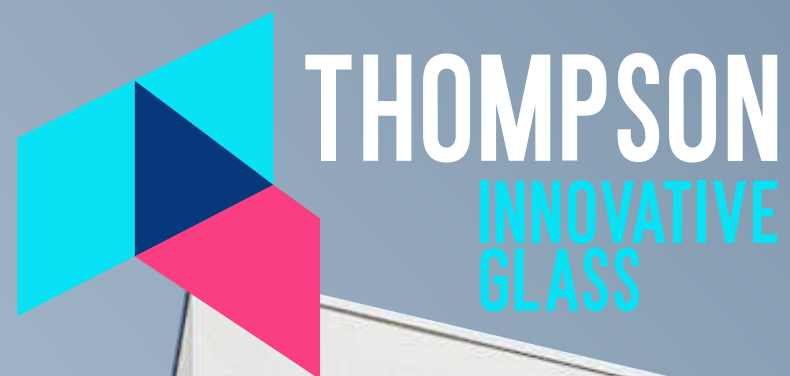




DEFENDER™

Bullet-Resistant & Forced Entry Protection Glass

- + Safety & Security
- + Design Freedom
- + Storm Protection
- + 3rd Party Certified
- + Occupant Comfort
- + Sound Attenuation

UNM McKinnon Center

Thompson's line of Defender® glass products offers a clear view of the outside while protecting those inside.

As an industry leader in advanced glass and lamination technologies, Thompson Innovative Glass offers customers throughout North America a full line of custom glass products. Our Quality Management System is ISO 9001:2015 Certified, delivering the highest quality products.

The Defender glass series offers many choices and eliminates specific threats. Defender's forced-entry protection products have been tested to withstand extensive physical attacks.

Several Defender products also offer different levels of bullet resistance (BR). Our Defender BR-rated products are certified through third-party testing to meet and exceed industry standard UL safety code requirements for those levels.



