ASME PASE-2024
(Revision of ASME PASE-2019)

Safety Standard for Portable Automotive Service Equipment

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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The American Society of Mechanical Engineers
Two Park Avenue • New York, NY • 10016 USA

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FOREWORD

This ASME Standard, Safety Standard for Portable Automotive Service Equipment, has been developed under the procedures for ASME Codes and Standards development committees. This Standard had its beginning in June 1979 when the Jack Institute addressed the B30 Committee on Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings. The Jack Institute requested the B30 Committee either to develop a standard for automotive jacks or to include this equipment as part of the revision of ASME B30.1, Jacks. The B30 Committee declined this request.

As a result, the Jack Institute petitioned the American National Standards Institute (ANSI) in July 1979 for the formation of a committee to promulgate safety and performance standards for portable automotive lifting devices, requesting the designation of ASME as sponsor of the project.

In September 1979, ASME's Policy Board, Codes and Standards, approved sponsorship of the committee to operate under the procedures developed by ASME and accredited by ANSI. A nominating committee was appointed to recommend a proposed membership to the ASME Safety Codes and Standards Committee for approval. The membership was approved at the beginning of May 1980.

The inaugural meeting of the ASME Committee on Portable Automotive Lifting Devices (PALD) was held in July 1980. The Committee determined that the format of this standard would be such that separate volumes, each complete as to design, marking, identification, testing, operation, inspection, and maintenance, would cover the different types of equipment included in the PALD scope. In the 1993 edition, the various volumes were combined into one standard with common requirements in one place and the information specific to a particular type of equipment set out in succeeding Parts. This allowed for greater consistency in requirements and eliminated redundancy.

In April 2007, the ASME Committee on PALD recognized the need to develop a standard for PALD-related equipment not covered under the ASME PALD standard. As a result, an ASME PALD subcommittee was appointed by members currently serving on the ASME PALD Committee to propose a new standard for these products. This subcommittee then drafted a basic scope and outline of this new standard and petitioned the ASME Council of Codes and Standards for permission to proceed with the development of this standard to cover equipment described in the charter of the ASME PALD Committee. The standard was approved by ANSI on February 3, 2010, as the Safety Standard for Automotive Service and Maintenance Products (ASP).

In July 2011, the PALD Committee approved changing the name and charter of the PALD Committee to the Portable Automotive Service Equipment (PASE) Committee to encompass both the ASME PALD and ASME ASP published standards. As a result of this change, the Committee decided to combine the two standards into this new Safety Standard for Portable Automotive Service Equipment. This Standard presents a coordinated set of rules that may serve as a guide to manufacturers, to government and other regulatory bodies, to municipal authorities, and to commercial users responsible for the inspection, maintenance, and instruction in the use of the equipment falling within its scope.

Safety codes and standards are intended to enhance public health and safety. Revisions result from Committee consideration of factors such as technological advances, new data, and changing environmental and industry needs. Revisions do not imply that previous editions were inadequate.

ASME PASE-2019 was approved by ANSI on March 25, 2019. ASME PASE-2024 was approved by ANSI on September 16, 2024.

ASME PASE COMMITTEE
PORTABLE AUTOMOTIVE SERVICE EQUIPMENT

(The following is the roster of the committee at the time of approval of this Standard.)

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S. J. Rucker, *Vice Chair*
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General. ASME codes and standards are developed and maintained by committees with the intent to represent the consensus of concerned interests. Users of ASME codes and standards may correspond with the committees to propose revisions or cases, report errata, or request interpretations. Correspondence for this Standard should be sent to the staff secretary noted on the committee's web page, accessible at https://go.asme.org/PASEcommittee.

Revisions and Errata. The committee processes revisions to this Standard on a continuous basis to incorporate changes that appear necessary or desirable as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published in the next edition of the Standard.

In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive email notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number, the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

Cases. The committee does not issue cases for this Standard.

Interpretations. Upon request, the committee will issue an interpretation of any requirement of this Standard. An interpretation can be issued only in response to a request submitted through the online Inquiry Submittal Form at https://go.asme.org/InterpretationRequest. Upon submitting the form, the inquirer will receive an automatic email confirming receipt.

ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the information submitted, it is the opinion of the committee that the inquirer should seek assistance, the request will be returned with the recommendation that such assistance be obtained. Inquirers can track the status of their requests at https://go.asme.org/Interpretations.

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Interpretations are published in the ASME Interpretations Database at https://go.asme.org/Interpretations as they are issued.

Committee Meetings. The PASE Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the secretary of the committee. Information on future committee meetings can be found on the committee web page at https://go.asme.org/PASEcommittee.

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PREFACE

GENERAL

This Standard is one of many safety standards on various subjects that have been formulated under the general auspices of The American Society of Mechanical Engineers (ASME). One purpose of the Standard is to serve as a guide to governmental authorities having jurisdiction over subjects within the scope of the Standard. It is expected, however, that the Standard will find a major application in industry, serving as a guide to manufacturers, suppliers, purchasers, and operators of the equipment. If adopted for governmental use, the references to other national standards in this Standard may be changed to refer to the corresponding regulations of the governmental authorities.

The use of portable automotive service equipment (PASE) is subject to certain hazards that cannot be precluded by mechanical means, but only by the exercise of intelligence, care, and common sense. It is therefore essential to have personnel involved in the use and operation of equipment who are careful, competent, trained, and qualified in the safe operation of the equipment and its proper use when servicing motor vehicles and their components. Examples of hazards are dropping, tipping, or slipping of motor vehicles or their components caused primarily by improperly securing loads; overloading; off-centered loads; use on other than hard, level surfaces; and using equipment for a purpose for which it was not designed.

The PASE Committee fully realizes the importance of proper size, strength, and stability as safety factors in the design of this equipment. This equipment is used on various motor vehicles and their components under variable working conditions. These conditions have been considered to provide safety and flexibility in its use. The requirements given in this Standard must be interpreted accordingly and judgment should be used in determining their application.

MANDATORY AND ADVISORY RULES

Mandatory rules of this Standard are characterized by use of the word *shall*. If a provision is of an advisory nature, it is indicated by use of the word *should* and is a recommendation to be considered, the advisability of which depends on the facts in each situation.

SI (METRIC) CONVERSIONS

This Standard contains SI (metric) units as well as U.S. Customary units. The values stated in U.S. Customary units are to be regarded as the standard. The SI units in the text have been directly (soft) converted from the U.S. Customary units.

ASME PASE-2024
SUMMARY OF CHANGES

Following approval by the ASME PASE Standards Committee and ASME, and after public review, ASME PASE-2024 was approved by the American National Standards Institute on September 16, 2024.

ASME PASE-2024 includes the following changes identified by a margin note, **(24)**.

Page	*Location*	*Change*
ix	Correspondence With the PASE Committee	Added
x	Preface	Revised
1	1-4	Updated
3	2-1.2	Definition of *load-loss control* added
4	2-2.1	Revised
5	2-4.2	Last sentence revised
9	4-2.1.2	Second and third sentences revised
16	4-4.1	Subparagraph (b) revised
18	5-1.2	Subparagraph (a) revised
20	5-4.1	Revised
21	6-2.3	Third and fourth sentences added
28	6-3.1	Subparagraphs (a)(8), (a)(9), and (b)(8) added and subsequent subparagraphs redesignated
29	6-4.1.1	First sentence added
34	8-1.1	Revised
34	8-1.2	Revised
34	8-2	Revised in its entirety
38	8-3.1.1	(1) Subparagraph (c) revised (2) Subparagraph (e) added and subsequent subparagraphs redesignated
38	8-3.1.2	Subparagraphs (c), (d), (g), and (h) revised
38	8-3.1.3	Revised
38	8-3.2.1	Subparagraph (b) added and subsequent subparagraph redesignated
39	8-3.2.2	Revised
39	8-3.2.3	Subparagraph (b) added and subsequent subparagraph redesignated
39	8-4.1	Revised in its entirety
39	8-4.2	Revised in its entirety
47	11-2.1.3	Revised
47	11-2.1.4	Added
47	Table 11-2.1.4	Added

Page	*Location*	*Change*
47	11-3.1	Subparagraph (f) added and subsequent subparagraph redesignated
47	11-3.2	Subparagraph (a) revised
48	11-4.1.6	Revised
46	Figure 11-1.3-2	Title of illustration (b) revised
66	17-4.1.2	Cross-reference in first sentence revised
67	18-1.2	Revised
72	Figure 19-1.3-1	Terms “Boom” and “Support arm” revised to “Transverse beam” and “Secondary beam,” respectively

Part 1
Introduction

1-1 SCOPE

The scope of this Standard is the standardization of safety and performance requirements for portable automotive service equipment (PASE) including, but not limited to, the following:

(a) attachments, adapters, and accessories
(b) automotive hydraulic jacks
(c) automotive mechanical jacks
(d) automotive stands
(e) automotive ramps
(f) mobile vehicle lifts and jacks
(g) vehicle transport lifts
(h) vehicle-moving dollies
(i) component dollies and jacks
(j) shop cranes
(k) engine stands
(l) shop presses
(m) oil-filter crushers
(n) strut spring compressors
(o) oil and antifreeze handlers
(p) portable hydraulic power kits
(q) engine support tools

This Standard includes requirements for safety, health, design, production, construction, maintenance, performance, or operation of electrical, mechanical, hydraulic, or pneumatically powered equipment, and qualification of personnel. Safety and construction requirements for electrical equipment are included in UL 201 and UL 2089. As deemed necessary by the ASME PASE Committee, additional equipment classified as PASE-related can be added as the need arises, to ensure the safe operation of the equipment by the end user.

1-2 APPLICATION

This Standard applies to design, construction, marking, operation, maintenance, and owner or operator inspection of the portable automotive service equipment listed in section 1-1 used during service, maintenance, and storage of components, vehicles, or both. Operation and maintenance instructions in this Standard are intended for general application. The equipment manufacturer or supplier shall be consulted for specific operating and maintenance instructions. This Standard does not apply to similar lifting devices designed and manufactured for other commercial or industrial uses, such as those within the scope of ASME B30.1, ANSI/ALI ALCTV, ANSI/ALI ALIS, and ANSI/ALI ALOIM.

1-3 PURPOSE

This Standard is designed to

(a) guard against and mitigate injury, and otherwise provide for the protection of life, limb, and property by prescribing safety requirements

(b) provide direction to purchasers, owners, employers, supervisors, and others concerned with, or responsible for, its application

(c) guide governmental and other regulatory bodies in the development, promulgation, and enforcement of appropriate safety directives

1-4 REFERENCES (24)

The following is a list of standards and specifications referenced in this Standard:

ANSI/ALI ALCTV. Standard for Automotive Lifts — Safety Requirements for Construction, Testing, and Validation. Automotive Lift Institute.
ANSI/ALI ALIS. Standard for Automotive Lifts — Safety Requirements for Installation and Service. Automotive Lift Institute.
ANSI/ALI ALOIM. Standard for Automotive Lifts — Safety Requirements for Operation, Inspection, and Maintenance. Automotive Lift Institute.
ANSI/ISEA Z87.1. Occupational and Educational Personal Eye and Face Protection Devices. International Safety Equipment Association.
ANSI Z535.1. Safety Colors. National Electrical Manufacturers Association.
ANSI Z535.3. Criteria for Safety Symbols. National Electrical Manufacturers Association.
ANSI Z535.4. Product Safety Signs and Labels. National Electrical Manufacturers Association.
ANSI Z535.6. Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials. National Electrical Manufacturers Association.
ASME B30.1. Jacks, Industrial Rollers, Air Casters, and Hydraulic Gantries. The American Society of Mechanical Engineers.

ISO/IEC 17050-1. Conformity assessment — Supplier's declaration of conformity — Part 1: General requirements. International Organization for Standardization.
ISO/IEC 17050-2. Conformity assessment — Supplier's declaration of conformity — Part 2: Supporting documentation. International Organization for Standardization.
UL 201. Standard for Safety for Garage Equipment. Underwriters Laboratories, Inc.
UL 969. Standard for Marking and Labeling Systems. Underwriters Laboratories, Inc.
UL 2089. Standard for Safety for Vehicle Battery Adapters. Underwriters Laboratories, Inc.

Part 2
General Requirements

2-1 SCOPE AND DEFINITIONS

2-1.1 Scope

This Part applies to all PASE defined in this Standard.

(24) 2-1.2 Definitions

accessory: a device that, when used with PASE, provides an alternative or supplementary function for the PASE.

adapter: a device attached to PASE that is used to support and/or stabilize those components for which it is especially designed.

alteration: any change to PASE other than maintenance, repair, or replacement.

appointed: assigned specific responsibilities by the employer or employer's representative.

appropriate means: the use of any device, e.g., blocking, cribbing, or vehicle-support stands, that adequately supports a vehicle off the ground by providing a stable support preventing the vehicle from tipping over or falling down to the ground.

approved: accepted as satisfactory by a duly constituted administrative or regulatory authority.

attachment: a device that, when connected to PASE, facilitates the intended purpose of the host PASE.

authorized: approved by a duly constituted administrative or regulatory authority.

authorized personnel: persons who have been instructed in the operation and/or maintenance of PASE and designated by the owner to use or maintain the equipment.

authorized service center: an independent service facility designated by the manufacturer to repair, service, and functionally test PASE.

base: the structure contacting the floor (may have wheels or casters) that supports the operational assembly of PASE and may be part of the frame.

controls, operating: the mechanisms that must be manipulated by the operator to govern the starting, stopping, direction of motion, acceleration, speed, and retardation of the moving member(s) of PASE.

cylinder: a means by which force is transmitted to an object by hydraulic or air pressure. Also referred to as a ram.

designated: selected or assigned by the employer or the employer's representative as being competent to perform specific duties.

electric: term used to describe a device that utilizes electricity to actuate the force or delivery-transmitting medium.

extender: an optional device supplied by the manufacturer to mechanically increase PASE height prior to applying the load.

fixed: permanently set in one location and not readily movable to another work area.

frame: the structure containing the operational assembly of PASE.

functional damage: any detrimental permanent deformation of the PASE structure that results in the loss of sealing capability to its hydraulic and/or pneumatic components, loss of load, loss of motion, or failure to meet or exceed the design qualification limits established.

hydraulic: term used to describe a device that utilizes hydraulics as the force or delivery-transmitting medium.

identical pair: a pair of PASE of equal height, length, and capacity.

internal load-limiting device: a device that limits the lifting capacity of PASE.

lift arm: the main lifting member through which the force is transferred from the power unit to the saddle.

lifting member: the moving portion of PASE upon which saddles (if any) are mounted.

lift point: the location at which the PASE lifting member or saddle contacts the vehicle component as designated by the vehicle manufacturer.

listed: refers to an electrical product that has been tested, found compliant, and approved by a Nationally Recognized Testing Laboratory to a specific standard.

load: the total superimposed weight of force to be overcome by PASE.

load-loss control: a means to prevent sudden upward travel of a pneumatic lift if the load is suddenly removed.

load restraint: a device to retain the load on the lifting member.

locking device: the mechanism used to hold the load-supporting means in the selected position or to restrain it from moving.

manufacturer: a company that produces goods for sale.

mechanical: term used to describe a device that utilizes manual energy as the force for operation.

mobile: term used to describe PASE that is readily movable from one work area to another without load.

overload: a load that exceeds the rated capacity of PASE.

PASE: any one of the various types of portable automotive service equipment listed in the scope of this Standard.

pawl: a pivoted component that, when engaged with the teeth of a ratchet, prevents undesired movement in a specific direction.

pneumatic: term used to describe a device that utilizes compressed air as the force or delivery-transmitting medium.

portable: not permanently fixed in one location and able to be moved from one workplace to another.

proof load: a load, greater than the rated capacity, applied centrally to PASE lifting or attaching points, or to the work surface as defined by the loading apparatus, to confirm the integrity of the structure.

qualified personnel: individuals who, by possession of a recognized degree in an applicable field or certificate of professional standing, or by extensive knowledge, training, and experience, have successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

raised height: the distance from the ground to the top of the saddle at the full extension of PASE.

ram: see *cylinder*.

ratchet: a toothed member for engagement with the pawl.

rated capacity: the maximum published operating load or volume that PASE is designed to lift, support, deliver, contain, receive, or transport.

regulator: an adjustable pressure-control device that limits the discharge pressure.

relief valve: a device that senses pressure beyond a specified level and allows the elevated pressure to vent to an area of lower pressure.

repair: the process of rehabilitation or replacement of parts that are the same as the original for the purpose of ensuring performance in accordance with the applicable requirements.

saddle: the portion of PASE that comes in contact with and/or engages a vehicle component.

stability: a measure of resistance to tipping or slipping while under load.

standard: any international, national, state, or local published set of criteria with which a product or service shall comply that is recognized by a governing body.

supplier: a company that controls the performance specification and/or design of the products distributed to the general public.

travel: extending or retracting movement of PASE.

