An extensive series of forced vibration tests was performed on this structure both before and after the seismic rehabilitation in 1975 (Hart and others, 1978). Mode shapes, damping ratios, and natural frequencies were measured for fundamental modes in translation in the N-S and E-W directions, and in torsion. Measurements of soil-structure interaction were also made. It was found that the upper floor slabs do not behave as rigid diaphragms during vibration, but rather they sustain significant in plane deformations. An ambient vibration test was performed on this structure after the earthquake (October 1978), and the results will be reported in a future publication.

The strong motion records recorded by instruments in North Hall are shown in Fig. 3.5. As observed from these records, it appears that the duration of strongest motion was approximately 2 to 3 seconds, with largest amplitudes in the N-S direction. The peak acceleration in the N-S direction on the ground appears to be about 0.45g and at the roof about 0.94g. These structural accelerations are among the largest ever recorded, and were accompanied by significant diagonal cracking of the newly constructed N-S shear walls throughout the structure, as reported in Chapter 7. The severity of cracking tended to diminish in the upper stories, but was still noticeable.

Freitas Building

The Freitas Building is located at 200 E. Carrillo Street in downtown Santa Barbara. A photograph of the structure is shown in Fig. 3.6. The structure is a 4 story steel frame with isolated exterior reinforced concrete shear walls. The foundation consists of spread footings with belled caissons under the shear walls, and the structure has a half basement. Floors in the upper stories consist of steel decking with 2.5" concrete topping. A floor plan and elevation of the structure locating each of the nine accelerometers is shown in Fig. 3.7.

The strong motion records from the Freitas Building are shown in Fig. 3.8. As observed from these records it appears that the strongest ground motion occurred in the E-W direction with a duration of strongest shaking of approximately 2 seconds. The peak acceleration in the E-W direction on the ground appears to be about 0.21g. The record shows a large acceleration in the E-W direction on the roof, in a trace with some unusual high frequency components. This structure sustained very few diagonal cracks in the shear walls, and the damage was generally less severe than that sustained by North Hall.

Goleta Free Field (Building 340, UCSB Campus)

The so-called Goleta free field instrument is located in Building 340 in the northwest corner of the UCSB campus (see Fig. 3.2). Building 340 is a single story storage structure of plan dimensions 30' x 50' with a concrete floor slab. A photograph of the structure is shown in Fig. 3.9. The structure consists of a steel frame with a steel roof and siding, and is founded on soft alluvial soil which borders on the Goleta slough. A substantial collection of soil borings is available for this site.

