INCH-POUND

MIL-P-197H
29 July 1994
SUPERSEDING
MIL-B-197G
3 March 1992

MILITARY SPECIFICATION

PACKAGING OF BEARINGS, ANTIFRICTION, ASSOCIATED PARTS AND SUBASSEMBLIES

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

1. SCOPE

1.1 Scope. This specification covers the cleaning, drying, packaging, packing and marking of stock and production antifriction bearings, associated parts and subassemblies.

1.2 Classification.

1.2.1 Levels of protection (see 6.4.3.1).

Level A - Provides maximum protection for worldwide shipment, handling, and storage (outdoor storage - 1 year minimum) conditions.

Level B - Provides intermediate protection for material under anticipated favorable worldwide shipment, handling, and storage (minimum 18 months of favorable warehouse environment).

Level C - Provides minimum protection under favorable conditions for material used at the first destination and for a maximum of 18 months under favorable warehouse environment.

Commercial - ASTM D 3951 is a guide to the minimum requirements for commercial packaging. Commercial packaging will be acceptable for any level of protection when the technical design of the package meets all conditions of the specified level of protection and provides the same level of protection as the military package.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Industrial Supply Center, DISC-E, 700 Robbins Avenue, Philadelphia, Pa. 19111-5096, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A AREA PACK

1.2.2 Preservation.

Level A (see 3.2)
Level C (see 3.3)
Commercial (see 3.4)

Protection	Preservation
Level A	Level A
Level B	Level A
Level C	Level A or C
Commercial	Level C or commercial

1.2.2.1 Default level of preservation. Level C preservation (see 3.3) shall be used when there is no level of preservation specified.

1.2.3 Packing.

Levels A, B, and C (see 3.5.2, 3.5.3, 3.5.4)
Commercial (see 3.5.5)

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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 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

L-P-378 - Plastic Sheet and Strip, Polyolefin
QQ-A-1876 - Aluminum Foil
TT-T-291 - Thinner, Paint, Mineral Spirits, Regular and Odorless
UU-P-268 - Paper, Kraft, Wrapping
VV-L-800 - Lubricating Oil, General Purpose, Preservative (Water-Displacing, Low Temperature)
VV-S-190 - Sealing Compound (Dipcoat)
PPP-B-566 - Boxes, Folding, Paperboard
PPP-B-576 - Boxes, Wood-Cleated Panelboard
PPP-B-585 - Boxes, Wood, Wirebound
PPP-B-591 - Boxes, Shipping, Fiberboard, Wood-cleated
PPP-B-601 - Boxes, Wood, Cleated-Plywood
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner
PPP-B-665 - Boxes: Paperboard, Metal Edged and Components
PPP-B-676 - Boxes, Setup
PPP-B-1055 - Barrier Material, Waterproofed, Flexible
PPP-C-795 - Cushioning Material, Packaging (Flexible Closed Cell Plastic Film for Long Shipping Cycle Applications)
PPP-C-1120 - Cushioning Material, Uncompressed Bound Fiber for Packaging

PPP-T-60 - Tape: Packaging, Waterproof
PPP-T-76 - Tape, Packaging, Paper (For Carton Sealing)

MILITARY

MIL-C-104 - Crates, Wood; Lumber and Plywood Sheathed, Nailed and Bolted
MIL-P-116 - Preservation, Methods of
MIL-B-117 - Bags, Sleeves and Tubing
MIL-B-121 - Barrier Material, Greaseproofed, Waterproofed, Flexible
MIL-P-130 - Paper, Wrapping, Laminated and Creped
MIL-P-149 - Plastic Coating Compound, Strippable (Hot Dipping)
MIL-C-3955 - Cans, Composite, Spirally Wound
MIL-L-6085 - Lubricating Oil: Instrument, Aircraft, Low Volatility
MIL-R-6130 - Rubber, Cellular, Chemically Blown
MIL-L-10547 - Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible
MIL-G-10924 - Grease, Automotive and Artillery
MIL-C-11796 - Corrosion Preventive Compound, Petrolatum, Hot Application
MIL-P-17667 - Paper, Wrapping, Chemically Neutral (Non-Corrosive)
MIL-B-17931 - Bearings, Ball, Annular, For Quiet Operation
MIL-L-19140 - Lumber and Plywood, Fire-Retardant Treated
MIL-R-20092 - Rubber or Plastic Sheets and Assembled and Molded Shapes, Synthetic, Foam or Sponge, Open Cell
MIL-B-22191 - Barrier Materials, Transparent, Flexible, Heat Sealable
DOD-G-24508 - Grease, High Performance, Multi-Purpose (METRIC)
MIL-B-26195 - Boxes, Wood-Cleated, Skidded, Load-Bearing Base
MIL-P-26514 - Polyurethane Foam, Rigid or Flexible, For Packaging
MIL-G-27617 - Grease, Aircraft and Instrument, Fuel and Oxidizer Resistant
MIL-C-52211 - Components and Assemblies for Industrial Gas Production, Storage and Transport Equipment, Packaging of
MIL-L-53131 - Lubricating Oil, Precision Rolling Element Bearing, Polyalphaolefin Based
MIL-G-81322 - Grease, Aircraft, General Purpose, Wide Temperature Range
DOD-L-81846 - Lubricating Oil, Instrument, Ball Bearing, High Flash Point
MIL-G-81937 - Grease, Instrument, Ultra Clean, Metric
MIL-F-83671 - Foam-In-Place Packaging Materials, General Specification For
MIL-P-87090 - Foam, Combustion Retardant for Cushioning Supply Items Aboard Navy Ship

STANDARDS

FEDERAL

FED-STD-209 - Airborne Particulate Cleanliness and Clean Zones
FED-STD-791 - Lubricants, Liquid Fuels, and Related Products; Methods of Testing

MILITARY

MIL-STD-129 - Marking for Shipment and Storage (Part 1 of 4 Parts)
MIL-STD-147 - Palatalized Unit Loads

MIL-STD-1190 - Minimum Guidelines for Level C Preservation, Packing and Marking
MIL-STD-1246 - Product Cleanliness Levels and Contamination Control Program
MIL-STD-1334 - Process for Barrier Coating of Anti-Friction Bearings

HANDBOOKS

MILITARY

MIL-HDBK-200 - Quality Surveillance Handbook for Fuels, Lubricants, and Related Products

(Unless otherwise indicated, copies of federal and military specifications standards, and handbooks are available from the Defense Printing Service Detachment Office, Bldg 4D, NPM-DODSSP, 700 Robbins Ave., Philadelphia, PA 19111-5096.)

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

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

JSCM 5322 - Precision Packaging Materials Cleanliness, Specification For.
Pub 8060.1 - *Flammability, Odor and Offgassing Requirements and* Test Procedures for Materials in Environments That Support Combustion

(Application for copies should be addressed to the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX 77058.)

LAWS AND REGULATIONS

Code of Federal Regulations, Title 21 (CFR 21)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be 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/AMERICAN BEARING MANUFACTURERS ASSOCIATION (ANSI/ABMA)

Standard 12.1 - Instrument Ball Bearings, Metric Design
Standard 12.2 - Instrument Ball Bearings, Inch Design
Standard 20 - Radial Bearings of Ball, Cylindrical Roller and Spherical Roller Type, Metric Design

(Application for copies should be addressed to the American Bearing Manufacturers Association, Inc., 1200 19th Street NW, Suite 300, Washington, DC, 20036-2401)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 1974 - Methods of Closing, Sealing and Reinforcing Fiberboard Shipping Containers
D 3951 - Standard Practice for Commercial Packaging. (DoD adopted)
D 4727 - Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade) and Cur Shapes
D 5118 - Practice for Fabrication of Fiberboard Shipping Boxes
D 5168 - Practice for Fabrication and Closure of Triple Wall Corrugated Containers

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

(Non-Government standards and 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 (except for related associated detail specifications, specification sheets, or MS standards), 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 Facilities. Packaging facilities shall meet the requirements specified herein. Where the bearing manufacturer does not operate captive facilities in accordance with this specification, contract packaging facilities may be utilized. The bearing manufacturer shall retain ultimate responsibility for acceptability of the bearings.

