INCH-POUND
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MILITARY SPECIFICATION

VALVES, COMBINED VENT-CHECK, FOR SUBMARINE MBT BLOW LINES (SIZES 1-1/2 TO 2-1/2 INCHES)

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all departments and agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers requirements for the construction, testing, and operation of combined vent-check valves with a nominal pressure seating of 4,500 pounds per square inch (lb/in^2), for use in submarine main ballast tank (MBT) high pressure air blow lines.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 4820

SPECIFICATIONS

FEDERAL

PPP-F-320	Fiberboard: Corrugated and Solid Sheet Shock (Container Grade) and Cut Shapes (UNS No. 05500)
QQ-N-281	Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections
QQ-N-286	Nickel-Copper-Aluminum Alloy, Wrought (UNS No. 05500)
QQ-N-288	Nickel-Copper Alloy and Nickel-Copper-Silicon Alloy Castings

MILITARY

MIL-V-3	Valves, Fittings, and Flanges (Except for Systems Indicated Herein); Packaging of
MIL-S-901	Shock Tests, HI (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for
MS 16142	Boss, Gasket Seal Straight Thread Tube Fitting, Standard Dimensions for
MIL-L-19140	Lumber and Plywood, Fire-Retardant Treated
MIL-B-24480	Bronze, Nickel-Aluminum (UNS No. C95800) Castings for Seawater Service

STANDARDS

FEDERAL

FED-STD-H28	Screw-Thread Standards for Federal Services

MILITARY

MIL-STD-22	Welded Joint Design
MIL-STD-167-1	Mechanical Vibrations of Shipboard Equipment (Type I – Environmental and Type II – Internally Excited)

MIL-STD-271	Requirements for Nondestructive Testing Methods
MIL-STD-278	Welding and Casting Standards
MIL-STD-798	Nondestructive Testing, Welding, Quality Control, Material Control, and Identification and HI-Shock Test Requirements for Piping System Components for Naval Shipboard Use
MIL-STD-889	Dissimilar Metals

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

803-1385884	Unions, Fittings, and Adapters Butt and Socket Welding, 6,000 PSI, WOG, and OXY IPS
810-1385970	Nuts, Union, Heavy Duty 6,000 PSI, WOG, and IPS

(Application for copies should be addressed to: Commander, Portsmouth Navy Shipyard, Code 202.2, Portsmouth, NH 03801.)

MATERIAL DESIGNATOR CATALOG, VOLUME II

(Application for copies should be addressed to Naval Sea Systems Command Attachment, Naval Material Quality Assessment Office (NMQAO) Federal Building, Room 423, 80 Daniel Street, Portsmouth, NH 03801 ATTN: SEA 07N.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

DTNSRDC Report C2537	A Method for the Design of Submarine Pressure Hull Attachments
UERD Plan No. RU 487	Full Scale Section Test Structure Ballast Tank

(Application for copies should be addressed to the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia PA 19120-5099.)

2.2 **Non-Government publications.** The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B 63	Standard Test Method for Resistivity of Metallically Conducting Resistance and Contact Materials
B 443	Standard Specification for Nickel-Chromium-Molybdenum-Columbian Alloy (UNS No. 6625) Plate, Sheet and Strip

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 **Order of precedence.** In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 **Qualification.** Valves furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.3 and 6.7).

3.2 **First article.** When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.6) in accordance with 4.4.

3.3 **Valve description.** Valves shall be spring-loaded check valves installed to prevent seawater backflow into submarine high pressure air ballast tank blow lines. A vent shall be incorporated to automatically open when the check poppet closes and thus eliminate residual upstream pressure and assure maximum seating differential across the check poppet. The vent shall close against upstream pressures as high as 4,500 lb/in^2 when the check poppet is open.

3.4 Materials. Materials shall be as specified in table I (see 6.3 and 6.9). Materials shall be corrosion-resisting and selected to prevent galling, seizing, or excessive wear on operating parts. Material selection and working clearances shall prevent interferences due to temperature changes. The use of dissimilar materials shall be minimized to preclude galvanic corrosion and shall be in accordance with MIL-STD-889.

