IN-POUNDS

MIL-C-4150J
29 Nov 1989
SUPERSEDING
MIL-C-4150H
3 March 1980

MILITARY SPECIFICATION

CASES, TRANSIT AND STORAGE, WATERPROOF AND WATER-VAPORPROOF

(This specification is approved for use by all Departments and Agencies of the Department of Defense.)

1. SCOPE

1.1 Scope. This specification establishes the requirements for rigid, reusable, fire retardant, waterproof and water-vaporproof, rectangular cases manufactured from ferrous or non-ferrous metals or non-metallic materials such as fiberglass reinforced plastics or other composite materials. The cases serve as combination transit and storage cases for loads with a net weight less than or equal to 113 kilograms (250 pounds). For loads with a net weight over 113 kilograms (250 pounds), approval of the procuring activity is required (see 6.2). This specification establishes a satisfactory level of ruggedness only for the transit case when used within its load limitations. Protection to the intended contents must consider the fragility of the item and the characteristics of the cushioning material (see 6.1). A case shall be defined as the external container shell, all hardware, and the internal shock mitigating system.

1.2 Classification. The cases covered by this specification shall be furnished in the following types, styles, classes, and varieties, as specified (see 6.2).

Type I - Waterproof
Type II - Water-vaporproof

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Air Force Packaging Evaluation Activity, HQ AFLC/DSTZ, Wright-Patterson AFB OH 45433-5999, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC: F4815 FSC 8115

Style 1 - Transit case
Style 2 - Combination case
Style 3 - Console case
Style 4 - Special design

Class A - For maximum gross weight up to 68 kilograms (150 pounds)
Class B - For maximum gross weight over 68 kilograms (150 pounds)

Variety NHC - Non-hinged closure
Variety HC - Hinged closure
Variety SHC - Sliding (removable) hinge closure

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

SPECIFICATIONS

FEDERAL

QQ-A-250/11	Aluminum Alloy 6061, Plate and Sheet
QQ-P-416	Plating, Cadmium (Electro Deposited)
TT-E-515	Enamel, Alkyd Type, Lusterless, Quick-Drying
TT-E-516	Enamel, Lusterless, Quick-Drying Styrenated Alkyd Time
TT-P-1757	Primer Coating, Zinc Chromate, Low Moisture Sensitivity

MILITARY

MIL-P-116	Preservation, Methods of
MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
DOD-D-1000	Drawings, Engineering and Associated Lists
MIL-T-10727	Tin Plating; Electrodeposited or Hot-dipped, for Ferrous and Nonferrous Metals

DOD-P-15328	Primer (Wash), Pretreatment (Formula No. 117 for metals) (Metric)
MIL-S-23769	Seal, Security
MIL-I-26860	Indicator, Humidity Plug, Color Change
MIL-V-27166	Valve, Pressure Equalizing, Gaseous Products
MIL-I-45208	Inspection System Requirements
MIL-C-87115	Coating, Immersion Zinc Flake/Chromate Dispersion

STANDARDS

FEDERAL

FED-STD-101	Test Procedures for Packaging Materials
FED-STD-595	Colors

MILITARY

DOD-STD-100	Engineering Drawing Practices
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-171	Finishing of Metal and Wood Samples
MIL-STD-210	Climatic Information to Determine Design and Test Requirements for Military Systems and Equipment
MIL-STD-648	Design Criteria for Specialized Shipping Containers
MIL-STD-889	Dissimilar Metals
MIL-STD-970	Standards and Specifications, Order of Precedence for the Selection Of
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment and Facilities
MIL-STD-1510	Container Design Retrieval System, Procedures for Use of

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

FEDERAL ACQUISITION REGULATION (FAR):

FAR 52.246-2	Inspection of Supplies - Fixed Prices

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

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D1008	Containers, Shipping, Water Vapor Permeability of
D3951	Standard Practice for Commercial Packaging
E162	Surface Flammability of Materials Using a Radiant Heat Energy Source
E662	Specific Optical Density of Smoke Generated by Solid Materials

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

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

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

3. REQUIREMENTS

3.1 First article. Unless otherwise specified (see 6.2), a sample shall be subjected to first article inspection (see 6.4) in accordance with 4.4.

3.2 Materials. Materials used in manufacturing these cases shall conform to the requirements specified herein. Materials shall be of the lightest practical weight, and shall meet the performance requirements specified herein. The water-vapor

transmission rate of materials used for the Type II case shells shall not exceed 0.050 grams/100 square inches/24 hours (0.775 grams/square meter/24 hours) in accordance with 4.6.2.1.

3.2.1 Metals. Metals shall be corrosion-resistant, or treated to resist corrosion. Dissimilar metals, as defined in MIL-STD-889, shall not be used in intimate contact unless suitably protected against electrolytic corrosion. When it is necessary that any combination of such dissimilar metals be assembled, an interposing material compatible to each shall be used. When aluminum alloy is used in the case it shall have corrosion resistant properties at least equal to QQ-A-250/11.

3.2.2 Non-metallic materials. Fiberglass reinforced plastics or other composite materials used to manufacture these cases shall be suitable for the purpose intended and meet the performance requirements of 3.5.

3.2.3 Fungus-proof materials. The case shall be designed so that the materials used are not nutrients for fungi or have been treated to resist attack by fungi (see 4.6.2.2).

3.2.4 Fire retardant materials. When specified (see 6.2), materials used in the construction of the cases shall be fire retardant (see 4.6.2.3).