FM 734735

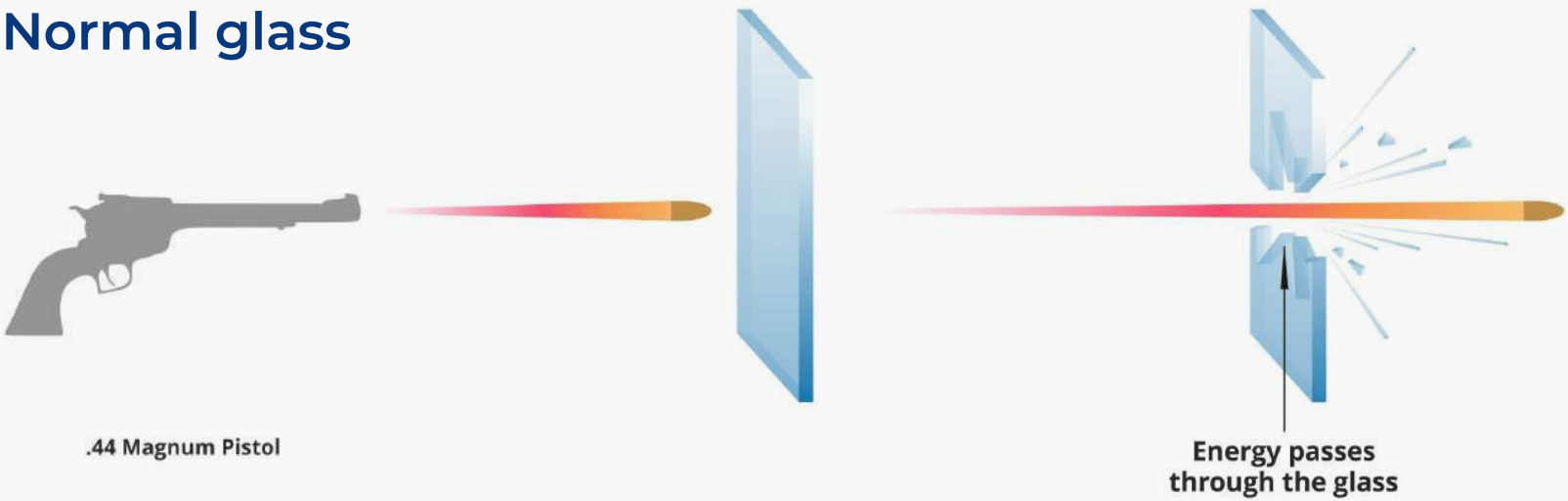
Bullet-resistant levels

Bullet-resistant level ratings are specified by UL-752 based on the type of weapon used and the type and number of rounds fired. As weapons get larger, the ammunition gets bigger in size and also increases in speed, resulting in higher amounts of energy hitting the glass. Generally, more layers and thicker packages are needed to

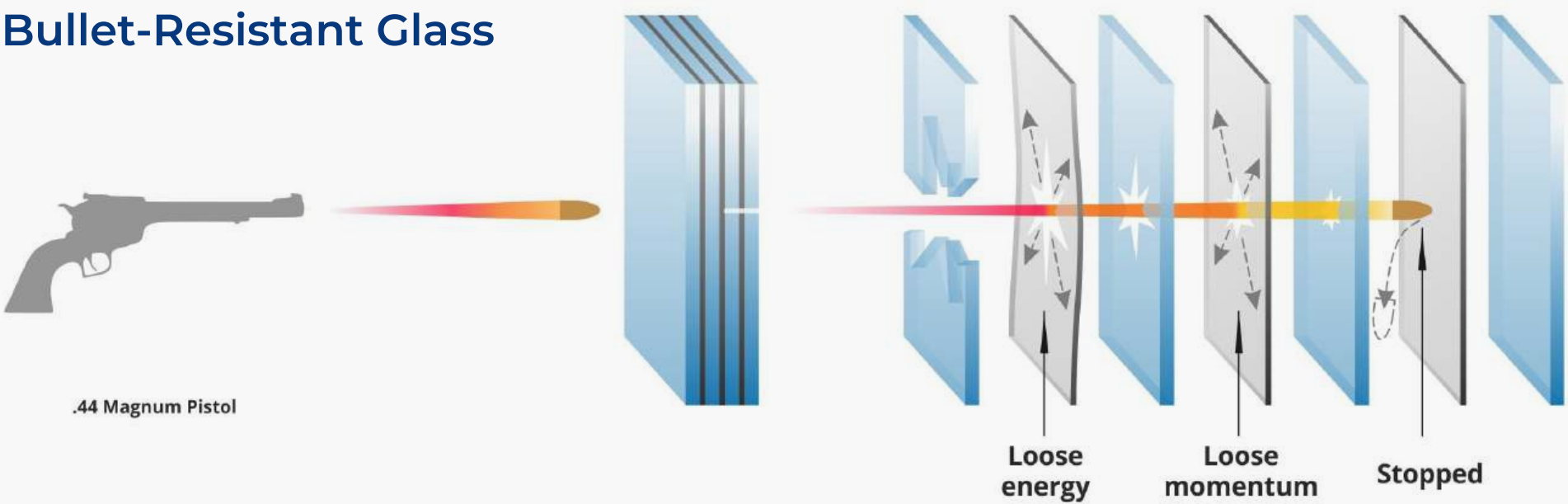
successfully dissipate that energy and stop the bullet.

In accordance with UL-752, bullet-resistant glass starts at level 1 and levels increase based upon weapon size and more powerful ammunition. Our Defender BR products follow these levels and, for many of these levels, offer no-spall and low-spall versions.

