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SUPERSEDING
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FEDERAL SPECIFICATION

JACKS, DOLLY TYPE, HYDRAULIC, AUTOMOTIVE

This specification is approved by the Assistant Administrator Office of Federal Supply and Services, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers manually operated, full standard chassis length, two speed, hydraulic jacks for lifting automotive vehicles.

1.2 Classification.

1.2.1 Types. Jacks furnished under this specification shall be of the following types, as specified (see 6.2):

Type I - 2 US ton load capacity.
Type II - 4 US ton load capacity.
Type III - 10 US ton load capacity.
Type IV - 20 US ton load capacity.

2. APPLICABLE DOCUMENTS

2.1 Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bid or solicitation for offers, shall apply.

Federal Specifications

PPP-B-601 - Boxes, Wood, Cleated-Plywood
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner
PPP-T-60 - Tape, Packaging, Waterproof

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research, Development and Engineering Center, ATTN: SMCAR-EST-S, Rock Island, IL 61299-7300 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 4910

Federal Standards

FED-STD-H28 - Screw-Thread Standards for Federal Services
FED-STD-101 - Test Procedures for Packaging Materials
FED-STD-123 - Marking for Shipment (Civil Agencies)
FED-STD-376 - Preferred Metric Units for General Use by the Federal Government

(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; Houston, 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 Specifications

MIL-P-116 - Preservation, Methods of
MIL-B-121 - Barrier Material, Greaseproofed, Waterproofed, Flexible
MIL-H-5606 - Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance
MIL-H-6083 - Hydraulic Fluid, Petroleum Base, For Preservation and Operation
MIL-F-17111 - Fluid, Power Transmission
MIL-P-19834 - Plates, Identification or Instruction, Metal Foil, Adhesive Backed, General Specification for

Military Standards

MIL-STD-129 - Marking for Shipment and Storage
MIL-STD-130 - Identification Marking of US Military Property
MIL-STD-889 - Dissimilar Metals
MIL-STD-1186 - Cushioning, Anchoring, Bracing, Blocking and Waterproofing; With Appropriate Test Methods
MIL-STD-1190 - Minimum Guidelines for Level C Preservation, Packing and Marking

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

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 date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM)

ASTM E4 - Standard Practices for Load Verification of Testing Machines

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

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

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), the contractor shall furnish one or more complete jacks for first article inspection. The first article may be either a preproduction model or an initial production item which conforms to the requirements of this specification. In any case, the approved first article and the production items shall be in accordance with the terms of the contract. Approval of the first article shall not relieve the contractor of the responsibility to furnish equipment in accordance with the requirements of this specification.

3.1.1 Pre-load. For the purpose of determining compliance with the permanent deformation limits, the contractor may elect to subject the jacks to a pre-load to settle it into a load carrying configuration, providing for minor set, peening, and coining of metal parts (see 4.4.2.2). The pre-load shall not exceed the specified load capacity. The pre-load shall not be applied after the baseline measurements are taken, and shall be applied only once per jack. Another load, not to exceed 250 pounds, may be applied to the saddle, with the split collar in place, before the baseline measurements are taken to peen or flatten any surfaces that interface the split collar during measurements.

3.2 Design. The standard chassis, full length jacks shall be new and shall meet the requirements of Table I and all other requirements in this specification. The jacks shall be of the manually operated dolly type, having a horizontally mounted, two-speed hydraulic lifting unit designed to raise and lower automotive vehicles and other loads within the specified load capacity for each type of jack. The design shall be such that parts subject to wear, breakage, or distortion shall be accessible for adjustment, repair, or replacement without modification, distortion, or damage to the jacks or any jack part or component.

3.2.1 Capacities. The jacks shall have the load capacity specified in the contract, with a maximum load capability of at least 125 percent of the specified load capacity, and shall comply with the associated physical characteristics listed in Table I of this specification. The specified load capacity, and all other requirements of Table I and this specification, must be met and may be exceeded.

3.2.2 Two speed unit. The two speed hydraulic system shall raise the saddle at two different speeds. The two speed feature shall provide a change in the ratio of the travel when the pump handle lever arm travel is compared to the saddle travel. When the ratio of the pump handle lever arm travel to the saddle travel is 1:X in a loaded condition, the ratio of the pump handle lever arm travel to the saddle travel shall be 1:4X or greater when in an unloaded condition. (The saddle must rise not less than four times farther per handle stroke distance when unloaded than when loaded.) The change in saddle raising speed shall be accomplished by an automatic change in the hydraulic system mechanical advantage and shall not be a result of changing the pump handle lever arm length or changing the distance of the stroke travel.

TABLE I. Capacities and dimensions.

Jack Characteristics Dimensions in inches, unless otherwise specified (see Figure 1).	Types I	II	III	IV
Load capacity (US Tons), not less than	2	4	10	20
Saddle in highest raised position (A) (lowest point in cup), not less than	19	21	21	21
Saddle in lowest position (B), highest point on saddle not more than	5 1/2	5 1/2	6 1/2	8 1/2
Jack height (C), highest point with handle in down position not more than	8	8	10 1/2	12
Chassis length (D), not less than	37	47	50	56
Jack width at widest point (E), not more than	17	18	23	27
Handle/pump lever length from pivot point at bottom to T-handle at top (F) not more than	54	54	54	54
Front wheel diameter (G), not less than	3 1/2	4	5 3/4	6 1/2
Wheel tread width (H), not less than	1 3/8	1 3/8	3	3 1/2
Caster wheel diameter (I), not less than	2 1/8	2 3/8	3 1/2	3 3/4
Force required to raise the specified load capacity, in pounds (applied at the T-handle on the lever), not more than	140	160	180	180
Size of the saddle, the silhouette of the saddle (as seen from above) shall have an area in square inches not smaller than	33.18	38.48	38.48	38.48

3.2.3 Measurement system. The US Customary System of Units (US) or the International System of Units (SI) may be used in the design and construction of the jacks. In this specification, all measurements, dimensions, sizes and capacities are given in the US system. These measurements may be converted to the SI system by using the conversion factors and methods specified in FED-STD-376.