3.1.1 Method of transfer. One of the methods specified in 3.1.1.1 or 3.1.1.2 shall be used when transferring bearings from the manufacturing facility to the contract packaging facility.

3.1.1.1 Prior to cleaning. Bearings shall be protected against damage and shipped to the packager with a minimum of storage and transport time. The packager shall perform preservation operations in accordance with the applicable level of preservation (see 6.2).

3.1.1.2 Prior to packaging. Preserved bearings (see 3.1.2.3) scheduled for transfer to a commercial packager shall be placed individually or in bulk in a clean dust-excluding container. Containers and lining shall protect the bearings against damage, corrosion and deterioration when shipped in the protective container. Storage and transport time shall be held to a minimum. Intimate wrapping shall be applied in the required packaging environment.

3.1.2 General preservation process. All bearings are subject to a general preservation procedure; the details of that procedure are determined by bearing type. The general procedure consists of the following sequential steps: 1) Demagnetization, 2) Cleaning, 3) Drying, 4) Preservation/ Lubrication, 5) Intimate Bagging or Wrapping, and 6) Unit Packaging. In all cases, the sequence of operations shall be such that minimal delay occurs once the preservation process has started.

3.1.2.1. Demagnetization, cleaning and drying. Prior to cleaning, the magnetization of instrument precision ball bearings shall not exceed a pole strength of 2 gauss and magnetization of all other bearings shall not exceed a pole strength of 5 gauss. Bearings in excess of the applicable value shall be demagnetized. Bearings shall be cleaned and dried according to type.

3.1.2.2 Certification and recertification. Lubricants shall be certified when procured to meet all requirements of the appropriate specification. Recertification of all remnants of that purchase to all requirements of the appropriate specification shall occur at 2 years for organic based oils, 3 years for organic greases, and 5 years for silicone and perfluorinated oils and greases. Visual check frequency for separation, color and contamination shall be 12 months. The use of nonconforming lubricants is prohibited.

TABLE I. Lubricants and preservative compounds

Bearing class (see 6.4.1)	Bearing closure (see 6.4.2)	Lubricant or preservative compound
General purpose and precision	Open	MIL-C-11796, class 3 1/ or VVL-L-800
	Closed	MIL-G-81322, DOD-G-24508 or MIL-G-10924
Instrument and	Open	MIL-L-6085, DOD-L-81846, MIL-L-53131
Instrument precision	Closed	MIL-G-81322, DOD-G-24508, MIL-G-81937, MIL-G-10924
Oxygen equipment (free of hydro-carbons)	Open Closed	Fluorocarbon grease MIL-G-27617
Large (over 16 inches od or 40 pounds)	Open	Operating lubricant
	Closed	

1/ VV-L-800 is recommended in accomplishing methods IA-8 and IB-2 for open bearings. Bearings shall cool to ambient temperature before packaging.

3.1.2.2.1 Contamination Levels for Lubricants and Preservative Compounds. Oils for general purpose, precision and large bearings shall be tested for cleanliness in accordance with MIL-STD-1246, level 25. Instrument and instrument precision bearing oils shall meet the particulate contamination levels of MIL-L-53131. Grease for general purpose, precision and large bearings shall be tested in accordance with FED-STD-791, method 3005.4; no more than 1000 particles per cubic centimeter (cm^3) of 25 micrometers or larger in size and no particles larger than 75 micrometers shall be allowed. For instrument and instrument precision bearing greases, the contamination requirements of MIL-G-81937 shall apply.

3.1.2.2.2 Certification and Recertification. Lubricants shall be certified, when procured, to meet all requirements of the appropriate specification. Recertification of all remnants of that purchase to all

requirements of the appropriate specification shall occur at 2 years for organic based oils, 3 years for organic based greases, and 5 years for silicon and perfluorinated oils and greases. Visual check frequency for separation, contamination and color shall be 12 months. The use of nonconforming lubricants is prohibited.

3.1.2.3 Preservative application. Bearing and bearing parts shall be coated with the lubricant or preservative compound specified in 3.1.2.2. Bearings shall be completely preserved so as to obtain a continuous coating on all surfaces. During or after preservation with the compound, all internal surfaces shall receive complete coverage. When an operational lubricant (grease or oil) is specified, the quantity applied shall conform to the item description or technical data applicable to the assigned National Stock Number (NSN) (or other identification number when an NSN has not been assigned) as specified (see 6.2). When no quantity is specified, it shall be in accordance with the manufacturer's standard practice. Open bearings shall be coated in oil or preservative compounds. Non-stainless steel sealed or shielded bearings shall have a thin coating of compatible lubricant on outer surfaces and shall be internally greased.

3.1.2.4 Intimate Wrap and Unit Packaging. Intimate wrap and unit packaging shall be as specified (see 6.2).

3.2 Level A Preservation by Bearing Type.

3.2.1 Oxygen Equipment Bearings.

3.2.1.1 Separate clean work area for oxygen equipment bearings. A minute deposit of hydrocarbon oil film on an oxygen equipment bearing presents an explosion hazard when installed in the system; for this reason a separate clean work area shall be designated for the processing of oxygen equipment bearings. This area shall be isolated from all manufacturing processes and shall contain only equipment necessary to process the oxygen equipment bearings. Work benches, tools, and processing equipment shall be maintained free of grease, oil, or other combustible materials and shall only be used on or for oxygen equipment. Personnel present in this area shall maintain themselves and their clothing in a condition which will prevent transferring contaminants to bearing surfaces.

3.2.1.2 Cleaning, drying, and unit protection of oxygen equipment bearings. The method of cleaning and drying as well as the cleanliness classification that determines the type of inspection shall be as specified (see 6.2). Cleaning and drying of oxygen equipment bearings shall be as specified in MIL-C-52211 and the appendix thereto. Preservation shall be level A, method IA-8 symbol G, and shall include the special marking requirements of MIL-C-52211. The environment and processing cleanliness for oxygen equipment bearings shall be the same as that described in 3.2.2.1.

3.2.1.3 Lubricants and preservative compounds for oxygen equipment bearings. The preservative for oxygen equipment bearings shall be the operating oil or the operating grease. Oils and greases shall be fluorocarbon. Hydrocarbon oils or greases are prohibited.

3.2.1.4 Intimate bags for oxygen equipment bearings. Intimate bag material shall be fluorocarbon or chlorofluorocarbon film (2 mils thick) which meets the liquid oxygen (LOX) impact compatibility requirements of NASA per tests specified in NASA Publication 8060.1. Closure shall be by heat sealing.

3.2.2 Instrument and instrument precision ball bearings.

3.2.2.1 Environment and process cleanliness of cleaning and drying areas for instrument and instrument precision bearings. Cleaning and drying areas are defined as those areas in which bearings are subjected to the cleaning and drying processes. Requirements of class 10,000 of FED-STD-209 for particle count shall be met (see 6.3.4). Relative humidity (R.H.) shall not exceed 45 percent at 75 ± 5 degrees Fahrenheit (^{o}F).

3.2.2.2 Preservation area environment and process control for instrument and instrument precision ball bearings. Preservation area shall be well illuminated and air conditioned. Requirements of class 10,000 of FED-STD-209 shall be met (see 6.3.4). The R.H. shall not exceed 45 percent at 75 ± 5^{o}F. The atmosphere within the preservation area shall contain no sulfur dioxide or hydrogen sulfide (see 4.6.4.2). As bearings emerge from the dryer, they shall be preserved and transferred to the packaging area in a continuous process.

3.2.2.3 Cleaning of instrument and instrument precision ball bearings. Bearings shall be cleaned in accordance with MIL-P-116, process C-1. The cleaning process shall include sprays, ultrasonics, and vapor rinsing. The use of chlorinated and fluorinated solvents and acetone and aqueous washes is permitted. Solutions used to clean barrier film coated bearings shall be stored separate from solutions used to clean nonbarrier film coated bearings. A barrier film coated bearing shall not be processed through the regular bearing cleaning area. Procedures for packaging barrier coated bearings are specified in MIL-STD-1334 and these procedures shall be followed. Bearings shall be thoroughly dried prior to lubrication and wrapping.

