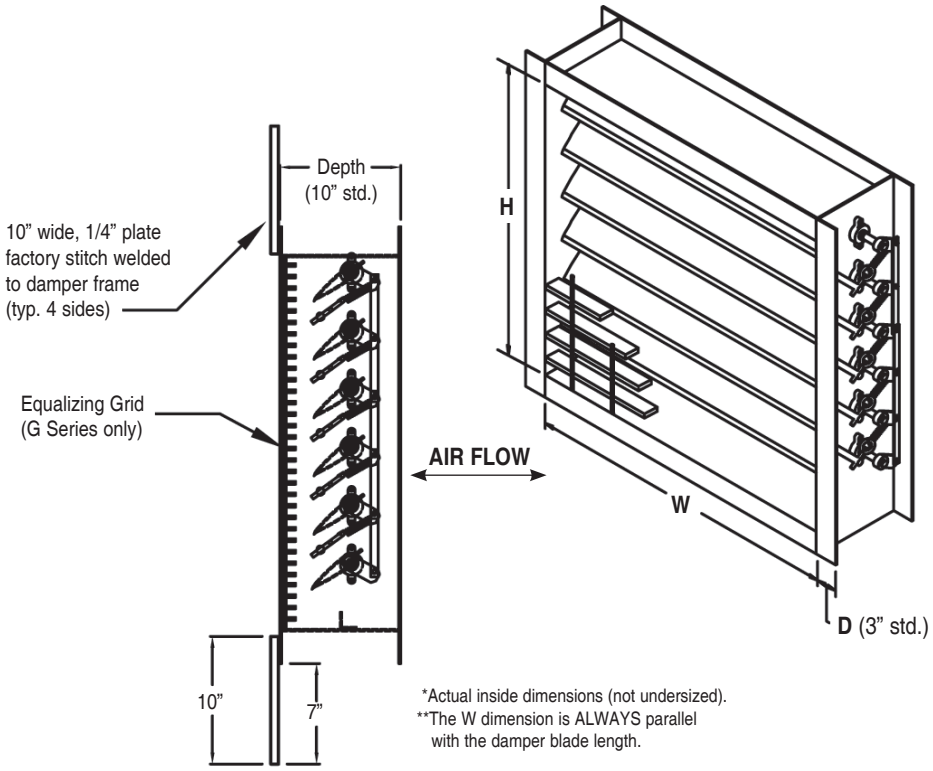
SPECIFICATION SHEET

Carnes Specialty Products —
Blast Resistant Damper

CARNES COMPANY 448 S. Main St., P. O. Box 930040, Verona, WI 53593-0040 Phone: (608)845-6411 Fax: (608)845-6504 www.carnes.com

Note: Equalizing Grid provided with G Series only



*Actual inside dimensions (not undersized).
**The W dimension is ALWAYS parallel with the damper blade length.

(BLAST #1 ARRANGEMENT SHOWN)

Optional: Damper above is shown without flange for induct mounting.

Max. Velocity: 4000 FPM

FEATURES:

Frame: 3" x 10" x 3", 10 ga carbon steel channel with 10" wide x 1/4" faceplate (ASTM A1011 CS Type B & A569CQ)
Blades: 10 ga carbon steel double skin airfoil
Blade Lock: latch mechanism to lock blades in close position after blast (exothermic reaction)
Axles: Ø 3/4" solid A36 steel on 6" centers
Ø 1" solid A36 steel on 6" centers
Linkage: 3/16" thick x 3/4" wide bars
Bearings: two hole flange ball bearing (type II)
Finish: zinc rich primer (ready to paint)
Size Limitations: minimum size - 8"w x 8"h
maximum single section - 48"w x 60"h (see graph for psi limitations)
For factory assembled multi-section size limitations, consult factory.

