

MIL-C-4751D  
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 SUPERSEDING  
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# MILITARY SPECIFICATION

## CASTERS, RIGID AND SWIVEL, PRECISION HEAVY DUTY, AND SHOCK ABSORBING

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

### 1. SCOPE.

1.1 This specification covers heavy-duty and shock absorbing, precision, rigid and swivel casters.

### 2. APPLICABLE DOCUMENTS.

#### 2.1 Government documents.

\*2.1.1 Specifications and standards. Unless otherwise specified (see 6.2), the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

### SPECIFICATIONS

#### FEDERAL

ZZ-T-410	Tire, Pneumatic, Industrial
PPP-B-576	Box, Wood, Cleated, Veneer, Paper Overlaid
PPP-B-585	Box, 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-T-60	Tape, Packaging Waterproof

#### MILITARY

MIL-P-116	Preservation, Methods Of
MIL-B-121	Barrier Material, Greaseproofed, Waterproofed, Flexible
MIL-F-3541	Fitting, Lubrication
MIL-W-8005	Wheels And Hubs, For Industrial Pneumatic Tires

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to the Engineering Division, San Antonio Air Logistics Center/MMEDO, Kelly AFB, TX 78241 by using the self-addressed Standardization Document Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 5340

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MIL-M-8090	Mobility, Towed Aerospace Ground Equipment, General Specification For
MIL-L-10547	Liners, Case, And Sheet, Overwrap, Water-Vapor- proof Or Waterproof, Flexible
MIL-G-10924	Grease, Automotive And Artillery

STANDARDSFEDERAL

FED-STD-601	Rubber, Sampling And Testing
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MILITARY

MIL-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-143	Standards And Specifications, Order Of Precedence For The Selection Of
MIL-STD-808	Finish, Protective And Codes For Finishing Schemes For Ground And Ground Support Equipment
MIL-STD-810	Environmental Test Methods
MIL-STD-831	Test Reports, Preparation Of
MIL-STD-889	Dissimilar Metals
MIL-STD-1186	Cushioning, Anchoring, Bracing, Blocking And Waterproofing, With Appropriate Test Methods
MIL-STD-1188	Commercial Packaging Of Supplies And Equipment
MS24373	Caster, Rigid And Swivel, Precision, Pneumatic Tired
MS24374	Caster, Rigid And Swivel, Precision, Spring Mounted
MS27149	Caster, Rigid And Swivel, Precision Heavy-Duty

\* (Copies of specifications, and standards required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

\*2.1.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

## 3. REQUIREMENTS.

3.1 Qualification. The casters furnished under this specification shall be a product which has been tested, and passed the qualification tests specified herein, and has been listed on or approved for listing on the applicable qualified products list.

3.2 Components. The casters shall consist of the following major components. In addition, each swivel-type caster shall contain steering provisions, when applicable, and a swivel lock, kingpin, and swivel bearings.

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- a. Mounting plate
- b. Horn assembly
- c. Wheel
- d. Tire
- e. Wheel bearings
- f. Bearing seals

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

3.4 Materials.

3.4.1 Metals. Unless suitably protected to resist corrosion during normal service life, metals shall be of the corrosion-resistant type.

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

3.4.2 Protective treatment. Materials used in the construction of the casters shall be protected against deterioration arising from environmental conditions of use, storage, and exposure. The protective media shall be stable and durable (shall not crack, chip, flake, powder, or scale) and shall not interfere with the performance characteristics required by this specification.

\*3.5 Design. The casters shall be single or dual wheeled, sprung or unsprung, rigid or swivel mounted, pneumatic or solid rubber tired in accordance with applicable part numbers specified in MS24373, MS24374 or MS27149. The casters shall be designed for the types of mobility specified in table I.

3.6 Construction. The casters shall be so constructed that no parts will work loose in service. They shall be designed to withstand the strains, jars, vibration, and other conditions incident to shipping, storage, installation, and service.

3.7 Performance. Unless otherwise specified, the casters shall operate satisfactorily under the following conditions:

- a. Temperatures ranging from -20° to +120°F
- b. Relative humidity up to 100 percent, including conditions wherein condensation takes place in the form of both water and frost
- c. Exposure to salt fog
- d. Sand and dust particles as will be encountered in desert areas.

