

Wall of Wind Mitigation Challenge (WOW! Challenge) – May 22nd, 2013

Teams comprised of South Florida high school students brainstormed innovative wind mitigation concepts within a well defined problem scope developed with IHRC academia. These concepts were then tested by the 12-Fan Wall of Wind, which was developed by the International Hurricane Research Center at Florida International University. The students focused on developing hurricane mitigation techniques that lead to human safety, property loss reduction, insurance cost reduction, and a "culture of preparedness" for natural disasters. This experience also increased student interest in pursuing an education and career in areas related to wind engineering and hurricane mitigation. South Florida media and distinguished hurricane experts attended and participated in the competition, giving IHRC the opportunity to showcase its research projects and the Wall of Wind.

The objective of this year's *Challenge* was for students to design a way to reduce the impact of wind scour on a building with a flat roof. Each student team was supplied with a model flat roof which would be attached to a building model representing a one-story building. Each team's task was to develop a mitigation solution that would improve the building's aerodynamic performance in order to prevent gravel on the roof from being blow away by hurricane-force winds. The mitigation solutions were actually tested by the real 12-Fan Wall of Wind in a controlled wind field to evaluate the effectiveness of the mitigation solution.

The mitigation solution could be created by:

1. Constructing a parapet on the roof.
2. Constructing and attaching a mitigation device along the upper edges of the building's walls.
3. Constructing and attaching a mitigation device along the perimeter of the roof
4. Any combination of options (1) and (2) and (3)

Teams from six South Florida high schools participated in the competition. They were from Miami Coral Park Senior High School, Jose Marti MAST Academy, Booker T. Washington High School, North Miami Senior High School, Homestead High School and Miami Northwestern High School.

An informational workshop detailing this year's *Challenge* was done for teachers and students before the actual competition. It was recorded and the video and workshop PowerPoint were made available on the *WOW Challenge* web page. The *Challenge* consisted of three required components, a physical test, a written paper and an oral presentation. All of the details of the *Challenge* rules and guidelines for the three required components are also found on the *WOW Challenge* web page located at: <http://www.ihrc.fiu.edu/outreach-education/wall-of-wind-challenge-2013/>

The Physical Test Description:

- Physical tests occurred on a uniform cube (3ft x 3ft x 3ft). These cubes represented a building with a flat roof. Teams will be provided with the top portion of the cube (3ft x 3ft x 0.5ft), which represented the flat roof, on which they attached their mitigation solution (see Figure 1).
- Gravel was applied on top of the flat roof. As stated, the objective will be to reduce the amount of scour on the flat roof.
- As shown shaded in green in Figure 2, the restrictions for the mitigation solutions if using a solid parapet, were to be no more than 1½ inches tall and ¾ inch thick. This parapet could be made out of any material.
- There was no restriction as to what could be placed in the area that extended 2¼ inches out of the top outer corner of the parapet and 6 inches below this same point. Any material could be used here. This area is shaded in black in Figure 2.
- In the 3" by 6" area above the area shaded in red, any material used was required to be 40% porous or greater. Proof of porosity was required. This area is shaded in red on Figure 2.

- Any type of non-hazardous material was allowed and considered acceptable for designing the mitigation solution, given that the solution complied with the construction guidelines. Some common examples of acceptable materials included (but are not limited to) wood, foam, plastic, metal, white glue, super glue, and epoxy.
- No material that extended outwards from the walls were to be used to decorate the building models. Paint, stickers, etc. were acceptable. The flat roof was not to be tampered with in any way.

