

Fig. 8.16 Fans dislodged from their vibration isolation supports on top of Biological Sciences II, UCSB (see Fig. 3.14).

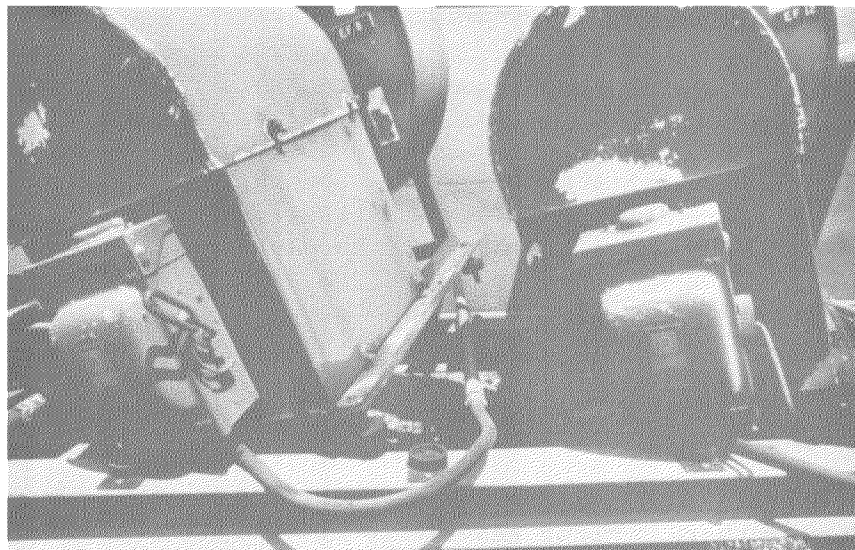


Fig. 8.17 Close up of damaged supports in Fig. 8.16.

penetration locations. One such break, which occurred in an eight-inch diameter discharge line, is shown in Fig. 8.19. In this instance, the soil around the wall of the installation settled several inches.

A noteworthy exception to the mechanical equipment damages just described was the equipment installed in the basement of the new four-story addition of the UCSB Library. This equipment was installed throughout with supports and restraints that conform with current seismic design criteria. Only a minor shift in the piping system in a north-south direction was noted. A typical piece of equipment in this installation is shown in Fig. 8.20, together with a close-up in Fig. 8.21 of its commercially available seismic restraints.

Equipment damage also occurred in homes. For example, in some residences, free standing water heaters came uncoupled from their water lines, and sometimes the tanks toppled over.

A large vibration shaker located in a ground level laboratory of a local company received damage to its supports. The shaker was designed for vertical acceleration only, and received damage to its supporting "O" rings. The shaker could not be floated after the earthquake.

8.4 Elevator Damage

Nearly half of the 49 elevators serving the UCSB campus buildings were incapacitated by the quake. The most frequent type of damage was the dislodgement of counterweights from guide rails of electric traction (cable) elevators. Brackets holding the guide rails were bent or broken, counterweight guide shoes were bent or broken, as seen in Fig. 8.22, and the loose counterweights twisted cables. The pattern of damage showed that elevators that had been high in a building (counterweight low) suffered no damage. However, elevators that had been low (counterweight high) were disabled. Two new elevators installed within the last year with the most up to date earthquake protection features, as required by the Elevator Code, were undamaged. On several of the elevators, power was cut off by earthquake activated inertial switches. Attempts to operate some of the older traction type elevators without such switches, where the counterweights had come loose, resulted in further damage when the loose counterweights collided with the cars and other equipment in the hatchways. On two elevators, the counterweights were snagged by beams and the continuing operation of the driving motor abraded the custom made sheaves against the cables.

Hydraulic elevators fared much better. The most notable damage was spilled oil and some misaligned doors. The door misalignments could be either a result of door frame deformation or guide rail displacement.

All elevators with rooftop machinery rooms suffered some damage to the equipment there. Motor generators and pumps were knocked off their