Blast-Resistant Products

BLAST PROTECTION TESTING PROCEDURES & RATINGS

GRAHAM ARCHITECTURAL PRODUCTS

Testing Methods

Photo courtesy of Architectural Testing, Inc., York, PA

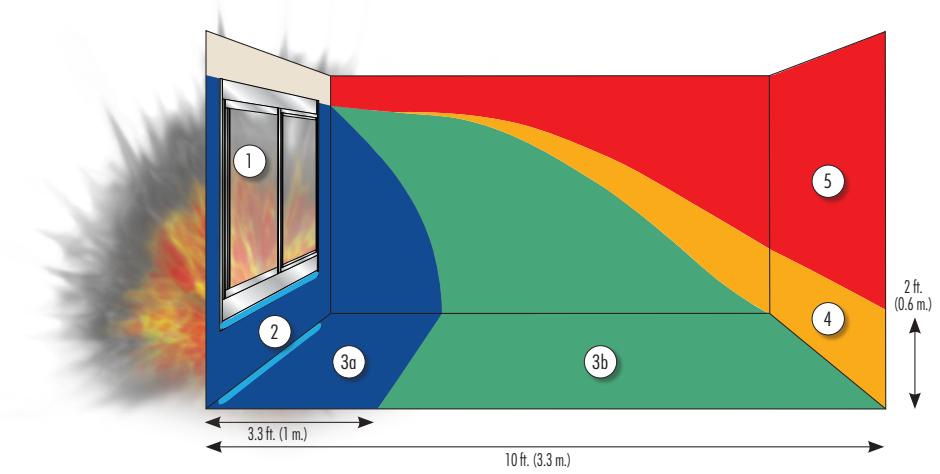
Shock Tube Testing is a test method using a compressed gas charge to simulate an explosion's blast pressures.

Arena Testing is conducted with an actual explosive charge of specified weight, positioned at a predetermined standoff distance. This test produces both the positive and negative phase blast effects.

FPED VI, Quantico, V

Both of these test methods measure the debris entering the room, as a result of the blast. Each tested window's "injury hazard performance condition" is graded from 1-5 (higher numbers signify more hazard to occupants). The weight and distance of the charge help determine pressure and impulse to calculate blast loading.

The General Services Administration (GSA) & American Society for Testing and Materials (ASTM) both have testing methods and rating levels for fenestration products and glazing subjected to blast loads. The information at the right summarizes each and compares them side by side.



GSA Performance Conditions and ASTM Hazard Ratings

GSA Condition	GSA Description	ASTM Rating	ASTM Description
1	Glazing does not break. No visible damage to glazing or frame.	No Break	The glazing is observed not to fracture, and there is no visible damage to the glazing system.
2	Glazing cracks but is retained by the frame. Dusting or very small fragments near sill or on floor acceptable.	No Hazard	The glazing is observed to fracture but is fully retained in the facility test frame or glazing system frame, and the rear surface (the surface opposite the airblast loaded side of the specimen) is intact.
3a	Glazing cracks. Fragments enter space and land on floor no further than 3.3 ft. from the window.	Minimal Hazard	The glazing is observed to fracture, and the total length of tears in the glazing plus the total length of pullout from the edge of the frame is less than 20% of the glazing sight perimeter. Also, there are less than 3 pinhole perforations and no fragment indents anywhere in a vertical witness panel located 3 m (120 in.) from the interior face of the specimen, and there are fragments with a sum total united dimension of 25 mm (1.0 in.) or less on the floor between 1 m (40 in.) and 3 m (120 in.) from the interior face of the specimen. Glazing dust and slivers are not accounted for in the rating.
3b	Glazing cracks. Fragments enter space and land on floor no further than 10 ft. from the window.	Very Low Hazard	The glazing is observed to fracture, and is located within 1 m (40 in.) of the original location. Also, there are three or less pinhole perforations and no fragment indents anywhere in a vertical witness panel located 3 m (120 in.) from the interior face of the specimen, and there are fragments with a sum total united dimension of 25 mm (1.0 in.) or less on the floor between 1 m (40 in.) and 3 m (120 in.) from the interior face of the specimen. Glazing dust and slivers are not accounted for in the rating.
4	Glazing cracks. Fragments enter space and land on floor and impact a vertical witness panel at a distance of no more than 10 ft. from the window at a height no greater than 2 ft. above the floor.	Low Hazard	The glazing is observed to fracture, but glazing fragments generally fall between 1 m (40 in.) of the interior face of the specimen and 0.5 m (20 in.) or less above the floor of a vertical witness panel located 3 m (120 in.) from the interior face of the specimen. Also, there are ten or fewer perforations in the area of a vertical witness panel located 3 m (120 in.) from the interior face of the specimen and higher than 0.5 m (20 in.) and none of the perforations penetrate through the first layer of the witness panel.
5	Glazing cracks and window system fails catastrophically. Fragments enter space impacting a vertical witness panel at a distance of no more than 10 ft. from the window at a height greater than 2 ft. above the floor.	High Hazard	Glazing is observed to fracture, and there are more than ten perforations in the area of a vertical witness panel located 3 m (120 in.) from the interior face of the specimen and higher than 0.5 m (20 in.) above the floor, or there are one or more perforations in the same witness panel area with a fragment penetration into the second layer of the witness panel.

1/2012

Check website for most current information including other installation and hardware options: www.grahamwindows.com
1551 Mt. Rose Avenue, York, Pennsylvania 17403-2909 • email: info@grahamwindows.com • (800) 755-6274 • 717-849-8100