INCH-POUND
MIL-PRF-52747F(AT)
26 February 1996
SUPERSEDING
MIL-N-52747E(ME)
26 October 1994
MIL-N-53094(ME)
7 February 1990

PERFORMANCE SPECIFICATION

NOZZLE ASSEMBLY, CLOSED-CIRCUIT REFUELING, STANDARD AND ARCTIC SERVICE

This specification is approved for use by the U.S. Army Tank-automotive and Armaments Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers two types of closed-circuit fuel servicing nozzle assemblies.

1.2 Classification. The nozzles will be of the following types and classes as specified (see 6.2).

Type I - Nozzle assembly, closed-circuit refueling, standard service.
  Class A - Coupling, quick-disconnect.
  Class B - Coupling, unisex.
Type II - Nozzle assembly, closed-circuit refueling, arctic service.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/BLUE, Warren, MI 48397-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A FSC 4930

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirement documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 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 that issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplements thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-T-5624	- Turbine Fuel, Aviation, Grades JP-4, JP-5 and JP-5/JP-8ST.
MIL-C-7024	- Calibrating Fluid, Aircraft Fuel System Components.
MIL-T-83133	- Turbine Fuel, Aviation, Kerosene Type, Grade JP-8.
MIL-C-83413/4	- Connectors and Assemblies, Electrical, Aircraft Grounding: Plugs, for Types I and II Grounding Assemblies.
MIL-C-83413/7	- Connectors and Assemblies, Electrical, Aircraft Grounding: Grounding Clamp Connector for Types I and III Grounding Assemblies, Clip, Electrical.

STANDARDS

DEPARTMENT OF DEFENSE

MS27026	- Coupling Half, Quick Disconnect, Cam-Locking Type, Female, External Pipe Thread, Type VII.
MS27029	- Coupling Half, Quick Disconnect, Cam-Locking Type, Plug.
MS27030	- Gasket, Coupling Half, Quick Disconnect, Cam-Locking.

STANDARDS

FEDERAL

FED-STD-595 - Colors Used in Government Procurement.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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

DRAWINGS

13219E0479	- Receiver, Adapter, Closed-Circuit Fuel Servicing.
13219E0486	- Nozzle Assembly Envelope, Closed-Circuit Refueling.
13219E9808	- Orifice.
13219E9810	- Test Fixture, Closed circuit Refueling.
13228E1768	- Gasket, Coupling Half, Arctic Service.

(Copies of these drawings are available from the U.S. Army Tank-automotive and Armaments Command, AMSTA-TR-E/BLUE, Warren, MI 48397-5000.)

2.3 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 NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/ASME B1.1	- Unified Inch Screw Threads (DoD Adopted).
ANSI/ASME B1.20.1	- Pipe Threads, General Purpose (Inch) (DoD Adopted).

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

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

ANSI/ASQC Z1.4 - Sampling Procedures and Tables for Inspection by Attributes (DoD Adopted).

(Application for copies should be addressed to The American Society for Quality Control, P.O. Box 305, 611 East Wisconsin Avenue, Milwaukee, WI 53201-4606.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D910 - Standard Specification for Aviation Gasolines (DoD Adopted).

ASTM D1729 - Standard Practice for Visual Evaluation of Color Differences of Opaque (DoD Adopted).

(Application for copies should be addressed to American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

2.4 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 First article. When specified (see 6.2) two or more nozzles shall be subjected to first article inspection in accordance with 4.2.

3.2. Materials. The contractor shall select the materials, but the materials shall be capable of meeting all of the operational and environmental requirements specified herein (see 4.4.1). Recovered materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs. Material in contact with fuels must be fully compatible with those fuels. Such materials should neither degrade nor be degraded by fuel. Metallic surfaces in continuous contact with hydrocarbon fuels or petroleum products should be free of copper, copper alloys or cadmium plating. The use of magnesium or any alloy thereof is prohibited.

3.2.1 Material deterioration prevention and control. Each nozzle shall be fabricated from compatible materials, inherently corrosion resistant or treated to provide protection against the various forms of corrosion and deterioration that may be encountered in any of the applicable operation and storage environment to which the nozzle may be exposed.

3.2.2 Threaded parts. All pipe threads shall conform to ANSI/ASME B1.20.1 and machine threads shall conform to ANSI/ASME B1.1. Antiseize tape shall be applied to all male pipe threads prior to assembly (see 4.4.2).

3.2.3 Cleaning, treatment, finish and protective coating. The nozzle shall be cleaned, treated and finished in accordance with the manufacturer's standard commercial practice. When required to provide a path for electrical current, protective coatings may be removed locally. Unless otherwise specified (see 6.2) top coat color shall be green 383 (No. 34094 of FED-STD-595). Color matching shall be in accordance with ASTM D1729 for general color match. Mating surfaces and surfaces in contact with fuel shall not be painted (see 4.4.2).

3.3 Design and construction. The closed-circuit refueling nozzle assemblies shall be as specified (see 4.4.2 and 6.2).

3.3.1 Type I nozzle. The Type I nozzle shall consist of a refueling nozzle as specified herein, equipped with a strainer, a quick-disconnect, automatic shutoff coupler and a class A or B inlet connector. The nozzle shall include ground cable assemblies.

3.3.1.1 Class A inlet connector. The Class A inlet connector shall be a 2-inch female cam-locking type quick disconnect coupling half with external pipe threads per MS27026, with a gasket per MS27030 and a plug per MS27029.

3.3.1.2 Class B inlet connector. The Class B inlet connector shall be a 2-inch, non-valve, unisex adapter with cap, per part number AE70725R or 64019J (see 6.4).

3.3.2 Type II nozzle. The Type II nozzle shall consist of a refueling nozzle as specified herein, equipped with a strainer, a quick-disconnect, automatic shutoff coupler and a 2-inch female cam-locking type quick disconnect coupling half with external pipe threads per MS27026, with a low temperature gasket conforming to Drawing 13228E1768 and a plug per MS27029. The nozzle shall include ground cable assemblies.