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TABLE I. Mobility and Terrain Characteristics.

Wheel Diameter (Inches) or Tire Size	Type of Mobility (MIL-M-8090)	Rated Speed (MPH)	Terrain
<u>Solid-tired casters</u>			
8, 10, and 12	Type I, class 1	2-1/2	Level paved surfaces
16	Type I, class 2	5	Level paved surfaces
<u>Pneumatic-tired casters</u>			
3:50 x 6	Type I, class 1	2-1/2	Level paved surfaces
4:00 x 8	Type I, class 2	5	Level paved surfaces
6:00 x 9	Type II	20	Level paved surfaces
		10	Graded gravel roads
7:50 x 10	Type II	20	Level paved surfaces
		10	Graded gravel roads

\*3.7.1 Strength. All casters, less only the rubber tread or tire, shall withstand for 1 minute a static load applied through the top plate to the caster unit equal to 5 times the rated load of the casters. The rated loads are specified on MS24373, MS24374, and MS27149.

3.7.1.1 All spring-mounted casters shall withstand the strength requirements specified in 3.7.1 when all of the shock-absorbing mechanisms are disengaged.

\*3.7.1.2 Deflection limits. Spring-mounted casters shall have equal heights under rated loads within the limitations as specified on MS24374 and, when under static rated load, the amount of deflection shall be within the limits of a minimum of 20 percent and a maximum of 50 percent of the total amplitude of deflection. Casters, less only the rubber tread or tire, shall have a range of deflection in accordance with the applicable MS standard while withstanding static loads up to 5 times the rated load.

\*3.7.1.3 Shock loads. Casters, less only the rubber tread or tire, shall withstand shock loads imposed by dropping the caster under rated load as specified on MS24374, a distance of 3 inches upon a concrete or steel surface. Casters shall not hit mechanical stops or the maximum point of deflection under the loads specified.

3.7.2 Operation. When operating under either no load or rated load, the caster wheel shall rotate freely. In swivel casters, the horn assembly shall swivel freely. There shall be no indication of binding or unnecessary looseness in the caster.

3.7.2.1 When operating under either no load or rated load, spring-mounted casters shall operate as specified in 3.7.2 when the deflection mechanisms are disengaged.

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\*3.7.3 Load capacities. The casters shall support the rated loads specified on MS24373, MS24374, and MS27149 at the rated speed specified in table I without showing any permanent deformation or excessive wear.

3.8 Mounting plate. The mounting plate shall be made of steel, castor iron, malleable iron, aluminum, or magnesium alloy.

3.9 Horn assembly. The horn assembly shall be made of steel plate, cast or forged steel, aluminum, or magnesium alloy. The design and quality of the horn assembly shall be adequate to insure rugged and rigid construction. The horn legs shall be either an integral part of the horn plate or welded thereto. The horn assembly of swivel casters shall be assembled to the mounting plate to permit independent rotation around the vertical axis.

3.10 Miscellaneous bushings. Miscellaneous bushings shall be made of a material suitable for the intended purpose. This requirement is intended to cover nonrotating bearing surfaces peculiar to shock-mount linkages only.

3.11 Lubrication. Wheel and swivel bearings shall be adequately lubricated upon assembly with greases as specified in MIL-M-8090. The bearings shall be furnished with readily accessible, pressure-type lubrication fittings conforming to MIL-F-3541. The fittings shall be so mounted that the bearings can be lubricated with a standard grease gun. Use of permanent life-time lubrication bearings is prohibited.

3.12 Bearing seals. Bearing seals shall be designed to permit the cleaning of bearings by purging and regreasing through use of a standard grease fitting and gun without disassembly or danger of seal blowout. Seals shall be made of oil-resistant material of lip-type or other suitable design provided they meet the above requirements when used with any grease normally applied through use of a grease fitting. Seals shall be provided for all bearings and shall be so designed as to exclude water and foreign material which would adversely affect the performance and life of the bearings. Seals on the wheel bearings shall conform to the dimensions specified in MIL-W-8005, as applicable to the wheel size and caster.

