

MIL-C-83260A(USAF)
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MILITARY SPECIFICATION

COUPLER, HYDRANT VALVE GRU-16/E

1. SCOPE

1.1 This specification covers a hydrant valve coupler which will mate with the Cla-Val model 352-AF hydrant adapter and liquid level control valve, as manufactured by the Cla-Val Company, Newport Beach, California 92663.

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 this specification to the extent specified herein:

SPECIFICATIONS

Federal

QQ-A-601	Aluminum-Alloy Sand Castings
QQ-W-423	Wire, Steel, Corrosion-Resisting
PPP-B-601	Box, Wood, Cleated-Plywood
PPP-T-45	Tape, Gummed, Paper, Reinforced and Plain, for Sealing and Securing

Military

MIL-P-116	Preservation, Methods of
MIL-P-5315	Packing, Preformed, Hydrocarbon Fuel Resistant
MIL-W-5424	Wire Rope, Steel (Corrosion-Resisting), Flexible, Preformed (For Aeronautical Use)
MIL-G-5572	Gasoline, Aviation, Grades 80/87, 100/130, 115/145
MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-A-8625	Anodic Coatings, For Aluminum and Aluminum Alloys
MIL-P-17667	Paper, Wrapping, Chemically Neutral (Non-Corrosive)
MIL-H-26894	Hose Assembly, Rubber, Gasoline, Refueling, Low Temperature

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STANDARDS

Military

MIL-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of US Military Property
MIL-STD-143	Standards and Specifications, Order of Precedence for the Selection of
MIL-STD-276	Impregnation of Porous Nonferrous Metal Castings
MIL-STD-470	Maintainability Program Requirements (For Systems and Equipments)
MIL-STD-810	Environmental Test Methods
MIL-STD-831	Test Reports, Preparation of
MIL-STD-889	Dissimilar Metals
MIL-STD-1186	Cushioning, Anchoring, Bracing, Blocking and Waterproofing, with Appropriate Test Methods

(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 publication. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids 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 DC 20402.)

3. REQUIREMENTS

3.1 Preproduction. This specification makes provisions for preproduction testing.

3.2 Selection of standards and specifications. Standards and specifications for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.3 Materials

3.3.1 Protective treatment. When materials are used in the construction of the coupler that are subject to deterioration when exposed to climatic and

environmental conditions likely to occur during service usage, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. The use of any protective coating that will crack, chip, or scale with use, age, or extremes of climatic and environmental conditions shall be avoided.

3.3.2 Fungusproof materials. Materials which are not nutrients for fungi shall be used to the greatest practicable extent. Where materials that are nutrients for fungi must be used, such materials shall be treated with a fungicidal agent acceptable to the procuring activity.

3.3.3 Metals. Unless otherwise specified herein, metals shall be of the corrosion-resistant type or treated to resist corrosion due to fuels, salt spray, or atmospheric conditions likely to be met in storage or normal service. All components that come into contact with the fuel shall be fabricated of aluminum alloy suitable for the application or 300 series stainless steel.

3.3.3.1 Dissimilar metals. Unless protected against electrolytic corrosion, dissimilar metals shall not be used in intimate contact with each other. Dissimilar metals are defined in MIL-STD-889.

3.3.3.2 Bonding. Metal parts shall be specifically bonded together to prevent the possibility of sparking.

3.3.3.3 Impregnation of castings. Aluminum castings may be impregnated in accordance with MIL-STD-276 to prevent minor weeping.

3.3.4 Elastomers. Elastomers used in the coupler which come into contact with fuel shall be compatible with fuels conforming to MIL-G-5572 and MIL-T-5624.

3.4 Design and construction. The coupler shall be of the spring-loaded, normally closed type designed and constructed for connection to and operation of the Cla-Val Company model 352-AF adapter and liquid level control valve provided on the Pritchard hydrant refueling system. The coupler body shall be an aluminum-alloy casting conforming to QQ-A-601, composition 356, temper T-6. Springs shall be made of stainless-steel wire conforming to QQ-W-423. The coupler shall be held in place by stainless-steel balls of the coupler in the groove provided on the adapter.

