Blast Resistant Assemblies

The following content is an excerpt from SDI's AIA course ***Specialty Steel Doors: A Primer on Acoustic, Tornado, Stainless Steel and More***.

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Blast Resistant Door & Frame Assemblies

- Blast resistant door assemblies protect people and property from detonations resulting from high explosives, vapor clouds, fine dust clouds, chemical reactions, and more.

- They are specified for buildings where security is a concern or an explosive event would be possible, such as military bases, government offices, and industrial facilities.

Blast Resistant Door & Frame Assemblies

SDI members provide designs that can withstand peak blast pressures ranging from very low levels of less than 1 lb. per square inch (psi) to more than 50 psi, as well as long blast durations which increase the impulse loading.

Explosion risk

Blast Resistant Definitions

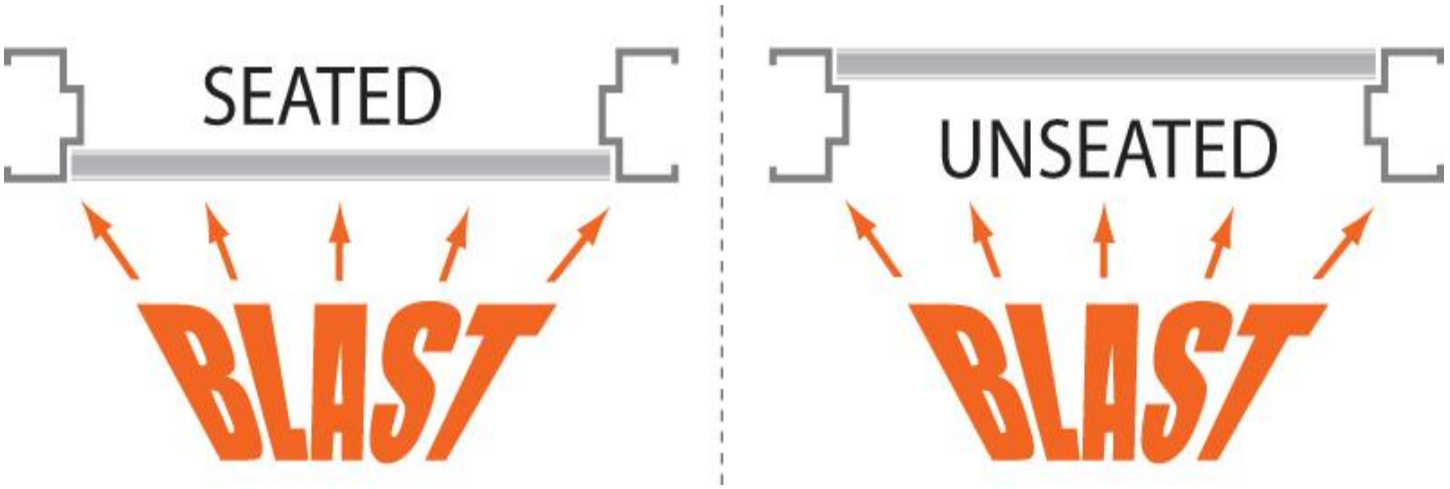
- **Blast pressure**: The maximum pressure expected to be exerted on the assembly by the projected blast event (measured in psi).

- **Blast duration**: Measured in milliseconds, the length of time required for the blast pressure to decay to zero.

- **Blast impulse**: The blast energy as described by the area under the pressure vs. time curve (measured in pressure-time units such as psi-msec).

Blast Resistant Definitions

- **Blast direction:** The direction of the blast load relative to the door assembly.



Blast Resistant Definitions

- **Rebound**: The percentage of the initial peak blast pressure that is reflected back on to the blast resistant unit.

- **Required response**: The acceptable level of damage that would result from the projected blast event on a door assembly. The responses range from Category I (no damage) to Category V (catastrophic failure). There are several different definitions of response provided in the following documents:

Blast Door Standards

- **ASTM F2247, ASTM F2927 and ASTM F1642** are commonly specified test methods for blast doors.

- **UFC 4-010-01** is one of the primary specifications required for all Department of Defense related construction.

- **ASCE** (Design of Blast Resistant Buildings in Petrochemical Facilities) and **PIP STC01018** are primarily used for petrochemical and offshore facilities.

Specifying Blast Resistant Assemblies

- When requesting a quote, you will need to provide:
  - ✓ Door size, either flush or with vision panel
  - ✓ Peak pressure, impulse and standoff distance
  - ✓ Seated or unseated
  - ✓ Rebound requirements, if applicable
  - ✓ Damage Category or Hazard Level (including the governing authority or specification such as ASTM F2247)

- Specifiers should work with a blast consultant to determine the projected blast conditions and desired response category.

Specifying Blast Resistant Assemblies

Sample Blast Requirement

- ✓ Size: 3’0” x 7’0”
- ✓ Vision: Yes, 12” x 12” Visible
- ✓ Pressure: 4 psi
- ✓ Impulse: 28 psi-msec
- ✓ Blast Direction: Seated
- ✓ Rebound: 50%
- ✓ Damage Level Category: II per ASTM F2247

Blast Resistant Assemblies

- Vision lights require a check of the blast resistance of the entire assembly, including the vision kit and glazing.
  - The mounting kit must be able to withstand the projected blast loading imparted by the glazing
  - The glazing needs to provide the desired level of performance.
  - The most common specification for glazing performance is GSA Test Protocol: GSA-TS01-2003.
- In general, blast resistant glazing requires a laminated component comprising either the single glazing pane or the inside pane of an insulated glass unit.

Blast Categories

Response categories following the blast event for doors can generally be defined as:

- **Category I**: undamaged
- **Category II**: permanent plastic damage but operable
- **Category III**: non-catastrophic failure (inoperable but remains a barrier to blast)
- **Category IV**: limited hazard failure (may rebound open)
- **Category V**: high hazard failure (door may be a flying debris hazard)

Specialty Steel Doors and Frames

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