Blast Shield
Blast Impulse

TASKDOOR include :
WOOD DOORS | STEEL DOORS | FRAMEWORKS | SPECIALTY DOORS

TASK
Safety & Security

Leader in door opening solutions supporting end-user for safety, security and suitability.

TASK Current - Keeping Pace with Changes

TASK - The leader in door opening solutions, committed to supporting end-user requirements for safety, security and suitability.

In response to the terrorist attacks, TASKDOOR began making blast-resistant doors and supplied them to government and private customers. Our engineering department having knowledge of specifications and application designed a door for the intended purpose.

Blast Relief

An increase in blast-type attacks and events has created a need for higher levels of protection in a wider range of applications. While total protection from bomb blasts and explosions is not possible, there are steps we can take to provide some relief to the extent or likelihood of damage.

Use of Blast Doors

For a retrofit or new design, blast-resistant doors are today a “grim reality of life”. The incorporation of blast-resistant doors for buildings has become a standard practice. It is clear that blast and ballistic resistant doors will benefit an extensive range of high profile structure in addition to protecting their occupants.

Meaning of Blast Resistant

“Blast Resistant” means that the door would have to withstand anything from a stick of dynamite to a truck bomb. Doors are built to withstand certain threat levels, to withstand pressures / impulses that model the effects of an explosion.

TASK Current

Blast-resistant doors are a key factor in lessening unnecessary injuries in the event of an accidental or intentional explosion. TASKDOOR was a pioneer in designing and manufacturing BLAST SHIELD doors. Now, TASKDOOR offers a full line of blast-resistant doors for all project applications at various protection levels, along with the specialized expertise necessary to deliver the appropriate product for your specific job.

The main advantages of TASK BLASTSHIELD solutions:

- Available with wood, hollow metal, doors and frames
- Available in a range of blast categories
- Available in a variety of design choices and options
- Can purpose designed door leaf system for all needs
- Provides long-lasting protection solution
- Robust design enhances operational reliability
- Shared aesthetic possible for mixed entrance systems
- Provided with all appropriate seals, thresholds and door bottoms(when required)

Blast Openings required on a Project

Consult TASKDOOR - your door manufacturer to help you get the information needed to quote and provide the correct product.

Security is a core responsibility of a door opening. The door, frame and hardware must work incordination to provide security from not only people, but also from fire, noise, storms, radio waves and explosions.

Protection from explosion requires high performance security. Blast openings are pivotal in securing buildings for the gas & chemical industry, military, embassy and government buildings. BlastShield door from TASK DOOR forge ahead with blast openings as they understand and perceive the type of product to supply.

Relevant information. The key to providing the correct products for blast is to know the relevant information required.

The details needed are:

- Specification with blast criteria listed
- Detailed take-off
- Elevations
- Section detail
- Frame anchorage
- Peak Pressure in psi (pounds per square inch)
- Impulse Load in psi ms (pounds per square inch-milliseconds)

Specification with blast criteria details included is critical in determining the correct door construction required. The specification will list the test standard and other details on blast size and standoff distance. A well written specification will also list the blast pressure and impulse load, both of which can be determined from the explosive weight and standoff distance. The specification might also reference “Level of Protection”, “Damage Category” or “Hazard Level”. All of this information helps determine the door construction needed to contain the blast pressure.

Detailed Take-off will provide the door size along with hardware. This information is needed to confirm the door construction provided will be correct.

Building Elevation provides the handing of the opening. It is very important to determine if the door is a seated (swings into the direction of the blast area) or unseated (swings away from the blast area) application. An opening that is seated has the advantage of using the frame to help support the door in a blast and does not require special hardware. In an unseated opening, the hardware is critical in keeping the opening secure because the frame only supports the door at the latch and hinge locations during a blast.

Section Detail and Frame Anchorage show the wall construction. The frame anchors and wall substrate are essential in keeping the frame intact. The frame provider has calculations that show how much pressure a particular anchor can withstand in various wall types.