3.3 Standard parts. MIL-STD-970 shall govern the selection and use of standard parts. AN or MS standard parts shall be used wherever they are suitable for the purpose, and shall be identified by their part numbers. Commercial utility parts such as screws, bolts, nuts, washers, cotter pins, etc., may be used provided they have suitable properties and are replaceable by the AN or MS standard parts without alteration, and provided the corresponding AN or MS numbers are referenced on the drawings and in the parts lists. In applications for which no suitable corresponding AN or MS part is in effect on date of invitation for bids, commercial parts may be used provided they conform to all requirements of this specification.

3.3.1 Gaskets. Gaskets shall be formed from synthetic or any rubber material that provides and maintains a seal to meet the requirements of this specification.

3.4 Design and construction. The case shall provide protection against shock and environmental conditions encountered during storage and shipment. The case cover shall be flat or convex to allow free drainage. Pockets on the exterior of the case shall be provided with a means of drainage in the normal case storage position. Where necessary, holes shall be drilled a minimum diameter of 0.97 centimeters (0.38 inches) to prevent

subsequent stoppage (of free drainage) if the case is painted. The structural integrity of the case shall be capable of passing all tests specified herein and not be dependent on the item stored in the case.

3.4.1 Case styles and sizes. Case styles shall be as specified herein. Case sizes shall be of the inside dimensions specified (see 3.4.12 and 6.2) and facilitate positioning and fastening the case sections together.

3.4.1.1 Transit case (Style 1). The transit case (see figure 1) shall consist of a "clam shell" configuration with two or more handles or lifting rings. One valise handle is permitted for an under 16 kilogram (35 pound) load (see 3.4.5). This style is normally equipped with cut or molded foam cushions that protect the item from shock and vibration (see 3.8).

3.4.1.2 Combination case (style 2). The combination case (see figure 2) shall be similar to style 1, but with an inner flange on the closure to permit direct mounting of the item to the case. The combination case may be used for both shipment (of rugged items) and storage, and also for operating the product while in the case. The case becomes part of the item and does not normally include cushioning.

3.4.1.3 Console case (Style 3). The console case (see figure 3) shall consist of a case shell with either one or two covers (see 6.2) and lifting handles or rings. The shell center shall include a frame suitable for mounting standard rack-mountable instruments allowing the instrument(s) to be operated in the case when the cover(s) are removed. The frame shall be shock isolated, if required (see 3.8).

3.4.1.4 Special designs (Style 4). Combinations or variations of case styles 1, 2 and 3 (see figure 4) are permitted provided they meet the requirements of this specification and are approved by the procuring activity.

3.4.2 Closure. The case design shall not transmit structural loads to the closure gasket, and shall limit the compression of the closure gasket to not exceed 30 percent. The case cover shall form a natural water shed when the case is in a normal upright position with the clasps either engaged or not engaged, preventing water flow into the case. The closure design shall mechanically hold the gasket firmly in place, but minimize set or abrasion. When the closure is fabricated separately from the case shell, it shall be permanently fastened to, and become an integral part of, the shell. The bond where the closure is secured to the shell shall meet the same requirements as the material used for the case shell.

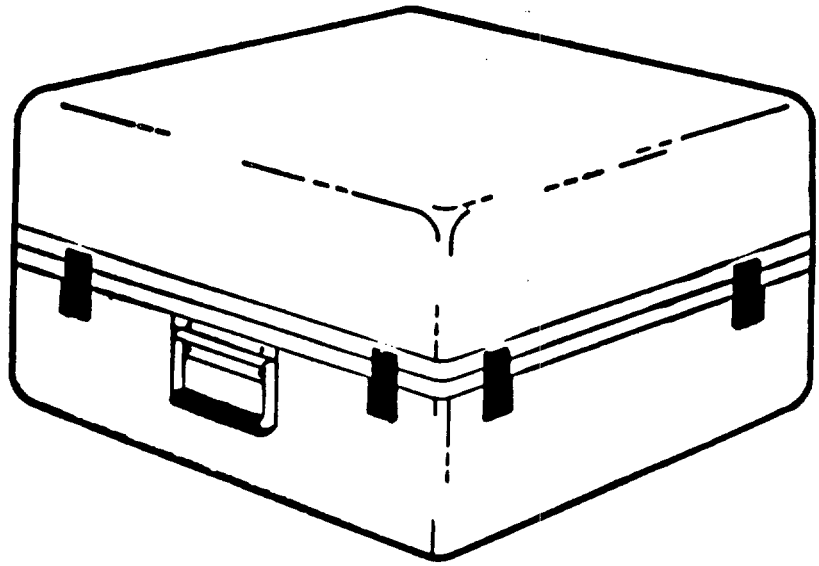

FIGURE 1. TRANSIT CASE - STYLE 1.

