MIL-V-24332(SHIPS) 1 July 1968

#### MILITARY SPECIFICATION

## VALVES. ANGLE RELIEF. FOR LIQUID SERVICE

#### (NAVAL SHIPBOARD)

- 1. SCOPE
- 1.1 Scope. This specification covers spring loaded relief valves of totally enclosed spring pressuretight construction for liquid service (except hydraulic oil).
- 1.2 Classification. Relief valves shall be of the following grades, as specified (see 6.2):

Grade A - Ferrous. Grade B - Nonferrous.

- 1.3 Ratings. Ratings shall be as specified in 3.4.1 through 3.4.2 (see 6.2).
- 2. APPLICABLE DOCUMENTS
- 2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

#### **SPECIFICATIONS**

PEDERAL.

QQ-N-286 - Nickel-Copper-Aluminum Alloy, Wrought. QQ-N-288 - Nickel-Copper Alloy and Nickel-Copper-Silicon Alloy Castings.

MIL-S-901 - Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements For.

MIL-D-1000/Z - Drawings, Engineering and Associated Lists.

MIL-F-I183 - Fittings, Tube, Cast Bronze, Silver-Brazing.

MIL-M-15071 - Manuals Equipment and Systems.

MIL-M-16576 - Metal, Gun: Castings.

MIL-F-20042 - Flanges, Pipe, Bronze (Silver-Brazing).
MIL-C-20159 - Copper-Nickel Alloy (70~30 and 90~10): Castings.
MIL-F-24227 - Fittings and Flanges, Cast Bronze, Silver-Brazing Suitable for Ultrasonic Inspection.

#### STANDARD

MIL-STD-167 - Mechanical Vibrations of Shipboard Equipment.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for hids or request for proposal shall apply.

NATIONAL BUREAU OF STANDARDS Handbook H28 - Screw Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.)

UNIFORM CLASSIFICATION COMMITTEE Uniform Freight Classification Rules.

(Application for copies should be addressed to the Uniform Classification Committee, 202 Union Station, 516 West Jackson Boulevard, Chicago, Illinois 60606.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

AlOS - Forged or Rolled Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

Alloy-Steel Bolting Materials for High Temperature Service.

Al94 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.

A216 - Carbon-Steel Castings Suitable for Fusion Welding for High-Temperature Service.

A217 - Alloy Steel Castings for Pressure-Containing Parts Suitable for High-

Temperature Service.

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A230 - Carbon-Steel Valve Spring Quality Wire.
A231 - Chromium-Vanadium Alloy Steel Spring Wire.
A232 - Chromium-Vanadium Steel Valve Spring Quality Wire.

A276 - Hot-Rolled and Cold-Finished Stainless and Heat Resisting Steel Bars.

A313 - Chromium-Nickel Corrosion-Resisting Steel Spring Wire.
A351 - Ferritic and Austenitic Steel Castings for High-Temperature Service.

B21 - Naval Brais Rod, Bar, and Shapes. B61 - Steam or Valve Bronze Castings. B164 - Nickel-Copper Alloy Rod and Bar.

B166 - Nickel-Chromium-Iron Alloy Rod and Bar.

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

UNITED STATES OF AMERICA STANDARDS INSTITUTE (USAS) B16.5 - Steel Pipe Flanges and Flanged Fittings.

(Application for copies should be addressed to the United States of America Standards Institute, 10 East 40th Street, New York, N. Y. 10016).

