UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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SECTION 23 33 56

SELF-ACTING BLAST VALVES

02/09

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USACE / NAVFAC / AFCEC / NASA	**UFGS-23 33 56 (February 2009)**

Preparing Activity: USACE	**Superseding**
	UFGS-23 33 56 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

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SECTION 23 33 56

SELF-ACTING BLAST VALVES
02/09

****
NOTE: This guide specification covers the requirements for self-acting blast valves used for blast protection of supply and exhaust air systems.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

PART 1 GENERAL

****
NOTE: This guide specification covers self-acting blast valves for facilities subjected to blast overpressures from accidental explosions, conventional weapons, explosion devices used by terrorists, and nuclear weapons.

This guide specification is intended for procurement of standard products that are readily available and have the required performance characteristics. This guide specification is not intended for procurement of blast valves having special performance characteristics such as actuation by delay paths and sensor actuation since they are not readily available as standard products and may require long lead times for development.

****

1.1 SUMMARY

This section specifies self-acting blast valve systems consisting of blast valve units and mountings.

1.2 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2016) Code of Standard Practice for Steel Buildings and Bridges
AISC 325	(2017) Steel Construction Manual
AISC 360	(2016) Specification for Structural Steel Buildings

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A5.4/A5.4M	(2012) Specification for Stainless Steel Electrodes for Shielded Metal Arc Welding
AWS B2.1/B2.1M	(2014; Errata 2015) Specification for Welding Procedure and Performance Qualification
AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A27/A27M	(2020) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A48/A48M	(2003; R 2016) Standard Specification for Gray Iron Castings
ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A148/A148M	(2020; E 2020) Standard Specification for Steel Castings, High Strength, for Structural Purposes
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A159	(1983; R 2020) Standard Specification for Automotive Gray Iron Castings
ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A220/A220M	(1999; R 2018; E 2018) Standard Specification for Pearlitic Malleable Iron
ASTM A240/A240M	(2020) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A276/A276M	(2017) Standard Specification for Stainless Steel Bars and Shapes
ASTM A278/A278M	(2001; R 2020) Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures Up to 650 degrees F (350 degrees C)
ASTM A297/A297M	(2020) Standard Specification for Steel Castings, Iron-Chromium and Iron-Chromium-Nickel, Heat Resistant, for General Application

ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A313/A313M	(2017) Standard Specification for Stainless Steel Spring Wire
ASTM A351/A351M	(2018) Standard Specification for Castings, Austenitic, for Pressure-Containing Parts
ASTM A439/A439M	(2018) Standard Specification for Austenitic Ductile Iron Castings
ASTM A447/A447M	(2011; R 2016) Standard Specification for Steel Castings, Chromium-Nickel-Iron Alloy (25-12 Class), for High-Temperature Service
ASTM A536	(1984; R 2019; E 2019) Standard Specification for Ductile Iron Castings
ASTM A560/A560M	(2012; R 2018) Standard Specification for Castings, Chromium-Nickel Alloy
ASTM A564/A564M	(2019) Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
ASTM A666	(2015) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
ASTM B85/B85M	(2018) Standard Specification for Aluminum-Alloy Die Castings
ASTM B108/B108M	(2019) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B211/B211M	(2019) Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 25	(1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

1.3 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Structural Supports by Contractor; G[, [_____]]

Submit fabrication, erection, and installation drawings showing framing layouts, elevations, sections, enlarged details, casing locations with dimensions, connections, and material designations.

SD-03 Product Data

Valve Systems

When data shows several products, the actual products proposed

shall be clearly identified.

Manufacturer's Field Service

SD-05 Design Data

Structural Supports by Contractor

SD-06 Test Reports

Blast Tests on Prototype Valve Units
Factory Air Flow Tests

Field Tests

Field test reports shall include an analysis and interpretation of test results.

SD-07 Certificates

Valve Systems

Certify that the valves provided were manufactured using the same materials, dimensions and tolerances as blast tested prototype valve units and that air flow and pressure drop rating meet specification requirements. Each certificate shall be signed by an official authorized to certify in behalf of the manufacturer and shall identify the quantity and date of shipment or delivery to which the certificate applies.

SD-08 Manufacturer's Instructions

Valve Systems

Submit manufacturer's instructions for valve unit and casing installation and field testing.

SD-10 Operation and Maintenance Data

Systems Manual

Information bound in manual format; in both hard copy and electronic.

