SECTION 2

TEST STRUCTURE AND ACTIVE BRACING SYSTEM

2.1 Full-Scale Test Structure

A dedicated full-scale test structure was erected for performance verification of the active bracing system under actual seismic ground motions. Located in Tokyo, Japan, the structure is a symmetric two-bay six-story building as shown in Figs. 2.1 and 2.2. It was constructed of rigidly connected steel frames of rectangular tube columns and W-shaped beams with reinforced concrete slabs at each of the floors. Having rectangular columns, the two orthogonal directions are not structurally identical. Weighing 600 metric tons, the structure was designed as a relatively flexible structure with a fundamental period of 1.1 sec in the strong direction and 1.5 sec in the weak direction, in order to simulate a typical high-rise building. The structure was constructed without claddings except for the top story (sixth floor), which houses an experimental active mass damper (AMD) (Aizawa et al, 1990). Side access stairs were built without connection to the main structure to preserve the symmetry of the system for sake of simplicity. Due to lack of cladding and the simple connections, the structure has very low damping in the dominant modes (between 0.5% and 1% of critical).

2.2 Active Bracing System (ABS)

As shown in Figs. 2.2 and 2.3, solid diagonal tube braces were attached at the first story of the building after the main structure was constructed (see details in Fig. 2.4). The control system enables longitudinal expansion and contraction of the braces by means of hydraulic servocontrolled actuators, inserted between the brace elements and forming an internal part of the bracing system. The control system includes also a hydraulic power supply, an analog and digital controller, and analog sensors as shown schematically in Fig. 2.5.

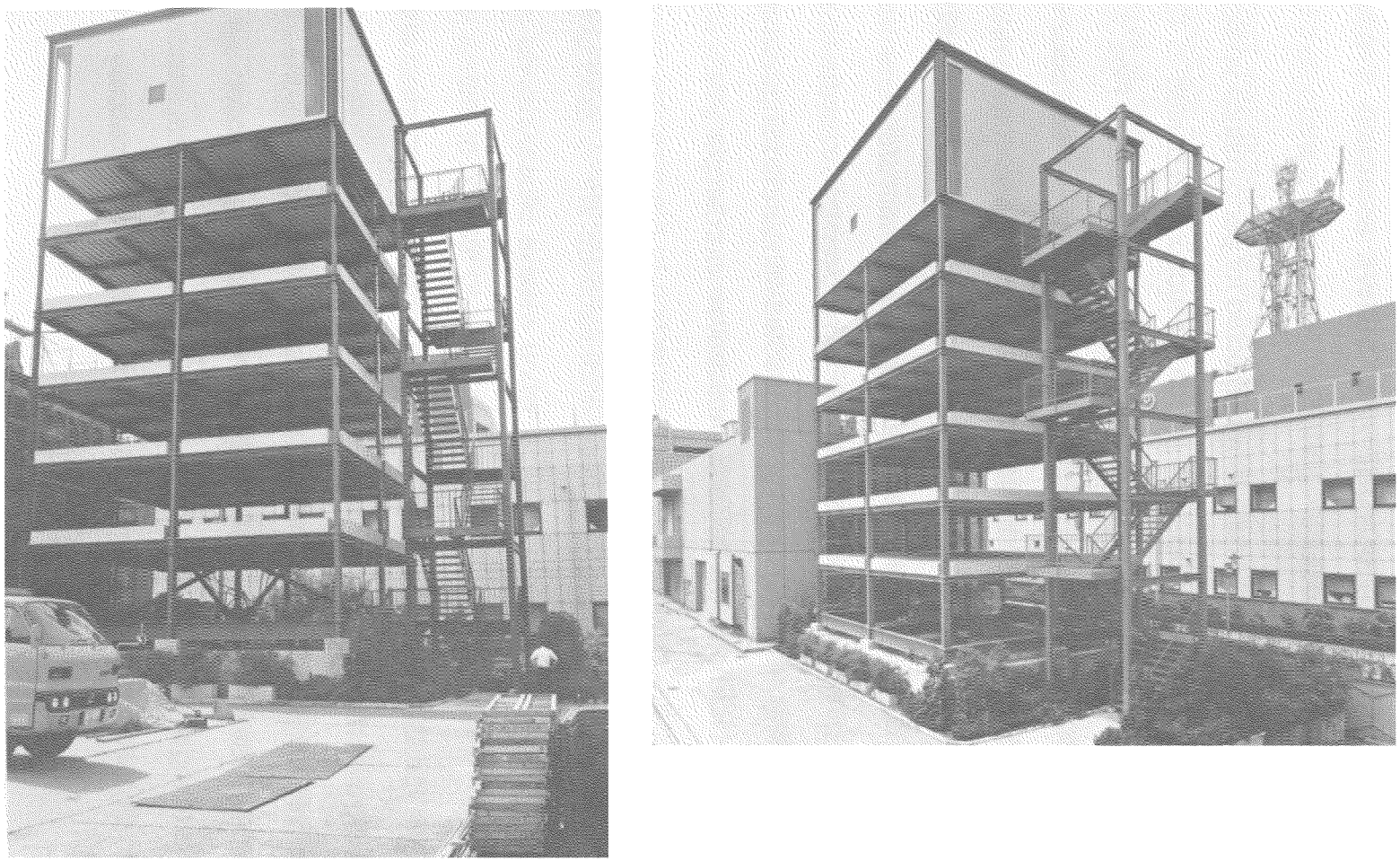
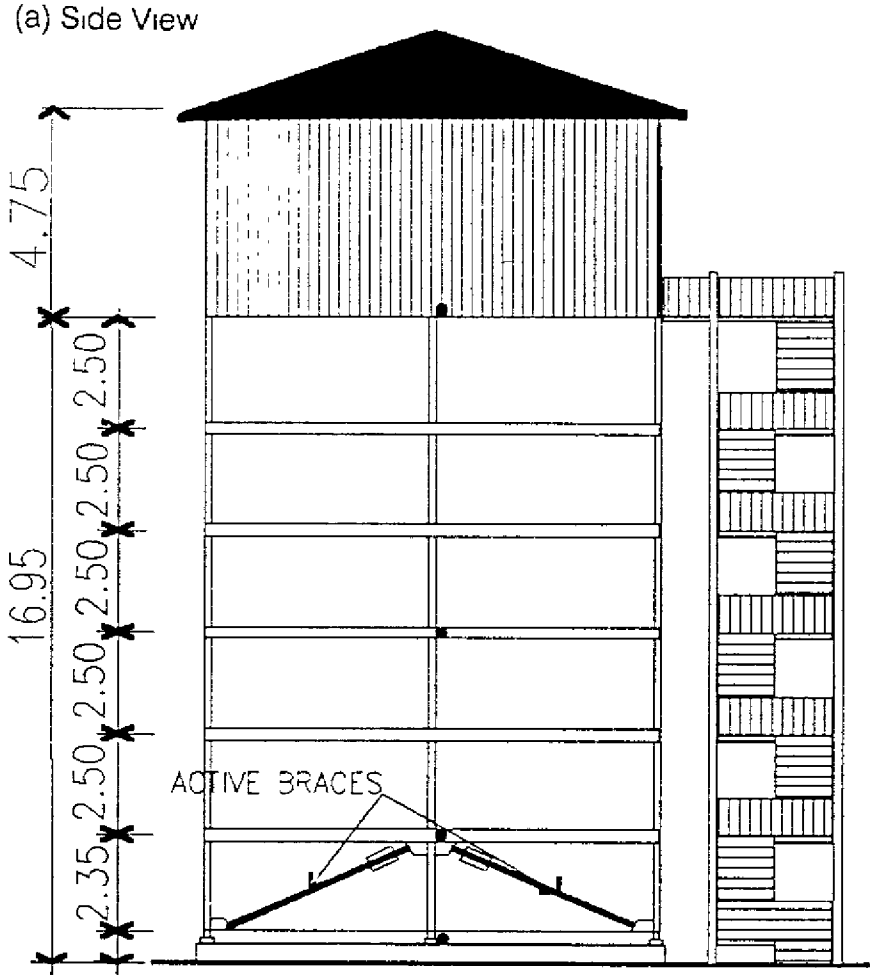