Specify: blast arrangement and reflective pressure (psi)

OPTIONS:

- Blade Seals (EDPM)
- Blade Seals (Silicone)
- 304 Stainless Steel Construction (ASTM-A240, SA240, AMS 5513)
- 316 Stainless Steel Frame & Blades (some parts may not be 316 ss) (ASTM-A240, SA240, AMS 5513)
- Powder Coating, Select Color
- Blast Deflector on Jambs
- Equalizing Grid
- Omit Flange (in duct mount)

Tag	Qty.	Size		Frame	Variations
		Width	Height		

Project **Location**
Arch./Engr. **Contractor**
Representative **Date**

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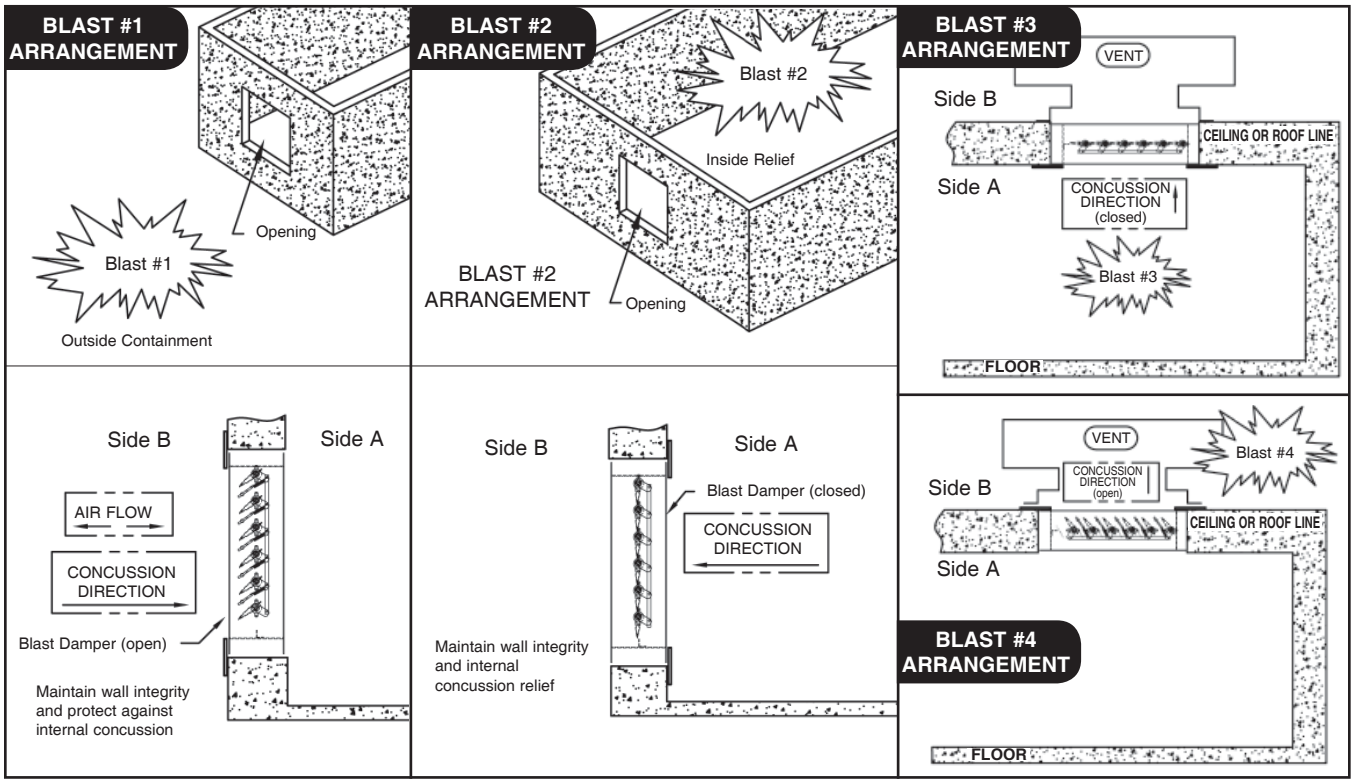
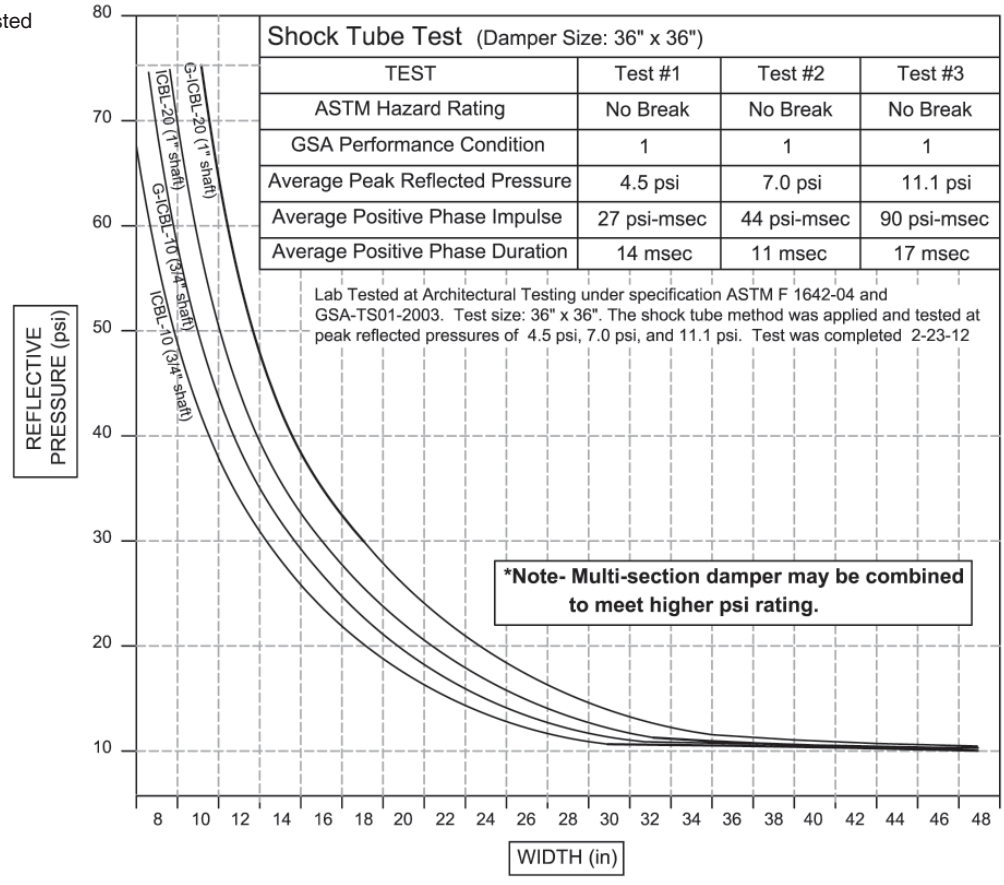