TABLE I. *List of materials.*

Name of part	Materials
Body	70-30 Nickel-Copper QQ-N-281 Composition QQ-N-288 Composition E (cast) INCONEL 625 ASTM B 443
Check poppet head, and stem one piece	Nickel-Copper-Aluminum QQ-N-286
Springs	70-30 Nickel-Copper or Nickel-Cobalt-Chromium-Molybdenum or INCONEL X-750 ASTM B 637
Parts not continually exposed to seawater (except where otherwise specified)	Nickel-Copper-Aluminum QQ-N-286
Poppet insert and O-rings	Nitrile Rubber (Buna-N) or Fluorocarbon Rubber (Viton)
Bonnet union nut (where applicable)	QQ-N-286
Cartridge guide assembly	Nickel-Aluminum-Bronze MIL-B-24480
Guide alignment pin	70-30 Nickel-Copper QQ-N-281, class A

3.4.1 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.5 **Construction requirements.**

3.5.1 **Concept.** Valves will be operated, maintained, and repaired onboard Naval ships and the configuration shall emphasize simplicity, maintainability, ruggedness, and reliability (see 6.3 and 6.8). Construction shall permit access for adjustment and repair when working from either side of the valve and without requiring removal of the valve body from the line.

3.5.2 **Maintainability.** Internal parts shall permit easy disassembly and reassembly and shall prevent, as far as practical, the incorrect reassembly of parts. Positioning and alignment of all parts in an assembly shall employ positive means so that correct reassembly is repeatedly assured. In no case shall parts for a given valve be physically interchangeable or reversible unless such parts are also interchangeable or reversible with regard to function, material compatibility in accordance with (table I), performance, and strength.

3.5.2.1 **Speed and use of maintenance.** Valve construction shall permit maintenance action to disassemble, replace guide and poppet, and reassemble within a time limit of 3/4 hour.

3.5.3 **Interchangeability.** Valve construction shall permit interchangeability without individual modification of like parts between all valves. Each part shall have a part number and shall be replaceable from stock or the manufacturer on a non-selective and random basis. Parts having the same manufacturer's part number shall be directly interchangeable with each other with respect to installation (physical) and performance (function). Physically interchangeable assemblies, components, and parts are those which are capable of being readily installed, removed, or replaced without alteration, misalignment, material incompatibility, or damage to parts being installed or to adjoining parts. No fabrication operations such as cutting, filing, drilling, reaming, hammering, bending, prying, or forcing shall be required. This is not intended to preclude the use of special tools, fixtures, and other shop aids during original assembly of the parts into the article. However, any special tools required for maintenance shall be supplied with the valve.

3.5.4 **Internal trim.** The main spring-check assembly, comprising the check poppet, seat, and return spring assembly, shall be incorporated into a cartridge assembly which can be inserted into and removed from the valve body as a single unit. The cartridge assembly of each manufacturer shall be identical and interchangeable between all sizes of vent-check valves made by the manufacturer to this specification. Except for the valve body, all other parts, such as the vent assembly and top closure, shall also be identical and interchangeable between all valve sizes covered by this specification. Thus, only the body, and the end connections attached thereto, where applicable, shall be different between the three size valves covered in this specification made by any particular manufacturer.

3.5.5 **Springs.** All springs shall be on the air side of the valve. Springs shall not be fully compressed during any normal operation or adjustment of the valve. Springs shall be designed so as to have a natural frequency high enough to prevent a permanent deformation of the spring resulting from surging, at least 12 times the maximum rate at which the spring operates. Surging

is defined as a phenomenon in which waves of successive compressions or extensions travel along the length of the spring and subject it repeatedly to a stress level associated with solid compression. Spring ends shall be squared and ground.

3.5.6 Threads. Threads shall conform to FED-STD-H28. Provisions shall be incorporated to prevent unintended loosening of threaded parts. Pipe threads shall not be used.