### 3.13 Additional components for swivel-type casters.

3.13.1 Kingpin. The kingpin for the swivel casters shall be made of hardened steel so secured that in swiveling it will not rotate in frictional contact with component members of the swivel bearing assembly. Kingpin and swivel assemblies shall be designed to permit fine adjustment of the swivel bearings.

3.13.2 Swivel assembly bearings. The main thrust load swivel bearing shall be a replaceable, precision type of ball or roller design. The secondary thrust load (counterthrust) swivel bearing shall be a tapered roller unit assembly. All single- or dual-wheel swivel bearing units shall be completely replaceable as a unit and shall have a commercial average life rating of 2,500 hours at 50 rpm under offset and rated load for dual wheel casters.

3.13.3 Swivel lock. All casters shall be equipped with a swivel lock that will lock the caster in at least four positions, 0°, 90°, 180°, and 270°. When engaged, the swivel lock shall prevent the caster from swiveling (1) while rolling and (2) while at right angles to the normal path of travel (to prevent rolling). When disengaged, the swivel lock shall permit full 360° free swiveling or steering.

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3.13.4 Steering provisions. When specified (see 6.2), swivel casters shall be provided with attachments to allow for steering arms or linkages in accordance with MS standards. The attachment shall be to the legs of the horn just above the axle bolt. Drilled and bushed lugs shall be provided fore and aft on both horn legs in the case of a fork-type mount.

3.14 Pneumatic-tired casters.

3.14.1 Wheels. All wheels, wheel bearings, arms, axles, and hubs used on the casters shall conform to MIL-W-8005, as applicable to the wheel size and class of caster. Dual wheel construction shall be cantilever-type mounting only.

3.14.2 Tires. All industrial, pneumatic-type tires and tubes used on the wheels shall conform to ZZ-T-410, except the 7.50-10 size shall be 10-ply rating. All tires shall have a free-rolling tread design. Ply ratings shall conform to MIL-W-8005, the 6.00-9 tire shall be supplied with the 10-ply rating only.

3.15 Solid-tired casters.

3.15.1 Wheels. Wheels shall have a rubber tread securely vulcanized or cured to the metal core or tread base. Wheel cores shall be made of fine-grain cast iron, malleable iron, aluminum or magnesium alloy, or steel.

3.15.1.1 Wheel bearings. Wheel bearings shall be replaceable, precision tapered, roller bearing unit assemblies having a continuous commercial average life rating of 2,500 hours at rated speed and load.

3.15.2 Rubber tread. The tread for the wheels shall consist of manufactured or natural rubber or any combination thereof provided the material meets the following requirements. Semipneumatic tires shall not be used.

3.15.2.1 Hardness. The hardness of the tread as received shall be 75  $\pm$  10 points as measured on the face of the tread by a type A Shore durometer.

3.15.2.2 Elongation. The elongation of the rubber treads as received shall be not less than 250 percent.

3.15.2.3 Tensile strength. The tensile strength of the tread as received shall be not less than 2,000 psi on natural rubber and not less than 1,500 psi on synthetic rubber.

3.15.2.4 Compression set. After accelerated aging under full load deflection of the test specimen, the permanent set shall not be more than 50 percent of the deflection.

3.15.2.5 Adhesion. The force necessary to separate the tread from its base or wheel rim shall be not less than 50 pounds per inch of tread width at the base of the tread.

3.15.3 Axle. The axle shall be made of hardened steel and shall be so designed that it will not rotate or become loosened under normal working conditions. The axle shall be quickly and easily removable to allow changing of the wheel.

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\*3.16 Brakes. When manually operated parking brakes are specified for rigid or swivel casters (see 6.2), they shall be provided with control levers which are readily accessible for operation, permitting quick and easy brake application and release. These brakes shall meet the performance specified herein. When service and parking brakes are specified (see 6.2) for rigid or swivel casters, they shall comply with the design, performance, and interlock requirements of MIL-M-8090 for the particular type of mobility required.

\*3.16.1 Brake performance. Control levers shall be readily accessible for manual operation and shall not require a physical force in excess of 30 pounds to set the brakes. When the casters are loaded to the rated loads specified on MS24373, MS24374 and MS27149, the brakes shall hold all caster wheels motionless whether headed up or down on a dry concrete 20° incline.

