DAILY JOURNAL OF COMMERCE
SEATTLE
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May 15, 2014

Team designs coastal school to be safe during a quake and tsunami

By JON SILVER
Journal Staff Reporter

The Ocosta School District will show designs today for what may be the nation's first vertical-evacuation structure built in a tsunami zone.

Image courtesy of TCF Architecture [enlarge]

The gym roof will have a concrete platform to hold more than 1,000 people, and 50-foot-deep auger cast piles should hold the building in place even if the soil liquefies or scours away.

The structure is part of an elementary addition and replacement project at Ocasta Elementary School, just south of Westport on a peninsula at the mouth of Grays Harbor.

The $14 million project will replace a 1960s school with a 37,000-square-foot structure that contains classrooms, a gym, library, music room, kitchen and administrative offices. The building will be connected to a classroom wing built in the 1980s.

TCF Architecture is the architect. Degenkolb Engineers is the structural engineer. A general contractor will be selected through a public bidding process.

Designers will present the plans at 6:30 p.m. at the elementary school, which is at 2580 S. Montesano St.

The school is less than a mile east of the Pacific Ocean, and vulnerable to tsunami waves that can follow a large earthquake.

The Cascadia subduction zone is a 700-mile-long offshore fault that follows the North American coast from Northern California to British Columbia. A powerful earthquake along the fault could abruptly push the seafloor upward, sending waves that reach as high as 30 to 40 feet crashing onto the coast, according to a 2013 report by the Cascadia Region Earthquake Workgroup.

The last such massive earthquake was an estimated 9.0-magnitude event that occurred in 1700.

Ocosta Elementary's evacuation structure is being designed to withstand a similar earthquake.

Cale Ash, an associate principal at Degenkolb Engineers, said design standards for structures like this are still a work in progress and aren't expected to be codified until the release of the 2018 International Building Code.

Japan has led the way in the construction of evacuation structures, and the 2011 earthquake and tsunami there provided many examples of successes and failures, he said. In the U.S., the Federal Emergency Management Agency has also contributed research.

While some evacuation structures built elsewhere look like towers or diving platforms, the Ocosta structure will be part of the school building.

The gym roof will have a concrete platform on top designed to hold 1,000 people or more. Each corner of the building will have an external staircase so no one has to enter the school first to reach the rooftop.

The platform will be bare bones, with no protection from the elements or other emergency-shelter amenities. Survivors aren't expected to be there for more than 24 hours.

The school structure is being designed to withstand an array of forces that could bring down a less-fortified building. To start, the structure will be anchored by 50-foot-deep auger cast piles that should hold the building in place even if the soil liquefies or scours away. A subduction-zone earthquake could also cause the ground to drop 3 to 6 feet, so designers took that into account, as well.

Ash said that despite some similarities to landslide areas, design research for coastal seismic zones “wouldn't relate” to structures such as the ones that were wiped away in Oso.

The structure will be concrete and steel. It must be sturdy enough to withstand the lateral forces caused by tsunami waves and survive pounding by floating debris, such as trees or even school buses.

The site elevation is 25 feet above sea level. Designers calculated the evacuation platform would need to be at least 15 above ground level to remain above water, plus extra height to account for whatever else comes at it. So the evacuation platform sits 28 feet above the ground, or 53 feet above sea level.

Brian Ho, a principal at TCF Architecture, said structures in Japan that didn't survive the 2011 tsunami often weren't tall enough or weren't sufficiently anchored, and simply tipped over. Reinforced concrete stood up best to lateral forces lateral forces during the tsunami.

At Ocosta Elementary, the existing classroom wing will be linked to the new structure, but won't be reinforced for tsunamis.

Construction is scheduled to begin in October and finish by late 2015.

Construction Services Group is the project manager. Hatton Godat Pantier is the civil engineer, Metrix Engineers is the mechanical engineer and BCE Engineers is the electrical engineer.

Ash from Degenkolb Engineers said seismic research was performed by University of Washington and funded by the state Emergency Management Division to prepare for the project.

This project should lay the groundwork for future structures in coastal in towns such as Long Beach and Ocean Shores.

Jon Silver can be reached by email or by phone at (206) 622-8272.