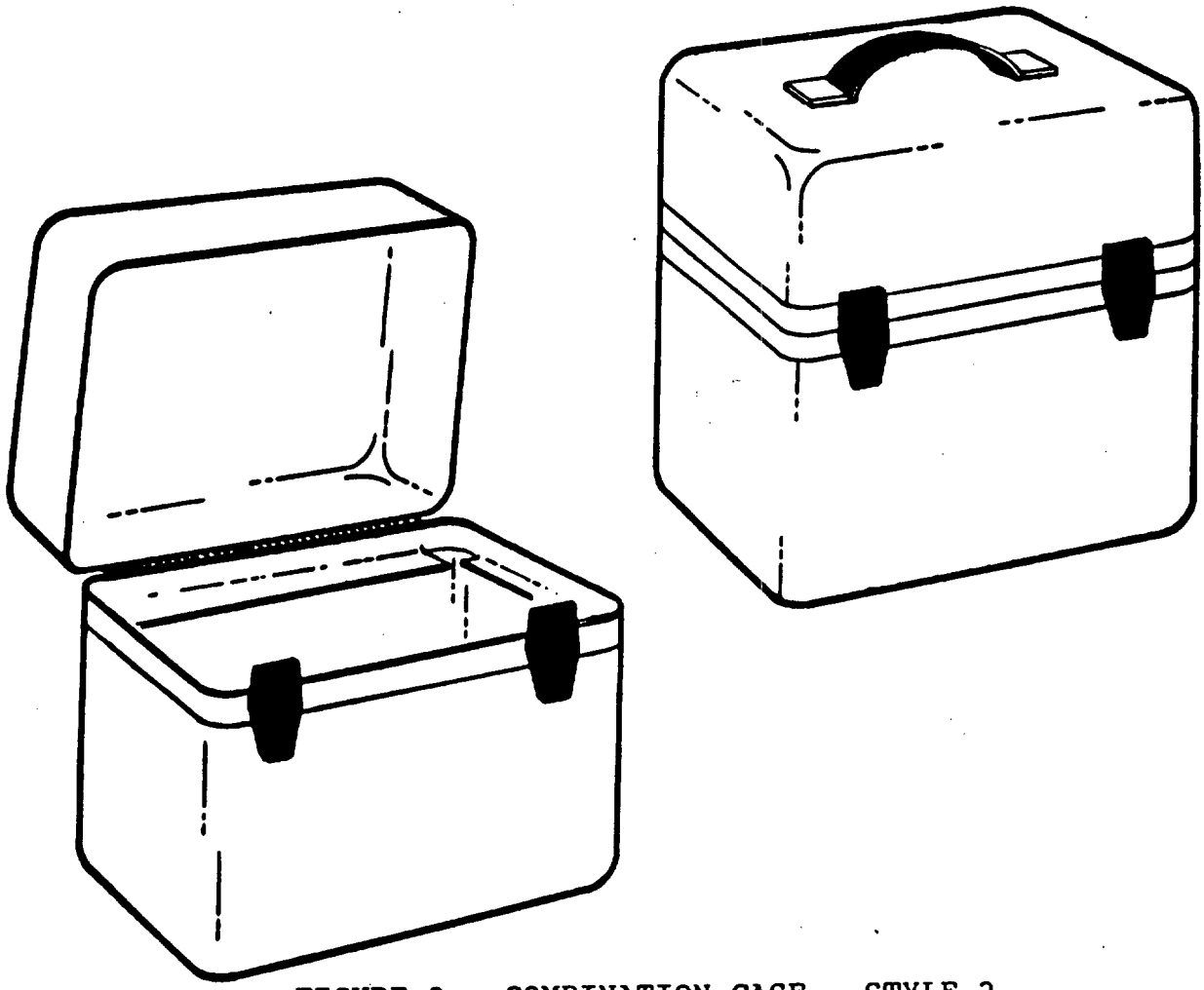

FIGURE 2. COMBINATION CASE - STYLE 2.

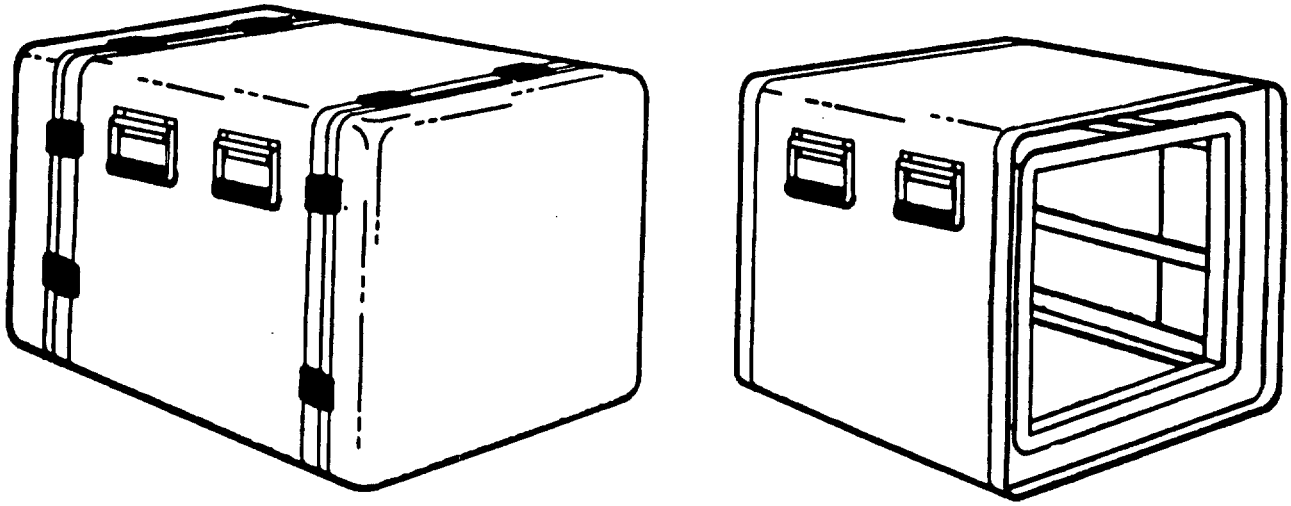

FIGURE 3. CONSOLE CASE - STYLE 3.