3.5.7 Poppet insert. The check poppet shall incorporate a soft-seating insert which is recessed to eliminate damage from overcompression and is of adequate strength to withstand the high flows and pressure transients associated with this application. The insert shall be replaceable on an interchangeability basis as defined by 3.5.3.

3.5.8 Vent. The vent shall terminate in a 1/2-inch boss in accordance with MS 16142 machined directly into the body or bonnet to permit attachment of an external line. An internal cut-out valve shall be incorporated in the body or bonnet to isolate the vent.

3.5.9 End preparation. End preparation shall be in line and shall be either 6,000 lb/in^2 socket or butt weld union in accordance with NAVSEA 803-1385884 and 810-1385970 or direct-weld ends (see 6.2). All welding procedures shall be in accordance with MIL-STD-278 and 22. Inside diameter of valves shall be as specified (see 6.2). Face-to-face distance between the threaded ends of union-end valves shall be in accordance with table II.

TABLE II. *Face-to-face dimensions.*

Valve size (inches)	End-to-end dimensions (inches)
1 1/2	9.00 ± 0.03
2	10.50 ± .03
2 1/2	10.50 ± .03

3.5.10 Boundary parts. The proof and burst pressures for pressure boundary parts shall be as specified in table III.

TABLE III. *Proof and burst pressures.*

Nominal rating	Proof pressure	Burst pressure (minimum)
(lb/in^2)	(lb/in^2)	(lb/in^2)
4,500	6,750	13,500

3.5.11 Bonnet union nut. The bonnet union nut shall be forged nickel-copper-aluminum in accordance with QQ-N-286, class A, age-hardened for attachment to the body.

3.5.12 Body construction. Valve bodies shall be machined from a one-piece casting or forging. Inlet and outlet parts shall be in-line.

3.6 Service and ambient conditions. Service and ambient conditions shall be as follows:

a. Fluid: Outlet – air and seawater, inlet – air
b. Maximum working pressure (inlet and outlet): 4,500 lb/in^2
c. Working temperature: minus 50 to plus 100 degrees Fahrenheit (°F)
d. Salt spray: external exposure to atmosphere containing salt-laden moisture
e. Vibration: environmental vibration in accordance with type 1 of MIL-STD-167-1
f. Shock: mechanical shock in accordance with grade A, class 1 of MIL-S-901
g. Underwater explosion shock: (see 3.7.9 and 4.6.18)
h. Water-slug: water-slug conditions (see 3.7.10 and 4.6.17).

3.7 Performance requirements.

3.7.1 Check feature flow capacity. Required capacity in this specification is in terms of blowdown time for a 25 cubic foot (ft^3) pressurized reservoir. When installed as specified in 4.6.11, the vent-check valve shall dump pressure from 1,500 lb/in^2 to 500 lb/in^2 in times not exceeding those specified in table IV (see 6.2).

TABLE IV. Capacity requirements.

Internal diameter of inlet and outlet bore (inches)	Maximum allowable blowdown time (seconds)
1.187 ± 0.010	6.3
1.338 ± 0.010	5.8
1.615 ± 0.010	5.1
1.750 ± 0.010	5.0

3.7.2 Opening/closing pressures. The check poppet shall begin opening before the pressure differential (inlet to outlet) across the valve exceeds 40 lb/in^2, shall be fully open before the pressure differential exceeds 100 lb/in^2, and shall be fully closed at or before zero lb/in^2 pressure differential on decreasing inlet pressure.

3.7.3 Vent capacity. The vent feature shall vent pressure in an upstream volume from 100 to 25 lb/in^2 in a time not greater than 2.7 seconds per 100 cubic inches of upstream volume.

3.7.4 Check poppet tightness. With a closing pressure differential (outlet to inlet) of anywhere between zero and 4,500 lb/in^2 there shall be no visible leakage past the check poppet.

3.7.5 Vent valve tightness. With the check valve open, leakage through the vent port, at upstream pressures anywhere between zero and 4,500 lb/in^2, shall be not greater than 40 standard cubic feet per minute (ft^3/min).