3.2.2.4 Intimate bags for instrument and instrument precision ball bearings for method IA-8. All intimate bags for instrument and instrument precision ball bearings shall be nylon 6 of 2 mils minimum thickness, certified as meeting Food and Drug Administration (FDA) requirements for direct contact with food, in accordance with 21 CFR paragraph 177.1500, transparent, and cleaned to NASA JSCM 5322 Level 25. Intimate bags shall be heat sealed so as to prevent free movement of the bearing inside the bag. Sealing shall take place in an environment meeting the requirements of FED-STD-209 class 100.

3.2.2.5 Outer bags (method IA8) for instrument and instrument precision ball bearings. Unit bags shall be in accordance with 3.2.4.3.1.

3.2.2.6 For Department of the Air Force. Unless otherwise specified (see 6.2), instrument precision bearings shall be protected in storage by controlled quantities of the specified grease or oil. Preservative oils or compounds shall not be used.

3.2.3 General purpose and precision bearings.

3.2.3.1 Environment and process cleanliness of cleaning and drying areas for general purpose and precision bearings. Care in dust control shall be maintained. The presence of dust- and dirt-producing sources, such as

cartons, trash barrels, and so forth, shall be kept at a minimum. Smoking, eating, and drinking shall not be permitted in the cleaning and drying areas. Cleaning and drying areas are defined as those areas within a 10 foot radius of the cleaning and drying equipment, including aisles.

3.2.3.2 Preservation area environment and process control for general and precision bearings.

3.2.3.2.1 Method IA19. Preservation area environment and process control for general purpose and precision bearings shall conform to 3.2.2.2.

3.2.3.2.2 Preservation area environment and process control for general and precision bearings for other than protection method IA-19. Preservation area shall be well illuminated. Requirements of class 100,000 of FED-STD-209 shall be met (see 6.3.4). The R.H. shall not exceed 45 percent at 75 $\pm$ 5^{O}F. The atmosphere shall contain no sulfur dioxide or hydrogen sulfide (see 4.6.4.2). Area control shall be in accordance with 3.2.3.1. As bearings emerge from the dryer they shall be preserved and transferred to the packaging area in a continuous process. Delays shall be minimized. Any dried bearing awaiting preservation in excess of 1 hour in this environment shall be recleaned. Preserved bearings shall immediately be transferred (after insertion of seals or shields) to the packaging area in clean dust excluding compatible containers.

3.2.3.3 Cleaning of general and precision bearings. Bearings shall be cleaned in accordance with MIL-P-116, process C-1. Agitation tanks and commercial filtration systems shall be used. Spray washes and ultrasonics are permitted. Bearings shall be thoroughly dried prior to lubrication and wrapping.

3.2.3.4 Intimate bags for general purpose and precision bearings. The intimate bag material shall be 2 mils thick nylon 6 or 6 mils thick polyethylene in accordance with L-P-378, type I. All materials shall be transparent. Intimate bags for precision bearings shall be cleaned to the requirements of NASA JSCM 5322 Level 50.

3.2.3.5 Intimate wrapping of large bearings exceeding 16 inches od and 40 pounds (method IA-20, Symbol M). Bearing shall be wrapped with an intimate wrap of material in accordance with MIL-B-121, grade A (greaseproof) and shall be wound in a spiral fashion from inside diameter (id) to od to id. An overwrap of material in accordance with MIL-B-121, grade C shall be applied in a spiral fashion and in the opposite direction of the intimate wrap. Hot wax shall be applied to the entire surface of the wrapped bearing in accordance with VV-S-190. The hot wax shall be applied with a brush in order to form a seal as water vaporproof and waterproof as possible.

3.2.4 Unit protection. Unit protection methods shall be in accordance with Table II and 3.2.4.1 through 3.2.4.9. Method IA-19 unit protection is required for MIL-B-17931 bearings. Unless otherwise specified (see 6.2), unit protection for instrument precision ball bearings shall be method IA-8. Other bearings shall be unit protected in accordance with one of the methods listed in Table III for the applicable bearing size. Bearings shall be packaged individually, in pairs, or as set, as applicable units. The quantity of bearing parts and of bulk packaging of bearings shall be as specified (see 6.2). Unit protection for balls and rollers shall be per method IA-8 (Symbol G), IA-13 (Symbol H), or IA-21 (Symbol N).

TABLE II. Unit protection method descriptions

Method	Symbol	Description
IA-6	F	Vials (plastic), bearings, balls, or rollers immersed in preservative oil, vial sealed.
IA-8	G	Bearing preserved or lubricated; wrapped; placed in greaseproof, waterproof, water-vaporproof bag; sealed.
IA-13	H	Vials (plastic), bearings, balls, or rollers dipcoat preserved or lubricated; wrapped, cushioned, vial sealed.
IA-13	J	Fiber cans; bearings preserved, wrapped, cushioned.
IA-19	L	Vacuum-formed plastic skin pack, bearing dipcoat preserved lubricated.
IA-20	M	Bearing preserved with operating fluid; wrapped in greaseproof spiral inner wrap; over wrapped with self-adhering greaseproof spiral wrap; external surface coated with hot wax, cushioned, and unit packaged in a container of fiberboard or wood (see 3.5.1 and 3.5.2).
IA-21	N	Multiple pocket oiled foam plastic with solid oiled foam plastic covers, bearings, balls, or rollers dip coat preserved or lubricated, and followed by installation into sealed plastic bag.
IB-2	A	Bearing dipcoated with preservative or operating lubricant followed by intimate aluminum wrap, then greaseproof wrapped.
IId	B	Metal drums, bearing wrapped, desiccated (bulk).

3.2.4.1. Method IA-6, symbol F - vials (plastic). After cleaning and drying, bearings, balls, or rollers shall be placed in a clean, dry, plastic vial as specified in 3.2.4.2. Each vial shall be cleaned with a blast of filtered dry air, by vacuum, or solvent washed before inserting the contents. Preservative oil shall be in accordance with 3.1.2.2. The vial shall be filled with oil so as to have 5 to 7 percent outage. When vials are not completely filled with bearings, balls, or rollers, clean particle-free compatible plastic or nylon buffer materials shall be used to prevent movement of the contents.

TABLE III. Methods of unit protection by size

Size	Open bearings		Closed bearings	
Up to and including 1.1811 inches or 30 mm (metric) OD1/	Method	Symbol	Method	Symbol
	IA-8	G	IA-8	G
	IA-6	F	----	-
	IA-13	H	IA-13	H
	II-d	B	II-d	B
Over 1.1811 inches or 30 mm (metric) but not exceeding 16 inches OD1/2/	IA-19	L	IA-19	L
	IA-8 3/	G	IA-8 3/	G
	IA-13	J	IA-13	J
	IB-2	A	IB-2	A
Greater than 16 inches od or 40 pounds	IA-20	M	IA-20	M

1/ Method IA-19 is required for bearings to MIL-B-17931.
2/ Method IB-2 may be used for bearings with OD over 4.86 inches.
3/ Method IA-8 bag weight limit is 10 pounds.

3.2.4.2 Vials (methods IA-6, symbol F and IA-13, symbol H). Vials shall be constructed of rigid or extruded plastic material (use of polyvinyl chloride (PVC) is prohibited) resistant to the particular lubricant or preservative being utilized. Vial wall thickness shall be 0.030-inch minimum and vial length shall not exceed 10 inches. The size of the vial shall be such as to provide minimum weight and cube, permitting not less than 0.010-inch play between bearings or bearing parts and inside diameter of the vials. For method IA-6, vials shall be closed initially by a secure leakproof closure. For method IA-13, the vial closure seal shall provide a water vapor transmission rate (WVTR) equal to the WVTR of the vial material. Vials shall be constructed for reclosure but need not be leakproof when reclosed.