1.4 QUALITY ASSURANCE

Welders, welding operators, welding procedures, and weld inspectors shall be qualified in accordance with AWS B2.1/B2.1M or AWS D1.1/D1.1M, as applicable.

1.5 DELIVERY, STORAGE, AND HANDLING

Protect valve units, casings, and accessories delivered and placed in storage from weather, excessive humidity and temperature variation, and dirt, dust, or other contaminants.

1.6 WARRANTY

Furnish manufacturer's written warranty covering valve units for 2 years

after installation and acceptance by the Government. The warranty shall provide for repair or replacement of the valve units in the event of malfunction due to defects in materials or workmanship except that finishes need only be warranted for 1 year and the warranty need not cover cleaning and other normal maintenance.

PART 2 PRODUCTS

2.1 VALVE SYSTEMS DESCRIPTION

All valve units and valve mountings shall be provided by one manufacturer. Submit valve unit data that shows complete dimensions and completely describe overpressure ratings, pass-through impulse leakage ratings, air flow rates, actuation mechanisms, and materials.

2.1.1 Sustained Blast Overpressures

****

NOTE: Delete this paragraph when only triangular overpressure waveforms are specified.

Blast overpressure waveforms may be specified or indicated as sustained (infinite duration) overpressures, triangular waveforms with peak overpressures and finite durations, or other pressure versus time histories. When the blast overpressures are low, a sustained overpressure can be specified or indicated conveniently without loss of economy. When the blast overpressures are high, specifying or indicating triangular waveforms will enhance economy and availability. The sustained overpressures shown in the text cover tested commercial products that are readily available. Some triangular waveform peak overpressures and durations for tested commercial products are shown below.

Peak Overpressure MPa psi	Duration (milliseconds)
12.41 1800	0.64
3.31 480	3
2.59 375	5
2.41 350	15

Sustained or triangular blast overpressure waveforms may be either specified or indicated on blast valve schedules shown on the drawings. Other waveforms should be shown on the drawings using waveform diagrams.

****

Casing mounted [supply valve] [exhaust valve] [valve] units shall operate under a zero rise time, sustained (infinite duration) blast overpressure of [1.793] [1.103] [0.276] [_____] MPa [260] [160] [40] [_____] psi [, and

casing mounted exhaust valve units shall operate under a zero rise time, sustained (infinite duration) blast overpressure of [1.793] [1.103] [0.276] [_____] MPa [260] [160] [40] [_____] psi.] [Valve units mounted in [supply] [exhaust] [diesel engine exhaust] piping or ducts shall operate under a zero rise time, sustained (infinite duration) blast overpressure of [1.793] [1.103] [0.276 kPa] [_____] MPa [260] [160] [40] [_____] psi.]

2.1.2 Blast Overpressure Waveforms

****
NOTE: Delete this paragraph when only sustained overpressures are specified. Coordinate with paragraph SUSTAINED BLAST OVERPRESSURES.
****

Casing mounted [supply valve] [exhaust valve] [valve] units shall operate under a triangular blast overpressure waveform having a zero rise time and a peak overpressure and duration of [_____] kPa psi and [_____] milliseconds [, and casing mounted exhaust valve units shall operate under a triangular blast overpressure waveform having a zero rise time and a peak overpressure and duration of [_____] kPa psi and [_____] milliseconds]. [Valve units mounted in [supply] [exhaust] [diesel engine exhaust] piping or ducts shall operate under a triangular blast overpressure waveform having a zero rise time and a peak overpressure and duration of [_____] kPa psi and [_____] milliseconds.] [Valve units shall operate under triangular blast overpressure waveforms having a zero rise time and the peak overpressures and durations indicated.] [Valve units shall operate under the blast waveforms indicated.]

2.1.3 Performance Requirements

2.1.3.1 Field Removable Valve Units

Blast valve units shall be completely removable from casings or other mountings.

2.1.3.2 Penetrations

Except for air flow openings, any penetrations through the valve system shall be sealed against blast leakage through the penetration.

2.2 MATERIALS

2.2.1 Iron Castings

Iron castings shall conform to ASTM A47/A47M, ASTM A48/A48M, ASTM A159, ASTM A220/A220M, ASTM A278/A278M, ASTM A439/A439M, or ASTM A536.

2.2.2 Steel Castings

Carbon and alloy steel castings shall conform to ASTM A27/A27M Grades U-60-30, 65-35, 70-36 or 70-40, or ASTM A148/A148M.