2-2 DESIGN

2-2.1 Durability Assessment (24)

In the design of all PASE, consideration shall be given to the anticipated useful life of each product, and the cumulative effects of repeated use and other potential changes in properties.

A required marking shall be permanent. All markings shall be located on a part that, if removed, would impair operation of the equipment or on a part that requires tools for removal. A permanent marking shall be either etched, molded, stamped, or etched metal that is permanently secured or is composed of a marking or labeling system complying with UL 969. A permanent marking shall be rated for the surface and expected environmental conditions involved and for exposure to oil.

Markings required by this Standard shall be durable and legible. The effects of normal use and exposure to shop chemicals on the durability of the marking shall be considered.

2-2.2 Ergonomic Considerations

The design of all PASE shall consider the operator interface for control size and placement; the interface to lift, support, output, contain, receive, or transport throughout its range of travel operation; and the force requirements at rated capacity for operation and movement of PASE.

2-2.3 Design Considerations

2-2.3.1 Operating Controls. Operating controls shall be designed in such a manner that they are readily visible and accessible to the operator and so that the operator will not be subjected to pinch points, sharp edges, or snagging hazards. The operation of controls should be clear to the operator by position, function, labeling, or a combination thereof. The handle (if employed) or other operating device shall be capable of being operated to the rated capacity of the attachment, adapter, or accessory without sustaining functional damage. To prevent accidental operation, the handle (if employed) or other operating device shall require intentional positive action by the operator to move or reposition the load.

2-2.3.2 Travel Limit. All PASE that move a load shall be provided with a positive means to prevent the load from being moved or repositioned beyond the design limit of travel in all possible directions.

2-2.3.3 Hydraulic Load-Limiting Device. Hydraulic-operated PASE shall have an internal load-limiting device that can be deactivated in preparation for the proof load test. The load-limiting device shall activate when lifting no less than 100% of rated capacity but no more than 125% of rated capacity.

2-2.3.4 Manual Operation. PASE actuated by manual force shall be capable of lifting the load at rated capacity (see para. 2-2.3.1) while the operator, in the operating position, exerts an ergonomically appropriate force on the actuating handle or pedal. The actuating handle or pedal should be designed to prevent overloading the PASE by deforming prior to reaching proof load.

2-2.3.5 Hoses. Hoses shall be designed to be compatible with the contained fluid. Pneumatic hose ratings shall be a minimum of 300 psi (2 068.4 kPa) working pressure. Hydraulic hose ratings shall be 2 times working pressure at rated capacity of the PASE.

2-2.3.6 Electrically Powered PASE. All PASE utilizing electrical power shall, at a minimum, meet the following requirements:

(a) The PASE shall provide over-current protection, which shall not automatically reset.

(b) The PASE shall meet an applicable standard, e.g., UL 201 or UL 2089.

(c) The PASE shall provide a means to permit controlled lowering or safe removal of a load if electrical power fails.

2-3 DESIGN QUALIFICATION TESTING

(a) In the design qualification testing of all PASE, the same sample shall be used for all tests where this is feasible.

(b) Restraint of PASE in a manner that does not simulate intended use is not permitted during load testing.

(c) For each design or design change that may affect the PASE's ability to meet this Standard, sample PASE built to design specifications shall be load tested. A centered preload of no more than 100% of rated capacity may be applied and removed once to establish initial overall height.

(d) To conform to this Standard, the PASE shall perform to design specifications and no functional damage shall occur, nor shall operational characteristics be detrimentally affected.

(e) If required, an external power unit is allowed to generate the pressure to lift the load throughout the lifting range. If an external power unit is used, then the integral pump shall be hydrostatically tested to 150% of the maximum pressure experienced during the rated load capacity test. It is permitted to perform this test outside of the PASE.

2-4 PRODUCT MARKING AND IDENTIFICATION

2-4.1 Rated Capacity

All PASE shall have the rated capacity marked in a prominent location on the PASE by casting imprint, metal stamp, or use of durable materials and attachment methods. These rated capacities should be stated as required based upon the nature of the PASE. PASE designed or intended to be used together in pairs or other multiple configurations shall display the rated capacity of each individual unit.

2-4.2 Identification (24)

All PASE shall include identification or identifying marks of the original manufacturer or supplier by casting imprint, metal stamp, or use of durable materials and attachment methods. The manufacturer shall be able to identify the month and year of manufacture of all PASE.

2-4.3 Safety Markings

All PASE shall include safety signs, labels, or both, developed by the manufacturer or supplier. The signs or labels shall be affixed by use of durable materials and attachment methods to all PASE in locations visible to the operator to avoid the hazard. The ANSI Z535 series of standards containing guidelines for product safety signs shall be followed.

Examples of safety markings for specific types of PASE are shown in the "Safety Markings" paragraph of each succeeding Part; safety markings need not be verbatim or limited to those listed.

2-5 PRODUCT INSTRUCTIONS AND SAFETY MESSAGES

2-5.1 Product Manuals and Instructions

All PASE shall be provided with an owner's manual or operator's instructions. The instructions shall specify the proper operating procedures and basic function of the components. The instructions shall contain the recommended replacement fluid, maintenance, and inspection procedures and intervals, as applicable. Formats shall follow the ANSI Z535 series of standards containing guidelines for instructions and manuals. Copy conveying the intent of section 2-7 shall be included with the instructions. Consideration should be given to multi-language instructions; however, English shall govern.

2-5.2 Safety Messages

Examples of safety messages are shown in the "Safety Messages" paragraph of each succeeding Part; safety messages need not be verbatim or limited to those listed.

2-6 QUALITY ASSURANCE

Producers of PASE shall adhere to a planned, written system of policies and procedures that will ensure consistent and continuing conformance to this Standard. Conformance to this Standard shall be demonstrated by the testing requirements set forth herein. ISO/IEC 17050-1 and ISO/IEC 17050-2 may be used as guides.

2-7 OPERATION, MAINTENANCE, AND INSPECTION

2-7.1 Operation

The owner and/or operator shall have an understanding of the product, its operating characteristics, and safety operating instructions before operating PASE. Safety information shall be understood. If the operator is not fluent in English, the product and safety instructions shall be discussed with the operator in the operator's native language by the purchaser, owner, or owner's designee, making sure that the operator comprehends their contents.

2-7.2 Maintenance

PASE shall be maintained by a qualified person.

2-7.3 Inspection

(a) Visual inspection shall be made before each use of PASE by checking for abnormal conditions, e.g., cracked welds, leaks, and damaged, loose, or missing parts.

(b) Other inspections shall be made per product operating instructions.

(c) PASE shall be inspected immediately if the device is believed to have been subjected to an abnormal load or shock. This inspection should be made by a manufacturer's or supplier's authorized repair facility.

(d) Owners and operators should be aware that repair of this equipment may require specialized knowledge and facilities.

(e) An annual inspection of PASE should be made by a manufacturer's or supplier's authorized repair facility, and any defective parts, decals, or safety labels or signs should be replaced with manufacturer's or supplier's specified parts. A list of authorized repair facilities should be available from the manufacturer or supplier.

2-7.4 Damaged Equipment

Any PASE that appears to be damaged in any way, is found to be worn, or operates abnormally SHALL BE REMOVED FROM SERVICE UNTIL REPAIRED. Necessary repairs should be made by a manufacturer's or supplier's authorized repair facility if repairs are permitted by the manufacturer or supplier.

2-7.5 Alterations

No alterations shall be made to any PASE.

2-7.6 Attachments and Adapters

Only attachments and adapters supplied by or approved by the manufacturer shall be used. Attachments and adapters shall be marked in accordance with section 2-4. When attachments and adapters are used with the host PASE, the published rated capacity of the system shall be no greater than the rated capacity of the lowest-rated component or combination of components that makes up the system.

2-7.7 Personal Protective Equipment

It shall be the responsibility of the employer to ensure that applicable personal protective equipment (PPE) complies with applicable local safety codes.

2-8 RELATED STANDARDS

Consideration shall be given in the design of each PASE regarding standards that might influence the design or use of the product for issues involving health, ergonomics, and applicable state and local requirements.

2-9 EFFECTIVE DATE

The effective date of this Standard shall be 12 months after the Date of Issuance.

Part 3
Attachments, Adapters, and Accessories

3-1 SCOPE AND CONFIGURATION

3-1.1 Scope

This Part applies to attachments, adapters, and accessories that are intended to be used in conjunction with PASE described herein for the purpose of enhancing their functionality. This Part does not apply to those attachments, adapters, or accessories described elsewhere in this Standard that are specific to host PASE.

3-1.2 Configuration

Attachments, adapters, and accessories, with or without operating controls or adjustment capability, are the configurations covered by this Part. When connected to the host PASE, attachments facilitate the intended purpose of the PASE, adapters facilitate lifting a load by the PASE, and accessories provide an alternative or supplementary function for the PASE. Representative devices covered by this Part include, but are not limited to, mobile lift attachments, transmission jack adapters or accessories for other vehicle components, below-the-hook devices for shop cranes, and load-positioning devices.

3-2 DESIGN

In addition to Part 2, the requirements in paras. 3-2.1 through 3-2.4 apply.

3-2.1 Design Requirement

Attachments, adapters, or accessories shall not increase the rated capacity of the host PASE. The attachment, adapter, or accessory shall be capable of holding, moving, or repositioning its rated capacity throughout its range of travel. It is the responsibility of the manufacturer of the attachment, adapter, or accessory that the device does not compromise the design integrity of the host PASE. The manufacturer of the attachment, adapter, or accessory shall also designate the intended use by stating the applicable make and model of the host PASE.

3-2.2 Proof Load

Attachments, adapters, or accessories shall be capable of performing the proof load test of para. 3-4.2 with a proof load of 150% of their rated capacity.

3-2.3 Stability

Attachments, adapters, or accessories shall not have loading positions that extend beyond the peripheral limits of the host device. The host PASE with the attachment, adapter, or accessory loaded to its rated capacity shall meet the stability requirements of the host PASE.

3-2.4 Lubrication

If needed, the attachment, adapter, or accessory shall be lubricated by the manufacturer.

3-3 SAFETY MARKINGS AND MESSAGES

3-3.1 Safety Markings

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating the device.

(b) Do not exceed rated capacity.

(c) Ensure load is secured to the device.

(d) To be used only with the following PASE: [list].

(e) Failure to heed these markings may result in personal injury, property damage, or both.

3-3.2 Safety Messages

The following are examples of safety messages:

(a) Release load-locking devices (if employed) slowly and carefully.

(b) No alterations shall be made to this product.

3-4 DESIGN QUALIFICATION TESTING

3-4.1 Load Tests

For each design or design change that may affect the ability of the attachment, adapter, or accessory to meet this Standard, sample attachments, adapters, or accessories built to design specifications shall be proof tested on host PASE. To conform to this Standard, the attachment, adapter, or accessory shall perform to design specifications and no functional damage shall

occur, nor shall operational characteristics be detrimentally affected.

3-4.1.1 Operating Test. The attachment, adapter, or accessory shall be operated in the most adverse positions, throughout the full range of travel with a connected load equal to their rated capacity.

3-4.1.2 Travel Limit Test. The attachment, adapter, or accessory shall be operated to the full extent of travel in all possible directions with a connected load equal to its rated capacity.

3-4.2 Proof Load Test

A proof load, as defined in para. 3-2.2, shall be applied centrally to the attachment, adapter, or accessory. The attachment, adapter, or accessory shall be capable of holding, moving, and repositioning the load throughout the range of travel. Should the original operating handle (if supplied) not be capable of operating the attachment, adapter, or accessory, a substitute handle may be used for the performance of this test.

Part 4
Automotive Hydraulic Jacks

4-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

4-1.1 Scope

This Part applies to hydraulic jacks for lifting but not supporting a load. This Part does not include hydraulic jacks used for emergency tire-changing.

4-1.2 Configuration

4-1.2.1 Self-Contained Hydraulic Jacks. Self-contained hydraulic jacks used individually or mounted in a wheeled frame for engaging a vehicle lift point are covered by this Part. A typical design consists of a jack with a base, ram with a saddle, hydraulic pump, release mechanism, and reservoir. The ram may have one or more stages and a screw extender or extension with a saddle that contacts the vehicle lift point. The jack is actuated by a pump with a handle or pneumatic means. A carrying handle or mobile frame with a handle and operating controls may be supplied for portability.

4-1.2.2 Service Jacks. Jacks having a lift arm with a saddle to contact the vehicle lift point are covered by this Part. A typical design consists of a mobile frame supporting a mechanism that actuates a pivoting lift arm equipped with a saddle having upward protrusion such as lugs, lips, or tangs for retaining the load. The lifting mechanism may be actuated by a hydraulic unit with a handle, pedal, or pneumatic means.

4-1.2.3 Forklift Jacks. Forklift jacks having a scissors-action lifting member with a saddle for contacting the vehicle lift point are covered by this Part. A typical design consists of a primary saddle and may integrate a notch or other means as a lift point. A secondary saddle not located on the lifting member may be included. The lifting mechanism may be actuated by a hydraulic unit that includes a handle or pneumatic means.

4-1.3 Illustrations

The illustrations show typical jacks covered by this Part and are not intended to be all-inclusive. Figures 4-1.3-1 through 4-1.3-4 show typical self-contained hydraulic jacks. Figures 4-1.3-5 and 4-1.3-6 show typical service jacks. Figure 4-1.3-7 shows a typical forklift jack.

4-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 4-2.1 and 4-2.2 apply.

4-2.1 Saddle Requirements

4-2.1.1 Self-Contained Hydraulic Jacks. The saddle configuration shall aid in the proper positioning, supporting, and retaining of the load.

4-2.1.2 Service Jacks. The saddle configuration shall have upward protrusion such as lugs, lips, or tangs to aid in the proper positioning, supporting, and retaining of the load. The jack shall be designed to ensure that the saddle remains within 3 deg parallel to the jack-supporting surface before and after performing each saddle periphery test of para. 4-4.3.2. The load shall be lifted throughout the range, starting with the lift arm parallel to the jack-supporting surface and continuing to the maximum height (see Figure 4-2.1.2-1). The saddle periphery, throughout the lifting range as defined above, shall not move outside the imaginary perimeter established by lines connecting centerlines of the front and rear wheels and/or caster pivot points (see Figure 4-2.1.2-2). (24)

4-2.1.3 Forklift Jacks. The primary saddle shall have raised protrusions on the surface to grip the load, and/or shall incorporate means intended to engage an edge on the load to be lifted. Other saddles may be included, e.g., an integrated lift point in the lifting member or a secondary saddle not located on the lifting member. Saddles may be separately rated.