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

- 3. REQUIREMENTS
- 3.1 Definitions. The following definitions are applicable to this specification.
- 3.1.1 Set pressure. The pressure at which the valve begins to open. Expressed in pounds per square inch gage (psig).
- 3.1.2 Set pressure tolerance. The permissible plus or minus deviation from the specified set pressure. Expressed in pounds per square inch (psi) or as a percent of the set pressure.
- 3.1.3 Set pressure range. The range over which the set pressure can be adjusted with the installed spring.
- 3.1.4 Accumulation. The increase in pressure, shove the set pressure, required to pass rated flow. Expressed in psi or as a percent of the set pressure.
- 3.1.5 Accumulation pressure. The set pressure plus the accumulation. Expressed in psig.
- 3.1.6 Blowdown. The decrease in pressure below the set pressure, required for the valve to reseat. Expressed in psi or as a percent of the set pressure. The accumulation and blowdown establish the operating band of the relief valve at a particular setting.
  - 3.1.7 Blowdown pressure. The set pressure minus the blowdown. Expressed in psig.
- 3.2 Valve description. This specification covers self-contained, single seated, spring loaded relief valves, where the inlet pressure is sensed under and directly operates the spring loaded disc.
- 3.3 Materials of construction. Materials shall be as specified in table I. All materials shall be suitable for the intended pressure and shall be selected to prevent galling, seizing, or excessive wear between parts. This specification is not intended to be restrictive, providing proposed alternate materials will provide satisfactory service. Naval Ship Engineering Center (NAVSEC) (Auxiliary Equipment Branch) approval is required for the use of any alternate material.

Table I - List of materials.

Name of parts	Grade A Applicable documents	Grade R Applicable documents
Body, bonnet, and yoke	ASTM AlOS grade II ASTM A216 grade WCB ASTM A217 grade WCI, WC6 ASTM A351 grade CF3, CF3M, CF8, CF8M	ASTM R61 MJL-N-16576 QQ-N-288 composition E MIL-C-20159
Disc and seat ring	ASTM A276 types 302, 303, ASTM A351 grade CF3, CF3M ASTM B164 QQ-N-288	, 304, 316, 431, 440 4, CF8, CF8M
Stem	ASTM A276 types 303, 304, 316 ASTM B164	ASTM B164 ASTM A276 types 303, 303Se ASTM B21
Springs	ASTN A231 ASTM A232 ASTM A230 ASTM A313	ASTM R164 ASTM B166 ASTM A313
Body holts and nuts	ASTM A193 grade B7 ASTM A194 grade 2H	ASTM B21 QQ-N-286 class A

# 3.4 Design and construction.

3.4.1 Inlet ratings and end connections. The inlet ratings for grade A valves shall be in accordance with USAS B16.5. Grade A valves shall have flanged inlet and outlet connections in accordance with USAS B16.5. Unless otherwise specified (see 6.2) the inlet ratings and end connections for grade B valves shall be in accordance with table II.

Table II - Inlet ratings and end connections for grade B valves.

Nominal pressure rating (psig)	Union end-	Flanged end
150	NIL-F-1183	MIL-F-20042
- 250	MIL-F-1183	M1L-F-20042
400	MIL-F-1183	N1L-F-20042

1/On applications where ultrasonic test inspection of silbrazed joint is required, MIL-F-24227 shall be used in lieu of MIL-F-1183.

- 3.4.1.1 When union end connections are specified, the union nuts and tailpieces shall be furnished. Only the pertinent dimensions of the documents listed in table II apply.
- 3.4.2 Outlet ratings. Unless otherwise specified (see 6.2), the outlet portion shall be designed to withstand ISO percent of the maximum system backpressure, or 100 psig, whichever is higher.
- 3.4.3 Bonnet construction. The bonnet or spring housing shall be attached to the body with bolted flanges or threaded union connection. Bearing surfaces of nuts and bolts and their respective mating surfaces on the valve, shall be finish machined.

