Florida Legislature Updates Building Codes in Wake of Hurricanes

Legislation that would update the hurricane standards of the Florida Building Code, while maintaining a controversial exemption for the Panhandle counties pounded by Hurricane Ivan, gained unanimous approval in the state Senate on Monday, May 9th, 2005. The bill, however, mandates the state building commission to study whether the Panhandle exemption from the state's hurricane shutter requirements should continue in light of the damage that Ivan inflicted on the region. The bill had the support of both insurers and home builders, two forces that have been opponents on hurricane issues ever since the legislature moved to develop a statewide code in 1999.

The state building code, adopted in 2000, requires that new homes be built with hurricane shutters or impact-resistant glass. The state's insurers supported the requirement as a safety measure. Builders argued that it would drive up the cost of homes without providing homeowners much benefit, especially in some parts of the state thought to be less hurricane-prone. As a compromise to get the code passed in the legislature, lawmakers granted Franklin County and all the counties to its west an exemption from the shutter requirement. Ivan compelled lawmakers to take a second look at the exemption, however. The original bills in both the House and Senate would have ended the exemption, but continued concerns over whether shutters provide a cost-effective benefit to homeowners in the region persisted.

The bill requires the commission to update the building code to meet the last standards set by the **American Society of Civil Engineers**. It also eliminates a provision that waived shutters on new construction if a home's walls could withstand the internal pressure if a hurricane blew the windows out.

The bill also creates a $200,000 fund to be used by the Florida Insurance Council and the Florida Home Builders Association to create a program to teach contractors the value of designing buildings to withstand wind-blown debris.▪

Photo courtesy of FEMA

Papers in the July Issue of the Journal of Bridge Engineering

Bruce E. Peterson, Editor

This issue of the journal begins with three papers on traffic induced vibrations. The first two papers are companion papers by Calcada, Cunha, and Delgado. *Analysis of Traffic Induced Vibrations in a Cable-Stayed Bridge, Part I: Experimental Assessment* discusses the experimental approach which was used to evaluate traffic induced dynamic effects in the Salgueiro Maia cable-stayed bridge. The tests evaluated the dynamic amplification factors under the passage of individual heavy trucks as well as groups of heavy trucks in various lanes and at different speeds. In *Analysis of Traffic Induced Vibrations in a Cable-Stayed Bridge, Part II: Numerical Modeling and Stochastic Simulation,* the authors continue with their work on the Salgueiro Maia cable-stayed bridge by developing a numerical model to simulate the dynamic response of the bridge. Further, stochastic Monte-Carlo simulations of the dynamic responses was used to evaluate dynamic amplification factors taking into account the randomness of different factors associated with characteristics of the pavement, the vehicles and the traffic flow.

The final traffic induced vibration paper is *Train-Induced Vibration Control of High-Speed Railway Bridges Equipped with Multiple Tuned Mass Dampers* by Lin, Wang, and Chen. This paper investigates the use of multiple tuned mass dampers to suppress train-induced vibration on railway bridges. The authors found that according to the train load frequency analysis, resonant effects will occur as the modal frequencies of a bridge are close

to the multiple of impact frequency of the train load. Numerical results from simply supported bridges under real trains showed that the proposed multiple tuned mass dampers were more effective and reliable than a single tuned mass damper.

This issue continues with three seismic papers. The first one *Modal Property Changes of a Seismically Damaged Concrete Bridge* by Bolton, Sikorsky, Park, Choi, and Stubbs describes the modal changes that occurred on the Lavic Road Bridge after an earthquake. Prior to the seismic event, periodic modal field tests were conducted on the structure to evaluate the impact of on-going reactive-aggregate induced structural deterioration. One of these tests was performed two weeks before the earthquake. A test was conducted 3 days after the event in order to capture any changes in the structure's modal properties that might have resulted from damage incurred as a result of the event.