3.3.3 Drawings. The drawings forming a part of this specification are interface drawings.

3.4 Environmental.

3.4.1 Operating conditions. The nozzle shall perform as specified herein during or after exposure to the following environments (see 4.4.4.8 thru 4.4.4.14).

a. Temperature range:
   Type I : -25 to +140◦F.
   Type II: -60 to +95◦F.
b. Relative humidity: Zero to 100 percent.
c. Vibration: Vibration incident to service.
d. Salt spray: Exposure to salt sea atmosphere.
e. Sand and dust:
   Type I : Exposure to desert environment.
   Type II: Exposure to dusty arctic environment.
f. Shock: No damage when tested as specified in 4.4.4.14.

3.4.2 Storage.

3.4.2.1 Type I nozzle. The nozzle shall not be damaged by storage in any ambient temperature from -50 to +160 degrees Fahrenheit (◦F).

3.4.2.2 Type II nozzle. The nozzle shall not be damaged by storage in any ambient temperature from -65 to +145◦F.

3.5 Maintainability.

3.5.1 Maintenance support. Assemblages or support elements shall be adequate to perform the intended function of assisting or conducting maintenance operations. Special hand tools shall be used only when common hand tools cannot be utilized or when they provide significant advantage over common hand tools (see 4.4.4.17).

3.5.2 Scheduled maintenance. The time required for the operator to accomplish all scheduled preventative maintenance while wearing clothing appropriate to the operating environment specified shall not exceed 5 minutes daily (see 4.4.4.17).

3.6 Closed-circuit refueling nozzle. The nozzle shall be equipped with a coupler for direct connection to a closed-circuit adapter, an internal pressure regulation device, a manually controlled on-off flow valve, a strainer assembly and a ground cable assembly. The type I nozzle shall be designed so that one person wearing gloves can easily couple it to a vehicle adapter and operate it (see 4.4.2). The type II nozzle shall be designed so that one person wearing arctic

mittens can easily couple it to a vehicle adapter and operate it (see 4.4.2). If the nozzle's installation requires that its bottom surface be used as a handhold during removal or installation, a nonslip grasp surface (e.g., grooved, knurled, or frictional) shall be provided (see 4.4.2). The nozzle shall be suitable for operation under all possible operating conditions from 0 to 115 gallons per minute (gpm) flow rate and 0 to 125 pounds per square inch (psi) nozzle inlet pressure. The nozzle shall withstand an internal pressure of 225 psi without damage. With the nozzle connected to a closed-circuit adapter and the flow control valve in the open position, it shall be possible to visually determine when the regulator has shut off fuel flow (see 4.4.4.1, 4.4.4.2, and 4.4.4.15).

3.6.1 Coupler. The nozzle shall include a quick-disconnect, automatic-shutoff coupler suitable for connecting the nozzle to any adapter conforming to Drawing 13219E0479 (see 4.4.2). The coupler shall automatically engage the adapter with a mechanical lock which eliminates the need for the operator to maintain any continuous manual holding force. When the nozzle is not coupled to an adapter, a seal which functions automatically shall make it impossible to initiate or maintain flow through the nozzle. Fuel spillage shall not occur when the nozzle is uncoupled from the adapter when the fuel flow control valve is closed. Fuel spillage shall not exceed 10 cubic centimeters (cm^3) when the nozzle is uncoupled from the adapter while flowing at the maximum flow rate (see 4.4.4.5, 4.4.4.6, and 4.4.4.7). The coupler shall include a dust plug or cap to prevent dust from entering that portion of the nozzle which engages the adapter. The dust plug or cap shall be adequately secured to the nozzle to prevent loss and shall withstand a pull test of 75 pounds (lbs).

3.6.2 Pressure regulation. The nozzle shall include an integral means to regulate the pressure at the interface between the nozzle and a closed-circuit adapter. The pressure regulator shall maintain the interface pressure of 15 pounds per square inch gauge (psig) nominally for nozzle inlet pressures from 20 to 125 psi (see 4.4.4.3). When the nozzle is connected to a closed-circuit adapter discharging through a fixed orifice, the pressure regulator shall function as a means of flow regulation. When the nozzle is tested as specified in 4.4.4.3, 4.4.4.16, and 4.4.4.19, the regulated flow shall be within the limits required. When the nozzle inlet pressure is less than that required to produce an interface pressure of at least 15 psig, the pressure regulating device shall remain in the full open position.

3.6.3 Flow control valve. The nozzle shall include a flow control valve which allows manual control of the flow rate from no flow to full flow. The movement of the flow control valve forward, will activate the flow rate from no flow to full flow. The flow control valve shall remain in the full closed or full open position as selected by the operator without the need of maintaining a continuous manual holding force. The flow control valve shall be protected from accidental actuation by providing the valve with interlocks so that extra movement or the prior operation of a related or locking control is required. The minimum clearances shall be a hand

width of 5 inches and finger height of 2 inches with the valve in the closed position for the type I nozzle. The minimum clearances shall be a hand width of 5.25 inches and finger height of 3 inches with the valve in the closed position for the type II nozzle. The valve must have identification markings as specified in 3.10.2 (see 4.4.2).

3.6.4 Strainer assembly and nozzle inlet. The nozzle shall include a strainer assembly. The strainer shall be fabricated in a manner that withstands a 150 gpm and has a 100 mesh screen. The strainer shall be capable of being inserted in, or removed from, the strainer assembly by hand without the use of any tool. The strainer shall be securely mounted to the nozzle to prevent any movement of the strainer when assembled. The inlet of each nozzle shall be a 2-inch by 11-1/2 NPT internal thread. The centerline of the nozzle inlet and strainer assembly shall be located 120 $\pm$10 degrees from the centerline of the nozzle outlet as shown in Drawing 13219E0486 (see 4.4.2).

3.6.5 Ground cable assembly. The nozzle shall be equipped with a ground cable assembly for grounding the nozzle to the vehicle and to a ground stake. The nozzle-to-vehicle ground cable shall consist of a grounding clamp, grounding plug and a coated wire as shown in figure 1. The nozzle-to-ground stake cable shall be coated wire 15 feet long, and the end shall be equipped with a grounding clamp. The grounding clamps shall clamp onto any rod ranging from 0.375 to 0.750-inch nominal diameter. The grounding cable assemblies shall be adequately secured to the nozzle to prevent loss and shall withstand a pull test of 75 pounds (see 4.4.2).