3.2.4.3 Method IA-8. After cleaning and drying, the bearings shall be coated as specified in 3.1.2.3 with the materials specified in 3.1.2.2. Bearings shall then be wrapped or bagged with the material specified in 3.2.2.4 or 3.2.3.4 as appropriate, closure being effected by means of drug store fold or heat sealing. Bearings shall then be placed individually into a water-vaporproof bag in accordance with MIL-B-117, type I, class E. Entrapped air shall be exhausted from the bag by any suitable means but not to the point where undue stress is placed upon the barrier and then the bag shall be heat sealed. Strength of the heat seals shall be as specified in 4.5.1, based upon samples made on production packaging equipment.

3.2.4.3.1 IA8 outer bags for instrument and instrument precision ball bearings. Outer bag for instrument and instrument precision ball bearings shall be MIL-B-22191 type I material heat sealed per 3.2.4.3.

3.2.4.4 Method IA-13.

3.2.4.4.1 Method symbol H - vials (plastic). After cleaning and drying, the bearings, balls, or rollers shall be coated as specified in 3.1.2.3 and wrapped with nylon 6 as specified in 3.2.2.4. Wraps shall be made secure either by heat sealing or drug store fold, followed by insertion into vials specified in 3.2.4.1. Each vial shall have been cleaned with a blast of dry

nitrogen, by vacuum, or solvent washed before inserting the contents. Additional dunnage of nylon 6 as specified in 3.2.2.4 shall be used when necessary to prevent movement of the bearings, balls, or rollers within the vial.

3.2.4.4.2 Method symbol J - fiber cans. After cleaning and drying, the bearings shall be coated as specified in 3.1.2.3 and wrapped with one of the materials specified in 3.2.3.4. Wraps shall be made secure either by application of tape conforming to PPP-T-76, heat sealing, or drug store fold, followed by insertion into the fiber cans specified in 3.2.4.4.3. Additional dunnage of any of the materials specified in 3.2.3.4 shall be used to prevent movement of the bearings within the can. Fiber cans shall be sealed in accordance with the applicable specification and shall withstand the test specified in 4.3.

3.2.4.4.3 Fiber cans (method IA-13, symbol J). Fiber cans shall conform to MIL-C-3955, type I, grade B. The nearest can size that will provide minimum weight and cube shall be used.

3.2.4.5 Method IA-19.

3.2.4.5.1 Method IA-19. After cleaning and drying, the bearings shall be thoroughly coated as specified in 3.1.2.3 and enclosed in the vacuum formed package as specified in 3.2.4.5.2. Plastic sheet shall be cleaned prior to draping over the bearing. Packaged bearing shall show no evidence of corrosion (see 4.5.3).

3.2.4.5.2 Vacuum formed plastic skin package (method IA-19). Material used in forming the package shall be either cellulose acetate, cellulose acetate butyrate, or cellulose propionate (use of PVC is prohibited). Material shall be sufficiently transparent to permit ease of reading and identification of bearing marking and visual examination of the exterior bearing surfaces. In packaging bearings up to 6 inches od the plastic sheet shall have a minimum thickness of 15 mils prior to forming. The minimum thickness after forming shall be 8 mils single thickness at the od and 4 mils in the bearing bore. In packaging bearings with od over 6 inches, the sheet shall have a minimum thickness of 30 mils prior to forming. Doughnut packages shall be limited to bearings with bore diameter 1 inch or larger. Dimpling at bore will be acceptable for all bearings and may be used as an alternate to the doughnut type pack, except that dimpling shall not be permitted between the inner and outer rings of any bearing.

3.2.4.5.3 Vacuum forming. Transparent plastic sheet shall be vacuum formed over the bearing. Single seal and single shield bearings shall be oriented with the bearing seal of shield up under the first drape. Bearings with snap rings on the od shall be oriented so that the snap ring is on the side opposite to the final seal.

3.2.4.5.3.1 Sealing. Packing shall be sealed at the base edge with a cellulose acetate base in acetone. Flange type seals are not permitted. Seal shall be positive and shall not impair the transparency of the package. Small air bubbles formed in the closing shall not be cause for rejection.

3.2.4.5.3.2 Matched sets. Matched bearing pairs, whose od is 4 inches or less may be placed in polyethylene bags. Otherwise, each bearing shall be individually packaged in vacuum-formed plastic. Individually packaged

bearings constituting a set shall be taped together with transparent pressure-sensitive tape before insertion into the unit package or heat sealed together as a set, or individual unit packages of a set shall be taped together so markings are not obscured. In all cases, the unit package shall have the following warning on two sides: "Matched Set, Do Not Separate".

3.2.4.6 Method IA-20. After cleaning and drying, bearings shall be dip preserved or lubricated with the bearing operating fluid. The bearings shall be wrapped in greaseproof spiral inner wrap and overwrapped with self-adhering greaseproof spiral wrap. The external surface of the overwrap shall be coated with hot wax. The unit shall be cushioned and unit packaged in a container of fiberboard or wood (see 3.5.1 and 3.5.2).

3.2.4.7 Method IA-21. After cleaning and drying, bearings, balls, or roller shall be placed in a clean, dry transparent foam plastic pockets specified in 3.2.4.7.1. Sufficient oil shall be added to the foam, especially at the pocket storage areas and covers to provide liquid transfer when the foam is pressed. The bearings, balls, or rollers shall be dip preserved or lubricated prior to installation into the storage pockets. The assembled container shall be tightly wrapped and sealed in cellulose acetate, cellulose acetate butyrate, or cellulose propianate with a minimum thickness of 15 mils. This package shall then be boxed so that no looseness between package components exists.

3.2.4.7.1 Multiple pocket foam plastic with foam plastic protective covers (method IA-21). Containers and covers shall be of foamed polyethylene or polyester urethane containing no corrosive compounds.

3.2.4.8 Method IB-2. After cleaning and drying, the bearings shall be coated as specified in 3.1.2.3 with the materials listed in 3.1.2.2. Bearings shall be securely wrapped in aluminum foil. The aluminum foil shall be in accordance with QQ-A-1876 and be 0.0015 inches thick for bearings weighing up to 5 pounds, and 0.0020 inches thick for bearings weighing more than 5 pounds. Bearings having a bore diameter of 3-1/2 inches or greater, or weighing over 20 pounds, shall be doughnut wrapped. Separable bearing assemblies, or cup and cone combinations that measure over 2-1/2 inches od shall have aluminum foil in accordance with QQ-A-1876 placed between each part to prevent brinelling. Bearings thus treated shall be cooled to room temperature and coated with a strippable compound conforming to type II of MIL-P-149 to a minimum thickness of 0.05 inch, and over-wrapped in a grease-proof barrier material conforming to MIL-B-121, grade A, type optional.

3.2.4.9 Method IId (bulk quantities only). Bearings shall be packaged utilizing the container specified in 3.2.8. Bearings shall be coated as specified in 3.1.2.3 prior to intimately wrapping each bearing with nylon 6 as specified in 3.2.2.4. Prior to wrapping, the bearings shall be drained of excess preservative. Bearings shall be secured in place in a manner devised by the contractor. Desiccant shall be used as specified for method II of MIL-P-116 and shall be evenly distributed among the bearings and in no case shall desiccant come in direct contact with the bearing surfaces. Size of the container shall be minimum, consistent with the quantity and weight of the bearings packed therein. Quantity of bearings shall be such that the gross weight shall not exceed 70 pounds. Additional overpacking is not required.

3.2.5 Unit packaging. Bearings and components larger than 1.625 inches or 40 millimeter outer diameter (od), unit protected in accordance with methods IA-8, IA-19, and IB-2, shall be individually packaged in a unit container. Bearings 1.625 inches od and smaller may be packaged up to 25 per unit container. Unit containers shall conform to PPP-B-665, PPP-B-566, or PPP-B-676 for contents not exceeding 5 pounds and ASTM D 5118 or PPP-B-665 for contents in excess of 5 pounds.

3.2.5.1 Closure of unit packs. Unit packs shall be closed as specified in the appendices or notes of the applicable container specifications. When level A packing is specified and ASTM D 5118 class weather-resistant or class domestic boxes are not to be intermediate packed, weather-resistant boxes shall be closed method V and domestic boxes closed method I in accordance with ASTM D 1974. Vial closures shall be in accordance with 3.2.4.2.

