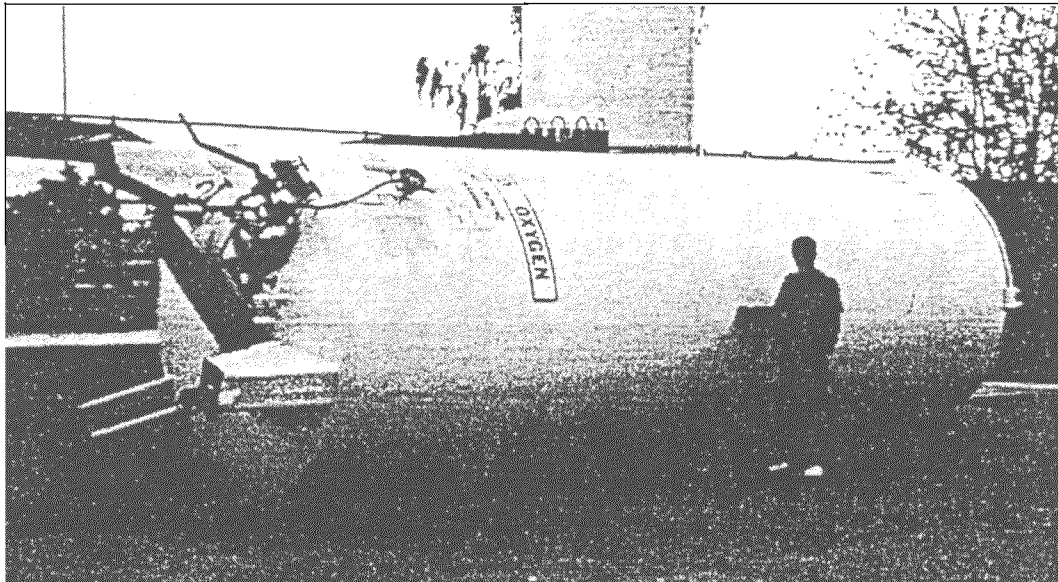


ther. Rather, the more generalized goal of remaining functional is used, without any further detailed criteria, although the Building Safety Board (now the Hospital Building Safety Board) has attempted through the years to produce such criteria. (SSC, 1977).

Office of Statewide Health Planning and Development (OSHPD) to require upgrading of either the nonstructural systems or the structure of pre-Act buildings, except those portions being altered or remodeled. It was felt that the normal pace of remodeling and replacing hospitals would



PHOTOGRAPH B7.2: The support pedestal system of this oxygen tank at Olive View Medical Center was damaged, leaving the tank leaning after the earthquake. It is shown after it was removed to allow for installation of a replacement unit. *photo credit: Don Jephcott, Earthquake Engineering Research Institute*

In 1972, there was little information available on code provisions intended to keep facilities functional. The procedures of the nuclear industry were considered overly rigorous and expensive for building construction, so provisions were developed that in essence made the structure stronger than for normal buildings and required seismic anchorage for nonstructural elements. The success of the Field Act for schools led to the inclusion of detailed plan and construction review. An advisory and appeals body, the Hospital Building Safety Board, was established by the law because of the lack of experience with either codes intended for hospitals in general or the specific objective of remaining functional.

The law applied only to the construction of new hospital buildings and to alterations or remodeling of existing buildings. No authority was given the

reduce the risk of pre-Act facilities within a reasonable period. However, a survey of all existing hospital buildings in the state, completed in 1987 and since updated and analyzed (ATC, 1991a), indicates that this was a poor assumption. Only 32 percent of the buildings at that time were in full compliance with the Hospital Act, and worse, only 16 percent of the hospital beds in the state were housed in these post-Act hospital buildings.

Originally, the Office of the State Architect (OSA, now Division of the State Architect or DSA) plan-checked the structural drawings under the overall supervision of the Office of Statewide Health Planning and Development (OSHPD). Local jurisdictions continued to plan-check other aspects of the drawings, sometimes including a second check of the structure. Later legislation created a complete building department within OSHPD, pre-

empting local jurisdictions, and recently the structural plan checking was also moved into OSHPD from DSA to create a one-source state agency to deal with all issues of construction in medical facilities.

