Learning from Earthquakes

The M7.3 September 2, 2009, West Java Quake

The information in this report was contributed by Indonesian colleagues, consulting engineer Teddy Boen, Sugeng Wijanto and Takim Andriono of PT Gistama Intisemesta, and Danny Hilman Natawidjaja of the Indonesian Institute of Sciences. The report is published by EERI as part of the Learning from Earthquakes Program, with funding from the National Science Foundation under grant #CMMI-0758529.

On September 2, 2009, at 2:55 pm local time, an M_w7.3 earthquake struck off the south coast of West Java, Indonesia. At least 80 people were killed and many more injured; damage was widespread in western Java. There was no tsunami. An earthquake-induced landslide at Cikangkareng buried 12 houses, killing 30 people. Many roads in this district were also closed, cutting off access to remote villages. The shaking was felt widely on Java, with maximum MMI intensities of VII at Tasikmalaya, VI at Cianjur and Sukabumi, V at Bandung, and IV at Jakarta.

According to the NEIC-USGS report, the earthquake source was located at about 7.8° S and 107.25° E with a depth of 46 km. According to the USGS CMT solution, the earthquake was on a reverse fault striking NNE and dipping steeply at about 45°. Although the hypocenter placed it near the subduction interface between the Indo-Australian and Eurasian plates, the orientation of the causative fault inferred from the seismic wave radiation pattern is inconsistent with the shock occurring as interplate faulting on that interface. Instead, the earthquake likely occurred as the result of faulting within the subducting Indo-Australian plate.

In Jakarta, tall buildings swayed and frightened the occupants; many started rushing out of buildings while they were still moving. In the course of the mass exodus, some people were injured. Subsequently, everybody gathered in the streets, causing a huge traffic jam. No major damage was found in the tall buildings, but there were nonstructural effects such as cracks at the interface of structural concrete frames and masonry infilled walls, separation of floor and wall tiles, and broken window glass.

In four districts near the epicenter, thousands of terrified residents ran from their buildings. More than 67,000 houses were badly damaged, while about 150,000 more experienced light to medium damage. The quake also caused severe damage to 2,700 one-story, nonengineered school buildings, about 50% of which are beyond repair.

Most of the damaged or collapsed buildings were not engineered. Single-story residential units that use simple timber frames, bamboo plaited mats for walls, clay tiles for roofs, and a raised floor system generally survived unscathed (Figure 1). However, houses using unreinforced clay bricks as their bearing walls suffered severe damage. Similar failures were also seen in one-story buildings using confined masonry walls, but with low-quality materials and poor workmanship (Figure 2). Many of the damaged buildings were made more vulnerable by a lack of maintenance over the years.

The badly damaged structures were not built according to the building standards and construction practices specified for seismic areas. A special effort is therefore required to encourage people to rebuild using appropriate seismic-resistant techniques.

To see maps and more images from this event, visit ***http://www.eeri.org/site/reconnaissance-activities/67-indonesia/735-m-70-java-indonesia****. Some information for this report came from the Indonesian newspaper* Kompas *(****http://regional.kompas.com/jawa****) and the Indonesian Meteorological and Geophysical Agency (BMKG) (****http:// www.bmg.go.id/60gempa.bmkg? Jenis=URL&IDS=9279258135813849788****).*

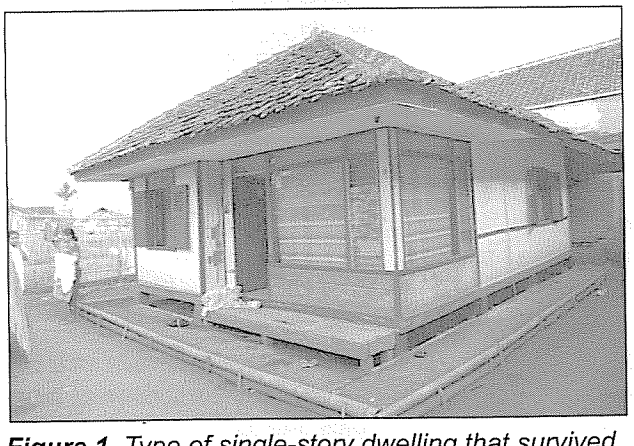

Figure 1. *Type of single-story dwelling that survived the quake (photo: N.K. Widiada).*

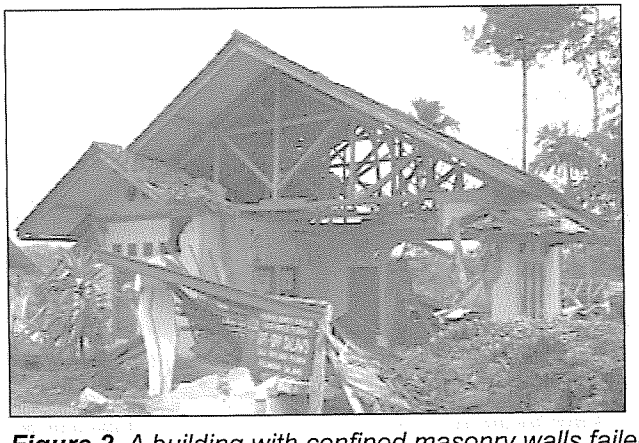

Figure 2. *A building with confined masonry walls failed due to low-quality materials and poor workmanship.*