3.2.6 Intermediate packing. Unless excepted by 3.2.6.1, or unless otherwise specified (see 6.2), unit packs shall be intermediate packed as specified in 3.2.6.2 or 3.2.6.3, as applicable. Intermediate containers shall provide a snug fit for contents and shall contain identical items only. Gross weight of intermediate packs shall be governed by the applicable container specification or a limit of 20 pounds, whichever is smaller. Unit packs shall be placed in the intermediate containers in an upright position, or a position that will preclude possible brinelling of the packed bearings. For methods IA-6 symbol F and IA-13, fiberboard separators of material conforming to ASTM D 4727 shall be provided to separate unit packs both horizontally and vertically. Intermediate packs shall be marked to indicate the top of the container.

3.2.6.1 Exceptions. Intermediate packing shall not be required when any of the following apply:

(a) Level C packing is required.
(b) Shipments do not exceed 20 pounds gross weight.
(c) Packs include a carton conforming to ASTM D 5118 as the unit package.

3.2.6.2 Intermediate packing when level A packing is specified. Intermediate packing shall be accomplished as specified in 3.2.6. Containers shall conform to ASTM D 5118, class weather-resistant. Containers shall be closed as specified in method V, ASTM D 1974.

3.2.6.2.1 For Army only. Containers shall be closed method as specified in method IV of ASTM D 1974.

3.2.6.3 Intermediate packing when level B packing is specified. Intermediate packing shall be accomplished as specified in 3.2.6. Containers shall conform to PPP-B-566, ASTM D 5118 (Class domestic), PPP-B-665 or PPP-B-676. Container closure shall be in accordance with the applicable specification and appendix thereto.

3.2.6.3.1 For Army only. Intermediate containers shall conform to class weather-resistant of ASTM D 5118 or PPP-B-665. Closure shall be in accordance with the applicable specification and appendix thereto.

3.2.7 Cushioning materials. The use of excelsior, newspaper, shredded paper (all types) and similar hygroscopic or nonneutral materials and all types of loose fill materials for applications such as cushioning, fill, stuffing, and dunnage is prohibited.

3.2.7.1 Navy. Unless otherwise specified (see 6.2), materials selected for cushioning and wrapping shall be in accordance with the specifications in Table IV.

TABLE IV. Cushioning materials

Specification	Material	Type, class or grade
UU-P -268	Paper, kraft wrapping	Type II, grade C or D
PPP-C-795	Plastic film, flexible, cellular	Class 3
PPP-C-1120	Bound fiber	Type II or III, class A, grade 1
MIL-P-130	Material- Laminated and creped wrapping paper	
MIL-R-6130	Rubber, cellular	Grade A
MIL-P-17667	Material- Paper, wrapping, chemically neutral (noncorrosive)	
MIL-R-20092	Rubber sheets and molded shapes, cellular, synthetic exploded shell	Class 5
MIL-P-26514	Polyurethane foam	
MIL-F-83671	Foam-in-place	
MIL-F-87090	Foam, combustion retardant	

3.2.8 Containers for bearings. Container selection shall be determined by the size and weight of the bearing (for example, fiberboard box, cleated plywood, nailed box, metal drum or wood crate per 3.5). Containers for large bearings shall have sufficient strength to withstand the forces exerted on the container during handling. Dunnage shall be used to prevent movement of the bearing within the container.

3.3 Level C preservation. Procedures, facilities, and materials for cleaning, drying, and application of preservative or lubricant shall conform to level A requirements. Packaging shall afford adequate protection against corrosion, deterioration, and physical damage during shipment from the source to the first domestic receiving activity. Unit quantities shall be as specified (see 6.2).

3.3.1 For Army only. Level C preservation shall be in accordance with MIL-STD-1190.

3.4 Commercial preservation. Commercial packaging shall be in accordance with ASTM D3951, except that procedures, facilities and material for cleaning shall conform to level A requirements.

3.5 Packing. Bearings shall be packed level A, B, C, or Commercial as specified (see 6.2).

3.5.1 General requirements for levels A, B, and C.

3.5.1.1 Navy, fire-retardant-treated lumber and plywood. Unless otherwise specified (see 6.2), all lumber and plywood, including laminated veneer material used in shipping containers and pallet construction, members, blocking, bracing, and reinforcing shall be fire-retardant-treated material conforming to MIL-L-19140 as follows:

Levels A and B - Type II - weather resistant,
Category 1 - general use.
Level C - Type I - non-weather resistant,
Category 1 - general use.

3.5.1.2 Navy, fire-retardant-treated fiberboard, PPP-B-320, PPP-B-636, and PPP-B-640. Domestic and weather resistant fire-retardant-treated fiberboard shall be used for unit and intermediate containers entering the Navy's supply system.

3.5.2 Level A packing. Except as specified in 3.5.2.1 and 3.5.2.2, packaged bearings shall be packed in containers conforming to the following:

Specification	Type or class
PPP-B-576	Class 2, overseas type
PPP-B-585	Class 3
PPP-B-591	Class II
PPP-B-601	Overseas type
PPP-B-621	Class 2
ASTM D 5118	Grade V2s
ASTM D 5168	Class 2

Shipping containers to be packed with nonweather-resistant type unit or intermediate packages shall be provided with case liners conforming to, closed, and sealed in accordance with MIL-L-10547. Alternately, wrapping of unit or intermediate packages with PPP-B-1055 barrier material with all seams sealed with minimum 2-inch wide tape conforming to PPP-T-60 or PPP-T-76 is acceptable in lieu of case liners. Boxes shall be closed, strapped, or banded in accordance with the applicable box specification or appendix thereto, except that ASTM D 5118 boxes shall be closed and reinforced per ASTM D 1974 method V and ASTM D 5168 boxes, style E or F closed and reinforced with nonmetallic strapping or tape in lieu of steel strapping. Unless otherwise specified (see 6.2), the gross weight of wood or wood-cleated boxes shall not exceed 200 pounds; fiberboard boxes shall not exceed the weight limitation of the applicable box specification.

3.5.2.1 For Army only. Unless otherwise specified (see 6.2), containers conforming to ASTM D 5118, ASTM D 5168, PP-B-591, and PPP-B-576 are prohibited as exterior shipping containers under level A.

3.5.2.2 Exception. Exceptions shall be as follows:

(a) Bearing unit protected method IA-6 and IA-13 (where shipments do not exceed 20 pounds gross weight) the shipping container shall be in accordance with ASTM D 5118 class weather resistant. Fiberboard separators, or other devices, of material in accordance with ASTM D 4727 shall be provided to separate unit packages both horizontally and vertically.

(b) Bearing unit protected method IA-20, shipping containers not exceeding 1000 pounds gross weight shall be in accordance with PPP-B-601 or PPP-B-621. Container shall have skids applied in accordance with applicable container specification. Shipping containers exceeding 1000 pounds gross weight shall be in accordance with MIL-B-26195 or MIL-C-104. Dunnage shall be used to prevent movement of the bearing relative to the crate. Nylon sling straps shall be used in lifting bearings from the crate.

3.5.3 Level B packing. Except as specified in 3.5.3.1 and 3.5.3.2, bearings shall be packed in containers conforming to one of the following specifications and subsidiary types or classes:

Specification	Type or class
PPP-B-576	Class 2
PPP-B-585	Class 1 or 2
PPP-B-591	Class 1
PPP-B-601	Domestic type
PPP-B-621	Class 1
ASTM D 5118	Class domestic
ASTM D 5168	Class 1

Box closures shall be as specified in the applicable box specification or appendix thereto.

3.5.3.1 Exception. Exceptions shall be as specified in 3.5.2.2, except the container shall be class domestic.

3.5.3.2 For Army only. Shipping container shall be class weather-resistant

3.5.4 Level C packing. Bearings, preserved as specified (see 6.2), shall be packed in containers acceptable to the common carrier and which will insure safe delivery at the destinations in a satisfactory condition at the lowest applicable rate. Containers or method of packing shall comply with Uniform Freight or National Motor Freight Classification rules or regulations.

3.5.4.1 For Army only. Bearings shall be preserved-packaged in accordance with MIL-STD-1190(SM).

3.5.5 Commercial packing. Material preserved as specified (see 3.4 and 6.2) shall be packed for shipment in accordance with ASTM D3951.

