

## RESEARCH

# Skyscraper Sway Generally Confirms Predicted Behavior

**U**nprecedented research on behavior of skyscrapers has so far determined that U.S. design assumptions generally are valid in predicting building sway. Researchers, who monitored three instrumented Chicago towers over three years, are seeking more funding to expand the sample.

The goal of the \$250,000 study, funded by the National Science Foundation with the Chicago Committee on Highrise Buildings, is to confirm or adjust design assumptions relating to building sway under wind and to fine-tune structural design. The project, led by Ahsan Kareem of the University of Notre

Dame's Dept. of Civil Engineering, also includes the Chicago office of architect-engineer Skidmore, Owings and Merrill and the University of Western Ontario.

So far, the buildings are performing "substantially as predicted" by wind tunnel tests and computer-based structural analysis models, though no large storms have occurred, says Robert Sinn, an associate partner with SOM.

Relating to fundamental periods of vibration, standard structural modeling assumptions can reliably predict in-situ periods of an uncoupled steel frame, one not connected to a frame in the orthogonal di-

rection. However, assumptions made in modeling the reinforced concrete building cannot be wholly validated because levels of cracking as-

**Monitoring program is first in U.S. focused on existing tall buildings and wind.**

sumed in the various service states have not been realized yet. Also, it is likely that the in-situ modulus of elasticity is higher than that assumed in the model, say the researchers. With respect to damping during annual wind events, the study revealed damping levels assumed at 1% for serviceability design were likely conservative for

concrete and even coupled steel frames. The 1% damping assumption seems appropriate for the uncoupled frame. Evaluations of pre-

dicted accelerations from wind tunnel tests revealed that data from full-scale monitoring followed the trend of the wind tunnel predictions.

The study has stumbling blocks. One is getting permission to instrument buildings from owners and engineers. Another is getting cooperation from building managers. ■