



WOW! CHALLENGE 2018

FIU WALL OF WIND (WOW) MITIGATION CHALLENGE

Physical Guidelines

Updated: 03-11-18

1. Design Objective

- 1.1: The objective for the 2018 *FIU Wall of Wind (WOW) Mitigation Challenge* is to reduce the wind-induced force on a building's foundation, by optimizing its overall shape. A schematic diagram of this interaction is shown in Figure 1. Mitigation solutions will demonstrate a sound comprehension of aerodynamic principles. Teams are tasked with developing a mitigation solution that will improve a building's aerodynamic performance in order to reduce the reaction forces and moments on a scale model of the building. The building models will be tested by the FIU Wall of Wind to evaluate the effectiveness of the mitigation solution. The mitigation solution may be created by re-shaping an allowable portion of the building model. Teams must develop and construct their building design in compliance with the requirements and restrictions described in this document below.
- 1.2: A workshop providing *WOW Challenge* information and describing the wind engineering principles related to this year's competition was conducted at the FIU Engineering and Computing Center on February 23rd. An archived video of the workshop will be available on the *WOW Challenge* web page. The PowerPoint used for the workshop will also be available on the PowerPoint section of the web page. **Please also review the technical questions covered in the FAQ Document in the Documents section of the web page.**

2. Scale Building Model Requirements and Restrictions

- 2.1: Each team will construct a building model and have it tested by the FIU Wall of Wind.
- 2.2: The goal is to construct a building model that will remain upright, not blown over, to as high a wind speed as possible.
- 2.3: The building model will be a minimum of 32 inches high (i.e. total height), which includes a gold painted wooden base (8x8x2 inches) which will be provided for each team; see Figure 2.
- 2.4: Above the lowest 2 inches of the building model, which is the gold painted wooden base, and up to at least 30 inches above the base, the building model must have a minimum **solid** width of 8 inches, or wider; see Figure 3.

- 2.5: Any shape, above the lowest two inches of the gold base, can be used as long as it always has a minimum **solid** width of 8 inches when viewed from any and all directions; see Figure 4 for shape examples.
- 2.6: All building models will be tested for two wind directions at 90 degrees to each other; see Figure 4 for wind directions on various shapes. The building model will be prevented from sliding during the Wall of Wind tests by a small ½ inch high stop that will be placed at the back and side edges of the gold base.
- 2.7: The goal is to have a building model shape that has the least tendency to be blown over by the wind when tested for the two directions at 90 degrees to each other. The wind speed for each of the two directions will be gradually increased until the model blows over. The higher the wind speed at which this happens, will result in a higher score for the team.
- 2.8: The weight of the building model must no greater than 40 lbs. The center of gravity must be directly above the center of the 8 inch square gold base (within 0.05 inches) and must be within 1 inch of the mid-height of the model building.

Other remarks:

- Any type of non-hazardous material shall be allowed and considered acceptable for designing the mitigation solution, given that the solution complies with the construction guidelines described in sections 2.1-2.8. Some common examples of acceptable materials include (but are not limited to) wood, foam, plastic, metal, white glue, super glue, and epoxy.
- Wind speeds will be measured by the FIU Wall of Wind team; competing high school teams will be able to watch their building model tests from the Wall of Wind Operations & Control Center Building.
- Each student team will be provided with \$50 for buying materials and supplies. Students are permitted to spend more than the provided \$50, but these additional costs shall be the responsibility of the student team.

3. Physical Test Requirements and Restrictions

- 3.1 : High school teams will bring their building models to FIU on May 23rd. During the competition, each Team's model building will be tested by the FIU Wall of Wind, which will generate incremental wind speeds (Figure 5).
- 3.2 : Only one building model will be accepted from each high school team for wind testing.
- 3.3: Safety is paramount during the competition and wind testing. Safety guidelines will be described to all student teams. The Wall of Wind team will be responsible for preparing and securing the building models for the wind testing. Student teams will NOT enter the Wall of Wind Building during testing of the building models. Everyone is required to wear a FIU safety hard hat in the Wall of Wind Building before and after the wind tests.