Shock Tube Tested
(see data)

BLAST DAMPERS
DESIGN PRESSURES VS. WIDTH

Shock Tube Test (Damper Size: 36" x 36")			
TEST	Test #1	Test #2	Test #3
ASTM Hazard Rating	No Break	No Break	No Break
GSA Performance Condition	1	1	1
Average Peak Reflected Pressure	4.5 psi	7.0 psi	11.1 psi
Average Positive Phase Impulse	27 psi-msec	44 psi-msec	90 psi-msec
Average Positive Phase Duration	14 msec	11 msec	17 msec

Lab Tested at Architectural Testing under specification ASTM F 1642-04 and GSA-TS01-2003. Test size: 36" x 36". The shock tube method was applied and tested at peak reflected pressures of 4.5 psi, 7.0 psi, and 11.1 psi. Test was completed 2-23-12

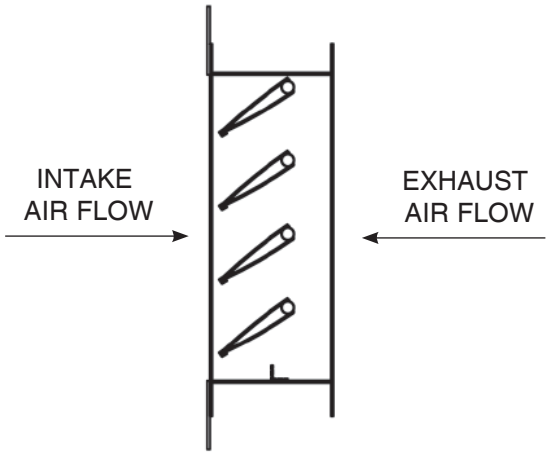


PERFORMANCE DATA

AMCA LAB TESTED

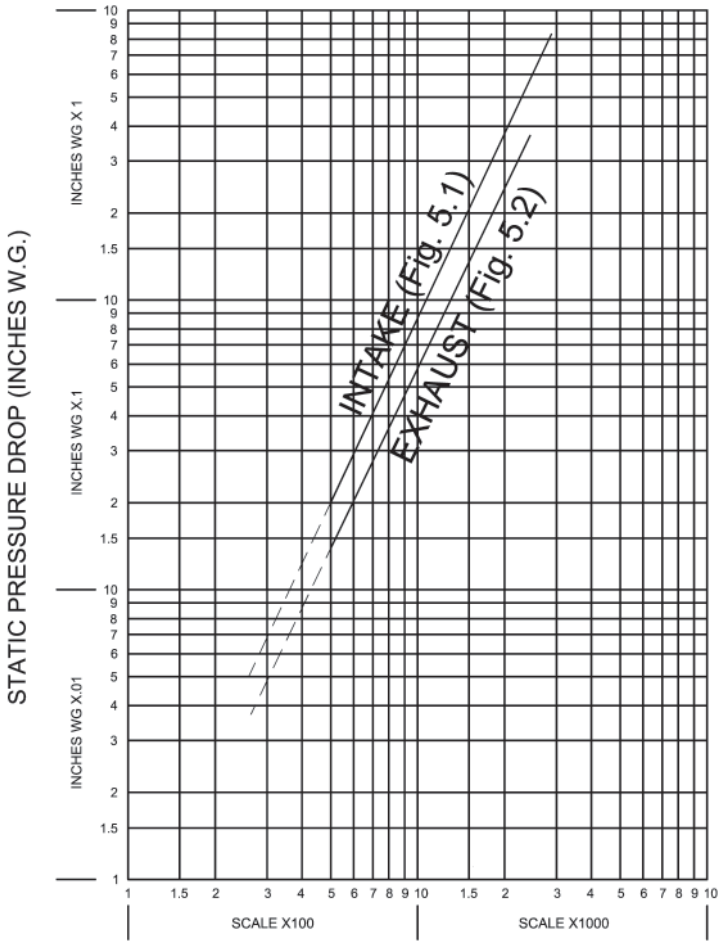
Tested per AMCA Standard 500-D (fig. 5.1 & fig. 5.2).
Ductwork upstream or downstream.

DIRECTION OF AIR FLOW
(See Chart For Pressure Drop)



D= $\sqrt{4ab/\pi}$ for Rectangular Ducts, 'a' is width, 'b' is height
D= Duct Diameter for round duct

PRESSURE DROP



FACE AREA / DUCT VELOCITY (FT/MIN)
Based on STANDARD Air - .075 lb. per cubic foot
TEST SIZE: 24" x 24"

Intake Application

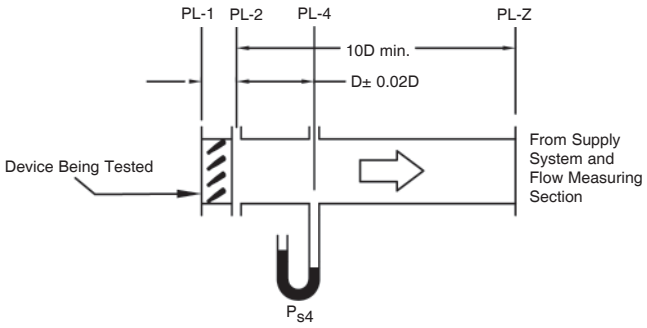


Figure 5.1 - Test Device Setup with Outlet Duct
TEST SIZE: 24" x 24"

