

Combination
Storm / *FEMA Iouwer / Blast Damper
ICBL-20-WR

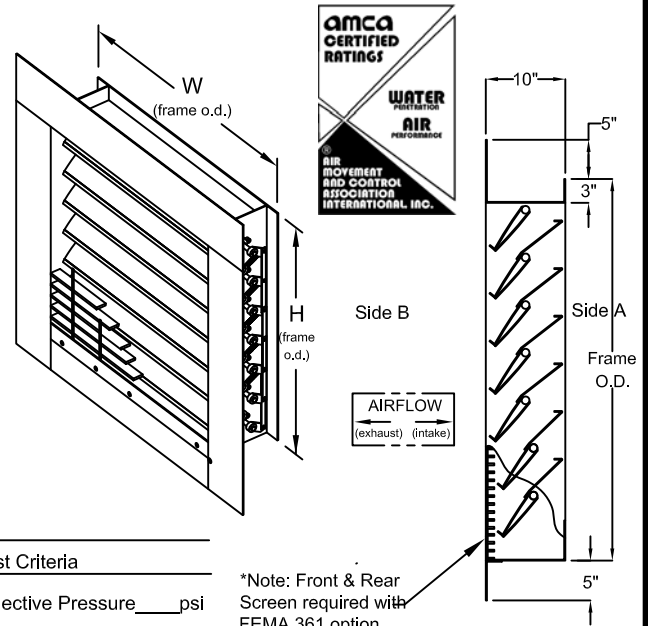
Application and Design

United Energetech has gained its position as a leader in the manufacturing of air movement and control equipment by producing high quality innovative products. In our most recent development, United Energetech teamed up with Applied Research Associates (ARA), a leading researcher in explosive dynamics, to develop a multi functional Blast Damper. The result is a damper/louwer system which can withstand a high yield blast, offer AMCA ratings for water penetration and pressure drop, and complies with FEMA 361 zone IV criteria, 250 mph winds (2"x 4"; 15lbs missile impact at 100mph) when ordered with the screen.

To facilitate the design, ARA examined the effects of blast loading using Finite Element Modeling and Single Degree of Freedom calculations. Their modeling replicated a close-in explosive threat, one similar to a car bomb. The simulation was a 200lb TNT surface charge at a range of 50 feet. The numerical simulation demonstrated that the damper was able to withstand the high peak incident pressure/short duration explosive load with only moderate damage. Further analysis showed that the blast overpressure downstream of the damper was greatly reduced by as much as 83%, thereby protecting equipment and personnel downstream. The ability of the Damper to reduce the downstream overpressure was accomplished by designing a blade profile and linkage system which quickly shuts at the onset of a blast pressure wave. In this simulation of a close range blast, the damper was able to close in 7 milliseconds. The ICBL-20-WR is also rated for gas/oil type and vapor cloud explosions.

The ICBL-20-WR is ideal for protecting equipment and personnel from sudden blasts and instantaneous pressure changes. Engineers can design with confidence when specifying this product.

Note: ICBL-20-WR Not intended for horizontal mount applications



STANDARD CONSTRUCTION:

FRAME:
10" (254mm) Deep, 10 ga. *(2x thickness @ jamb flange)
Carbon Steel Frame (ASTM A-653)

BLADES:
10 ga Carbon Steel Double Skin Airfoil
(ASTM A-653)

BLADE LOCK:
Latch mechanism to lock blades in closed position after Blast

AXLES:
Ø 1" (25.4mm) solid A36 steel on 6" (152mm) centers

REAR SCREEN:
18 ga x 1/2" (12.7mm) Expanded Steel

LINKAGE:
3/16" (4.76mm) thick x 3/4" (19.05mm) wide bars

BEARINGS:
Two hole flange ball bearing (type III)

