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SUPERSEDING
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FEDERAL SPECIFICATION

CASTERS, RIGID AND SWIVEL (INSTITUTIONAL DUTY)

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers rigid and swivel casters for institutional service.

1.2 Classification. The casters shall be of the following types, classes, wheel diameters, styles, and mountings, as specified (see 6.2):

Type I - Rigid
Type II - Swivel

Class A - Light duty

- Wheel diameter - 3 inches
- Wheel diameter - 4 inches
- Wheel diameter - 5 inches

Class B - Medium light duty

- Wheel diameter - 3 inches
- Wheel diameter - 3 1/2 inches
- Wheel diameter - 4 inches
- Wheel diameter - 5 inches

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014, 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 FSC 5340

Class C - Medium duty

Wheel diameter - 5 inches
Wheel diameter - 6 inches
Wheel diameter - 8 inches

Style a - Assembled wheels with tires. Tires shall be rubber (natural, or synthetic) or polyurethane (see 6.2).

Style b - Resilient tread wheels. Tread shall be rubber (natural or synthetic) or polyurethane (see 6.2).

Style c - Molded hard tread wheels. Tread shall be rubber (natural or synthetic), polyurethane, polypropylene, or other plastic (see 6.2).

Mounting A - Stem with adjustable socket adapter (type II casters).
Mounting N - Stem with nonadjustable socket adapter (type II casters).
Mounting P - Plate (types I and II casters).
Mounting T - Threaded stem (type II casters).

2. APPLICABLE DOCUMENTS

2.1 Government publications. The following documents of the issue in effect on the date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

Federal Specifications

PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner
PPP-B-636 - Boxes, Shipping, Fiberboard

Federal Standards

FED-STD-H28 - Screw - Thread Standards for Federal Service
FED-STD-123 - Marking for Shipment (Civil Agencies)
FED-STD-601 - Rubber: Sampling and Testing.

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

(Single copies of this specification and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.)

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specification

MIL-L-10547 - Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible

Military Standards

MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	-	Marking for Shipment and Storage
MIL-STD-147	-	Palletized Unit Loads

(Copies of military specifications and standards required by contractors in connection with specific procurement functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on the date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM)

D 412	-	Rubber Properties in Tension
D 573	-	Rubber Deterioration in an Air Oven
D 1055	-	Flexible Cellular Materials - Latex Foam
D 2240	-	Rubber Property - Durometer Hardness
D 3951	-	Standard Practice for Commercial Packaging
E 18	-	Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

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

American Society of Mechanical Engineers (ASME)

ANSI MH 11.1 - USA Standard Specification for Industrial Casters

(Application for copies should be addressed to the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017.)

National Sanitation Foundation (NSF)

Basic Criteria C-2 for the Evaluation of Special Equipment and/or Devices

Listing of Food Service Equipment

(Application for copies should be addressed to the National Sanitation Foundation, P.O. Box 1468, 3475 Plymouth Road, Ann Arbor, Michigan 48106.)

Caster and Floor Truck Manufacturers Association (CFTMA)

CFT-W6 - Polyurethane Industrial Wheel Standard for Manually Operated Equipment

CFT-W7 - Demountable-Tired Wheels

(Application for copies should be addressed to the Caster and Floor Truck Manufacturers Association, 800 Custer Avenue, Evanston, IL 60602.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

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

3 REQUIREMENTS

3.1 Standard product. The casters covered by this specification shall be the manufacturer’s current commercial product except for any changes necessary to comply with this specification.

3.2 Codes and Standards. The casters shall conform to the applicable requirements of the codes and standards in 3.2.1, 3.2.2, and 3.2.3. Satisfactory evidence that these requirements have been met shall be submitted to the contracting officer or his authorized representative prior to the start of product (see 4.3).

3.2.1 NSF standard. When specified (see 6.2), the casters shall comply with the applicable requirements of NSF Standard Basic Criteria C-2 in compliance with end use instructions imposed by the medical department of the service for which casters are being procured.

3.2.2 ASME. Casters shall conform to applicable requirements of American Society of Mechanical Engineers Publication ANSI MH 11.1 USA Standard Specification for Industrial Casters.

3.2.3 CFTMA. When specified (see 6.2), casters shall conform to applicable requirements of the Caster and Floor Truck Manufacturers Association Publication CFT-W6, Interim Polyurethane Industrial Wheel Standard, and CFT-W7, Demountable-Tired Wheels Standard.

3.3 Material. Material not definitely specified shall be of the quality normally used by the manufacturer for casters, provided that the completed item complies with all the provisions of this specification.