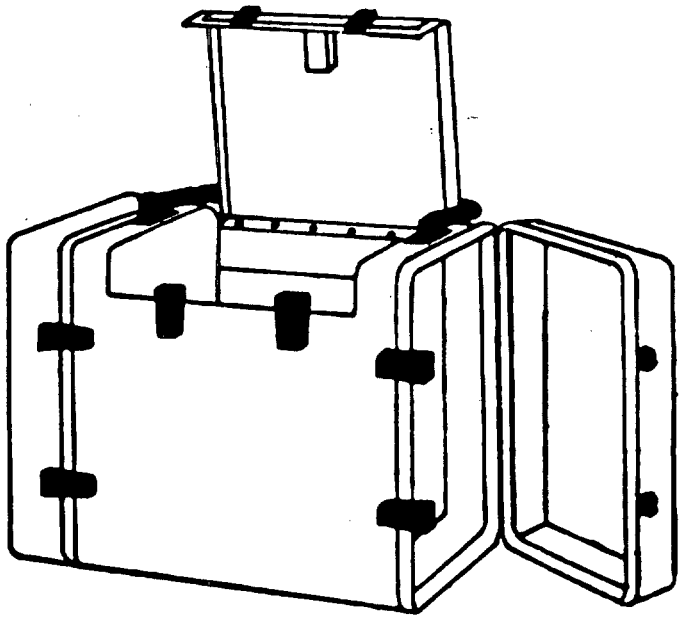

FIGURE 4. SPECIAL DESIGN - STYLE 4.

3.4.2.1 Security seal. Unless otherwise specified (see 6.2), each case shall have provisions for a tamper-proof security seal in accordance with MIL-S-23769 on diagonally opposite corners of the case closure. The seals shall be affixed after closure in such a manner that the case cannot be opened without destroying the seal.

3.4.3 Hinges. The hinge design shall have corrosion/erosion resistant properties and shall meet the performance requirements specified herein. The hinges shall be securely fastened to the case such that no racking shall occur during performance tests. Sliding (removable) hinge design shall allow the case cover to be easily removed without tools by shifting the cover, yet retaining proper alignment of the cover for closure.

3.4.4 Clasps (latches). The clasps shall be over-the-center type, tension clasps with corrosion resistant properties, and shall withstand the tests specified herein. The clasps shall be of adequate quantity and spacing to draw the case sections together and securely hold them in a closed position. The clasps shall prevent any separation of the closure or unlocking of the clasps when the case is subjected to the tests of section 4. The clasps shall be recessed within the maximum envelope of the case, protected from damage and shall withstand direct impacts of the performance tests without malfunctioning or cracking. The clasps shall not interfere with cover removal when unlatched. Provisions shall be made to permit field replacement of worn or damaged clasps with the use of simple hand tools without destroying the waterproof/water-vaporproof seal. Other types of clasps may be specified (see 6.2) as long as all test requirements are met.

3.4.5 Handles. The handles shall be a swing free, chest type with stops to hold the bail at right angle to the mounting plate when in carrying position and spring loaded to fold the bail into a down position when released. The bail of the handles shall have a grip diameter not less than 0.94 centimeters (0.38 inch), an inside length not less than 11.43 centimeters (4.50 inches) with a minimum clearance of 5.08 centimeters (2.00 inches) between the bail grip and the mounting plate. The handles and handle mounts shall pass the test of 4.6.3.7 without deformation, failure or damage to the case. The number and location of handles for each case (when loaded) shall limit load distribution per handle to 20.5 kilograms (45 pounds) and shall be as evenly distributed as practical for easy handling. Handles shall be installed sufficiently above the center of gravity of the equipment to ensure carrying stability. Unless otherwise specified (see 6.2), a single non-springloaded handle (valise type) shall be provided for lifting and carrying gross loads of less than 16 kilograms (35 pounds) and

attached to a long side of the bottom section of the case at the center of balance. The handles shall recess within the maximum envelope of the case.

3.4.5.1 Handles, class A cases. Unless otherwise specified (see 6.2), folding metal handles shall be provided for lifting and carrying gross loads of 16 kilograms (35 pounds) or more, but less than 68 kilograms (150 pounds) in accordance with 3.12.

3.4.5.2 Handles, class B cases. Handles on the class B case shall be used for easy removal and installation of the case cover only, in accordance with 3.12.

3.4.6 Lifting rings, class B cases. Unless otherwise specified (see 6.2), a minimum of four lifting rings or eyes shall be symmetrically installed on the bottom section of each case (see figure 5). The rings or eyes shall not interfere with stacking. The rings or eyes shall be located on the case to ensure lifting stability. The rings or eyes shall be designed for surface mounting and fold down flat against the mounting plate. The rings or eyes shall support a minimum load of 159 kilograms (350 pounds) or a load 5 times the gross weight of a loaded case, whichever is larger. Unless otherwise specified (see 6.2), a ring or eye shall have a minimum inside diameter of 6.4 centimeters (2.5 inches). A lifting ring or eye shall pass the test of 4.6.3.7 without deformation, failure or damage to the case. The lifting rings shall recess within the maximum envelope of the case when not in use.

3.4.7 Stacking interface. An interface shall be provided on the top and bottom of the case for stacking. The interface shall ensure a stable stacking configuration with a minimum of movement in any direction.

3.4.8 Manual vacuum and pressure relief valve. When specified (see 6.2), each case shall be provided with a simple, manually operated valve to equalize the air pressure inside the case with the outside air pressure. The valve shall be designed, positioned, and recessed on the case to prevent damage and accidental opening. The valve assembly shall be replaceable without opening the case and shall not require the use of special tools.

