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Many older buildings not ready for the big one

■ *Seattle has 1,000 unreinforced masonry buildings and 156 old high-rises that are vulnerable to earthquakes.*

By STANTON PHILLIP BECK
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Lane Powell PC

A frequent news peg whenever disaster strikes elsewhere is: Can it happen here? When it comes to the Japan earthquake last March, it most certainly can.

The more important question is: Are we ready? From the standpoint of buildings constructed before 1994, the answer may be a sobering no.

The numbers from the March 11 Sendai/Tohoku earthquake and tsunami were frightening, and were made more so by the dramatic live television pictures as the disaster unfolded. The subduction quake measured 9.0 on the Richter scale, originating from the nearby Japan Trench, which caused a tsunami up to 133 feet high. The Pacific Plate moved some 66 feet under the Japan Plate, shifted the entire island of Honshu 8 feet, dropped 250 miles of Japanese coastline 2 feet and, in the process, 20,000 people were killed or missing and 125,000 buildings were damaged or destroyed, including seven nuclear reactors. The losses are estimated at up to $34 billion.

Almost the same magnitude subduction earthquake is predicted for Western Washington, British Columbia and Oregon.

Like Japan, the Pacific Northwest is on the Pacific Ring of Fire and has a similar subduction zone, called the Cascadia Subduction Zone (CSZ), where the Juan de Fuca Plate meets the North American Plate 600 miles long and no more than 100 miles off the Washington and Oregon coasts.

Subduction zones are places where one tectonic plate moves forcibly under another, potentially generating super quakes.

Geologist Chris Goldfinger, professor at Oregon State University, considers Portland and Seattle to have a 10 to 15 percent chance of experiencing a Sendai-like magnitude 9.0 subduction earthquake in the next 50 years.

It wouldn't be the first time for this area. Around 1991, geologists discovered a history of massive, if infrequent, subduction zone earthquakes in the CSZ. In addition, they discovered that a quake of approximately magnitude 9.0 took place on Jan. 26, 1700, as well as some 40 other partial or full fault quakes in the last 10,000 years ranging from magnitude 8.0 to 9.2.

The 311-year interval since the 1700 CSZ quake is longer than 75 percent of the inter-quake intervals for the CSZ in the last 10,000 years, with 41 magnitude 8.0 or higher CSZ quakes in the last 10,000 years.

Goodbye coasts?

In a magnitude 9.0 CSZ quake, large plate movement occurs. Release of that much stored energy over the typical four-minute timeframe could initiate a 45-foot or higher tsunami, which would flatten and carry away most of the low-lying structures on the Oregon and Washington coasts.

The damage to Seattle and Western Washington would come from liquefaction and/or subsidence and the one-minute or longer shock wave(s) that would severely damage a substantial percentage of the buildings, homes and infrastructure.

Unreinforced masonry and high-rise buildings built prior to 1994 are especially at risk. Quake shock waves at periods of one second or more can create a damaging resonance between the ground and the long/tall structures above, such that an old high-rise building that would easily survive a magnitude 6.5 crustal quake might be severely damaged in a CSZ quake.

Unreinforced masonry buildings are vulnerable to quake damage because typically they:

- Have inadequate strength to resist horizontal forces.
- Lack structural connections.
- Lack flexibility and are heavy.
- Have weak roof and floor diaphragms.
- Have parapets, cornices, chimneys and stone ornamentation prone to breaking off.

In 2007, Seattle commissioned the engineering firm Reid Middleton to study unreinforced masonry building seismic hazards. The study identified 850 to 1,000 unreinforced masonry and 156 old high-rise buildings in Seattle; and 2,200 unreinforced masonry buildings in King, Pierce and Snohomish counties.

These buildings are a key component of "close-in" rental housing and commercial space and they contribute to Seattle's historic fabric, as evidenced by Pioneer Square. However, in an earthquake they could be severely damaged. In fact, an inventory of high-rise buildings (12 stories or higher) in the Pacific Northwest identified that two-thirds (743 of the 1,131 high-rise buildings along the I-5 corridor, including Vancouver, B.C.) predate the mid-1990s building code changes that upgraded the seismic requirements for much of Oregon and Washington.

Many buildings at risk

Seattle does not mandate the seismic upgrading of vulnerable structures

except when the owner is making substantial alterations, such as changing occupancy to a more hazardous use, significantly increasing the occupant load, or repairing a building that has suffered major damage or is deemed dangerous.

The Director's Rule and Client Assistance Memo No. 314 of the Seattle Department of Planning and Development provide a comprehensive explanation of the requirements for buildings undergoing substantial alterations or repairs but must be read in conjunction with Seattle Ordinance No. 123379, passed last year, which modifies some requirements and applications.

While the 2001 Nisqually earthquake might have served as a wake-up call, the reality is that only 7 percent of unreinforced masonry buildings in Seattle were upgraded within seven years thereafter, even though 74 of those buildings were damaged. With increasing awareness of the CSZ risk, particularly in the aftermath of the Sendai earthquake, owners of unreinforced masonry buildings are likely to come under increasing pressure from casualty insurers and mortgage lenders to perform seismic upgrades to their buildings, which can be a costly proposition.

Life-safety retrofits of an unreinforced masonry building in many cases could approach $30 a square foot, a substantial percent of the value of that building. In addition, there are few tax or other governmental incentives for such work. Aside from marginally lowering earthquake insurance premiums and mortgage interest rates, a retrofit rarely supports a rent increase and adds little to the cash flow of the building.

Nevertheless, the owners and/or managers of unreinforced masonry and old high-rise buildings can and should take some preventative steps:

1. Consult a structural engineer and commission a seismic risk assessment of your building.

2. Determine if your building has been identified by your local government as an unreinforced masonry building or otherwise seismically deficient. The Reid Middleton study lists 20 pages of unreinforced masonry buildings in Seattle.

3. Consult your attorney as to possible liability to tenants and their guests and even passersby in the event of death, injury or property damage arising from building systems failure in an earthquake. Note such liability has been found to apply in at least one California case arising out of the magnitude 6.5 San Simeon earthquake of 2003.

4. Review the relevant sections of leases with commercial tenants to determine if the landlord has the right to pass on voluntary or government-mandated seismic upgrade costs as a "common area maintenance charge" or "additional rent."

5. Determine what governmental incentives, if any, are available for the seismic upgrades. If your building is historic, there is a possible federal 20 percent historic income tax credit and a possible charitable deduction for a facade donation. Washington does not offer any incentives. Proposition 13 in California, passed in 2010, amended that state's constitution to prohibit tax assessors from re-evaluating new construction for property tax purposes when the underlying purpose of the new construction is to seismically retrofit an existing building.

While a 10 to 15 percent chance of a CSZ earthquake occurring in the next 50 years might seem low, the consequences of not being prepared could be devastating. Investigating the options now is easier than rebuilding shattered structures and lives in the aftermath.

Stanton Phillip Beck is a member of the board of directors and the Construction Services Group at Lane Powell PC in Seattle. He received his engineering and law degrees from the University of Washington, where he was editor of Washington Law Review. He has been involved in most of the major construction projects in the Pacific Northwest, as well as significant national and international projects.