3.7 Fuel resistance. The nozzle shall be resistant to, and suitable for use with, fuels and test fluids conforming to MIL-T-5624, grade JP-4; MIL-C-7024, type II; MIL-T-83133, grade JP-8 and ASTM D910 (see 4.4.4.8).

3.8 Physical characteristics.

3.8.1 Dimensions. The nozzle, including all actuating handles, shall be contained within the envelope shown on Drawing 13219E0486 (see 4.4.2).

3.8.2 Strength. The nozzle shall withstand, while operating, a side load that produces a moment of 100 foot-pounds about the intersection of the nozzle outlet centerline and the locking lug reference plane on a closed-circuit adapter (see figure 2 and 4.4.4.2).

3.8.3 Electrical conductivity. The resistance between the closed-circuit adapter and the nozzle inlet with a hose attached and the resistance between the adapter and the plug on the ground cable shall not exceed 10 ohms (see 4.4.4.4).

3.8.4 Weight. The weight of each nozzle shall be not more than 9 pounds (see 4.4.2).

3.8.5 Disengagement. The force required to remove each nozzle from the closed-circuit adapter shall not be more than 32 pounds nor less than 10 pounds (see 4.4.4.18).

3.9 Lubrication. The nozzle shall operate satisfactorily without the use of lubricants other than solid film lubricants, and those provided by fuel being dispensed through the nozzle (see 4.4.2).

3.10 Identification marking.

3.10.1 Identification. Each nozzle shall be permanently and legibly marked as follows (see 4.4.2):

a. Nozzle assembly, closed-circuit refueling
b. NSN
c. Part no.
d. Contract no.
e. Manufacture
f. Date manufactured
g. Serial no.

3.10.2 Fuel flow marking. The flow control valve operating device shall be provided with double ended arrows showing the direction of operations and labeled at each end to indicate the functional result (“open”, “close”, etc.) (see 4.4.2).

3.11 Interchangeability. All parts having the same vendor part number shall be directly and completely interchangeable with respect to installation and performance (see 4.4.2).

4. VERIFICATION

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

a. First article inspection (see 4.2).
b. Conformance inspection (see 4.3).

4.2 First article inspection.

4.2.1 Examination. Unless otherwise specified (see 6.2), two first article nozzle assemblies shall be examined as specified in 4.4.2 (see table I). Presence of one or more defects shall be cause for rejection.

4.2.2 Tests. Each nozzle shall be subjected to the tests marked "X" in the first article columns of table II. Failure of any test shall be cause for rejection. Unless otherwise specified (see 6.2), the Government reserves the right to perform first article testing on three or more nozzle assemblies. The tests shall consist of any of the tests in table II which the Government desires to perform.

4.3 Conformance inspection.

4.3.1 Sampling. Sampling for examination and test shall be in accordance with ANSI/ASQC Z1.4, inspection level II. Sample size shall be determined by table I and table IIA. A lot shall be accepted when zero defects are found, and rejected when one or more defects are found.

4.3.2 Examination. Each nozzle shall be examined for the defects specified in 4.4.2. Presence of one or more defects shall be cause for rejection.

4.3.3 Tests. Samples selected in accordance with 4.3.2 shall be subjected to the tests marked "X" in the conformance column of table II. Failure of any test shall be cause for rejection.

4.4. Method of inspection.

4.4.1 Material. Conformance to 3.2 shall be determined by inspection of contractor records providing proof or certification that materials conform to requirements. Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

TABLE I. Classification of defects.

Category	Defects	Method of examination
Major:		
101	Threaded parts not as specified (see 3.2.2).	SIE 1/
102	Cleaning, treatment, finish and protective coating not as specified (see 3.2.3).	Visual
103	Color not as specified (see 3.2.3).	Visual
104	Assembly incomplete or incorrect (see 3.3).	Visual
105	Easy of operation not as specified (see 3.6).	Functional
106	Nonslip grasp surface not as specified (see 3.6).	Visual
107	Coupler not as specified (see 3.6.1).	Visual
108	Flow control valve and markings not as specified (see 3.6.3).	Visual
109	Dimensions not as specified (see 3.6.3 and 3.8.1).	SIE
110	Strainer assembly not as specified (see 3.6.4).	Visual
111	Nozzle inlet not as specified (see 3.6.4).	Visual
112	Ground cable assemblies not as specified (see 3.6.5).	Visual
113	Weight not as specified (see 3.8.4).	Gage
114	Lubrication not as specified (see 3.9).	Visual
115	Identification or special marking missing or illegible (see 3.10).	Visual
116	Interchangeability not as specified (see 3.11).	Visual

1/ SIE = Standard Inspection Equipment

4.4.2 Defects. Conformance to 3.2.2, 3.2.3, 3.3, 3.6, 3.6.1, 3.6.3, 3.6.4, 3.6.5, 3.8.1, 3.8.4, and 3.9 thru 3.11, shall be determined by examination for defects listed in table I. Examination shall be visual, tactile, or by measurement with SIE.

4.4.3 Test conditions. Unless otherwise specified herein, tests may be performed without shelter and at the climatic conditions existing at the place of test. The nozzle shall operate as specified herein without maintenance other than the contractor's recommended normal scheduled maintenance as established by a maintenance schedule prepared and submitted by the contractor prior to test.

TABLE II. Test schedule.