- 3.4.4 Internal trim. Valve seats may be separate or integral with the valve body. Valves without separate seat rings shall have sufficient metal, at the seat section, to permit installation of a separate seat ring if required as a service repair. Seat rings shall be threaded in and shall be easily replaceable, using hand tools, after extended service. The seat ring shall shoulder against the body to provide a positive pressuretight joint in which the threads are not used to seal. Where a nonmetallic seal is used between the body and seat ring, a gland or cavity shall be provided in either the body or seat ring to insure proper retention of the seal. The stem or stem and disc assembly shall be top guided (all guides shall be on the discharge side of the seat), Guiding surfaces (bushings and posts) shall have the proper hardness, finish, concentricity, parallelism, clearances, length and rigidity to prevent binding or seizing and to insure proper scating under all operating conditions. These alignment requirements shall be maintained with interchangeable parts and under any tolerance stack-up condition. Where the valves are intended for services where the operating temperatures do not exceed 250°F., a nonmetallic seating feature shall be incorporated in either the disc or seat.
- 3.4.5 Springs. Springs shall be designed so that they will not be fully compressed during any normal operation or adjustment of the valve. When removed and compressed solid, the springs shall not exhibit a permanent set exceeding 0.010 inch per inch of free spring length, measured 10 minutes after release of the spring. Spring ends shall be squared and ground.
- 3.4.6 Threads. All threads shall conform to Handbook H28. Where necessary, provisions shall be incorporated to prevent the accidental loosening of threaded parts. Pipe threads shall not be used.
- 3.4.7 Interchangeability. All parts having the same manufacturer's part number should be directly interchangeable with each other with respect to installation and performance and should not require selection, fitting, or machining of any kind. Where machining is required after installation of a seat ring or guide in order to maintain critical concentricity or alignment dimensions, detailed instructions must be provided with each repair part.
- 3.4.8 Hand lifting device. Valves shall be designed so that they may be operated by hand for testing purposes with an inlet pressure of 75 percent of the set pressure. The necessary lever or tool shall be furnished as part of each valve.
- 3.4.9 Stuffing boxes. A stuffing box on the valve stem shall not be permitted. A stuffing box on the shalt of the hand lifting device, which will have no effect on the relief valve setting, shall be required.
- 3.4.10 <u>Gagging device</u>. Where required for system test purposes, a gagging device shall be specified to be supplied with the valve (see 6.2). Valves shall be capable of being gagged without alteration of the set point. The gagging screw shall be provided with a knurled or wing nut type head to discourage the use of wrenches when gagging the valve. The gagging device shall be designed to minimize the possibility of overlooking its removal after test and shall include a tag or other warning to this effect.
- · 3.4.11 Accessibility. Valves shall be accessible for adjustment and repair without requiring removal from the line, except in the case of full nozzle designs.
- 3.4.12 Valve adjustment. Means shall be provided for adjusting the setting with the valve under pressure. The adjusting screw shall have right hand threads so that clockwise rotation increases the set pressure. The adjusting device shall be provided with a locknut and cap, or other suitable means, to prevent accidental change of adjustment.
- 3.5 Performance. Unless otherwise specified (see 6.2), the performance requirements shall be in accordance with 3.5.1 through 3.5.7.
- 3.5.1 Set pressure range. For set pressures up to 250 psig, the set pressure shall be adjustable over a range of plus or minus 10 percent and for set pressures over 250 psig, the set pressure shall be adjustable over a range of plus or minus 5 percent without requiring replacement of any internal parts.
- . 3.5.2 Operation. Where properly installed in accordance with the limitations specified by the valve manufacturer, relief valves shall operate over the entire flow range without chatter. Valve opening and closing may be gradual and in proportion to the inlet pressure. Valve shall reseat tightly when the inlet pressure is reduced to the blowdown pressure.

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- 3.5.3 Set pressure tolerance. The set pressure tolerance, plus or minus, shall not exceed 2 psi or 2 percent of the set pressure, whichever is greater.
- 3.5.4 Accumulation. Valves shall be sized to pass the capacity specified (see 6.2) without permitting the inlet pressure to exceed the accumulation limit specified on figure 1.
- 3.5.5 Blowdown, Valves shall operate satisfactory with a blowdown not exceeding that permitted by figure 1.
- 3.5.6 Seat tightness. Valves with a nonmetallic seating feature shall seat tightly (defined as no visible leakage over a 2 minute period) with an inlet pressure equal to the minimum blowdown pressure permitted by figure 1 for the applicable setting. Valves incorporating metal-to-metal seating shall not have more than 10cc per hour per inch of seat diameter leakage.
- 3.5.7 Installation limitations. Unless otherwise specified (see 6.2), valve operation shall not be adversely affected by an inlet pressure loss up to 25 percent of the relief valve blowdown, a discharge pressure buildup up to 10 percent of the set pressure or both. Where the installation will subject the valve to greater piping restrictions, this information must be included in the contract or order.
- 3.6 Shock and vibration. Valves shall be designed to meet the H.I. mechanical shock requirements of grade A, class I of MIL-S-901 and vibration requirements of type I of MIL-STD-167. Requirements for shock and vibration testing shall be as specified (see 6.2).