2.2.3 Corrosion Resistant Alloy Steel Castings

Corrosion resistant alloy steel castings shall conform to ASTM A297/A297M, ASTM A351/A351M, ASTM A447/A447M, or ASTM A560/A560M.

2.2.4 Structural Steel

Structural steel shall conform to ASTM A36/A36M.

2.2.5 Stainless Steel

2.2.5.1 Plate, Sheet, and Strip

Stainless steel plate, sheet, and strip shall conform to ASTM A167, ASTM A240/A240M, or ASTM A666.

2.2.5.2 Bars and Shapes

Stainless steel bars and shapes shall conform to ASTM A276/A276M or ASTM A564/A564M.

2.2.5.3 Spring Wire

Stainless steel spring wire shall conform to ASTM A313/A313M.

2.2.6 Aluminum

2.2.6.1 Castings

Aluminum-alloy castings shall conform to ASTM B85/B85M or ASTM B108/B108M.

2.2.6.2 Sheet and Plate

Aluminum sheet and plate shall conform to ASTM B209M ASTM B209.

2.2.6.3 Bars and Rods

Aluminum bars and rods shall conform to ASTM B211/B211M ASTM B221.

2.2.7 Anchors

Concrete anchors shall conform to ASTM A36/A36M, ASTM A108 or ASTM A307.

2.2.8 Primer

****
NOTE: Delete paragraph on primer when casing supports are galvanized and when valves are mounted in piping or ducts.
****

Primer shall conform to SSPC Paint 25.

2.3 COMPONENTS

****
NOTE: Except for diesel exhaust piping, select single-acting nonlatching, double-acting nonlatching or latching type valves. Double-acting nonlatching valves are the least expensive.
****

Valves shall close under the positive blast overpressures specified or indicated and shall be fully operational after the blast.

2.3.1 Blast Operation of Valves Mounted in Casing Supports

[[Supply valves] [Valves] shall be the single-acting nonlatching type that automatically return to the open position except that double-acting valves that close under both positive and negative overpressure may be substituted for single-acting valves.] [[Supply valves] [Valves] shall be the double-acting nonlatching type that close under both positive and negative blast pressure and automatically return to the open position.] [[Supply valves] [Valves] shall be the latching type that remain in the closed position until manually released.] [Exhaust valves shall be the single-acting nonlatching type that automatically return to the open position except that double-acting valves that close under both positive and negative overpressure may be substituted for single-acting valves.] [Exhaust valves shall be the double-acting nonlatching type that close under both positive and negative blast pressure and automatically return to the open position.] [Exhaust valves shall be the latching type that remain in the closed position until manually released.]

2.3.2 Blast Operation of Valves Mounted in Piping or Ducts

[Valves mounted in diesel engine exhaust piping or ducts shall be the single-acting nonlatching type that return to the open position under the diesel exhaust pressure.] [[Supply valves] [Valves] mounted in piping or ducts shall be the single-acting nonlatching type that automatically return to the open position except that double-acting valves that close under both positive and negative overpressure may be substituted for single-acting valves.] [[Supply valves] [Valves] mounted in piping or ducts shall be the double-acting nonlatching type that close under both positive and negative blast pressure and automatically return to the open position.] [[Supply valves] [Valves] mounted in piping or ducts shall be the latching type that remain in the closed position until manually released.] [Exhaust valves mounted in piping or ducts shall be the single-acting nonlatching type that automatically return to the open position except that double-acting valves that close under both positive and negative overpressure may be substituted for single-acting valves.] [Exhaust valves mounted in piping or ducts shall be the double-acting nonlatching type that close under both positive and negative blast pressure and automatically return to the open position.] [Exhaust valves mounted in piping or ducts shall be the latching type that remain in the closed position until manually released.]

2.3.3 Pass Through Impulse

****

NOTE: Specify low pass-through impulse when valves are in close proximity to filters and higher pass-through impulse when valves vent to expansion chambers or other open unoccupied areas.

****

The incident pass-through impulse leakage behind the valve shall not exceed [48.3] [137.9] [_____] kPa-milliseconds [7] [20] [_____] psi-milliseconds [for supply valves nor [48.3] [137.9] [_____] kPa-milliseconds [7] [20] [_____] psi-milliseconds for exhaust valves].

2.3.4 Minimum Operating Overpressure

****

NOTE: Insert appropriate minimum blast overpressure.
****

Valves shall completely close under a minimum blast overpressure of [4.1] [_____] kPa [0.6] [_____] psi.

