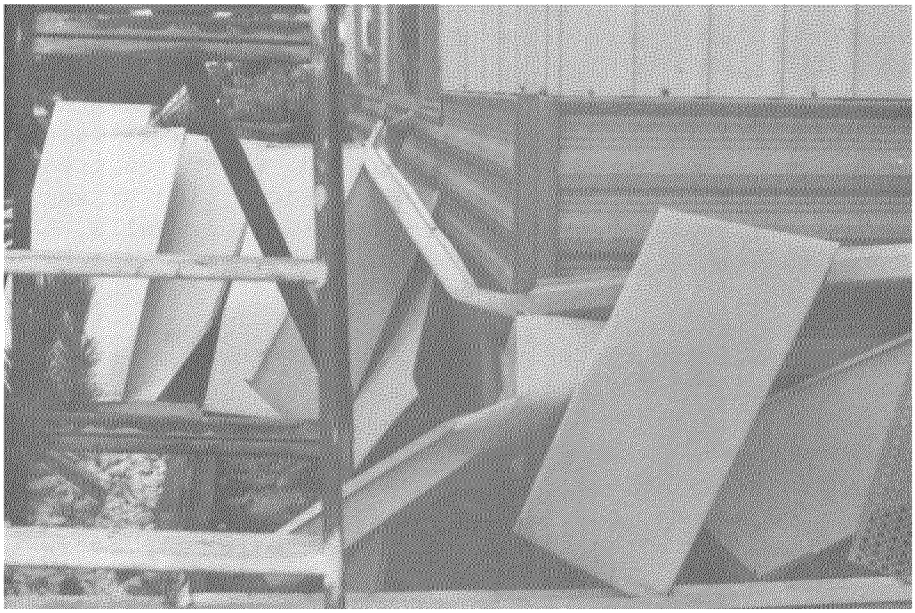

Fig. 7.59 Close up of fallen mobile home showing total horizontal shift of approximately 1 to 2 feet.

Air Traffic Control Tower

The air traffic control tower received significant structural damage as a result of the earthquake. The tower is a steel frame structure with lateral reinforcement provided by rectangular steel tube bracing. The bracing tubes are attached so that they make an angle of 18½ degrees with respect to the horizontal, and are attached to the wide flange steel columns. A photograph of the structure is shown in Fig. 7.60.

Earthquake induced stresses in the bracing tubes were sufficiently large that nonlinear response and permanent deformation was sustained at the joints. As a result, it is estimated that the top of the tower may have sustained a permanent deflection on the order of ½ to 1 inch.

Nonlinear joint behavior occurred in the first and second stories, and is shown in Figs. 7.61 through 7.63. Each bracing tube is welded to a ¼ inch steel connection plate which is then bolted to a wide flange steel column. The amplitude of motion was sufficiently large that the connection plate was permanently pried away from the column leaving a gap of approximately 1/8 inch at the bottom edge. Possible initiation of cracks in the weld between the plates and tubes was noted, and minor buckling of the tubes occurred in the first story.

Hangars of Aero Spacelines, Inc.

Earthquake damage was sustained by the structural supports for the large sliding doors on two of the large hangars owned by Aero Spacelines, Inc. These hangars are steel frame structures with sheet metal covering and a substantial concrete floor slab. The steel columns and girders in each building form a series of bents aligned along the north-south direction. Shear forces in the north-south direction are resisted by steel rigid frames. In the east-west direction, shear resistance is provided at lower levels by diagonal tension braces made of angle section steel. The hangars, which have no interior columns or walls, have plan dimensions of 180 feet by 220 feet, and a roof height of approximately 51 feet.

Structural damage to these buildings consisted of plastic deformation and mild buckling of the diagonal tension bracing steel in the east-west direction (as shown in Figs. 7.64 and 7.65), and failure of some of the structural connections at the supports for the large sliding doors along the west edge of the buildings. It is noteworthy that an identical third hangar which had no doors sustained damage only to the diagonal bracing steel. Damage to the structural supports for the doors is shown in Figs. 7.66 and 7.67. Several of the steel bracing members, which angle up from the rail at the top of the doors to the roof, were torn loose from the railing. One such member nearly fell off and was left dangling by a single bolt. These bracing members, which are steel C sections approximately 18 feet long, were not well attached, as they typically sheared off the bolts at the railing.