#### 3.7 Marking.

- 3.7.1 Body markings. The manufacturer's name or trademark and the body material composition shall be cast or forged integral with the valve body. The size and rating (inlet and outlet) shall be cast or forged integral with the valve body or stamped on the O.D of the flanges.
- 3.7.2 Identification plates. Each valve shall have an identification plate permanently attached to an exposed position on the valve. The identification plate shall be made of a corrosion-resistant material and shall contain the following information or a space therefor:
  - Manufacturer's name or trademark.
  - Rated capacity at the applicable setting, accumulation, and fluid temperature. (b)
  - Body material composition. (c)
  - Service fluid. (d)
  - Set pressure (psig), blowdown pressure (psig), and accumulation pressure (e)
  - (psig). Range of set pressure adjustment available with installed spring. (f)
  - Installation limitations of valve (maximum permissible inlet pressure loss and maximum permissible backpressure buildup for which valve is designed).

    Manufacturer's model or part number and drawing number.

  - Space for 9 digit CID number.

## 3.8 Drawings.

- 3.8.1 Preliminary drawings. Preliminary drawings which are sufficient to permit evaluation of the design and approval of materials, shall be submitted with bids to the procuring activity. These drawings shall show the following:
  - (a) A sectional assembly of the valve and details of the seat, and disc and stem

  - (b) Finishes of all guiding and seating surfaces.
     (c) Bill of materials listing specification, grade, condition, and any other data required to fully identify the properties of the materials proposed.
     (d) Installation dimensions, end connection detail, and clearance dimensions
  - required for disassembly.
  - Note any previous shock, vibration, or first unit test approval.
  - (f) Recommended assembly, torques, or other equivalent procedures, for making up all joints and threaded assemblies.

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J.8.2 Final drawings. Final drawings and certification data sheets shall be submitted to the procuring activity for approval within 60 days after date of contract. These drawings shall be in accordance with types II and III of MIL-D-1000/2 except for extent of dotail. Only the information required in 3.8.1 need be furnished for the type II drawings. The following data; in addition to that required in MIL-D-1000/2, shall be furnished for the type III drawings. type III drawings:

Ship identification.

Applicable assembly drawing number(s).

Applicable technical manual number. CID (APL) number. Application description.

(c) (d)

(e)

(£) Valve description.

Set pressure and adjustable set pressure range.

Required capacity.

Rated capacity (at accumulation pressure).

Maximum allowable accumulation.

Accumulation (at rated capacity).

Maximum allowable blowdown. (1)

Blowdown (if adjustable, list adjustable blowdown range as well as actual (a)

blowdown setting).
Installation limitations of valve (maximum permissible inlet pressure loss and maximum permissible backpressure buildup for which valve is designed). (n)

3.8.3 Limited rights legend. When the Government has only limited rights in the data shown on the drawings, as determined by the contractural provisions regarding rights in technical data, the drawings furnished may be marked with the following restrictive legend:

, except for: (a) emergency repermission of pairs or overhaul work by or for the Government, where the item or process concerned is not otherwise reasonably available to enable timely performance of the work; or (b) release to a foreign government, as the interests of the United States may require; provided that in either case the release, use duplication or disclosure hereof shall be subject to the foregoing limitations. This legend shall be marked on any reproduction hereof in whole or in part.

- 3.9 Manuals. Manuals shall be furnished in accordance with type I of MIL-M-15071. The quantity and distribution of manuals shall be as specified (see 6.2). The following, in addition to that required for type I of MIL-M-15071, shall be included as part of the manual
  - (a) The approved engineering drawings for the valve (including certification data sheet). These drawings shall be supplemented by additional illustrations where necessary to adequately illustrate operation and maintenance. These additional illustrations may consist of blowouts, partial or full sections, etc., and may eliminate extraneous lines and details to clarify the inter-

action of parts.