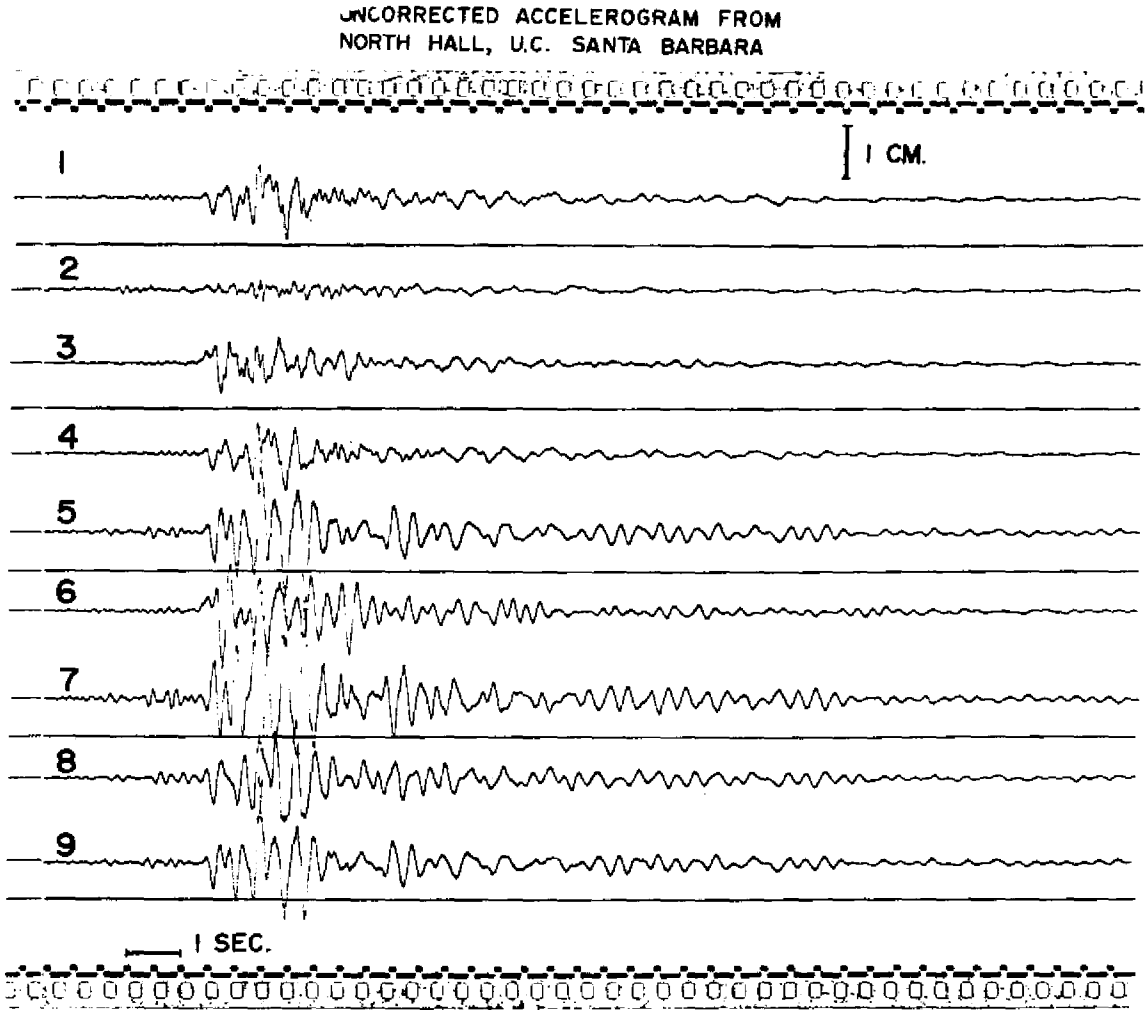

Fig. 3.5 Uncorrected Raw Accelerogram Recorded at North Hall, UCSB. 1.8 cm ≅ 1g. (Obtained by Office of Strong Motion Studies, California Division of Mines and Geology).