Exhaust Application

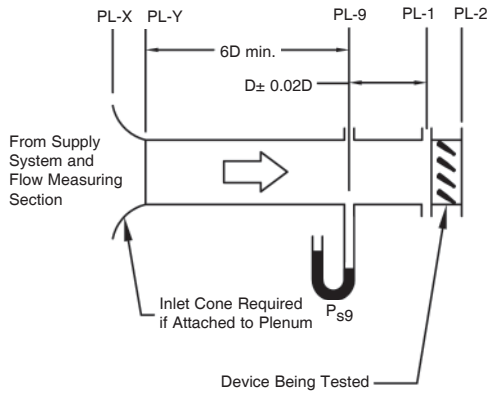


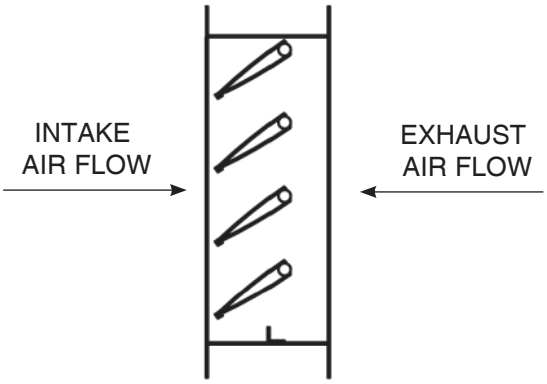
Figure 5.2 - Test Device Setup with Inlet Duct
TEST SIZE: 24" x 24"

PERFORMANCE DATA (cont.)

AMCA LAB TESTED

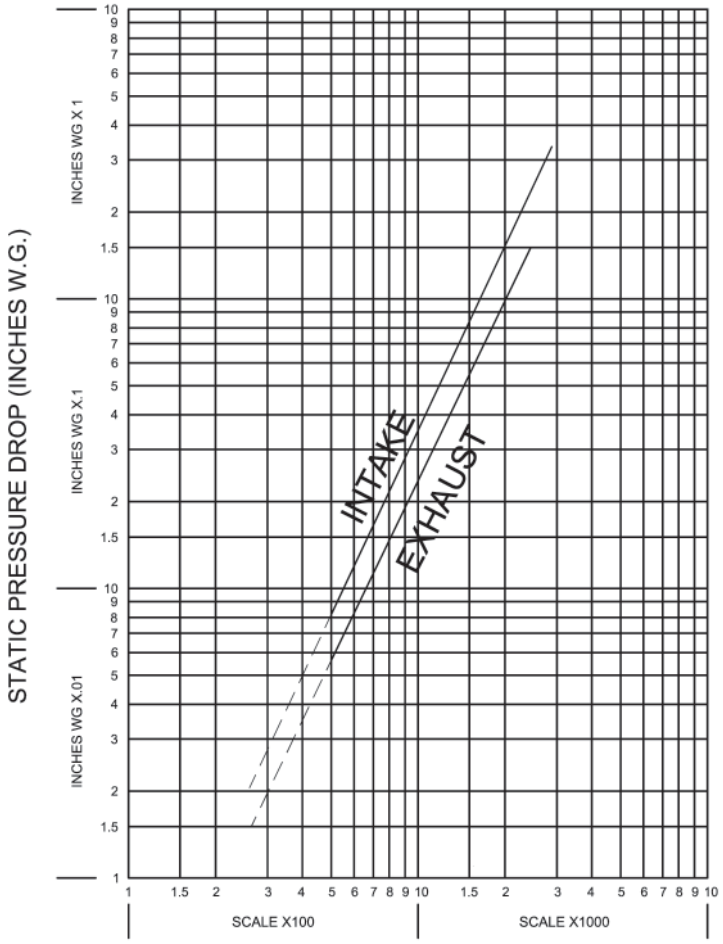
Tested per AMCA Standard 500-D (fig. 5.3) with ductwork installed both upstream or downstream.