Figure 4-1.3-1
Typical Single-Stage Hydraulic Jack

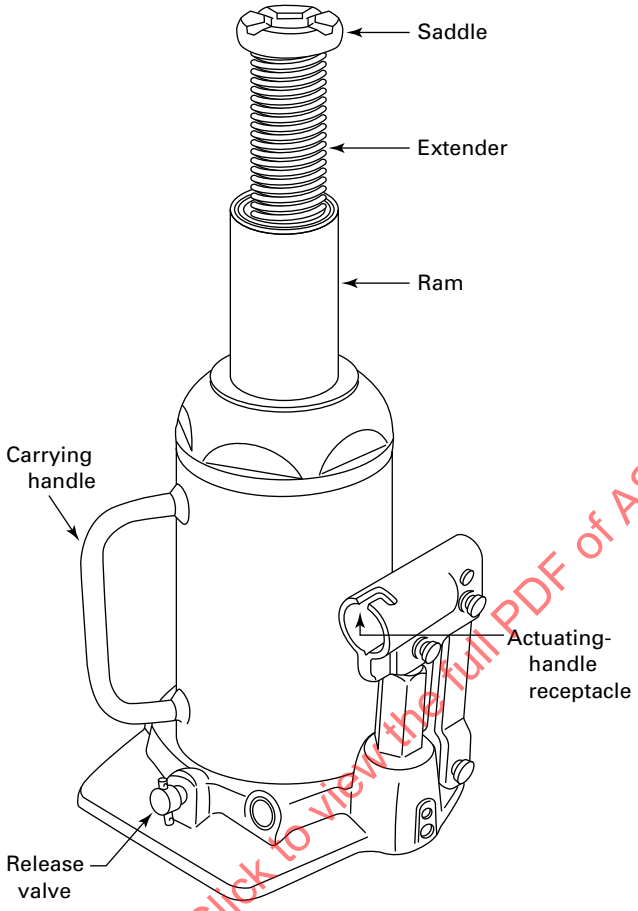


Figure 4-1.3-2
Typical Multiple-Stage Hydraulic Jack

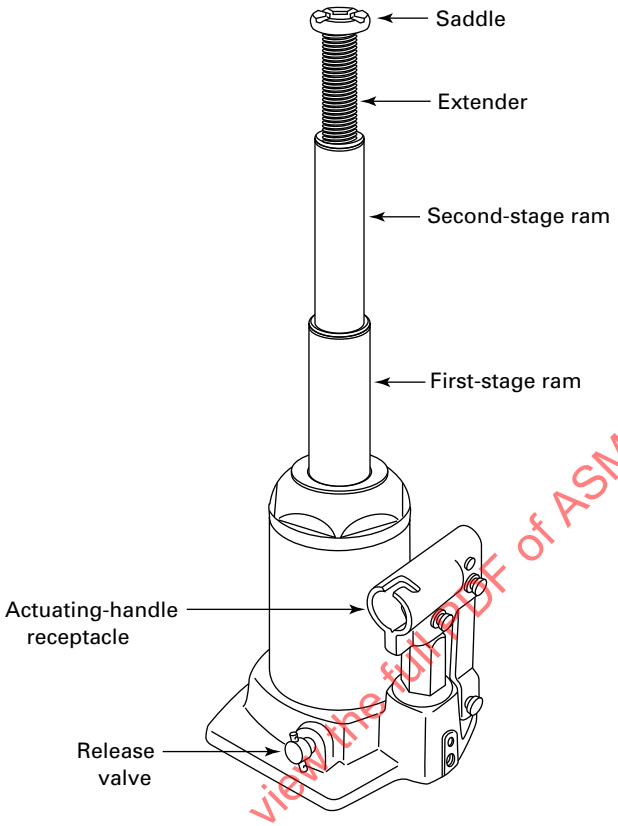


Figure 4-1.3-3
Typical Pneumatic/Hydraulic Jack

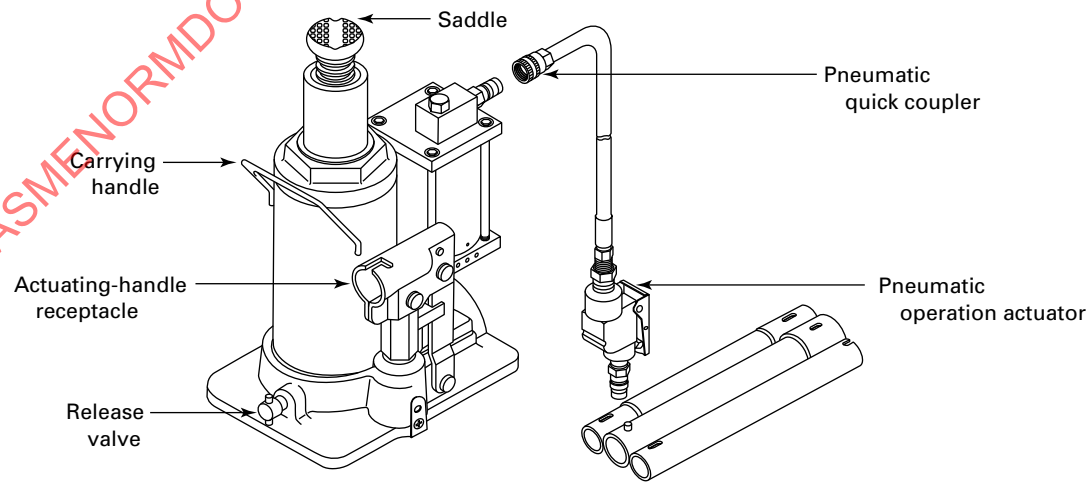


Figure 4-1.3-4
Typical Wheeled Pneumatic/Hydraulic Jack

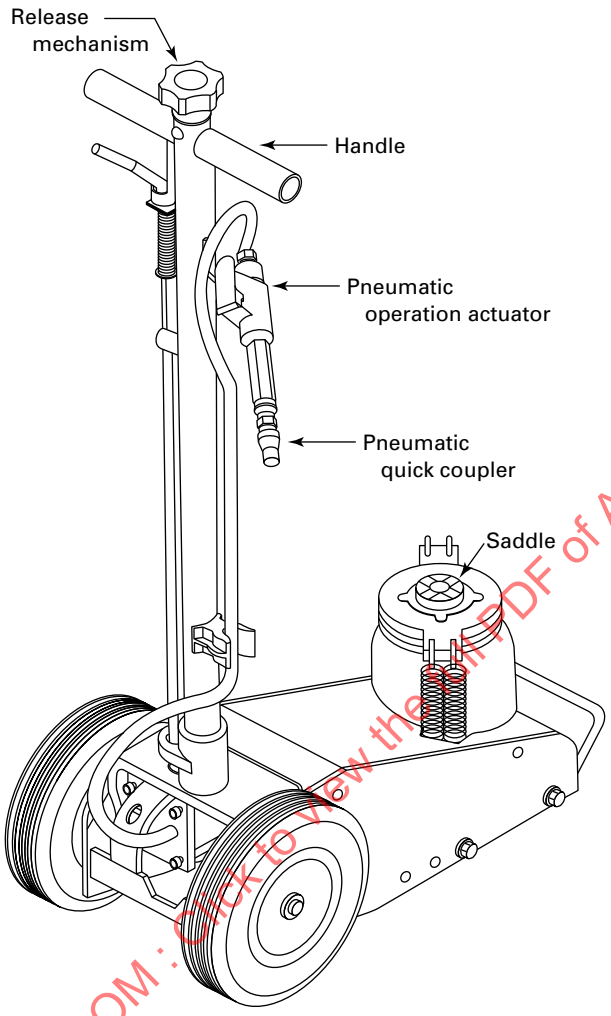
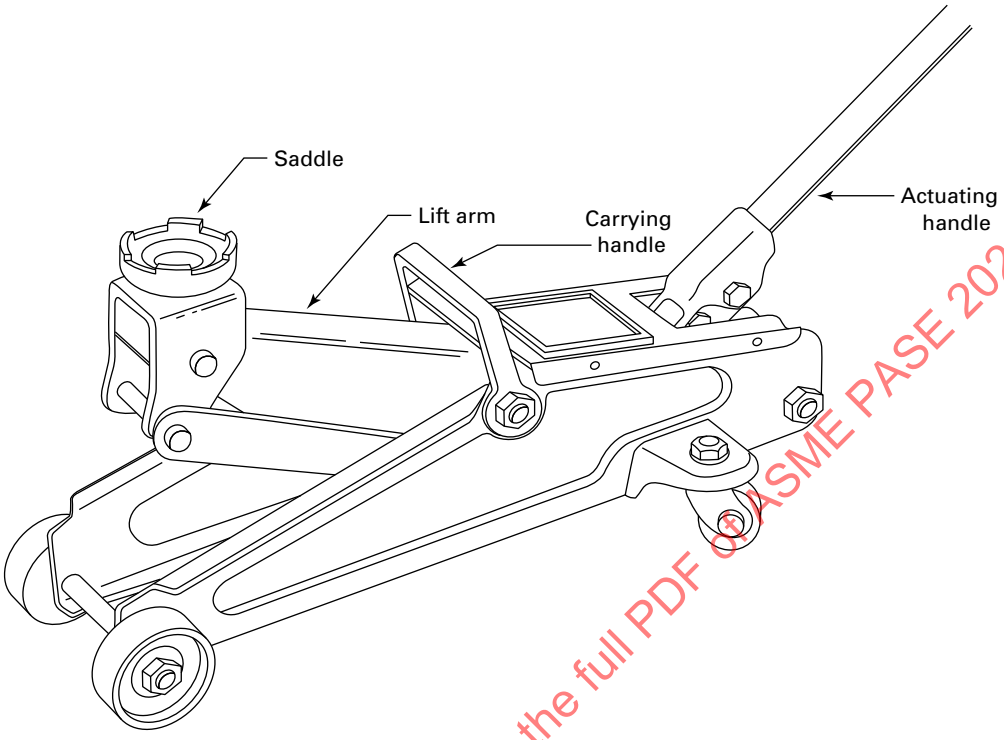
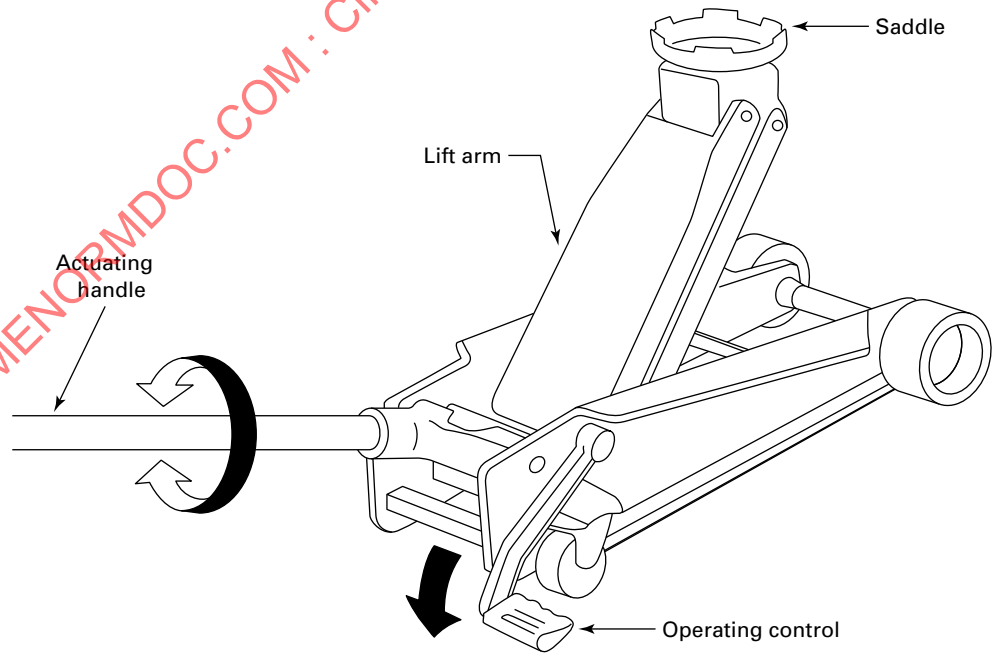


Figure 4-1.3-5
Typical Hydraulic Service Jacks

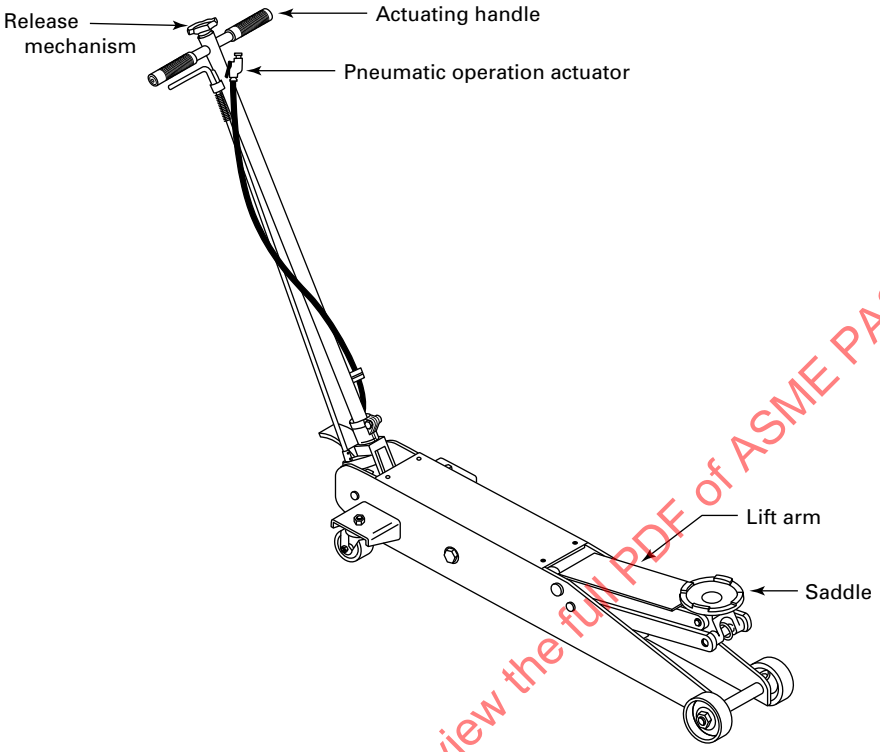


(a)

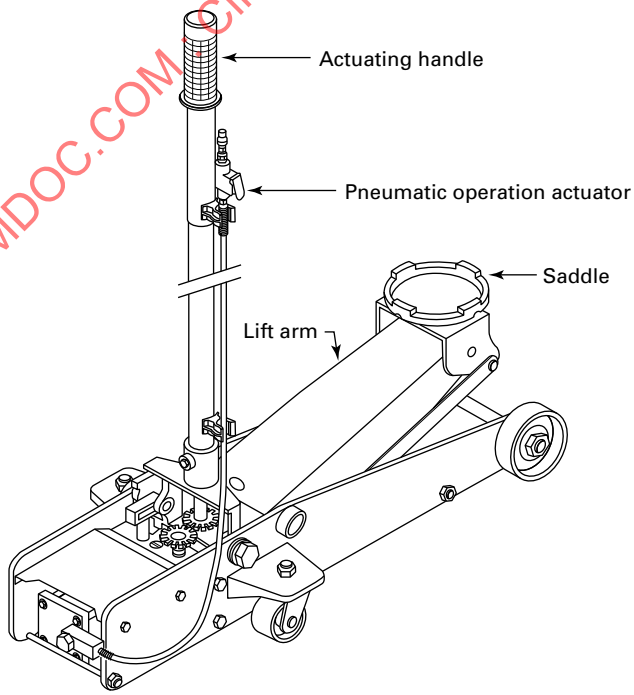


(b)

Figure 4-1.3-6
Typical Pneumatic/Hydraulic Service Jacks



(a)



(b)

Figure 4-1.3-7
Typical Forklift Jack

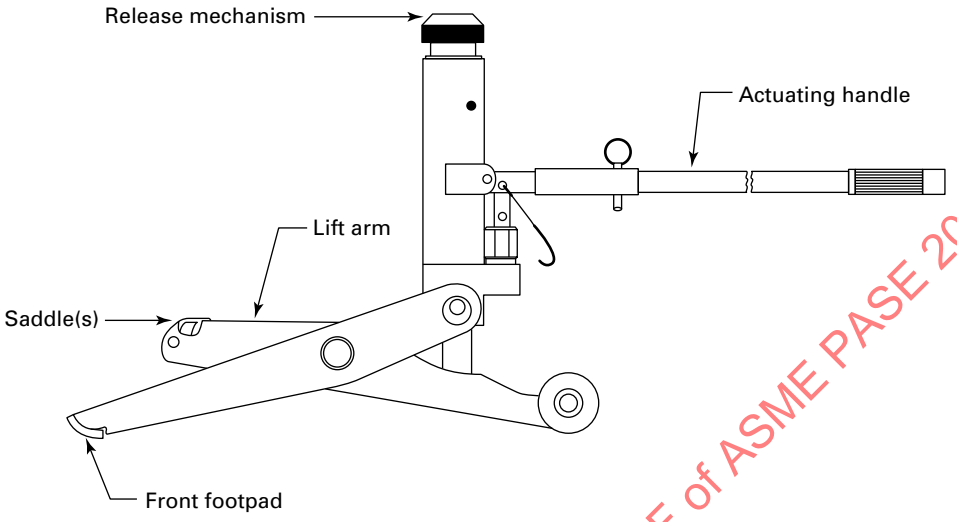
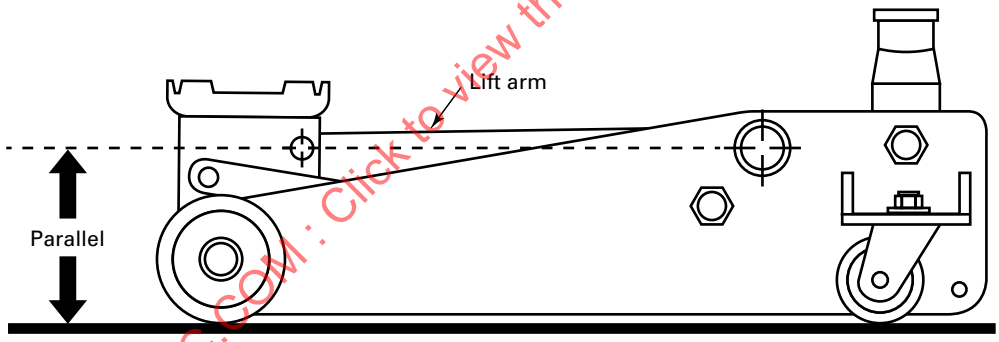
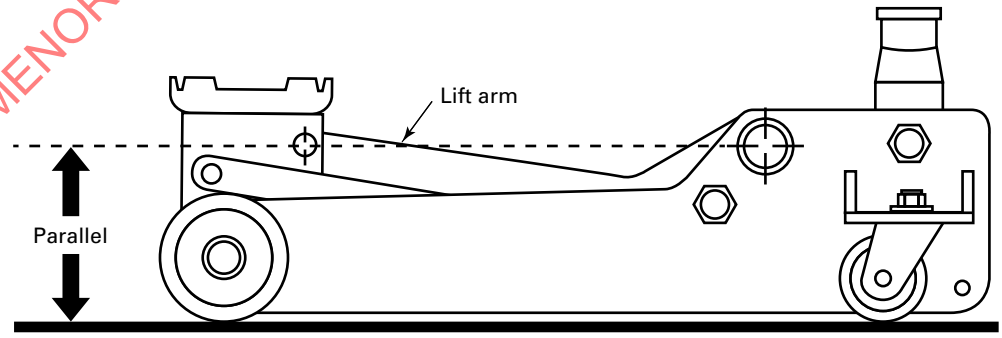


Figure 4-2.1.2-1
Lift Arm Parallel

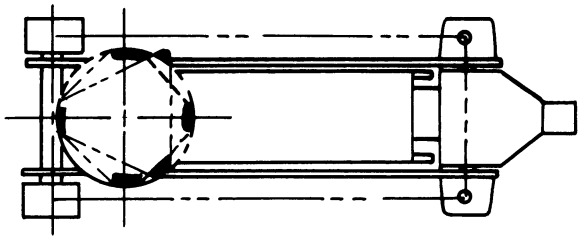


(a)



(b)

Figure 4-2.1.2-2
Saddle Periphery Limits



4-2.2 Proof Load

Each jack shall be capable of performing the proof load test of para. 4-4.4 with a proof load of 150% of rated capacity.

4-3 SAFETY MARKINGS AND MESSAGES

4-3.1 Safety Markings

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating this device.

(b) Do not exceed rated capacity.

(c) Use only on a hard, level surface capable of supporting the load.

(d) Support the vehicle with appropriate means immediately after lifting.

(e) Failure to heed these markings may result in personal injury, property damage, or both.

4-3.2 Safety Messages

4-3.2.1 General. The following are examples of safety messages:

(a) Lift only on areas of the vehicle as specified by the vehicle manufacturer.

(b) No alterations shall be made to this product.

(c) Only attachments and/or adapters supplied by the manufacturer shall be used.

4-3.2.2 Additional Safety Messages for Service Jacks. The following is an example of an additional safety message for service jacks: Do not move or dolly the vehicle while it is on the jack.

4-3.2.3 Additional Safety Messages for Forklift Jacks. The following is an example of an additional safety message for forklift jacks: Position this jack perpendicular to the vehicle such that the load is balanced by the remaining two wheels in contact with the surface.

4-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the requirements in paras. 4-4.1 through 4-4.4 apply.

4-4.1 Load Tests (24)

Each jack's ability to sustain a load and limit a load shall be tested by applying a load centrally to the saddle with the lifting mechanism positioned as follows:

(a) self-contained hydraulic jacks — with the ram fully extended and the extender, if so equipped, fully extended, and/or adapters in place. Jacks with multiple ratings shall be tested at the rated load for each stage.

(b) service jacks — with the lift arm parallel to the lifting surface (see Figure 4-2.1.2-1). The parallel position shall be established when the load is applied and the lifting arm is parallel to the lifting surface. This test shall be repeated with the extender in the fully extended position and/or with the adapter in place, if so equipped.

(c) forklift jacks — with the lifting member raised approximately 0.5 in. (12.7 mm) above its lowest position.

4-4.1.1 Load-Sustaining Test. A load of rated capacity shall not lower more than 0.125 in. (3.18 mm) in the first minute nor more than a total of 0.1875 in. (4.76 mm) in 10 min. The initial measurement shall be taken when the load is applied, and the other measurements at the time period specified.

4-4.1.2 Load-Limiting Device Test. The load-limiting device shall activate when lifting no less than 100% of rated capacity but no more than 125% of rated capacity.

4-4.2 Release Test

The release valve shall be operated to control the rate of descent to no more than 1.0 in./sec (25.4 mm/s). A load equal to or greater than the rated capacity shall be applied centrally to the saddle with the lifting mechanism positioned as follows:

(a) self-contained hydraulic jacks — with the ram at its full extension.

(b) service jacks and forklift jacks — with the lift arm at full extension. The jacks shall be tested over the full lifting range.

4-4.3 Off-Center Load Test

4-4.3.1 Self-Contained Hydraulic Jack Angular Load Test. A proof load, as defined in para. 4-2.2, shall be applied to the edge of the saddle of the jack with the extender, if so equipped, fully extended and/or adapters in place, and the jack at its full extension while the jack's base is placed on a 5-deg slope relative to the axis of the applied load.

4-4.3.2 Service Jack Saddle Periphery Test. The lift point of the jack at the saddle shall be divided, using imaginary lines, into segments as shown in Figure 4-4.3.2-1. Lift point no. 1 of the saddle periphery (see para. 4-2.1.2) shall be loaded to rated capacity, the load to be applied over a contact area not greater than 1.0 in.^{2} (645 mm^2). The jack shall be tested throughout

the range, from the lift arm parallel to the lifting surface to the maximum height. The load shall be removed and the jack checked for compliance with para. 4-2.1.2. The procedure shall be repeated until all remaining lift points of the saddle periphery have been tested in lift point nos. 2 through 4. The orientation of the lift points of saddles that are neither square nor circular shall be rotated for each successive test to provide the maximum distance from the saddle centerline to the load point on the segment line. This test shall be repeated with the extender in the fully extended position and/or with the adapter in place, if so equipped.

Prior to each test described above, the jack shall be placed on a smooth, flat surface with the rear wheels or casters in contact with the surface and loaded with sufficient force, not to exceed the rated capacity, to remove all vertical play in the wheels or casters.

4-4.3.3 Forklift Off-Center Load Test. A vertical load equal to the rated capacity shall be applied and sustained by means of a 1.0-in. (25.4-mm) wide rectangular block through the entire lifting range and maintained for 10 min on each outermost edge at full extension prior to lowering.

4-4.4 Proof Load Tests

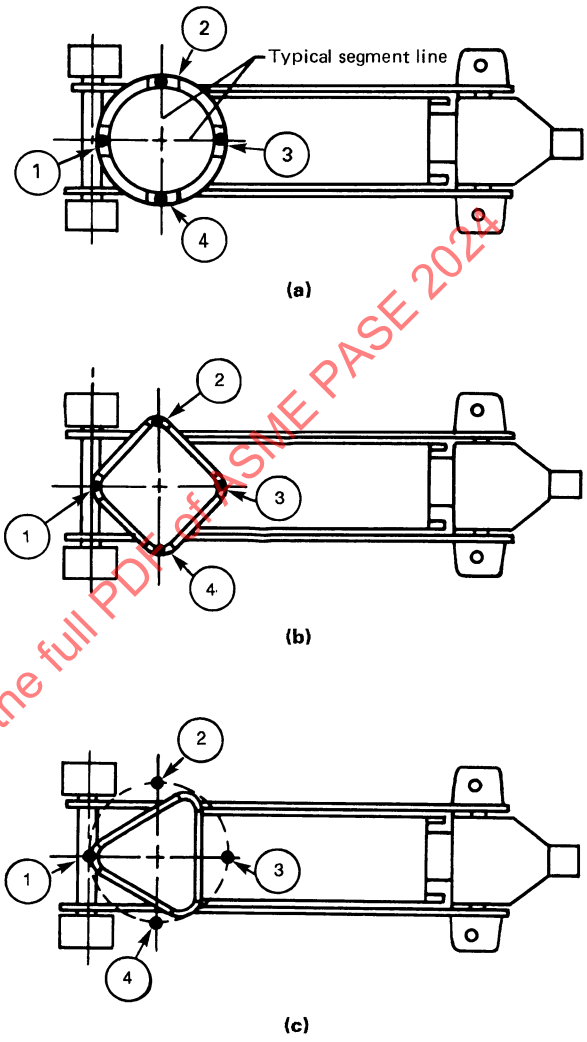
A proof load, as defined in para. 4-2.2, shall be applied centrally to the saddle. The load shall be lifted, sustained, and lowered throughout the range of travel. For purposes of this test, any internal load-limiting device should be deactivated. A handle may be substituted to accommodate the load. The following conditions apply:

(a) Self-contained hydraulic jacks proof test is fulfilled by the angular load test.

(b) Service jacks shall be tested through the range from the lift arm parallel to the lifting surface to full extension. This test shall be repeated with the extender in the fully extended position and/or with the adapter in place, if so equipped.

(c) Forklift jacks shall be tested with the lifting member raised approximately 0.5 in. (12.7 mm) above its lowest position to full extension. All saddles and integrated lift points shall be tested separately.

Figure 4-4.3.2-1
Saddle Periphery Test



Part 5
Automotive Mechanical Jacks

5-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

5-1.1 Scope

This Part applies to mechanical jacks for lifting but not supporting a load. This Part does not include mechanical jacks used for emergency tire changing.

(24) 5-1.2 Configuration

Configurations are as follows:

(a) mechanical screw jacks consisting of concentric telescoping screws or a single screw, that actuate an adapter or saddle, extended and retracted by a gear system, for engaging a load

(b) mechanical ratchet jacks consisting of a lever-actuated ratchet for engaging a load

(c) hinged jacks (mechanical, electrical, hydraulic, or pneumatic actuation) consisting of linkages united by pivotal joints for engaging a load

5-1.3 Illustrations

The illustrations show typical jacks covered by this Part and are not intended to be all-inclusive. Figure 5-1.3-1 shows typical mechanical screw jacks. Figure 5-1.3-2 shows typical mechanical ratchet jacks. Figure 5-1.3-3 shows a typical hinged jack.

5-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 5-2.1 through 5-2.4 apply.

5-2.1 Design Requirements

(a) The jack shall be capable of lifting and sustaining its rated capacity throughout its range of travel, except that hinged jacks shall follow a height-to-weight curve.

(b) It shall not be possible to assemble the jack incorrectly.

(c) Each jack shall be provided with a positive means to prevent inadvertent disassembly.

(d) Combinations of PASE configurations shall conform to the requirements of each.

5-2.2 Proof Load

Each jack shall be capable of performing the proof load test of para. 5-4.2 with a proof load of 150% of rated capacity.

5-2.3 Hinge Points

All hinge points shall be designed and assembled to resist lateral movement (or buckling) detrimental to the jack's performance.

5-2.4 Lubrication

The jack shall be lubricated by the manufacturer.

5-3 SAFETY MARKINGS AND MESSAGES

5-3.1 Safety Markings

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating this device.

(b) Do not exceed rated capacity.

(c) Use only on a hard, level surface capable of supporting the load.

(d) Support the load with appropriate means immediately after lifting.

(e) Failure to heed these markings may result in personal injury, property damage, or both.

5-3.2 Safety Messages

The following are examples of safety messages:

(a) Lift only on areas of the vehicle as specified by the vehicle manufacturer.

(b) No alterations shall be made to this product.

(c) Only attachments and/or adapters supplied by the manufacturer shall be used.

Figure 5-1.3-1
Typical Mechanical Screw Jacks

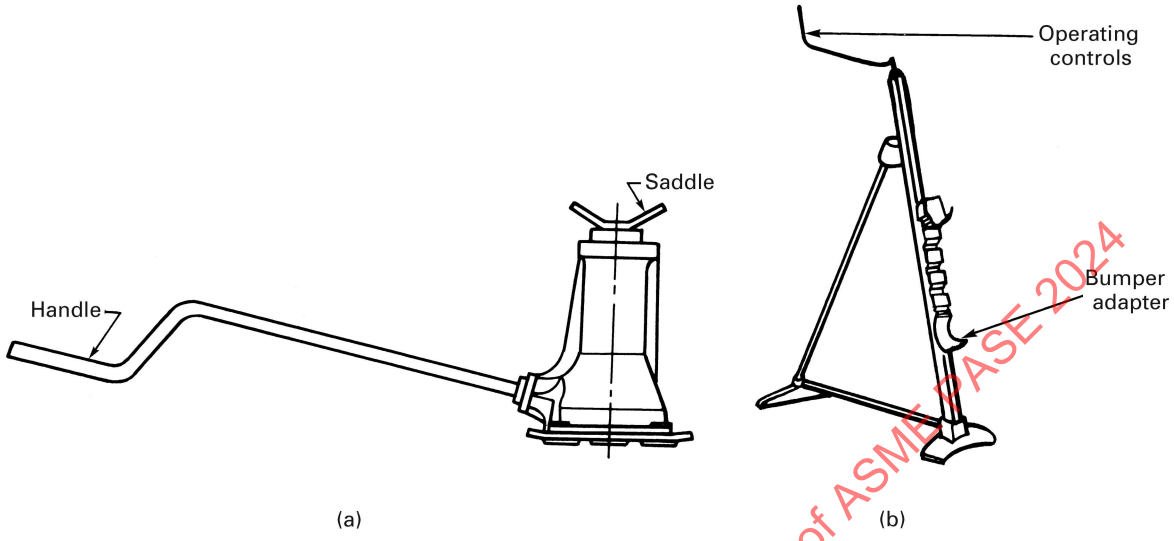


Figure 5-1.3-2
Typical Mechanical Ratchet Jacks

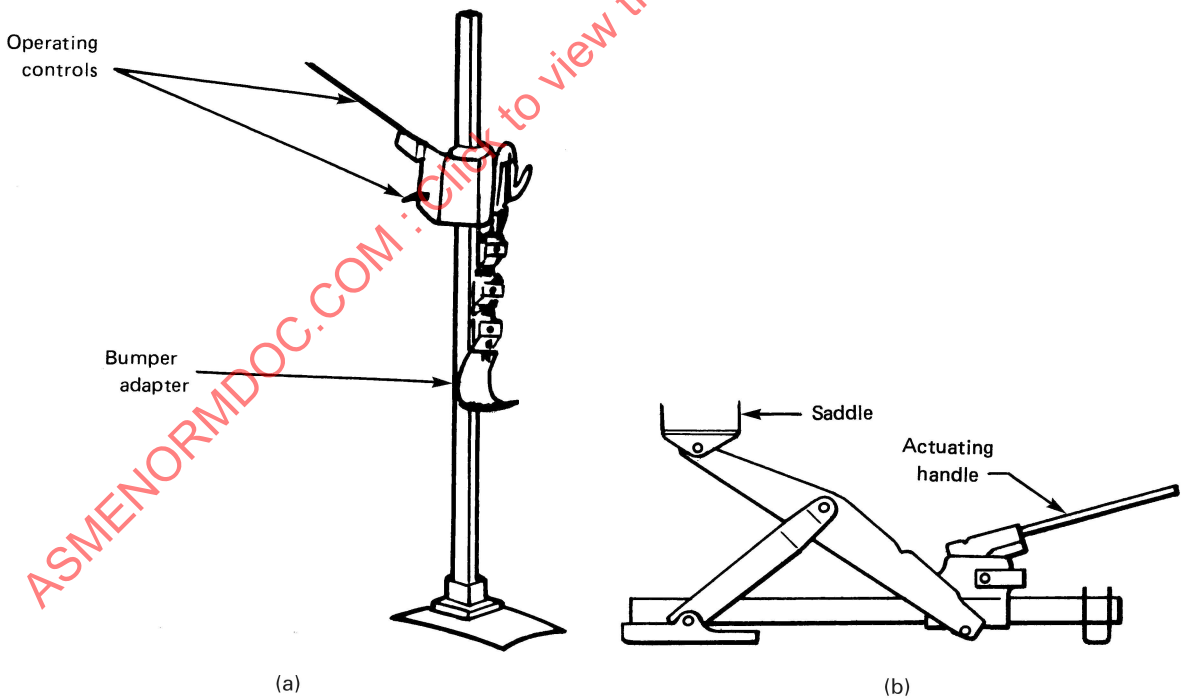
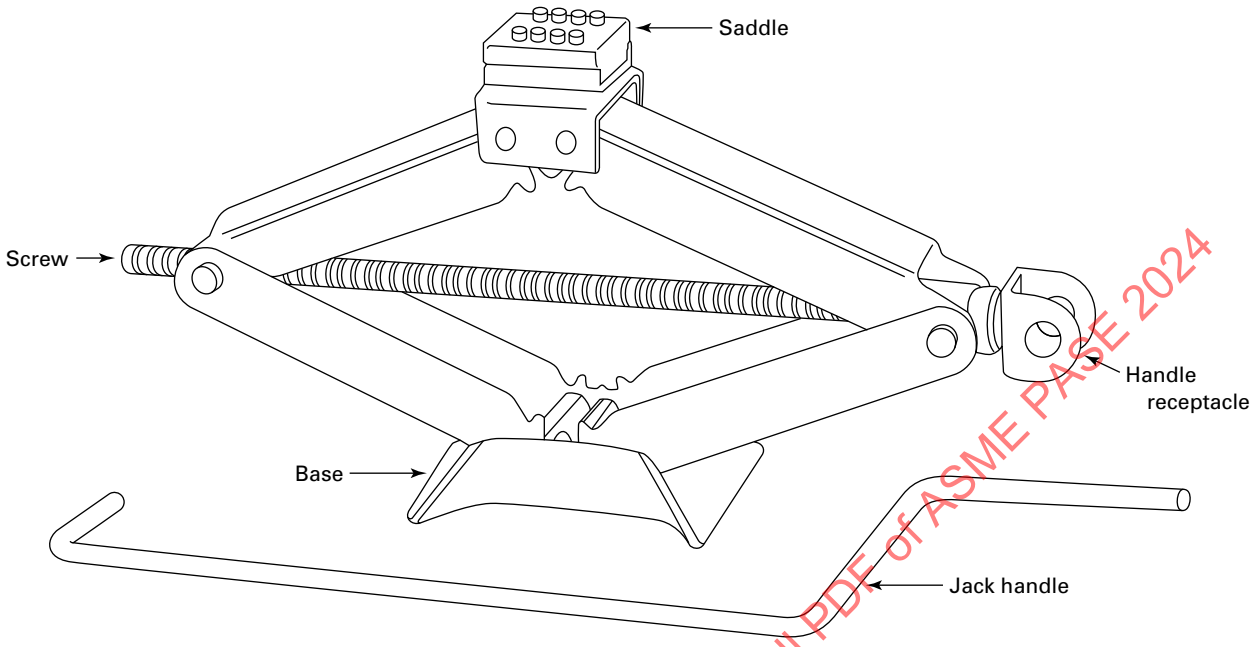


Figure 5-1.3-3
Typical Hinged Jack



5-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the following requirements apply: For each design or design change that may affect the jack's ability to meet this Standard, sample jacks built to design specifications shall be load tested. To conform to this Standard, the jacks shall perform to design specifications and no functional damage shall occur, nor shall operational characteristics be detrimentally affected.

(24) ### 5-4.1 Load Tests

Each jack's ability to sustain a load and limit a load shall be tested by applying a load centrally to the saddle or adapter with the lifting mechanism positioned as follows and using the jack's actuating handle to raise and lower the load over the entire range of the jack.

5-4.1.1 Load-Sustaining Test. A load of rated capacity shall not lower more than 0.125 in. (3.18 mm) in the first minute nor more than a total of 0.1875 in. (4.76 mm) in 10 min. The initial measurement shall be taken when the load is applied when fully raised and fully lowered, and the other measurements at the time period specified.

5-4.1.2 Off-Center Load Test. A proof load as defined in para. 5-2.2 shall be applied to the edge of the saddle of the jack, with the extender, if so equipped, fully extended and/or adapters in place, and the jack at its full extension while the jack's base is placed on a 5-deg slope relative to the axis of the applied load.

5-4.2 Proof Load Test

A proof load, as defined in para. 5-2.2, shall be applied to the saddle or adapter. The load shall be lifted, sustained, and lowered throughout the range of travel. A substitute handle may be used for the performance of this test. Inability of the jack to return, unloaded, to within 0.5 in. (12.7 mm) of the fully raised, pretest position at the completion of this test constitutes failure.

For hinged jacks, the jack shall sustain, for 10 min, a proof load, applied to the saddle, equal to 150% of the rated capacity based on the height-to-weight curve provided by the manufacturer at the following positions: 35%, 60%, and 100% of the range of travel. Inability of the jack to return, unloaded, to within 0.5 in. (12.7 mm) of the fully raised, pretest position at the completion of this test constitutes failure.

Part 6
Automotive Stands

6-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

6-1.1 Scope

This Part applies to

(a) vehicle stands used in identical pairs for supporting one end of a vehicle at predetermined height

(b) high-reach stands designed to support a vehicle with two or more identical pairs after the vehicle has been raised by an automotive lift and the automotive lift has been removed

(c) supplementary stands used to stabilize a vehicle while the vehicle is engaged on an automotive lift

(d) auxiliary stands designed as a means of partial support for, and positioning of, vehicle components during their installation and removal, but not for use in stabilizing or supporting vehicles

6-1.2 Configuration

Vehicle stands, high reach stands, and supplementary stands are automotive supporting devices constructed with a saddle and column retained by a base. The column can be fixed, or adjustable and retained by a locking device to hold the column in the selected height position.

Auxiliary stands are freestanding devices that may be manipulated to position components.

6-1.3 Illustrations

The illustrations show typical stands covered by this Part and are not intended to be all-inclusive. Figure 6-1.3-1 shows typical vehicle support stands, Figures 6-1.3-2 and 6-1.3-3 show typical high-reach vehicle support stands, Figure 6-1.3-4 shows a typical high-reach supplementary stand, and Figure 6-1.3-5 shows typical auxiliary stands.

6-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 6-2.1 through 6-2.4 apply.

6-2.1 Base

The base may be any configuration that provides the equivalent of three or more points of contact with the floor. A circular, triangular, or polygon base shape (see Figure 6-2.1-1) is considered equivalent to the above. The upper portion of the base structure shall be designed to house and guide the column.

6-2.2 Column

A means shall be provided to prevent use at heights beyond the intended range. Stands utilizing rack-and-pawl-type locks (see Figure 6-1.3-1) shall have a means provided to prevent the inadvertent separation of the column from the base. In the fully retracted position, the lower end of the column shall not extend below the plane made where the base contacts the floor. The column-and-base juncture of high-reach stands should be configured to limit the potential for a pinch point between the base and the column when the column is fully retracted.

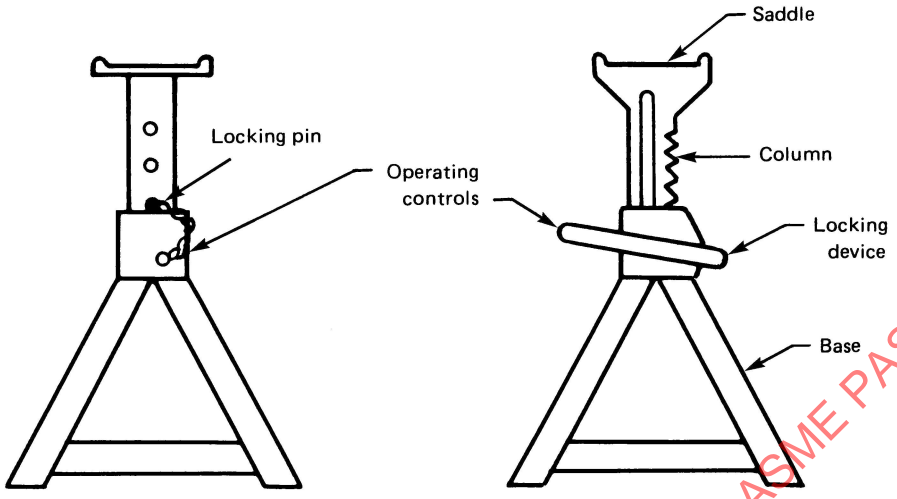
6-2.3 Locking Device (24)

The locking device of vehicle stands, high-reach stands, and supplementary stands shall prevent adjustment of the column height after the load has been applied. If the column is supported by means of a locking pin, the pin shall be attached to the stand to prevent its removal. Screw connections are considered self-locking if an axially applied force does not cause the screw to turn. Otherwise, a nut may be required to lock the screw connection and prevent adjustment.

6-2.4 Saddle

The saddle configuration shall be such as to aid in the proper positioning, supporting, stabilizing, and retaining of the load.

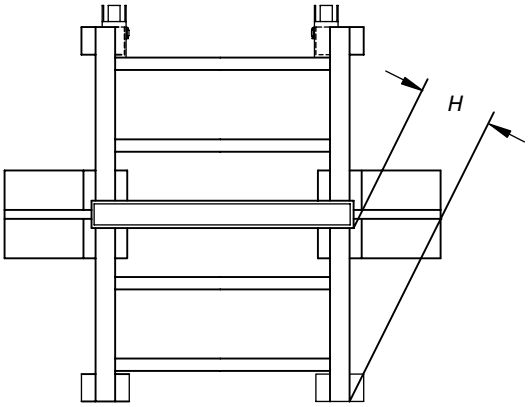
Figure 6-1.3-1
Typical Vehicle Support Stands



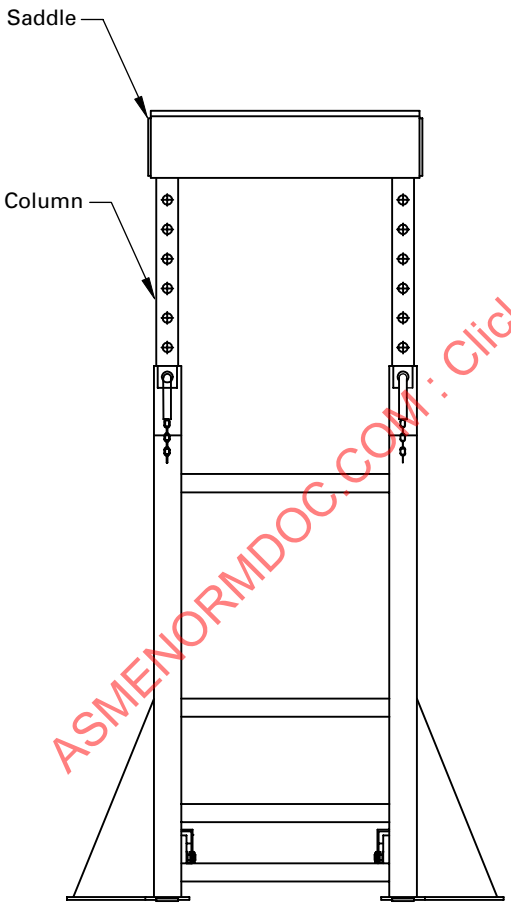
(a) Pin-Type Lock

(b) Rack-and-Pawl-Type Lock

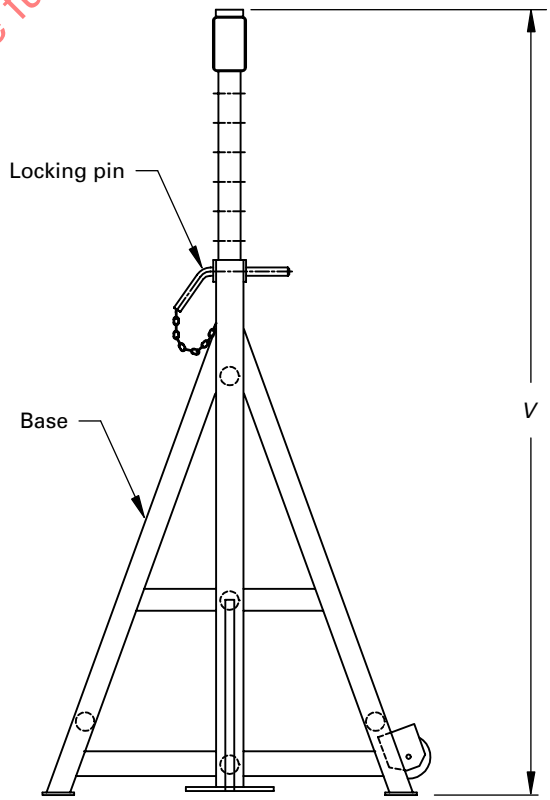
Figure 6-1.3-2
Typical High-Reach Fixed Stand, Sawhorse Type



(a) Top View

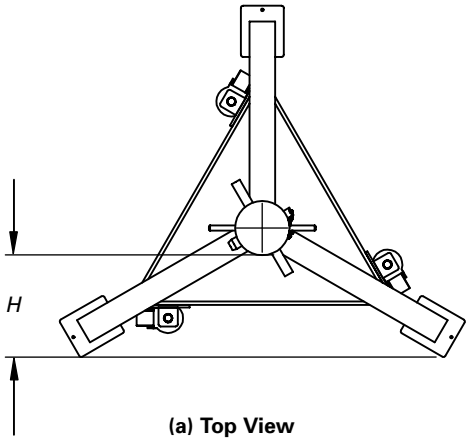


(b) Side View

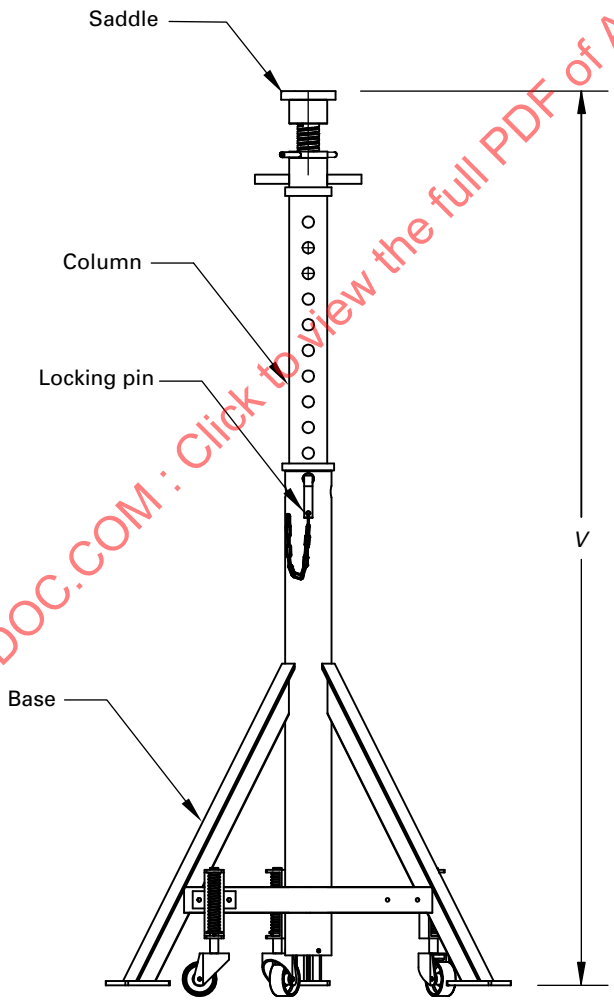


(c) End View

Figure 6-1.3-3
Typical High-Reach Fixed Stand, Tripod Type



(a) Top View



(b) Side View

Figure 6-1.3-4
Typical High-Reach Supplementary Stand

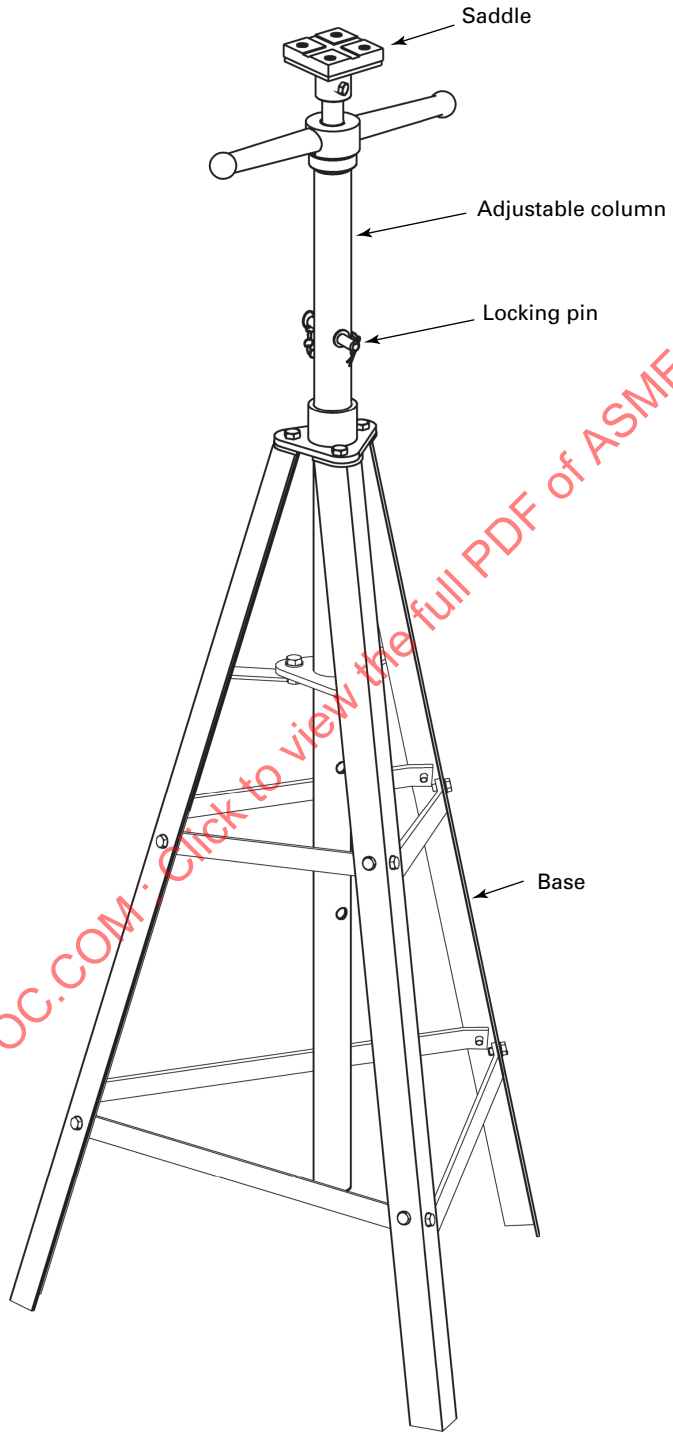
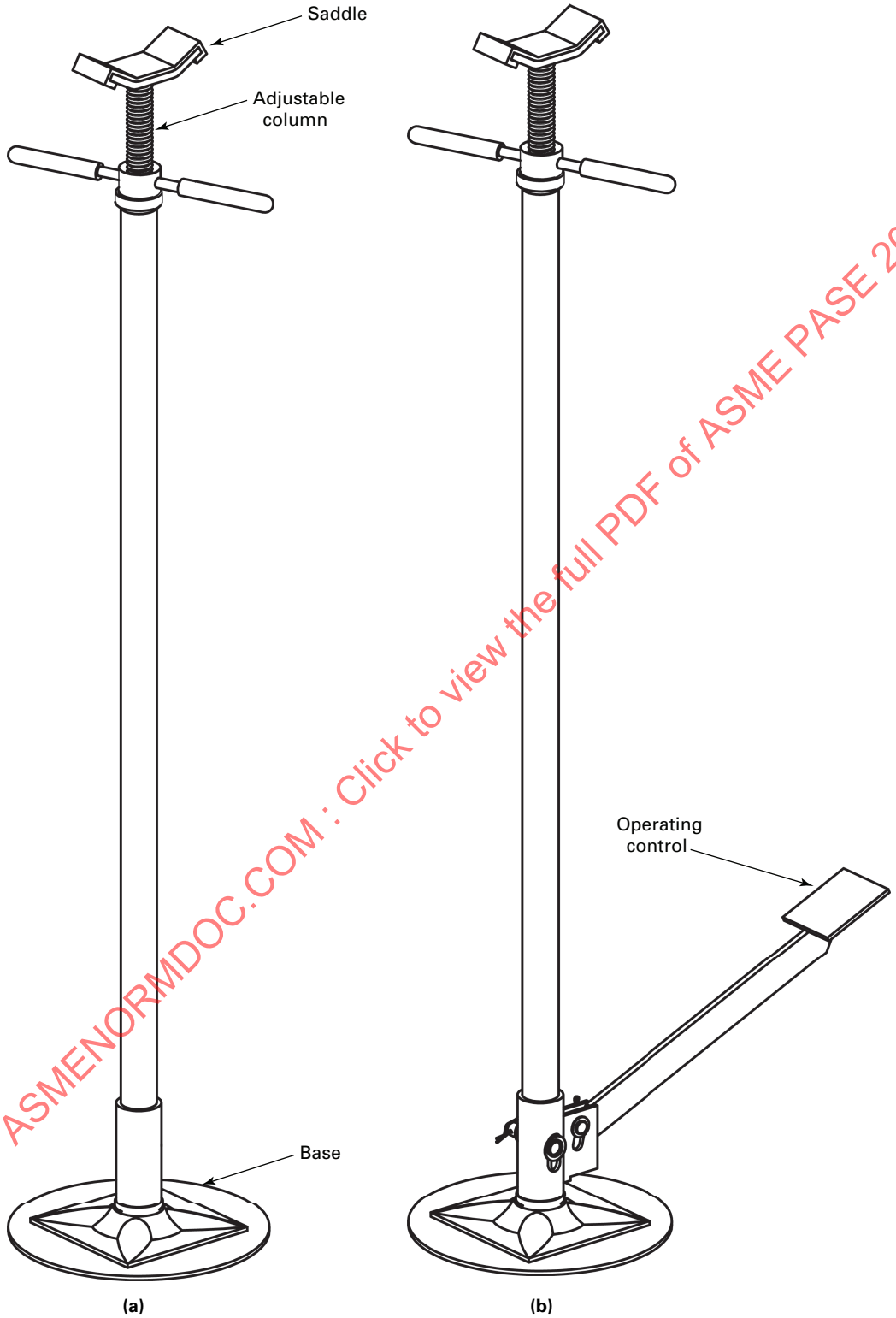


Figure 6-1.3-5
Typical Auxiliary Stands



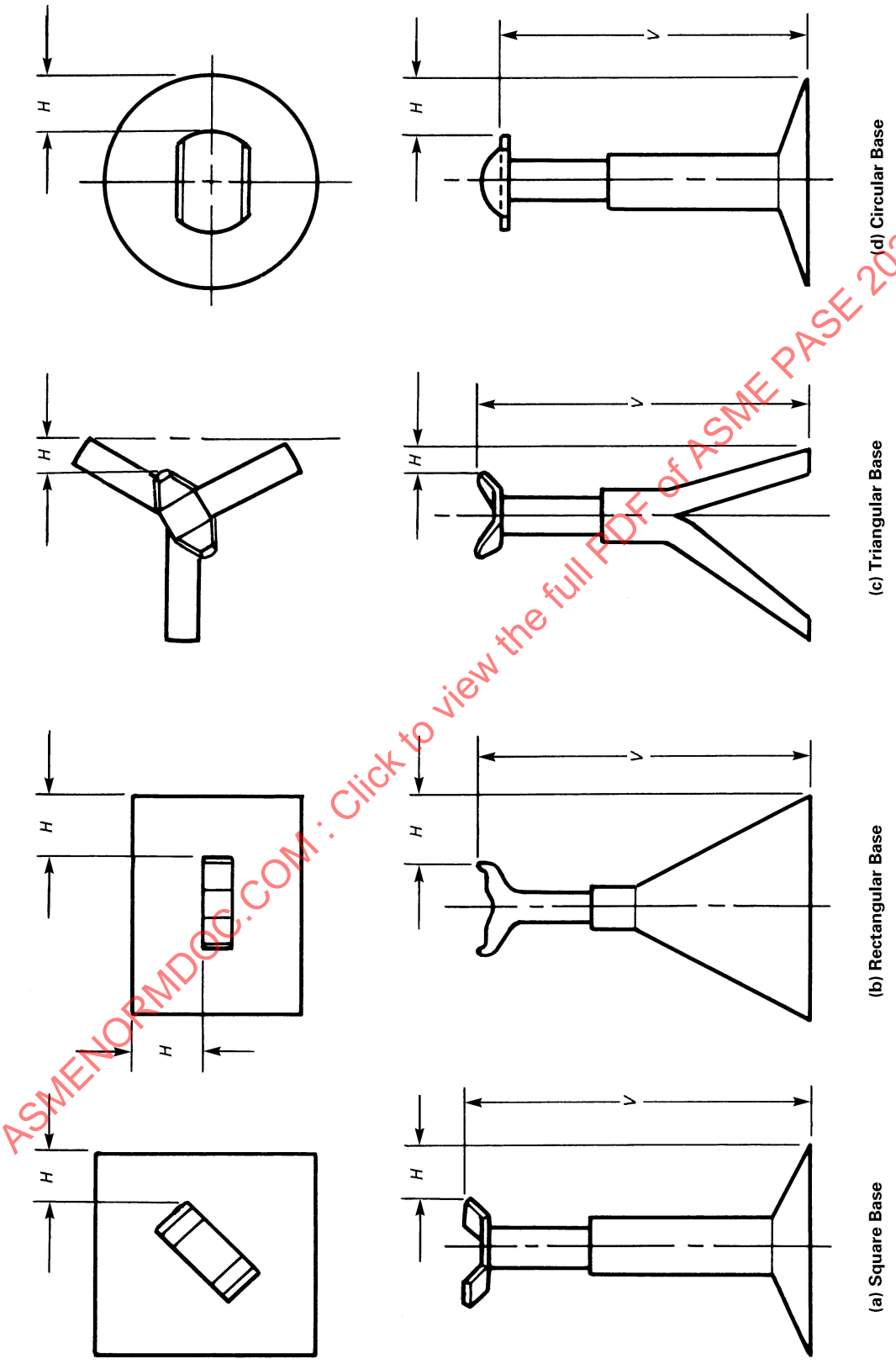


Figure 6-2.1-1
Horizontal Dimensions and Vertical Heights for Stability

6-2.5 Wheels

If wheels are provided on the base to facilitate relocation of the stand, the wheels shall not be subject to load when the stand is loaded.

6-2.6 Stability

Vehicle stands, high-reach stands, and supplementary stands shall be designed so that the minimum horizontal distance from the projected edge of the saddle to the nearest edge of the base is

(a) 8% for vehicle stands

(b) 8% for high-reach stands

(c) 4% for supplementary stands

See Figure 6-2.1-1, in which the horizontal dimension is shown as *H* and the vertical height as *V*. The column shall be moved by hand to remove all slack in the direction of the vertical measurement.

Auxiliary stands shall be freestanding.

6-2.7 Proof Load

Each stand shall be capable of performing the proof load test of para. 6-4.1.2 with a load of 200% of rated capacity.

6-3 SAFETY MARKINGS AND MESSAGES

(24)

6-3.1 Safety Markings

The following are examples of safety markings:

(a) Vehicle Stands

(1) Study, understand, and follow all instructions before operating this device.

(2) Use only as an identical pair.

(3) Maximum load capacity per identical pair shall not exceed the rated capacity of the individual stand.

(4) Use stands to support one end of a vehicle only.

(5) Use only on a hard, level surface capable of supporting the load.

(6) Center load on saddle.

(7) Locate saddles at vehicle manufacturer's designated support points.

(8) Ensure the locking device is fully engaged with the column before lowering vehicle onto stands.

(9) Carefully lower vehicle onto both stands simultaneously.

(10) Failure to heed these markings may result in personal injury, property damage, or both.

(b) High-Reach Stands

(1) Study, understand, and follow all instructions before operating this device.

(2) Use a minimum of four stands to support and stabilize a vehicle, and a minimum of two additional stands for each additional axle assembly, before starting repairs.

(3) Do not exceed rated capacity.

(4) Use only on a hard, level surface capable of supporting the load.

(5) The vehicle shall be raised only once to place vehicle support stands under the entire vehicle.

(6) Ensure stands are stable and vehicle is balanced before lowering the vehicle onto stands.

(7) Locate saddles at vehicle manufacturer's designated support points.

(8) Ensure the locking device is fully engaged with the column before lowering vehicle onto stands.

(9) Carefully lower the vehicle onto all stands simultaneously.

(10) Center load on saddles.

(11) Do not apply horizontal forces or large torque loads to vehicle while the vehicle is supported on stands.

(12) Failure to heed these markings may result in personal injury, property damage, or both.

(c) Supplementary Stands

(1) Study, understand, and follow all instructions before operating this device.

(2) Do not exceed rated capacity.

(3) Use only on a hard, level surface capable of supporting the load.

(4) Do not use the stand to support a vehicle.

(5) Center load on saddle.

(6) Use stands in pairs to stabilize the vehicle before starting repairs.

(7) Failure to heed these markings may result in personal injury, property damage, or both.

(d) Auxiliary Stands

(1) Study, understand, and follow all instructions before operating this device.

(2) Do not exceed rated capacity.

(3) Use only on a hard, level surface capable of supporting the load.

(4) Adequately support the vehicle before starting repairs.

(5) Center load on saddle.

(6) Do not use to support or stabilize vehicle.

(7) Failure to heed these markings may result in personal injury, property damage, or both.

6-3.2 Safety Messages

The following are examples of safety messages:

(a) All Automotive Stands. No alterations shall be made to this product.

(b) Vehicle Stands. Stands are not to be used to simultaneously support both ends of a vehicle.

(c) High-Reach Stands

(1) Only attachments, restraints, or adapters supplied by the manufacturer shall be used.

(2) Do not enter the vehicle or start the engine while the vehicle is supported on stands.

(d) Auxiliary Stands. This stand is intended to provide partial support of vehicle components during removal and installation.

6-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the requirements in para. 6-4.1 apply.

6-4.1 Load Tests

(24) **6-4.1.1 Off-Center Load Test.** Auxiliary stands are excluded from the off-center load test. For the off-center load test, a horizontally constrained vertical load equal to rated capacity shall be applied. The column and the saddle shall be moved to the most disadvantageous position. This test shall be conducted in both the fully extended position and the lowest possible position of the column that can be achieved regardless of whether the locking device is engaged. On saddles comprising lugs, the load shall be applied to the most disadvantageous lug. On flat saddles, the load shall be applied to the most disadvantageous edge by a load application surface flush with the edge and with a width not exceeding 1 in. (25.4 mm). The load shall be applied for at least 10 min on the lug or edge of the saddle as shown in Figure 6-4.1.1-1. The saddle's ability to retain the load shall not be adversely affected by this test. A permanent reduction in height, measured after the removal of the load, at the point of load contact as shown in Figure 6-4.1.1-1 shall not exceed 0.125 in. (3.18 mm). The test shall be repeated on all lugs and edges.

A preload of not more than 100% of rated capacity may be applied and removed to establish initial overall height.

6-4.1.2 Proof Load Test. A proof load, as defined in para. 6-2.7, shall be applied centrally to the saddle, with the column in both the fully extended position and the lowest possible position of the column that can be achieved regardless of whether the locking device is engaged, with the base resting on a hard, level surface. The load shall be applied as shown in Figure 6-4.1.2-1 for at least 10 min. A permanent reduction in overall height, measured after the removal of the load, at the point of load contact shall not exceed 0.125 in. (3.18 mm). A preload of no more than 100% of rated capacity may be applied and removed to establish initial overall height.

Figure 6-4.1.1-1
Application of Load for Off-Center Load Test

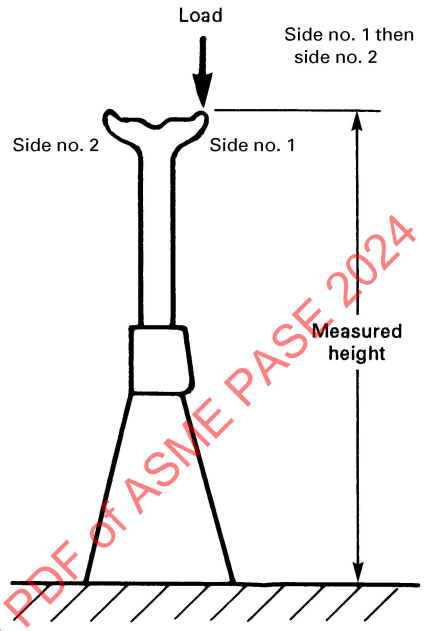
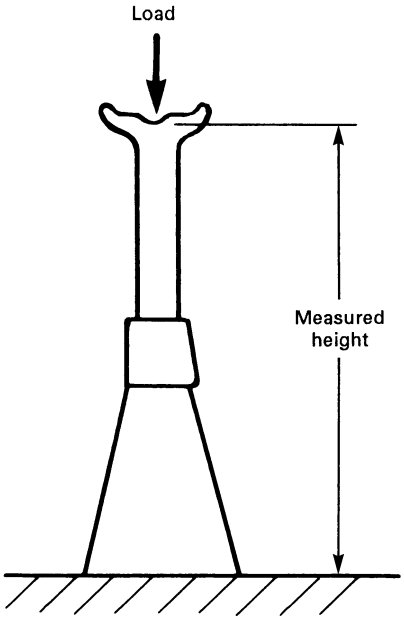


Figure 6-4.1.2-1
Application of Load for Centered Load Test



Part 7
Automotive Ramps

7-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

7-1.1 Scope

This Part applies to automotive ramps to be used as identical pairs to support one end of a vehicle. They are not to be used to simultaneously support both ends or one side of a vehicle.

7-1.2 Configuration

Automotive ramps covered by this Part are made in identical pairs, and have a sloping surface joined to a platform that locates and supports the vehicle by means of the tire.

7-1.3 Illustrations

Figure 7-1.3-1 shows typical automotive ramps that are covered by this Part; the illustrations are not intended to be all-inclusive.

7-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 7-2.1 through 7-2.5 apply.

7-2.1 Base

The base may be of any configuration that provides ramp stability under proof load and that resists longitudinal and lateral movement while a vehicle is being driven onto and off the ramps.

7-2.2 Stability

The ramps shall be designed such that the width of the base is equal to or greater than the height of the ramp platform. The projected edges of the incline and platform shall align with or be within the area of the base.

7-2.3 Surfacing

The top surface of the inclined portion of the ramps shall be constructed to provide slip resistance.

7-2.4 Locating Devices

The platform of the ramp shall be equipped with a device or configuration so that the vehicle operator or the observer will be able to ascertain that the wheel of the vehicle is in the correct location.

7-2.5 Resistance to Roll-Off

Each ramp shall have an inherent means of resisting roll-off of a vehicle from the ramp.

7-3 SAFETY MARKINGS AND MESSAGES

7-3.1 Safety Markings

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating this device.

(b) Do not exceed rated capacity.

(c) Use only on a hard, level surface capable of supporting the load.

(d) Center load between the sides of the ramp.

(e) Use as an identical pair to support one end of a vehicle.

(f) Failure to heed these markings may result in personal injury, property damage, or both.

7-3.2 Safety Messages

The following are examples of safety messages:

(a) Ramps are not to be used to simultaneously support both ends or one side of a vehicle.

(b) Maximum allowable tire width is [manufacturer to specify for each set of ramps].

(c) Do not use other lifting equipment in conjunction with the ramps.

(d) Do not disconnect brakes, engine, transmission components, drive train, drive shaft, universal joints, or wheels while the vehicle is on the ramps.

(e) Be sure the wheels to be driven on the ramps are positioned straight forward in alignment with the ramps, and center the two ramps against the tires.

(f) Another person, standing clear from the vehicle path, should observe and guide the vehicle operator when ascending and descending the ramps.

Figure 7-1.3-1
Typical Automotive Ramps

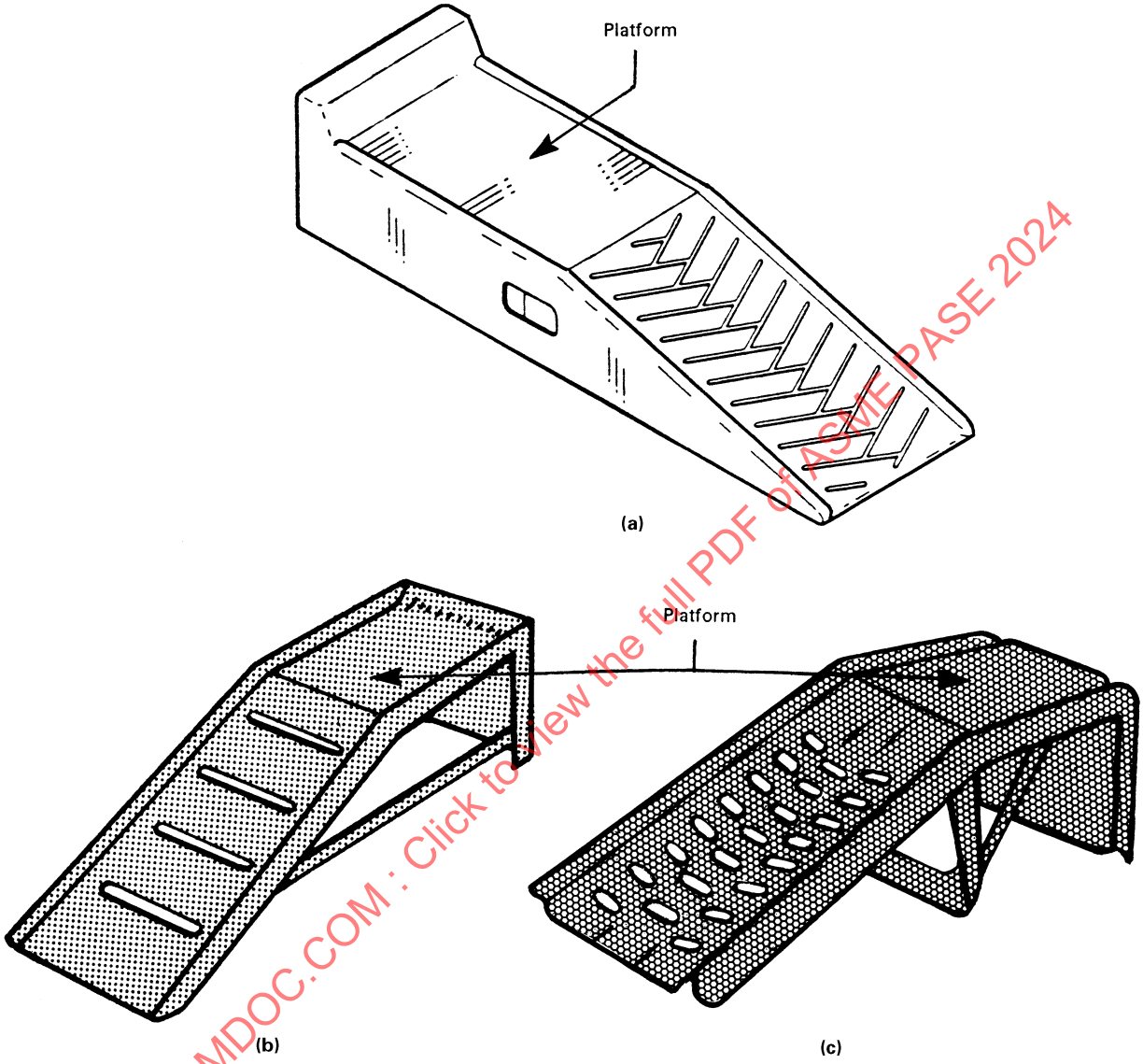
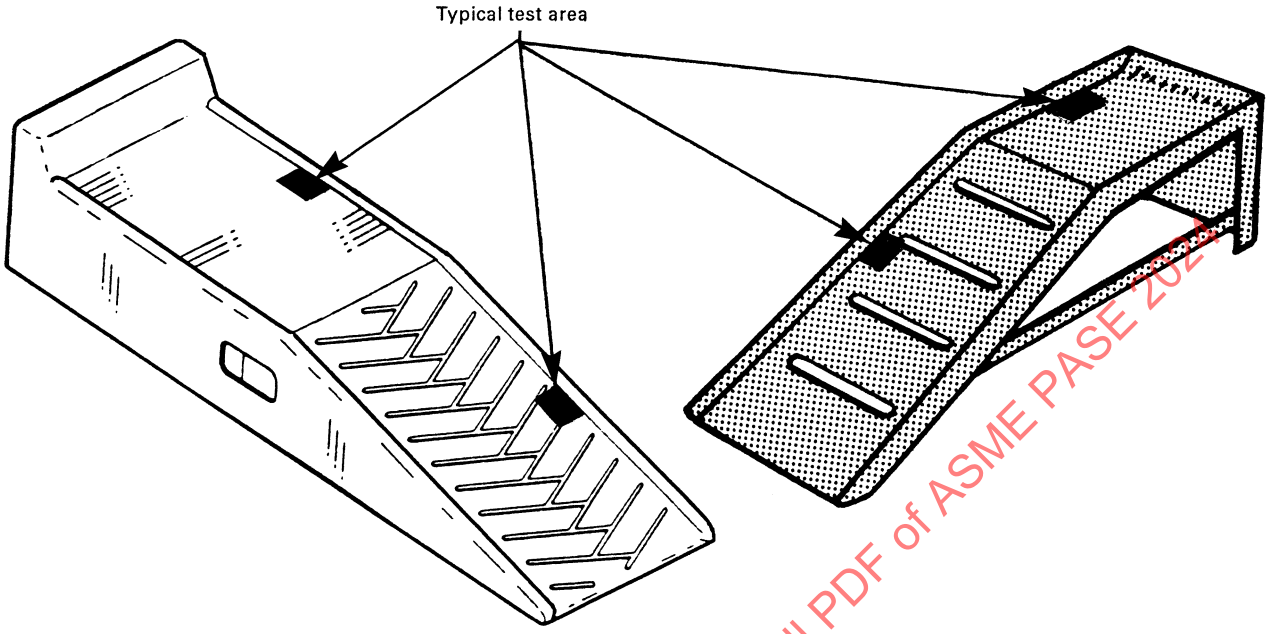


Figure 7-4.1.1-1
Typical Test Area for Off-Center Load Test



(g) Never accelerate or apply brakes suddenly. Proceed slowly and cautiously. Once the vehicle reaches the top of the ramps, apply brakes only to prevent roll-off.

(h) Place the vehicle in neutral. Release brakes; vehicle should not move. Set emergency brake. Place vehicle in park (or in reverse gear for manual transmission). Chock wheels on the ground.

(i) Be sure that both tires are properly positioned on the ramp's support platform. Use caution in positioning your body clear of danger; shake vehicle sideways and endways to be sure that vehicle and ramps are stable. Check that ramps have not become damaged or bent during loading.

(j) Supplier may provide information to assist the user in the selection of appropriately rated ramps for different gross vehicle weights.

(k) If assembly is required, follow the assembly instructions provided.

(l) No alterations shall be made to this product.

7-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the requirements in para. 7-4.1 apply.

7-4.1 Load Tests

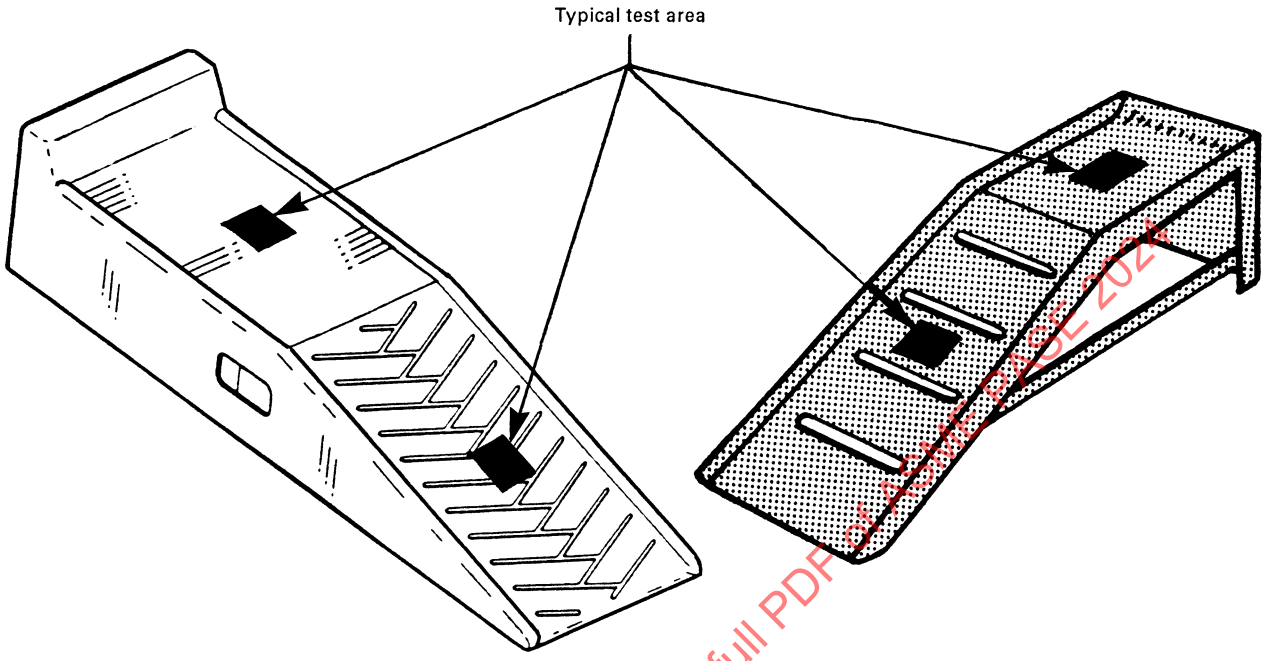
A platen nominally 4.0 in. (102 mm) long by 6.0 in. (152 mm) wide shall be used in conjunction with the tests specified in paras. 7-4.1.1 and 7-4.1.2.

NOTE: Material may be added to the platen to simulate a tire surface and prevent slippage of the platen.

7-4.1.1 Off-Center Load Test. A horizontally constrained vertical load equal to rated capacity shall be applied using the platen, first to the outside edge of the platform (one at a time) and second to the outside edges of the inclined portion of the ramp (one at a time), as shown in Figure 7-4.1.1-1, for a period of 10 min with the base resting on a hard, level surface.

7-4.1.2 Proof Load Test. A horizontally constrained vertical load of 200% of rated capacity shall be applied for at least 10 min at the midpoint of the ramp incline using the platen. The load shall then be applied for at least 10 min to the portion of the platform designed to receive the tire footprint. See Figure 7-4.1.2-1.

Figure 7-4.1.2-1
Typical Test Area for Proof Load Test



Part 8
Mobile Vehicle Lifts and Jacks

8-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

(24) 8-1.1 Scope

This Part applies to the following:

(a) upright mobile lifts

(1) end lifts used individually for lifting but not supporting one end of a vehicle

(2) wheel lifts used as an identical pair to lift and support one end of a vehicle by cradling opposing tires

(b) bridge jacks used on the floor or over a service pit for lifting and supporting a vehicle

This Part does not apply to bridge jacks used with an automotive lift covered by ANSI/ALI ALCTV.

(24) 8-1.2 Configuration

(a) Upright Mobile Lifts. A typical design has a lifting member attached to a vertical structure mounted in a mobile frame with a base or a scissors mechanism. Pneumatic cylinders normally actuate the lifting member, although hydraulic or other means may be used. Typical configurations are

(1) end lifts having saddles attached to the lifting member, contacting the vehicle at two points across the bumper, bumper supports, frame members, front axle, rear axle, or suspension components

(2) wheel lifts having forks attached to the lifting member that cradle the tires during lifting of the vehicle

(b) Bridge Jacks Used on the Floor and Over a Service Pit. These are designed with a pair of laterally spaced saddles that raise and lower in unison, attached to a lifting member in a rolling or sliding frame. Typically the lifting member is actuated by a scissors mechanism with hydraulic cylinder (s) or pneumatic cylinders that swing into lifting position.

8-1.3 Illustrations

The illustrations show typical configurations and are not intended to be all-inclusive. Figure 8-1.3-1 shows typical end lifts. Figure 8-1.3-2 shows a typical wheel lift. Figure 8-1.3-3 shows bridge jacks.

8-2 DESIGN (24)

In addition to Parts 2 and 3, the requirements in paras. 8-2.1 through 8-2.7 apply.

8-2.1 Saddles

The saddles on end lifts and bridge jacks shall have raised protrusions, e.g., a tang or rail, on the leading and trailing edges to act as a load restraint. Means shall be incorporated to limit the outward lateral adjustment of the saddles. The contact surface of the forks on wheel lifts shall have a raised profile to prevent movement between the tire and the fork.

8-2.2 Secondary Load-Holding Means

8-2.2.1 All upright mobile lifts and bridge jacks, except those using self-braking screw drive systems, shall incorporate an automatically engaging mechanical load-holding device (e.g., a latching system) to prevent downward movement of more than 6 in. (152 mm) after stopping motion. Function shall begin within 6 in. (152 mm) of rise and shall continue to the full rise position. Load-holding devices shall require positive action for release.

8-2.2.2 Automatic release of latches is prohibited unless all the following conditions apply:

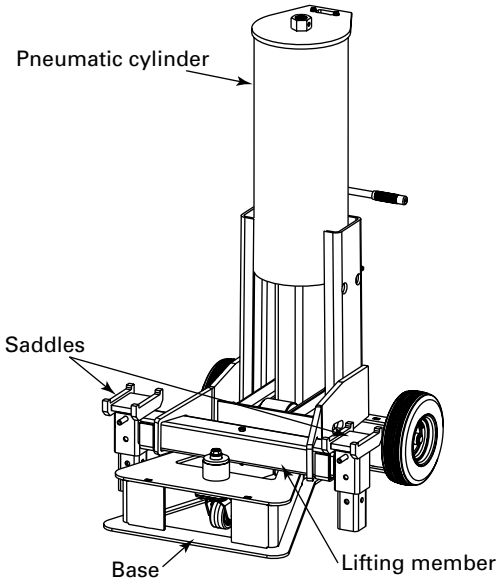
(a) The default position is where engagement will occur upon unintentional lowering.

(b) Release cannot be caused by any other input (intended or unintended).

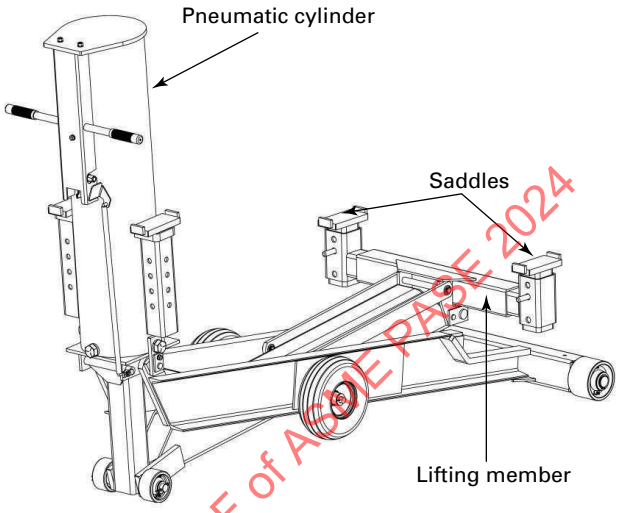
(c) Operating instructions clearly explain the automatic release.

8-2.2.3 After disengagement, to permit lowering the load, the latches shall automatically reset when downward movement is stopped at any height above 6 in. (152 mm) of rise. Alternately, if latches do not automatically reset after disengagement to permit lowering the load, then the lift shall incorporate a warning label at the point of latch operation and at the point of lift operation that states that the latches do not automatically reset after lowering. The printed materials furnished with the lift shall incorporate the same warning.