\*3.17 Part numbering of interchangeable parts. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-STD-100 shall govern the manufacturer's part numbers and changes thereto.

\*3.18 Dimensions. The dimensions shall be as specified on MS24373, MS24374 and MS27149.

3.19 Finishes. All exposed metal surfaces on caster assemblies that are subject to wear or corrosion shall be treated or painted in accordance with the requirements of MIL-STD-808.

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

3.21 Bolt connections. Bolt holes shall be accurately punched, drilled, reamed or cast, and adjacent edges shall have no burrs or fins to interfere with proper seating of bolt head or nut. Where parts subject to critical vibration are assembled with bolts or studs, nuts shall be sufficiently drawn against lock washers, or castellated nuts shall be provided with cotter pins or safety wire of suitable size or antivibration self-locking nuts that are properly drawn shall be used.

3.21.1 Welding. Welding shall be sound, free from porosity or cracks or incomplete fusion, deformation of the metal, or rough and projecting edges. Where steel above 0.40 carbon content is welded in fabrication, a subsequent heat treatment for stress relief, or preheating, or low-hydrogen electrodes shall be used to provide maximum physical properties in the joint.

3.21.2 Castings. Castings shall be homogeneous and shall be of uniform quality and condition, free from injurious blowholes, porosity, hard spots, shrinkage, cracks, or other injurious defects. Castings shall not be repaired, plugged, or welded to affect adversely the strength, use, or machinability.

3.22 Workmanship. The casters, including all parts and accessories, shall be fabricated and finished in a workmanlike manner. Particular attention shall be given to freedom from blemishes, defects, burrs and sharp edges, and marking of parts and assemblies.



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## 4. QUALITY ASSURANCE PROVISIONS.

\*4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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

- a. Qualification inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 Qualification inspection. (see 6.3).

4.3.1 Test samples. The test samples shall consist of two complete casters. For tests of spring-mounted casters having vulcanized or cured on tires, an additional sample less rubber tread shall be provided to permit the accomplishment of the shock load test specified in 4.5.2.3. Samples shall be identified with the manufacturer's name and part number, MS number, specification number, and any additional information required by the letter of authorization.

4.3.2 Test report. Upon completion of the qualification testing, a test report shall be prepared in accordance with MIL-STD-831.

4.3.3 Qualification inspection. Qualification inspection shall consist of all tests described under 4.5.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the following:

- a. Individual test.
- b. Sampling tests.

4.4.1 Individual test. Each caster shall be subjected to an examination of product test as described under 4.5.

4.4.2 Sampling tests. Sample casters, less only the rubber tread or tire, shall be selected in accordance with MIL-STD-105 and subjected to the load tests as described in 4.5.2. The inspection level shall be S-2 and the rejection number shall be 1.

4.5 Test methods.

4.5.1 Examination of product. The casters shall be inspected to determine compliance with the requirements specified herein with respect to materials, dimensions, workmanship, and marking.



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4.5.2 Load tests. Casters, without the rubber tread or tire, shall be subjected to the load tests as follows:

- \* a. Casters conforming to MS24373, MS24374 and MS27149 shall be subjected to the static test.
- \* b. Casters conforming to MS24374 shall also be subjected to the strength, shock, and deflection tests.

4.5.2.1 Static test. A static load equal to 5 times the rated load shown on the applicable MS standard shall be applied through the top plate of the casters by means of weights or a press for a period of 1 minute. The caster assemblies shall then be inspected to determine that no damage or permanent deformation has occurred. Any damage or permanent deformation in the caster assemblies shall be cause for rejection.

4.5.2.2 Strength test. Casters which have been subjected to the static test shall be subjected to the same test with all deflection mechanisms disengaged and inoperative. The caster assemblies shall then be inspected to determine that no damage or permanent deformation has occurred. Any damage or permanent deformation in the caster assemblies shall be cause for rejection.

4.5.2.3 Shock test. Casters which have been subjected to the static test shall be dropped a distance of 3 inches upon a concrete or steel surface when carrying the applicable rated load. This shall be repeated 10 times. The caster assemblies shall then be examined to determine that no damage, permanent deformation, or bottoming on the stops of the deflection mechanism has occurred. Any evidence of damage, permanent deformation or bottoming on the stops of the deflection mechanism shall be cause for rejection.