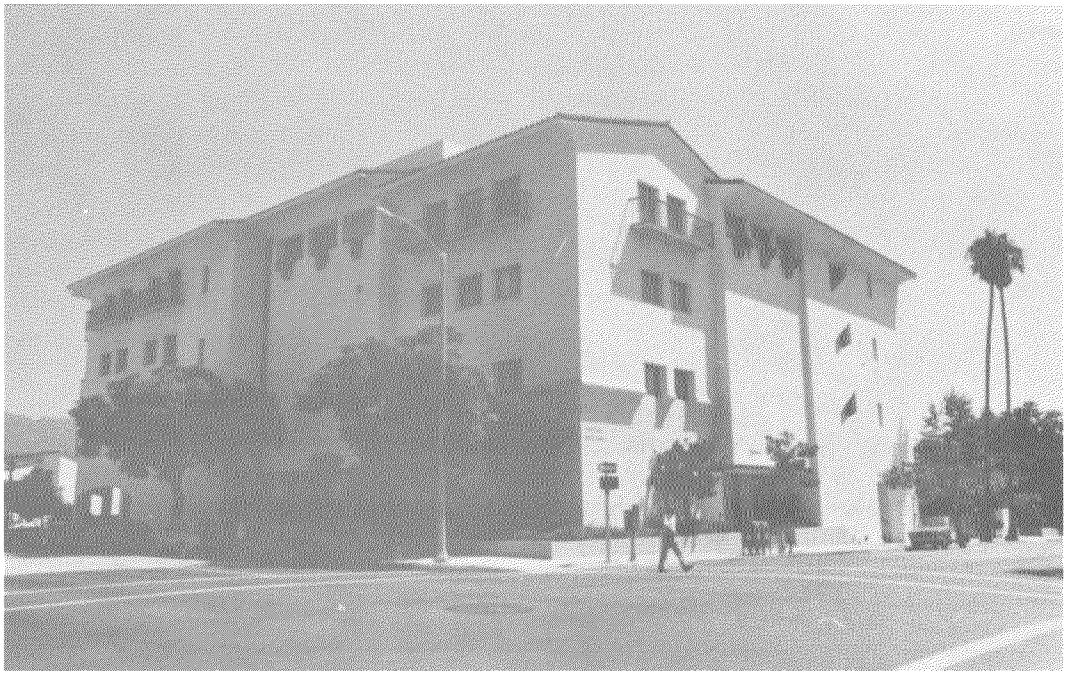

Fig. 3.6 Freitas Building, 200 E. Carrillo Street, Santa Barbara.

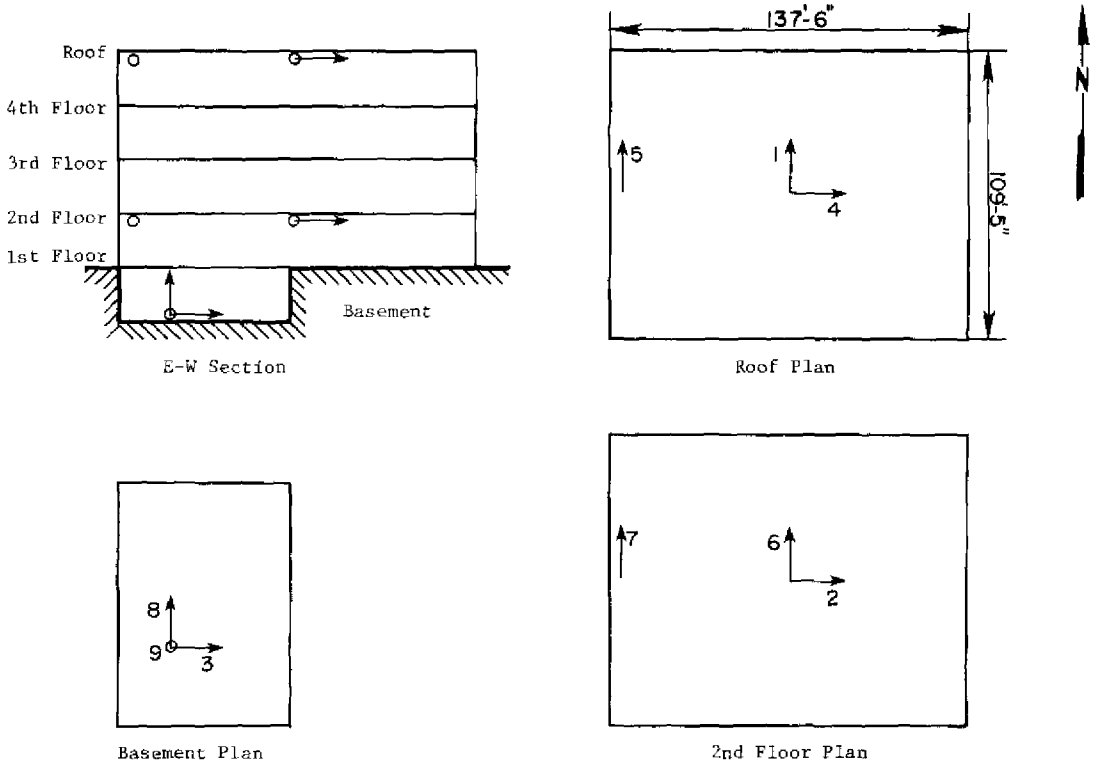

Fig. 3.7 Location of accelerometers within Freitas Building, Santa Barbara.