3.4.1 Rotation. The coupler shall be so designed that it can be rotated 360 degrees around the vertical axis of the adapter when the coupler and adapter are connected both with and without internal pressures up to 150 psig. The coupler shall have a 4-8 NPT internal threaded end at 90 degrees to the centerline of the end which connects to the adapter.

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3.4.2 Durability. The coupler shall be so designed and constructed that no parts will work loose in service, or while being moved between service operations, and to withstand the strains, jars, vibrations, and other conditions incident to shipping, storage, and service.

3.4.3 Reliability. The coupler shall have a mean-time-between-failure (MTBF) of 344 cycles with a minimum reliability of .997 for 1 cycle per mission at a confidence factor of .90. (See 6.4.1 and 6.4.2.)

3.4.4 Maintainability. The maintainability design criteria of MIL-STD-470 shall be applied in the design and construction of the coupler.

3.4.5 Foolproofness. Where improper installation of an item could cause malfunction of the item or the equipment in which it is installed, an unsymmetrical mounting means shall be provided, where practical. The mounting shall allow the item to be installed only in its proper operating position. If an unsymmetrical mounting means is not practical, the item shall be so mounted that its proper operating position can be readily and visibly determined by service maintenance personnel.

3.4.6 Control lever. The coupler and adapter poppet valves shall be actuated by a control lever on the hydrant coupler. The control lever shall be interlocked such that during connection of the coupler with the adapter the control lever can only be operated when the coupler and adapter are correctly in place. To prevent accidental fuel leakage, the hydrant coupler shall be designed to prevent it from being detached from the hydrant unless the valve lever is in the closed position (see 3.10). In addition, after it is detached it shall not be possible to move the valve lever to the open position.

3.4.7 Gasket. A gasket shall be provided which will effect a leaktight seal between the coupler and adapter. The gasket shall be designed to assure its retention to the coupler.

3.4.8 O-rings. O-rings shall be in accordance with MIL-P-5315. If an O-ring gasket is used to seal the coupler to the adapter, it shall be in accordance with MIL-P-5315, except as follows:

- a. The amount of volume change shall not exceed 14 percent
- b. The tensile strength shall be a minimum of 1,200 psi at manufacture
- c. The ultimate elongation shall be a minimum of 250 percent at manufacture
- d. The shore A hardness shall be 70 \pm 3 durometers at manufacture.

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3.4.9 Pressure sensing provisions. A 3/4-14 NPT internal connection shall be provided in the portion of the coupler which is parallel to the poppet valve and the side farthest from the poppet valve. A 3/4-14 NPT external thread square or hexagon head aluminum-alloy plug shall be provided for sealing this connection.

3.4.10 Dust plug. An elastomeric dust plug resistant to fuel, water, and weather shall be provided to protect the coupler poppet valve, sealing gasket, and sleeve which fits over the adapter. The dust plug shall be provided with a security wire rope of 1/16-inch diameter in accordance with MIL-W-5424, except with a clear nylon jacket. The wire rope shall be attached to the coupler and dust plug.

3.4.11 Handling provisions. Handles shall be provided to assist in handling, connecting, and disconnecting the hydrant coupler when a 4-inch hose is attached. Two provisions oriented approximately 180 degrees apart shall be included for a person's foot to be used in assisting the attachment of the coupler to the adapter.

3.4.12 Bumper. A replaceable fuel-, water-, weather-, and abrasion-resistant elastomeric bumper shall be provided to protect the leading edges of the coupler that fit over the adapter during handling, storage, and connection of the hydrant coupler. The bumper shall also protect the leading edges of the adapter during connection and disconnection of the coupler.

3.4.13 Disconnect swivel assembly. Unless otherwise specified (see 6.2), a disconnect swivel assembly shall be provided on the outlet of the hydrant coupling to improve handling of the 4-inch hose during servicing operations. The swivel shall be provided with a male 4-inch NPT on one end and a 4-inch female NPT on the other end. The swivel shall be provided with internal wrench lugs to permit screwing the male half to the hydrant coupling. The design of the swivel shall include ball bearings, O-ring seals, and a locking ring to provide for a 360-degree rotation on the horizontal axis. The swivel shall be provided with an enclosed lockpin, lockspring, and setscrew. They shall be so arranged that after both halves of the swivel are connected, the lockpin release will be made only after the setscrew is loosened. The swivel shall meet all the applicable tests specified in 4.4.3.

3.4.14 Handtools. The coupler shall be designed and constructed in a manner that will allow general maintenance, assembly, and disassembly to be performed to the maximum practical extent with the use of common handtools.

3.4.15 Lubricants. Liquid lubricants or lubricants soluble in fuel shall not be used. Wherever practicable, lubricated-for-life components not requiring servicing shall be used.

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3.5 Performance

3.5.1 Environmental conditions. The coupler shall be capable of operating under and withstanding the following environmental conditions:

3.5.1.1 Storage temperatures. The coupler shall not be damaged by storage in ambient temperatures ranging from -80° to +160°F for not less than 50 hours.

3.5.1.2 Operating temperatures. The coupler shall perform as specified herein at ambient temperatures between -65° and +125°F.

3.5.1.3 Humidity. The coupler shall not be damaged by operation or storage in any relative humidity up to and including 100 percent, including conditions wherein condensation takes place in the form of water and frost.

3.5.1.4 Fungus. The coupler shall not be damaged by exposure to moist fungus growth such as encountered in tropical and subtropical climates.

3.5.1.5 Salt atmosphere. The coupler shall not be damaged by operation or storage in an atmosphere containing salt-laden moisture, such as encountered near bodies of salt water and in transportation on shipboard.

3.5.1.6 Sand and dust. The coupler shall not be damaged by operation or storage in an atmosphere containing sand and dust particles as encountered in desert areas. With the threaded end sealed and dust plug in place, sand and dust shall not enter the coupler.

3.5.1.7 Rain. The coupler shall not be damaged by operation or storage in rainfall as encountered in any locale. The coupler shall not have areas that could trap and retain water from rainfalls in either the stored or operating configuration.

3.5.2 Poppet valve actuation. The control lever shall permit simultaneous opening of the coupler poppet valve and adapter poppet valve when there is 16 inches of mercury to 150 psig on the inlet side of the adapter poppet valve. The force required to open the poppet valves shall not exceed 130 foot-pounds when the inlet side pressure is 150 psig. No damage or degradation shall occur to the adapter poppet valve, the hydrant coupler poppet valve, or actuating mechanism.

3.5.3 Poppet valve leakage. Upon disengagement of the coupler from the adapter while being subjected to a 150-psig internal pressure, the poppet valve leakage shall not exceed 10 milliliters of fuel.

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3.5.4 Pressure loss. The pressure loss across the adapter and coupler with the poppet valves in the full-open position shall not exceed 7.5 psi using grade JP-4 fuel in accordance with MIL-T-5624 at a temperature of +50° to +60°F and a flow rate of 600 gpm.

3.5.5 Hydrostatic pressure. The coupler, when connected to the adapter with the poppet valves open, shall be designed for an operating pressure of 350 psig. The coupler shall be capable of withstanding a hydrostatic test pressure of 425 psig for 5 minutes with no evidence of weakness, impending failure, or leakage. The coupler poppet valve shall be capable of withstanding a hydrostatic test pressure of 200 psig on the inlet (adapter side) of the poppet valve for 5 minutes without leakage or impending failure.

3.5.6 Negative pressure. When connected to the adapter with the poppet valves open, the coupler shall be capable of losing not more than 5 inches of mercury in 4 hours when the initial negative pressure is 20 inches of mercury below atmospheric pressure.

3.5.7 Drop resistance. The coupler shall be capable of withstanding being dropped a distance of 4 feet with random attitudes on a concrete surface when a 4-inch ID diameter hose in accordance with MIL-H-26894 is attached to the 4-8 NPT internal threaded end and not be damaged. The dust plug, other dust protection devices, bumpers, et cetera, shall not be damaged or come loose as a result of the coupler being dropped.

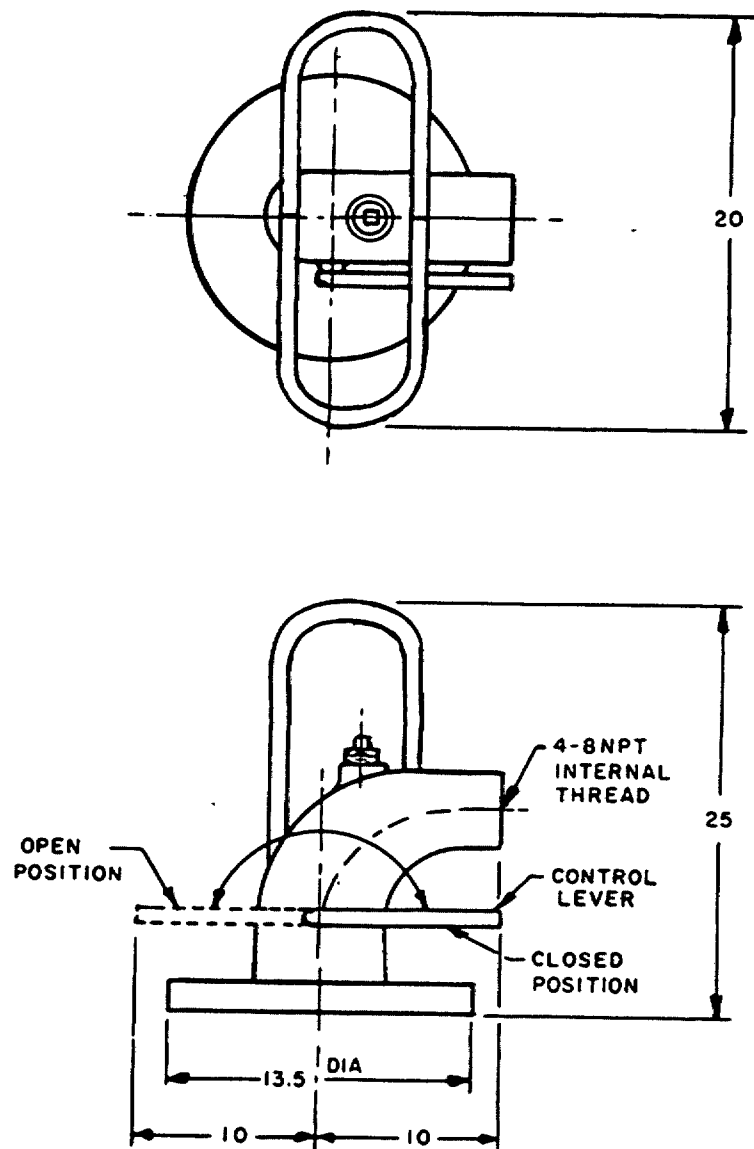
3.5.8 Endurance. The coupler shall be capable of 900 coupling and uncoupling cycles with the adapter while the adapter is subjected to a 150-psig internal pressure and shall not exhibit evidence of degradation, malfunction, or damage. A cycle shall consist of connecting the coupler to the adapter while the adapter has a 150-psig internal pressure, operating the control lever to fully open the poppet valves, stabilizing the pressure at 150 psig, operating the control lever to fully close the poppet valves, disconnecting the hydrant coupler, and reducing the coupler internal pressure to 0 to 5 psig.

3.6 Part numbering of interchangeable parts. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-STD-100 shall govern the manufacturer's part numbers and changes thereto.

3.7 Screw and pipe threads. Screw and pipe threads shall conform to Handbook H28.

3.8 Dimensions. The overall dimensions of the coupler shall not exceed those shown on figure 1.

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DIMENSIONS IN INCHES
ALL DIMENSIONS ARE MAXIMUM VALUES

FIGURE 1. Hydrant Valve Coupler GRU-16/E

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3.9 Anodized finish. All aluminum-alloy parts shall be given an anodic coating of the applicable type in accordance with MIL-A-8625. All aluminum surfaces which are subject to frictional movement relative to adjacent metallic surfaces shall be given a hard coating anodization such as the Martin process.

3.10 Control lever marking. Markings shall be provided to clearly indicate the OPEN and CLOSED turning directions of the control lever.

3.11 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.12 Workmanship. Workmanship shall be of the highest grade throughout and shall be in accordance with good commercial practice for this type of component.

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 Classification of tests. The inspection and testing of the coupler shall be classified as follows:

- a. Preproduction testing See 4.4
- b. Acceptance tests See 4.5.

4.3 Test conditions

4.3.1 Test fluid. Unless otherwise specified herein or in a referenced component specification, the test fluid shall be grade JP-4 in accordance with MIL-T-5624 with a specific gravity of 0.77 \pm 2 and at a temperature of 60° to 80°F.

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4.4 Preproduction testing (see 6.2)

4.4.1 Test sample. One coupler shall be subjected to the preproduction tests specified in 4.4.3. When the disconnect swivel assembly is to be provided (see 3.4.13), it shall be attached to the hydrant coupler during all tests specified in 4.4.3.

4.4.2 Test report. Upon completion of the preproduction tests, a preproduction test report shall be prepared in accordance with MIL-STD-831 and three copies furnished the procuring activity. An authorized Government quality control representative shall countersign all data sheets and the report. The following shall be incorporated as a part of an enclosure to the test report:

- a. 35-mm colored slides - several views of complete coupler and of the coupler parts when disassembled
- b. Certification that the elastomeric items are in accordance with the requirements specified herein
- c. Outline drawings of the coupler with general dimensions.

4.4.2.1 Reliability and maintainability information. The following information shall be included as an attachment accompanying the preproduction test report (same quantity and quality of copies) or shall be incorporated as part of that report:

- a. All failures, maintenance, and other events recorded shall be identified by accumulated operating time, miles, cycles, or position in the test procedure as appropriate. Test conditions during the failures or irregular operations identified shall be recorded.
- b. Summary of the engineering reasoning and of any tests conducted to determine assignable causes for all failures and irregular operations identified.
- c. Summary of the engineering reasoning behind any corrections made, to be made on production items, or proposed to be made and behind the predicted effectiveness of those corrections.
- d. Test activity or contractor comments on item features or requirements that, if modified, should improve the item.
- e. Test activity or contractor comments on field conditions or procedures to be avoided or cultivated to increase the reliability and useful life of the item.

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4.4.2.2 Items accompanying test report. Unless otherwise specified (see 6.2), the following items shall accompany the test report sent to the engineering activity:

- a. Hydrant coupler, as specified herein
- b. Cla-Val Company model 352-AF hydrant adapter and liquid level control valve.

4.4.3 Preproduction tests. The preproduction tests shall consist of all the tests described under 4.6.

4.5 Acceptance tests. The acceptance tests shall consist of the individual tests.

4.5.1 Individual tests. Each coupler shall be subjected to the following tests as described under 4.6:

- a. Examination of product See 4.6.1
- b. Functional check See 4.6.2
- c. Hydrostatic pressure test See 4.6.3.

4.6 Test methods

4.6.1 Examination of product. The coupler shall be inspected to determine compliance with the requirements specified herein with respect to materials, workmanship, dimensions, configuration, marking, et cetera. For the preproduction coupler, this examination shall be accomplished using a checklist which lists each requirement not validated by tests and the results of the examination after each requirement.

4.6.2 Functional check. The coupler shall be connected to an adapter and disconnected demonstrating the control lever interlock feature and operation of the mechanism which opens the poppet valves, and the 360-degree rotation capability.

4.6.3 Hydrostatic pressure test. The coupler shall be connected to the adapter and with poppet valves opened shall be hydrostatically tested at 425 psig for a minimum of 5 minutes and shall show no evidence of leakage or impending or actual failure. The coupler, with the poppet valve closed, shall be pressure tested on the inlet side at 200 psig for a minimum of 5 minutes and shall show no evidence of leakage or impending or actual failure.

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4.6.4 Negative pressure (vacuum) test. The coupler connected to the adapter with the poppet valves opened shall be subjected to negative pressure of 20 inches of mercury below atmospheric pressure and then the vacuum producing equipment valved off. The negative pressure in the coupler and adapter shall not decrease more than 5 inches of mercury.

4.6.5 Drop resistance test. The coupler shall be connected to a 10-foot length of 4-inch ID hose in accordance with MIL-H-26894 which is connected to a fixture 2 feet above a concrete surface. The coupler shall be elevated 4 feet above the concrete surface and allowed to drop freely striking the concrete surface. This test shall be conducted six times so that the coupler strikes the concrete surface in different random attitudes and ones which would probably occur during actual use. The coupler shall be examined for damage, loose components, et cetera. The coupler shall be connected to the adapter and the control lever operated and disconnected from the adapter. Damage, loose components, et cetera, failure to connect, improper operation of the control lever, or failure to rotate 360 degrees shall be causes for rejection.

4.6.6 Pressure loss test. The coupler connected to the adapter shall be installed in a test setup such that the pressures upstream and downstream of the assembly are measured in a 4-inch pipe at least 40 inches from the assembly. The flow rates shall be from 100 to 600 gpm in increments of 50 gpm with the pressures, flow rate, and fluid temperature being measured and recorded for each flow rate. The test fluid shall conform to 4.3.1. The pressure loss at 600 gpm shall not exceed 7.5 psi.

4.6.7 Poppet valve actuation test. The torque required to open the coupler and adapter poppet valves for pressures upstream of the adapter poppet of 16 inches of mercury, 50 psig, 100 psig, and 150 psig shall be determined and recorded. During this test, prior to opening the poppet valves, the pressure downstream of the coupler poppet valve shall be 0 to 5 psig. Evidence of damage, degradation, or excessive torque required to activate the lever control as a result of this test shall be cause for rejection.

4.6.8 Poppet valve leakage test. The coupler shall be connected to the adapter, poppet valves opened, internal pressure using the test fluid shall be increased to 150 psig, poppet valves closed, and the coupler disconnected from the adapter. The test fluid that remains outside the poppet valves shall meet the requirement of 3.5.3. This requirement shall also be demonstrated during the endurance test.

4.6.9 Endurance test. The coupler shall be subjected to 900 cycles of being connected and disconnected as set forth in 3.5.8. Test fluid conforming to 4.3.1 shall be used. The coupler shall exhibit essentially no degradation or wear to the mating and sealing components, the lever control actuation shall exhibit no degradation or impending failure, and no poppet valve or seal leakage between the coupler and adapter shall occur as a result of this test.

4.6.10 Environmental tests. The following environmental tests shall be conducted on the coupler in accordance with the specified methods of MIL-STD-810. Unless otherwise specified (see 6.2), an engineering evaluation may be performed in lieu of conducting the tests specified in 4.6.10.3 through 4.6.10.7. The engineering evaluation shall consist of a written detail analysis of the coupler and all the parts and components to satisfactorily accomplish the required environmental conditions.

4.6.10.1 High temperature test. The coupler shall be subjected to high temperature in accordance with method 501, procedure I. No adverse effects that would affect operation at normal temperature shall result from this exposure. The chamber temperature shall be reduced to 125°F and the tests specified in 4.6.3 and 4.6.8 conducted.

4.6.10.2 Low temperature test. The coupler shall be subjected to low temperature in accordance with method 502, procedure I. The temperature shall be maintained at -80°F for 48 hours. The temperature shall then be raised to -65°F and the coupler temperature allowed to stabilize at -65°F. The tests specified in 4.6.3 and 4.6.8 shall then be conducted. If a failure occurs, the test shall be repeated with the temperature stabilized at -40°F.

4.6.10.3 Humidity test. The coupler shall be subjected to humidity in accordance with method 507, procedure I. There shall be no excessive corrosion resulting from this test.

4.6.10.4 Fungus test. The coupler shall be subjected to fungus in accordance with method 508, procedure I. The coupler shall not exhibit any deleterious attacks caused by the fungus.

4.6.10.5 Salt-fog test. The coupler shall be subjected to salt-fog in accordance with method 509, procedure I. The coupler shall exhibit no effects of a deleterious nature as a result of this test.

4.6.10.6 Dust test. The coupler shall be subjected to sand and dust in accordance with method 510, procedure I. No entrance of sand and dust shall be permitted.

4.6.10.7 Rain test. The coupler shall be subjected to rain in accordance with method 506, procedure I.

4.6.11 Reliability and maintainability demonstration. Satisfactory completion of all tests specified herein without failure demonstrates compliance with the quantitative reliability and maintainability requirements of this specification.

4.6.12 Disassembly and inspection. At the conclusion of the preproduction tests, the coupler shall be disassembled and inspected. There shall be no evidence of excessive deterioration, wear, or corrosion.