Normal glass



Bullet-Resistant Glass



Defender BR Glass Overview

Defender bullet-resistant glass meets your need in the education sector as well as for retail and commercial applications. Additionally, these products can be customized in various ways such as low-E, tints on minored glass. Defender supports UL 752 levels 1-8

UL 752 level ballistic rating	Weapon	Ammunition
1	 9mm Pistol	 9mm Full Metal Copper Jacket with Lead Core
2	 357 Magnum Pistol	 357 Magnum Jacketed Lead Soft Point
3	 44 Magnum Pistol	 44 Magnum Lead Semi-Wadcutter Gas Checked
4	 30-06 Hunting Rifle	 30 Caliber Rifle Lead Core Soft point (30-06 Caliber)
5	 AR-10 Assault Rifle	 7.62mm Rifle Lead Core Full Metal Copper Jacket Military Ball (308 caliber)
6	 Uzi Sub Machine Gun	 9mm Full Metal Copper Jacket with Lead Core
7	 M16 Assault Rifle	 5.56mm Rifle Full Metal Jacket with Lead Core
8	 NATO Semi-Automatic Rifle	 7.62 x 51-mm, 150-grain M80 FMJ copper jacket

Please visit our [website](#) for complete details

No-spall vs Low-spall

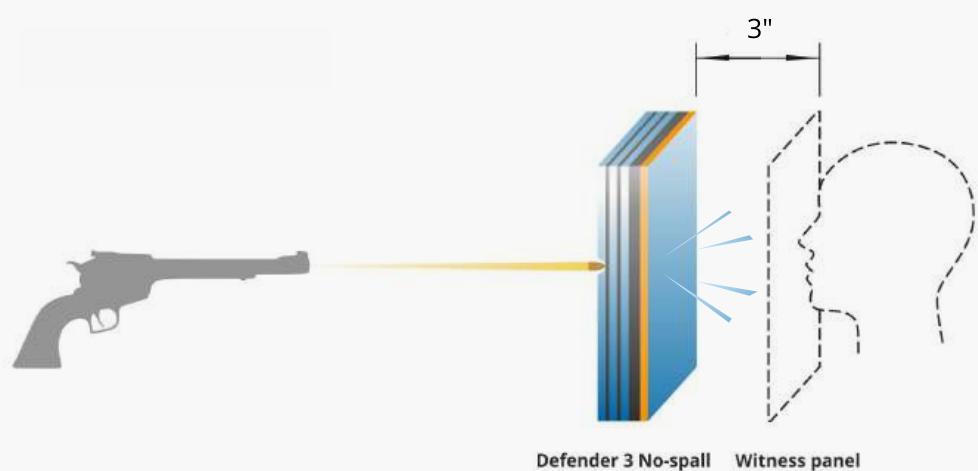
Any glass that gets hit by a bullet must absorb a large amount of energy in a split second. For certain glass make-ups, this may result in some very small fragments of glass coming off the witness-side (the inside) of the unit. These small fragments are referred to as 'spall'.

Our Defender products offer no-spall (NS) and low-spall (LS) versions for several UL-752 levels.

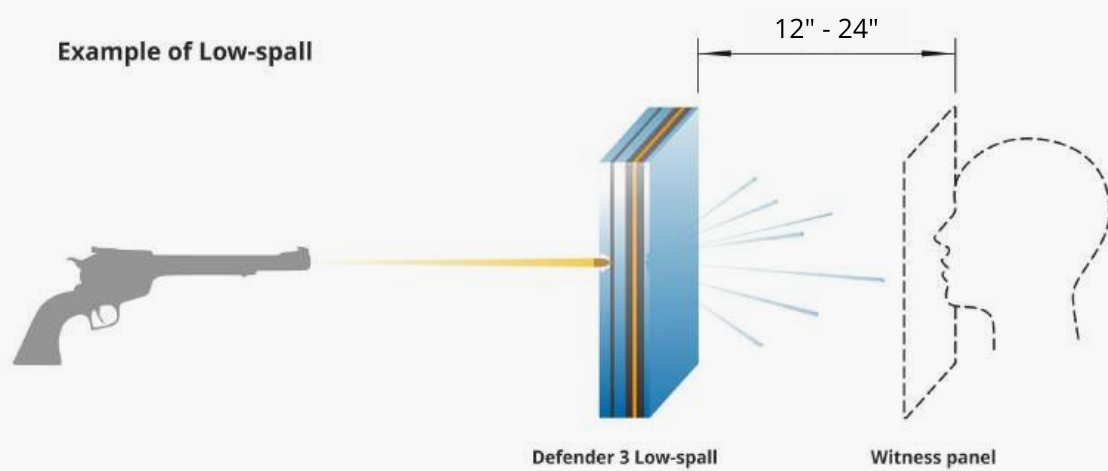
To determine spall during the testing procedures, a witness panel, made of thin cardboard or aluminum, is placed behind the glass to determine how far glass fragments may travel without penetrating this panel.

