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CIVIL TALK

CIVIL ENGINEERING ♦ SURVEYING

STRUCTURAL ENGINEERING ♦ GRANT WRITING

A NEWSLETTER FROM HENEGHAN & ASSOCIATES, P.C.

Celebrating Our 23rd Year in Business **February 2010**

Earthquakes & Structural Engineering

The largest recorded earthquake in the U.S. was a magnitude of 9.2 that struck Prince William Sound, Alaska on Good Friday in 1964. The largest recorded earthquake in the world was a magnitude of 9.5 in Chile in 1960. Moonquakes or earthquakes on the moon do occur. It is estimated that there are 500,000 detectable earthquakes in the world each year. 100,000 of those can be felt, and 100 of them cause damage. Powerful earthquakes occurred along the New Madrid fault in the Mississippi Valley in 1811-1812. Shaking from earthquakes in this part of the U.S. is felt at a much greater distance from the epicenters than in other parts of the U.S. California has the most damaging earthquakes. Alaska is the most earthquake-prone state. Florida and North Dakota have the smallest number of earthquakes in the U.S.

Unfortunately the Midwest is located a pretty good distance from Florida and North Dakota. In fact, most of you reading this newsletter are located near the New Madrid fault—a fault that has caused earthquakes in our local area as recent as 2007. Because of the potential for a catastrophic earthquake in our area, it is important for structures such as bridges and buildings to be constructed with seismic analysis and engineering—the work of a structural engineer. The goal of a structural engineer as related to earthquakes is to reduce the chances of earthquake hazards by designing earthquake-resistant structures and facilities.

One of the first things a structural engineer will consider is the suitability of the site selected for whatever is being constructed. The stability and/or instability of the soil must be analyzed during this step. For example, the primary reason for damaged structures during the Nigata, Japan earthquake in 1964 was attributed to ground failures. In some cases it is possible to design safe structures by proper design of their foundation while in other cases, the only safe solution is to change the structure's location or site.

One of the next things a structural engineer will consider is that the whole structure-foundation system should work as a unit, with the structure being tied or anchored to the foundation and properly braced. The result of insufficient bracing or tying together all the components of a building was seen during the 1983 Coalinga, California earthquake when porches collapsed because they were not properly anchored to the main structure and/or did not have proper bracing.

Another consideration is the material used to build the structure. Traditional structural materials include timber, masonry, concrete, and metals including steel and aluminum. The most efficient earthquake resistant material for low-rise buildings is timber. On the other hand, unreinforced masonry is very susceptible to damage during earthquake shaking. Solid brick masonry is so heavy, its ability to be flexible is very minimal. Catastrophic failures of unreinforced masonry have occurred in many earthquakes. Often, the walls of these kinds of buildings start to fall as soon as the building vibrates from moderate ground shaking.

Concrete, which is heavy like masonry, must be properly reinforced with steel in order to be effective in seismic-resistant construction. The use of lightweight concrete offers significant advantages in seismic regions.

While steel proves to be a tougher building material than concrete and masonry, its slenderness gives way to buckling which is a serious problem during earthquakes.

The dramatic collapse of bridges has resulted by failure of their foundations and/or supports and by lack of integral action between the substructure and superstructure. Bridges during the earthquakes of 1964 Alaska, 1964 Niagata, and 1971 San Fernando collapsed from a lack of adequate connections at the supports. After the collapse of the San Francisco – Oakland Bay Bridge, engineers knew that returning the bridge to its pre-earthquake state would not be sufficient. So they designed the bridge to move like a machine. The bridge is a 150-year design. The work of a structural engineer is extremely important. The seismic work of a structural engineer can save lives and reduce damage and costs during a catastrophic earthquake. Heneghan and Associates' structural engineering department can help you with your seismic engineering needs.

San Francisco –Oakland Bay Bridge

- by Cheryl A. Moody

CLIENT SPOTLIGHT

City of Jerseyville

Fairgrounds Avenue—In Progress
City of Jerseyville

Heneghan and Associates is proud of its working relationship with the City of Jerseyville and the opportunities to make improvements which ultimately resulted in a better quality of life for the city's residents and business owners. From water and wastewater to transportation engineering and surveying, to grant writing, HA has been there to guide the city and look out after the city's best interests in civil engineering. Some of the projects currently under design for the City of Jerseyville include a new 2 MGD wastewater treatment plant, a 5,000 LF replacement of Fairgrounds Ave., a new sanitary sewer lift station and force main, and stormwater improvements in the Curtis/Adams area.

MEET & GREET

Ronnie Paul, P.E.

This month's "Meet & Greet" employee is Mr. Ronnie Paul. Ronnie was hired in 2001 by Heneghan and Associates as a civil engineer. Ronnie proudly serves on the board of directors for HA. He has amassed 12 years of experience as an engineer with several of those years concentrated in the field of agricultural engineering. He graduated from the University of Missouri in 1997 with a B.S. in Civil Engineering and from the University of Kentucky in 1999 with an M.S. in Biosystems/Agricultural Engineering. While Ronnie is versed in most aspects of civil engineering, his specialty is in the field of water and wastewater. He originally hails from Carlinville and presently resides in Chesterfield with his wife and four children. When not working at HA, you might find Ronnie at his home where he farms and raises cattle. He also finds himself busy being a chauffeur to his four young children and serving as a volunteer coach for his kids' sports teams.

CIVIL TALK is published by **Heneghan & Associates P.C.**
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