4.5.2.4 Deflection test. Casters which have been subjected to the static test shall be measured for deflection when carrying the applicable rated load. The deflection shall be measured from the centerline of the axle to the top face of the top plate. The casters shall have a minimum deflection of 20 percent and a minimum deflection of 50 percent. The rated deflection shall be a percentage of the total deflection. Total deflection is the measured distance from the no-load position to the maximum travel position when bottoming on the stops.

4.5.3 Test course towing test.

4.5.3.1 Test course. The test course for the towing test shall consist of 30 percent pierced-steel planking and 70 percent graded gravel surfaces and shall include obstacles such as doorsills and rail crossings. The doorsills shall project 1 inch above the surface of the roadbed and shall be 1 inch in width. Corners of the sills may be rounded off with a radius of 1/4 inch. Rail crossings shall be the flush-mounted type and should simulate those used in highway construction.

4.5.3.2 Test procedure. All casters shall be towed on a course, as specified in 4.5.3.1, for a distance of 100 miles under rated loads at average speeds equal to the rated speeds indicated in table I. Except for specified turns and stops, at no time during the test shall the towed speed vary from the rated speed by more than 20 percent. During the test, each type of obstacle shall be crossed at least 10 times, and at least 50 short-radius right turns, 50 short-radius left turns, and 25 sudden stops from rated speed shall be

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accomplished. At the conclusion of the test, the casters shall be examined. Excessive wear, tire separation or other damage to the casters shall be cause for rejection.

#### 4.5.4 Pneumatic-tired casters.

4.5.4.1 Road test. The casters shall be towed continuously, under rated loads, at average speeds equal to the rated speeds indicated in table I, for a distance of 100 miles over smooth paved concrete. At no time during the test shall the towed speed vary from the rated speed by more than 20 percent. At the conclusion of this test, the casters shall show no signs of damage or wear in excess of 1 percent of original tread thickness.

\*4.5.4.2 Wheels and hubs. Wheels, rims, axles, and hubs shall be subjected to the tests specified in MIL-W-8005.

#### 4.5.5 Solid-tired casters.

4.5.5.1 Road test. The casters shall be towed continuously, under rated loads, at average speeds equal to the rated speeds indicated in table I for a period of 15 minutes over smooth, paved concrete. At no time during this period shall the towed speed vary from the rated speed by more than 20 percent. At the conclusion of the 15-minute period, the casters shall be allowed to stand for 60 minutes and the cycle repeated 10 times. At the conclusion of this test, the casters shall be examined. Excessive wear, tire separation, or other damage to the caster shall be cause for rejection.

4.5.5.2 Rubber tread test. The rubber tread tires on all casters shall be tested as follows:

4.5.5.2.1 Hardness. The hardness of the tread as received shall be as measured on the face of the tread by a type A Shore durometer and shall be 75  $\pm$  10 points when tested according to FED-STD-601, method 3021.

4.5.5.2.2 Elongation. The tread shall be tested for elongation and shall be not less than 250 percent when tested according to FED-STD-601, method 4121.

4.5.5.2.3 Tensile strength. The tensile strength of the tread as received shall be tested and shall be not less than 2,000 psi on natural rubber and not less than 1,500 psi on synthetic rubber when tested according to FED-STD-601, method 4111.

4.5.5.2.4 Compression set. The compression set of the tread shall be measured as follows: The outside diameter of the wheel tread shall be measured within 0.010 inch and the point of measurement shall be marked with a line not wider than 1/8 inch. The casters shall be loaded to their normal rated load with the marked point of measurement at the point of ground contact, and the tread deflection measured within 0.010 inch. The loaded casters shall be placed in an air oven at 69° to 71°C for 24 hours. At the end of this period, the load shall be removed and the casters allowed to cool at room temperature approximately 21°C for 30 minutes. The outside diameter of the wheel shall be measured at the marked point. The percentage of set shall not exceed 50 percent when calculated as follows:

$$C = \frac{D - D_1}{R} \times 100$$

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Where:

C = Percentage of set

D = Original diameter of wheel

D<sub>1</sub> = Final diameter of wheel

R = Tread deflection under load.