Our low-spall products provide a cost-effective way to offer protection where no-spall is not required.

Example of No-spall



Example of Low-spall



Laminate vs Film

When it comes to security glass, two common approaches are laminated glass and film adhered to the glass. Both methods enhance the security and impact resistance of standard glass, but they differ in terms of construction, performance, and durability.

Laminated Glass

Laminated Glass is made by sandwiching layers of glass with a polyvinyl butyral (PVB) or other specialized interlayers. These interlayers bond the glass together, making it stronger and resistant to shattering. The main benefit of laminated glass is its strength and impact resistance. The interlayer makes the glass much harder to break, and even when cracked, the pieces stick to the interlayer, preventing easy entry. Laminated glass also features uniform performance across the entire surface, providing reliable protection against break-ins. Laminated glass can block harmful UV rays, reducing fading of interior furnishing and offers soundproofing benefits, reducing noise pollution. Depending on the application, laminated glass can be manufactured to provide both forced entry and bullet resistance in the same installation.

Film Adhered to Glass

Adding film is an aftermarket solution applied directly to the surface of existing glass. These films are made of a polyester or similar material that holds glass shards together if the glass is broken. While films can be applied to almost any existing glass, making them a versatile solution, they don't provide the same level of protection against force as laminated glass. In addition, film can be scratched or degraded over time, reducing its effectiveness.



Forced Entry Glass

Forced Entry Glass refers to a specialized type of glass that is designed to resist breakage or penetration attempts, typically through impact or blunt force. This glass is engineered for security purposes and is composed of layers of materials, such as laminated glass or a polycarbonate, that work together to absorb and dissipate energy when subjected to force. These layers are bonded together, often with a tough interlayer, making the glass highly resistant to shattering or being compromised. Thompson Innovative Glass has tested our Defender products to the ASTM F1233 standard and continues development to provide the end user with the best possible options.

Key Features

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Impact Resistance
Able to withstand blows from hammers, crowbars, or other tools typically used in break-in attempts.

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Durability
The glass is built for long-term use, retaining its security properties over time.

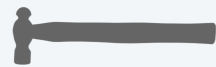
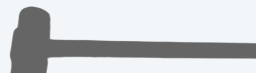
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Shatterproof
While the glass may crack under extreme force, it remains intact rather than breaking into pieces, preventing entry.

+

Customization
Can come in various thicknesses and layers depending on the level of protection needed.

Defender forced entry glass features multiple make-ups and performance levels and can be combined with energy efficiency products as well as bird-friendly materials

ASTM 1233 Sequence	Test Objects	Impacts	ASTM 1233 Test Achieved
1	 Ball Peen Hammer	10	1.0
2	 Ball Peen Hammer	10	1.1
3	 Pipe Sledge	25	1.2
4	 Fire Extinguisher	1 minute	1.3
5	 Sledge Hammer	25	1.4



School Security Glass

The glass used in schools for security is an essential ingredient in the mission to provide a safe environment. As the desired level of security threat varies by the school, it is common to use a mix of bullet-resistant glass and forced entry glass products to support security requirements in different areas of the school building. In addition to bullet-resistant glass and forced entry glass, ASTM F3561 was developed in response to the growing concerns around school safety, particularly in the wake of violent incidents like school shootings and other forms of intrusion.

The primary goal is to create a secure barrier while maintaining visibility and natural light in classrooms and common areas.