3.7.6 Check poppet stability. Valves shall operate without chatter or instability at all flow rates above 400 ft^3/min. Packing on the check poppet stem, or other means to improve stability which could adversely affect the functional reliability of the valve, shall not be used.

3.7.7 External leakage. There shall be no external leakage except that allowed from the vent port (see 3.7.5) when tested as specified (see 4.6.8).

3.7.8 Mechanical shock and vibration. Valves shall meet the mechanical shock requirements of grade A, class I, of MIL-S-901 and the environmental vibration requirements of type I of MIL-STD-167-1.

3.7.9 Underwater explosion shock. Valves shall meet the underwater explosion shock requirements outlined (see 4.6.18).

3.7.10 Water-slug. Valves shall withstand the transient shock pressure conditions which can result when the piping upstream of the valve is completely flooded with water and then subjected to 4,500 lb/in^2 air by way of a quick opening valve. The valve shall meet the requirements of the water-slug test as specified (see 4.6.17).

3.8 Marking.

3.8.1 Body markings. The manufacturer's name or trademark and body material composition shall be cast or forged integral with the valve body. The size, pressure, rating, and a flow arrow shall be cast or forged integral with the valve body or die-stamped on raised metal pads (1/8-inch added wall thickness minimum).

3.8.2 Identification plates. Each valves shall have an permanently attached identification plate made of corrosion-resisting material and containing the following information or a space therefore:

a. Manufacturer's name and address
b. MIL-V-23953
c. Size
d. Manufacturer's model and part number or identification
e. Manufacturer's drawing number (assembly and CD)
f. Technical manual number
g. Part or Identifying Number (PIN)
h. Contract number.

3.8.3 **Material identification control (MIC).** MIC markings shall be applied to all parts designated for control by the contract or order (see 6.2). The following information shall be provided on all permanently marked MIC material:

a. Type of material (in accordance with the material specification)
b. Traceability number
c. Manufacturer's name, trademark or symbol
d. Activity identification designator (AID) (if applicable).

All MIC parts shall be marked and traceable to certification data attesting to the composition and mechanical properties for each piece (i.e. heat number, heat-treat number/or lot number, as applicable, in accordance with material specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order (see 6.2), the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program (see 6.3). The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.3)
b. First article inspection (see 4.4)
c. Quality conformance inspection (see 4.5).

4.3 Qualification inspection. Qualification inspection shall be conducted at a laboratory satisfactory to the Naval Sea Systems Command (NAVSEA). Drawings in accordance with 3.5.1 shall be submitted prior to authorization of qualification tests. Qualification testing shall be as specified in 4.3.1, 4.3.2, and 4.6.1 through 4.6.24.

4.3.1 Qualification test sample. A sample vent-check valve of the size to be supplied by the manufacturer shall be submitted for qualification inspection. The sample shall be produced with equipment and procedures normally used in production. In addition to the test valve, the following items shall be provided:

a. Internal replaceable parts – two complete sets
b. Special tools required for installation, operation, and maintenance – one complete set
c. Seals – two complete sets
d. Instruction book for installation, operation, and maintenance
e. Drawings in accordance with 3.5.1.

4.3.2 Inspection routine. The sample unit shall be subjected to the qualification inspection specified in table V.

TABLE V. *Qualification inspection.*

	Examination or test	Test method
(1)	Dimensions and visual	4.6.2 and 4.6.3
(2)	Nondestructive test	4.6.4
(3)	Proof test	4.6.5
(4)	External leakage test	4.6.7
(5)	Check valve seat tightness	4.6.8
(6)	Backpressure strength test	4.6.6
(7)	Vent valve seat tightness	4.6.9
(8)	Functional test	4.6.10
(9)	Check feature flow capacity test	4.6.11
(10)	Vent feature flow capacity test	4.6.12
(11)	Operational test	4.6.13
(12)	Low temperature operational test	4.6.14
(13)	Low flow stability test	4.6.15
(14)	Valve poppet vent test	4.6.16
(15)	Water-slug test	4.6.17
(16)	Underwater explosion shock test	4.6.18
(17)	High-impact shock test	4.6.19
(18)	Vibration test	4.6.20
(19)	Burst test	4.6.21
(20)	Spring comparison examination	4.6.22
(21)	Material examination	4.6.23

4.4 First article inspection. The first valve of the same size furnished under a contract or order, shall be examined in accordance with the tests specified in table VI (see 6.3).