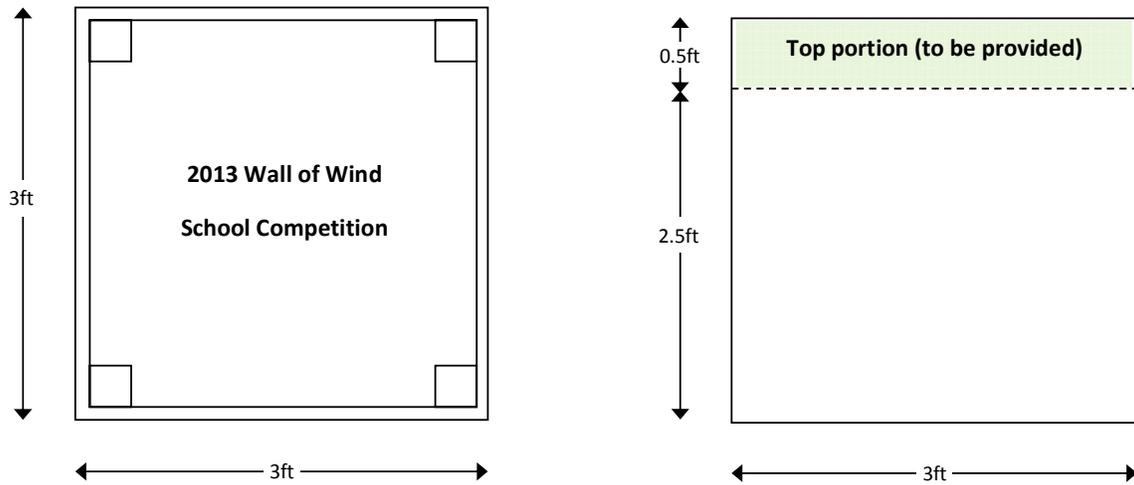


Figure 1. Plan and side views of the building model.

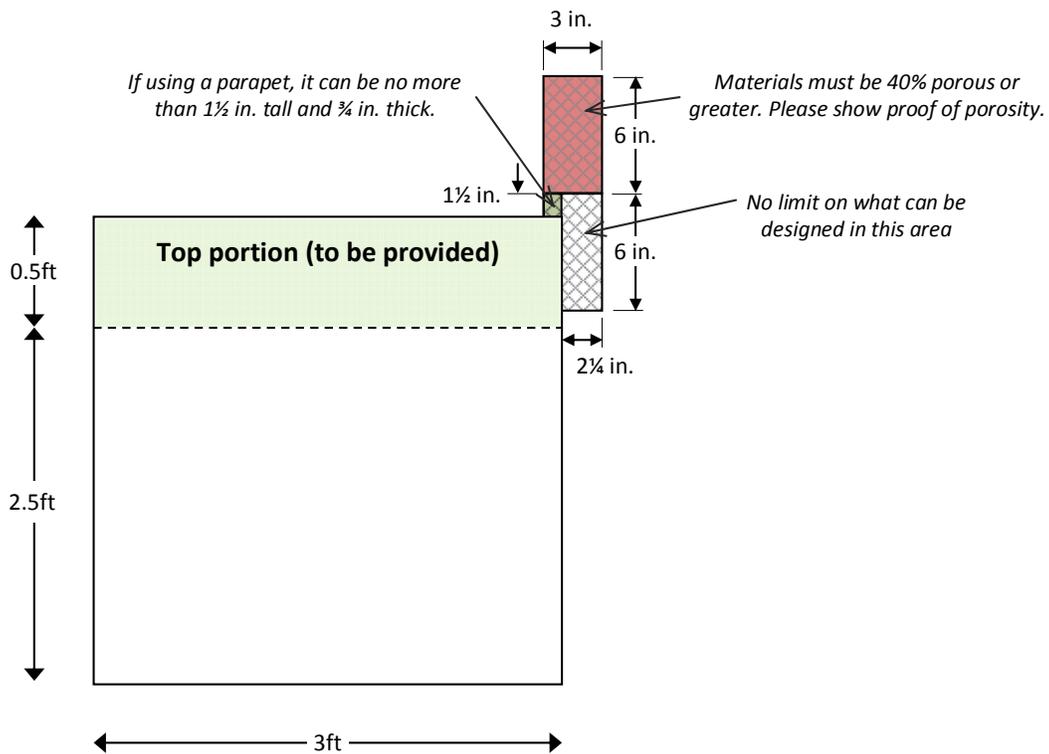


Figure 2. Design parameters for the building model.

