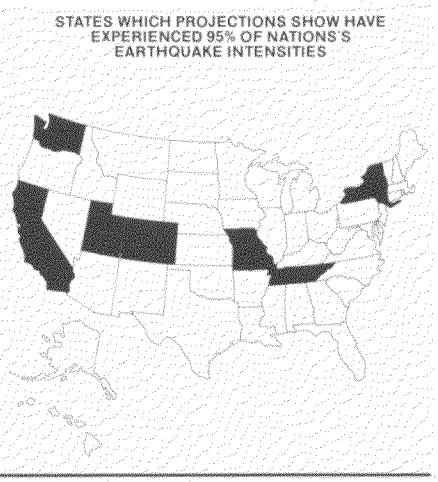
EARTHQUAKE



Far more areas of the nation have experienced severe earthquake damage than is generally recognized During the past 200 to 400 years of recorded earthquake history, only 25 of the 50 states have been virtually quake free.

Based on today's exposure and past history, California would account for over 65 percent of the nation's earthquake damage to buildings Another nearly 30 percent would occur in six states seldom linked with the hazard. Colorado, New York, Missouri, Tennessee, Utah and Washington In fact, over the span of reported history, there have been severe quake intensities registered in each of these seven states, as well as in Arkansas, Illinois, South Carolina and New England.

The first step in the Wiggins Study was to develop a hazard map of shake intensity by geographic location, based upon reported earthquake history. The nation's building inventory was next superimposed onto the map and broken down by building type, then related to potential vulnerability for the purpose of computing the probable losses.

New Approaches Required

Even if the reported pattern of earthquake frequency and/or intensity remains constant, more and more dollars will be required to replace or repair buildings destroyed or damaged by earthquakes unless new approaches which mitigate such destruction are identified and implemented This is because the rising value of real estate, even after being discounted for inflation; the growing ratio of buildings to people in earthquake susceptible areas; and the continuing population movement to these regions all tend to boost the loss probability at an ever-increasing rate

If history continues to repeat itself, conservative models indicate the potential annualized cost of replacing and repairing buildings hit by earthquakes will increase almost 25 percent in constant dollars between 1970 and 1985. It will then rise another approximately 45 percent between 1985 and the year 2000 Other computer models were developed to estimate possible loss reductions if any of several potential approaches to minimizing building damage from earthquakes were taken

An approximately 15 percent reduction in new construction losses and 5 percent lowering of overall building losses could be realized annually by the year 2000, if the new NSF/NBS/ATC code was invoked throughout the nation, beginning in 1980. This code, recently developed for the Bureau of Standards by the Applied Technology Council of the Structural Engineers Association of California under a National Science Foundation grant, would require new buildings to be approximately twice as earthquake resistant as they are today.

Another approach suggests annualized new construction losses could be cut up to 12 percent and overall structural building losses reduced approximately 5 percent by 2000, if the existing 1973 Uniform Building Code, published by the International Conference of Building Officials, was required across the country after 1980 These savings could be approximately doubled by doubling the code requirements for damage resistance

Loss Reductions Possible

A third model demonstrates that if the nation can replace existing structures 10 percent faster than it is currently doing, as well as require all new construction to adhere to the 1973 Code, beginning in 1980, losses will drop 8 to 10 percent annually by the year 2000.

A great deal of money has been allocated to research aimed at early detection of impending earthquakes, as well as potential methods for preventing or delaying them or diminishing their intensity Unfortunately, thus far none have met with significant success Surprisingly, according to one model, if current experiments aimed at eliminating major quakes by breaking them into a series of smaller ones were successful and the technology implemented, the annualized cost of building damage would actually increase nearly 45 percent.

Impact More Dramatic

When applied to a computer scenario based upon an actual event, the impact of these findings is even more dramatic. One scenario is targeted at determining what damage to buildings caused by the 1906 San Francisco Earthquake would cost, in constant dollars, if it reoccurred in 1970, 1980, 1990 and 2000. The quake, which was measured at over 8 on the Richter Scale, destroyed buildings with costs translated into 1978 dollars of almost $170 million and took 700 lives The fire which ensued caused another $3.5 billion in damage The model indicates that should the quake reoccur in 1980, it would cause $24 billion in building damage and about 5,000 deaths and 700,000 injuries. Much of this increase is due to the larger number and value of buildings, as well as population growth since 1906 Dollar losses are limited, however, to shake damage and do not take into account the possibility of later fire damage or destruction of any kind to infrastructure Using similarly conservative figures, by 1990, the costs would mount to $30 billion and in 2000 they would reach $36 billion Lost lives would increase to over 5,000.

It appears that taking any one or combination of the steps cited earlier could bring these losses down dramatically