3.2.4 Maintainability. The design and assembly of the jacks and the placement of adjusting features shall assure that maintenance of operational capability is reduced to the simplest form, requiring a minimum of skills and common tools. Instructions for disassembly, repair, assembly, and adjustment shall be clear, concise, and definitive in application, and shall be included in the manual(s) supplied with the jacks. Repair parts shall be clearly identified in the instructions. The overload protection device is specifically excluded from the above requirement. Adjustment or deactivation of the overload protection device shall require special tools or access techniques.

3.2.5 Threads. Threads shall conform to FED-STD-H28 and the applicable Detailed Standard section referenced therein.

3.2.6 Interchangeability. All parts shall be manufactured to definite standards, clearances, and tolerances in order that any such parts of a particular type or model may be replaced, interchanged, and adjusted without modification of the replacement parts or any other parts of the unit. When practical, all parts shall be permanently and legibly marked in accordance with MIL-STD-130.

3.3 Material. Material shall be as specified herein and as shown on the applicable drawings. Materials not specified shall be selected by the contractor and shall be subject to all provisions specified herein. Materials shall be free from defects which would adversely affect the performance, reliability, durability, longevity, or maintainability of the individual components or overall assembly. When dissimilar metals are used in contact with each other, suitable protection against galvanic corrosion shall be applied in accordance with MIL-STD-889.

3.3.1 Reclaimed materials. The manufacturer may use reclaimed materials for fabricating new parts. Reclaimed materials shall be reprocessed, remanufactured, or recycled in a manner that restores them to the same chemical composition and physical properties as the raw materials orginally selected for use. Use of reclaimed parts as is or rebuilt from scrap or other used equipment shall not be permitted .

3.4 Construction. The jacks shall be furnished complete so they can be used for the operations specified herein.

3.4.1 Castings and forgings. Castings shall be free from visible blowholes, porosity, hard spots, shrinkage defects, cracks, or other defects. Forgings shall be free from visible scale, inclusions, cold shuts, mismatching, sharp edges, or other defects. Castings and forgings shall be free from any properties adversely affecting their strength, durability, or suitability. Reclaiming or repair of castings and forgings is not permitted.

3.4.2 Welding, brazing, and soldering. Welding, brazing, and soldering shall be of a quality which shall sustain all requirements of the welded, brazed, or soldered parts. These operations shall not be employed as repair measures for defective parts.

3.4.3 Fastening devices. Screws, pins, bolts, and similar parts shall be installed with means for adjustment and for preventing loss of tightness. The methods for adjustment and for preventing loss of tightness shall be in accordance with accepted engineering standards and practices. All such parts when subject to renewal or adjustment shall not be swaged, peened, staked, or otherwise deformed.

3.4.4 Lubrication. All bearings (except sealed-for-life type), mating gears, and all other working parts requiring periodic lubrication shall be provided with accessible means for lubrication. Each jack shall be properly lubricated prior to submission for Government acceptance.

3.5 Safety and health requirements. The jacks shall have a maximum load lifting capability of at least 125 percent or more of the specified load capacity. The jacks shall incorporate a hydraulically activated overload protection system which activates at more than the specified load capacity and less than 125 percent of the specified load capacity (see 3.8.1.1).

3.5.1 Warning and identification plates. Warning and identification plates shall be fastened in a permanent manner in accordance with any of the following materials and methods:

(a) Adhesive backed aluminum foil plate in accordance with MIL-P-19834
(b) Adhesive backed plastic plate or plastic coated plate with physical characteristics equivalent to the aluminum plate specified in (a) above. These plates shall be capable of meeting the requirements specified in MIL-P-19834.
(c) Metal plates permanently fastened and permanently marked.

3.5.2 Fluid identification plate. The manufacturer shall indicate either MIL-H-5606, MIL-H-6083, or MIL-F-17111 as the applicable fluid to be used for refilling the jacks. If the jacks use hydraulic fluid meeting the requirements of MIL-F-17111, the following message shall be attached in a conspicuous location near the filler plug(s) of the reservoir:

CAUTION
USE NO FLUID OTHER THAN
MIL-F-17111

If the jacks use hydraulic fluid meeting the requirements of MIL-H-5606 or MIL-H-6083, the following message shall be attached in a conspicuous location near the filler plugs(s) of the reservoir:

CAUTION
USE NO FLUID OTHER THAN
MIL-H-5606
OR
MIL-H-6083

3.5.3 Safety warning plate. The following message shall be permanently and legibly printed on a warning plate conforming to 3.5.1, and shall be attached in a location visible to the operator.

WARNING
THIS IS A LIFTING DEVICE ONLY. LOAD SHALL BE SUPPORTED IMMEDIATELY BY OTHER APPROPRIATE MEANS. FAILURE TO HEED THIS WARNING MAY RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

3.6 Components. The jacks shall consist of the following principle components.

3.6.1 Frame. The jack frame, with its wheels and casters, shall provide the jack with stability such that the jack shall not rotate its position more than ten degrees while under load, but shall allow the jack to align itself forward as the load is raised and rearward as the load is lowered. The frame shall remain flat when in an unloaded condition, both before and after loading, within 0.125 inch as indicated by a clearance between any wheel and the base (see 4.4.1.3) when all wheels are oriented to be in contact with the base, or as close to the base as possible, and marked (see 4.4.2.1).

3.6.2 Wheels and casters. Wheels and casters shall be as specified in Table I. The jacks shall have two swivel type rear casters and two or more front wheels. The wheels and swivel casters shall be replaceable, shall not loosen or tighten under service use conditions, and shall be securely fastened to the jacks.

3.6.3 Lifting mechanism. The jacks shall incorporate a horizontally mounted, two speed hydraulic lifting mechanism (see 3.2.2), manually operated with a pump handle lever, for raising and lowering the lifting member. The lifting mechanism, operating at slow speed under full rated load, shall possess a mechanical and hydraulic advantage requiring no more force on the handle than that specified in Table I to raise the full specified load capacity under the following conditions:

(a) Full load capacity applied on the center of the saddle plate.
(b) Lifting arm in horizontal position, plus or minus five degrees.
(c) Handle not less than 27 degrees, and not more than 33 degrees from the horizontal, with the jack setting on the base (see 4.4.1.3).
(d) Operating force applied straight downward at the "T", or cross, on the handle.