(b) Table listing wrench sizes and assembly torques (or other equivalent procedures) for making up all joints and threaded assemblies.

(c) Instructions to permit overhaul by shippard or other repair facility. These should include procedures for checking all critical dimensions subject to war or change and the acceptable dimensional limits, surface finish condition, etc. Also, the appropriate procedure (that is, part replacement, correction at repair facility, or repair at manufacturer's facility) which should be followed to correct each case of damage or wear.

(d) Detailed disassembly and reassembly procedures. In addition to providing procedures for the complete disassembly and reassembly of the equipment, maintenance and troubleshooting sections shall contain, or refer to, only the limited disassembly and reassembly required to accomplish each particular operation. This is intended to reduce the possibility of unnecessary disassembly and unnecessary disturbance of adjustments when performing specific or limited maintenance or troubleshooting operations.

(c) Adjustment procedures.

#### 4. QUALITY ASSURANCE PROVISIONS

- 4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.
- 4.2 First unit examination and tests. The first valve of the same size, design, pressure rating, setting, and capacity, furnished under a contract or order shall undergo first unit examination and tests as outlined in table III. Acceptance criteria shall be as given in table III. All subsequent valves of the same size, design, pressure rating, setting and capacity furnished under that contract or order shall undergo the quality conformance examination and tests specified in 4.3.

Table III -	First	unit	examinati	on and	test	outline.
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Examination or tests	Test conditions	Purpose of test	Acceptance criteria
Visual examination.		To verify conformance to the requirements of this specification.	Complete conformance.
Proof test.	Water at 1.5 times the set pressure applied to inlet and outlet.	To test strength and soundness of pressure containing envelope.	No external leakage, permanent deforma- tion, or structural failure.
Set pressure, blowdown, and seat tightness test.	Inlet pressure increased until valve lifts. Inlet pressure reduced until valve reseats. Check for leakage over a 3 minute period with an inlet pressure equal to the minimum blowdown pressure permitted by figure 1.	To determine set point and blowdown setting of valve. To test for seat tightness at the minimum allowable blowdown pressure.	Blowdown - see 3.5.5. Seat tightness - see 3.5.6. No damage to seating surfaces. No instability.
Set pressure repeatability and endurance test (see note 3).	Cycle valve 50 times After each 10 cycles check for leakage.		Set pressure repeat- ability - see 3.5.3. Seat tightness - see 3.5.6. No damage to seating surface caused by cycling impact (see note 4). No instability.

## Notes:

- 1. The test setup shall impose an inlet pressure loss and outlet pressure buildup equal to the maximums specified in 3.5.7 (25 percent of the blowdown and 10 percent of set pressure). Where greater losses are specified in the contract or order (see 6.2), they shall be imposed instead.
- 2. The performance requirements listed in table II are based on figure 1. If other parameters are specified in the contract or order (see 6.2), they shall be used instead.

- 3. This test may be waived providing certified test data is available showing that the same basic design and size has previously passed these tests.
- 4. Any damage caused by foreign particle entrapaent on the seating surfaces shall be repaired prior to acceptance of the valve.
- 4.3 Quality conformance examination and tests. Each valve shall be subjected to quality conformance examination and tests. These shall consist of the visual examination, proof, set pressure, blowdown and seat tightness tests, outlined in tabled III. Any discrepancies or failures shall be corrected prior to acceptance.
- 4.4 Inspection of preparation for delivery. The packaging, packing, and marking shall be inspected for compliance with section 5 of this document.
  - 5. PREPARATION FOR DELIVERY

(The preparation for delivery requirements specified herein apply only for direct Government procurements.)