DIRECTION OF AIR FLOW
(See Chart For Pressure Drop)



D= $\sqrt{4ab/\pi}$ for Rectangular Ducts, 'a' is width, 'b' is height
D= Duct Diameter for round duct

PRESSURE DROP



FACE AREA / DUCT VELOCITY (FT/MIN)
Based on STANDARD Air - .075 lb. per cubic foot
TEST SIZE: 24" x 24"

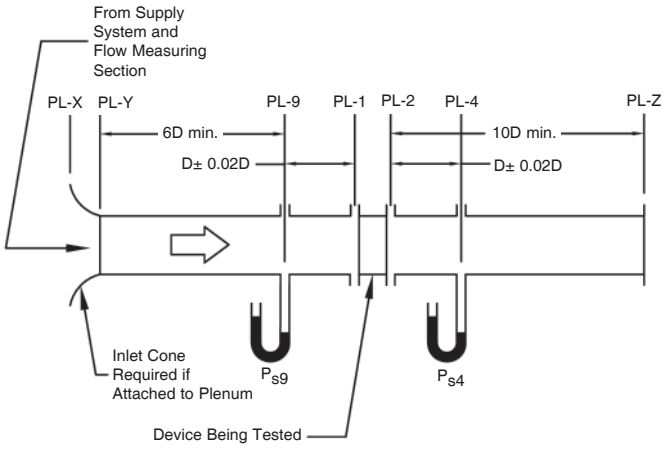


Figure 5.3 - Test Device Setup with Inlet and Outlet Ducts
TEST SIZE: 24" x 24"

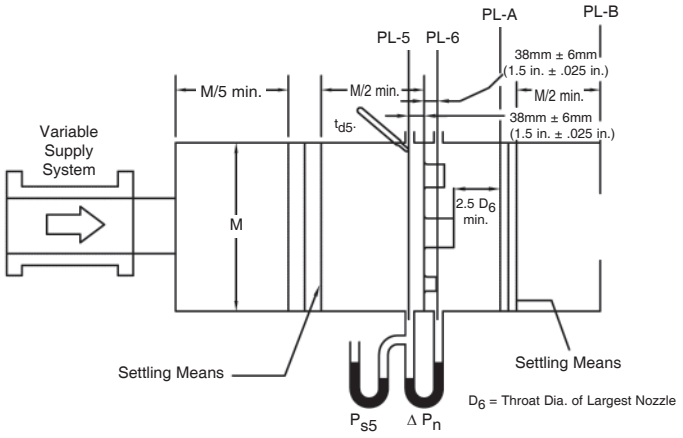


Figure 6.5 - Air Flow Rate Measurement Setup - Multiple Noozle Chamber on Fan Outlet