3.6.3.1 Handle/pump lever. The handle/pump lever shall have a cross or T-type handle. Length shall be as specified in Table I.

3.6.3.2 Hydraulic unit. The two speed hydraulic unit, when installed in the jack, shall raise, support, and lower the loads as specified herein. The two speed hydraulic unit shall include the following: cylinder, drive piston(s), piston shaft(s)/ram(s), reservoir, and valves. The two speed hydraulic unit shall be removable, for replacement, as a unit assembly. The hydraulic unit shall provide two-speed operation as specified in 3.2.2.

3.6.3.3 Reservoir. The reservoir's volume shall provide at least a 20 percent surplus capacity for hydraulic fluid, in addition to the total displacement of hydraulic fluid required to assure pumping action throughout the full lifting range of the jacks. The hydraulic reservoir of each jack shall be filled, to the manufacturer's recommended operating level with the specified hydraulic fluid (see 3.6.3.4), as part of the manufacturing and production process. The jacks shall be delivered to the Government with the reservoir filled. The filler hole of the reservoir shall be fitted with a permanent and removable breather plug that shall prevent hydraulic fluid leakage during shipment and storage of the jack in any position. The breather plug material, and any interfacing seals, shall be compatible with the hydraulic fluid provided by the manufacturer. Except during storage and shipment of the jack, the breather plug shall provide means to prevent positive or negative air pressure (vacuum) build-up in the fluid reservoir.

3.6.3.4 Hydraulic fluid and seals. Only hydraulic fluid conforming to MIL-H-5606, MIL-H-6083, or MIL-F-17111 shall be provided in each jack. The seals of the hydraulic unit shall be compatible with the hydraulic fluid that is chosen by the manufacturer and used in the jacks. The solid particle contamination requirements in MIL-H-5606 and MIL-H-6083 shall not apply for hydraulic fluids used in these jacks. Instead, the hydraulic fluids shall be filtered through a 15 micron or finer mesh screen prior to packaging by the fluid manufacturer.

3.7 Control systems.

3.7.1 Hydraulic bypass system. The hydraulic system shall incorporate a hydraulic fluid bypass to prevent overtravel of the lifting member after reaching its highest raised position. Unlimited buildup of hydraulic pressure, after reaching the point of highest rise, shall not be acceptable.

3.7.2 Overload protection system. The hydraulic system shall incorporate a hydraulically activated overload protection system, which is separate in design and operation from the load release system and not externally adjustable, and which is located in the pump side of the hydraulic circuit such that it shall bypass hydraulic fluid from the pump to the reservoir. The system's activation point shall be between the specified load capacity of the jack and 125 percent of the specified load capacity of the jack when the lifting arm is within five degrees of true horizontal.

3.7.3 Load release system. The hydraulic unit shall incorporate a manually activated hydraulic release system to permit controlled lowering and complete stopping, at any position of the saddle, when the saddle is either fully loaded or completely unloaded, throughout the entire range of saddle travel. The load release system shall control the saddle's overall rate of descent to one foot per minute or slower throughout the full range of saddle travel, without stopping, while under full capacity load. The release system shall be controlled at the "T" or cross end of the handle.

3.8 Product performance and characteristics.

3.8.1 Maximum load.

3.8.1.1 Maximum load selection. The maximum load shall be 125 percent or more of the specified load capacity of the jacks. The manufacturer shall be responsible for selecting the specific values of both the maximum load for the jacks and the load point at which the overload protection device activates, consistent with 3.7.2.

3.8.1.2 Maximum load performance. With the overload protection device deactivated, the jacks shall raise the maximum load when the load is centered on the saddle (see 4.4.1.2). The jacks shall support the maximum load such that there is no visible dropping of the jack saddle and load before, during, or after any down stroke of the pump lever. The jacks shall raise and lower the maximum load through the full lifting range with no hydraulic system leakage. There shall be no permanent deformation in excess of 0.125 inch measured at the center of the saddle plate. There shall be no change in the inclination of the saddle greater than three degrees from the established baseline inclination and no permanent inclination of the saddle greater than five degrees, when measured with the saddle plate. There shall be no damage to any part of the jack.

3.8.2 Capacity load retention capability. With the overload protection device activated, the jacks shall lift, support, and lower the full load capacity specified in the contract throughout the full lifting range. The jacks shall support the specified load capacity at any height, within the lifting range, for a period of not less than one minute without a change in the height position of the saddle in excess of 1/32 inch and without hydraulic system leakage.

3.8.3 Saddle periphery load. The jacks shall lift, support, and lower the full load capacity specified in the contract throughout the full lifting and lowering range, while supporting the full load at each individual 90 degree, or less, segment of the saddle periphery, one at a time. The saddle periphery is the outside edge of the saddle, including any upward protrusions such as lugs, lips, or tangs, and is restricted to the highest point of contact between the saddle and a flat plate covering only 90 degrees of the surface of the saddle. During each lift, no portion of the load shall contact or be applied to the inner part of the saddle. No movement of the saddle from its initially marked rotational position relative to the jack's frame shall be allowed except to determine maximum inclination, after which the saddle shall be returned to the original marked position. Permanent deformation of the jack saddle, as indicated by a change in the tilt of the saddle and measured with the saddle plate on the saddle, shall not exceed three degrees. Maximum inclination shall not exceed five degrees. Permanent visible deformation of the jack saddle, as indicated by a deformed lug or rim, shall not be acceptable. Permanent deformation of the frame shall not result in a clearance between any wheel and the floor equal to, or greater than, 0.125 inch. Permanent deformation of the saddle or other jack members shall not result in a deviation from the baseline saddle height greater than 0.125 inch, when measured at the center of the saddle plate. At least one of the casters must remain on the plate throughout the full lifting and lowering range when loaded with a full capacity load on each of the four quadrants of the saddle. There shall be no hydraulic system leakage.