FINISH:
Zinc Rich Gray Primer

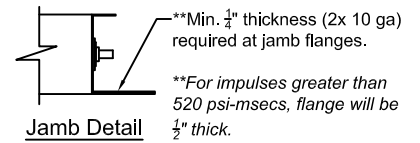
SIZE LIMITATIONS:
Minimum size: 14"w x 14"h (356mm x 356mm) O.D.
Maximum single section:
48"w x 66"h O.D.
(1219mm x 1676mm) O.D.
For factory assembled multi-section size limitations, consult factory

REQUIRED SPECIFICATIONS:

- | | |
|--|--|
| Airflow / Volume _____ | Blast Criteria _____ |
| <input type="checkbox"/> Intake <input type="checkbox"/> Exhaust | Reflective Pressure _____ psi |
| Air Volume _____ cfm | Duration _____ msec |
| Adjustable Spring Tensioner location _____ | Impulse _____ psi-msec |
| <input type="checkbox"/> Accessible from Interior (Side A) -Standard | The following equation can be used to approximate impulse: |
| <input type="checkbox"/> Accessible from Exterior (Side B) -Optional | $Impulse \approx \frac{1}{2} Duration \times pressure$ |

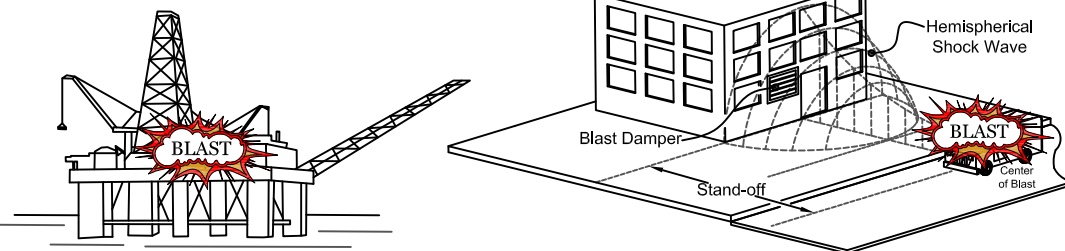
*Note: Front & Rear Screen required with FEMA 361 option

Max. Free Area Velocity: 4000 FPM



VARIATIONS:

- 304 Stainless Steel construction (ASTM-A240,SA240,AMS 5513)
- 316 Stainless Steel frame and blades (some parts may not be 316 ss) (ASTM-A240,SA240,AMS 5513)
- Custom Finish Powder Coating, select color
- FEMA 361 Screen
- Omit Flange (in duct mount-see installation details)



*Note: Front & Rear Screen required with FEMA 361 option

Complies with FEMA 361 and ICC 500 storm shelter and safe room standards

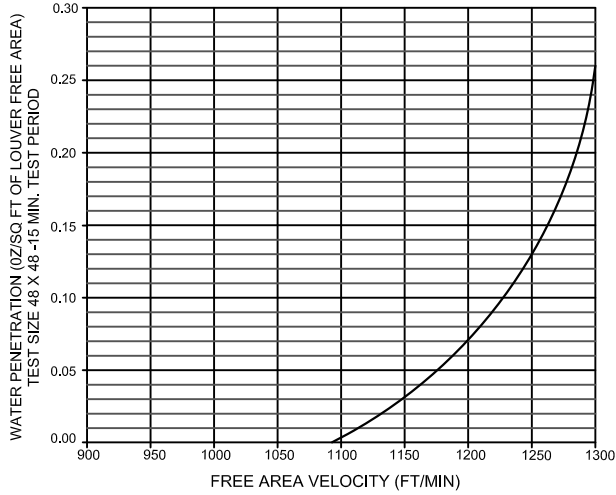
Due to continuing research, United Energetech reserves the right to change specifications without notice.

| | | | |
|-------------|--|------------------------|----------------------------|
| Job Name: | <input checked="" type="checkbox"/> ICBL-20-WR | | |
| Location: | | | |
| Architect: | DRAWN BY: CLJ | DATE: February 2013 | REV. DATE: October 2013 |
| Engineer: | REV.NO.: 2 | APPROVED BY: BGT | DWG NO.: C-28a |
| Contractor: | | | |

