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**PROTECT YOURSELF
PREPARE YOUR HOME
TO WITHSTAND A**

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Of the STAR Staff

Puerto Rico has not seen a major earthquake since San Fermín in 1918. Buildings crumbled and the island suffered \$3.5 million in damages. A series of subsequent quakes terrified our ancestors for several weeks in October and November of that year.

San Fermín and its aftershocks caused 116 deaths and injured 241 people. Today, only a few remain who remember the horror.

Scientists, however, know that a repeat could happen at any time.

The island is surrounded by faults. The Puerto Rico Trench is about 40 miles north. About 20 miles west of Aguadilla is the Mona Canal, about 50 miles to the southeast is the Anegada Passage, and Fosa de Muerto is to the south.

How 20th century high-rises and mod-

ern, concrete homes would withstand a significant earthquake, nonetheless, is an open question.

"Unfortunately, an earthquake is the only experimental laboratory for testing the effectiveness of a building's structural design," explains Dr. Samuel I. Díaz Santiago, a structural engineer and member of the local Earthquake Commission of the Engineers Association of Puerto Rico.

"In designing earthquake resistant buildings, life safety is the main issue. Property damage comes second."

Since its revision in 1987, the local building code requires that all construction be engineered earthquake resistant.

"The new code was based on California's building code," says Díaz, who is also an assistant professor at the Colegio Universitario Tecnológico in Bayamón.

But unlike California, which sits right on a fault, Puerto Rico's more active faults occur in the sea.

"This puts us in a more advantageous

situation" explains Díaz, "because the epicenters where seismic waves originate are located at the faults. Therefore, seismic forces attenuate somewhat by the time they reach land."

Earthquakes apply dynamic impact loads to structures. Random jerks are transmitted from a building's foundation, and larger oscillatory motions can be felt on higher floors.

The way a building behaves during an earthquake depends on its structural characteristics, and the nature of the quake itself. Yet, because of effective engineering, tall buildings can survive jolts that destroy poorly designed small ones.

And although there is much to learn about prediction, there are ways to prepare for such an event.

If you are considering building a new home, consult an architect. He or she can provide a well qualified design team which will include, of course, a structural engineer. A competent team works together to provide a safe, aesthetically

pleasing code-cor

"The structural elements for resistance," explains Díaz. "A figuration with pr in two directions

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At left are examples of homes and buildings in Mayaguez damaged by the earthquake of 1918. The photos were taken from "Puerto Rico 1900," by Jorge Rigau. On the cover, homes on stilts are particularly vulnerable to earthquakes.

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the house. Builders of developments or *urbanizaciones* have record drawings of their prototypical homes for each project.

Another alternative is to contact the architectural or engineering firm responsible for the design. For a small printing fee, they should be able to provide copies of the design from their document morgue.

Unfortunately, many haphazardly designed homes and additions never go through the Regulations and Permits Authority (ARPE), or the hands of qualified design professionals.

Properly mixed concrete with carefully calculated and located reinforcing steel is essential for correctly designed structures. And adding more steel than one might assume is required isn't necessarily the right solution. Only a structural engineer can design for earthquake resistance.

Owners of homes on local mountain slopes should beware.

"Concrete homes on stilts are extremely vulnerable," says Díaz. "And the taller the stilts, the worse the condition due to potential torsion during a quake." Stilts can be reinforced with cross bracing, or filled in with solid walls between them for better earthquake resistance.

Concrete homes can be designed to withstand collapse from an earthquake, and possibly receive minimal damage. And certain measures can be taken to stay safe — and alive — inside your home.

Items that could tip or fall should be fixed and secured. This includes wall hangings, tall furniture such as bookcases or armoires, and lamps. Strong latches installed on kitchen cabinet doors can reduce losses and minimize the chances of someone slashing their feet on broken glass.

Beds should be away from heavy dressers, and windows that may shatter. Remember, if the ground shakes, everything will move; and what is loose, will move too.

If you use gas appliances, it is advisable to replace rigid gas line connections with flexible ones. Water heaters should be braced in place with plumber's tape.

Furthermore, decide on the safest place in your home for protection — under a sturdy table or desk.

Exit routes should be kept free from heavy or unstable objects. (It's also a good idea to have a rendezvous point for your family, to eliminate confusion about whether anyone is trapped inside the home.)

The potential for earthquakes is one reason why construction should be taken seriously, even in little houses. Every home should provide its occupants with safe shelter.

For more information on earthquake resistant engineering and safety, you can contact the Engineers Association at 758-2250.