WW-V-160B
August 18, 1983
SUPERSEDING
WW-V- 160A
May 5, 1969

FEDERAL SPECIFICATION

VALVES, RADIATOR, HEATING (PACKED AND PACKLESS)

This specification was approved by the Assistant Administrator, Federal Supply and Services, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers shutoff valves for use on the inlet connections of radiators and convectors in steam and hot water heating systems.

1.2 Classification. The radiator valves shall be of the following types, styles, patterns, services, classes, and sizes, as specified (see 6.2):

Type I - Packed bonnet.

Style A - Stuffing box with adjustable packing nut (all classes).
Style B - Stuffing box with spring-compressed, self-adjusting packing (classes 25, 60, and 100).

Type II - Packless bonnet.

Style D - Metallic diaphragm seal (classes 25, 100, and 125).

Pattern 1 - Straightway, globe.
Pattern 2 - Angle, globe.

Service 1 - Steam or vapor.
Service 2 - Hot water, with circulation vent.
Service 3 - Hot water, without circulation vent.
Service 4 - Steam and hot water.

Class 25 - 25 pounds per square inch gage (psig) working preasure.
Class 60 - 60 psig working pressure.
Claas 100 - 100 psig working pressure.
Class 125 - 125 psig working pressure.
Class 150 - 150 psig working pressure.
Class 200 - 200 psig working pressure.

Sizes - 1/2, 3/4, 1, 1-1/4, and 1-1/2 inch.

2. APPLICABLE DOCUMENTS

2.1 Government publications. The issues of the following documents, in effect on date of invitation for bids or solicitation for offers, form a part of this specification to the extent specified herein.

Federal Standards:

FED-STD-123 - Marking for Shipment (Civil Agencies).

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

(Federal Government activities may obtain copies of Federal standardization documents, and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications:

MIL-V-3 - Valves, Fittings, and Flanges (Except for Systems Indicated Herein); Packaging of.

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by contractors 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 bid or solictation for offers, shall apply.

American Society for Testing and Materials (ASTM) Standards:

B61 - Steam or Valve Bronze Castings.
B62 - Composition Bronze or Ounce Metal Castings.

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

Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Standard Practices:

SP-25 - Standard Marking System for Valves, Fittings, Flanges and Unions.

(Application for copies should be addressed to the Manufacturers Standardization Society of the Valve and Fittings Industry, 1815 North Fort Myer Drive, Arlington, VA 22209.)

American National Standards Institute (ANSI) Standards:

B2.1 - Pipe Threads (Except Dryseal).

(Application for copies should be addresssed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Description. The radiator valves shall be of the globe type, either angle-or straightway in accordance with the pattern specified. The valves shall consist essentially of a body, bonnet, disk assembly, stem, operating handles, and an element or assembly to prevent leakage between the stem and the bonnet. Numerical designations used herein to indicate valve sizes shall be the nominal pipe size of the inlet and outlet connections. Styles specified under type I and Il valves shall be furnished only within the applicable class limitations imposed herein.

3.1.1 Style A. Type I, style A packed valves shall be furnished with a conventional stuffing box and stuffing box nut. All classes specified herein shall be applicable to style A valves.

3.1.2 Style B. Type I, style B packed valves shall be furnished with a stuffing box in which conventional stem packing is maintained under compression by the thrust of a cadmium-plated steel or stainless steel coil spring. The coil spring shall exert sufficient pressure on the packing to prevent the development of stem leakage without requiring supplemental adjustment of a packing nut and without adverse effect on the operability of the valve. Style B valves shall be limited to classes 25, 60, and 100.

3.1.3 Style D. Type II, style D packless valves shall be furnished with a phosphor bronze or stainess steel diaphragm seal. The diaphragm shall be either the spring type with aperture or the solid type without aperture at the option of the supplier, unless either type is definitely specified in the contract (see 6.2). The diaphragm with aperture shall consist of at least two metallic, spring disks which exert a constant force at the aperture against a collar on the stem to maintain a leakproof seal. The diaphragm without aperture shall be a solid, continuous, metallic disk. Valves equipped with solid diaphragms shall include a two-piece stem and an internal operating-level assembly. The upper portion of the stem shall bear against the diaphragm and shall be equipped with a free-turning, pressure-bearing button to minimize wear on the diaphragm. Style D valves shall be limited to classes 100 and 125 but may also be used at lesser pressures. Style D

valves with solid, continuous diaphragms shall also be suitable for use at vacuums up to 25 inches of mercury.