Peak Pressure and Impulse Load is important for determining the door type needed to meet the particular building blast requirement. Both are calculated from the blast size (charge weight) and standoff distance (distance from the door to the blast origin). The blast size is referenced as Explosive Weight. The Explosive Weight is categorized as 1 or 2, with Explosive Weight 1 being a larger (vehicle type) explosive and Explosive Weight 2 a smaller (carried by a person) explosive charge. The standoff distance is the span in feet from where the explosive can go off in relation to the opening. The greater the standoff distance, the less force or pressure on the building or opening.

- The peak pressure is measured in Pounds per Square Inch (psi).
- The Impulse Load is also measured in psi along with Milliseconds (ms).
- The impulse load is the duration (length) of the blast load on the building or opening times the blast load (pressure).
- The peak pressure and impulse load are calculated by an engineer based on size of the explosive and the standoff distance.

Blast Hazard

Primary Fragments – is the most apparent hazard which consists of flying glass pieces and debris that can travel at very high speed.

Blast Pressure – It only takes 15 PSI to rupture eardrums and cause lung damage. Depending on the blast load and distance from target, the pressures created during an explosion can be extreme.

Secondary Fragments – such as rocks, and grime can be propelled at very high speeds and travel large distances. We can never completely protect against these secondary fragments.

Structural Collapse/Damage – The most devastating and deadly. Structural collapse occurs when a pressure load is stronger than the actual building components themselves, causing failure of the building structure.

Blast Protection - Anti-Terrorism Force Protection (ATFP)

Blast Protection – also commonly known as Anti-Terrorism Force Protection (ATFP), has increasingly become an area of focus in building / structure design due to hundreds of terror bombings around the world. Terror attack prevention and protection has become a top national concern.

TASKDOOR Deliver Superior BlastShield to environs

TASKDOOR BlastShield solutions provide a number of choices for environs with increased requirements that meet industry standards and government, military, and embassy safety and security objectives for blast resistance. Demonstrating leadership in door opening solutions TASKDOOR is industry's first to address blast - safety challenges. TASK DOOR with technical expertise generate manufacture products that meet or exceed the most stringent blast resistant requirements.

Collateral Damage - Loss of Life, Business Disruption, Property Damage

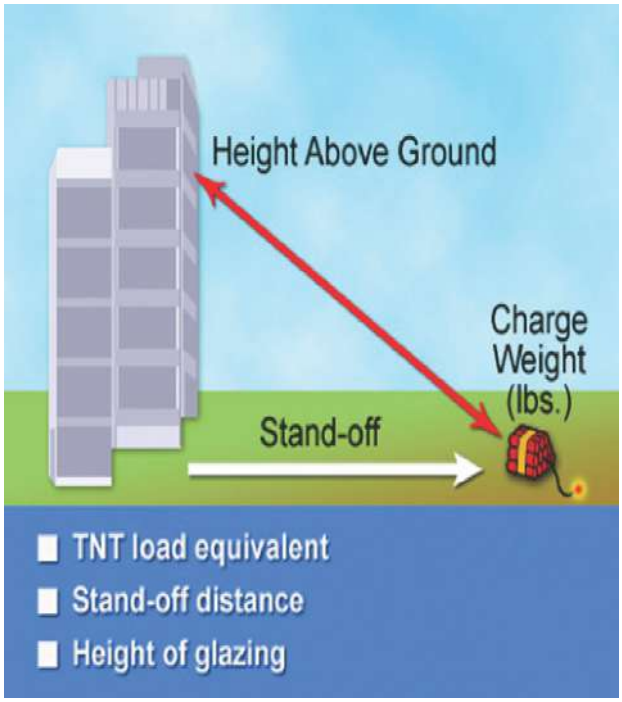
Blast hazards are not limited to the particular building where the blast occurs, but also the surrounding area, which is impacted to varying degrees. Buildings that were more than 10 blocks away can encounter broken glass and debris. Many buildings within a few blocks can sustain structural damage and can even collapse

Within a city, the pressure waves created by an explosion cannot readily escape. A portion of the pressure wave can dissipate upwards but much of it will move through the streets, reflecting and rebounding off buildings and pavement as it travels outwards from the origin of the blast.