3.4 Design and construction. Rigid and swivel casters of the same class, wheel diameter, style, and mounting shall have the same designed nominal overall height, attachment, and capacity when furnished by the same contractor. The type I rigid caster shall consist of a mounting assembly, horn assembly, wheel, and wheel axle assembly. The type II swivel caster shall consist of a mounting assembly, swivel assembly, horn assembly, kingbolt, wheel, and wheel axle assembly.

3.4.1 Type I, rigid caster.

3.4.1.1 Caster horn. The caster horn shall be fabricated from steel or aluminum alloy in accordance with the manufacturer's current commercial practice. The legs of the caster horn shall be spaced to accommodate the wheel assembly without binding. The caster mounting attachments shall be either fastened to the top of the caster horn or formed into an integral unit with the caster horn.

3.4.1.2 Wheel axle assembly, type I The wheel axle assembly shall consist of a bolt and nut fabricated from steel in accordance with the manufacturer's current commercial practice. The axle when assembled to wheel and caster horn shall not rotate and the nut shall not become loose under operating conditions. Means shall be provided to prevent the clamping of the wheel between the legs of the caster horn when the nut is tightened on the axle bolt.

3.4.2 Type II, Swivel caster The mounting attachment, swivel assembly, and caster horn shall be assembled (see 3.4.2.2) to allow the caster horn to rotate independently in the swivel assembly.

3.4.2.1 Swivel assembly. The swivel assembly shall consist of a bearing raceway containing ball bearings. The raceways and balls shall be as specified in 3.4.2.1.1 and 3.4.2.1.2. The raceways may be formed or machined into the top plate and the caster horn in accordance with the manufacturer's current commercial practice.

3.4.2.1.1 Raceways. All steel raceways for the ball bearings used in the swivel assembly shall be hardened to a minimum depth of 0.005 inch and a minimum value of 80 on the Rockwell 15N scale (see 4.4.1).

3.4.2.1.2 Bearing balls and rollers. Bearing balls used in raceways shall be fabricated from steel and shall be heat treated, ground, and polished. Roller bearings shall be fabricated from steel and shall be heat treated or case hardened. The difference between any two diameters of the same ball and roller shall not exceed 0.001 inch. The difference between the diameters of any two balls or rollers in the same bearing assembly shall not exceed 0.002 inch. The balls and rollers shall be heat treated to a minimum value equivalent to 50 on the Rockwell C scale (see 4.4.1).

3.4.2.2 Kingbolt. The kingbolt shall be either a steel bolt and nut or an integral part of the mounting stem A, N, or T or may be a steel rivet used to hold the swivel assembly together. Alternatively, the swivel assembly may be spot welded together or assembled together in accordance with the manufacturer's current commercial practice.

3.4.2.3 Swivel caster horn. The swivel caster horn shall be fabricated of steel or aluminum alloy in accordance with the manufacturer's current commercial practice. The horn legs and plate of the caster horn shall be formed or fabricated into an integral unit. The top of the caster horn may be formed or machined for use as the bottom raceway of the swivel assembly.

3.4.2.4 Wheel axle assembly, type II. The wheel axle assembly for the type II swivel caster shall be as specified in 3.4.1.2.

3.4.2.5 Brakes. When specified (see 6.2), the swivel casters shall be furnished with brakes in accordance with the manufacturer's current commercial practice.

3.4.2.6 Swivel lock. When specified (see 6.2), a swivel lock to prevent the caster from swiveling shall be furnished.

3.4.3 Mounting assemblies. Unless otherwise specified (see 6.2), the following mounting assemblies for type I and type II casters shall be the means of attaching the caster to the equipment or equipment legs.

3.4.3.1 Mounting A. Mounting A shall consist of a threaded steel caster stem with an adjustable metal or rubber expansion adapter used for holding the caster in a metallic tubular leg. A wrench surface shall be provided to expand the adapter to grip the inside wall of the tubular leg in order to withstand an extractive force of 50 pounds when tested as specified in 4.4.2. The inside diameter of the leg tube shall be as specified (see 6.2).

3.4.3.2 Mounting N. Mounting N shall consist of a nonadjustable spring adapter to fit onto a round steel caster mounting stem. When inserted into a tubular or square leg, the adapter shall grip the wall of the leg and hold the caster securely in place. The flange at the lower end of the stem shall fit neatly against the leg. When tested as specified in 4.4.2 and with an extractive force of 25 pounds, the stem shall not pull free from the tube. Inside diameter or dimension of leg tubing, as applicable, shall be as specified (see 6.2).

3.4.3.3 Mounting P. Mounting P shall consist of a flat metal mounting plate fabricated of steel or aluminum alloy attached to the top of the caster horn in accordance with the manufacturer's current commercial practice. The mounting plate shall be rectangular and shall have four holes (round or slotted) for bolt mounting to equipment. Size of plate, hole or slot size and spacing shall be as specified (see 6.2).