Carnes Specialty Products — Blast Resistant Damper
INSTALLATION INSTRUCTIONS

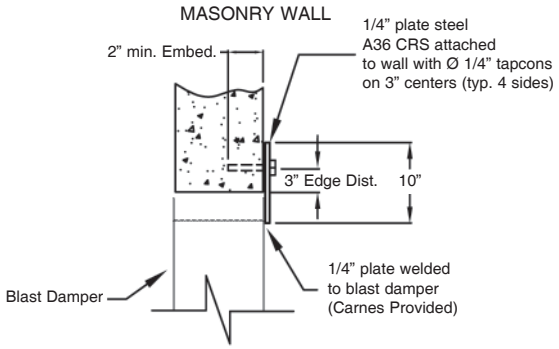


PLATE STRESS (ksi) 1" AXLE = 16.4 ksi

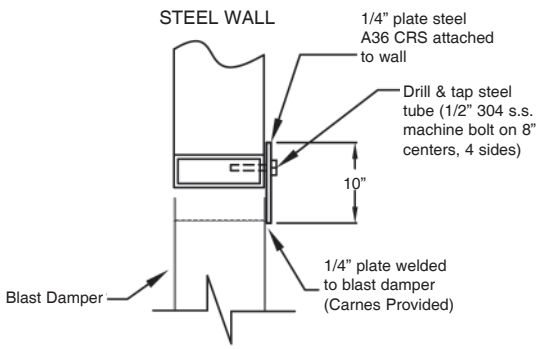
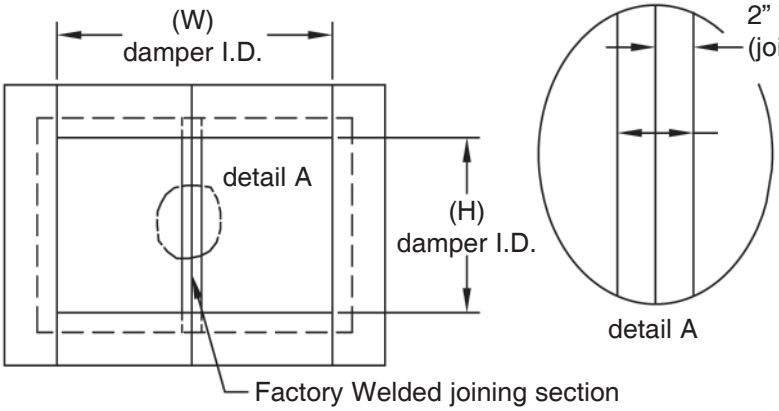


PLATE STRESS (ksi) 1" AXLE = 16.4 ksi

NOTE: Attachment is to be made on the same side as the blast. Substrates may vary from above application; site specific engineering may be required.

FACTORY ASSEMBLED MULTIPLE SECTION DAMPERS



NOTES:

1. For openings larger than 48"w x 60"h, contractor must divide the width of the opening into two or more sections with the substrate dividing the sections designed to maintain the integrity and load ratings of the wall.
2. Dampers with widths larger than 48" and heights less than 60" may be eligible for more than 2 or more factory supplied sections (this may occur if psi is over 3). Consult factory if conditions exist.
3. Maximum factory assembled multi-section size is 48"w x 60"h (if psi is over 3, 2 or more sections may occur). Consult factory if condition exists.
4. When more than one partition/mullion exists as mentioned above, field supplied reinforcement may be necessary behind the mullions depending on load rating and height of the opening.

Where Were Blast Dampers Being Used?

- Chemical, paint or hazardous material storage rooms
- Pharmaceutical facilities, college laboratories and other R & D areas
- Bioscience and nanotechnology research buildings
- Refineries, petrochemical and other industrial complexes
- Nuclear power stations
- Engine test cells
- Ammunition depots, munitions storage facilities and arsenals
- Missile tests and launch sites

Now Added To The List Are:

- All federal government new facilities within the US and overseas
- Some federal and state agencies are also being required to update their existing and leased facilities
- Some data storage facilities
- Some medical facilities
- Major sporting venues
- And some very nervous people

What Is An Explosion?

Definition: It is a rapid release of stored energy characterized by a bright flash and an audible blast.

- Part of the energy is released as thermal radiation
- Part is coupled into the air as airblast (waves) and part into ground as shock waves

Deflagration is an exothermic reaction (a moving flame front), which propagates from the burning gases to the unreacted material by conduction, convection and radiation. It travels slower than the air will burn when ignited under the proper conditions.

Detonation is an exothermic reaction characterized by the presence of a shock wave in the material that establishes and maintains the reaction. It travels at a speed greater than the speed of sound.