3.2 First article. When specified (see 6.2), the contractor shall furnish a valve of each classification ordered for first article inspection and approval (see 4.2.1 and 6.3).

3.3 Standard commercial product. The valve shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification but which are a part of the manufacturer's standard commercial product, shall be included in the valve being furnished. A standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model.

3.4 Interchangeability. All valves of the same classification, furnished with similar options under a specific contract, shall be identical to the extent necessary to insure interchangeability of component parts, assemblies, accessories, and spare parts.

3.5 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. The term "recovered materials" means materials which have been coIlected 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 are allowed under this specification unless otherwise specified.

3.6 Design. Service 1 valves shall be designed for use in steam heating systems at the working pressure and coincident steam saturation temperature applicable to the class specified. Service 2 and service 3 valves shall be designed and rated for nonshock service in hot water heating systems at the working pressure applicable to the class specified and a coincident temperature of 250 deg. Fahrenheit (F). The disks or seats on service 2 valves shall be drilled with a vent hole to provide limited circulation when the valve is closed. Service 4 valves shall be designed for interchangeable use as either service 1 or service 3 valves. For service 4 valves, the specified working pressure shall apply to steam pressure at saturation temperature. The hot water, nonshock rating of service 4 valves at 250 deg. F shall then be equal to or greater than the working steam pressure rating. Valve seats on all valves (including service 2 valves before drilling) shall be leaktight to the following extent:

a. When tested with water at a pressure equal to 1.5 times the rated working pressure the seat leakage rate shall not exceed 10 cubic centimeters per hour for 1/2, 3/4, and 1-inch valves and 12.5 and 15.0 cubic centimenters per hour for 1-1/4 and 1-1/2 inch valves, respectively.

b. When tested with air or gas at a pressure equal to 1.5 times the rated working pressure for classes 25 and 60 and at a pressure of 80 psig for classes 100 and over, the seat leakage rate shall not exceed one-tenth of a cubic foot of standard air or gas per inch of nominal valve size.

When specified (see 6. 2), valves shall be designed to provide modulating service by positive manual regulation of the flow rate of steam or water to the connected radiator or convector. When specified (see 6. 2), modulating valves shall be equipped with a dial indicator to show the position of the disk with respect to the seat from fully-opened to fully-closed positions. Modulating valves shall require one full turn of the stem or less to revert from the fully-open to fully-closed positions and vice versa.

3.7 Details of components.

3.7.1 Body. The valve bodies shall be cast of brass or bronze alloys conforming to ASTM B61 or B62 for classes 100, 125, 150, and B61 for class 200. Bodies for classes 25 and 60 valves shall be cast of B61, B62, or any of the other copper alloys listed in table I. Body casting shall be of sufficient strength and thickness to withstand a test pressure of 125 psig for classes 25 and 60 and a test pressure equal to twice the rated working pressure for classes 100, 125, 150, and 200.

TABLE I. Material for valve body castings.

Alloy number	Nominal composition	Commercial designations
838	83, 4, 6, 7	Hydraulic bronze; leaded red brass
844	81, 2, 7, 9	Valve metal; leaded semi-red brass
848	76, 2-1/2, 6-1/2, 15	Plumbing goods brass; leaded semi-red brass
852	72, 1, 3, 24	High-copper yellow brass; leaded yellow brass

Note: The nominal composition reflects percentages of copper, tin, lead, and zinc, in that order.

3.7.2 Bonnet. The bonnet joint shall be of the inside-screw-type, one-piece screw-over type, or union-ring type. Contact surfaces between the body and bonnet shall be machined or finished as required to provide a pressure-tight, metal-to-metal joint without need for a gasket. The bonnet shall be cast or forged of brass or bronze and shall be provided with parallel-sided, polygon flats to permit assembly and disassembly with standard parallel-sided wrenches.

3.7.3 Stuffing box. Stuffing boxes on type I, style A valves shall be either of the gland-follower type or the packing-nut type at the option of the supplier except that class 200 valves shall be of the gland-follower type only. Stuffing boxes shall be packed prior to shipment. Packing shall be suitable for the maximum pressure and temperature for which the valve is rated and shall be the manufacturer’s standard material.

3.7.4 Disk. Disks shall be of the metallic type or of the nonmetallic, composition type at the option of the supplier. Composition disks shall be supported in a brass or bronze disk holder and shall be readily replaceable.

Material for composition disks shall be suitable for the temperatures and pressures applicable to the class specified. Metallic disks shall be of a brass or bronze alloy normally used by the manufacturer for metallic disks.