Test	Test	Requirement	First article		Conformance
			Sample No. 1	Sample No. 2	Samples
Test conditions	4.4.3	-	X	X	X
Functional test	4.4.4.1.	3.6	X	X	X
Strength	4.4.4.2	3.6 and 3.8.2	X	X	X
Regulator	4.4.4.3	3.6.2	X	X	X
Electrical resistance	4.4.4.4	3.8.3	X	X	X
Coupler spillage, normal	4.4.4.5	3.6.1	X	X	X
Coupler spillage, under pressure	4.4.4.6	3.6.1	X	X	X
Coupler spillage, flowing	4.4.4.7	3.6.1	X	X	X
Fuel resistance	4.4.4.8	3.4 and 3.7	-	X	-
Low temperature	4.4.4.9	3.4 and 3.8.1	-	X	-
Vibration	4.4.4.10	3.4.1	X	-	-
Sand and dust	4.4.4.11	3.4.1	X	X	-
Humidity	4.4.4.12	3.4.1	-	X	-
Accelerated corrosion	4.4.4.13	3.4.1	-	X	-
Drop test	4.4.4.14	3.4.1	X	-	-
Burst pressure	4.4.4.15	3.6	X	-	-
Performance	4.4.4.16	Section 3	X	-	-
Maintainability	4.4.4.17	3.5	X	X	X
Disengagement	4.4.4.18	3.8.5	X	X	-
Refueling	4.4.4.19	3.6.2	X	X	X

4.4.3.1 Cleaning. Before testing any nozzle, all oil, grease, or any other corrosion-resistant compound shall be removed from the interior and exterior surfaces.

4.4.3.2 Test fluid. Except as specified herein, all tests shall be conducted using a test fluid conforming to MIL-T-5624, grade JP-4; MIL-C-7024, type II; MIL-T-83133, grade JP-8 and ASTM D910. The test fluid temperature shall be between +60 and +90°F for type I nozzle and -60 to +90°F for type II nozzle, with the exception of the fuel resistance test 4.4.4.8 through low temperature test 4.4.4.9. The test fluid temperature shall be at ambient temperature for the refueling test 4.4.4.19. All flow rate performance data shall be corrected to a specific gravity of 0.78.

4.4.4 Tests. Tests shall be performed as specified in table II.

4.4.4.1 Functional test. With the flow control valve closed, apply a pressure of 25 psi to the nozzle inlet. Connect the nozzle to a closed-circuit fuel servicing adapter, hereinafter referred to as a test adapter, conforming to Drawing 13219E0479. Open the flow control valve initiating flow. Block the test adapter discharge port and check for visual indication that the regulator has shut off flow. Close the flow control valve and disconnect the nozzle from the test adapter. Open the test adapter discharge port, increase the nozzle inlet pressure to 125 psi and connect the nozzle to the test adapter. Open the flow control valve and adjust flow rate to maintain 125 psi nozzle inlet pressure. Block the test adapter discharge port and check for visual indicating that the regulator has shut off flow. Close the flow control valve and disconnect the nozzle from the test adapter. Any evidence of leakage during flow conditions, binding, valve chatter, distortion, or requiring excessive operating force shall constitute failure of this test (see 3.6).

4.4.4.2 Strength.

4.4.4.2.1 Proof pressure-open. Connect the nozzle to the test adapter with the test adapter discharge port blocked. With the nozzle flow control valve in the open position apply a pressure of 5 psi to the nozzle inlet for a period of not less 1 minute. Repeat this procedure increasing the nozzle inlet pressure in 25 psi increments until an inlet pressure of 180 psi is reached. Any evidence of leakage or distortion shall constitute failure of this test (see 3.6).

4.4.4.2.2 Proof pressure-closed. With the nozzle dust cap removed and the flow control valve in the closed position, pressure shall be applied to the nozzle inlet in accordance with 4.4.4.2.1. If the flow control valve can be put in flow position without connecting the nozzle to an adapter, the test procedure shall be repeated with the flow control valve in the full open position. Any evidence of leakage or distortion shall constitute failure of this test (see 3.6).

4.4.4.2.3 Side load. With the nozzle connected to a rigidly mounted test adapter with the discharge port blocked, apply 125 psi pressure to the nozzle inlet. Apply a load to the nozzle inlet to cause a moment of 100 foot-pounds about the intersection of the nozzle outlet centerline and the locking lug reference plane on the test adapter as shown in figure 2. Actuate the flow control valve from the closed, to the open, to the closed positions. Any evidence of leakage, binding or distortion shall constitute failure of this test (see 3.8.2).

4.4.4.2.4 Pull test. The dust cap or plug security cable and the grounding cable assemblies shall be connected to the nozzle and subjected to a proof load of 75 pounds. Any breakage shall constitute failure of this test.

4.4.4.3 Regulator. Connect the nozzle to a test fixture conforming to Drawing 13219E9810 (see 3.6.2).

NOTE: The test fixture shall be mounted in a normal aircraft mounting attitude (i.e.: test fixture centerline axis is horizontal) and above the fluid level within the test reservoir. The test reservoir shall be vented to atmosphere.

With orifice plate 13219E9808-1 installed in the test fixture, complete the following:

a. Slowly increase the nozzle inlet pressure from zero to 125 psi. The flow rate through the nozzle shall be measured for nozzle inlet pressures of 15, 25, 50, 75, 100, and 125 psi. Failure of the regulator to remain fully open while pressure is less than 15 psig shall constitute failure of this test.
b. Close the flow control valve, set the nozzle inlet pressure at 15 psi. Open the flow control valve and measure the flow rate through the nozzle. Repeat for inlet pressures of 25, 50, 75, 100, and 125 psi.

Replace the test fixture orifice plate and repeat test a and b for each orifice listed in table III. Any evidence of valve chatter or unstable flow conditions at any nozzle inlet pressure from zero to 125 psi shall constitute failure of this test. Failure of the nozzle to regulate flow within the limits specified in table III for nozzle inlet pressures from 15 to 125 psi shall constitute failure of this test. Any evidence of leakage shall also constitute failure of this test.

TABLE III. Regulator test limits.

Orifice	Flow Rate (gpm)		
	Minimum	Normal	Maximum
13219E9808-1	17.0	20	23.0
13219E9808-2	55.0	65	75.0
13219E9808-3	85.0	100	115.0

4.4.4.4 Electrical resistance. With the nozzle connected to a test adapter, an ohmmeter shall be used to measure the resistance between the test adapter and the nozzle inlet with a hose attached and the resistance between the adapter and the plug on the ground cable assembly. Resistance exceeding 10 ohms shall constitute failure of this test (see 3.8.3).

4.4.4.5 Coupler spillage, normal. The nozzle shall be coupled to a test adapter with the discharge port open. When flowing at a rate of not less than 50 gpm, the discharge port on the test adapter shall be blocked. Close the flow control valve and uncouple the nozzle from the test adapter. Spillage of test fluid from between the nozzle and test adapter shall constitute failure of this test (see 3.6.1).

4.4.4.6 Coupler spillage, under pressure. If the coupler and flow control valve are actuated by separate mechanisms, the test as describe in 4.4.4.5 shall be repeated, except the flow control valve shall be in the full open position when the nozzle is uncoupled from the test adapter. Spillage of test fluid from the nozzle exceeding 10 cm^3 shall constitute failure of this test (see 3.6.1).

4.4.4.7 Coupler spillage, flowing. If the coupler and flow control valve are actuated by separate mechanisms, the nozzle shall be tested as follows. When flowing at a rate of not less than 100 gpm, the nozzle shall be uncoupled from the test adapter. The flow control valve shall be in the full open position during the uncoupling operation. Spillage of test fluid from the nozzle exceeding 10 cm^3 shall constitute failure of this test (see 3.6.1).

4.4.4.8 Fuel resistance. The test specified in 4.4.4.8.1 through 4.4.4.9 shall be conducted in the sequence listed and each test shall follow immediately after the preceding test (3.7).

4.4.4.8.1 Fuel soak, phase I. The nozzle shall be maintained for a period of 4 days in such a manner as to ensure complete contact of all nonmetallic parts with the fluid as would be expected under normal service conditions. The fluid shall be MIL-T-83133, grade JP-8 at a temperature of +160 $\pm$3.6°F for type I nozzle and +145 $\pm$3.6°F for type II nozzle. During the first 72 hours, the flow control valve shall be in the closed position. During the last 24 hours, the flow control valve shall be in the open position. After a minimum of 4 days fuel soak, the nozzle shall be tested with the ambient air and test fluids at a temperature of +140 $\pm$3.6°F for type I nozzle and +95 $\pm$3.6°F for type II nozzle as specified in 4.4.4.1, 4.4.4.2, and 4.4.4.3.

4.4.4.8.2 Drying cycle, phase I. Drain all test fluid from the nozzle and allow it to dry for 24 hours in an ambient air temperature of +160 $\pm$3.6°F for type I nozzle and +145 $\pm$3.6°F for type II nozzle. The nozzle shall then be tested with the ambient air and test fluids at a temperature of +140 $\pm$3.6°F for type I nozzle and +95 $\pm$3.6°F for type II nozzle as specified in 4.4.4.1, 4.4.4.2, and 4.4.4.3.

4.4.4.8.3 Fuel soak, phase II. Repeat 4.4.4.8.1, except fuel soak period shall be 3 days minimum with the flow control valve in the closed position for 48 hours, then in the open position for 24 hours.

4.4.4.8.4 Drying cycle, phase II. Repeat 4.4.4.8.2, except the drying period shall be 30 hours.

4.4.4.9 Low temperature. The nozzle shall be maintained for a period of 3 days in such a manner as to ensure complete contact of all nonmetallic parts with the fluid as would be expected under normal service conditions. The quick-disconnect coupling with gasket shall be added to the type II nozzle for this test. The fluid shall be MIL-T-83133, grade JP-8 at a temperature of -50 ±3.6°F for type I nozzle and -65 ±3.6°F for type II nozzle. During the first 48 hours, the flow control valve shall be in the closed position. During the last 24 hours, the flow control valve shall be in the open position. After a minimum of 3 days fuel soak, the nozzle shall be tested with the ambient air and test fluids at a temperature of -25 ±3.6°F for type I nozzle and -60 ±3.6°F for type II nozzle as specified in 4.4.4.1, 4.4.4.2, and 4.4.4.3 and for 250 cycles each at 15, 50, and 125 psig. A cycle is defined in 4.4.4.16. The personnel completing the test shall be clothed and equipped as they would be in a low temperature tactical situation (see 3.4).

4.4.4.10 Vibration test. The nozzle shall be placed on a 1/2-inch plywood-covered bed of the test equipment in its unpacked configuration. The movement of the bed of the test equipment, where the nozzle is placed, shall be a 1-inch diameter orbital path at 5 Hz for a duration of 45 minutes. After being subjected to the specified vibration, the nozzle shall be examined and tested in accordance with 4.4.4.1, 4.4.4.2, and 4.4.4.3 (see 3.4.1).

4.4.4.11 Sand and dust. The nozzle shall be tested as follows (see 3.4.1):

a. Place the nozzle in the test chamber, adjust the temperature to +73 ±3.6°F and the relative humidity to less than 30 percent. (Maintain less than 30 percent relative humidity throughout the test.)
b. Adjust the air velocity to 1750 ± 175 ft/min.
c. Adjust the dust feed control for dust concentration of 0.3 ± 0.2 g/ft^3.
d. Maintain condition of steps a through c for a least six hours.
e. Stop the dust feed, reduce the air velocity to 300 ft/min and adjust the temperature to +140 ±3.6°F for type I nozzle and +95 ±3.6°F for type II nozzle.
f. Maintain step e conditions until stabilization.
g. Adjust the air velocity to that used in step b and restart the dust feed to maintain the dust concentration as in step c.
h. Maintain conditions for at least nine hours. During the first six hours, the flow control valve shall be in the closed position. During the last three hours, the flow control valve shall be in the open position.
i. Turn off all chamber controls and allow the nozzle to return to standard ambient conditions.
j. Remove accumulated dust from the nozzle by brushing, wiping or shaking, taking care to avoid introduction of the additional dust into the nozzle. Do not remove dust by either air blasting or vacuum cleaning.
k. Test the nozzle in accordance with 4.4.4.1 and 4.4.4.3.