4.5.5.2.5 Adhesion test. Adhesion tests of the rubber tread molded to a metal or composition base shall be conducted at room temperature in accordance with method 8031 of FED-STD-601. The tread may be trimmed down to the base along the flanges to minimize tearing of the tread. With the wheel supported horizontally on free-rotating bearings in a suitable fixture, the tread shall be separated circumferentially from the base at the rate of approximately 6 inches per minute. The force necessary to separate the tread shall be not less than 50 pounds per inch of tread width at the base of the tread. Upon completion of the test, the material pulled off shall show no indication of blistering or porosity.

\*4.5.6 Brake tests. When rigid or swivel casters are equipped with brakes they shall be tested as follows:

a. Brake performance.

(1) Manually operated parking brakes - The casters shall be loaded to rated loads as specified on MS24373, MS24374 and MS27149, and the brakes applied. The physical force required on the control lever to set the brakes shall not exceed 30 pounds. The brakes shall hold the caster wheels motionless whether headed up or down on a dry concrete, 20° incline.

(2) Service and parking brakes - The casters shall be tested in accordance with MIL-M-8090.

b. Environmental effects - The casters with the brakes installed shall be subjected to each of the environmental tests specified in 4.5.7. At the conclusion of each test, the brakes and actuating system shall be examined. Any distortion, band or shoe separation, or other damage shall be cause for rejection. The casters shall then be subjected to the applicable performance test above. Any tendency toward erratic function, failure to pass, or other damage shall be cause for rejection.

4.5.7 Environmental tests. The following tests shall be conducted in accordance with the specified procedures of MIL-STD-810:

4.5.7.1 High temperature. The casters shall be subjected to high temperature in accordance with method 501, procedure I, except the temperature shall be +120°F. At the conclusion of this test, the casters shall meet the test specified in 4.5.4 or 4.5.5, as applicable.

\*4.5.7.2 Low temperature. The casters shall be subjected to low temperature in accordance with method 502, procedure I, except the temperature shall be -65° and -20°F. At the conclusion of this test, the casters shall be subjected 20 times to an instantaneously applied load of one-half the rated load as specified on MS24373, MS24374 and MS27149.

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4.5.7.3 Humidity. The casters shall be subjected to humidity in accordance with method 507, procedure I, disregard reference to "Airborne Electronic Equipment." At the conclusion of the test, there shall be no substantial evidence of corrosion or failure of finishes or protective coatings.

4.5.7.4 Sand and dust. The casters shall be subjected to sand and dust in accordance with method 510, procedure I. At the conclusion of the test, there shall be no evidence of dust particles in the bearings of either the wheels or the swivel and no substantial failure of coatings or finishes.

4.5.7.5 Salt fog. The casters shall be subjected to salt fog in accordance with method 509, procedure I for a period of 50 hours. There shall be no substantial evidence of corrosion, bearing failure, or failure of the finishes or protective coatings.

4.6 Inspection of preparation for delivery. The inspection of the preservation, packaging, and packing shall be in accordance with the instructions in section 5 herein.

\*5. PACKAGING.

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

5.1.1 Level A.

5.1.1.1 Unit Packaging. Casters shall be preserved in accordance with method I of MIL-P-116. Ball or roller antifriction bearings shall be adequately lubricated with a preservative grease conforming to MIL-G-10924, or equal. Each caster shall be wrapped in grade A greaseproof barrier material conforming to MIL-B-121 and further overwrapped with kraft paper, 60-pound (24 by 36 by 500), to prevent abrasion. Unit quantities shall be as specified by the procuring activity.

5.1.2 Level C. Casters shall be preserved and packaged in accordance with the MIL-STD-1188.

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

5.2.1 Level A. Casters preserved and packaged as specified in 5.1 shall be packaged in exterior shipping containers conforming to PPP-B-576, style B, class 2, PPP-B-585, style 3, PPP-B-601, overseas type, or PPP-B-621, class 2. As far as practical, exterior container shall be of uniform shape and size, of minimum cube and tare consistent with the protection required, and shall contain identical quantities. The gross weight of each pack shall be limited to approximately 200 pounds. Containers shall be closed and strapped in accordance with the applicable container specification or appendix thereto. Flat steel strapping shall be type I, class B. Containers shall be provided with a case liner conforming to MIL-L-10547 and shall be sealed in accordance with the appendix thereto. The case liner will not be required when the unit, intermediate, or exterior container is sealed at all joints and seams, including the manufacturer's joint, with tape conforming to PPP-T-60.