ICBL-20-WR PERFORMANCE DATA

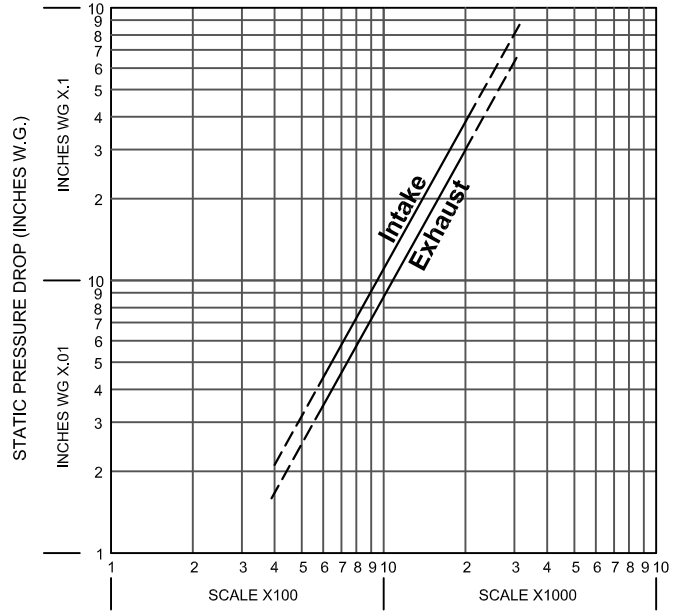
Water Penetration

Standard Air-.075 lb/ft³



Beginning point of WATER PENETRATION is 1090 fpm free area velocity at .01 oz. of water penetration

Air Flow Resistance



FREE AREA VELOCITY (FT/MIN)

Based on STANDARD AIR-.075 lb. per cubic foot.

Ratings do not include the effects of screen.

Test size 48" x 48"

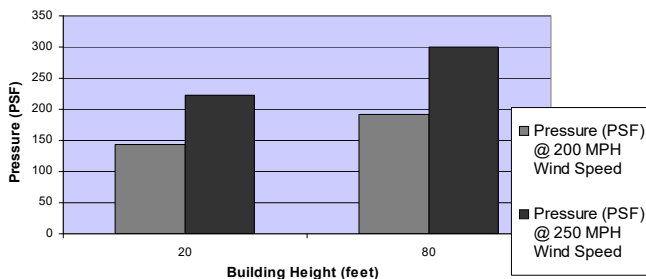
Free Area Chart (square feet):

| Louver O.D. Height in Inches | Louver O.D. Width in Inches | | | | | | |
|------------------------------|-----------------------------|------|------|------|------|------|-------------|
| | 14 | 18 | 24 | 30 | 36 | 42 | 48 |
| 14 | 0.16 | 0.25 | 0.38 | 0.50 | 0.63 | 0.75 | 0.88 |
| 24 | 0.42 | 0.63 | 0.94 | 1.25 | 1.56 | 1.88 | 2.19 |
| 30 | 0.58 | 0.88 | 1.31 | 1.75 | 2.19 | 2.63 | 3.06 |
| 36 | 0.67 | 1.03 | 1.50 | 2.02 | 2.50 | 3.04 | 3.52 |
| 42 | 0.76 | 1.15 | 1.72 | 2.29 | 2.86 | 3.44 | 4.01 |
| 48 | 0.98 | 1.29 | 1.91 | 2.60 | 3.18 | 3.81 | 4.36 |
| 54 | 1.12 | 1.68 | 2.51 | 3.35 | 4.18 | 5.03 | 5.27 |
| 60 | 1.26 | 1.90 | 2.84 | 3.79 | 4.74 | 5.69 | 6.13 |
| 66 | 1.38 | 2.05 | 3.18 | 4.13 | 5.16 | 6.19 | 7.03 |



United Enertech certifies that the ICBL-20-WR shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publications 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA certified rating seal applies to air performance ratings and water penetration ratings.