3.4.3.4 Mounting T. Mounting T shall consist of a threaded steel stem fabricated from cold drawn steel in accordance with the manufacturer's current commercial practice. Stem length, diameter, and type of screw thread shall be as specified (see 6.2). Threaded stems shall be furnished with hexagonal nuts, if specified, for securing the caster to the equipment leg.

3.4.4 Load ratings and dimensions.

3.4.4.1 Operational load ratings. Caster operational load ratings (nominal) shall be as shown in table I. Specific ratings for diverse usage shall be as specified in 3.2.1, 3.2.2, and 3.2.3, as applicable. Operational load ratings shall be the generally accepted manufacturers recommended weight to be carried on a caster used for manual operation at a speed of 2 to 4 miles per hour (mph) on a relatively smooth surface such as concrete with normal minor obstacles.

3.4.4.2 Static load ratings. Caster assembly static load ratings shall be as specified in 3.2.1, 3.2.2, and 3.2.3, as applicable to specific material and usage. Caster assemblies shall show no permanent deformation or damage to any part when tested as specified therein (see 4.4.3).

3.4.4.3 Dimensions. Caster wheel and tread dimensions (nominal) shall be as shown in table I. Specific dimensions shall be as specified in 3.2.1, 3.2.2, and 3.2.3, as applicable.

TABLE I. Nominal operational load ratings and dimensions

Class of duty	Size: Wheel dia. (in)	Style a - Assembled: Rubber tire Load cap (lb)	Rubber tire Tread width (in)	Polyurethane tire Load cap (lb)	Polyurethane tire Thread width (in)	Style b - Resilient: Rubber Load cap (lb)	Rubber Thread width (in)	Polyurethane Load cap (lb)	Polyurethane Tread width (in)	Style c - Hard: Rubber or polypropylene Load cap (lb)	Rubber or polypropylene Tread width (in)
"A"	3	75	7/8	120	7/8	100	7/8	100	7/8	125	7/8
light	4	120	15/16	180	15/16	110	15/16	125	15/16	135	15/16
duty	5	140	15/16	210	15/16	125	15/16	140	15/16	145	15/16
"B"	3	120	1 1/4	180	1 1/4	125	1 1/4	210	1 1/4	210	1 1/4
medium	3 1/2	200	1 1/4	200	1 1/4	140	1 1/4	225	1 1/4	200	1 1/4
light	4	160	1 1/4	240	1 1/4	165	1 1/4	250	1 1/4	200	1 1/4
duty	5	190	1 1/4	250	1 1/4	190	1 1/4	250	1 1/4	200	1 1/4
"C"	5	240	1 1/2	360	1 1/2	240	1 1/2	400	1 1/2	350	1 1/2
medium	6	3401	1 1/2	500	1 3/4	400	2	600	2	560	2
duty	8	410	1 3/4	500	1 3/4	475	2	900	2	900	2

NOTE: Tread width is shown as nominal for reference purposes. Tread width does not affect interchangeability of the complete caster (see ANSI MH11.1).

3.4.5 Wheel assemblies. The style a wheel assembly shall consist of a wheel with a wheel bearing. The Styles b and c wheel assemblies shall consist of wheel bearing and a molded wheel and tread.

3.4.5.1 Wheel bearings, types I and II casters.

3.4.5.1.1 Class A casters. The class A casters shall have self-lubricating wheel bearings. The bearings shall be sintered bronze or iron saturated with lubricating oil or a self-lubricating plastic.

3.4.5.1.2 Class B and C casters. Class B and C casters shall have either ball or roller bearings or self-lubricating plastic bearing. Ball bearings shall be of either the annular or cup and cone construction. Annular ball bearings shall have the inner races carried on a steel sleeve of full hub length to contain the axle. Roller bearings shall be of the cage type with outer raceway and a spanner bushing. Raceways or races shall conform to the hardness requirements specified in 3.4.2.1.1. Bearing balls and rollers shall conform to the hardness requirement in 3.4.2.1.2.

3.4.5.2 Wheels.

3.4.5.2.1 Style a. Wheels shall be assembled to hold the tire securely between the rims of the wheel. The tire base, except polyurethane tire bases, shall be stiffened or reinforced to protect against sliding or stretching. The tire tread shall conform to 3.4.5.4.

3.4.5.2.2 Style b. The style b wheel shall consist of a molded core with a molded-on resilient tread and shall conform to the requirements specified in 3.4.5.4. The wheel bearing shall be secured to the wheel in a manner to prevent the bearing from working loose under normal operating conditions.