3.4: Prior to wind testing, Judges will inspect the building models to verify that the design and mitigation solution is in compliance with the requirements and restrictions listed in Section 2; the Judges reserve the right to disqualify from competition any design and or mitigation solution that is found to be in violation of the rules and regulations listed in Section 2.

4. Scoring

4.1 : The score for each high school team for the wind tests will be calculated as follows. Two “blow-over” speeds will be recorded for each building model; one for wind direction 1 and one for wind direction 2 at 90 degrees from the first direction. The score will be the lower of these two speeds plus 0.9 x the higher of the two speeds.

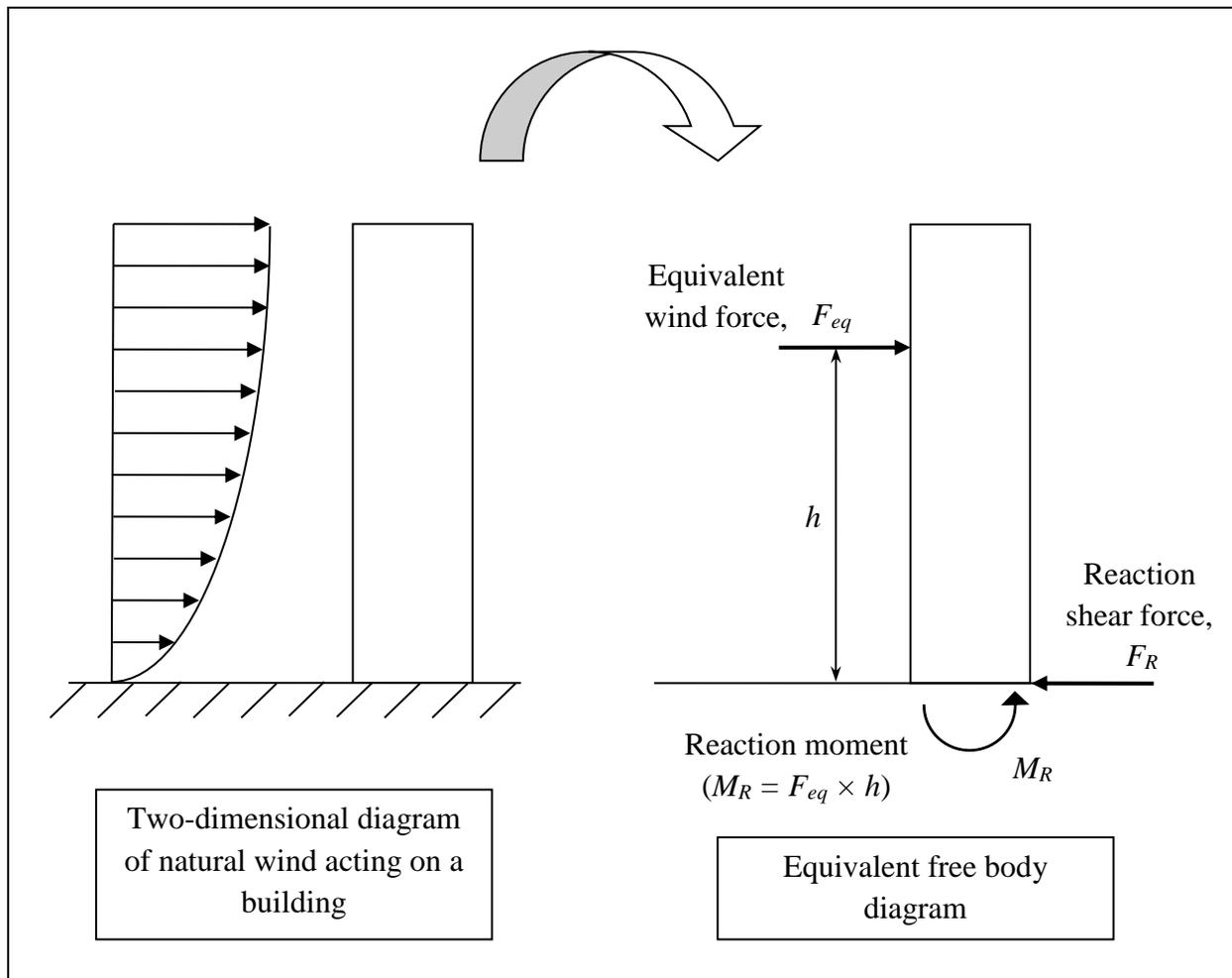


Figure 1: Simplified two-dimensional schematic diagram of wind acting on a tall building, and the equivalent free body diagram. Note: across wind forces and moments may also exist, and will act into or out of the building.