- 5.1 Sub-contracted material and parts. The preparation for delivery requirements of referenced documents listed in Section 2 do not apply when material and parts are procured by the supplier for incorporation into the equipment and lose their separate identity when the equipment is shipped.
- 5.2 Domestic shipment and early equipment installation and for storage of onboard repair parts (see 5.4.1).
  - S.2.1 Valves.
- 5.2.1.1 Preservation and packaging. Preservation and packaging which may be the supplier's commercial practice, shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation.
- 5.2.1.2 Packing. Packing shall be accomplished in a manner which will insure acceptance by common carrier at the lowest rate and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early installation. The shipping containers or method of packing shall conform to the Uniform Freight Classification Rules or other carrier regulations as applicable to the mode of transportation and may conform to the supplier's commercial practice.
- 5.2.1.3 Marking. Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the contractor's commercial practice. The information shall include nomenclature, Federal stock number or manufacturer's part number, contract or order number, contractor's name and destination.
- 5.3 Domestic shipment and storage or overseas shipment. The requirements, and levels of preservation, packaging, packing and marking for shipment shall be specified by the procuring activity (see 5.4.2 and 6.2).
  - 5.4 Use of polystyrene(loose-fill) material.
- 5.4.1 For domestic shipment and early equipment installation and level C packaging and packing. Unless otherwise approved by the procuring activity (see 6.2), use of polystyrene (loose-fill) material for domestic shipment and early equipment installation and level C packaging and packing applications such as cushioning, filler and dunnage is prohibited. When approved, unit packages and containers (interior and exterior) shall be marked and labelled as follows:

#### "CAUTION

Contents cushioned etc with polystyrene (loose-fill) material.

Not to be taken aboard ship.

Remove and discard loose-fill material before shipboard storage.

If required, recushion with cellulosic material bound fiber, fiberboard or transparent flexible cellular material."

5.4.2 For level A packaging and level A and B packing. Use of polystyrene (loosefill) material is prohibited for level A packaging and level A and B packing applications such as cushioning, filler and dunnage.

### 6. NOTES

- 6.1 Intended use. Pressure relief valves covered by this specification are intended for overpressure protection onboard ship.
  - 6.2 Ordering data. Procurement documents should specify the following:

(b)

(c)

- (£)
- Title, number, and date of this specification.

  Grade and rating required (see 1.2 and 1.3).

  Inlet ratings and end connections for grade 8 valves, if other than as specified in 3.4.1.

  Maximum inlet pressure and temperature.

  Outlet ratings, if other than as specified in 3.4.2.

  If a gagging device is required to be supplied with valve (see 3.4.10).

  Set pressure required.

  Performance requirements (set pressure tolerance, accumulation, blowdown, etc.) if other than as specified in 3.5.

  Capacity required (see 3.5.4).

  Data on the inlet and outlet piping restrictions which will be imposed on the valve (see 3.5.7).

  When shock and vibration tests are required (see 3.6).

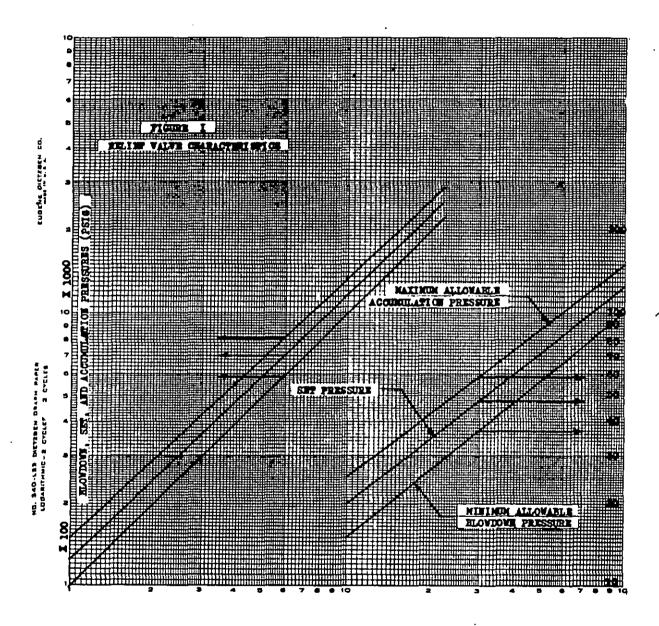
  Quantity and distribution of manuals (see 3.9).

  Levels of preservation, packaging, packing and marking if other than as specified in 5.2 (see 5.3).

  When polystyrene (loose-fill) material is approved (see 5.4.1).

- (a)

Preparing activity: Navy - SH (Project 4820-N0172)



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NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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