TABLE VI. *First article inspection.*

	Examination or test	Test method
(1)	Dimensions and visual	4.6.2 and 4.6.3
(2)	Functional test	4.6.10
(3)	Check feature flow capacity test	4.6.11
(4)	Water-slug test	4.6.17
(5)	High-impact shock test	4.6.19
(6)	Vibration test	4.6.20
(7)	Underwater explosion test	4.6.18
(8)	Burst test	4.6.21
(9)	Spring compression examination	4.6.22
(10)	Verification examination	4.6.24

4.5 Quality conformance inspection. Each production valve shall be examined and tested as specified in table VII (see 6.3). If a valve is rejected, the manufacturer may rework it to correct the defects. Such valves may be reinspected and shall not be tendered for acceptance unless the former rejection or requirement for correction is disclosed.

TABLE VII *Quality comformance inspection.*

	Examination or test	Test method
(1)	Nondestructive tests	4.6.4
(2)	Proof test	4.6.5
(3)	External leakage test	4.6.7
(4)	Check valve seat tightness	4.6.8
(5)	Verification examination	4.6.24

4.6 Test methods.

4.6.1 Safety. Some of the tests outlined in this section require the use of very high pressures and low temperatures. Personnel performing such tests shall take adequate preventive measures to prevent personal injury.

4.6.2 Dimensions and visual. The sample valve shall be disassembled and visually and dimensionally examined to determine conformance with the requirements of this specification and the valve drawings. On reassembly a new poppet insert shall be installed, selected randomly from those provided with the test valve. Any difficulty in assembly or disassembly shall be noted.

4.6.2.1 Maintainability. The maintenance actions specified in 3.5.2.1 shall be demonstrated.

4.6.3 Disassembly and examination after test. The valve shall be disassembled, visually and dimensionally examined for damage, wear, and operation of parts.

4.6.4 Nondestructive test. Nondestructive tests shall be in accordance with MIL-STD-278 and MIL-STD-271. Acceptance criteria shall be in accordance with MIL-STD-278.

4.6.5 Proof test. With the outlet port capped off, 6,750 lb/in^2 of water shall be applied to the inlet port for a minimum of 5 minutes. There shall be no external leakage, permanent distortion, or structural failure. At completion, vent the pressure before examining the valve as specified in 4.6.3.

4.6.6 Backpressure strength test. With the inlet port open, 4,500 lb/in^2 of water shall be applied to the outlet port for a minimum of 5 minutes. At completion, the valve shall be examined as specified in 4.6.3.

4.6.7 External leakage test. With the outlet port capped off, 4,500 lb/in^2 of air shall be applied to the valve inlet. Leakage shall be checked using bubble fluid or by submerging the valve in water.

4.6.8 Check valve seat tightness. Check valve seat tightness tests shall be conducted by slowly applying water at pressures of 5, 10, 25, 100, 600, and 900 lb/in^2 to the outlet port of the valve. There shall be no visible leakage at the inlet port over a 5-minute period at each pressure. External leakage shall be zero.

4.6.9 Vent valve seat tightness. The check poppet shall be blocked open, or removed, as necessary to allow closure of the vent poppet. Remove the vent poppet plunger if the check poppet is removed from the valve. Apply 2,250 lb/in^2 of air to the valve. Leakage from the vent shall not exceed 40 ft^3/min.

4.6.10 Functional test. With the outlet port open to atmosphere, air pressure shall be applied to the inlet port. Slowly vary the pressure at the valve inlet from zero to 100 to zero lb/in^2. Note the cracking, full-open, and reseat pressures. Cracking, full-open, and reseat pressures shall be as specified in 3.7.2.