3.8.4 Saddle positioning. The saddle shall rotate to all positions (0 degree to 360 degrees) in the horizontal plane and shall remain parallel with the floor, throughout the lifting and lowering range, within five degrees. The saddle shall remain parallel with the floor within five degrees after each specified loading has taken place, and shall not change its inclination by more than three degrees. Throughout the full lifting and lowering range, no part of the saddle shall extend beyond the front of the front axle when the saddle is rotated to any position.

3.9 Painting. Unless otherwise specified (see 6.2), painting and finishing shall be in accordance with the best commercial practice in the industry. Before painting, all surfaces shall be clean and be free of all foreign matter detrimental to painting. At least one coat of primer (or a phosphate or chromate base) and one coat of enamel, or equivalent (i.e., epoxy enamel), shall be applied.

3.10 Product identification. The jacks shall be marked for product identification in accordance with MIL-STD-130 and, unless otherwise specified (see 6.2), shall include the National Stock Number. The load capacity shall be legibly and permanently marked on a nameplate complying with MIL-P-19834 and also cast into the metal in a visible location.

3.11 Workmanship. Standards of workmanship shall assure that the jacks shall have the stability, strength, safety, and efficient operating characteristics found in the best commercial units and as specified in Section 3.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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.

4.1.1 Responsibility for compliance. All items must meet all requirements of Sections 3 and 5. The inspections 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 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 materiel, either indicated or actual nor does it commit the Government to acceptance of defective materiel.

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

(a) First article inspection (see 4.2.1).
(b) Quality conformance inspection (see 4.2.2).

4.2.1 First article inspection. When specified (see 6.2), first article inspection and tests shall be performed on the preproduction model or initial production item (see 3.1). First article inspection and tests shall consist of the examinations and tests identified in Table II. Failure of the first article to pass the examinations or any of the tests shall be cause for rejection.

4.2.2 Quality conformance inspection.

4.2.2.1 Inspection and tests. Quality conformance inspection and tests shall be applied to production units offered for acceptance under the contract. Quality conformance inspection and tests shall be as identified in Table II. Failure of any jack to pass an examination or test shall be cause for rejection of the jack. Tests shall be performed in accordance with the requirements of 4.4.1 and 4.4.2.

4.2.2.2 Sampling. Sampling for quality conformance inspection shall be performed as listed with all samples selected randomly.

Inspection or Test	Lot or Batch Size	Sample Size
Product examination (4.3)	1-150	13
Maximum load test (4.4.4)	1-150	13
Overload protection device test (4.4.5)	1-150	13
Saddle periphery loading test (4.4.6)	1-150	13
Release system and load retention test (4.4.7)	1-150	13
Reservoir leak test (4.4.11)	1-150	13
Packaging inspection (4.5)	1-150	5
Packaging validation tests (4.6)	1-150	*

The lots shall not exceed the maximum sizes indicated above. If lot size is less than or equal to sample size, 100 percent inspection is required. Each lot shall be accepted with no defects and rejected if one or more defects are found.

*The packaging validation tests shall be conducted on sample of four of the packaged items selected from the first lot submitted for quality conformance inspection and tests.

TABLE II. Classification of Inspections and Tests.

Examination Measurement, or Test	Requirement Paragraph	First Article Inspection, Examination, or Test Paragraph	Quality Conformance Inspection, Examination or Test Paragraph
Product examination	3.2, 3.2.1, 3.2.3 through 3.6.2, 3.6.3.1 through 3.7.2, and 3.8.4 through 3.11	4.3	4.3
Baseline measurement	3.6.1 and 3.8.4	4.4.1 through 4.4.3	4.4.1 through 4.4.3
Maximum load test	3.8.1.1 and 3.8.1.2	4.4.1, 4.4.2 and 4.4.4	4.4.1, 4.4.2 and 4.4.4
Overload protection device test	3.7.2 and 3.8.1.1	4.4.1 and 4.4.5	4.4.1 and 4.4.5
Saddle periphery loading test	3.8.3	4.4.1, 4.4.2 and 4.4.6	4.4.1, 4.4.2 and 4.4.6
Load release system and load retention test	3.7.3 and 3.8.2	4.4.1 and 4.4.7	4.4.1 and 4.4.7
Rate of descent test	3.7.3	4.4.1 and 4.4.8	Not applicable
Force on handle test	3.6.3	4.4.1 and 4.4.9	Not applicable
Two speed unit test	3.2.2	4.4.10	Not applicable
Reservoir leak test	3.6.3.3	4.4.11	4.4.11
Packaging inspection	5.1 through 5.4.3	4.5	4.5

NOTE: The baseline measurements of 4.4.3 shall be taken for each jack subjected to the maximum load or saddle periphery load tests.

4.3 Product examination. Visually, dimensionally and manually examine each jack to determine conformance with the requirements of 3.2, 3.2.1, 3.2.3 through 3.6.2, 3.6.3.1 through 3.7.1, and 3.8.4 through 3.11. Visual examination shall include verification of completeness of manufacture and assembly, conformance to specified standards, adequacy of markings, proper cleaning, and freedom from the identified defects. Dimensional examination includes measuring dimensions as specified. Manual examination shall include the operation of movable parts by hand to assure proper functioning. The examination provisions may be applied at the earliest practical point in manufacturing at which it is feasible to inspect for acceptance without risk of change in the characteristic by subsequent operations. Failure of the contractor to provide objective evidence that the jack and its components have passed the examinations prescribed for them by the contractor's inspection system shall be cause for rejection. In addition, failure of the contractor to provide objective evidence that all parts are manufactured to definite standards, clearances, and tolerances so that no replacement part will degrade the form, fit, or functions of the end item (see 3.2.6) shall be cause for rejection.

4.4 Tests. The application of the preload in 4.4.2.2, the baseline measurements of 4.4.3, and the tests of 4.4.4 and 4.4.6 shall be performed in the order given.

4.4.1 Test equipment. The contractor shall provide the following special test equipment for performance of the baseline measurements of 4.4.3 and the test of 4.4.4 through 4.4.9.