4.4.4.12 Humidity. The nozzle shall be tested as follows (see 3.4.1):

a. Place the nozzle in the test chamber, adjust the temperature to +73 ±3.6°F and the relative humidity to 50 ±5 percent.
b. Maintain these condition for 24 hours.
c. Adjust the chamber conditions to those given in table IV for the time 0000.
d. Perform a 24 hour cycle with the time-temperature-humidity values specified in table IV.
e. The flow control valve shall be in the closed position for hours 0000 through 0600, opened for hours 0600 through 1200, closed for hours 1200 through 1800, and opened for hours 1800 through 0000.
f. Repeat steps d and f for a total of twelve, 24 hour cycles.
g. Adjust the chamber to the conditions specified in step a and maintain for at least 24 hours.
h. Test the nozzle as specified in 4.4.4.1 and 4.4.4.3.

TABLE IV. Humidity tests.

Time	Temp °F	R. Humidity	Time	Temp °F	R. Humidity
0000	80	100	1200	94	75
0100	80	100	1300	94	74
0200	79	100	1400	95	74
0300	79	100	1500	95	74
0400	79	100	1600	93	76
0500	78	100	1700	92	79
0600	78	100	1800	90	82
0700	81	94	1900	88	81
0800	84	88	2000	85	91
0900	87	82	2100	83	95
1000	89	79	2200	82	96
1100	92	77	2300	81	100

1/ For chamber control purpose 100% RH implies as close to 100% as possible but not less than 95%.

4.4.4.13 Accelerated corrosion. The nozzle shall be immersed in a solution of 2.5 percent by weight NaCL in distilled water. After immersion, the solution shall be drained and the nozzle shall be heated in an oven to a temperature of 130 ± 5°F for a period of not less than 1 hour. The immersion and heating cycle shall be repeated 50 times. The nozzle shall not be operated at any time during the immersion cycles. Immediately after completing the immersion cycles, the nozzle shall be washed out with warm water to remove salt accumulation.

The nozzle shall be dried, wet with fuel, and tested as specified in 4.4.4.1, 4.4.4.2, and 4.4.4.3. Corrosion of any part of the nozzle to a degree that affects performance shall constitute failure of this test (see 3.4.1).

4.4.4.14 Drop test. With the nozzle attached at a 10-foot length of 2 inch diameter hose, the dust cap removed, and the upstream portion of the hose laying at floor level, the nozzle shall be dropped on a concrete floor from a height of 6 feet. The nozzle shall be dropped five times with at least one impact occurring on the nose plane and one impact on the operating handle. The remainder of the impacts shall occur on that part of the nozzle considered to be most vulnerable to damage. Upon conclusion of the drops, the nozzle shall be tested as specified in 4.4.4.1, 4.4.4.2, and 4.4.4.3 (see 3.4.1).

4.4.4.15 Burst pressure. With the nozzle flow control valve in close position, apply a hydrostatic pressure of 250 psi to the nozzle inlet and maintain the pressure for not less than 3 minutes. Release the pressure, connect the nozzle to a test adapter with the discharge port blocked and repeat the pressure test. Any evidence of leakage or distortion shall constitute failure of this test (see 3.6).

4.4.4.16 Performance. The nozzle shall be subjected to the series of operational cycles in accordance with phase I, II, II, IV, V, and VI as shown in table V. For phases IV and V the test fluid shall contain contaminants in accordance with table VI. Upon completion of each phase, the nozzle shall be tested in accordance with 4.4.4.3. One test cycle shall consist of the following:

a. Connect nozzle to a test adapter. (The discharge port of the test adapter shall be open for flow.)
b. Position the flow control valve in the open position.
c. Shut off flow by blocking the discharge port of the test adapter after establishing full flow for approximately 10 seconds.
d. Position the flow control valve in the closed position.
e. Disconnect nozzle from the test adapter.

Any evidence of fuel leakage or inability of the nozzle to pass the test specified in 4.4.4.3 and 4.4.4.16 at the conclusion of each test phase shall constitute failure of this test.

TABLE V. Endurance test.

Phase	Cycles	Test fluid	Nozzle inlet pressure (psig)
I	500	Clean	15
II	500	Clean	50
III	500	Clean	125
IV	500	Contaminated	15
V	500	Contaminated	125
VI	500	Clean	50

TABLE VI. Fuel contaminants.

Contaminant	Particle size	Quantity (Minimum)
Iron oxide	0 - 5 microns 5 - 10 microns	28.5 gm/400 gal. 1.5 gm/400 gal.
Sharp silica sand	150 - 300 microns 300 - 420 microns	1.0 gm/400 gal. 1.0 gm/400 gal.
Coarse road dust	Mixture as follows: 0 - 5 microns (12%) 5 - 10 microns (12%) 10 - 20 microns (14%) 20 - 40 microns (23%) 40 - 80 microns (30%) 80 - 200 microns (9%)	8.0 gm/400 gal.
Cotton linters	Staple below 7 (U.S. Dept of Agriculture Grading Standards)	0.1 gm/400 gal.
Crude naphthenic acid Salt water solution shall contain 4 parts NaCL to 96 parts H_2O by wt.		0.03 % by volume 0.01 % entrained

4.4.4.17 Maintainability. Maintenance operations required during all testing shall be accomplished by operating and support personnel. Failure of the support elements to maintain the nozzle as specified shall constitute failure of this test. All maintenance data shall be collected, and adequate records of time required to perform maintenance action shall be kept (see 3.5).

4.4.4.18 Disengagement. Follow procedures in items a, b, c, and d of 4.4.4.16. The nozzle shall then be disengaged from the test adapter by applying a steady pull along the axis of the nozzle discharge barrel. The procedures of a, b, c, and d, and disengagement shall be repeated 10 times. The force required for disengagement shall be measured to the nearest pound with a calibrated force gauge. Failure to meet the requirements of 3.8.5 shall constitute failure of this test.