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4.7 Inspection of the preservation, packaging, packing, and marking for shipment and storage. Sample items or packs and the inspection of the preservation, packaging, packing, and marking for shipment and storage shall be in accordance with the requirements of section 5.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C as specified (see 6.2).

5.1.1 Level A

5.1.1.1 Cleaning and drying. The coupler shall be cleaned in accordance with process C-1 and dried in accordance with procedures D-1 and D-4 of MIL-P-116.

5.1.1.2 Unit packaging. Each coupler shall be preserved and packaged in accordance with method III of MIL-P-116. All openings shall be sealed by covering with wrapping material conforming to MIL-P-17667 and securing with tape conforming to PPP-T-45, or equal.

5.1.2 Level C. The coupler shall be preserved and packaged to afford adequate protection against corrosion, deterioration, and physical damage during shipment from the supply source to the first receiving activity. This level may conform to the supplier's commercial practice when it meets the requirements of this level.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2).

5.2.1 Level A. The coupler, preserved and packaged as specified in 5.1, shall be packed in an overseas-type style A or B shipping container conforming to PPP-B-601. Closure and strapping shall be in accordance with the appendix to the container specification. Containers shall be of uniform size and shape and of minimum tare and cube.

5.2.2 Level B. Level B packing shall be the same as level A, except the shipping container shall conform to PPP-B-601, domestic type, style A or B.

5.2.3 Level C. The coupler, preserved and packaged as specified in 5.1, shall be packed to afford adequate protection against damage during shipment from the supply source to the first receiving activity. Shipping containers shall conform to the Uniform Freight Classification Rules or regulations of other carriers applicable to the mode of transportation. This may conform to the supplier's commercial practice when it meets the requirements of this level.

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5.3 Physical protection. Interior cushioning, anchoring, blocking, and bracing shall be in accordance with MIL-STD-1186.

5.4 Marking. In addition to any special markings specified in the contract or order (see 6.2), containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The GRU-16/E coupler is used for connection to the Cla-Val Company model 352-AF hydrant adapter and liquid level control valve, as provided on the Pritchard hydrant refueling system. The coupler attaches to the inlet hose of the MH-2 and MH-2A fuel servicing units conforming to MIL-F-83028.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this specification
- b. When a disconnect swivel assembly is not to be provided (see 3.4.13)
- c. Location and conditions for preproduction testing (see 4.2)
- d. When a hydrant coupler and a Cla-Val model 352-AF hydrant adapter and liquid level control valve are not required to be furnished with the test report (see 4.4.2.2)
- e. When an engineering evaluation will not be accepted in lieu of the testing specified in 4.6.10.3 through 4.6.10.7 (see 4.6.10)
- f. Required levels of preservation and packaging, and packing (see section 5)
- g. Special shipment markings (see 5.4)

6.3 Abbreviations. In order to save space and avoid the spelling out of repetitious words and phrases, the following abbreviations have been used in the text of this specification:

dia	diameter
gpm	gallons per minute
ID	inside diameter
mm	millimeter
NPT	National taper pipe (thread)
psi	pounds per square inch
psig	pounds per square inch gage

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6.4 Definitions. For the purpose of this specification, the following definitions shall apply:

6.4.1 Reliability. Reliability is defined as the probability of performing a specified function under given conditions without failure for a specified period. Recognizing that, in general, the rate of failure of equipment is fairly constant throughout the life of the equipment, the probability of nonfailure over an operating time interval decreases exponentially as a function of the length of the interval, during which time there is a constant failure rate, and can be expressed as follows:

Confidence level: 90 percent

$$MTBF = \frac{\text{Total test cycles}}{2.3}$$

$$\text{Reliability} = e^{-X} \quad \frac{\text{Mission cycle}}{MTBF} = X$$

The $2.3 = \frac{4.61}{2}$ is based on the constant for the Poisson/Chi squared distribution, assuming an exponential (2-degree freedom) distribution even though the failure rate for the test is zero.

6.4.2 Mean-time-between-failures. The mean life or mean-time-between-failures is defined as the arithmetical mean (average) of the operating cycles between failures.

6.5 Identification of changes. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodian:
Air Force - 11

Preparing activity:
Air Force - 11

Reviewer:
Air Force - 82

Project No. 4930-F151