Wind Pressure Examples per ICC500



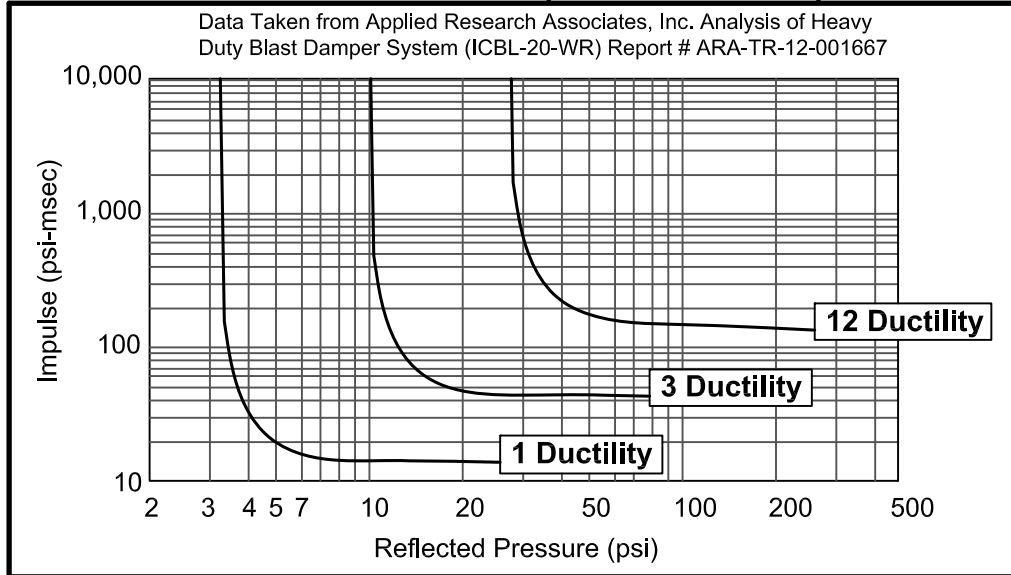
Complies with FEMA 361 and ICC 500 storm shelter and safe room standards

FEMA 361 / ICC-500 MISSILE IMPACT TEST:

| MISSILE TYPE | VELOCITY IN MPH | IMPACTS |
|--|-----------------|---------|
| 15 lb. 2"x4" (Wood grade #2 or better) | 100 | 4 |