2.3.5 Operating Temperatures

****
NOTE: Edit appropriate temperature requirements. Do not include temperature ranges in the specifications when operating temperatures are shown on a valve schedule.
****

Valve units shall be fully operational over [a temperature range from [minus 20 to plus 77] [[_____] to [_____]] degrees C [-4 to 170] [[_____] to [_____]] degrees F] [a temperature range from [minus 20 to plus 77] [[_____] to [_____]] degrees C [-4 to 170] [[_____] to [_____]] degrees F for supply valves and [minus 20 to plus 149] [[_____] to [_____]] degrees C [-4 to 300] [[_____] to [_____]] degrees F for exhaust valves] [the temperature ranges indicated] [except that the maximum operating temperature for valves mounted in diesel exhaust piping or ducts shall not be less than [454] [649] [_____] degrees C [850] [1200] [_____] degrees F].

2.3.6 Air Flow Capacity

****
NOTE: Edit value of air flow pressure drop. Delete pressure drop in the specifications when pressure drops are shown on a valve schedule.
****

Valves shall meet the air flow rates [and pressure drops] indicated on the valve schedules. [The total pressure drop across each casing mounted supply and exhaust valve shall not exceed [254] [_____] Pa [1] [_____] inch of water gauge at the air flows indicated.] [The total pressure drop across each valve mounted in [diesel engine exhaust] [supply and exhaust] piping or ducts shall not exceed [_____] Pa inch of water gauge at the flows indicated.]

2.4 ACCESSORIES

Blast valve systems shall be complete with valve units, casings, fasteners, anchors, and all other accessories required to provide a complete, operable installation.

2.5 STRUCTURAL SUPPORTS BY CONTRACTOR

****
NOTE: Delete reference to structural steel when valve casings are cast directly into concrete.
****

In lieu of the concrete openings and supports indicated, the Contractor may design openings and supports to accommodate the proposed valve system. Provide submittals when concrete opening and framing systems require changes to accommodate proposed valve casings. Weld symbols used shall conform to AWS A2.4.

2.5.1 Design

Design openings and framing using loads computed from the blast overpressures specified or indicated. Determine structural steel mechanical properties, such as minimum yield stress, tensile strength and member section properties, based on the proposed framing system. Dynamic increase factors shall be based on applicable strain rates and the concrete unconfined compressive strength, concrete reinforcement yield stress, and structural steel yield stress. Perform flexural analyses using equivalent single degree of freedom or other approved dynamic analysis methods. Deformation limits shall be selected by the Contractor so that ultimate deflections do not inhibit proper valve unit operation.

2.5.2 Design and Analysis Calculations

Submit design and analysis calculations showing concrete opening and framing systems requiring changes to accommodate the proposed valve casings. When applicable, analysis and calculations shall include a narrative discussion of the analysis techniques used; sketches showing the design overpressure loadings, member cross-sections, layouts and dimensions; elastic and plastic section properties for all load-carrying members; minimum yield and tensile strengths for steel materials; plastic moment capacities for load-carrying members; resistance function sketches showing equivalent ultimate resistance and elastic deflections; and design deformation limits and response values for maximum deflections, ductility ratios, and support rotations. Design and analysis calculations shall be stamped by a Registered Professional Engineer experienced in dynamic analysis and design methods.

2.6 FABRICATION

Valve units and mountings shall be factory fabricated units. Valve units shall be connected to mountings using approved bolts, nuts, and washers. Welding shall be in accordance with AWS D1.1/D1.1M. Stainless steel shall be welded using electrodes conforming to AWS A5.4/A5.4M.

2.6.1 Valve Units

Valve units shall be atmospheric corrosion resistant. Valve bodies shall be fabricated from iron, steel or aluminum-alloy castings except that bodies for valves mounted in diesel engine exhaust piping or ducts shall be fabricated from corrosion resistant alloy steel castings. Internal parts such as spindles and pressure disks shall be fabricated from stainless steel or aluminum. Helical springs shall be fabricated from stainless steel spring wire. Special iron, steel and aluminum-alloy castings used to fabricate valve bodies, and special stainless steels and aluminum-alloys used to fabricate internal parts will be permitted when the materials used in the valve units provided are the same as those used in blast tested prototype valve units. Valve surfaces that contact to prevent blast leakage shall be machined or fitted with approved neoprene gaskets to ensure a tight fit.