3.4.5.2.3 Style c. The style c wheel shall consist of a core and tread that may be molded into one piece. The wheel bearing shall be secured to the wheel in a manner to prevent the bearing from working loose under normal operating conditions. The wheel shall conform to the requirements specified in 3.4.5.4.

3.4.5.3 Thread guards. When specified (see 6.2), thread guards shall be furnished (not applicable to NSF approved casters).

3.4.5.4 Tread. Tread materials shall be plastic, rubber (natural or synthetic), or combinations as specified (see 6.1 and 6.2) and shall meet the following requirements:

[a] Hardness. The hardness of the tread shall be 70 to 100 points on the "A" scale for the resilient tread and 70 to 85 points on the "D" scale for the hard tread, as measured on the face of the tread by the Shore durometer (see 4.4.4). In addition, after being subjected to the accelerated aging test specified in 4.4.4, the hardness of the tread shall not increase by more than 10 points.

[b] Tensile strength. The tensile strength of the style a rubber tire tread, as received, shall be not less than 1,250 pounds per square inch (psi); for style b rubber tread, not less than 1,200 psi; for style c rubber tread, not less than 3,300 psi; and for all polyurethane treads, not less than 6,000 psi (see 4.4.4). In addition, after being subjected to the accelerated aging test specified in 4.4.4, the tensile strength of the tread shall not decrease by more than 25 percent.

[c] Elongation. The elongation of the tread, as received, shall be not less than 250 percent for rubber nor less than 375 percent for polyurethane tread (see 4.4.4). In addition, after being subjected to the accelerated aging test specified in 4.4.4, the elongation of the tread shall not decrease by more than 25 percent.

[d] Compression set. The compression set of tread, as received, shall be not greater than 50 percent when the specimen is tested as specified in 4.4.4.1, except that polyurethane shall not exceed 25 percent.

[e] Floormarking. The tread shall leave no mark on concrete or hardwood floor visible to the naked eye when wheel is in motion and subjected to rated loads (see 3.4.4.1 and 4.4.5); not applicable to treads used on electrically conductive casters.

[f] Impact strength. The core material of the style b wheel and the material of the style c wheel shall have a minimum impact strength of 60 inch-pounds without any indication of breaks or cracks when tested as specified in 4.4.9.

3.5 Electrically conductive casters. When specified (see 6.2), the assembled casters shall be electrically conductive. The tires shall be of such composition and construction that, when the caster is subjected to the test specified in 4.4.7, the average electrical resistance of the caster shall be less than 250,000 ohms and the maximum electrical resistance readings shall be less than 1,000,000 ohms.

3.6 Performance operation. The type I and type II caster wheels shall roll, and the horn assembly (type II) shall swivel freely and smoothly without binding when caster is operating under no-load and rated load conditions. Swivel casters shall swivel in both the clockwise and counterclockwise directions a full 360 degrees, except when swivel locks are applied (when furnished). Casters shall be capable of intermittent operation for 25 hours at a minimum speed of 2 mph with rated load without any evidence of warping or chipping, binding, looseness, or permanent deformation (see 4.4.6). Caster brakes shall prevent the casters from rolling when applied under rated load conditions (see 4.4.8). The casters shall operate (swivel and wheels rotate) throughout a temperature range of -45 deg to +120 deg without any indication of unsatisfactory operation (see 4.4.10). The average rolling resistance of the casters shall not exceed 4 percent of the rated capacity when tested as specified in 4.4.11.

3.7 Screw threads. Screw threads shall be in accordance with screw thread standards of FED-STD-H28.

3.8 Finish. Unless otherwise specified (see 6.2), exterior metal surfaces of casters, except for aluminum alloy, shall be zinc plated in accordance with the manufacturer’s commercial practice. Aluminum alloy surfaces shall be finished in accordance with the manufacturer’s commercial practice.

3.9 Marking for identification. Casters shall be permanently and legibly marked with the manufacturer’s name and trademark. This marking shall be visible when the caster is installed.

3.10 Workmanship. The caster shall be clean and properly agsembled. Burrs and sharp edges shall be removed. Parts shall not be damaged or impaired in any manner and shall show no evidence of corrosion. Bolt holes shall be accurately located. Welds shall be sound and free from porosity, cracks, fractures, incomplete fusion, or burnt holes. Rivet holes shall be accurately punched or drilled, with burrs and fins removed. Rivet heads shall be full, neatly made, concentric with rivet holes, and in full contact with joining surface. Thread guards shall be a snug fit against sides of wheel. The tire or wheel tread shall be free of blisters, pits, cracks, porosity, checks, and gouges. There shall be no separation of tire from wheel (style a) or separation of tread from wheel (style b and c).