3.5.6 Palletization. When specified (see 6.2), shipping containers shall be palatalized in accordance with MIL-STD-147 level A or B shipments.

3.6 Marking.

3.6.1 Levels A, B, and C. In addition to the marking required in 3.6.1.1 through 3.6.8 interior (unit and intermediate) packages, exterior shipping containers, and palatalized unit loads shall be marked in accordance with MIL-STD-129.

3.6.1.1 Method IA-8 marking. Bearings unit protected in accordance with method IA-8 shall have the barrier bag and unit container marked in accordance with MIL-STD-129.

3.6.2 Commercial. Unless otherwise specified (see 6.2), bearings packaged commercially shall be marked in accordance with ASTM D3951.

3.6.3 Bar coding. Unless otherwise specified (see 6.2), bar code markings shall be applied on interior (unit and intermediate) packs, exterior shipping containers, and palatalized unit loads, in accordance with MIL-STD-129.

3.6.4 Precautionary marking. One of the following markings shall appear on one side of each unit and intermediate package, as applicable:

(a) For level A and level C preservation of other than barrier film coated and oxygen equipment bearings lubricated for immediate use:

"PACKAGED MIL-P-197
LUBRICATED WITH (SPECIFICATION NUMBER)"
(NOTE: Use above marking only if an operational lubricant is used as specified (see 6.2)).

(b) For level A and level C preservation of other than barrier film coated and oxygen equipment bearings requiring lubrication prior to use:

"PACKAGED MIL-P-197
PRESERVED WITH (SPECIFICATION NUMBER)
CLEAN AND LUBRICATE PRIOR TO USE WHEN REQUIRED"

(c) For barrier film coated bearings:

"PACKAGED MIL-P-197
LUBRICATED WITH (SPECIFICATION NUMBER)
BARRIER FILM COATED"

(d) For oxygen equipment bearings:

"PACKAGED MIL-P-197
LIQUID OXYGEN/GASEOUS OXYGEN SYSTEM"
(Special Marking and Labeling in accordance with MIL-C-52211 also required).

3.6.5 Handling markings. Each bearing and shipping container packaged method IA-20 symbol M shall be labeled or marked with the following: "Nylon sling straps shall be used to lift bearings from the shipping containers." The container for large bearings shall be marked in a conspicuous place with letters not less than 1/2 inch high as stated above.

3.6.6 Special requirement bearings. There should be no deviation from MIL-STD-129. Special circumstances however, may require special marking. For example, bearings may be acquired for a special project. Such bearings would require marking that shows the project designation (see 6.2).

3.6.7 Method IB-2 labeling. In addition to the required markings on containers, bearings unit protected to method IB-2 shall be labeled as follows:

(a) A label shall be affixed to the outermost circumference (tapered rollers may be packed separately) of the bearing after the bearing has been foil wrapped.
(b) Printing on the label shall be readable through the strippable compound applied at the hot dip operation.
(c) The label shall include applicable data such as the following: National Stock Number, manufacturer, manufacturer's serial number, date, noise tested, complete word description of the bearing, bearing dimensions, ABEC (or RBEC) number, all special features (for example, shields, seals, type retainer, special materials), internal clearance, stickout, or preload, preservative and operating lubricant, and any additional information necessary to uniquely describe the bearing or to ensure its successful operation.

3.6.8 Method IA-19 labeling. In addition to required markings on containers, bearings unit protected to method IA-19 shall be permanently marked with the NSN and date packaged. The marking may be printed directly onto the plastic or may be applied as a label. The label, if used, shall be compatible with the plastic and shall not be affected by the lubricant or preservative compound. Labels shall be sealed between layers of the transparent material around the outer circumference of the bearing. If the label obscures more than 50 percent of the outer circumference of the bearing, it shall be of a transparent material.

3.7 Workmanship. Workmanship shall be such that when the proper process and procedure are followed, materials and items shall be protected against corrosion, deterioration, and damage during handling, shipment, storage, and require minimum processing for service.

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 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall 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 the 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.

4.1.1.1 Materials. All materials to be used in the packaging or lubricants shall be inspected in accordance with the applicable material specification and the cleanliness levels of this specification, or certified

inspection and laboratory test reports shall be provided which show that materials as furnished conforms to the detailed specification.

4.2 Lot. A lot shall consist of one day's production or processing of bearings, regardless of bearing dimensions, subject to the same packaging method and cleanliness level.

4.3 Quality conformance inspection. The quality conformance inspection shall consist of the inspections and tests shown in Table V. Quality conformance inspection shall be performed on every lot of packaged bearings acquired under this specification.

TABLE V. Quality conformance inspection and test applicable to each method of unit protection

Inspection/ test	Method IA-6	Method IB-2	Method IId	Method IA-19	Method IA-8	Method IA-13	Sample Plan plan
-Visual/ dimensional examination (see 4.4)	X	X	X	X	X	X	A
-Leakage test (see 4.5.1)	X1/	-	X	-	X	X	A
-Fingerprint corrosion and cleanliness test (4.5.2)	X	X	X	X	X	X	B
-Heat-sealed seam test (see 4.5.1)	-	-	-	-	X	-	A
-Corrosion (see 4.5.3)	-	-	-	X	-	-	C
-Marking examination (4.4.2)	X	X	X	X	X	X	A

1/ Leakage test not required for bearings packaged in bulk quantities.

4.3.1 Sampling for quality conformance inspection. As a minimum the contractor shall randomly select a sample quantity from each lot of completed packages in accordance with tables V and VI and inspect them in accordance with 4.4 and 4.5. Sample size depends on the sampling plan code letter shown in table VI. If one or more defects are found in any sample, the entire lot shall be rejected. The contractor has the option of screening 100 percent of the lot for the defective characteristics or providing a new lot which shall be inspected in accordance with the sampling plan contained herein. The contractor shall maintain for a period of 3 years after contract completion, records of inspections, tests, and any resulting rejections.

TABLE VI. Sample size for quality conformance inspections and tests

Lot size	Sample size		
	Sampling plan code letter A	Sampling plan code letter B	Sampling plan code letter C
2 to 8	2	1/	2/
9 to 15	2	1/	2/
16 to 25	3	1/	2/
26 to 50	5	1/	2/
51 to 90	5	1/	2/
91 to 150	6	1/	2/
151 to 280	7	1/	2/
281 to 500	9	1/	2/
501 to 1200	11	1/	2/
1201 to 3200	13	1/	2/
3201 to 10,000	15	1/	2/

1/ Sampling for fingerprint corrosion and cleanliness test. Every lot shall be sampled and tested for fingerprint corrosion and cleanliness in accordance with 4.5.2 (not applicable to ceramic materials). Samples shall be one of the following:

(a) Five panels fabricated of the same material as the bearing outer ring and having the same surface finish as the bearing outer ring.

(b) Five bearings or bearing outer rings selected at random which are classified as "scrap" or "reject", but whose surfaces are adequate for the purpose of this test.

2/ Sampling for corrosion test (method IA-19). Two packages prepared by the same production procedures as the packages being offered for acceptance shall be selected at random as often as necessary for the test of 4.5.3. Material contained in the packages may be as specified in 1/. This shall be a continuous test and packages shall be examined daily. A new set of test packages shall be placed under test every week (168 hours) unless a failure is noted prior to the end of the 168-hour period. If a failure (any corrosion) is noted prior to the end of the 168-hour period, a new package, or packages, as applicable, shall be placed under test immediately and packaging by the method represented by the failure shall be stopped. All items packaged by the method represented, which have not already been shipped, shall be rejected. After the correction of procedural deficiencies, the rejected material shall be reprocessed, repackaged, resampled, and retested. This test is for process control only and shall not affect material already shipped.

4.4 Examination. Each of the sample packages selected in accordance with 4.3.1 shall be visually and dimensionally examined to verify compliance with the requirements of this specification listed in table VII, as applicable.