4.6.11 Check feature flow capacity test. The valve shall be connected to a 25 ft.^{3} reservoir. A 2-inch ball valve shall be installed between the reservoir and the vent check valve. The piping used shall have an internal diameter of 1-3/4 inches. The length of piping in the flow capacity test setup shall be as follows: 8 inches between the reservoir outlet and the ball valve inlet, 24 inches between the ball valve outlet and the vent check valve inlet, and 24 inches at the vent check valve outlet. Initial reservoir pressure shall be between 1,650 lb/in^2 and 1,850 lb/in^2 and initial reservoir temperature shall be between 70 and 90 °F. Flow shall be initiated through the test valve, and reservoir pressure versus time shall be plotted with a continuous pressure recorder. The time required for pressure to drop from 1,500 lb/in^2 to 500 lb/in^2 shall not exceed that specified in table IV.

4.6.12 Vent feature flow capacity test. With the check poppet blocked closed, and the outlet port capped off to prevent leakage, a blowdown test shall be conducted to verify capacity of the vent feature. Vent capacity shall be as specified in 3.7.3.

4.6.13 Operational test. The vent-check valve shall be flow cycled 5,000 times. The following conditions shall be produced: during the flow portion of each cycle, pressure at the valve inlet shall be at least 1,300 lb/in^2 and pressure at the valve outlet shall not exceed 1,000 lb/in^2; during the check portion of each cycle, pressure at the valve outlet shall exceed the pressure at the valve inlet by at least 600 lb/in^2. At the completion of each 2,500 cycles, the valve shall be tested as specified in 4.6.8 through 4.6.10 and examined as specified in 4.6.3.

4.6.14 Low-temperature operational test. The vent-check valve shall be cycled 1,000 times as specified in 4.6.13 except that the valve shall be maintained at a temperature not exceeding minus 50 °F during the test. To measure the temperature of the vent-check valve a thermocouple shall be placed on the valve body. At the completion of this test the valve shall be tested as specified in 4.6.8 through 4.6.10 and examined as specified in 4.6.3.

4.6.15 Low-flow stability test. The valve shall be operated for a minimum of 2 minutes at the flow rate specified in 3.7.6. Flow shall then be increased to approximately 50 percent of required valve capacity in 100 $stdft^3/min$ increments. Flow shall be held for a minimum of 15 seconds at each increment. There shall be no instability or cycling during this test.

4.6.16 Valve poppet vent test. The poppet of the vent-check valve shall be tested to verify its integrity under conditions of rapid depressurization. The valve poppet may either be removed from the valve and placed in a test chamber or may be blocked in the open position in the valve for this test. The poppet shall be pressurized to 4,500 lb/in^2 for not less than 5 minutes. The pressure around the poppet shall then be released to zero lb/in^2 over a period of 3 seconds or less. This sequence shall be repeated 12 times. At the completion of 12 cycles, the valve shall be examined and tested as specified in 4.6.8 through 4.6.10 and 4.6.3. There shall be no damage or degradation to the seating insert.

4.6.17 Water-slug test. The vent-check valve shall be subjected to tests which simulate the condition which can exist aboard ship when the header upstream of the vent-check valve is flooded with water at the time the emergency blow system is actuated. The system for this test shall comprise a 4,500 lb/in^2 air reservoir of not less than 25 ft^3 capacity, a 2-inch quick-opening full-ported ball valve close-coupled to the reservoir, 8 feet of straight 2-inch pipe, a 2 by 1-1/2 inch reducer, 12 feet of straight 1-1/2 inch pipe, and the vent-check valve. The 20 feet of piping separating the ball valve from the vent-check valve shall be laid out and sloped in such a manner that it can be completely flooded, without any entrapped air, prior to each water-slug cycle. Isolatable vents shall be incorporated, as necessary, to assure the elimination of all entrapped air. The vent-check valve shall be subjected to 40 water-slug shots. Each shot shall consist of an initial reservoir pressure of not less than 4,500 lb/in^2, opening the ball valve in 20 milliseconds or less, and leaving the ball valve open at least 2 seconds. The system upstream of the vent-check valve

shall be completely flooded and purged of any entrapped air prior to each shot. At the completion of the 40 shots, the vent-check valve shall be removed and tested as specified in 4.6.7 through 4.6.10 and examined as specified in 4.6.3. There shall be no damage or degradation to performance.