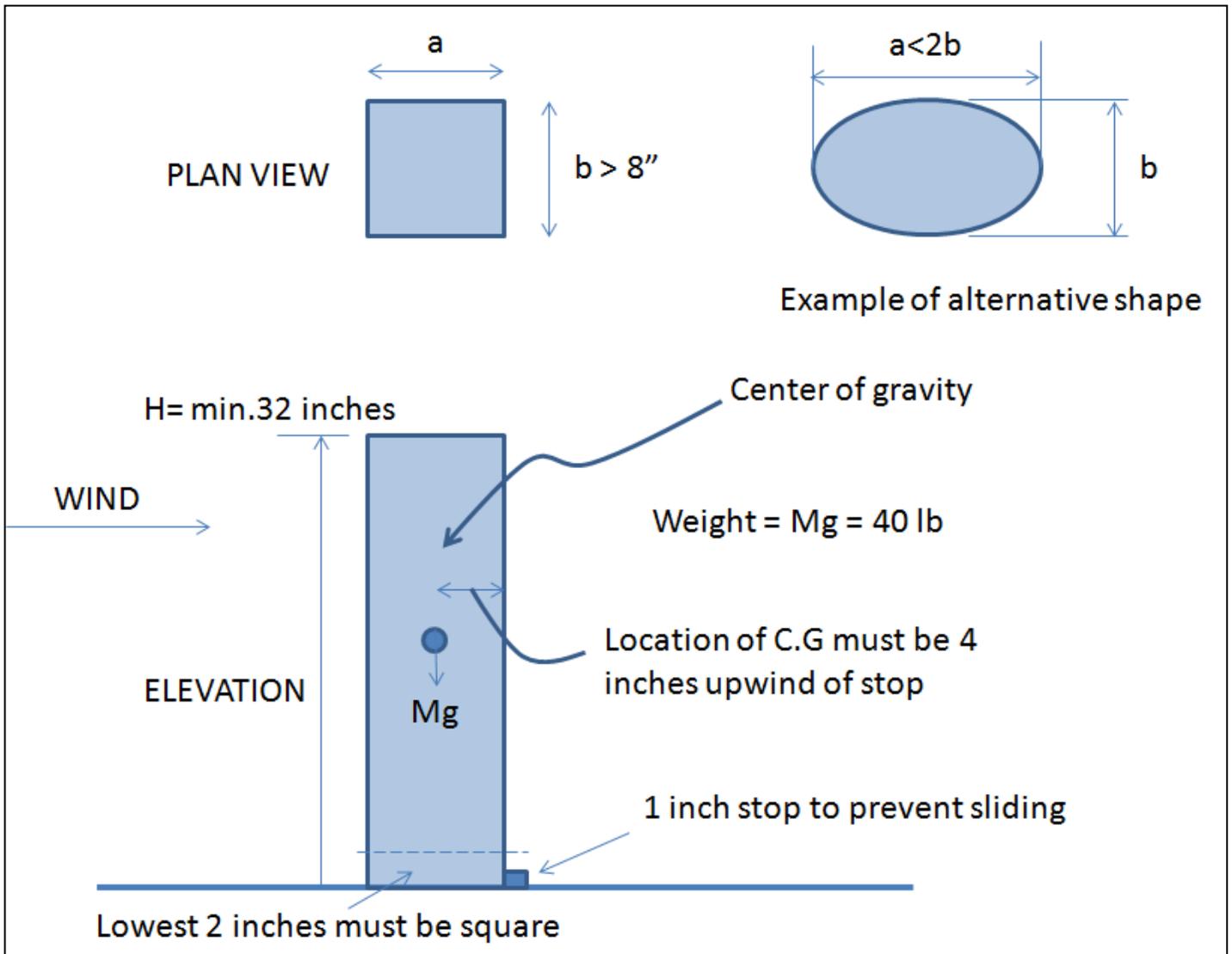


Figure 2: Schematic diagram of the building model, showing dimensions of side and plan views.