Physical Testing:

- Student teams brought their flat roof models to FIU on May 22nd, for live testing. During the competition, each team's flat roof model was attached to the building model and tested by the 12-Fan Wall of Wind.
- All building models were tested with a 45° wind angle of incidence.
- The building models were subjected to wind forces with increasing intensity, up to Category 1 hurricane force. Each wind speed interval was maintained for 30 seconds.

The Oral Presentation Description:

- The oral presentations were no more than 7 minutes in length.
- Oral presentations should effectively communicate some scientific process or analysis involved with the development of the hurricane wind mitigation solution.
- Oral presentations should also communicate the benefits and values of the hurricane wind mitigation solution, similar to a new business presentation to potential investors.
- How is hurricane wind mitigation being addressed with your mitigation solution?
- What is hurricane wind mitigation? What is the importance of hurricane wind mitigation?

The Written Paper Description:

- The written papers were no more than three pages in length and were submitted to IHRC and scored before the on-site competition of the physical tests and oral presentations.
- Written technical papers should include any scientific or mathematical process and analysis involved with the development of the hurricane wind mitigation solution.
- How is hurricane wind mitigation being addressed with your mitigation solution?
- What is hurricane wind mitigation?
- What is the importance of hurricane wind mitigation?

All three required components of the competition were judged and scored by a combination of IHRC academia and a panel of experts.

The judges included the following individuals:

- Arindam Gan Chowdhury, PhD, Wall of Wind Director, International Hurricane Research Center
- Ioannis Zisis, PhD, Assistant Professor, Dept. of Civil and Environmental Engineering, FIU
- Peter A. Irwin, Ph.D., Wall of Wind Professor of Practice
- Amy B. Aiken, Director, Department of Emergency Management, Florida International University
- Cathie Perkins, Emergency Management Planner, Office of Emergency Management, Miami-Dade Fire Rescue Department
- Gladys A. Barrio, Ph.D., District Science Supervisor, Division of Mathematics, Science, and Advanced Academic Programs, Miami-Dade County Public Schools
- J. Sebastian Oddone, District Supervisor, Office of Academics and Transformation, Miami-Dade County Public Schools
- Max Mayfield, former NHC Director and WPLG-TV Hurricane Expert
- Jaime D. Gascon, P.E., Supervisor, Product Control Section, Miami-Dade County Department of Regulatory and Economic Resources (RER)
- Timothy R. Smail, SVP Engineering and Technical Programs, Federal Alliance for Safe Homes

The scores from the judging for all three required components were added up for a cumulative total and were used to determine the top three teams; the final results were as follows:

- *First Place* achieved by Miami Coral Park Senior High School.
- *Second Place* achieved by North Miami Senior High School.
- *Third Place* achieved by Booker T. Washington High School.

Once again the *Challenge* was supported by local media. The media coverage resulted in a Total Publicity Value amounting to \$8,824.72. This resulted in great positive visibility in the community for IHRC, FIU and FLDEM's message of mitigation. The following media representatives participated:

- Max Mayfield, WPLG-TV, ABC-TV, former Director, National Hurricane Center
- Florida International University News



Student Team giving their oral presentation.



Another student team giving their oral presentation.



Judges and students observing a physical test.



Live viewing in the Operations & Control Center.



Switching out rooftop building models for next test.



Pouring gravel on rooftop model for next test.



Max Mayfield, WPLG-TV



Media coverage of Wall of Wind Challenge



Student team taking pictures of their rooftop.



Judges scoring a rooftop model.



Judges in front of the Wall of Wind.



Judges scoring another rooftop model.



Discussion between Judges and student team.



Student team with their rooftop building model.



WOW Challenge rooftop models.



1st Place Team - Miami Coral Park Senior HS



2nd Place Team - North Miami Senior High School



3rd Place Team - Booker T. Washington High School