4.6.18 Underwater explosion shock test. The vent-check valve shall be subjected to and successfully pass the underwater explosion shock test outlined herein. Design guidance and information on this test and the test vehicle may be obtained from Naval Ship Research and Development Center (DTNSRDC), Report C-2537. Extension of test qualification criteria for underwater explosion shock testing is equivalent to that established in MIL-S-901 for mechanical shock test extensions. Underwater explosion testing will be conducted using the Full Scale Section Number 5 (FSS-5, shown in Underwater Explosion Research Division (UERD), Plan No. RU 487), or equivalent, as the test vehicle. The vent-check valve shall be structurally supported in a manner representing the most vulnerable shipboard installation. Shipboard inlet and outlet piping runs shall be simulated in the test installation. The test shall consist of two shots of 125 pounds of HBX-1, with the vent-check valve on a horizontal radius from the centerline of the test vehicle and the charge on an extension of that radius at a standoff of 15 feet from the valve outlet port for the first shot and 13.5 feet for the second shot. This test shall be conducted at a Government facility designated by NAVSEA. After each shot, the vent-check valve shall be visually inspected, without dismantling, for leakage or distortion of the pressure-containing envelope, cycled twice to demonstrate operability, and then tested to submergence pressure at the outlet. Threaded parts shall be checked for tightness and retightened, if necessary. The amount of retightening required, and the calculated loosening thus indicated, shall be noted. Following the second shot, the vent-check valve shall be inspected and tested as specified for the first shot. It shall then be removed and tested as specified in 4.6.7. through 4.6.10 and examined as specified in 4.6.3. There shall be no damage or degradation to performance.

4.6.19 High-impact shock test. The valve shall be subjected to and meet the high-impact mechanical shock tests for grade A, class 1 of MIL-S-901. At the completion of this test the valve shall be tested in accordance with 4.6.7 through 4.6.10 and examined in accordance with 4.6.3 and MIL-STD-798.

4.6.20 Vibration test. The valve shall be vibration tested in accordance with type 1 of MIL-STD-167-1. Following completion of vibration testing the valve shall be tested as specified in 4.6.7.

4.6.21 Burst test. Water shall be applied at 13,500 lb/in^2 to the pressure containing envelope for not less than 5 minutes. The valve shall safely contain this pressure and remain intact structurally.

4.6.22 Spring compression examination. The main poppet spring shall be visually inspected following completion of operational tests to verify that no compressional reduction of spring length has occurred.

4.6.23 Material examination. Test and inspection reports provided with the material to insure that they include all data required by the drawing or purchase order shall be examined. Verify that the reported results for chemical composition and mechanical properties are in compliance with the material specification.

4.6.24 Verification examination. Verify that the MIC marking correctly identifies the material required by the acquisition documents or applicable drawing or specification.

4.7 Inspection of packaging. The sampling and inspection of preservation, packing, and marking for shipment, stowage, and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.11.)

5.1 Packaging requirements. Valves shall be preserved level A, C, or commercial, and packed level A, B, C, or commercial, as specified (see 6.2) and marked in accordance with MIL-V-3 and shall include bar codes and applicable packaging acquisition options therein as specified (see 6.2). In addition, for Navy acquisitions, the following applies:

a. Navy fire-retardant requirements.

(1) *Lumber and plywood.* Unless otherwise specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping container construction members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Levels A and B	–	Type II – weather resistant Category 1 – general use
Level C	–	Type I – non-weather resistant Category 1 – general use

(2) *Fiberboard.* When otherwise specified (see 6.2), fiberboard used in the construction of class-domestic, non-weather resistant fiberboard and cleated fiberboard boxes including interior packaging forms shall meet the flamespread and the specific optic density requirements of PPP-F-320 and amendments thereto.

5.1.1 Special marking. In addition to the marking required in 5.1, shelf life markings applicable shall be applied to packages containing poppet inserts or O-rings.