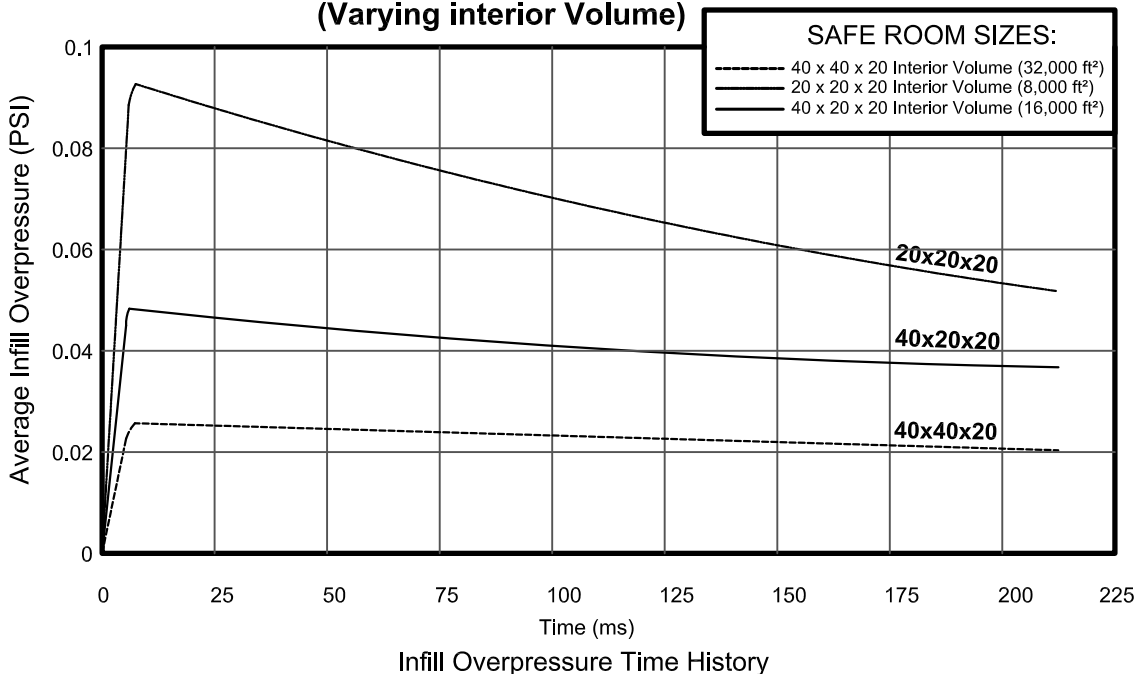
ICBL-20-WR PERFORMANCE DATA

United Enertech Louver / Blast Damper - Pressure / Impulse Curves



A ductility of 1 corresponds to minor damage, a ductility of 3 corresponds to moderate damage, and a ductility of 12 corresponds to a severe level of damage. Damper failure is likely at or above a ductility of 12. This analysis is based upon a unit section of 42" in width (36" i.d.)

Infill Pressure with ICBL-20-WR installed (Varying interior Volume)



Data Taken from Applied Research Associates, Inc. Analysis of Heavy Duty Blast Damper System (ICBL-20-WR) Report # ARA-TR-12-001667

Blast Criteria: 13 psi incident over pressure (25 psi reflective pressure) with a positive phase duration of 10 msec.
(TYPICAL OF A 200 LB TNT BLAST AT A RANGE OF 50 FT)

ICBL-20-WR PERFORMANCE DATA

Blast Criteria: 25 psi incident over pressure with a positive phase duration of 150 msec.
(TYPICAL OF A GASOLINE OR VAPOR CLOUD EXPLOSION)

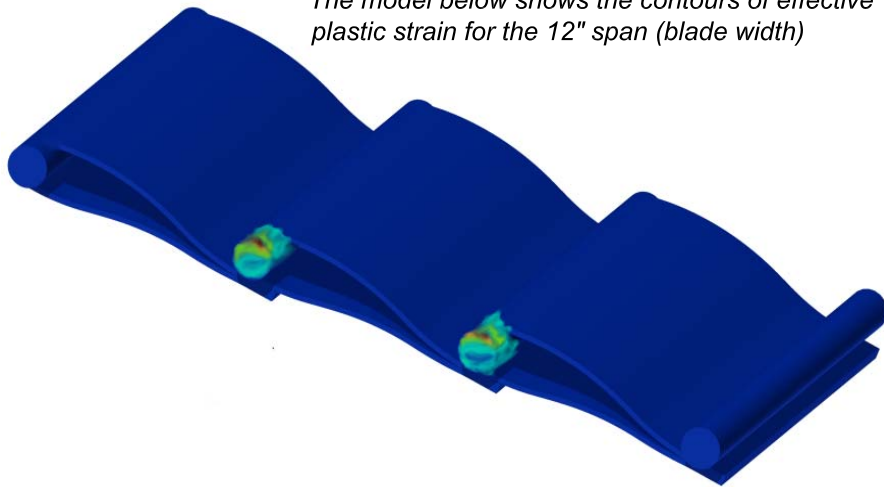
ICBL-20-WR FINITE ELEMENT ANALYSIS

| *SPAN (blade width) | DISPLACEMENT | ROTATION | **STRAIN |
|---------------------|--------------|----------|----------|
| 8 inches | 0.09 inches | 1.29 | 1.80% |
| 10 inches | 0.28 inches | 3.15 | 5.40% |
| 12 inches | 0.48 inches | 4.55 | 8.10% |
| 18 inches | 0.88 inches | 5.63 | 9.96% |
| 24 inches | 1.24 inches | 5.95 | 10.23% |
| 36 inches | 2.30 inches | 7.33 | 11.24% |