4.4.1.1 Loading device. A compression testing machine shall be used to provide test loads for the jacks. The testing machine shall incorporate alignment devices which insure that the load is applied axially and uniformly, and which shall provide a constant force on the jack through the jack's full lifting range, regardless of whether the jack saddle is being raised, lowered, or held stationary. The testing machine shall have a gage which indicates the load being directly applied to the jack in pounds of force, and which is readable to the nearest hundred pounds of force. The accuracy of the testing machine shall be verified in accordance with ASTM E4, including the effects of eccentric loading. The permissible variation for the testing machine shall be plus or minus 1.0 percent, within a verified loading range of 100 to 125 percent of the jack's specified load capacity. When testing 10 ton and 20 ton jacks, a hydraulic testing machine meeting all of the above requirements shall be used.

4.4.1.2 Saddle plate. Where indicated, a flat 10 by 10 inch steel plate shall be used to provide a stable reference for measurement. The underside of the plate shall be equipped with locating lugs, rings, pins, or other means to assure centering of the plate within 1/16 inch of the center of the saddle. The center of the upper surface of the saddle plate shall be permanently marked.

4.4.1.3 Base. Where indicated, the jack shall be placed on a flat, hardened steel plate to provide a stable reference plane for measurements. The plate shall be of sufficient strength and hardness to withstand the loads encountered during the tests without permanently deforming, and shall be of sufficient size to hold the entire jack and accommodate the jack's normal movement range when raising and lowering a load. The surface of the plate shall be flat within ±0.005 inch. If suitable, the platen or platform of the loading device may be used for this purpose.

4.4.1.4 Split collar. To provide repeatability of measurements, a split collar (or other approved method or device) shall be used to hold the jack saddle at a fixed distance of not more than four inches above the wheels or any other jack member that might interfere with the placement of the saddle plate. The split collar shall be placed on the hydraulic ram to prevent the ram from fully retracting when the release mechanism is activated. The design of the split collar shall be such that each time it is installed on the ram the ram shall retract to the same position. If the design of the jack prevents use of a split collar, the manufacturer shall devise another method or device, acceptable to the Government, which provides the same effect. The split collar shall be installed on the ram only when measurements are being taken, and shall be capable of being installed and removed without dissassembly of the jack.

4.4.2 Test methods. The following test methods shall be used for the baseline measurements of 4.4.3, and the tests of 4.4.4 and 4.4.6.

4.4.2.1 Reference. Prior to testing the jack, alignment marks (chalk, scribe, etc.) shall be placed on the jack's wheels, casters, saddle, and lifting arm and on the saddle plate and base. The marks shall be used throughout the tests to recreate the original rotational position of the saddle and saddle plate relative to the frame and the original placement of the jack on the base, as well as the original orientation of the wheels, for measurement of deformation (see 3.6.1). In addition to the alignment marks, the saddle periphery shall be marked fore-to-aft and side-to-side with respect to the frame, dividing it into four 90 degree segments, using the centerline of the saddle pivot pin to locate the segments.

4.4.2.2 Pre-load. Prior to performing the baseline measurements, the jack may be subjected to the pre-load and split collar seating load only once (see 3.1.1). The pre-load shall not exceed the specified load capacity and the split collar seating load shall not exceed 250 pounds.

4.4.2.3 Method for measurement. Measurement for determining deformation of the jack shall be accomplished as follows:

(a) The jack shall be placed on the base and the saddle raised. The split collar shall be installed on the jack's hydraulic ram and the saddle lowered until the split collar prevents further descent. The saddle plate shall be placed on the saddle, and all reference marks shall be aligned.

(b) With no load on the jack, the saddle height, as indicated by the distance from the center of the upper surface of the saddle plate to the base, shall be measured. The height gage used shall have an accuracy of at least ±0.001 inch.

(c) The inclination of the saddle in relation to the base shall then be measured in degrees and minutes in two directions, diagonally (at forty-five degrees) with respect to the centerline of the frame, with an inclinometer having an accuracy of at least ±five minutes of arc.

(d) With the inclinometer in place on the saddle plate, the saddle shall be rotated 180 degrees to determine the maximum inclination of the saddle in relation to the base; both with the saddle lowered until the split collar prevents further descent, and with the saddle fully raised. After the maximum inclination has been determined, the saddle shall be returned to its original marked position.

(e) The flatness of the jack's wheelbase shall be checked by attempting to slide a 0.125 inch block under each wheel and caster in turn.

4.4.3 Baseline measurements. After the pre-load and split collar seating load, if used (see 4.4.2.2), and before any other loading, baseline measurements of saddle height and inclination shall be taken in accordance with 4.4.2.3 and the initial condition of the jack determined by visual inspection. The baseline measurements shall be performed only once for each jack, and shall be taken for each jack subjected to the maximum load or saddle periphery loading tests. Deformed or damaged parts of the jack, inclination of the saddle in excess of five degrees, or the ability to slide a 0.125 inch block under any wheel shall be cause for rejection of the jack (see 3.6.1 and 3.8.4). The results of the baseline measurements and visual inspection shall be recorded for comparison with similar measurements and inspection taken during and after the tests of 4.4.4 and 4.4.6.

4.4.4 Maximum load test. With the jack overload protection device deactivated, the jack pump handle shall be operated to raise the maximum load of 3.8.1.1 from the saddle's lowest position until the saddle is fully raised. While raising the load, the jack shall support the maximum load as specified in 3.8.1.2. After the maximum load has been fully raised, the jack shall be

operated to lower the load, and the load shall be removed. The jack shall then be measured for permanent deformation in accordance with 4.4.2.3. Occurrence of any of the following shall be cause for rejection of the jack (see 3.8.1.2):

(a) Failure of the jack to raise, support, and lower the maximum load without damage.

(b) Permanent deformation of the jack resulting in a change of the saddle height measurement in excess of 0.125 inch from the baseline measurement, a change in saddle inclination in excess of three degrees, or a maximum saddle inclination of more than five degrees.

