



Glass Informational Bulletin

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## Bullet Resistant Glazing

### Introduction

Bullet resistant glazing provides an improved safety barrier against ballistic attack. Bullet resistant glazing materials include all-glass laminates, glass-clad polycarbonate laminates, and other laminated or monolithic plastics.

Typical applications include banks, currency exchanges, police stations, embassies, military installations, prisons, detention centers, government offices, and schools.

### Ballistics Test Standards

Ballistics testing is conducted on each of the components of the bullet resisting system (i.e., frame, glass, speakholes, passthroughs, etc.); therefore, the glazing is tested as a stand-alone component separately from the system. The test standards for glazing include:

- Underwriters Laboratories (UL) Standard 752 - *Standard for Bullet Resisting Equipment*
- National Institute of Justice (NIJ) Standard 0108.1 - *Ballistic Resistant Protective Materials*

Other forced entry test standards that include ballistics testing are:

- ASTM F 1233 - *Standard Test Method for Security Glazing Materials and Systems*
- H.P. White Laboratories - HPW-TP-0500.03 - *Transparent Materials for Use in Forced Entry or Containment Barriers*
- US State Department – SD-STD-01.01 – Certification Standard – Forced Entry and Ballistic Resistance of Structural Systems
- Walker McGough Foltz & Lylerla (WMFL) - *Ballistics and Forced Entry Test Procedure*

Ballistics tests specify levels of performance based on test ammunition, nominal bullet mass, suggested barrel length, required bullet velocity, and number of shots. Typical test ammunition is specified as armor piercing, full metal jacketed, jacketed soft point, long rifle high velocity, round nose, or semi-wadcutter.

The protocol may also require testing of the glazing at cold, ambient and hot temperatures. The performance of glazing products may change with test temperature.

Most test protocols included a method for evaluating the effects of spall (flying material fragments) that may come off the rear face of the glazing material when impacted by a bullet.

UL 752 has multiple levels of performance with a supplementary shotgun level. The NIJ and ASTM standards have six levels of performance.

It is important to note that there are differences between the ammunition caliber, loading and manufacturer specified in the standards, as well as differences in required shot patterns and methods for measuring spall. These differences can make a difference in whether a specific glazing construction passes or fails one of these tests.

In addition, it is important to note that a ballistics glazing product qualified at one level may not provide the performance required for a higher ballistics level.

## **Test Reports**

Ballistics testing is conducted in a controlled laboratory environment to evaluate performance based on any of the tests referenced above. Test reports can be requested from the glazing manufacturer or security system manufacturer to demonstrate compliance with a particular test method.

## **Certification Programs**

Underwriters Laboratories offers a certification program for ballistics system components. Therefore, manufacturers of glazing can elect to list their bullet resistant glazing products for use in other certified ballistics frames of the same level of performance. This means, for example, that a UL Level 1 ballistics glazing is suitable for installation in a UL Level 1 ballistics frame.

Manufacturers participating in the UL program are required to send glazing samples to UL on a routine basis for testing. They are also required to demonstrate their participation in the program through the application of a third-party label on the glazing. UL publishes the names of companies that have “listed” products for ballistics.

## **Conclusion**

Bullet resistant glazing provides improved security in a variety of commercial, institutional, and government settings where ballistic attack can occur. Glazing is designed to provide a safety barrier from bullet penetration and flying fragmentation. Testing of the glazing to one of the ballistics test standards is required to demonstrate ballistics performance. Proper specification of bullet resistant glazing will include the level to which the glazing has been tested.



*The Glass Association of North America (GANA) has produced this Glass Informational Bulletin solely to provide general information as related to bullet resistant glazing applications. The Bulletin does not purport to state that any one particular type bullet resistant glazing product or procedure should be used in all applications or even in any specific application. The user of this Bulletin has the responsibility to ensure the design, engineering and installation guidelines from the bullet resistant glazing and window system supplier(s) are followed. GANA disclaims any responsibility for any specific results related to the use of this Bulletin, for any errors or omissions contained in the Bulletin, and for any liability for loss or damage of any kind arising out of the use of this Bulletin.*

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