3.7.5 Stem. The valve stem shall be a brass or bronze alloy and shall be either of the rising or nonrising design in accordance with the manufacturer's standard practice, except that type I, style B valves shall be of the nonrising design only. All valves shall be designed to open by rotation of the stem in a counter-clockwise direction.

3.7.6 Seat. Valve seats shall be cast integrally with the body and shall be machined or finished as required to meet the requirements of 3.6 for seat tightness.

3.8 Connections.

3.8.1 Standard connections. Standard connections for all valves shall be a female, threaded inlet connection and a male, threaded, outlet connection with union nut and male, threaded tailpiece. The union nut and tail piece shall be brass or bronze. The union nut shall be provided with parallel-sided polygon flats to permit tightening with standard wrenches. The valve shall be so designed that, when the connections are properly made, there will be no interference with or damage to the valve or the working parts thereof.

3.8.2 Optional connections. When specified (see 6.2), valves shall be equipped with one of the following combinations of inlet and outlet connections:

a. Threaded, male, union, inlet; threaded, female outlet.
b. Threaded, female, union inlet; threaded female outlet.
c. Solder (sweat) inlet; threaded, male, union outlet.
d. Solder (sweat) inlet; solder tsweat) female, union, outlet.

Union nuts and tailpieces shall be brass or bronze. Threaded inlet and outlet connections shall have standard taper pipe threads conforming to ANSI B2.1.

3.9 Valve operators. Valves shall be operated by a heat-resistant handwheel suitably attached to the stem. Modulating valves may, at the option of the supplier, be equipped with heat-resistant, lever-type handles. The heat-resistant portions of handwheels and lever handles shall be molded phenolic or an equivalent plastic or composition material.

3.9.1 Optional operators. When specified (see 6.2), valves shall be equipped with (1) a lock-shield and key, (2) an extension stem, or (3) a cord or chain wheel.

3.9.1.1 Lock-shield and key. Lock-shield valves shall be equipped with a stem recessed or protected at the operating end by a shield. The stem shall be designed for operation by a key furnished with each valve in lieu of the standard handwheel.

3.9.1.2 Extension stems. Extension stems shall be designed for attachment to the standard valve stem to permit the operating handwheel or lever handles to be located remote from the valve body. The length of the extension and the type of stem (straight or offset) shall be as specified (see 6.2).

3.9.1.3 Chain and cord. Chain and cord operators shall be designed for attachment to the stem of valves located at ceiling heights to permit operation of the valves from the floor. The length of the chain or cord shall be as specified (see 6.2). The operating wheel shall be designed and sized for use with the nominal size and class of valve on which it is mounted.

3.10 Marking. Valves shall be marked in accordance with MSS SP-25.

3.11 Spare parts. When specified (see 6.2), spare parts such as disks shall be furnished. The items and quantity to be furnished shall be as specified in the contract or order or, when applicable, shall be determined in accordance with the provisioning procedures of the contract.

3.12 Workmanship. The quality of worlcmanship shall be consistent with the level of quality established by the valve and fittings industry for radiator valves and similar valves produced for commercial distribution. Castings shall be free from cracks, hot tears, blowholes, porosity or other defects affecting structural soundness. Castings which must be plugged, impregnated, brazed, or burned-in to correct defects will not be acceptable. Inside and outside surfaces of castings shall be clean. Machined parts shall be free of cracks or other defects which will interfere with the proper functioning of the valve.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Component and material inspection. Components and materials shall be inspected in accordance with all the requirements specified herein and in applicable referenced documents.

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

a. First article inspection (see 4.2.1).
b. Quality conformance inspection (see 4.2.2).

4.2.1 First article inspection. The first article inspection shall be performed on one valve of each classification when a first article is required (see 3.2 and 6.2). This inspection shall include the examination of 4.4 and the tests of 4.5. The first article may be either a first production item or a standard production item from the supplier’s current inventory provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.4, the tests of 4.5.1, and the packaging for delivery inspection of 4.6. This inspection shall be performed on the samples selected in accordance with 4.3.

4.3 Sampling. Sampling and inspection procedures shall be in accordance with MIL-STD-105. All units of the same classification offered for delivery at one time shall be considered a lot for the purpose of inspection. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and

resubmit for a complete reinspection. Resubmitted lots shall be reinspected using tightened inspection. If the rejected lot was screened, reinspection shall be limited to the defect causing rejection. If the lot was reprocessed, reinspection shall be performed for all defects. Rejected lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.3.1 Sampling for examination. Examination shall be based on inspection level II and an acceptable quality level (AQL) of 2.5 percent defective for major defects.