School security glass has several additional features that contribute to the overall safety and security of the school environment including the ability to maintain visibility and natural light and meet energy codes and standards with high performance glass.

Benefits for Schools

Increased Safety

Security glass offers peace of mind to teachers, students, and parents by providing a physical barrier that makes it much more difficult for intruders to gain access.

Cost-Effective Security

While more expensive than regular glass, security glass is a long-term investment in school safety. It requires little maintenance once installed and can be integrated with other security systems like locks and alarms.

Improved Learning Environment

Security glass ensures safety without compromising on the open, welcoming atmosphere that windows provide, promoting both a secure and positive learning environment.

Defender school security glass can be manufactured to meet ASTM F3561 when used in an approved system. Design options include tints, Low-E's, reflectives, decorative, and specialty glass. In addition, Thompson Innovative Glass has been active within the National Glass Association task groups including those that created the new test method for forced-entry-resistance of fenestration systems and several other technical documents in this space.

ASTM F3561 Level	Drop Height (ft.)	Accumulated Impact Energy J(ft*lbft)
1	0.50	100
2	1.00	300
3	1.50	600
4	2.00	1000
5	2.50	1500
6	3.00	2100
7	3.50	2800
8	4.00	3600

ASTM F3561

Standard Test Method for Forced-Entry-Resistance of Fenestration Systems After Simulated Active Shooter Attack. Active shooter glass testing consists of pre-weakening glazing using 10 shots with 556 M193 bullets, followed by escalating impacts with a 45-kg (100-lb) torpedo-shaped impactor. The standard consists of levels 1 through 8, with 8 being the highest. This is not a ballistic resistance test as the bullets are used to pre-weaken the glass and are anticipated to pass through.

Defender Glass – Benefits

Even though safety is generally considered to be the number one priority of those looking for forced-entry protection or bullet-resistant glass, there are actually many additional benefits.

- + Provides time for occupants to react and first responders to arrive
- + Increases mental well-being of building occupants
- + Offers the same aesthetics as regular insulated glass
- + Allows damaged glass to be replaced at your convenience because it remains functional
- + Reduces sound
- + Provides immediate safety
- + Deters criminals after initial attempt at impact
- + Adds additional benefit of severe weather protection when used as an exterior application



Why choose Defender Glass?

We know you have choices when it comes to forced-entry protection and bullet-resistant glass. So what makes Thompson's Defender glass unique?

1. One-stop shop

As a full-service glass fabricator, Thompson Innovative Glass offers a full line of glass products including insulated glass and laminated glass. This means that projects requiring safety glass and 'regular' insulated glass can get it all from the same source.

2. Insulated BR-rated glass

Unique in the marketplace, we can offer bullet-resistant rated glass that is insulated and will fit most window frame systems, combining safety with comfort and energy savings.

3. Customizable

Because we are a full-service fabricator, we can offer customized safety glass. Customizations can include low-E, tinted glass or one-way mirror glass.

4. Faster Lead Times

With a large team of dedicated employees, Thompson I.G. has the flexibility to pool manpower where most urgently needed. This results in faster lead times for you when you need your glass 'yesterday'.

5. Competitive pricing

As a full-service fabricator, we work on 'regular' insulated glass as well as on specialty glass products like bullet-resistant glass. This translates to zero downtime and lower overhead, resulting in very competitive pricing for you!

6. High-quality

With state-of-the-art dedicated clean rooms and multi-step inspection procedures, we guarantee high-quality.

7. A partner, not just a supplier

We partner with our customers. We offer advice, on-site visits and informational presentations to make sure that you end up with the best possible solution for your project.

DEFENDER GLASS. SAFETY WITH A VIEW.



Your Partner.

At Thompson Innovative Glass we are proud to do our part to keep building occupants safe. Instead of simply being a supplier, we enjoy partnering with you so you get the best solution and ROI for your specific project. When it comes to safety glass, we don't think one size fits all. So let's take a look at your project and figure out the best solution together.

Please contact us now at **810.629.9558** or send an email to **defender@thompsonig.com**

www.thompsonig.com