5.2 **Technical manuals.** In addition to the requirements of MIL-V-3, the copy(s) of the technical manual shall be placed in the shipping container housing the main unit.

5.3 **Data (see 3.5.1).** Data shall be prepared for delivery so as to ensure the required information is protected against deterioration, physical damage, or loss during shipment from the contractor to the receiving activity. Packages or shipping containers shall as a minimum conform to the level C requirements of 5.1.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 **Intended use.** The vent-check valves specified herein are intended for installation in submarine high-pressure air ballast tank blow lines.

6.2 **Acquisition requirements.** Acquisition documents must specify the following:

a. Title, number, and date of this specification

b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2)

c. When first article inspection is required (see 3.2)

d. Whether socket or butt weld unions or direct butt weld ends are required and the inside diameter required for valves (see 3.5.9)

e. Internal diameter of inlet and outlet bore (see 3.7.1)

f. Parts designated for MIC (see 3.8.3)

g. Applicable levels of preservation and packing required (see 5.1)

h. When fire-retardant materials are not required (see 5.1)

i. Special marking required (see 5.1.1)

j. Packing of technical manuals (see 5.2)

k. Additional spare parts and seals (see 6.5)

l. Specific control of processed materials and certification thereof (see 6.9).

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DIDs) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DIDs are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
3.4	DI-E-2121	Certificate of Compliance	–
3.5.1	DI-E-7031	Drawings, Engineering and Associated Lists	Level II
3.5.1	DI-E-5586	Engineering Documentation	Level II
3.5.1	DI-E-20477	Imaged Aperture/Tabulating Cards	Para. 10.2
4.1.1	DI-R-4803	Inspection System Program Plan	–
4.4	DI-T-4902	First Article Inspection Report	–
4.5	DI-T-5329	Inspection and Test Reports	–

The above DIDs were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DIDs are cited on the DD Form 1423.

6.4 Technical manuals. The requirement for technical manuals should be considered when this specification is applied on a contract. If technical manuals are required, military specifications and standards that have been cleared and listed in DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL) must be listed on a separate Contract Data Requirements List (DD Form 1423), which is included as an exhibit to the contract. The technical manuals must be acquired under separate contract line item in the contract.

6.5 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract.

6.5.1 When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts should meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should also be specified.

6.6 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first production items, a standard production item from the contractor's current inventory (see 3.2), and the number of items to be tested as specified in 4.4. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.7 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List No. 23953 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests must be made in accordance with "Provisions Governing Qualification SD-6" (see 6.7.1).

6.7.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.8 Drawings. Drawings which illustrate or describe pressure boundary components as defined in 3.8.3 should be stamped or labeled, "Material Identification Control," in or near the title block.

6.9 Mechanical properties certification. A certification of two mechanical properties of the material used in the fabrication of all vent-check valves should be provided. When the mechanical properties of the material used in the fabrication of a valve are altered by metal working processes or heat treatment, sample material from each lot of material, as defined in the material specification, should be subjected to tensile tests in the final heat treated condition for the valve. As a minimum, tensile tests should determine ultimate strength, percent reduction in area, percent

elongation and hardness. The tensile tests should be conducted on test samples machined from the heat treated material or from a piece of parent stock which had been heat treated in the same batch in the lot processed at the same time. Acceptance criteria for the mechanical properties should be in accordance with the material specification or as approved by the design review agency. In no case should ductility of less than 10 percent elongation in 2 inches be allowed. Certification of the chemical test results for each heat of material and the specific heat treatment (including temperature and holding time) to which each casting was subjected should be provided. This certification should list both chemical test results and specification requirements.

6.10 Patent notice. Where the government has limited rights in the data shown on the drawings as determined by the contractual provisions regarding rights in technical data, the drawings may be marked with a legend. If used, the "Limited Rights Legend" of FAR should be used.

6.11 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.12 Subject term (key word) listing.

Blowdown
Check poppet
High-pressure air blow
Spring loaded check valves
Water-slug

6.13 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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