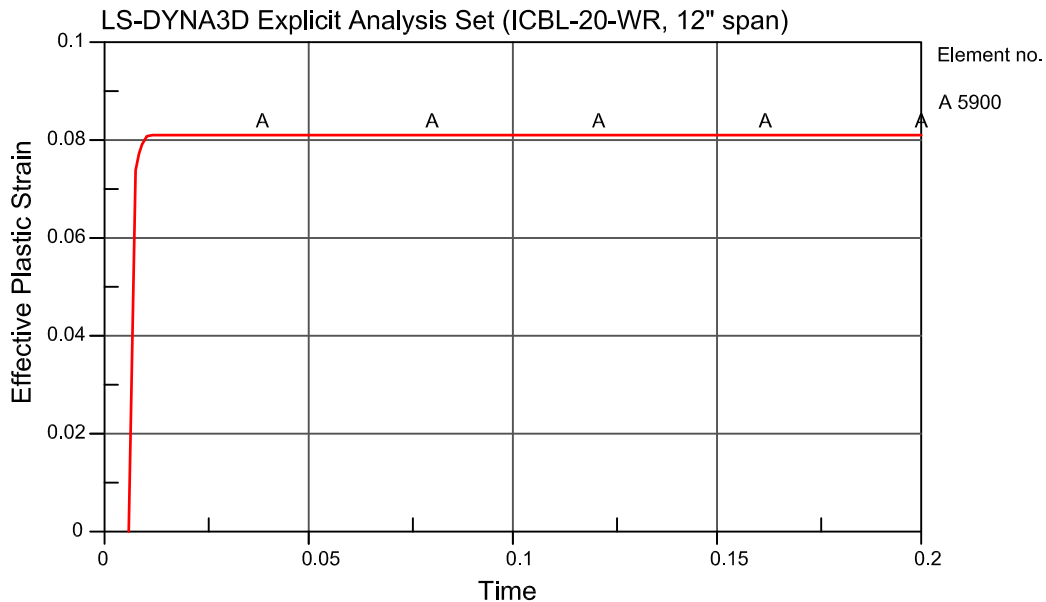
*Add 6" to the "span" for the actual o.d. for sizing

**A36 Steel is guaranteed to exceed a strain of 20% at failure with typical breaking strengths over 30%

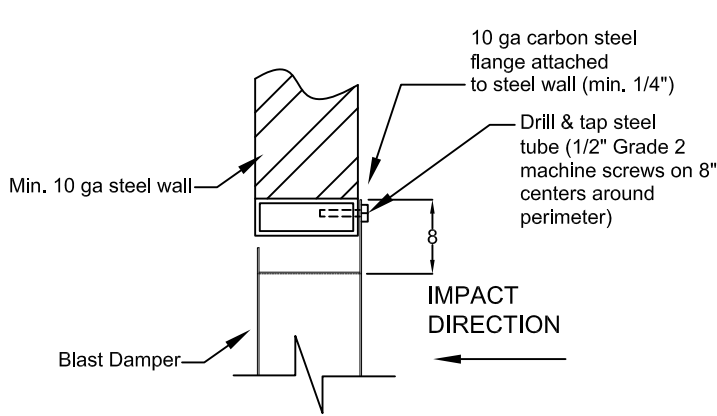
The model below shows the contours of effective plastic strain for the 12" span (blade width)