Analysis of a Blast Event

Charge Weight
Amount of explosives used (TNT equivalent)
Typically measured in pounds or kilograms of TNT

Stand-off Distance
Distance from point of detonation to the target



Buildings are designed to meet certain pressures which are generated from two measurable points – charge weight and stand-off distance. The charge weight is the power of the blast, expressed as the equivalent weight of TNT that is considered to be what the building is likely to encounter.

This is a guess based on the local environment and assumed conditions from a potential threat assessment. This method of estimation has its limitations, as a large enough blast will overcome any preventive measures as a truck carrying the equivalent of TNT can explode right at the front door.

The stand-off distance is the distance between the building and the potential location for an explosive discharge is usually determined, at a minimum, by the "controlled perimeter," meaning a physical boundary which is accessed by vehicles or individuals is controlled, such as by fencing, concrete barriers or other means.

The greater the stand-off distance is, the lesser the explosive threat to the building. The key concept is that the further away the blast charge is from the target building, the greater the drop in blast wave pressure. This pressure drops exponentially as stand-off distance increases.

Duration & Pressure
Duration

- The time a blast pressure load is applied to the target
- 30-40 blast durations occur in 1 blink of the human eye
- Measured in mili-seconds (msec, thousandths of a second)

Peak Pressure

- Occurs instantaneously
- Dissipates exponentially
- Maximum pressure during incident

Over Pressure

- Pressure reading over atmospheric pressure

Analysis of a Blast Event

Reflected Pressure

- Pressure wave that has rebounded off the target or surrounding structures
- Peak & Over Pressure: Used interchangeably. It is just the maximum pressure generated by a detonation at the target or at the point of measurement of the pressure.

Air blast pressures occur very quickly and are typically measured in milliseconds. Results vary for differing structural materials. Flexible materials will absorb the energy and rigid materials resist the energy. Both are valid design approaches. Material strength will be affected by the choice of a flexible or ductile material.

Shock Wave

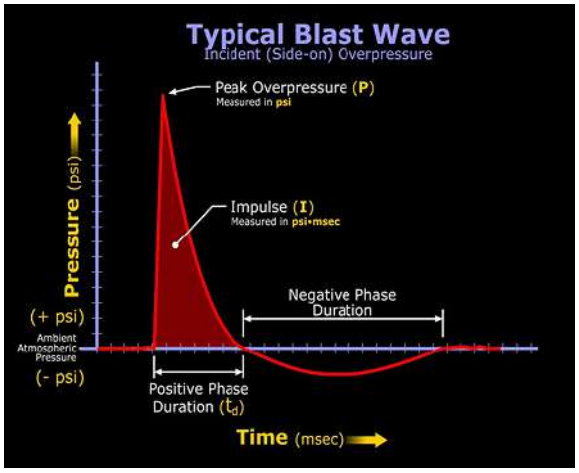
- Positive Phase of Pressure
- Time the pressure acts positively on an object

Impulse (very important)

- Area under pressure-time curve
- Measure of the total energy acting on an object
- Impulse= ½(t x d)
- t = duration & d = pressure

Negative Phase of Pressure

- Rush of air to fill the void behind the blast wave



Positive pressure
Pressure that is produced by a blast in a positive movement.

Negative pressure
When the positive pressure wave passes and the air tries to fill the void left behind, it is possible for doors to be sucked out of their test fixtures rather than blown into the protected area during blast testing.

The peak pressure of the blast and the time over which the initial pressure wave decays to zero together define the impulse energy delivered. While pressure is instantaneous, the delivered energy is cumulative, and is at the root of the damage that can result. Mathematically, the impulse energy is figured as the area under the pressure-time waveform.

Although blast loads are applied very quickly – within milliseconds – their characteristics exhibit a distinctive profile. As this graph shows, the typical waveform features a positive phase as the blast pressure acts from the exterior, characterized by a virtually instantaneous rise to the peak over pressure. There is then a rapid decay of pressure to zero.

The impulse as displayed on the curve above is the area under the positive over pressure blast curve. It is a function of pressure and time and is mathematically calculate by ½ x pressure x duration. This is the formula of area of a triangle ½ x base x height. It is essentially a triangle.

