FIGURE 54.—Collapse of a new church, Iglesia del Divino Redentor, Guatemala City (Zone 11).

displacements of the deck (fig. 64). An old steel-truss railroad bridge near the Agua Caliente Bridge sustained no damage.

The Benque Viejo multiple-span steel-truss bridge across the Platanos River was near collapse because of the large relative displacements between the trusses and their supports. The rollers have snapped flat between the upper and lower bearing plates (fig. 65).

GENERAL OBSERVATIONS

During the damage survey, it was found that similar problems recurred many times. Some of them are briefly described below.

The use of nonstructural masonry walls in reinforced-concrete framed structures was frequently neglected in the design, as has been observed in previous earthquakes, for example, the 1970 and 1974 Peruvian earthquakes (Husid and Gajardo, 1970; Berg and Husid, 1973; Husid and others, 1976). When lateral displacements occur in structures, resisting elements are loaded in proportion to their stiffnesses. Hence, short columns will be loaded with far greater shear forces than long columns. A column having a free height H has a stiffness approximately eight times greater than that of a column of equal cross section and height $2H$. Hence, the short column carries a lateral load approximately eight times larger than that carried by the larger column. One of the many examples of this kind of failure observed in Guatemala is shown in figure 66.