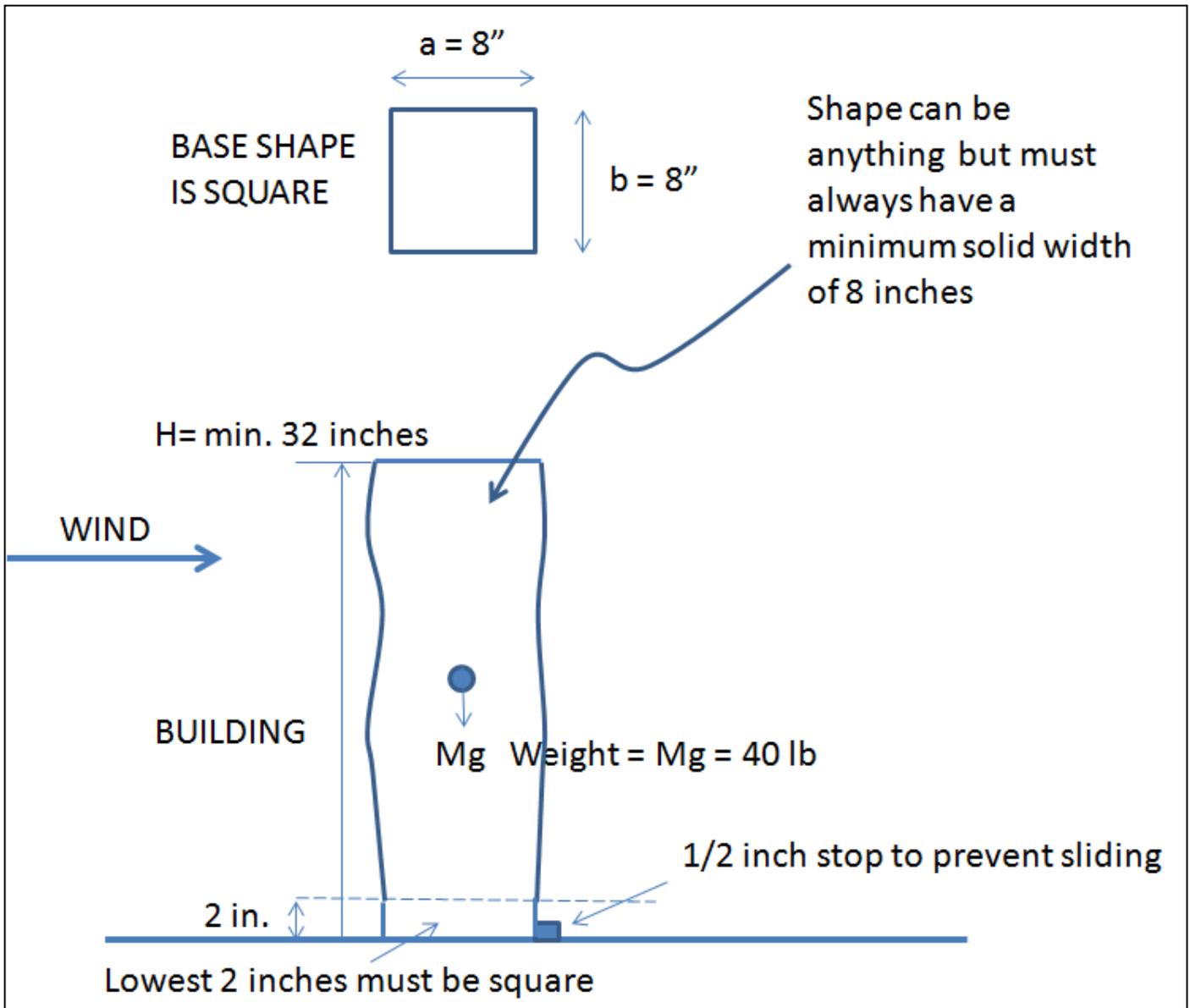


Figure 3: Schematic diagram of the building model, showing variable shape above the 2-inch rectangular shape.