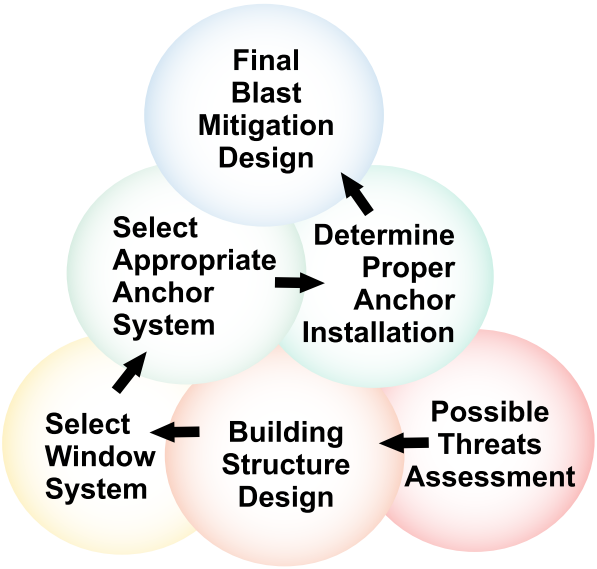
Designing Blast - Resistant Structures

Once the blast threat has been determined, a systems approach to justifying that threat is recommended. Using the combined criteria of the threat assessment, the available building preparation and a desired door system, the designer can develop a comprehensive blast justifying design solution.

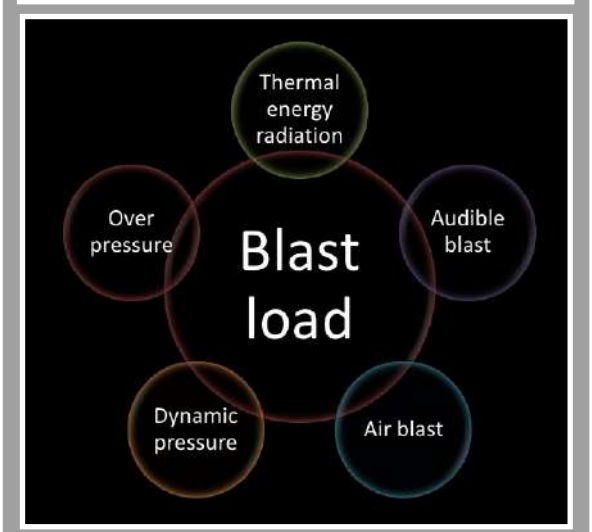
There are different types of blast threats; designs can be created for other explosives or combustibles as well as for TNT. For example in an oil refinery, the threat may be oil or gas explosions but “for blast” the threat has to be converted to equivalent TNT quantity in order to calculate the blast pressure and impulse.

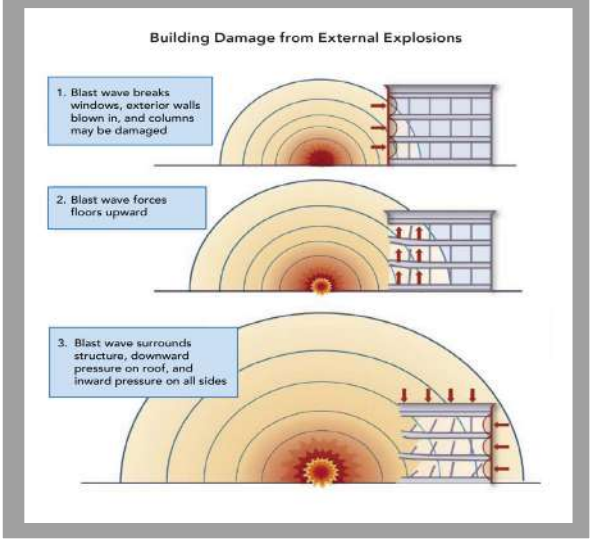
The building structure walls and supports need to be analyzed for blast resistance. The structure must support the blast load as well as the components within the frontage.

The selected doors must be of the proper operation type with an appropriate hinge system and installation detail. The hinges have to be analyzed and stresses calculated to withstand the projected load. Size and spacing as well as details of hinge to use for the designed conditions are given on approved drawings. Typically these are heavy duty engineered hinges. Door installation should be done by contractors experienced with blast door installation. Blast mitigation projects employ heavier duty units; thicker glass, larger and more hinges, and heavier frames.