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

4.1.1 Responsibility for Compliance. All items must meet all requirements of section 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 requirement in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Certificates of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

4.2 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.2.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of section 3 and referenced documents, unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

4.2.2 Intermediate inspection.

4.2.2.1 Intermediate dimensional examination. Bearing balls for swivel and wheel bearings (not including roller bearings) shall be examined to determine compliance with dimensional requirements of 3.4.2.1.2. The lot shall consist of all bearing balls of the same diameter offered for inspection at one time. The sample unit shall be one ball. The inspection level shall be S-2 and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 1.5.

4.2.2.2 Hardness tests. Raceways, bearing rollers, and balls, as applicable, shall be tested for hardness as specified in 4.4.1. A lot shall consist of raceways, bearing rollers, or balls of like casters (type, class, size, and style) that have been hardened. The sample unit shall be one raceway, bearing roller, or ball. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 1.5. Depth of hardness of raceways (see 3.4.2.1.1) shall be determined during the hardness test. Any nonconformance shall be classified as a defect.

4.2.2.3 Physical properties test, tread. The material used for treads shall be tested for hardness, tensile strength, and elongation as specified in 4.4.4, compression set as specified in 4.4.4.1, and impact as specified in 4.4.9 and shall represent each batch or lot used on all wheels of the same type and size. Failure of any test shall be cause to reject the batch or lot represented by the test specimen. Certificates of compliance may be accepted in lieu of test reports, as evidence of compliance with requirements.

4.2.2.4 Wheel bearings. Wheel bearings shall be examined when assembled to determine compliance with the requirements of 3.4.5.1.1 and 3.4.5.1.2. Any evidence of noncompliance shall require correction of affected items.

4.2.3 End item visual examination. The end item shall be examined for the defects listed in table II. The lot size shall be expressed in units of casters of one type, class, wheel diameter, method of mounting, and style. The sample unit shall be one complete caster. The inspection level shall be II and the AQL, expressed in terms of defects per hundred units, shall be 2.5 for major defects and 6.5 for total defects.

TABLE II. End item visual defects

Examine	Defect	Classification	
		Major	Minor
Finish	Evidence of rust or corrosion	101	
	Not plated or anodized as required		201
Design	Rigid caster not assembled as specified	102	
	Swivel caster not assembled as specified	103	

TABLE II. End item visual defects - Continued

Examine	Defect	Classification	
		Major	Minor
Design - continued	Rigid and swivel casters of same class, diameter, style, and mounting from same manufacturer do not match	104	
Construction and workmanship	Improperly assembled	105	
	Bowed, bent, deformed, buckled, wheel binds, swivel binds, or, otherwise impaired	106	
	Burrs or sharp edges		202
Tire, tread, and wheel	Loose on wheel (style a)	107	
	Not style specified	108	
	Separation of tire from wheel (style a)	109	
	Separation of tread from wheel (styles b and c)	110	
	Screw threads striped	111	
	Blisters, pits, cracks, porosity, gouges, checks, or discoloration		203
	Bolt head, washer, or nut does not set properly due to burrs or fins on adjacent edges of bolt holes		204
Mounting assemblies	Stem not threaded when required	112	
	Round stem not as specified	113	
	Expandable adapter does not expand	114	
	Adapters do not fit on stem	115	
	Mounting plate not as specified	116	
	Hexagon nut not furnished (when required)		205
Brakes (when applicable)	Not furnished	117	

TABLE II. End item visual defects - Continued

Examine	Defect	Classification	
		Major	Minor
Thread guards (when applicable)	Not tight fit against sides of wheel		206
Rivet connections	Rivet heads not full, not neatly made concentric with rivet holes, or not in full contact with joining surface	118	
Castings	Not free from blowholes; has porosity, shrinkage, or cracks	119	
	Plugged or welded	120	
Welding	Cracks, burnt holes, porosity, or incomplete fusion	121	
Marking identification	Missing, incomplete, not legible, or not located as specified		207

4.2.4 End item dimensional examination. The end item shall be examined for the dimensions specified in table I. Any dimension not within specified requirements shall be classified as a defect. The lot size shall be expressed in units of casters of one type, class, wheel diameter, method of mounting and style. The sample unit shall be one complete caster. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

4.2.5 End item testing. The casters shall be tested as specified in 4.4.3, 4.4.6, 4.4.10, and 4.4.11. The lot size shall be expressed in units of casters. The sample unit shall be one caster. In addition, the tests in 4.4.2, 4.4.5, 4.4.7, and 4.4.8 shall be conducted when applicable. Failure of any test shall be cause for rejection of the lot. The inspection level shall be S-3 and the AQL, expressed in terms of defects per hundred units, shall be 1.5.