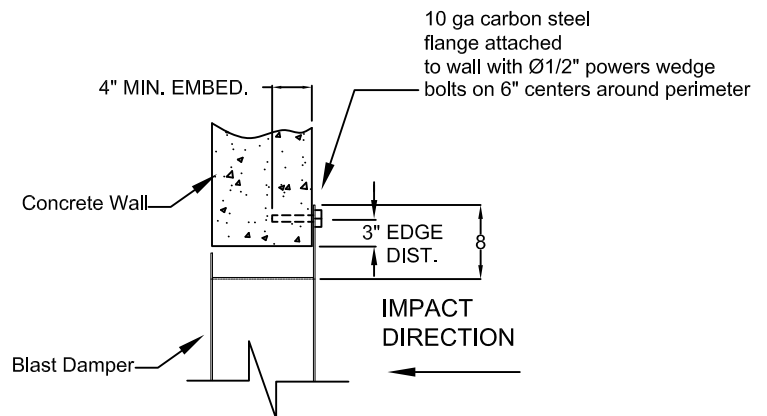
The graph below shows that the effective plastic strain for the 12" span (blade width) is only 8.10%



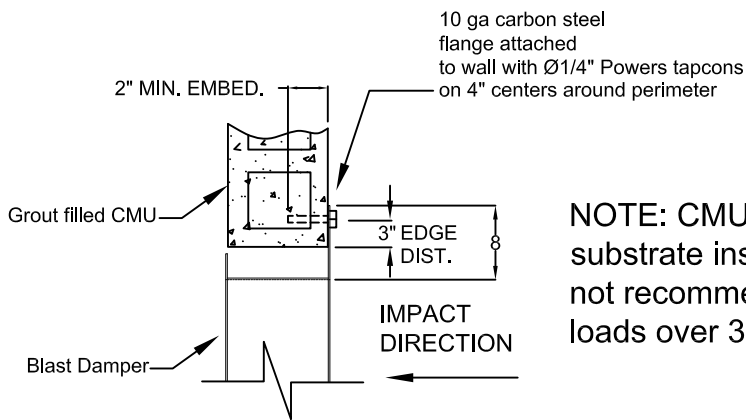
ICBL-20-WR INSTALLATION INSTRUCTIONS



STEEL INSTALLATION



CONCRETE INSTALLATION



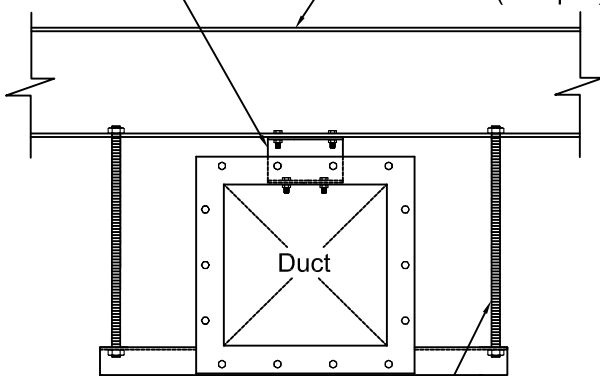
NOTE: CMU Block substrate installations are not recommended for blast loads over 3.5 psi