Designing Blast - Resistant Structures





Building Preparation and Design

- A building cannot be designed to be blast or ballistic proof. The key is to limit the damage to an acceptable level.
- An important consideration is how extensive and how widespread is the “acceptable” damage.
- Good design is always a compromise between acceptable damage and product cost.
- Products can be designed to reflect (rigid) or absorb (flexible) energy.

Unknown factors make it impractical to attempt to prevent damage under all circumstances. The design objective is to mitigate the effects of a blast, to diminish the severity of damage and reduce the potential for injury and death.

For some buildings, blast resistance may not be possible / practical. In some situations the problem can be a trade-off between functionality and security; in other situations it may be costs. Determining what damage is acceptable can be a hard question to answer when dealing with human life and property assets.

Information Required for design calculations:

- Charge weight & Stand-Off
- Charge weight: lbs of TNT
- Stand-off: feet or meters

Pressure & Duration

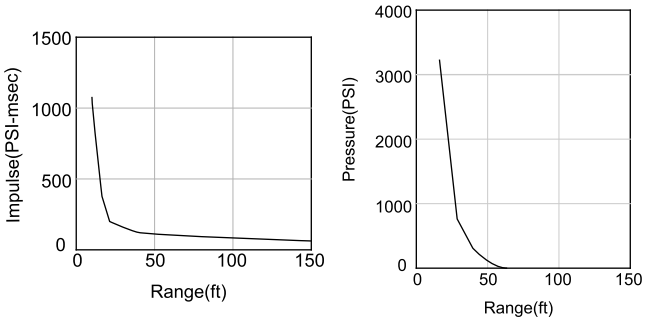
- Pressure: PSI or kPa (kilopascal)
- 1PSI = 1/7 x kpa
- Duration: msec
- Pressure & impulse
- Pressure: PSI or kPa (kilopascal)
- Impulse: PSI-msec

Designing Blast - Resistant Structures

Charge Weight and Stand-off : How Charge Weight & Stand-off Relate

- As charge weight increases, peak pressure increases
- Pressure decreases exponentially with stand-off distance
- As stand-off distance increases, peak pressure decreases, and duration changes (greater impulses)
- Both are used to determine Peak Overload, Pressure and Impulse

Buildings are designed to meet certain pressures and impulses which are generated from two quantitative points – charge weight and stand-off distance.



Analytical methods are used to determine or predict the blast effect of various threat levels on a building. Analytical methods exist in the form of several government sponsored software products available to designers.

3rd Party Tested Blast Assemblies

Free-Field Peak Positive Pressure Range	3.5 - 3.7 psi	24 - 26 kpa
Free-Field Positive Impulse Range	0.023 psi - sec	0.16 kpa - sec
Reflected Peak Positive Pressure Range	5.6 - 5.8 psi	39 - 40 kpa
Reflected Positive Impulse Range	0.035 - 0.039 psi - sec	0.24 - 0.27 kpa - sec

Test Methods

TASKDOOR are field tested

Open Arena

- Detonation of an actual explosive device is required
- Cannot be safely done on a project site
- Should always be performed by an experienced blast engineering firm

Shock Tube

- High pressure air pulses are released through a pipe or tube directed at the test specimen
- Can be performed safely in a controlled accredited laboratory setting

The arena test is an open - field test that most accurately reproduces the blast waveform by employing an actual explosion. It is the most costly option as peak pressure declines with distance from the blast, but the delivered impulse energy actually increases, a good arena test set-up must be quite large with long Stand-Off distances.

