The Debris Cannon Labratory

Introduction

The Debris Cannon Laboratory is a joint venture between Department of Civil, Construction, and Environmental Engineering and the Alabama Center for Insurance Information and Research.

In many parts of the country, a resilient building envelope design needs to consider loads from extreme wind events such as hurricanes and tornadoes. These events not only create very large wind loads but also contain wind-borne debris that impacts a building envelope. From post-event field observations, structures tend to be struck multiple times by multiple types of flying debris. A debris cloud can contain anything that is picked up from the ground such as vegetation or rocks to broken building components such as wood framing or roofing material.
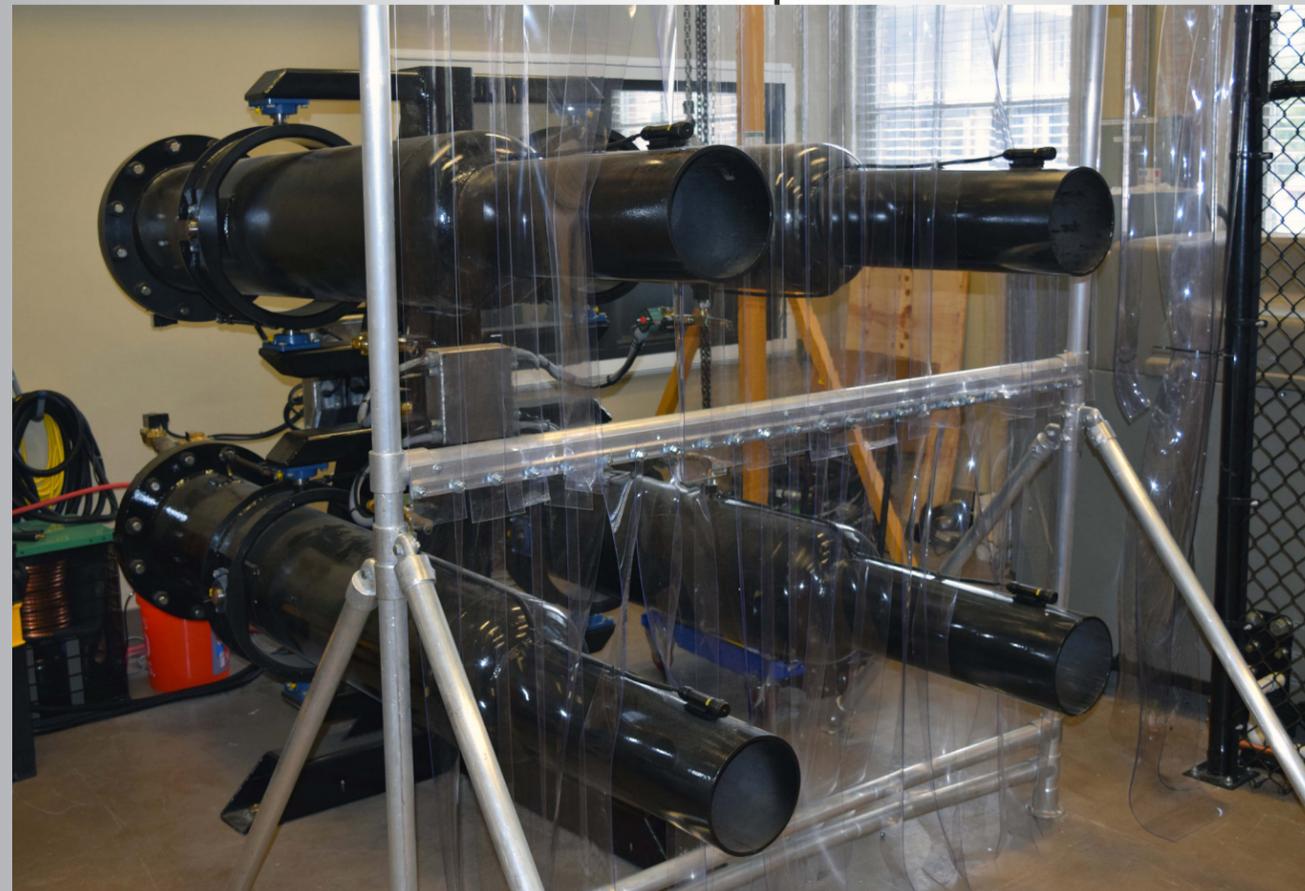

The Debris Cannon

The cannon can independently or simultaneously launch debris from each of the four barrels. Each barrel can be independently loaded with unique material, aimed, and fired at different speeds.

The University of Alabama commissioned a four-barrel debris cannon to simulate and study building envelope damage caused by wind-borne debris. The ability to launch four projectiles allows researchers to strike a structure at four different critical locations either simultaneously or in succession.

Two high-speed cameras track the speed of the flying debris as well as capture the impact area to study how the specimen failed.

The lab will be equipped with a load frame that allows forces to be applied on building components to simulate twisting or racking movements during wind events. The cannon can be used in this laboratory setting or mounted on a mobile platform in order to test specimens in the field.
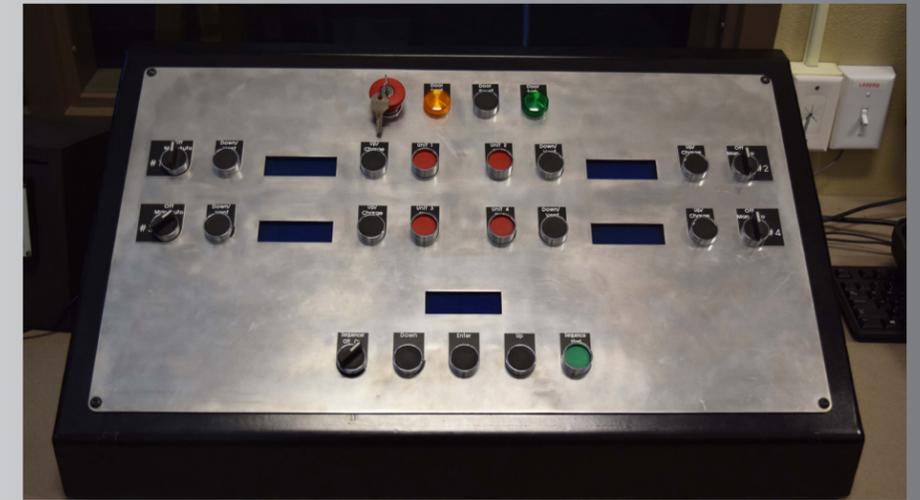

Testing

Testing will be done for the following practical applications:

- Simulate wind-borne debris
- Research and develop new innovative products to help resist wind-borne debris damage
- Recreate damage post-storm to determine more precise wind speed in damage band
- Impact test specimens with multiple debris to simultaneously represent debris cloud

Data Acquisition

The cannon is controlled through mechanisms like the controller and pressure gauge, while the data is tracked through other devices like high-speed cameras and Speedgoat Data Acquisition.

Far Left: Debris Cannon Port, *Left*: Technicians prepare demonstration, *Below*: The Debris Cannon

Top: Debris Cannon Controller, *Center:* High Speed Cameras, *Left: R*esults of demonstration show damage caused by flying debris, *Above:* Pressure Guage.