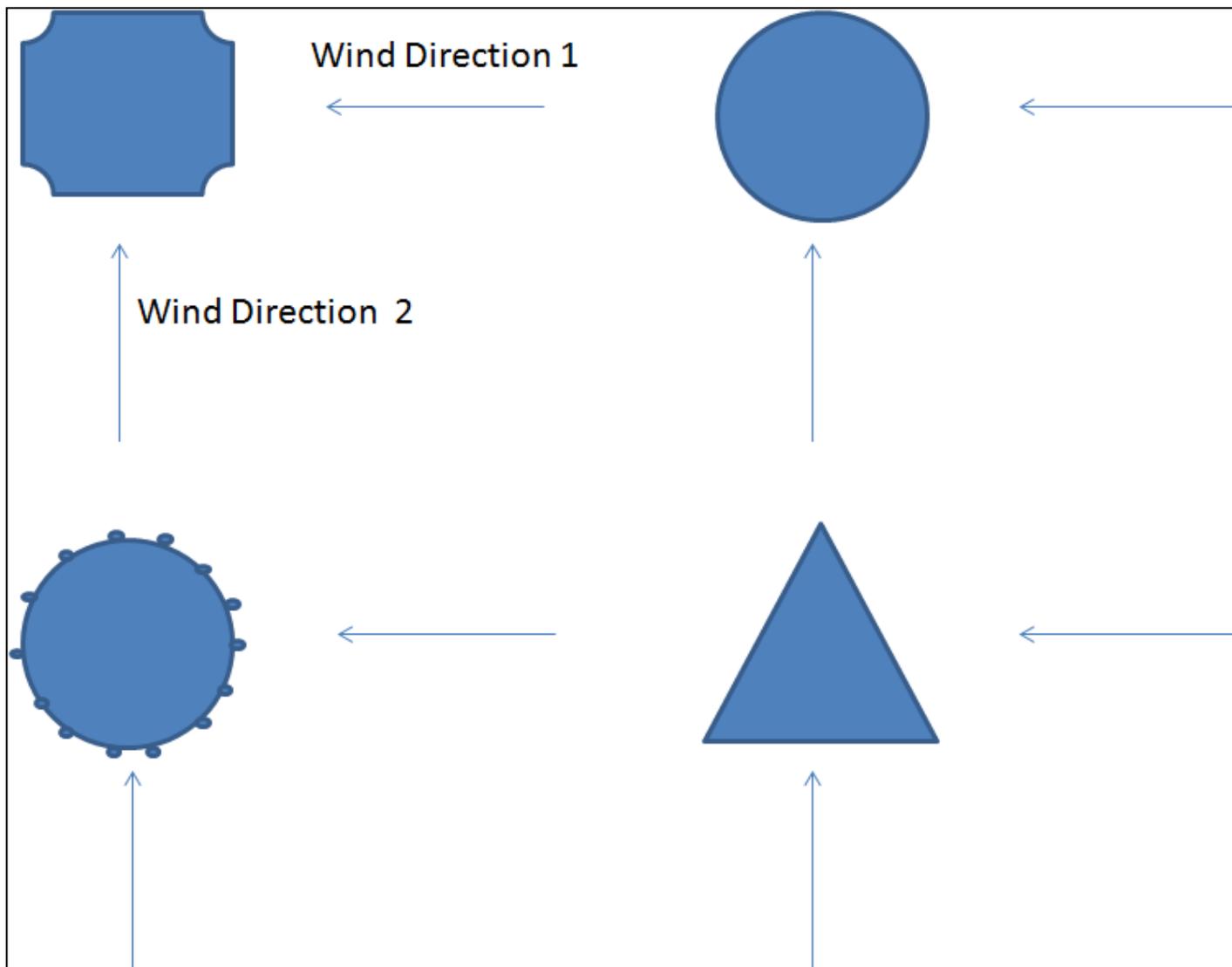


Figure 4: Examples of allowable cross-section shapes and wind directions that will be tested by the FIU Wall of Wind.



Figure 5: The FIU Wall of Wind will test the building models for the 2018 Wall of Wind Mitigation Challenge; the FIU Wall of Wind can generate sustained wind speeds up to the highest classification in the Saffir–Simpson Hurricane Scale, a Category 5 hurricane.