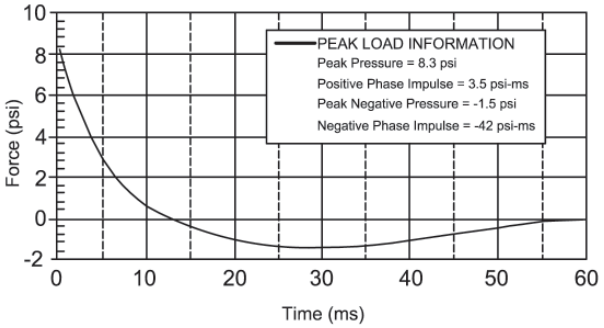
Blast Forces or Loads

- Free field blast - 360° blast
- Reflective blast - restrictions around it

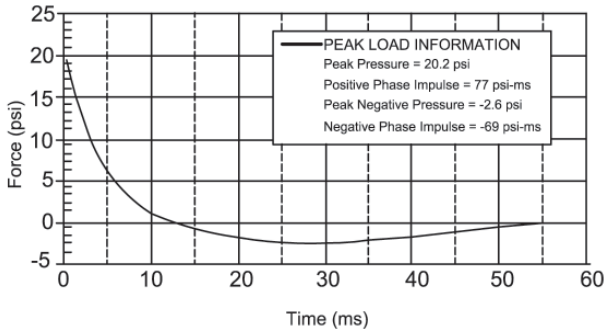
  The amount of damage usually depends on many things like: charge weight, distance, shape, height above ground, level of confinement.

  Mostly weighted on charge weight and distance.
- Reflective pressure - is impulse pressure with the additional loads of reflected pressure from adjacent or opposite surfaces.

Incident Impulse Pressure for Free Field Blast



Reflective and Impulse Pressure:
Actual blast load of 100 lbs. of TNT at 50 ft. away
Note: 20 psi Peak Load
(18”x60”=21,600 lbs. of force)



BLAST RESISTANT DESIGN with STRUCTURAL STEEL
Common Questions Answered

Anatol Longinow, Ph. D. and
Farid Alfawakhiri, Ph. D.

Strategies for blast protection have become an important consideration for structural designers as global terrorist attacks continue at an alarming rate. Conventional structures, particularly those above grade, normally are not designed to resist blast loads; and because the magnitudes of design loads are significantly lower than those produced by most explosions, conventional structures are susceptible to damage from explosions. With this in mind, developers, architects and engineers increasingly are seeking solutions for potential blast situations, to protect building occupants and the structures themselves. The questions and answers that follow offer some explanation of explosions and the potential dangers they present to steel-framed buildings. The authors take a look at the historical response of steel-framed structures to blast situations and which types of structural frames, connections and steel shapes best resist blast loads. They also examine strategies designers can use to implement heightened building security and greater structural resistance to blast threats. Design specifications, code requirements, progressive collapse, seismic requirements and composite construction also are considered. Lastly, a list of references on the topic of blast protection is provided, along with information about computer software programs that can aid designers.

Complete Print-out of article:
Google search: Modern Steel Construction, October 2003

BLAST-RESISTANT DESIGN CONSIDERATIONS FOR PRECAST, PRESTRESSED CONCRETE STRUCTURES

Sanaa Alaoui and Charles Oswald

Blast-resistant design is becoming more common in the precast concrete industry as more blast-resistant buildings are constructed with precast/prestressed concrete components. This is occurring primarily because many large government and U.S. Department of Defense buildings now require some level of blast-resistant design. Blast design has been performed for many years for the chemical and petrochemical industry and explosive storage and manufacturing facilities, which have inherent accidental explosion hazards. Based on both theoretical analysis and testing, blast design guidelines and methods have been developed for many common types of building components, including steel members, concrete masonry unit walls and reinforced concrete members.[1, 2] Much of the this blast design guidance is applicable to precast/prestressed concrete components, though it is not widely understood by designers within the precast concrete industry. Some of the design guidance is restricted to official government use only or is based on proprietary research, but most of this information resides in the public domain. This paper presents prevalent blast-resistant design information that can be used for precast/prestressed concrete elements and structures. It is part of work in progress of the newly formed PCI Blast Resistance and Structural Integrity Committee.

Complete Print-out of article:
Google search: PCI Journal, November - December 2007