Fig. 2.1 View of Building

(a) Side View



(b) Top View

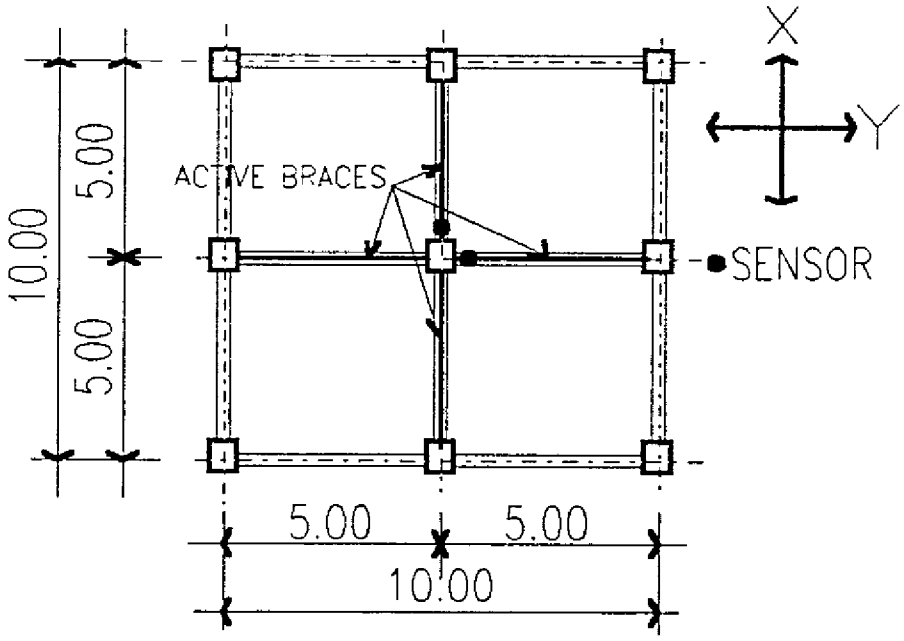


Fig. 2.2 Configuration of Active Bracing System