4.2.6 Packaging examination. The fully packaged end items shall be examined for the defects listed below. The lot size shall be expressed in units of shipping containers. The sample unit shall be one shipping container fully packaged. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

Examine	Defect
Marking (exterior and interior)	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application
Materials	Any component missing, damaged, or not as specified
Workmanship	Inadequate application of components, such as incomplete sealing or closure of flap improper taping, loose strapping, or inadequate stapling Bulged or distorted container
Content	Number per container is more or less than required

4.2.7 Palletization examination. The fully packaged and palletized end items shall be examined for the defects listed below. The lot size shall be expressed in units of palletized unit loads. The sample unit shall be one palletized unit load fully packaged. The inspection level shall be S-1 and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

Examine	Defect
Finished dimensions	Length, width, or height exceeds specified maximum requirement
Palletization	Pallet pattern not as specified Interlocking of loads not as specified Load not bonded with required straps as specified
Weight	Exceeds maximum load limits
Marking	Omitted; incorrect; Illegible; of improper size, location, sequence, or method of application

4.3 Certification compliance examination. Certifications, certified test reports, or listing marks for codes and standards, as applicable, submitted in accordance with 3.2.1, shall be examined and validated as proof of compliance.

4.3.1 NSF. Acceptable evidence of meeting the requirements of NSF shall be one of the following:

[a] Display of the NSF seal on the finished casters or listing in the current edition of the NSF "Listing of Food Service Equipment."

[b] A certification for the casters issued by NSF under their special one-time contract evaluation/certification service.

[c] A certified test report from a recognized independent testing laboratory, acceptable to the medical department of the service for which casters are being procured, indicating that the casters have been tested and conform to NSF Standard Basic Criteria C-2.

4.3.2 ASME. Acceptable evidence of meeting the applicable requirements of ANSI MH 11.1 USA Standard Specification for Industrial Casters shall be a certified test report from a recognized, independent testing laboratory acceptable to the Government stating that the casters have been tested and conform to ANSI MH 11.1.

4.3.3 CFTMA. Acceptable evidence of meeting the applicable requirements of CFT-W6 and CFT-W7 shall be a certified test report from a recognized, independent testing laboratory acceptable to the Government stating that the casters have been tested and conform to CFT-W6 and CFT-W7.

4.4 Methods of inspection.

4.4.1 Hardness. Bearing raceways, bearing balls, and bearing rollers shall be tested for Rockwell hardness in accordance with ASTM E 18 to determine conformance with 3.4.2.1.1 and 3.4.2.1.2. Hardness of raceways shall be taken on an adjacent surface to the raceway surface. Any noncompliance shall constitute a failure of this test.

4.4.2 Socket adapter test. The socket adapter mounting A (adjustable expansion adapter) or mounting N (nonadjustable spring adapter) shall be inserted into a metal tube of the same type and size to be used for regular mounting of the caster. When the adapter is of the adjustable expansion type (mounting A), the expanding member or members shall be tightened. An extractive force of 50 pounds for mounting A or 25 pounds for mounting N, as applicable, shall be applied for 1 minute to the caster to determine compliance with 3.4.3.1 and 3.4.3.2, respectively. Any noncompliance shall constitute a failure of this test.

4.4.3 Static load. A compressive load as specified in 3.4.4.2 shall be applied to the caster through the mounting assembly by means of weights or a press for a period of 1 minute. The load shall then be removed and the caster shall be inspected to determine conformance. Any noncompliance shall constitute failure of this test.

4.4.4 Tread. A sample slab of tread material 6 inches by 6 inches by 0.250 +/- 0.002 inch shall be tested for hardness, tensile strength, and elongation in accordance with ASTM D 2240 and D 412, respectively, before and after accelerated aging at 158 deg. for 70 hours in the air-oven process of method 7001 of FED-STD-601 and ASTM D 573 to determine conformance with 3.4.5.4 (a), (b), and (c), as applicable. Any noncompliance shall constitute a failure of this test.

4.4.4.1 Compression set. A sample slab of material used for the tread, shall be tested for compression set in accordance with ASTM D 1055 to determine conformance with 3.4.5.4 [d], except for the following:

[a] The specimen shall be circular, within a range of 0.502 to 0.505 inch in diameter, punched from the center of the tread face.

[b] The specimen shall have a thickness within the range of 0.252 to 0.255 inch.

[c] The specimen shall be placed in an air-oven for a period of 22 hours at 69 deg. to 71 deg.

[d] The load shall be such as to cause a deflection of 25 percent of the specimen's original thickness. Any noncompliance shall constitute a failure of the test.