TABLE VII. Examination

Examination	Requirement
Material for method IA-19 is transparent	3.2.4.5.2
Thickness after draw for method IA-19 meets specified minimum	3.2.4.5.2
Magnetism of bearing does not exceed specified level	3.1.2.1
Coating of lubricant or preservative is continuous	3.1.2.3
Package conforms to specified method	3.2.4
Dunnage is sufficient to prevent bearing movement	3.2.4.1/3.2.4.4.1
Oil filled containers have specified outage	3.2.4.1
Strippable coating meets specified minimum thickness	3.2.4.6

4.4.1 Visual examination under magnification. When specified (see 6.2), instrument precision ball bearings packaged in transparent materials shall be visually examined under a 10X scope through the package for contamination within the bearing or the package prior to shipment.

4.4.2 Marking examination. Unit, intermediate, and exterior packages, and packing shall be examined to determine compliance with the marking requirements specified in 3.6 through 3.6.8.

4.5 Test methods.

4.5.1 Leakage and heat-sealed seam tests. The leakage and heat-sealed seam test shall be in accordance with MIL-P-116.

4.5.2 Fingerprint corrosion and cleanliness test. Sample specimens shall be cleaned and dried according to bearing along with the production lot. The test shall be performed by suspending the samples in the air over the water in a static humidity chamber at 75 $\pm$ 5^{o}F for 24 hours. If no corrosion is seen without visual aid at the conclusion of the test, satisfactory cleanliness has been achieved.

4.5.3 Corrosion test. Packaged bearings, selected in accordance with 4.3.1, shall be exposed for 1 week (168 hours) at 90 $\pm$ 5 percent R.H. at 120 $\pm$ 5^{o}F in a humidity cabinet.

4.6 Atmosphere in work rooms.

4.6.1 Temperature, humidity, and airborne particle count. R.H., temperature, and particle count for work rooms shall be tested daily for conformance to 3.2.2.1, 3.2.2.2, 3.2.3.1 and 3.2.3.2. Testing for airborne particle count shall be performed in accordance with class 100, class 10,000 and class 100,000 of FED-STD-209. Applicable work rooms shall be tested in accordance with 4.6.4.1 semi-annually to determine conformance to these requirements.

4.6.2 Industrial gases. The test of 4.6.4.2 shall be performed semi-annually to determine conformance to the requirements of 3.2.2.2 and 3.2.3.2.

4.6.3 Equipment calibration. Equipment used to control and monitor clean room and work station conditions shall be calibrated annually.

4.6.4 Environment and process cleanliness tests.

4.6.4.1 Packaging room environment test (airborne particle counting methods). This test shall be conducted in accordance with FED-STD-209.

4.6.4.2 Packaging room environment test (sulfur dioxide (SO_2) and hydrogen sulfide (H_2S) gases). Samples of the packaging room air shall be collected and submitted to colorimetric Rosaniline (Fuchsin) procedure or equivalent method (see 6.3.5). Prior to sampling, the air from the packaging room shall be run through the sample container for a minimum of 10 minutes before closing the petcock valve. No sulfur dioxide or hydrogen sulfide shall be present.

5. PACKAGING

5.1 This section is not applicable to this specification.

6. NOTES

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

6.1 Intended use. This specification is intended for use as reference in section 5 of the bearing commodity specifications and for direct reference in acquisition documents. It is intended to furnish direction in the packaging of bearings at Military and other Government activities and at plants of commercial subcontractors. The packaging requirements specified herein are intended to ensure proper and safe transportation, storage, and stowage of bearings for shipment to Government activities.

6.2 Acquisition requirements. Acquisition documents should specify the following:

(a) Title, number, and date of this specification.
(b) Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).
(c) Lubricant or preservative compound, and quantity required (see 3.1.2.2 and 3.1.2.3).
(d) For Navy, cushioning and wrapping if other than fire retardant (see 3.2.7.1).
(e) Level of preservation and level of packing required.
(f) Method of cleaning, drying, and cleanliness classification for oxygen service bearings (see 3.2.1.2).
(g) Intimate bags for instrument precision ball bearings if other than specified (see 3.2.2.4).
(h) For Air Force, instrument precision bearing protection in storage if other than specified (see 3.2.2.6).
(i) Unit protection for instrument precision ball bearings if other than specified (see 3.2.4).
(j) Bulk pack quantity required (see 3.2.4).
(k) When intermediate packs are not required (see 3.2.6).
(l) Level C packaging unit quantities (see 3.3).
(m) For Navy, when fire-retardant-treated lumber and plywood are required (see 3.5.1.1).
(n) Box weight limit if other than specified (see 3.5.2).
(o) For Army, when level A shipping containers may conform to

PPP-B-636, PPP-B-640, PPP-B-591, or PPP-B-576 (see 3.5.2.1).
(p) Palletization, when required (see 3.5.6).
(q) Special marking required (see 3.6.2 and 3.6.6).
(r) When bar coding is not required (see 3.6.3).
(s) If an operational lubricant is used (see 3.6.4(a)).
(t) When visual examination is required (see 4.4.1).
(u) Materials, if other than specified.

6.3 Cleanliness.

6.3.1 Cleaning the exterior of the bearing package before opening. This note is directed particularly toward instrument precision ball bearings, although it can apply generally to all types. After the bearing has left the manufacturer's plant (or in the case of other bearings, the packaging facility) properly packaged under clean room conditions, the exterior of the package may become dirty. Containers and packages frequently generate small amounts of static electricity which attracts dirt and dust particles, and contamination adheres to the package. Particularly for instrument precision ball bearings, control should be established to clean the exterior instrument precision ball bearings, control should be established to clean the exterior parts of the package before entry into the processing area. A recommended method is to have the package blasted with absolutely clean dry air or remove static electricity charge with an appropriate solvent. Once entering the processing area and placed in a laminar flow hood, the package should be washed again with the appropriate solvent for approximately 5 to 10 seconds to remove exterior contaminant before being placed in a clean container ready to be cut open. The package should be opened carefully so that there will be no chips of the packaging material generated and the bearing should be removed with stainless steel tweezers, or suitable handling tools. Bearing should never be handled with bare hands or fingers.

6.3.2 Bearing cleanliness. Cleaning is a most important part of bearing preservation. It is essential that the cleaning method not leave residues which either may react unfavorably with the preservative, lubricant, or packaging material, or may be unstable and decompose to form corrosive residues.

6.3.3 Bearing (support item). When bearings are acquired by equipment contractors for subsequent delivery to the Government as spares, proof of conformance to the provisions of this document by the bearing manufacturer, including the environment and process cleanliness provisions of 4.6, may serve as the basis for Government acceptance.

6.3.4 Air cleanliness classes. The information contained in the appendix of FED-STD-209 should be utilized to the fullest in achieving and maintaining the air cleanliness classes required herein for clean rooms and work stations.

6.3.5 References to Rosaniline (Fuchsin) method of test (see 4.6.4.2). The following documents are recommended for the above references:

(a) Standard Methods of Chemical Analysis, 6th Edition 1963, Van Nostrand, Volume 2, part A, page 631.
(b) Colorimetric Determination of Nonmetals, D.F. Boltz Interscience Publishers, N.Y.
(c) Handbook of Analytical Chemistry, McGraw Hill, N.Y., Boltz & Schenk.

(d) Colorimetric Methods of Analysis, F.D. and C.T. Snell, Van Nostrand.
(e) Encyclopedia of Chemistry, 1957 and 1958 Supplement, Chemical Colorimetry, page 736.

6.3.6 Oxygen-use bearings must be free of any contamination by hydrocarbons. Hydrocarbons in the form of oil, grease, lint, debris or combustible foreign matter present an explosion hazard in the presence of oxygen.

6.4 Definitions.

6.4.1 Bearing class. For classification purposes of this specification, bearing classes are defined in terms of ABEC tolerances in 6.4.1.1 through 6.4.1.6. ABEC tolerances are as defined in ANSI/ABMA Standards 12.1, 12.2 and 20.

6.4.1.1 General purpose bearings. General purpose bearings are bearings which fall into the following tolerance classification: Tolerances coinciding with those of unground bearings up to and including the ANSI/ABMA tolerances of ABEC 1 and RBEC 1.

