

SECTION 4 SUMMARY AND CONCLUSIONS

1. This earthquake demonstrated the need to increase education, awareness, and preparedness at all levels of government and the private sector. Mitigation programs should be accelerated to include preparedness planning, response and recovery planning, engineering vulnerability studies, and retrofit of hazardous buildings and structures.
2. The primary cause of death was the lack of education and awareness about earthquakes combined with the collapse of URM buildings and the high-rise concrete building in Cairo.
3. The quality of construction in Cairo is poor and clearly contributed to the number of collapses. This problem is not unique to Egypt. To ensure that a structure is properly constructed and will perform as designed, it is necessary to assure adequate quality, by having the design engineer perform inspections during the construction process.
4. Concrete-frame structures, one of the most popular types of design construction, caused about 10% of the deaths in the Cairo Earthquake. The technology to build safe concrete-frame structures and strengthen existing ones is well developed and can be applied by knowledgeable and skilled engineers. However, all too frequently, inadequately designed structures are built. The cost to strengthen existing concrete-frame buildings can be significant. It is far more cost-effective to implement a seismic quality control program during design and construction. The seismic performance of reinforced concrete frames is significantly affected by many factors. One of these is proper design and detailing to ensure a ductile (flexible) system. Such a system is a more heavily reinforced concrete frame that is capable of undergoing larger deformations without failure. Concrete-frame buildings often have infill walls of concrete block or other masonry, which may or may

not be designed as structural elements. If infill walls (which must be reinforced) are designed as nonstructural elements, it is necessary to allow for movements of the frame relative to by the infill walls.

5. In general, the newer buildings performed well; however, this earthquake did not provide the severe ground motions to adequately test them.
6. Poor performance of old buildings was due to the use of brittle construction materials, inadequate design and detailing, lack of maintenance, or deficiency in workmanship. In many cases, all these factors were present in a single structure.
7. URM buildings once again proved to be the most hazardous form of building construction. The presence of rigid diaphragms appeared to reduce the probability of total collapse of the structures.
8. Strong motion instrumentation is needed in Egypt.

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