4.4.5 Floor marking. A test dolly shall be equipped with four swivel casters of the same wheel diameter and class. The dolly shall be loaded with weights (equally distributed) equal to four times the load rating of the individual wheel (see 3.4.4.1) less the weight of the dolly. The dolly shall be moved back and forth not less than six revolutions of the wheel in each direction (one cycle) on a smooth concrete or hardwood surface, for six cycles, after which the floor surface shall be inspected to determine conformance with 3.4.5.4 (e). Any noncompliance shall constitute a failure of this test.

4.4.6 Endurance. The caster (type I or type II) with rated load shall be run at a minimum speed of 2 mph on an endless belt or drum-type testing machine with a smooth uninterrupted running surface. The casters shall be run continuously for 10 minutes, then rested for 10 minutes, alternating for a total elapsed time of 25 hours. In addition, swivel casters with rated load shall then be made to pass over a 1/8-inch high obstacle for 3-, 4-, or 5-inch wheel diameter casters and a 1/4-inch high obstacle for the 6- and 8-inch wheel diameter casters once every 6 feet of travel (at 2 mph) for a duration

of 2 hours with not more than 15 minutes of rest after the first hour. The obstacle may have a 1/16-inch radius on the impacting edge. At the completion of these tests, the caster shall be examined to determine conformance with 3.6. Swivel casters shall swivel freely without excessive play at bearings, and, when swivel locks are required, the locks shall prevent swiveling of the caster. Any noncompliance shall constitute a failure of this test.

4.4.7 Electrical conductivity. The surface of the tire shall be cleaned by any method that removes wax and dir t but does not abrade or permanently change the tire surface. After cleaning, the surface of the tire shall be dried and the casters shall be conditioned at ordinary room temperature and at a relative humidity of less than 80 percent for not less than 24 hours. The caster shall be tested while supporting a load equal to 25 percent of its load rating. The caster to be tested shall be rolled on to a clean, dry flat metal plate. The metal plate and the metal parts of the caster shall form the electrodes for the test. If the caster is tested while supporting equipment, all other casters under the equipment shall be insulated from the floor on which the electrode is placed. The resistance between the electrodes shall be measured by any resistance measuring apparatus of suitable range that has an open circuit direct voltage (DC) of approximately 500 volts. For the safety of the operator, the maximum current that can be delivered by the apparatus through a resistance of 500 ohms should be less than 10 milliamperes. Readings shall be made with five separate areas of the tire successively in contact with the plate, and the average and maximum values shall be determined for compliance with 3.5. Any noncompliance shall constitute a failure of this test.

4.4.8 Brake test. The test dolly and load as specified in 4.4.5 shall be placed at the top of a 10 deg. slope. Two brakes shall be applied for not less than 10 minutes. Any movement of the dolly shall constitute failure of this test (see 3.6).

4.4.9 Impact strength test. A sample slab of material as used for the wheel or core shall be tested for impact strength by being placed in a tester where a free falling weight shall be dropped on the test specimen. The specimen shall be subjected to a single drop from 18 inches by a 25-pound weight. The blows shall be struck on the impact or wear surface of the test specimen. The specimen shall be 4 inches in diameter and 1 1/2 inches thick, mounted on a 3/4-inch diameter axle supported by "V" grooves. After the impact, the specimen shall be examined to determine compliance with 3.4.5.4 [f]. Any noncompliance shall constitute a failure of this test.

4.4.10 Temperature test. The casters shall be put into a cold chamber and brought to a temperature of -45 deg., then examined for compliance with the cold temperature requirements of 3.6. The same casters shall be placed in an oven and brought to a temperature of +120 deg., then examined for compliance with the hot temperature requirements of 3.6. Any failure shall be cause for rejection of the lot.

4.4.11 Rolling resistance test. The test dolly and load as specified in 4.4.5 shall be towed, utilizing a tension dynamometer, over a smooth, level surface at a speed of not less than 2 mph. After the caster has attained a speed of 2 mph, the tension dynamometer shall be observed for a distance of not less than 20 feet. An average rolling resistance greater than 4 percent of the test load shall constitute failure of this test (see 3.6).

5. PACKAGING

5.1 Preservation. Preservation shall be level A or Commercial, as specified (see 6.2).

5.1.1 Level A. Each caster shall be lubricated to capacity with the manufacturer's recommended lubricant containing a rust inhibitor and wrapped in kraft paper or polyethylene film to prevent abrasion.

5.1.2 Commercial. Casters shall be preserved in accordance with ASTM D-3951.

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

5.2.1 Level A packing. Casters, preserved as specified in 5.1, shall be packed in the quantity specified (see 6.2) in a nailed wood shipping container conforming to class 2, style 2 or 4 of PPP-B-621. Casters shall be immobilized within nailed wood shipping containers with lumber blocking and bracing. Each shipping container shall be provided with a type I or II, grade C case liner conforming to MIL-L-10547. Each shipping container shall be closed and reinforced in accordance with the appendix of PPP-B-621. Weight of contents of each nailed wood container shall not exceed 120 pounds.

5.2.2 Level B packing. Casters, preserved as specified in 5.1, shall be packed in quantities as specified (see 6.2) in a nailed wood or fiberboard shipping container conforming to class 1, style 2 or 4 of PPP-B-621, or style RSC, type CF, variety SW, or type SF, class domestic of PPP-B-636. Casters shall be immobilized within nailed wood containers with lumber blocking and bracing, or within fiberboard containers with scored or die-cut fiberboard inserts. The weight of contents of each nailed wood container shall not exceed 120 pounds; the weight of contents of each fiberboard container shall not exceed 65 pounds. Each fiberboard shipping container shall be closed in accordance with method II of the appendix of PPP-B-636.

5.2.2.1 Weather-resistant shipping containers. When specified (see 6.2), the fiberboard shipping containers shall be a grade V3c, V3s, or V4s box fabricated in accordance with PPP-B-636 and closed in accordance with the appendix of PPP-B-636.

5.2.3 Commercial packing. Casters, preserved as specified in 5.1, shall be packed in accordance with ASTM D 3951.

5.3 Palletization. When specified (see 6.2), casters, packed as specified in 5.2.2 and 5.2.3, shall be palletized on a 4-way entry pallet in accordance with load type I or Ia, as applicable, of MIL-STD-147. Pallet type shall be type I (4-way entry), type IV or type V in accordance with MIL-STD-147. Each prepared load shall be bonded with primary and secondary straps in accordance with bonding means K and L or film bonding means 0 or P. The pallet pattern shall be in accordance with the appendix of MIL-STD-147. Interlocking of loads shall be effected by reversing the pattern of each course. If the container is of a size that does not conform to any of the pallet patterns specified in MIL-STD-147, the pallet pattern used shall first be approved by the contracting officer.

5.4 Marking.

5.4.1 Civil agencies. In addition to any special marking required by the contract or purchase order, unit packs, shipping containers, and palletized unit loads shall be marked in accordance with FED-STD-123 or ASTM D 3951, as applicable.

5.4.2 Military requirements. In addition to any special marking required by the contract or purchase order, unit packs, shipping containers, and palletized unit loads shall be marked in accordance with MIL-STD-129 or ASTM D 3951, as applicsble.

6. NOTES

6.1 Intended use. Casters are intended to be attached to equipment used in mess halls, kitchens, hospitals, and laboratories. Wide-faced wheels are recommended for use on soft or on rough surfaces. Soft treads should be used where quietness is required or shock and vibration are to be kept at a minimum. Hard treads are better suited for heavier loads. Larger diameter wheels are recommended for rough surfaces, door sills, or other places that cause shock. Polyurethane tread permits selection of small wheels to support a given load.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

[a] Title, number, and date of this specification.
[b] Type, class, wheel diameter, style, and tread material, capacity and mounting of caster required (see 1.2 and 6.1).

[c] When NSF or CFTMA approval is required (see 3.2.1 and 3.2.3).
[d] When wheel brake is required (see 3.4.2.5).
[e] When swivel lock is required (see 3.4.2.6).
[f] When other mounting assembly is required (see 3.4.3).
[g] Inside diameter of leg tubing to be used with mounting A (see 3.4.3.1).
[h] Inside diameter or dimension of leg tubing to be used with mounting N (see 3.4.3.2).
[i] Size of mounting plate (mounting P), mounting hole or slot size, required (see 3.4.3.3).
[j] Stem length, diameter, and type of screw thread required for mounting T (see 3.4.3.4). Specify if mounting nuts are required.
[k] When thread guards are required (see 3.4.5.3).
[1] When electrically conductive casters are required (see 3.5).
[m] When finish is other than specified (see 3.8).
[n] Selection of applicable levels of preservation and packing (see 5.1 and 5.2).
[o] Quantity required per pack (see 5.2.1 and 5.2.2).
[p] When fiberboard shipping containers are required to be weather resistant grade for level B packing (see 5.2.2.1).
[q] When palletization is required (see 5.3).

6.3 Subject term (key word) listing.

Casters
Tread, polyurethane
Wheels

MILITARY INTERESTS:

Custodians
Army - GL
Navy - YD

Review activities

Army - GL
DLA - IS

User activity

Army - ER

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA - FSS
JUSTICE - FPI
VA - OSS

PREAPARING ACTIVITY:

Army - MD
Project No. 5340-1688