3.4.9 Automatic vacuum and pressure relief valve. Unless otherwise specified (see 6.2), each case shall be provided with an automatic relief valve to relieve internal or external pressures. The valve shall meet the requirements of MIL-V-27166 and be sized with a flow rate sufficient to protect the case against damage. The valve design shall maintain within the case a differential pressure of 6.9 kiloPascals +3.4/-0 (1.00 pounds per

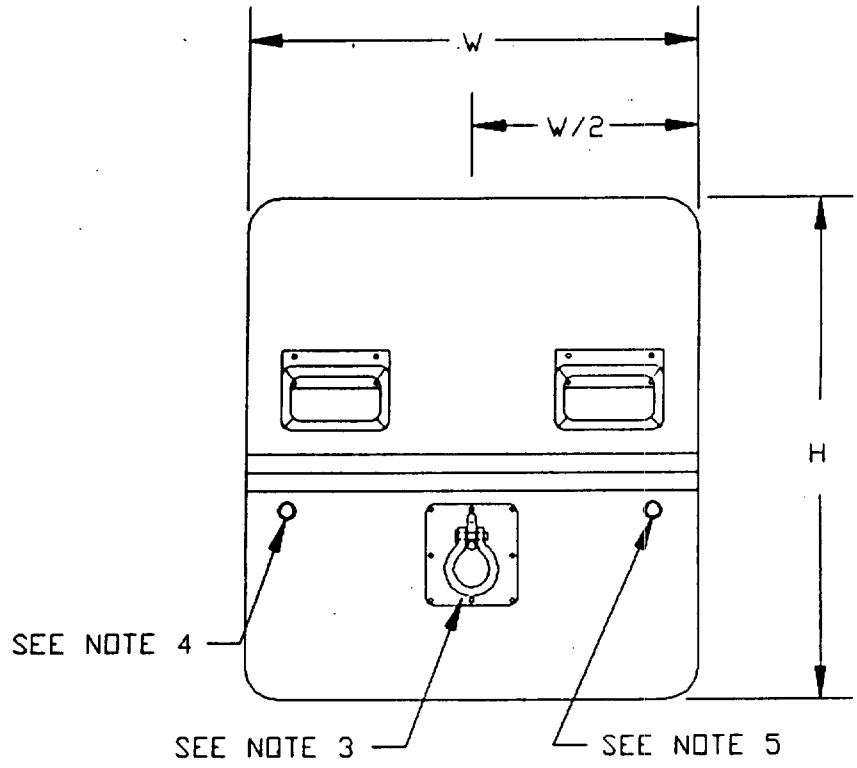

FIGURE 5. LOCATION OF LIFTING RINGS, HUMIDITY INDICATOR AND VACUUM-PRESSURE VALVE ON A STYLE 1, CLASS B CASE (END VIEW).

NOTES:

1. Dimensions W and H are applicable to the width and height of case, respectively. When more than two lifting rings are used, they shall be located symmetrically about the case to ensure lifting stability.

2. Tolerance for lifting ring location is ± 0.64 centimeters (± 0.25 inch).

3. Lifting rings of 3.4.6 shall be installed on the bottom section of the case. The lifting ring design shall permit the ring to fold down flat against the mounting plate and meet the requirements of 3.4.6.

4. Unless otherwise specified, the provisions for the humidity indicator (see 3.4.10) will be located as shown on the side or end of the case containing the lifting rings.

5. Vacuum and pressure relief valve(s) will be installed adjacent to the provisions for the humidity indicator provisions (see 3.4.8 and 3.4.9).

square inch (psi) +0.50/-0) or vacuum of -6.9 kiloPascals +0/-3.4 (-1.00 psi +0/-0.50). When the automatic valve is used, it shall be in addition to the manually operated valve, unless such features are built into the automatic valve. The valve shall be replaceable without removing the cover and shall not require the use of special tools.

3.4.10 Relative humidity indicator. Unless otherwise specified (see 6.2), each case shall be provided with facilities to accommodate a humidity indicator meeting the requirements of MIL-I-26860 (see figure 5, note 4). The facility design shall not protrude beyond the outer limits of the case. When humidity indicators are not furnished, the facilities provided for these indicators shall be fitted with a threaded protector capable of sealing.

3.4.11 Attachment of fittings. All fittings, such as closures, clasps, and handles shall be self-draining and shall be attached to the case to not allow the ingress of moisture.

3.4.12 Size and weight. Cases shall be of the sizes specified by the procuring activity (see 6.2). Internal design and fabrication dimensions shall be measured between opposite points of tangency of the inscribed corner arcs. The tolerance of the plane lines shall be ± 1.52 millimeter (± 0.06 inch) for the length, width and base and lid depth. Estimated weight of the cases shall be as shown in Table I and shall be tested in accordance with 4.6.3.6.

3.4.13 Useful life. The case shall be capable of meeting performance requirements of section 3.5 when exposed to environments in 3.5.6 during handling, storage and transportation for 10 years.

3.4.14 Desiccant holder. Voids in the cushioning system or a basket shall be provided inside the case to accommodate the quantity of desiccant as required in MIL-P-116.

3.5 Performance.

3.5.1 Reusability. The loaded case shall be capable of repeated opening and closing without the aid of tools and without any degradation of the reusability of the case (see 4.6.3.1).

3.5.2 Leakage. The leakage rate shall not exceed 0.05 psid/hour (0.35 kiloPascals) when the cases are subjected to the leak test of 4.6.3.2.

TABLE I

Case Volume (cubic in)	Case Volume (cubic m)	Case Est Weight (Tare) (pounds)	Case Est Weight (Tare) (Kg)	Test Load (Net) (pounds)	Test Load (Net) (Kg)
1,000 - 1,500	.016 - .025	10	4.5	20	9.1
1,501 - 2,000	.025 - .033	15	6.8	30	13.6
2,001 - 3,000	.033 - .049	25	11.4	50	22.7
3,001 - 6,000	.049 - .098	35	15.9	70	31.8
6,001 - 10,000	.098 - .164	45	20.4	90	40.8
10,001 - 15,000	.164 - .246	65	29.5	130	59.0
15,001 - 20,000	.246 - .328	78	35.4	150	68.0
20,001 - 25,000	.328 - .410	85	38.6	170	77.1
25,001 - 30,000	.410 - .492	95	43.1	190	86.2
30,001 - 35,000	.492 - .574	105	47.6	210	95.3
35,001 - 40,000	.574 - .655	115	52.2	230	104.3
40,001 - 45,000	.655 - .737	125	56.7	250	113.4

3.5.3 Concentrated load. Each case shall support the superimposed weight of a number of like cases having the maximum allowable tare weight and containing the applicable test load of Table I (or as identified in 6.2) to simulate a minimum stacking height of 5 meters (16 feet) (see 4.6.3.3).