(c) Leakage of the jack's hydraulic system.

(d) The ability to slide a 0.125 inch block under any wheel or caster.

4.4.5 Overload protection device test. After the overload protection device has been set to activate at a load greater than the jack's load capacity, but less than 1.25 times that capacity, in accordance with 3.8.1.1 and 3.8.2, the device shall be tested as follows. The jack shall be positioned in the testing machine with the saddle in its lowest position. The jack pump handle shall then be operated to raise a load equal to the load capacity and to attempt to raise a load equal to at least 1.25 times that load capacity. Occurrence of any of the following shall be cause for rejection of the jack (see 3.8.1.1 and 3.8.2):

(a) Failure of the jack to raise, support, and lower its specified load capacity without damage.

(b) Leakage of the jack's hydraulic system.

(c) Failure of the overload protection device to prevent the jack from raising 1.25 times the load capacity past the region where the lifting arm is within five degrees of horizontal.

4.4.6 Saddle periphery loading test. The jack shall be positioned on the testing machine with the saddle in its lowest position. The reference marks on the jack's saddle and lifting arm shall be aligned, and the angle between the jack frame and the reference line on the lower platen of the testing machine measured to the nearest degree. A load equal to the jack's load capacity shall be applied directly and exclusively on one of the marked segments of the saddle periphery as specified in 3.8.3. The jack pump handle shall then be operated to raise and lower the load through one complete lifting cycle. During the lift, the maximum change in the angle between the jack frame and the reference line on the lower platen of the testing machine shall be noted. At the completion of the lifting cycle, the load shall be removed and the permanent deformation of the jack measured in accordance with

4.4.2.3. With the reference marks aligned, the load shall be applied and raised on each of the remaining marked segments of the saddle periphery in turn (one at a time), the jack rotational movement measured during each lifting cycle, and permanent deformation measured after each lifting cycle, so that the entire saddle periphery is tested. Occurrence of any of the following during the test shall be cause for rejection (see 3.7.1 and 3.8.3):

(a) Permanent deformation, as measured after any lifting cycle, resulting in:

(1) a change in the saddle height measurement in excess of 0.125 inch from the baseline measurement.

(2) a change in the inclination of the saddle in excess of three degrees from the baseline inclination.

(3) a maximum inclination of the saddle in excess of five degrees.

(4) ability to slide a 0.125 inch block under any wheel or caster.

(b) Visible permanent deformation of the saddle periphery.

(c) Other deformation or damage to the jack.

(d) Rotation of the jack frame in excess of ten degrees while under load.

(e) Failure of the jack to keep at least one caster in contact with the lower platen at all times.

(f) Leakage from the jack's hydraulic system.

4.4.7 Release system and load retention test. The jack, with the saddle in its highest position, shall be placed in the loading device and a load equal to the load capacity applied to the saddle. The release system shall then be operated to lower and stop the load at three random points, ending with a point where the lifting arm is within five degrees of horizontal but at least two inches above the bottom of its travel. Immediately upon stopping the load with the lifting arm within five degrees of horizontal, the distance between the saddle periphery and the base shall be measured with a height gage having an accuracy of at least $\pm$0.001 inch. The jack shall then be allowed to stand for one minute with the height gage in position, and the height of the saddle periphery measured again after the minute has elapsed. Following the above, the jack pump handle shall be operated to raise the saddle to it's maximum height under no load. The release system shall then be operated to lower the unloaded saddle. Failure of the release system to stop the load at any point in its descent, a drop of the load in excess of 0.031 inch during the one minute interval, or failure of the saddle to fully and smoothly lower when released under no load shall be cause for rejection (see 3.7.3 and 3.8.2).

4.4.8 Rate of descent test. The jack, with the saddle in its highest position, shall be placed in the loading device, and a load equal to the load capacity shall be applied to the saddle. The release system shall be operated to fully lower the load at the jack's slowest rate of descent without stopping, and the overall rate measured. Failure of the release system to permit control of the rate of descent to an overall speed of one foot or less per minute shall be cause for rejection (see 3.7.3).

4.4.9 Force on handle test. The jack shall be placed on the base in the loading device with the saddle in its lowest position. Without use of the saddle plate, the jack shall be operated to raise its load capacity until the lifting arm is in the horizontal position. The jack handle shall be positioned at not less than 27 degrees and not more than 33 degrees to the horizontal, and the downward force needed to move the handle and raise the load shall be measured by applying force straight downward through the handgrips. Failure of the jack handle to be moved to the bottom of its stroke by a downward force less than, or equal to, the force specified for the jack in Table I shall be cause for rejection (see 3.6.3).

4.4.10 Two-speed unit test. The jack shall be placed on the base in the loading device with the saddle in its lowest position. A load equal to the load capacity of the jack shall be placed on the saddle, and the rise in the saddle for each full stroke of the pump handle shall be measured. The load shall then be removed and the saddle returned to its starting position. The rise in the unloaded saddle for each full stroke of the pump handle shall be measured. Failure of the unloaded saddle to rise at least four times farther per stroke than the loaded saddle shall be cause for rejection (see 3.2.2).

4.4.11 Reservoir leak test. The reservoir shall contain the correct amount and type of hydraulic fluid specified in 3.6.3.4 for the leak test. The breather plug shall be placed in the filler hole of the reservoir. The jack shall then be positioned to place the breather plug below, or at the bottom of, the reservoir. The jack shall remain in this position for no less than one minute. Any evidence of fluid leakage during this test shall be cause for rejection (see 3.6.3.3).

4.5 Packaging inspection. Packaging inspection shall be conducted before and after packaging to determine compliance with the requirements of Section 5.