CMU INSTALLATION

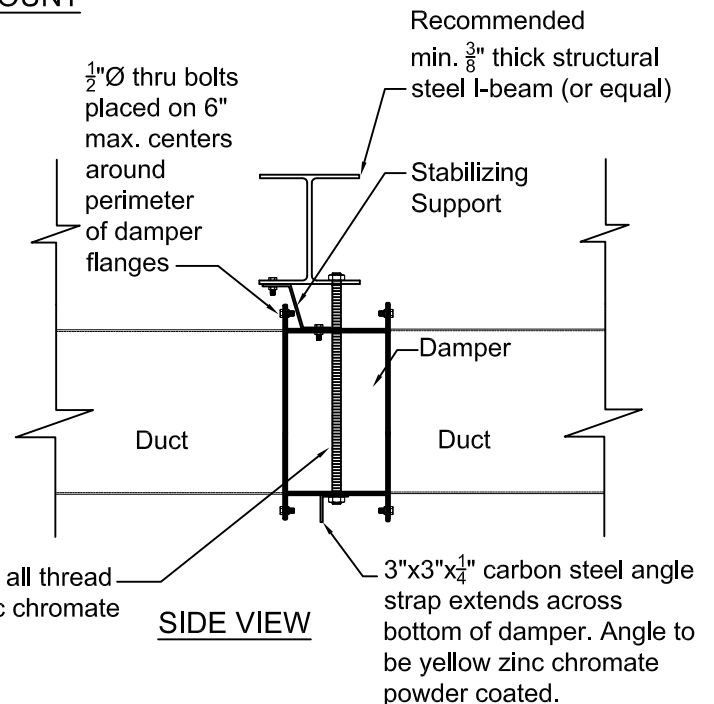
DUCT MOUNT

"z" bracket attached to beam with (2) 1/2" Ø 316 s.s. bolts. Att. to damper sim. to beam.

Recommended min. 3/8" thick structural steel I-beam (or equal)



FRONT VIEW

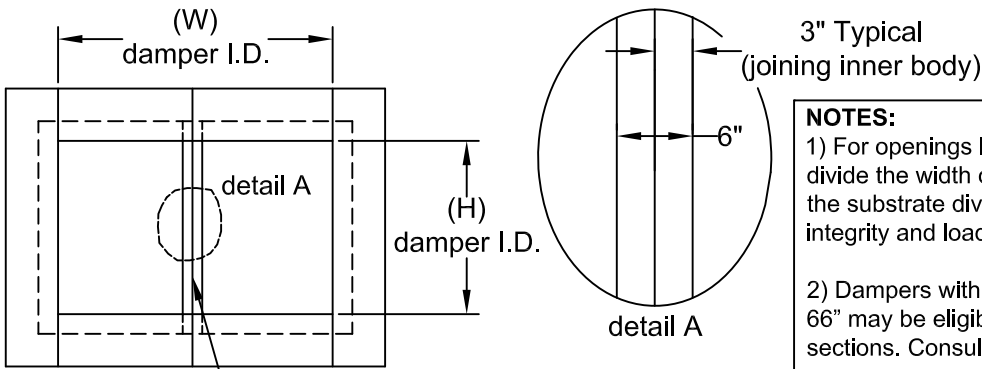


SIDE VIEW

1" carbon steel all thread rod, yellow zinc chromate powder coated

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



Factory Welded joining section
If load rating exceeds single section max,
then multiple joints may be required.

NOTES:

- 1) For openings larger than 48" w x 66" h, contractor may 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 66" may be eligible for more than 2 or more factory supplied sections. Consult factory if conditions exist.
- 3) Maximum factory assembled multi-section size is 48" w x 66" h (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.

SUGGESTED SPECIFICATION

Furnish and install, at locations shown in plans or in accordance with schedules, industrial grade louver/blast dampers meeting the following construction standards. Frame shall be 8" to 12" deep (10" std.) x 3" flanged 10 gage carbon steel channel. Sleeve or channel with innerframe is not acceptable. The blades shall be drainable type maximum 7" wide, minimum 10 ga carbon steel airfoil shaped double-skin. Front flange to be 5" wide, 10 ga carbon steel (integral flange). Axles shall be continuous (not axle pins) 1" diameter plated steel welded to blade. Linkage shall be minimum 3/16" thick, 3/4" bar located on side of damper out of airstream. Pivot pins in linkage shall be stainless steel. Linkage shall include externally mounted release springs and adjustable tension to keep damper open until blast of specified pressure forces blades closed. Louver/Damper shall include blade locks for delayed exothermic reaction (a moving flame front). Louver/Damper structural integrity shall be determined by finite element modeling and single degree of freedom calculations. Louver/Damper shall have data for both bomb and gas/oil type explosions. Louver/Damper shall have a water penetration rating of 1090 fpm, and shall be pressure drop testing in accordance with AMCA 500-L. Louver/Damper shall comply with FEMA 361 and ICC-500 storm shelter and safe room standards. Louver/Damper must be installed per manufacturer's installation instructions (optional: omit flange to duct mount). Louver/Damper shall be United Enertech Model ICBL-20-WR.



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