

# News and Information

## Building in Coastal Areas

### Post-Tsunami Thailand Yields Lessons for Coastal Construction

An inspection of Thai villages and ports struck by tsunami waves has uncovered some engineering lessons that might reduce casualties and destruction in future oceanic upheavals, a Johns Hopkins researcher said.

Robert A. Dalrymple, Professor of Civil Engineering at Johns Hopkins, was part of a nine-member team that recently toured southern Thailand, examining landscape and structural damage in areas that had been battered by waves up to 30 feet high. The research trip to Thailand, along with similar expeditions to Sri Lanka and India, was organized and funded by the American Society of Civil Engineers (ASCE), in cooperation with the Institution of Civil Engineers.

"The force of the fast-moving waves on structures was tremendous," said Dalrymple. "We wanted to see which buildings and other structures held up against the waves and which didn't."

ASCE is preparing a detailed technical report. But Dalrymple said team and personal observations led him to compile a list of general lessons for builders in coastal areas where future tsunamis may occur. Lessons include:

*Elevated structures survive better.* Elevated buildings that allowed the moving water to pass through the lower level with little interference fared better than those with solid first-floor walls.

*Materials matter.* Reinforced concrete structures were more likely to survive the wave forces. In general, masonry (brick) and wooden structures did not fare as well.

*Orientation is important.* Walls facing the ocean, allowing perpendicular impact from the waves, sustained more damage. Walls oriented in the direction of the flow sustained less.

*Strong foundations are necessary.* In addition, landscaping or other features can protect the foundations against scouring.

*Seawalls can be a very effective way to reduce wave damage.* The structures must be continuous, however, with no gaps for pedestrian crossings. Also, such structures should not slope inland, allowing waves to slide up and over the walls like a skier.

*Debris in the flow is hazardous.* Debris can be minimized if vehicles are parked and heavy items stored on the inland side of buildings.

*Beaches in Thailand recover rapidly.* The ASCE researchers discovered that within weeks of the disaster, natural ocean forces had returned the sandy beaches nearly to their pre-tsunami condition.

Dalrymple said several questions raised during the trip require further research. These include why the height of the tsunami varied dramatically along the coast of Thailand and how engineers can construct a mathematical model of wave forces as they pass through coastal structures. ■

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## Structural Engineering Certification Board Update

Since its inception late last year, the SECB has received nearly four hundred applications for certification in the practice of Structural Engineering. Although the interest in certification has been steady, many applicants could miss the first important deadline. Applications received after July 1, 2005 for certification by "grandfathering" will be subject to an additional \$100 fee per year for every year, or partial year, after January 1, 2005. Application forms are available online at [www.secertboard.org](http://www.secertboard.org).

The SECB web site also contains information about the SECB, the certification process, and status of applications. Stakeholders, as well as applicants, will be able to verify

structural engineers who have been certified. As the web site matures, it will become the primary source for all inquiries regarding the status of structural engineers and the certification process.

Starting July 1, 2005, the SECB will begin issuing certificates to those who have recently applied and have been certified in the practice of structural engineering.

The SECB is an independent accreditation organization headquartered in Chicago, Illinois and representing the regulated professional practice interests of over 30,000 structural engineers nationwide ■

# Raising the Roof

## Cardinal Stadium Gets a New Lid

On Monday, February 21<sup>st</sup>, 120 engineers, steel workers and specialized equipment operators at the Arizona Cardinals Stadium put a "lid" on the \$370.6 million venue. 5,600 tons of steel were lifted and installed during the four-day project.

On Tuesday, Robert S. Aylesworth, Executive Vice President with the Hunt Construction Group, provided a final update on the lift:

"The stadium roof was lifted to its maximum elevation of 156 feet above the stadium floor at approximately 2:00 PM on Monday. Local 75 Ironworker crews working for Schuff Steel Company, the steel fabricator and erector, then completed installation of the transfer girders and final attachment of the roof to the concrete frame. In spite of the weather, the roof lift went almost entirely 'as planned' with 5,600 tons of steel lifted and installed during the four-day project."

Four concrete super-columns designed into the bowl of the Stadium support the weight of the lift. In a unique construction sequence, the stadium bowl was constructed in pie-like sections, to accommodate building trusses inside the stadium, near ground level. Piecing the roof's trusses together in this fashion was safer, easier and more cost effective.

The roof's central features are two 700-foot-long Brunel trusses, weighing 1,770 tons apiece and had their tapered ends built into vertical slots in the concrete supercolumns that support them. Retractable roof panels were attached securely atop the parallel arcs, stabilizing them for the lift.

Work will start in March to link smaller trusses from the top edge of the stadium bowl to the Brunel trusses. When structural roof work is finished in late June, a specialized fabric known as Birdair will be stretched over the skeletal frames of the retractable panels and other parts of the roof. In late fall, the retractable panels will open for the first time.

The new stadium is on schedule to open in August of 2006. Visit [www.azcardinals.com](http://www.azcardinals.com) to view a live construction cam. ■