4.3.2 Sampling for tests. Tests shall be based on inspection level S-2 and an AQL of 2.5 percent defective.

4.4 Examination. Each sample selected shall be examined for defects listed in table I.

TABLE I. Classification of defects.

Classification	Defects	Requirement paragraph
Major:		
101	Wrong type, style, pattern, service, class, or size.	1.2
102	Details of construction not in accordance with applicable style.	3.1.1 - 3.1.3
103	Component part or parts missing.	3.1
104	Replacement valve partg not inter-changeable.	3.4
105	Valves not new or unused except to extent required to perform tests.	3.5
106	Modulating valves not as specified or not furnished when specified.	3.6
107	Packing on type I, style A valves not installed.	3.7.3
108	Disks not as specified.	3.7.4
109	End connections not as specified.	3.8.1
110	Valve operators not furnished or not of specified type and design.	3.9
111	Castings not free from cracks, hot tears or other visible defects.	3.12
Minor:		
201	Vent holes not furnished on service 2 valves.	3.6
202	Bonnet connection not as specified.	3.7.2
203	Marking not in accordance with MSS SP-25.	3.10
204	Spare parts not furnished when speci-fied or not of the type or quantity required.	3.11

4.5 Tests.

4.5.1 Shell test. The body castings on the first article sample, if furnished, and on the sample valves selected in accordance with 4.4.2 shall be hydrostatically or pneumatically tested at the applicable pressure specified in 3.7.1. Any leakage attributable to casting defects or inferior workmanship shall be cause for rejection of the defective casting.

4.5.2 Seat test. Each assembled valve furnished under a contract shall be tested in the closed position for leakage past the seat using water, air, or gas at the applicable test pressure specified in 3.6. The pressure shall be applied under the seat in the direction tending to lift the disk off the seat. If no leakage occurs within 30 seconds after the test pressure has been applied the test may be discontinued. If any visible leakage is evident, the test shall be continued for a time sufficient to permit accurate determination of the leakage rate. Any leakage exceeding the permissible rates specified in 3.6 shall be cause for rejection of the valves unless the condition can be corrected by replacing the disk or by refinishing the seat and satisfactory retest of the valve.

4.6 Preparation for delivery inspection. The inspection of the preservation, packing, and marking shall be in accordance with the requirements of section 4 of MIL-V-3.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packing. Preservation and packing shall be in accordance with the requirements of MIL-V-3 with the level of preservation and the level of packing as specified (see 6.2).

5.2 Marking.

5.2.1 Military agencies. Shipments to military agencies shall be marked in accordance with MIL-STD-129.

5.2.2 Civil agencies. Shipments to civil agencies shall be marked in accordance with FED-STD-123.

6. NOTES

6.1 Intended use. The valves covered by this specification are intended for use on radiators, convectors, unit heaters, and similar heating equipment. All steam valves covered by this specification are suitable for steam heating systems in which the return mains are at a vacuum of up to 10 inches of mercury. Modulating valves should not be procured for use on one-pipe steam heating systems since any position except full-open will interfere with condensate return. Service 2 valves with circulation vents are intended for hot water heating systems where limited circulation through radiators is required when the valves are closed in order to prevent air locks or freeze-up.

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents.

a. Title, number, and date of this specification.
b. Type, style, pattern, service, class, and size required (see 1.2).

c. When type II, style D valves shall be furnished with one type of diaphragm only and the type required (see 3.1.3).
d. When first article inspection is required for inspection and approval (see 3.2, 4.2.1, and 6.3).
e. When modulating valves are required (see 3.6).
f. When modulating valves with a pointer and a dial indicator are required (see 3.6).
g. When optional in lieu of standard end connections are required and the type of connections required (see 3.8.2).
h. When an optional valve operator is required (see 3.9.1).
i. Length of extension and type of stem required (see 3.9.1.2).
j. Length of chain or cord required (see 3.9.1.3).
k. Type and quantity of spare parts when required (see 3.11).
l. Level of preservation and level of packing required (see 5.1).

6.3 First article. When a first article inspection is required, the item will be tested and should be a first production item consisting of one complete valve. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination, test, and approval of the first article.

MILITARY INTEREST:

Custodians

Army - ME
Navy - YD
Air Force - 99

Review Activities

DLA - CS
Air Force - 84

User Activity

Army - CE

CIVIL AGENCY COORDINATING ACTIVITY:

GSA - FSS

PREPARING ACTIVITY:

Navy - YD

Project No. 4520-0283

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein.