

**Specification Section 08 39 54**  
**Blast Resistant Sliding Door Units**

**PART 1 – GENERAL**

**1.1 Scope**

- A. This specification covers the requirements to design and fabricate blast resistant sliding steel door assemblies where indicated on door schedule and specified for \_\_\_\_\_ in \_\_\_\_\_. The room /or/ building is located in an area that could receive a blast wave from an explosion accident.
- B. Section Includes:
  - 1. Specification covers PDI Models DB-SL horizontal sliding and DB-VL vertical lift door systems.
  - 2. Blast resistant sliding steel door, blast restraints, steel track and trolleys /or/ cable assemblies and guides, and operational system (as required).
  - 3. The building design allows for the door types listed in Table 1.

**Table 1: Door Types**

Type	Clear Opening (Width x Height)	Quantity
A – Horizontal Sliding Door Assembly		
B – Vertical Lift Sliding Door Assembly		
C – Other		

- C. The blast pressure each door must resist is provided in Part 2 of this specification. After the explosion, the door is to remain operable from the inside to allow egress from the room or building (if required), Medium Response Category II. Specify if door panel is to be seated into wall by the event of an explosion or unseated against blast restraints. Door shall remain in closed position and will not open on the rebound.
- D. Furnish blast resistant sliding door assembly consisting of:
  - 1. Horizontal sliding door: Steel door panel, sliding door hardware, blast restraints, steel track and trolley system with trolley pendant, operational system (as required), stay roller, safety devices and optional weatherstripping. The door system shall be top-hung. A bottom floor track shall not be utilized unless blast criteria warrants additional support at the sill.
  - 2. Vertical lift sliding door: Steel door panel, sliding door hardware, blast restraints, cable assemblies and guides, sheaves, counterweights and cover panel, power operator and controls, safety devices and optional weatherstripping.
- E. All structural openings shall be field verified by contractor prior to fabrication. In cases where the walls are not erected, contractor shall verify that the structural opening dimensions shall be maintained. Wall and/or drawings shall be verified for no mechanical or other interferences impacting sliding door panel.

**1.2 References**

- A. Biggs, J.M., *Introduction to Structural Dynamics*, McGraw Hill Book Company, New York, NY, 1964.
- B. *Design of Blast Resistant Buildings in Petrochemical Facilities*, Second Edition, prepared by the Task Committee on Blast Resistant Design, Published by American Society of Civil Engineers (ASCE), 2010.
- C. Harris, C.M. and Crede, C.E., "Shock and Vibration Handbook", McGraw-Hill Book Company, Volume 3, 1961.
- D. NFPA 101, "Life Safety Code".
- E. PIP ARS08390, "Blast Resistant Doors, Frames, and Related Hardware Specification", Process Industry Practices (PIP) Architectural, Construction Industry Institute, The University of Texas at Austin, June 2013.
- F. PIP STC01018, "Blast Resistant Building Design Criteria", Process Industry Practices (PIP), Construction Industry Institute, The University of Texas at Austin, October 2014.
- G. "Structural Analysis and Design of Nuclear Plant Facilities", American Society of Civil Engineers, 1980.
- H. "Structural Welding Code", AWS D1.1, latest edition.
- I. UFC 3-340-02, "Structures to Resist the Effects of Accidental Explosions", Unified Facilities Criteria, December 2008 (formerly Dept. of the Army Technical Manual TM5-1300).

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### 1.3 Design Basis

- A. Blast resistant sliding door system as shown on drawings from a single source shall be **Model DB-SL** manufactured by **Protective Door Industries (PDI)**, Harvey, IL 60426 at 708/225-3539, sales@protectivedoor.com or prior approved equal.

### 1.4 Quality Assurance

- A. Door manufacturer shall be certified to ISO quality program ISO 9001:2015.
- B. Welder and weld qualifications, procedures and testing shall be in accordance with AWS D1.1.
- C. Door manufacturer shall be engaged in the successful design and manufacture of blast resistant door assemblies for a minimum of 10 years.

### 1.5 Submittals

- A. Before fabrication is started, manufacturer shall produce a set of submittal drawings and analysis calculations showing conformance for approval. The submittal package shall be sent electronically in '.pdf' format.
- B. Calculations:
  1. The required maximum resistance for each door assembly shall be based on the static equivalent pressure. Analysis calculations shall be performed using Protective Door Industries' simple beam diagram methodology. When the criteria is specified as a dynamic load, door manufacturer has the authority to convert the dynamic pressure to the static equivalent load by multiplying the  $P_r$  peak reflected pressure by the maximum dynamic increase factor of 2. Calculations shall cover the seating and unseating response loads which are transferred to the frame and/or wall via bearing on the jamb restraints and factored in the design to prove the door remains lodged in place during single accidental event. Stresses shall be within the yield strength of the materials.
  2. Manufacturer shall submit one reproducible copy of analysis calculations printed on 8 ½" x 11" white paper. Calculations shall be clear and concise and done in an organized manner. All terms and variables shall be clearly defined and used consistently throughout the calculations. All references shall be documented. The calculations and all text shall be in English.  
*Optional:* The cover sheet of the calculations shall bear the stamp and seal of a PE Professional Engineer registered in state of Illinois or Pennsylvania.
- C. Drawings:
  1. General reference / installation drawings shall be submitted for review before door fabrication begins. All drawings shall be produced in vendor's standard format. The drawings shall be in English. These drawings shall be considered the 'as built' drawings reflecting the final fabricated and installed doors.
  2. The design pressure will be specified on drawing along with the seating and unseating stress loads transferred to walls.
  3. Drawing shall contain Door Ledger with Mark number(s), door handing, wall and structural opening dimensions. Type of operation and components shall be listed as well as other hardware parts. General layout shall detail door elevation, door weight, door thickness, overall door construction, dimensions, restraint anchorage and field locations.
- D. Product Data: Include information on track and trolley system, operator and components, safety devices and weatherstripping.
- E. Spare Parts: Each complete door assembly is a custom manufactured unit and therefore, no spare part numbers exist for the actual door panel, track system or hardware. Contact manufacturer to rectify or replace any issues.

### 1.6 Warranty

- A. Blast door manufacturer shall warrant its' products to be free of defects in labor and material for one (1) year after shipment.
- B. The original manufacturer's warranty applies to all outsourced components (i.e. door operator, safety edge, etc.)

## PART 2 – DESIGN REQUIREMENTS

### 2.1 Blast Loading

- A. Door system shall be designed to resist a positive blast force of up to \_\_\_\_\_ PSF or \_\_\_\_\_ PSI static equivalent loading at \_\_\_\_\_ % rebound (if not specified, 100% rebound will be used) with the positive pressure acting to \_\_\_\_\_ seat the door into wall /or/ \_\_\_\_\_ unseat the door against the restraints. Deflection shall be limited to the yield strength of the materials.
- A. Door system shall be designed to resist positive blast force of \_\_\_\_\_ PSI  $P_r$  peak reflected pressure for a duration of \_\_\_\_\_ msec. in the \_\_\_\_\_ seating direction (against wall) /or/ \_\_\_\_\_ unseating direction (against restraints); rebound as calculated. Deflection shall be limited to the yield strength of the materials.
- B. The door system shall be designed to withstand the applied blast load one time only.
- C. Door performance shall meet response category Medium Level II and be undamaged after application of the specified blast load.

## PART 3 – PRODUCT

### 3.1 Door Fabrication

- A. Blast door panel shall be of noncombustible construction, full flush or *optional* vision lite, insulated, nom. 2 3/4" thk. (4 1/4" thk. for oversize door panels or as required) and fabricated of steel sheet with internal steel stiffeners for reinforcement *or* steel plate to resist the stresses resulting from the specified blast load. On an oversized opening where shipping constraints mandate size, door leaf shall be field spliced with each side of door panel prepared for proper set-up and alignment.
- B. The door panel shall have a factory installed recessed pull on the wall side and a surface mounted bow handle on the exterior side.
- C. Blast restraints are an integral part of the sliding blast door system and shall not fail under blast load or rebound. Restraints shall be manufactured from steel angles or formed steel to the size and thickness warranted by the analysis calculations. The jamb and head restraints will link with the wall restraints to form a secure interlocking condition. Connections between wall restraints and adjacent construction shall be calculated to ensure restraints remain anchored in place during event. Location of restraints and type of anchorage shall be detailed on the installation drawings. Anchorage and appropriate amount of steel shims shall be supplied by blast door manufacturer.
- D. Where a requirement for non-sparking environment exists, Type 304 SS stainless steel shall be used and/or lined at surfaces in contact with any moving parts.
- E. Steel material shall conform to the standards of the American Institute of Steel Construction. All work shall be assembled using all welded construction per the standards of AWS D1.1. Welds to be of a size and type as required per the engineering analysis.
- F. Structural channel frame or steel embeds shall be furnished and installed at the jamb opening by others, as specified in Division 05, Structural Steel, and designed to support the loads impacting the opening. The stress loads transferred to the adjacent wall and/or steel framing shall be provided on the submittal.
- G. Track system:
  - 1. Horizontal sliding door: Door panel shall be top-hung, hardware suitable to door weight and blast load. Door system shall include a track, track hanger brackets with shims and/or crush plates, four-wheel ball bearing type trolleys, trolley pendant, door stop and stay roller assembly. Track supports shall be furnished with anchorage bolts and steel shims necessary for proper alignment.
  - 2. Vertical lift door: Door panel shall ride in heavy angle guides at either side. Guides shall be mounted on structural steel members of sufficient depth to retain door leaves and allow for proper alignment. Guide shoes shall be adjustable, pre-lubricated anti-friction type. Galvanized aircraft cable (two per leaf) shall be used to raise and lower the door panel. Cables shall be suspended over sheaves, rotating on bearings, and mounted on steel weights housed in a steel weight box with angle guides.
  - 3. A track hood or shroud, if required, shall be manufactured and supplied by others.
- H. Weatherstripping (optional). Exterior door shall be sealed with brush-type weatherstripping in aluminum retainers at 3- or 4-sides.

### 3.2 Operation

- A. Architectural hardware schedule shall designate manual, electric power or pneumatic operation with the operator supplied by blast door manufacturer. Consult factory for options on any type of operation.

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- B. The electric operation shall consist of an industrial chain drive operator of type NEMA 1, NEMA 12 or NEMA 4 weatherproof enclosure. Where specified, the operator can be modified for intrinsically safe wiring under NEMA 7/9 explosion proof environment. The unit shall be mounted on an iron track with support brackets, required shims and anchor bolts. Power operated system shall contain a \_\_\_\_ V AC, 3-phase, single speed motor of sufficient horsepower with low voltage controls and emergency disconnect pin for manual operation in case of power failure. A rotary limit switch shall stop the door in full, open or closed position. Starter shall be magnetic reversing type. The leading door edge or bottom door edge shall be equipped with a reversing safety edge.
- C. The pneumatic operator shall be controlled from central air supply or separate air compressor unit. The system shall contain an air cylinder assembly sized by door manufacturer mounted to an overhead support bracket, with timer override and pneumatic control panel with adjustable valves to control door speed; recommended speed at approximately 4" per second. A non-sparking manual disconnect bracket attached to door panel can be activated in case of power failure. The leading door edge or bottom door edge shall be equipped with a pneumatic safety edge.
- D. Standard actuators for power operation are a 3-button pushbutton station with open-close-emergency stop buttons, pull cord or remote-control device with the NEMA rating applicable to the type of operator supplied and/or installation location. One control device is normally installed at interior room side and optional device can be ordered for exterior use.
- E. A fusible link self-closing device shall be standard for openings having fire rated requirement.
- F. General reference / installation drawings shall fully detail operational system and define the sequence of operation.
- G. All field wiring, pneumatic piping or tubing, fittings, connections, air supply, etc. is by others.

### 3.3 Finish

- A. All tool marks and imperfections shall be removed and exposed welding joints dressed smooth. Surfaces shall be cleaned and if required, sand blasted for maximum paint adhesion. Exposed surfaces shall be factory prime painted with manufacturer's standard rust inhibitive metal primer.

## PART 4 – EXECUTION

### 4.1 Packing and Shipping

- A. Each door panel shall be marked with the Architectural door number.
- B. Material shall be securely attached to pallets for shipping. Door vendor shall determine best manner to organize and arrange material. Packing list shall be included with shipment.
- C. Upon receipt of materials and prior to installation, store all materials in a dry, protected interior location to prevent damage.

### 4.2 Installation

- A. Installation shall be in strict accordance with the approved 'as built' installation drawings and data sheets provided by door vendor at time of submittal. Track shall be installed level and rigid. Door shall be securely hung in place and adjusted for proper operation and ease of slide. Field operational test shall be performed by Contractor's personnel or owner's representative after completion of installation.
- B. Door assembly shall be finish painted as applicable under another referenced section.