

## **Engineers' tour -- Japan takes earthquakes more seriously than U.S.**

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**Sandi Doughton, Seattle Times, 6-16-11**

To see how seriously Japan takes earthquake preparedness, a team of visiting engineers from Washington had to look no further than their hotel.

A model on display in the lobby showed that the building was constructed on flexible bearings that act like shock absorbers when the ground shakes.

More than 2,600 commercial buildings and nearly 4,000 single-family homes across Japan employ the technology. The United States has less than 200 structures in the same league.

"The market in Japan demands more emphasis on earthquake protection," said Dave Swanson, of the Seattle engineering firm Reid Middleton. "The marketplace in the U.S. demands more emphasis on cost-effectiveness — and usually the first thing you throw away is higher levels of earthquake performance."

Though the Pacific Northwest is vulnerable to the same type of mega-earthquake and tsunami that struck Japan in March, the region isn't nearly as ready to ride it out, team members found during a 10-day inspection tour that ended last week.

While newer high-rises in Seattle and other Northwest cities are likely to survive a magnitude 9 megaquake on the coast, they will probably suffer more damage than did modern buildings in Japan, said Swanson, who participated in a technical briefing Wednesday presented by the Structural Engineers Association of Washington.

"Tall buildings in Japan are generally stiffer and stronger than equivalent buildings" here, he said in an interview.

Seattle also has hundreds of old brick buildings and concrete structures that won't stand up to the three or more minutes of shaking expected from a major coastal quake.

"We've known this for a long time," said Mark Pierepiekarz, of Bellevue-based MRP Engineering. "These are lessons relearned."

With more frequent quakes than the Northwest, Japan gets constant reminders that the earth is unstable — and the Japanese have acted on that knowledge.

Sendai, near the earthquake epicenter, suffered little structural damage from the quake, team members found. Only a handful of old buildings collapsed.

The rest had been retrofitted with sturdy braces, dampers or both. In Sendai and Tokyo, major damage was concentrated along waterfronts and neighborhoods located atop fill and loose soils, Swanson said.

Current building codes in Japan and the U.S. are very similar, said Andy Taylor, of KPFF Consulting Engineers. But the Japanese often go beyond the basic requirements, which are meant to ensure buildings don't collapse and kill people.

Shock-absorbing foundations aren't required, but savvy businesses are willing to pay for the extra margin of resilience. Japanese construction and engineering firms invest heavily in research and development on earthquake mitigation, something unheard of in the United States, Swanson said.

Even so, Japan's cities saw many "high-rise refugees" after the March quake. Apartments and condominiums lost power and water, stranding residents without elevators or basic necessities. Many businesses also ground to a halt because of damage to equipment or building interiors.

"Just because the buildings survive doesn't mean there isn't damage," said University of Washington architect Ken Tadashi Oshima, who also visited Japan recently with a group of students.

The Japanese are already considering new requirements that would make utility lines and other nonstructural elements like windows, facades and ceilings more earthquake-resistant, Taylor said.

Japanese officials estimate the tsunami was responsible for 90 percent of deaths in March. But with about 23,000 people confirmed or presumed dead, that means as many as two thousand people might have perished in the earthquake — though it may never be possible to sort out.

"The tsunami damage covered up a lot of the quake damage," Swanson said.

Seattle's emergency-management chief Barb Graff didn't travel to Japan with the engineering team, but has been tracking Japan's disaster and response and will brief the Seattle City Council next month. The triple whammy of earthquake, tsunami and nuclear meltdown makes it clear that emergency responders need to broaden their worst-case scenarios.

"We need to practice for tougher stuff," Graff said.

She's also envious of the early-warning system in Japan that gave residents in Tokyo and other cities up to 30 seconds notice before the strongest shaking hit — enough time to dive under a table, shut down equipment and slow bullet trains.

"It saved lives," she said. "We're no where near that."