4.4.4.19 Refueling. The nozzle shall be tested on specified military aircraft at a specified location (see 6.2). The exact number of each type aircraft may vary depending on availability. However, testing on at least two of each type should be anticipated. Standard military refueling equipment, refueling procedures and personnel shall be used. The total amount of fuel transferred into each aircraft shall be at least 40 gallons. The refueling equipment shall provide a pressure of 25 to 125 psi to the nozzle inlet coupling. The flow rate through the nozzle shall be calculated by dividing the total amount of fuel transferred by the total fuel transfer time. Flow rates of at least 25 gpm for OH-58 series helicopters, 45 gpm for UH-1/AH-1 series helicopters and 60 gpm for UH-60/UH-64 series helicopters shall be demonstrated. If any individual aircraft displays a fuel transfer rate less than that specified, another aircraft of the same type shall be tested. If transfer into the second aircraft is acceptable, the original test shall be disregarded. Failure of the nozzle to demonstrate required flow rates or any evidence of valve chatter or unstable flow conditions shall constitute failure of this test. Any evidence of leakage from the nozzle shall also constitute failure of this test (see 3.6.2).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use.

6.1.1 Type I nozzle. This nozzle is intended for use with fuel dispensing systems to safely deliver contaminant-free fuel to military aircraft, vehicles, and other powered equipment in a standard environment. This nozzle will use either the quick-disconnect or unisex coupler.

6.1.2 Type II nozzle. This nozzle is intended for use with fuel dispensing systems to safely deliver contaminant-free fuel to military aircraft, vehicles, and other powered equipment in a low temperature (-60°F) environment.

6.2 Acquisition requirements. Acquisition documents should specify the following:

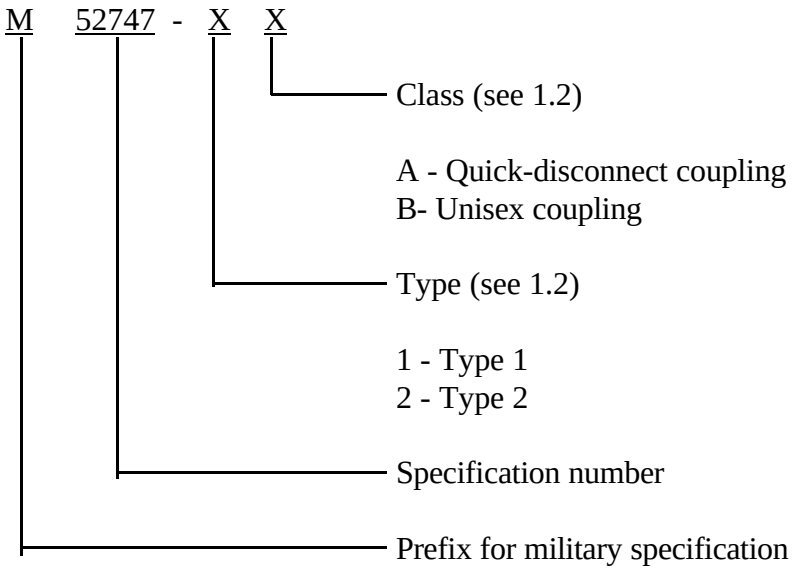
a. Title, number, and date of this specification.
b. Type and class of nozzle assembly required (see 1.2 and 3.3).
c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
d. When a first article is required for inspection and approval, and number of units required (see 3.1).
e. When the Government will conduct any or all of the first article examination and tests. When the Government will conduct some but not all of the first article examination and tests, the contracting officer should specify which examination and tests will be conducted by the Government and which examination and tests will be conducted by the contractor (see 3.1).
f. Color required for the nozzle (see 3.2.3).
g. The military aircraft and location will be specified after contract award (see 4.4.4.19).
h. Packaging requirements (see 5.1).

6.3 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.

6.4 Class B inlet connector. Part number AE70725R may be obtained from Aeroquip Corporation, Aerospace Group, 300 South East Avenue., Jackson, MI 49203-1972, CAGE Code 00624. Part number 64019J may be obtained from Carter Ground Fueling Company, Division of Carter JC Company, Inc., 671 West 17th Street, Costa Mesa, CA 92627, CAGE Code 86090.

6.5 Provisioning. The contracting officer should include provisioning requirements for repair parts and maintenance tools as necessary (including any special tools), and instructions on shipment of the nozzle.

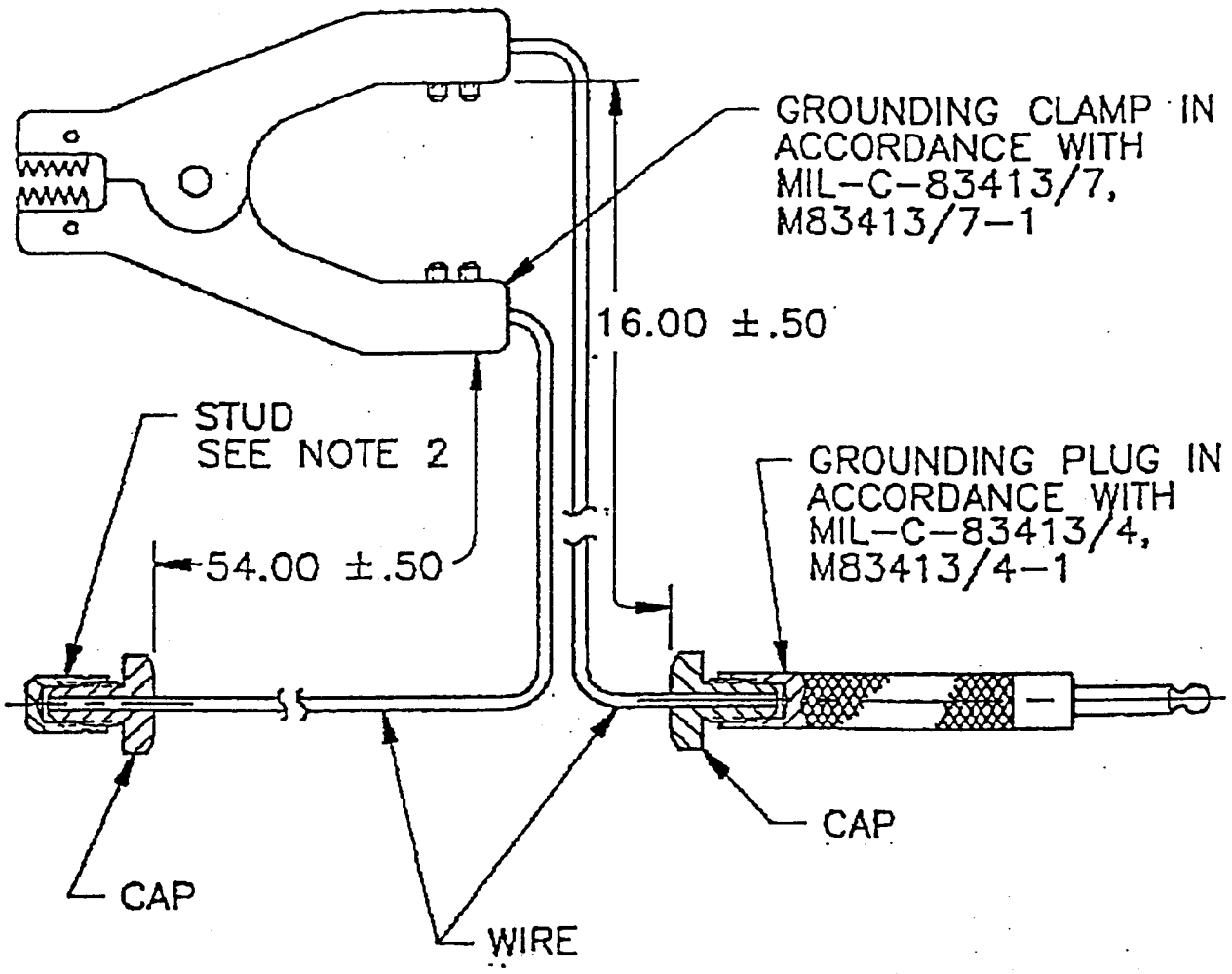
6.6 Part or identifying number (PIN). The PINs to be used for the compressors acquired to this specification are created as follows:



