



Appropriate Seismic Regulations for Urban Structures

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Summary

Urban areas subjected to significant earthquake shaking require appropriate regulations and guidelines for seismic resistant construction. While seismic design codes and criteria are similar worldwide, every country and urban area has specific limitations on certain construction types and systems. There is a need for universal criteria, however there must be suitable caution in adopting new approaches not yet proven in actual earthquake exposures.

Bridges have been the subject of major changes in design criteria in recent years, hopefully to prevent the all too frequent collapse of critical spans. Underground structures and tunnels have received little attention recently and appropriate criteria is needed built on a consensus base. New buildings are perhaps the most regulated of structures, although new performance based designs are pushing the bounds for acceptance. These new designs need careful and thorough study to ensure acceptable performance. Existing buildings and bridges are perhaps our greatest urban hazard in strong earthquakes, and appropriate mitigation strategies and criteria are needed to gradually reduce these hazards.

1. Introduction

Our planet earth is an active planet with its geologic plates still floating and adjusting towards a possible equilibrium. Along these plate boundaries that ring the Pacific Ocean, transverse the south of Europe and into Asia and elsewhere lie many of the worlds major population centers and large cities. Many of these locations are frequented by earthquakes, some every 50 years or so, some every few hundred years and some less frequently. While the desire for worldwide building regulations or codes is a worthy cause, it is really unpractical, partially due to the different levels of seismicity in the various population centers, not to mention extreme wind and hurricane exposures and other climatic variations. In addition, local traditions of construction practice and zoning somewhat preclude such universal regulations.

Thus it is necessary for each country or each major urban center to develop its own appropriate building regulations and codes to properly protect its citizens from loss of life and control of damage when there infrequent earthquakes occur. It is also appropriate, in the author's opinion, that each urban area study and recognize its own seismic exposure (or extreme wind – tornado – hurricane exposure) and establish its own standards for building performance and life safety protection of its population.

The issue of new buildings and bridges is relatively simple. Our engineering knowledge is now quite complete that we can easily draft codes and regulations for appropriate safety and performance, recognizing that codes can never be completely up to date with new concepts of construction. Dealing with the existing building and bridge inventory is a much larger and more difficult problem, as we know many of those structures are very vulnerable to seismic events. This issue takes considerable community study debate to reach a consensus of how the potential hazard can be reduced and how the cost to abate will be funded and justified. Finally, one component of urban construction often ignored for seismic performance is the underground structure. As we build