3.5.4 Drop test. Each case shall withstand the drop tests of 4.6.3.5 when loaded with the applicable maximum test load of Table I or as identified by the procuring activity (see 6.2) without any damage that impairs the function of the case.

3.5.5 Vibration tests. When specified (see 6.2), the case design shall prevent damage to the item resulting from the transportation vibration environment. The transmissibility at the resonant frequency in the major translational modes of vibration shall not exceed that specified in FED-STD-101, method 5019 and MIL-STD-648, para 5.3.2 (see 4.6.3.8).

3.5.6 Environmental requirements. The case shall protect the item and withstand the environmental conditions specified herein. No degradation of materials (i.e. cracking, warpage, disintegration of surfaces, etc.) or performance (i.e. leaks or stackability) shall impair the functional use of the case during testing. The case shall be designed to be capable of withstanding the worldwide extremes of MIL-STD-210, with temperature extremes of -54 to 74 °C (-65 to +165°F), and relative humidity extremes ranging from 0 to 100% over the temperature extremes. (See 4.6.3.4)

3.5.7 Interchangeability. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The drawing and part number requirements of DOD-STD-100 shall govern assignments and changes in the manufacturer's part numbers. Matching sections of each case shall be numbered to aid in matching sections.

3.6. Color. Unless otherwise specified (see 6.2), the case color shall be 24064 or 34087 color number of FED-STD-595. The external hardware on the case shall be similar low profile coloration.

3.7 Finish. All exterior and interior surfaces shall have a corrosion/erosion and abrasion resistant finish in accordance with requirements specified herein. Materials used in the construction of the case shall not deteriorate when exposed to environmental conditions.

3.7.1 Metal cases. Unless otherwise specified (see 6.2), metal cases shall be finished in accordance with MIL-STD-171. The non-ferrous metal case shall be prime coated with DOD-P-15328 or TT-P-1757. Unless otherwise specified (see 6.2), the case exterior shall be painted with TT-E-515 or TT-E-516. Where unpainted aluminum is used (such as case sealing surface), it shall be protected in accordance with MIL-C-5541.

3.7.1.1 Plating. Tin-plating in accordance with MIL-T-10727 or zinc-plating in accordance with MIL-C-87115, Class 3 shall be used in lieu of cadmium plating to the maximum extent practical. If cadmium plating is used, it shall conform to QQ-P-416.

3.7.2 Non-metallic cases. Ultraviolet inhibitors shall be used with non-metallic materials to prevent environmental degradation. Protective coatings that crack, chip, scale or erode with age or environmental conditions shall be not be used. Non-metallic cases having the color impregnated in the material shall not require painting.

3.8 Cushioning and mounting provisions. Cushioning or shock mount system requirements for the cases shall be specified in the contract (see 6.2). The case shall limit transmission of shocks to the contents to the maximum level specified in 6.2. This attenuation shall apply when testing in accordance with FED-STD-101, level A (see 4.6.3.5). Provisions shall be made for only one orientation of the cover when necessary to ensure proper alignment of internal cushion systems to the packaged item.

3.9 Marking. Unless otherwise specified (see 6.2), the case markings shall be in accordance with MIL-STD-129.

3.9.1 Nameplate. Unless otherwise specified (see 6.2), the case markings shall be in accordance with MIL-STD-130 and shall be located as specified in 6.2.

3.9.2 Cushioning marking. When a cushioning system is furnished as part of the purchase order or contract (see 6.2), it shall be permanently and legibly identified. Identification information shall be visible when cushioning is installed in the case.

3.10 Workmanship. The case, including all parts, shall be free from any defects (i.e. poor molding fabrication, loose materials, damaged or improperly assembled cases, peeling, or chipping of plating or finish, nick and burrs of metal parts and post molding warpage) which affect the durability, strength, safety or serviceability. All exposed edges of non-metallic cases that have been machined, drilled, etc., shall be perma-nently sealed. The case, the weld quality, the finish of exposed edges/surfaces shall be smooth, free of sharp or jagged edges.

3.11 Technical data.

3.11.1 Drawings. Unless otherwise specified (see 6.2), one copy of the level III case assembly drawings in accordance with DOD-D-1000 shall be forwarded to Container Design Retrieval System in accordance with MIL-STD-1510 (see 6.3).

3.11.2 First article inspection plan. Unless otherwise specified (see 6.2), a first article inspection plan shall be provided for each case identified in 4.4 (see 6.3).

3.11.3 First article inspection report. Unless otherwise specified (see 6.2), a first article inspection report shall be provided for each case inspection (see 6.3).

3.12 Human factors. Unless otherwise specified (see 6.2), the case design shall meet human factors requirements as defined in MIL-STD-1472.

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

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

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

a. First article inspection (see 4.4).

b. Quality conformance inspection (see 4.5).

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed at ambient temperature.

4.4 First article inspection. The first article inspections shall consist of all the examinations in 4.5 and tests specified in 4.6. First article inspection shall be performed on the largest case of each type, style, class, and design representative of the cases to be supplied under the contract. The contractor shall inform the procuring activity two weeks in advance when and where tests are to be performed so that a representative may be designated to witness and monitor the tests, when so desired. Cases exceeding the volume of the largest case listed in Table I shall be tested and approved by the procuring activity before production commences.

4.4.1 Useful life analysis. The contractor shall certify to the government, during first article testing, that the useful life of the case is a minimum of 10 years and shall meet all specification requirements.

4.5 Quality conformance inspection. Unless otherwise specified (see 6.2), all inspection requirements shall be performed and documented in accordance with MIL-I-45208 as a minimum. Inspections performed on less than 10 cases may conform to FAR 52.246-2.

4.5.1 Inspection lot. For the purpose of sampling, a lot shall consist of all cases of the same type, style, class and size manufactured under the same conditions and offered for delivery at one time.

4.5.2 Sampling plan. A random sample of cases from each lot shall be selected in accordance with MIL-STD-105, general inspection level II. An Acceptable Quality Level (AQL) of 1.5 is established for major defects and an AQL of 4.0 is established for minor defects.

4.5.3 Examination of product. Each case shall be carefully examined to determine conformance with material, workmanship and requirements as specified in Table II.

TABLE II

CATEGORIES	DEFECTS
MAJOR:	
101	Cases not conforming to type, style, class, variety or size as specified in contract or purchase order.
102	Top and bottom of case not matched.
103	Closure allows above 30% compression to the gasket.
104	Closure does not shed water when case is in upright position.
105	Hinges not as specified.
106	Clasps cracked or not as required.

TABLE II (Continued)

CATEGORIES	DEFECTS
107	Rough spots in the case shell that would impair the serviceability.
108	Lifting rings or handles not installed on cases as specified.
109	Stacking interface not as specified.
110	Provisions for humidity indicator not installed when required.
111	Vacuum and pressure relief valve not provided.
112	Bolts, rivets, etc., used to attach fittings, left with sharp ends and spurs protruding beyond the surfaces of the case.
113	Welded seams rough, uneven and subject to develop leaks while in use.
114	Gaskets not proper size (do not fit).
115	Specified number of handles not provided.
116	Fittings, clasps, etc., not plated or protected as required.
117	Cases not marked as specified.
118	Parts with the same manufacture's part number not as specified.
119	Provisions for desiccant not as specified.
120	Desiccant not provided.
MINOR:	
201	Standard part nonconformance with 3.3.
202	Handles smaller than specified.

TABLE II (Continued)

CATEGORIES	DEFECTS
203	Handles not spring loaded or will not swing freely (when required).
204	Color not as specified.
205	Finish not as specified.
206	Cushioning and mounting provisions (when furnished) not identified.
207	Suspension systems (when furnished) not marked as specified.
208	Nameplate not as specified.
209	Case marking not as specified.

4.5.4 Quality conformance tests. The quality conformance tests shall consist of the tests specified in 4.6.3.2 and 4.6.3.6 and shall be performed on each case produced.

4.6 Tests and test methods. Unless otherwise specified herein, all of the following test methods shall be in accordance with FED-STD-101.

4.6.1 Preparation of case. All tests except the tests of 4.6.2 and 4.6.3.2 shall be conducted with the case fully assembled and loaded. The test load shall be a dummy test load in accordance with Table I.

4.6.2 Non-metallic materials test.

4.6.2.1 Water-vapor transmission rate of non-metallic materials (Type II only). This test shall be conducted in accordance with ASTM D1008 for conformance with 3.2.

4.6.2.2 Fungus resistance. The fungus resistance test shall be conducted in accordance with method 3020 for compliance with 3.2.4.

4.6.2.3 Flammability and smoke density test. When flame retardant materials are required in 3.2.4 a case shall be tested in accordance with ASTM E162 and ASTM E662. This test applies only to non-metallic materials.

4.6.3 Performance tests.

4.6.3.1 Reusability. The case shall be opened and closed five times to demonstrate reusability without degradation. Ease of operation and freedom from interference shall constitute acceptance. (See 3.5.1)

4.6.3.2 Leak Test. Either test listed below shall be conducted to demonstrate sealing capability. The leak test shall be performed before and after all tests for compliance with 3.5.2. The same closure gasket shall be used for the series of leak tests.

4.6.3.2.1 Submersion. This test shall be conducted in accordance with method 5009, submersion technique. Presence of moisture inside the case shall constitute cause for rejection.

4.6.3.2.2 Pneumatic pressure test. This test shall be conducted in accordance with method 5009, pneumatic pressure technique. A vertical water manometer or equivalent shall be used for pressure tests.

4.6.3.3 Concentrated load test. The concentrated load test shall be conducted in accordance with method 5016 for conformance with 3.5.3. In addition, non-metallic cases shall be tested with the temperature and relative humidity of 49°C (120°F) and 90 percent, respectively for 168 hours in accordance with method 5016, para 6.1.1.

4.6.3.4 Environmental tests. Environmental tests shall be conducted at -20 (+0/-6) °C (-20 (+0/-10) °F) and 60 (+6/-0) °C (+140 (+10/-0) °F) for tests described in 4.6.3.5 (see 3.5.6).

4.6.3.5 Drop tests. All cases shall be conditioned for the drop tests in accordance with 4.6.3.4.

4.6.3.5.1 Free-fall drop tests. Cases with gross weights of less than 68 kilograms (150 pounds) shall be subjected to free-fall drop tests in accordance with method 5007, procedure G for compliance with 3.5.4.

4.6.3.5.2 Rotational drop tests. Cases with gross weights 68 kilograms (150 pounds) or greater shall be subjected to the following drop tests for compliance with 3.5.4.

4.6.3.5.2.1 Cornerwise-drop (rotational) test. Cornerwise drops shall be conducted in accordance with method 5005.1 (see 3.5.4).

4.6.3.5.2.2 Edgewise-drop (rotational) test. Edgewise drops shall be conducted in accordance with method 5008.1 (see 3.5.4).