4.6 Packaging validation tests. After the Quality Assurance inspection and tests have been successfully completed, four jacks, packaged in accordance with the requirements of Section 5 Packaging, shall be selected at random and subjected to the following rough handling tests specified in FED-STD-101. If a First Article Test (FAT) is required by the contract, the packaging validation test shall be conducted on the jacks used for the FAT. If a FAT is not required by the contract, then jacks from the first production lot used for the quality conformance tests listed in 4.2.2.2 shall be used for the packaging validation tests. The apparatus used shall be as described in FED-STD-101. A dummy load shall not be used. All tests are to be conducted

under ambient conditions. Environmental temperature/humidity tests are not required. After the tests have been completed, the containers shall be inspected. Defects in accordance with those described below shall be cause for rejection. The four units shall then be unpacked and again subjected to the Quality Assurance inspections and tests of 4.3, 4.4.11 and 4.5 to reaffirm that the jacks meet the requirements of the specification. The quality conformance tests in 4.4.4, 4.4.5, 4.4.6, and 4.4.7 do not need to be repeated after the packaging validation tests. After all requirements have been met, the units shall be inspected and repackaged (see 4.5) before submission for government acceptance.

4.6.1 Superimposed-load (stackability) test. Test shall be conducted using Method 5016.1 of FED-STD-101. The superimposed load shall consist of three fully loaded boxes, containing one jack each, imposed on top of the fourth box. Criteria for passing/failing of the test is stated in 7.1.5 of Method 5016.1.

4.6.2 Mechanical handling test. Test shall be conducted using 6.2 of Method 5011.1 (Lifting and transportation by forklift truck) of FED-STD-101. Criteria for passing/failing of the test is stated in 7.1.5 of Method 5011.1.

4.6.3 Packaging durability test. A minimum of four jacks, packaged in accordance with Section 5, shall be vertically stacked on top of each other with a forklift. The boxes shall be unstacked and restacked for a minimum total of five times. After the fifth restacking, the boxes shall remain stacked for at least one hour to demonstrate that the boxes are adequately designed for bearing the load. Any evidence of sagging, tilting, in any direction, or deterioraton of the structural integrity of the boxes, shall be cause for rejection (see 5.5).

5. PACKAGING

5.1 Disassembly. The jacks may be disassembled to the extent necessary to assure that all surfaces requiring a preservative are accessible for processing, to assure minimum cube for packing, and to permit reassembly without special skills or tools. Disassembly, when applicable, shall be as specified in MIL-STD-1186.

5.2 Preservation/packaging. Preservation/packaging shall be level A or C, as specified in the contract (see 6.2).

5.2.1 Level A.

5.2.1.1 Cleaning and drying. The jacks and components shall be cleaned and dried in accordance with any applicable procedures of MIL-P-116 so long as the procedure is not injurious to the item(s).

5.2.1.2 Preservative application. Immediately after cleaning and drying, a coat of type P-1 or P-19 preservative shall be applied to all exterior, noncritical, ferrous metal surfaces. Critical, ferrous metal surfaces shall be preserved with type P-2 or type P-11 preservatives. P-type preservatives and procedures for application shall conform to the requirements as specified in MIL-P-116.

5.2.1.3 Unit protection. The method of unit protection shall conform to method I of MIL-P-116. The jack handle may be disassembled from the jack and secured to the jack, in a convenient location, with common annealed wire or steel strapping. Hardware items shall be reinstalled into one of the mating parts and secured to prevent their loss. Barrier material conforming to MIL-B-121, grade A, shall be loosely applied around critical, coated parts to protect the preservative and secured in place with tape conforming to PPP-T-60, type optional.

5.2.2. Level C. Level C preservation shall be as specified in MIL-STD-1190.

5.3 Packing. Packing shall be levels A, B, or C, as specified in the contract (see 6.2).

5.3.1 Level A. Each jack shall be packed in a cleated plywood or nailed wood box conforming to PPP-B-601, overseas type, or PPP-B-621, class 2, respectively. Blocking and bracing shall be as specified in MIL-STD-1186.

5.3.2 Level B. Jacks shall be packed as specified in 5.3.1 except that the shipping containers shall conform to PPP-B-621, class 1.

5.3.3 Level C. Level C packing shall be as specified in MIL-STD-1190. The jacks shall be packed one per container. The containers shall be capable of being stacked at least four units high without damage to the container or its contents.

5.4 Marking. All markings, on interior and exterior containers, shall be in accordance with the requirements as specified in MIL-STD-129.

5.5 Superimposed load and frequent handling requirements. Each box constructed with blocking and bracing, shall be strong enough to support the weight of three other fully loaded boxes imposed on top of it without fracturing, leaning, tipping over, sagging or separation of joints. For testing purposes a demonstration of supporting the weight for the period of one hour shall be considered as evidence that the box is adequately designed for bearing load. The four boxes shall accommodate warehouse stacking, with forklift capabilities, at least four boxes high, restacking without deterioration of the structural integrity of the boxes. For testing purposes stacking and restacking the boxes a total of five times shall provide evidence of adequate durability for handling. The container, its contents and the packaging shall not be damaged, functionally or physically, or items displaced by the appropriate testing.

6. NOTES

6.1 Intended use. These jacks are intended for use by the field military for maintenance procedures on tactical and staff vehicles.

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 (size/capacity) required (see 1.2.1).

(c) First article when required (see 3.1 and 4.2.1).

(d) Painting and finishing if different (see 3.9).

(e) Product identification if different (see 3.10).

(f) Level of preservation/packaging, packing, and marking required (see 5.2 and 5.3).

6.3 Contract data requirements. Required technical data such as operator's manuals, parts lists, and other instructions for operation and maintenance, as identified on a numbered DD Form 1664, should be specified on a DD Form 1423 incorporated in the contract.

6.3.1 Repair part manuals. Repair part identification, in repair part manuals, should include the prime contractor's name, nomenclature, part number, equipment/part manufacturer (OEM - actual part manufacturer), Commercial and Government Entity Code (CAGE), nomenclature, part number, and price of the part immediately after the prime contractor's part identification. High mortality rate items should be identified as shown in MIL-M-7298.

6.4 Definitions. Terms used in this specification are defined as follows:

(a) Saddle - That portion of the jack that contacts the object to be lifted.

(b) Saddle periphery - the saddle periphery is explicitly the outermost, outside edge of the saddle and any upward protrusions such as lugs, lips, or tangs, and is reserved to the highest point of contact between the saddle and load when the load is covering no more than a 90 degree segment/arc of the outside edge of the saddle.