Since 1972, the design provisions for hospitals have been upgraded in parallel with the Uniform Building Code (UBC), but there were few research results or observations relating directly to hospitals upon which specific improvements could be based. In addition, due to a lack of moderate or large earthquakes in heavily urbanized areas in California, neither the structural nor nonstructural design criteria had been fully tested until the Northridge earthquake.

Although the Loma Prieta earthquake caused scattered damage in hospitals, most was in pre-Act buildings. No post-Act facilities were tested with shaking that even approached the levels foreseen by the code or experienced by many facilities in the Northridge event. Based upon the nonstruc-

tural damage patterns noted in Loma Prieta, the Building Safety Board prepared, and OSHPD distributed to all hospitals in the state, a list of vulnerable elements and systems that should be internally reviewed on a voluntary basis. (Meeks, 1990) Many of the elements were covered by post-Act provisions and should have therefore been adequate in the newer buildings, but some, like emergency water supply and communications, are not specifically covered and could be a problem in any hospital. The details of this list are of interest because of the similarities to problem areas highlighted by the Northridge event. The Building Safety Board advice in 1990 concerning this short list of major problems proved to be quite prophetic.

In the late 1970s, the Building Safety Board, which included several members who had been instrumental in obtaining enactment of the Hospital Act, noted that the failure to deal directly with the existing building stock in the Act might have been a

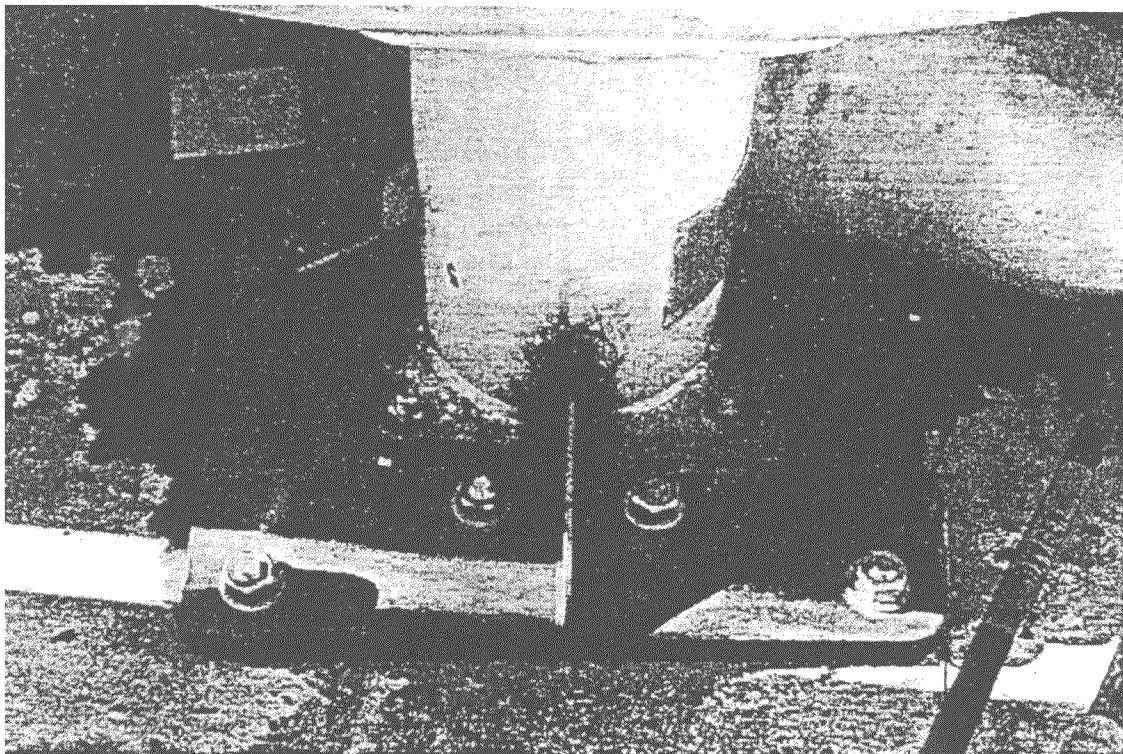


FIGURE B7.3: Welded-on enlargement to existing oxygen tank base plate, rapidly installed after the earthquake to retrofit damaged tank support *photo credit California Office of Emergency Services*