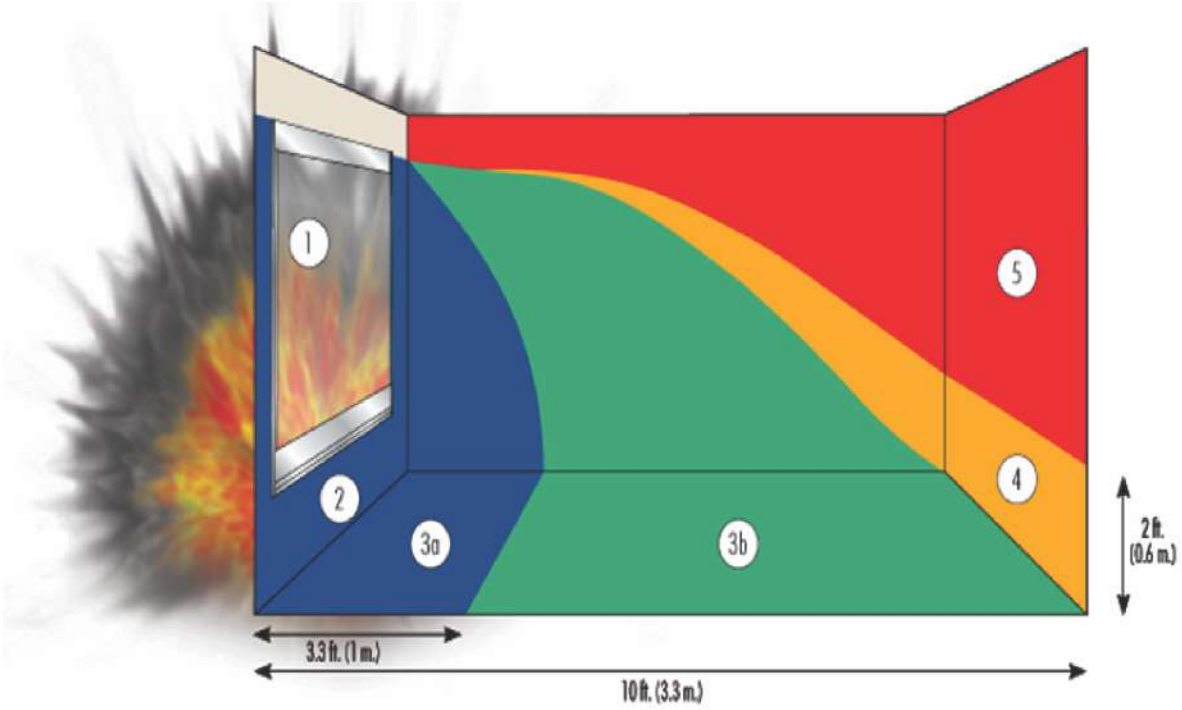
Blast qualification is performed by both laboratory and field testing as a means to quantify actual performance. For blast resistance, these test methods have developed over time from several sources. Both deal, in one way or another, with one or more of the two basic approaches to testing doors for blast resistance. These are open arena and shock tube testing. Both the open arena method and the shock tube method allows for testing of one door test at a time.

The shock tube test is a method that uses an air cannon powered by high pressure air or nitrogen. It provides a much better simulation of the positive phase of the blast waveform, and at low cost, but still does not address negative and rebound phases of the blast wave.