(c) Load capacity - the load capacity of the jack is that load which the jack was deliberately designed and manufactured to lift and support safely, repeatedly, and reliably, and which is specified in the contract.

(d) Overload protection system activation load - that load point above the specified load capacity at which the overload protection mechanism activates and prevents the jack from lifting increased loads.

(e) Maximum load - the maximum load is that load (usually unadvertised) which the jack is designed and required to lift and support if the overload protection mechanism fails or is accidently deactivated. It is required to be at least 125 percent or more of the specified load capacity of the jack.

(f) Lifting range - the lifting range of the jack is the full distance from the stopped resting position of the saddle at the bottom of its travel to the fully extended stopped position of the saddle at the top of it's travel.

(g) Permanent deformation - permanent deformation is the difference between the baseline measurements taken before loading and the corresponding measurements taken after loading.

(h) Damage - damage is a change in physical characteristics that can be determined visually or by measurement or inspection techniques i.e., the difference between straight and bent lifting arms or straight and bent frame rails, or such conditions as elongated holes, leaking seals, wheels that won't turn, cracks, fractures, etc.

(i) Leakage - leakage is the formation of a droplet of hydraulic fluid from the hydraulic system seals, filler ports or any other part of the hydraulic system or formation of a droplet on any part of the jack. The droplet need not fall in order to be an indication of leakage.

6.5 Subject term (keyword) listing.

Dolly type
Pre-load
Lifting
Hydraulic

MILITARY INTERESTS:

Custodians
Army - AL
Navy - YD
Air Force - 99

Review Activities
Army - ME
Air Force - 82

User Activity
Army - AT

CIVIL AGENCY COORDINATING ACTIVITY:
GSA-FSS

PREPARING ACTIVITY:
Army - AL

DoD Project 4910-0746

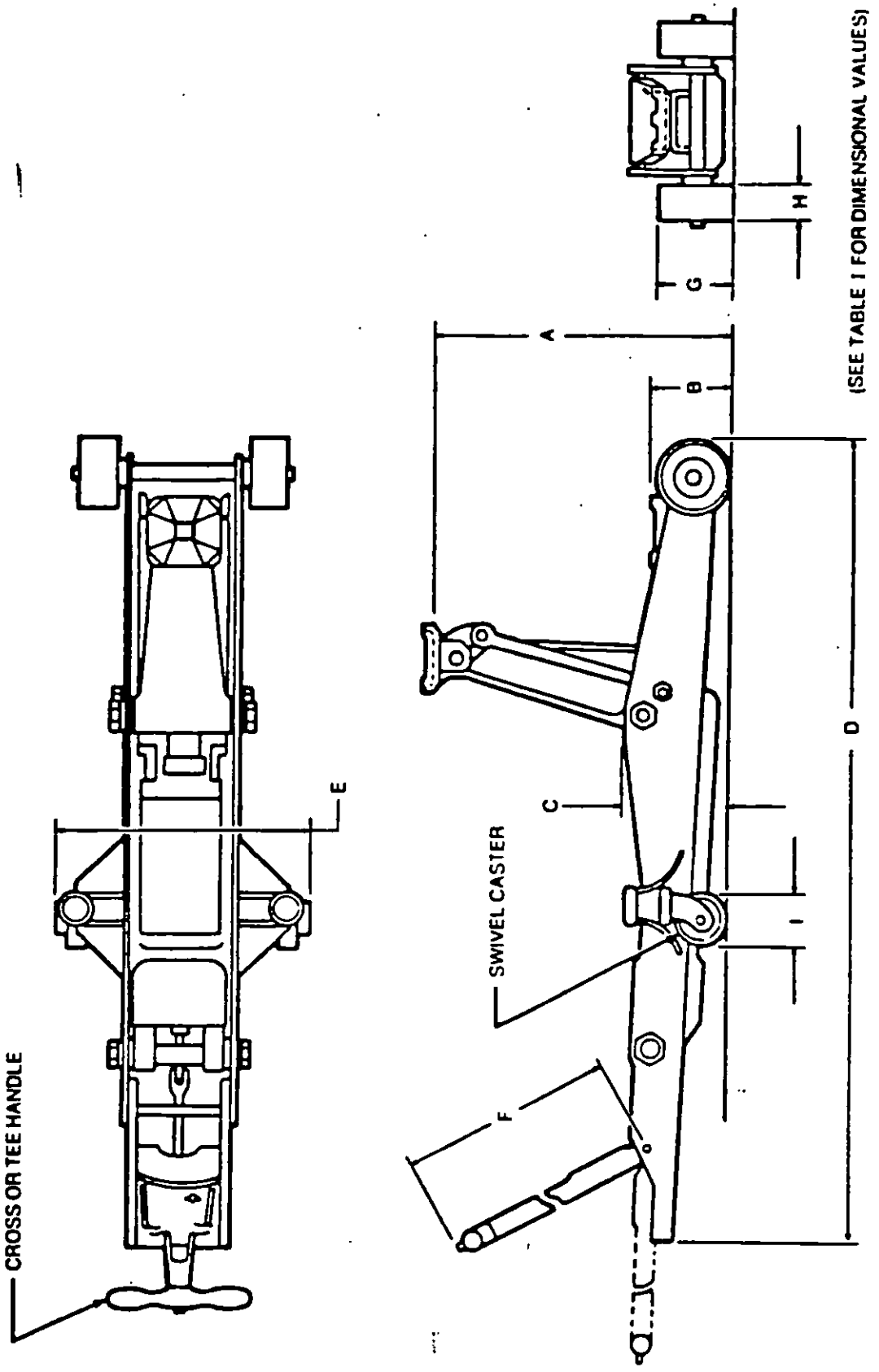

FIGURE 1. Hydraulic jack, dolly type, automotive.

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.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
DOCUMENT TITLE		

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

REASON FOR RECOMMENDATION

5. 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	b. TELEPHONE (*Include Area Code*) (1) Commercial (2) AUTOVON/DSN	
c. ADDRESS (*Include Zip Code*)	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	

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