4.6.3.5.2.3 Impact test. The impact test shall be in accordance with method 5012 or method 5023 (see 6.2 for specified drop height and velocity) (see 3.5.4).

4.6.3.6 Weight test. Each case shall be weighed and shall have the minimum weight required as established during first article testing (see 3.4.12).

4.6.3.7 Handling test. The sample case shall be lifted clear of the floor or ground and suspended by one handle, lifting ring, as applicable, for a minimum of 2 minutes. Each handle and lifting ring of the sample case shall be tested for compliance with 3.4.5 and 3.4.6.

4.6.3.8 Vibration test. When specified (see 6.2), the vibration environment shall be as defined in FED-STD-101, method 5019 and MIL-STD-648, para 5.3.2. (See 3.5.5)

4.7 Examination of packaging. The sampling and inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of the applicable case specification shown in section 5. The inspection of marking for shipment and storage shall be in accordance with MIL-STD-129. The inspection of commercial packaging shall be as specified in the contract (see 6.2).

5. PACKAGING

5.1 Preservation. Not applicable.

5.2 Packaging. Unless otherwise specified (see 6.2), the requirements for packaging shall be in accordance with ASTM D3951. The appropriate amount of desiccant as identified in 3.4.14 shall be installed in each case.

5.3 Marking. Unless otherwise specified (see 6.2), the shipping case shall be marked in accordance with ASTM D3951.

6. NOTES

6.1 Intended use. These cases are intended for use as shipping and storage case for items of military equipment and supplies requiring moisture and water-vaporproof protection. These cases are also intended for use when homogeneous molded, die-cut cushioning or shock mounting suspension systems are specified in the contract or order for specific requirements.

6.1.1 Cross references. Cases meeting the requirements of this specification generally meet or exceed the case requirements of the following specifications:

MIL-T-21200
MIL-T-28800 (styles A, C, G, and H)
RDD-STD-2 (ARMY)

6.2 Acquisition requirements. Invitation for bids, contracts, and purchase orders should state the following:

a. Title, number, and date of this specification.

b. Identify load exceeding 113 kilograms (see 1.1, 3.5.3 and 3.5.4).

c. Type, style, class, and variety of case (see 1.2 and 3.4.1).

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

e. When a first article is required for inspection and approval (see 3.1, 4.4 and 6.4).

f. Whether fire retardant materials are required (see 3.2.4).

g. Inside dimensions of case (see 3.4.1 and 3.4.12).

h. For style 3, specify one or two covers (see 3.4.1.3).

i. Whether security seals are required (see 3.4.2.1).

j. Specify type of clasp if other than specified in 3.4.4.

k. Handle requirements if different from 3.4.5 and 3.4.5.1.

l. Lifting rings or eyes requirement if different from 3.4.6.

m. Manual or automatic pressure-vacuum relief valve requirement (see 3.4.8 and 3.4.9).

n. Humidity indicator facility and plug requirements (see 3.4.10).

o. Whether vibration tests are required (see 3.5.5 and 4.6.3.8).

p. Color and finish if different from 3.6 and 3.7.1.

q. Cushioning or shock mount provision requirements and the maximum shock transmission limit of the actual item (fragility) (see 3.8 and 3.9.2).

r. Marking requirements (see 3.9 and 3.9.2).

s. Nameplate location, if required (see 3.9.1).

t. Incorporate data items for technical data (see 3.11 and 6.3).

u. Identify variations with MIL-STD-1472 (see 3.12).

v. Quality conformance inspection requirements (see 4.5).

w. The required impact velocity (see 4.6.3.5.2.3).

x. Inspection requirements for commercial packaging (see 4.7).

y. Packaging and special marking for packaging if different than required (see 5.2 and 5.3).

6.3 Data requirements. The Data Item Descriptions (DID's) in Table III must be listed, as applicable, on the Contract Data Requirements List (DD Form 1423) when this specification is applied on a contract, in order to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

TABLE III

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
3.11.1	DI-E-7031/T	Drawings, Engineering	Level III drawings provided 30 days prior to first article testing. Submit revised drawings 30 days after first article,

TABLE III (Continued)

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
			incorporating all discrepancies identified at first article. Provide drawings on aperture cards and deliver within 90 days after first article testing.
3.11.2	DI-T-3714A/T	Acceptance Test Procedures	Submit 30 days after contract award. Revisions are required.
3.11.3	DI-T-3718A/T	Test Reports - General	AF approval will be provided within 45 days. Submit no less than 30 days after qualification testing & first article acceptance testing.

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

6.4 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors that the item(s) shall be a first article sample (see 4.4). The contracting officer shall also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids shall provide that the Government reserves the right to waive the requirement for samples of first article inspection. Those bidders offering a product which has been previously acquired or tested by the Government, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract, provided the cases or materials have not been changed or modified in any manner. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.5 Subject term (key word) listing.
Case
Case, Transit and Storage
Case, Transit and Storage, Waterproof and Water-vaporproof
Container, Transit and Storage
Packaging
Packaging, Case, Transit and Storage
Packaging, Case, Transit and Storage, Waterproof and Water-vaporproof

6.6 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.

Custodians:
Air Force - 69
Army - GL
Navy - AS

Preparing activity:
Air Force - 69

(Project 8115-F486)

Reviewer activities:
Air Force - 13, 18, 84, 99
Army - ER, ME, MI, SM
Navy - OS

User activities:
Air Force - 99
Navy - MC, SA, SH

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-C-4150J	Cases, Transit and Storage, Waterproof and Water-Vaporproof

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)

DD FORM 82 MAR 1426 PREVIOUS EDITION IS OBSOLETE.