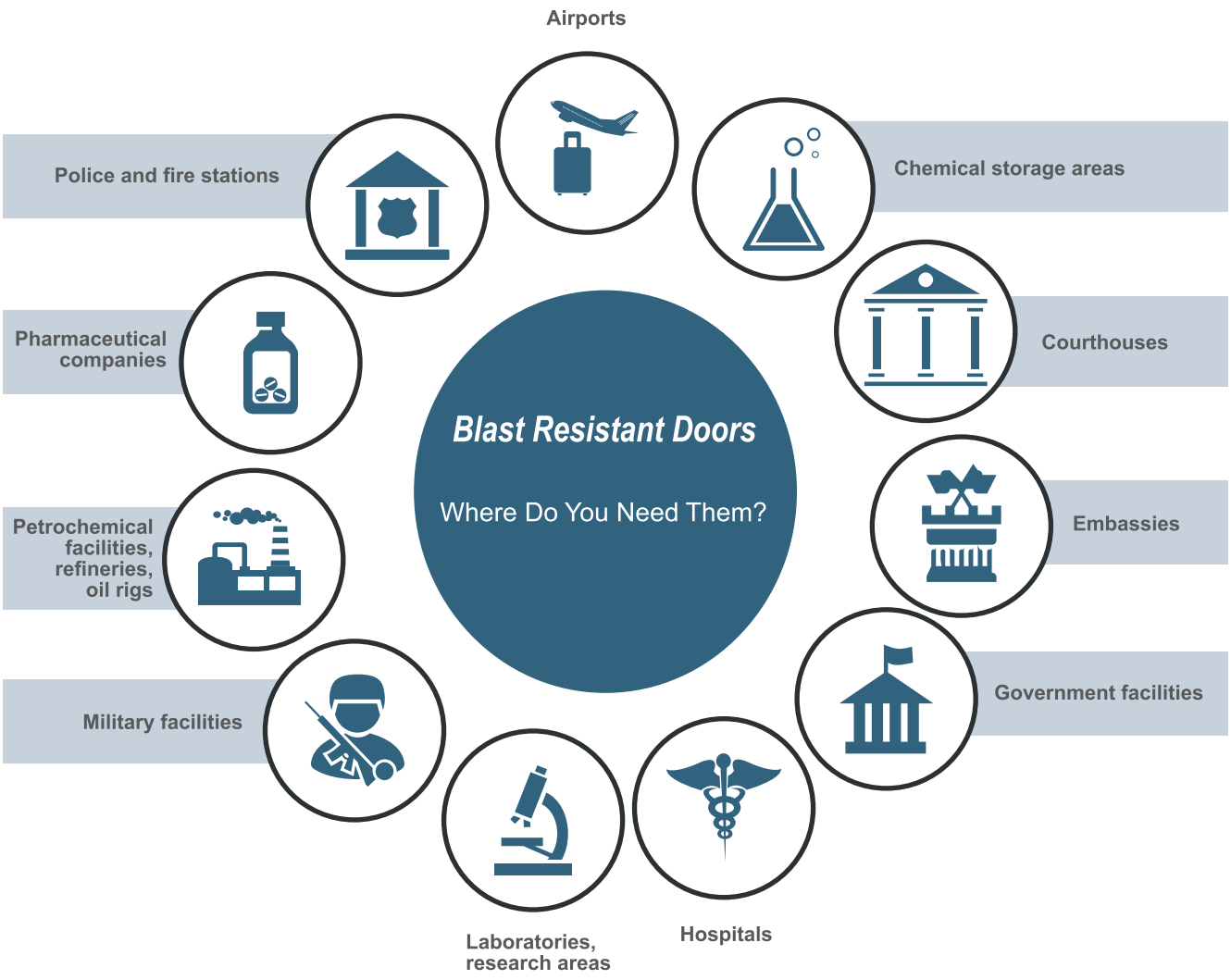
Due to the growing number of bomb attacks, several government and industry groups have developed blast testing methodologies that have developed over the past decade.

Hazard Classification

There are five injury hazard conditions that indicate how far debris penetrate into a room when the door and wall segment are subjected to a blast of calculated impact pressure. The protection performance conditions are numerically defined from 1 (“safe”) through 5 (“low protection”).



The chart shows injury hazard classifications 1 through 5


Airports
Chemical storage areas
Courthouses
Embassies
Government facilities
Hospitals
Laboratories, research areas
Military facilities
Petrochemical facilities, refineries, oil rigs
Pharmaceutical companies
Police and fire stations
Blast Resistant Doors
Where Do You Need Them?

TASKDOOR - Security Solution Providers

Our Security Solutions Providers and specification consultants work with distributors and end-users to ensure complete life-safety and security solutions for commercial facilities. This is achieved by understanding end-user needs and combining products accordingly. Support services include architectural education, technical expertise, and assistance with code compliance. Visit www.taskdoor.com to learn how we can help with your security and life-safety needs.

TASK Safety & Security

Leader in door opening solutions supporting end-user for safety, security and suitability.

Engineered Special Doors

Arora WOOD STEEL | Ambiente WOOD STEEL | Trankuil WOOD STEEL | BULLET RESIST | Pressure proof | BLAST SHIELD

Fire Rated Wood Doors

Grandeur

Grandeur

Non Fire Rated Wood Doors

Regal

Regal

Fire Rated-Non Fire Rated Steel Doors

Regente

Stalwart

Tiara

Majestic

Victor

Cresta

Hardware

LARES

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TASK is a brand.

TASKDOORS – BLAST SHIELD - BLAST IMPULSE