



TEXAS TECH UNIVERSITY

National Wind Institute™

Finite Element Simulation Models for Tornado Shelter Door System

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2:30 p.m. to 3:30 p.m.

Room 120 in Experimental Sci Building (on campus)

The practice of installing tornado shelter doors that have not been tested for debris impacts or wind-induced pressures has become a widespread problem. Interest in this problem has since peaked and its importance was highlighted when a fatality occurred in Arkansas in May 2014 as an inward-swinging shelter door was impacted by a tornado-generated missile, damaged structurally, and opened. One person taking refuge in the shelter was killed, and another was injured. Manufactured doors capable of withstanding the wind pressures and debris impacts equal to F5 tornadoes are available on the open market; however, such tested doors proven capable of meeting requirements are expensive compared with some untested duplicates with similar features. Currently NWI does have the test bed for debris impacts or wind-induced pressures for tornado shelter door system and it has about 40 year experiences. However, this test bed can only provide the test results for available doors and it can't provide information how to design a better and optimal door system.

This talk will present the results from the NWI discovery project. This project has developed a finite element simulation model and validated this model through lab experiments. Based on the validated model it can be used for assessing current available tornado shelter door systems and designing new optimal door systems. In addition, it can be used to simulate the response to other lab untested conditions to save time and money. This model is useful to test causes and effects easily. The validated simulation model can be easily adapted for design purpose for optimal design of the door systems through advanced finite element simulation tools.