2.6.2 Casing Supports

****

NOTE: Specify ground smooth welds when appearance is important.

****

Valve casing supports shall be structural steel fabricated in accordance with either AISC 360 or AISC 325. Groove welds used to splice face plates shall be complete penetration welds with complete joint fusion. In order to reduce distortion and residual stresses, a welding sequence shall be used. All welds shall be stress relieved, and welded casings shall be post weld straightened. Fabricated steel shall be well-formed to shape and size, with sharp lines and angles. Intermediate and corner joints shall be coped or mitered. Exposed welds other than fillet welds shall be ground smooth.

2.6.3 Pipe Mountings

Valves indicated for installation in piping systems shall be flange connected. Flange dimension shall be compatible with the piping specified or indicated or companion flanges shall be provided and welded to the adjacent piping.

2.6.4 Surface Preparations, Coatings, and Finishes

The coatings and finishes used shall be suitable for preventing atmospheric corrosion and shall be resistant to heat damage under the operating temperatures specified.

2.6.4.1 Valve Unit Finishes

Ferrous metal surfaces other than stainless steel shall be prepared and factory coated and finished using the manufacturer's standard process.

2.6.4.2 Casing Support Finishes

****
NOTE: Edit option for galvanizing or priming and painting. Priming and painting is recommended for most applications.
****

[Valve support casings shall be galvanized in accordance with ASTM A123/A123M except that surfaces that will be embedded in concrete need not be galvanized. Exposed portions of concrete anchors, fasteners that connect casing parts, and fasteners that connect valve units to casings shall be galvanized in accordance with ASTM A153/A153M.][Valve support casings shall be prepared for priming in accordance with either AISC 360 or AISC 325 and factory primed and finish painted, except that surfaces that will be embedded in concrete need not be primed and shall not be finish painted. Finish painting shall be the manufacturer's standard.]

2.7 TESTS, INSPECTIONS, AND VALIDATIONS

2.7.1 Blast Tests on Prototype Valve Units

Validation of valve performance under blast shall be accomplished by blast tests performed on prototype valve units. Such tests shall validate that the specified pass-through impulse leakage is not exceeded and that the valve unit is fully operational after blast loading. When finite duration overpressure waveforms are specified, the overpressure waveforms used in the prototype test shall exceed the specified waveforms in both overpressure and impulse.

2.7.2 Factory Air Flow Tests

****
NOTE: Edit air flow test requirements.
****

Valve units shall be factory air flow tested to ensure that assembled valve units meet the air flow rates and pressure drops specified or indicated. Product sampling and air flow testing methods and procedures shall be the manufacturer's standard except that at least [5] [_____] percent of the total number of each valve type shall be tested.

2.7.3 Verification Inspection of Welds

Verification inspection of welds shall be performed in accordance with AWS D1.1/D1.1M.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Valve Units

Valve units shall be installed in accordance with the valve manufacturer's written instructions.

3.1.2 Casing Supports

Structural steel casing supports shall be erected in accordance with the manufacturer's instructions, AISC 303 and either AISC 360 or AISC 325.

3.2 FIELD QUALITY CONTROL

Field tests on valve units shall be performed in accordance with the valve manufacturer's written instructions and the testing requirements specified in other specification sections. Submit certified blast and air flow test reports for valve units, including the name and location of the testing agency or laboratory, the date of the tests, a description of the valve units tested, the overpressure waveforms, and the testing apparatus. The test reports shall document the pass-through impulse leakage, the ability of the valve units to resist the specified loads, and the air flow rate versus pressure loss characteristics over the operating pressures.

3.3 CLOSEOUT ACTIVITIES

3.3.1 Systems Manual

Provide a manual consisting of manufacturer's safety precautions, preventative maintenance and schedules, troubleshooting procedures, special tools, parts list, and spare parts data. Edit all data to cover only the valves furnished.

3.3.2 Manufacturer's Field Service

****
NOTE: Specify field service for large valve installations. Edit instruction period duration and instruction videotape requirements.

****

Upon completion of the work, and at a time designated by the Contracting Officer, provide the services of one engineer and other technical personnel, as required, for a period of not less than [4] [_____] hours to instruct Government personnel in the operation and maintenance of the blast valves and all other items furnished under this specification section. Submit information describing training to be provided, training aids to be used, and a description of the training. The instructions shall also include use of the systems manual and videotapes plus an instruction outline and procedure approved prior to scheduling the instruction.

-- End of Section --