5.2.2 Level B. Casters preserved and packaged as specified in 5.1 shall be packed in domestic type exterior containers conforming to PPP-B-576,

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PPP-B-591, PPP-B-601, or PPP-B-621. Exterior containers shall be of minimum cube and tare consistent with the protection required. As far as practical, exterior containers shall be of uniform shape and size and shall contain identical quantities. The gross weight of each pack shall be limited to approximately 500 pounds. Containers shall be closed and strapped in accordance with the applicable container specification or appendix thereto.

\*5.2.3 Commercial. Packages which require overpacking for acceptance by the carrier shall be packed in accordance with MIL-STD-1188.

5.3 Physical protection. Cushioning, blocking, bracing, and bolting as required shall be in accordance with MIL-STD-1186 except for domestic shipment, waterproofing requirements for cushioning materials and containers shall be waived. The drop tests of MIL-STD-1186 shall be waived when preservation and packaging, and packing of the item are for immediate use or when the drop tests of MIL-P-116 are applicable.

5.4 Marking. Interior and exterior containers shall be marked in accordance with MIL-STD-129. The nomenclature shall be:

Caster, Rigid (or Swivel, as applicable), Heavy Duty (or Shock Mounted, or Pneumatic Tired, as applicable).

## 6. NOTES.

6.1 Intended use. The casters covered by this specification are intended for application on military ground support equipment designed for type I or type II mobility in accordance with MIL-M-8090 and will be used as running gear on equipment items that require towing or moving on paved or comparable surface areas in accordance with table I.

### \*6.2 Ordering data.

\*6.2.1 Acquisition requirements. Acquisition documents should specify the following.

- a. Title, number, and date of this specification.
- b. Caster required (see MS24373, MS24374 or MS27149).
- c. When attachment for steering is required (see 3.13.4).
- \* d. When manually operated parking brakes are required (see 3.16).
- \* e. When service and parking brakes in accordance with MIL-M-8090, are required (see 3.16).
- \* f. Level of preservation and packaging and packing (see 5.1 and 5.2).

\*6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in Qualified Products List 4751, whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this

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specification. The activity responsible for the Qualified Products List is San Antonio ALC/MMIRCC, Kelly AFB, Texas, 78241 and information pertaining to qualification of products may be obtained from that activity.

#### 6.4 Definitions.

6.4.1 Precision. Precision is the quality and workmanship used in construction of the overall article, not the accuracy of dimensions or material.

6.4.2 Horn assembly. The horn assembly is an integral unit assembly composed of the horn plate and horn legs.

6.4.3 Horn legs. The horn legs are that part, or parts, of a caster to which the wheel is attached through use of the axle.

6.4.4 Horn plate. The horn plate is that horizontal member at the top of the horn legs and to which they are attached.

6.4.5 Kingpin. The kingpin forms the means of efficiently maintaining the proper relationship of swivel bearing components for the life of the caster under normal operating conditions.

6.4.6 Clearance radius. The clearance radius is the space necessary for a caster to swivel, being the horizontal distance from the vertical centerline of the caster kingpin to the outside edge of the wheel tread.

6.4.7 Spring mount. Any combination of linkages or springs which allow two dimensional vertical and longitudinal independent movements of the axle-wheel assembly from the rest of the caster.

#### 6.4.8 Overall height.

6.4.8.1 Pneumatic tired casters. For this specification only, the height shall be defined as the vertical distance between the point at which the equipment rests on the top plate and the centerline of the axle.

6.4.8.2 Solid tired casters. The vertical distance measured under rated load between the point at which the equipment rests on the top plate and the bottom of the wheel which in effect is the vertical distance from floor surface to the equipment base.

6.4.9 Tread width. A measure of the width of the wheel tread at the base of the tread proper.

6.4.10 Exposed surfaces. Exposed surfaces are metal surfaces which, after assembly, are exposed to wear or corrosion. Bearing surfaces are not considered as exposed surfaces as long as they are protected by lubricants.

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\*6.5 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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