6.4.1.2 Precision bearings. Precision bearings are bearings manufactured to, or better than, the following ABEC tolerances:

(a) ABEC 5 and RBEC 5 for metric ball and roller bearings.
(b) ABEC 5T for torque tube and extra thin type bearings.
(c) Class 3 for inch tapered roller bearings.

6.4.1.3 Instrument bearings. Instrument bearings are ball bearings with outside diameter (OD) not over 30mm or 1.1811 inches.

6.4.1.4 Instrument precision bearings. Instrument precision ball bearings are ball bearings with outside diameters not over 30mm or 1.1811 inches and ABEC tolerances of ABEC 5P, 5T, or better.

6.4.1.5 Oxygen equipment bearings. Oxygen equipment bearings are those bearings used in gaseous or liquid oxygen systems and high pressure submersible, life support systems. They must be free from combustible materials, lubricants, or debris.

6.4.1.6 Large bearings. Large bearings are those bearings exceeding 16 inches od or 40 pounds in weight.

6.4.1.7 Small bearings. Small bearings are those bearings that do not exceed 16 inches od or 40 pounds in weight.

6.4.2 Bearing closure. Bearing closure is defined in accordance with 6.4.2.1 and 6.4.2.2.

6.4.2.1 Open bearings. Open bearings are those having a single shield, or those having no seals or shields, or those that are separable.

6.4.2.2 Closed bearings. Closed bearings are those having either seals, shields, bands, or retainment plates, or other devices completely closing both sides of bearings, or a single contact seal on one side only, rendering cleaning and relubrication difficult.

6.4.3 Packaging. Definitions or explanations of packaging terms shall be in accordance with MIL-P-116, ANSI MH15.1, ASTM D 996, and as described herein.

6.4.3.1 Levels of protection. The following levels of protection apply equally to preservation and packing.

6.4.3.1.1 Level A. This packaging provides maximum protection. It is needed to protect material under the severest worldwide shipment, handling, and storage conditions. Preservation and packing will be designed to protect material against direct exposure to extremes of climate, terrain, and operational and transportation environments, without protection other than that provided by the pack. The conditions to be considered include, but are not limited to:

(a) Multiple handlings during transportation and in-transit storage from point of origin to final user.
(b) Shock, vibration, and static loading during shipment.
(c) Loading on shipdeck, transfer at sea, helicopter delivery, and offshore or over-the-beach discharge to final user.
(d) Environmental exposure during shipment or during in-transit operations where port and warehouse facilities are limited or nonexistent.
(e) Outdoor storage in all climatic conditions for a minimum of 1 year.
(f) Static loads imposed by stacking.

NOTE: For packing (exterior containers) the joint DOD packaging administrators have determined and agreed that fiberboard and paperboard are unacceptable materials for use under level A packing.

6.4.3.1.2 Level B. This packaging provides intermediate protection. It is needed to protect material under anticipated favorable environmental conditions of worldwide shipment, handling, and storage. Preservation and packing will be designed to protect material against physical damage and deterioration during favorable conditions of shipment, handling, and storage. The conditions to be considered include, but are not limited to:

(a) Multiple handlings during transportation and in-transit storage.
(b) Shock, vibration, and static loading of shipments worldwide by truck, rail, aircraft, or ocean transport.
(c) Favorable warehouse environment for a minimum of 18 months.
(d) Environmental exposure during shipment and in-transit transfers, excluding deck loading and offshore cargo discharge.
(e) Stacking and supporting superimposed loads during shipment and extended storage.

NOTE: For packing (exterior containers) weather resistant grades of fiberboard and paperboard are permitted under level B. Domestic type or grade (non-weather-resistant) fiberboard and paperboard are unacceptable under level B packing.

6.4.3.1.3 Level C. This packaging provides minimum protection. It is needed to protect material under known favorable conditions. The following criteria determine the requirements for this degree of protection:

(a) Use or consumption of the item at the first destination.
(b) Shock, vibration, and static loading during the limited transportation cycle.
(c) Favorable warehouse environment for a maximum of 18 months.
(d) Effects of environmental exposure during shipment and in-transit delays.
(e) Stacking and supporting superimposed loads during shipment and temporary storage.

6.4.3.1.4 Commercial. Although not specifically defined by any Government regulation or instruction, commercial packaging (preservation and packing) is understood to be those practices by the manufacturers and suppliers to protect and identify material and items packaged for retail and wholesale distribution purposes. ASTM D 3951 provides guidance in the application of commercial packaging. Joint DOD instruction has determined that commercial, also in some areas addressed as industrial, packaging should be used or specified only when such packaging is known to satisfy the DOD needs. Such use should be determined before a contract for supplies is awarded or within the life cycle of the contract when substantial savings to the Government may result. Commercial (industrial) packaging should not be specified where multiple shipments and handlings are anticipated or desired.

6.4.3.2 Exterior pack. An exterior pack is a container, bundle, or assembly that is sufficient by reason of material, design and construction to protect material during shipment and storage. This can be the unit packs or a container with any combination of unit or intermediate packs.

6.4.3.3 Intermediate pack. An intermediate pack is a wrap, box, or bundle that contains two or more unit packs of identical items.

6.4.3.4 Intimate Bag/Wrap. The inner bag or wrap used directly against the bearing/ bearing component.

6.4.3.5 Marking. Marking is the application of numbers, letters, labels, tags, symbols, or colors for handling or identification during shipment and storage.

6.4.3.6 Military packaging. Military packaging refers to the materials and methods or procedures prescribed in Federal and Military specifications, standards, drawings, or other authorized documents that are designed to provide the degree of packaging protection determined necessary to prevent damage and deterioration during worldwide distribution of material.

6.4.3.7 Outer Bag. The bag that the intimate bag/wrap is placed into, providing water-vaporproof protection as specified in Method IA-8.

6.4.3.8 Packaging. Packaging is the process and procedures used to protect material from deterioration and damage. It includes cleaning, drying, preserving, packing, marking, and unitization.

6.4.3.9 Packing. Packing refers to the assembling of items into a unit, intermediate, or exterior pack with necessary blocking, bracing, cushioning, weatherproofing, reinforcement, and marking.

6.4.3.10 Preservation (unit protection). Preservation (unit protection) is the application of protective measures, including cleaning, drying, preservative materials, barrier materials, cushioning, and containers when necessary.

6.4.3.11 Unit pack. A unit pack is the first tie, wrap, or container applied to a single item or quantity thereof, or to a group of items of a single stock number, preserved or unpreserved, that constitutes a complete or identifiable package.

6.4.3.12 Drug store fold. Drug store fold (confectioners wrap) refers to a method of closing the long fold of an overwrapped package by multiple folding.

6.4.4 ANSI/ABMA. American National Standards Institute/American Bearing Manufacturers Association.

6.4.5 ABEC. Annular Bearing Engineers Committee. The class or degree of precision of radial ball bearings.

6.4.6 RBEC. Roller Bearing Engineers Committee. The class or degree of precision of radial roller bearings.

6.5 Subject term (key word) listing.

Drying
Intimate wrapping
Lubricant compounds
Marking
Preservation
Preservative compounds

6.6 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
Army - AR
Navy - SH
Air Force - 99

Review activities:
Army - AT, SM
Navy - AS, MC, OS, SA
Air Force - 11

Preparing activity:
DLA - IS

(Project PACK-0897)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-P-197H	2. DOCUMENT DATE (YYMMDD) 94/07/29

3. DOCUMENT TITLE
Bearings, Antifriction, Associated Parts and Subassemblies, Packaging of

4. NATURE OF CHANGE (*Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.*)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (*Last, First, Middle Initial*)	b. ORGANIZATION	
c. ADDRESS (*Include Zip Code*)	d. TELEPHONE (*Include Area Code*) (1) Commercial (2) AUTOVON (*If applicable*)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME Defense Industrial Supply Center	b. TELEPHONE (*Include Area Code*) (1) Commercial: (215) 697-0971 (2) AUTOVON: 442-0971
c. ADDRESS (*Include Zip Code*) DISC-E 700 Robbins Avenue Philadelphia, PA 19111-5096	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340