The second seismic paper is by Dicleli, Mansour, and Constantinou. In *Efficiency of Seismic Isolation for Seismic Retrofitting of Heavy Substructured Bridges*, the efficiency of seismic isolation for seismic retrofitting of bridges with light superstructures and heavy substructures is studied. The results found that the bearings and substructures of these types of bridges need to be retrofitted. Retrofitting the bearings versus replacing the bearings with seismic isolation bearings was investigated, and it was found that the use of seismic isolation bearings was significantly less costly than retrofitting the existing bearings.

The third and final seismic paper, *Seismic Modeling of Skewed Bridges with Elastomeric Bearings and Side Retainers* by Maleki, compares the seismic response of straight and skewed slab-girder single-span bridges with varying gap distances between the elastomeric bearing and side retainers. The behavior is non-linear and the study shows that ignoring this non-linear behavior can lead to erroneous results.

Engineers managing existing bridges and transportation systems will find the next three papers of potential interest. Sirca and Adeli, in *Case-Based Reasoning for Converting WSD Based Bridge Ratings to LFD-Based Ratings*, present a methodology and an intelligent decision support system to aid in the conversion of working stress design based bridge ratings to a load factor design based rating system. The system uses an artificial intelligence approach to case-base reasoning to aid the work.

Overview of a Modal Based Condition Assessment Procedure by Wang, Kangas, Padur, Liu, Swanson, Helmicki, and Hunt summarizes a condition assessment procedure based on a complete system of field-testing, finite element modeling, and load rating. Modal testing and truckload testing are used to collect measurements of constructed systems. Varying physical parameters of finite element models are adjusted during calibration to achieve convergence between the experimental measurements and the analytical results, in order to develop at a bridge load rating from the calibrated model.

The final paper in this group is authored by Liu and Frangopol. In *Balancing Connectivity of Deteriorating Bridge Networks and Long-term Maintenance Cost through Optimization*, the authors present a network-level bridge maintenance planning problem as a combinatorial optimization that is automated by a genetic algorithm to select and allocate maintenance interventions of different types among networked bridges and over a specified period of time. The paper shows that the proposed maintenance planning procedure satisfactorily prioritizes scarce maintenance needs to deteriorating bridges that are most critical as well as cost-effective in distributing maintenance interventions over the specified time horizon.

The tenth paper of this issue provides the results of an investigation of bridge approach slabs and their supporting soils. Cai, Shi, Voyiadjis, and Zhang, in *Structural Performance of Bridge Approach Slabs under Given Embankment Settlement*, shows the development and presents a means to correctly design an approach slab which considers the interaction between the approach slab and the supporting embankment soil underneath.

The final paper of this issue is titled *Experimental Study on Moment-Plastic Rotation Capacity of Hybrid Beams*, by Ito, Nozaka, Shirosaki, and Yamasaki. In this paper the moment-inelastic rotation behavior of hybrid steel girder bridges is experimentally investigated. Inelastic rotation capacities are experimentally obtained and then are compared with predicted moment-inelastic rotation curves by White and Barth. It was concluded that hybrid girders have a greater deformation capacity than homogeneous ones and that the prediction curve is more conservative for girders with a higher web slenderness ratio.

There is a discussion and a closure in this issue in regards to *Dynamic Behavior of Deck Slabs of Concrete Road Bridges*, by Broquet, Bailey, Fafard, and Brühwiler. In his discussion, Gilbert H. Béguin concludes that the extensive modeling which was performed by the authors should be experimentally evaluated.▪

ASCE/SEI Announce Public Comment Period

ASCE/SEI will conduct a public comment period on revisions to ASCE 25-97, *Earthquake Actuated Gas Shutoff Devices* beginning July 1, 2005, and concluding on August 14, 2005. The standard provides minimum functionality requirements for earthquake actuated automatic gas shutoff devices and systems (hereafter referred to as *devices*) meant to include mechanical devices consisting of a sensing means and a means to shutoff the flow of gas. To participate in the Public Comment Period, contact ASCE Standards Coordinator Eileen Boeing at **eboeing@asce.org**.▪