6.7 Subject term (key word) listing.

Adapter
Aircraft
Dispensing
Fuel
Servicing

6.8 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.



NOTE:

1. Unless otherwise specified, dimensions are in inches.

FIGURE 1. Nozzle -to-vehicle ground cable assembly.

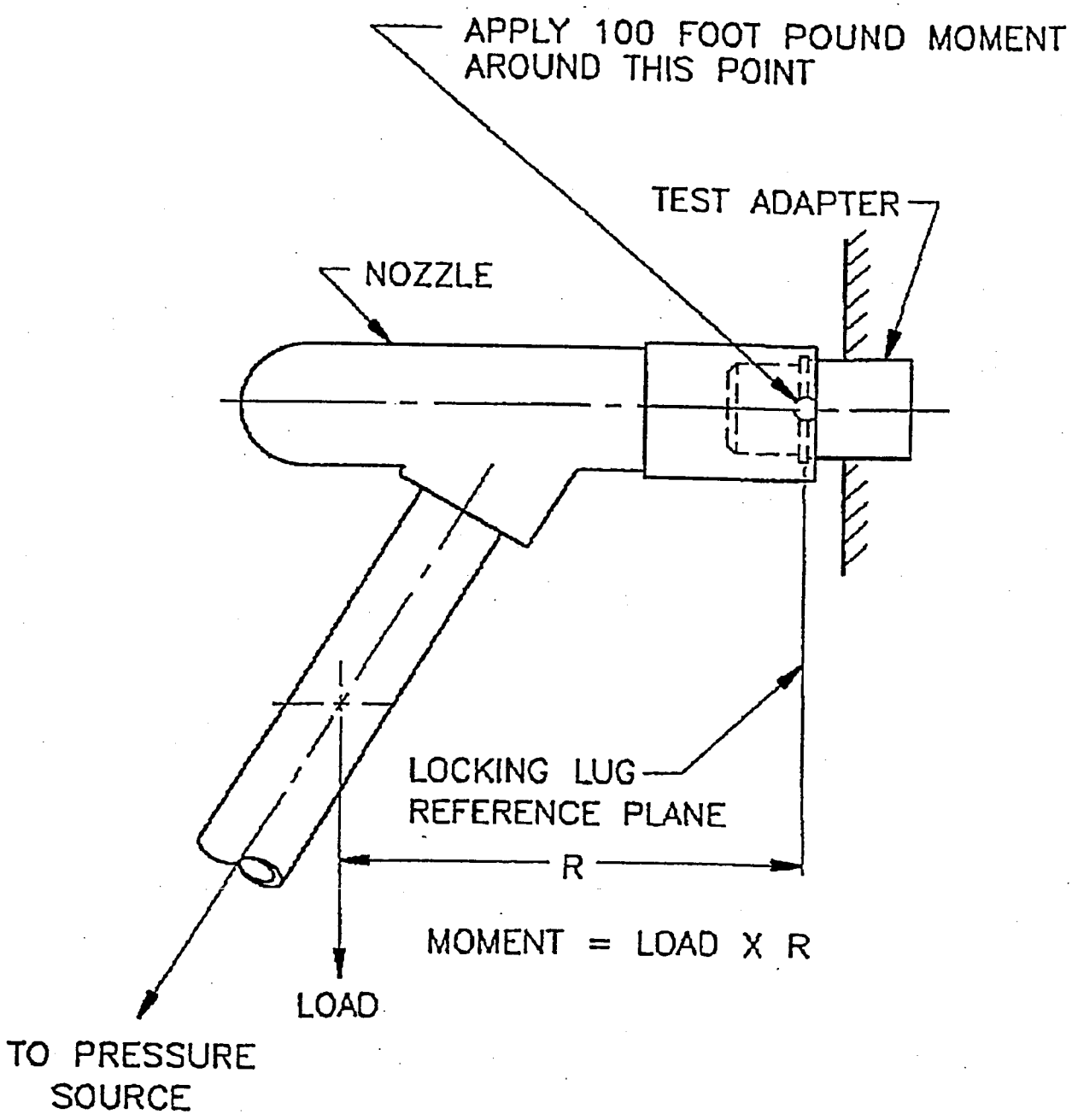


FIGURE 2. Side load test.

Custodian:
Army - AT

Preparing Activity:
Army - AT

Review Activity:
Army - AV

(Project 4930-0017)