Figure 8-1.3-1
End Lifts



(a) Upright Type



(b) Scissors Type

Figure 8-1.3-2
Wheel Lift

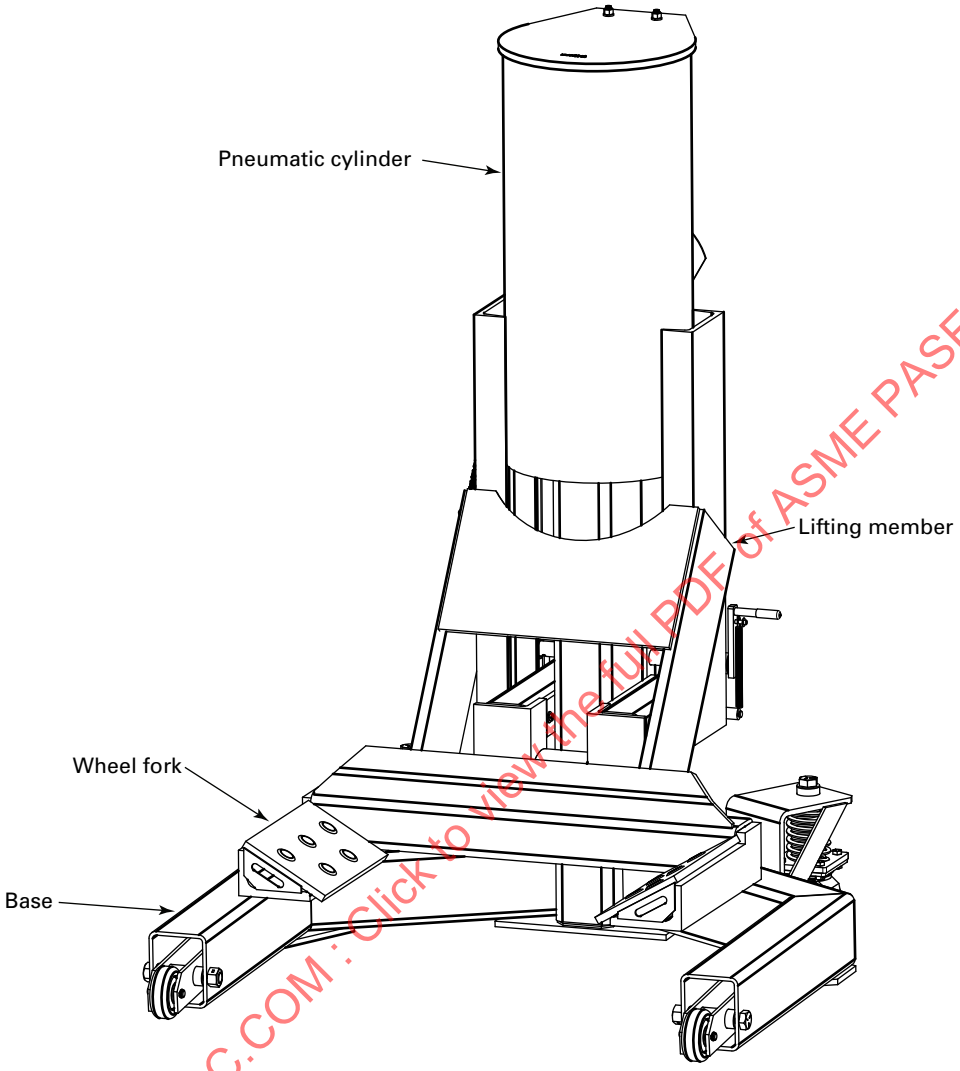
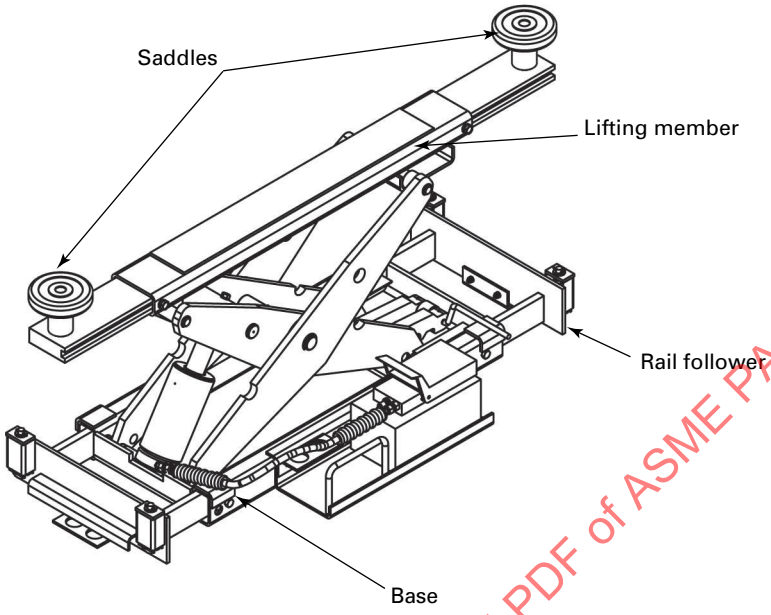


Figure 8-1.3-3
Bridge Jack



GENERAL NOTE: A rail-type bridge jack is shown. A floor-type bridge jack would have casters and a handle.

8-2.3 Mobility

When unloaded, upright mobile lifts and bridge jacks shall be readily movable to engage or disengage the vehicle lift points. When loaded, the base of the unit shall be in contact with the floor and shall not be movable.

8-2.4 Load-Loss Control

Pneumatic-operated upright mobile lifts and bridge jacks shall have a restraint to prevent the lifting member from extending beyond its maximum travel if the load is suddenly removed from the lift. In addition, in the event of load loss at any elevation, the lift shall not leave the ground by more than 1.0 ft (305 mm) and the lifting member, saddles, and attachments shall remain affixed to the lift assembly.

8-2.5 Operating Controls

Individual controls shall be provided to facilitate level lifting and lowering when wheel lifts or bridge jacks are used in pairs.

Lowering controls may be adjustable and shall permit the lowering speed to be limited to no more than 3 in./sec (76.2 mm/s) when averaged over the full range of travel.

NOTE: In normal use, the rate of descent may exceed 3 in./sec (76.2 mm/s).

8-2.6 Stability

The forks of a wheel lift shall lie within the base envelope to prevent tipping when loaded.

8-2.7 Proof Load

Each upright mobile vehicle lift and bridge jack shall be capable of performing the proof load test of para. 8-4.2 with the following proof loads:

(a) 150% of rated load for each end lift, wheel lift, and bridge jack

(b) 200% of rated load for each wheel lift and bridge jack with secondary load-holding means engaged

8-3 SAFETY MARKINGS AND MESSAGES

8-3.1 Safety Markings

(24) **8-3.1.1 End Lifts.** The following are examples of safety markings for end lifts:

(a) Study, understand, and follow all instructions before operating the device.

(b) Use only on a hard, level surface capable of supporting the load.

(c) Do not raise one end of the vehicle if the other end is raised.

(d) Do not exceed rated capacity.

(e) Disengage parking brake and place the transmission in neutral after the end lift has been placed to engage the vehicle.

(f) Lift only on areas of the vehicle as specified by the vehicle manufacturer.

(g) Load saddles equally.

(h) Support the vehicle with appropriate means immediately after lifting.

(i) Failure to heed these markings may result in personal injury, property damage, or both.

(24) **8-3.1.2 Wheel Lifts.** The following are examples of safety markings for wheel lifts:

(a) Study, understand, and follow all instructions before operating the device.

(b) Use only on a hard, level surface capable of supporting the load.

(c) Do not raise one end of the vehicle if the other end is raised.

(d) Do not exceed rated capacity.

(e) Wheel lifts shall be used in identical pairs.

(f) Disengage parking brake and place the transmission in neutral after the wheel lifts have been placed to engage the vehicle tires.

(g) Do not allow any part of your body under the vehicle until the load-loss control has been activated.

(h) Failure to heed these markings may result in personal injury, property damage, or both.

(24) **8-3.1.3 Bridge Jacks.** The following are examples of safety markings for bridge jacks:

(a) Study, understand, and follow all instructions before operating the device.

(b) Use only a hard, level surface capable of supporting the load.

(c) Do not exceed rated capacity.

(d) Disengage parking brake and place the transmission in neutral after the bridge jack has been placed to engage the vehicle.

(e) Lift only on areas of the vehicle as specified by the vehicle manufacturer.

(f) Load saddle equally.

(g) Lower jack to the nearest locking position before getting under the vehicle.

(h) Not for use on automotive lifts

(i) Failure to heed these markings may result in personal injury, property damage, or both.

8-3.2 Safety Messages

(24) **8-3.2.1 End Lifts.** The following are examples of safety messages for end lifts:

(a) Only attachments and adapters supplied by the manufacturer shall be used.

(b) Do not lift the entire vehicle with multiple sets of lifts.

(c) No alterations shall be made to this product.

(24) **8-3.2.2 Wheel Lifts.** The following are examples of safety messages for wheel lifts:

(a) Only attachments and adapters supplied by the manufacturer shall be used.

(b) Do not lift the entire vehicle with multiple sets of wheel lifts.

(c) Use wheel lift only beneath the vehicle tires on opposite ends of the same axle.

(d) When two wheel lifts are used, synchronize the raising and lowering so the vehicle remains laterally level.

(e) No alterations shall be made to this product.

(24) **8-3.2.3 Bridge Jacks.** The following are examples of safety messages for bridge jacks:

(a) Only attachments and adapters supplied by the manufacturer shall be used.

(b) When two bridge jacks are used to raise a vehicle free of the ground, synchronize the raising and lowering.

(c) No alterations shall be made to this product.

8-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the requirements in paras. 8-4.1 and 8-4.2 apply.

(24) ### 8-4.1 Load Tests

8-4.1.1 Load-Sustaining Test. A load not less than the rated capacity shall be applied to the saddles or forks when positioned at the maximum lifting height with the secondary load-holding means deactivated. The load shall be equally distributed between both fully extended saddles or forks over the outboard most 3 in. (76.2 mm) for end lifts and bridge jacks or 6 in. (152 mm) for wheel lifts. The load shall not lower more than a total of 0.125 in. (3.18 mm) in the first minute nor more than a total of 0.1875 in. (4.76 mm) in 10 min. The initial measurements shall be taken at each saddle or fork when the full load is applied and the other measurements taken at the time specified.

8-4.1.2 Secondary Load-Holding Means Test. Lifts shall be loaded to not less than rated capacity and operated to raise the load to a position just below each step in the secondary load-holding device. When the internal pressure is released, the secondary load-holding means shall automatically stop the lift and hold the load within a descent of 6.0 in. (152 mm).

8-4.1.3 Lowering Control Test. A load not less than the rated capacity shall be applied to the saddles at approximately 100% of the lifting range. The lowering controls shall be operated to control the average rate of descent to no more than 3.0 in./sec (76.2 mm/s).

The secondary load-holding device shall be deactivated for this test.

8-4.2 Proof Load Tests (24)

Saddles shall be set to full extension, and a proof load, as defined in para. 8-2.7, shall be applied to all saddles. For purposes of these tests, any load-limiting device shall be deactivated. There shall not be any critical failures nor deformation that can cause loss of the load.

8-4.2.1 Dynamic Proof Load. The load shall be lifted and lowered three times through the range of travel.

8-4.2.2 Static Proof Load. For wheel lifts and bridge jacks, the load defined in subpara. 8-2.7(b) shall be applied and held for 10 min with the lifting device at full extension, the secondary load-holding means engaged, and the load-loss control engaged.

8-4.2.3 Pneumatic Lifts. Pneumatic lifts shall be loaded to rated capacity and the lifting member shall be raised to a height determined to provide the maximum momentum to the lifting member if the load were to be removed. The load-loss control shall be activated prior to removing the load. The load shall be removed in such a manner that the vertical height of the lifting member does not change until the load is completely removed. The lift shall not leave the ground by more than 1.0 ft (305 mm). The lifting member, saddles, and attachments shall remain affixed to the lift assembly.

Part 9
Vehicle Transport Lifts

9-1 SCOPE, CONFIGURATION, AND ILLUSTRATION

9-1.1 Scope

This Part applies to lifts that are used for lifting, transporting, servicing, and storing vehicles with two wheels. It includes only those lifts that raise the vehicle clear off the floor. This Part does not include those devices that are designed to lift one end or side of a vehicle, nor does it include stationary automotive lifts or automotive lifts that become stationary when loaded.

9-1.2 Configuration

Lifts covered by this Part are lifts equipped with wheels, rollers, or slides that render them capable of being manually moved while the vehicle is in the raised position. The vehicle is supported by a lift platform with brackets, adapters, and restraints to retain the vehicle, and a mechanical load-holding means secures the lift platform in a raised position. The lifting member raising and lowering the lift platform may be actuated by hydraulic, pneumatic, or mechanical means, or a combination thereof.

9-1.3 Illustration

Figure 9-1.3-1 shows a typical vehicle transport lift covered by this Part; the illustration is not intended to be all-inclusive.

9-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 9-2.1 through 9-2.6 apply.

9-2.1 Lift Platform

The lift platform shall be designed to minimize slipping or sliding of the load along the platform's horizontal surface. The lift platform shall be designed in such a manner as to be capable of sustaining a proof load placed across its intended load contact member(s).

9-2.2 Load Restraint

A load restraint shall be designed and positioned to prevent the inadvertent loss of the load during movement.

9-2.3 Mechanical Load-Holding Means

The lift shall be provided with a self-acting mechanical means of preventing inadvertent lowering of the load in the event of failure of the force-transmitting means. Such means shall prevent inadvertent lowering of more than 3.0 in. (76.2 mm) after raising to any position at or above the lowest designated storage position. Such means shall automatically reset upon full descent.

9-2.4 Positioning Device

A means shall be provided to prevent the lift, while loaded, from moving on the floor when it is placed in its designated location.

9-2.5 Mobility

The force to move the vehicle transport lift when loaded to rated capacity shall be accomplished by the operator pushing or pulling the lift. Wheels and/or casters shall be configured to allow movement in the desired direction of travel.

9-2.6 Proof Load

All vehicle transport lifts shall be capable of performing the proof load test of para. 9-4.2, with a proof load of 150% of rated capacity while lifting and 200% of rated capacity while being supported by mechanical load-holding means.

9-3 SAFETY MARKINGS AND MESSAGES

9-3.1 Safety Markings

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating this device.

(b) Do not exceed rated capacity.

(c) Use only on a hard, level surface capable of supporting the load.

(d) Center load on lift platform.

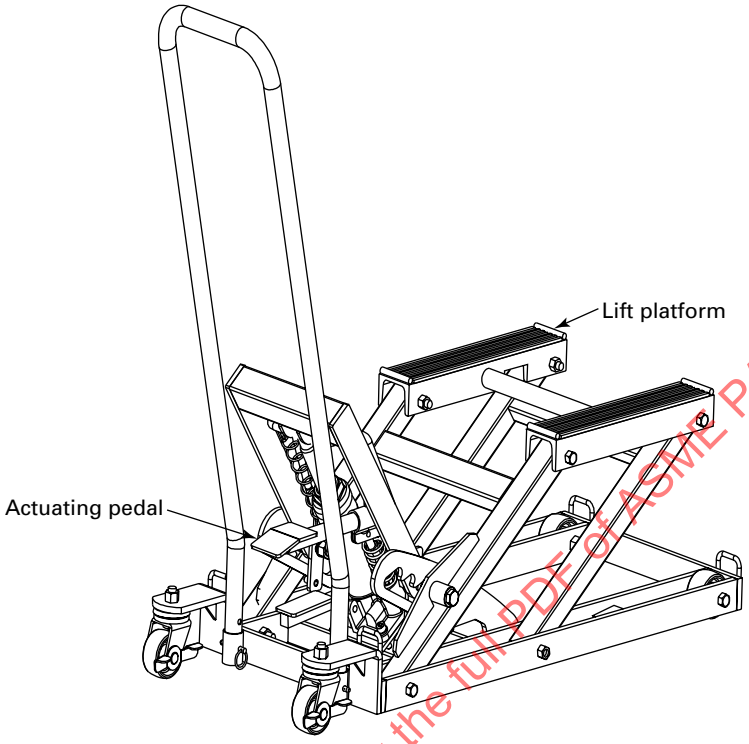
(e) Lift only those areas of the vehicle specified by its manufacturer.

(f) Immediately after lifting load, ensure lift mechanical load-holding means is engaged.

(g) Before moving, lower the load to the lowest possible point.

(h) Secure load with appropriate restraint device.

Figure 9-1.3-1
Typical Vehicle Transport Lift



(i) Failure to heed these markings may result in personal injury, property damage, or both.

9-3.2 Safety Messages

The following are examples of safety messages:

(a) Use of this product is limited to lifting, lowering, transporting, and storing, in the lowered position, loads consisting of a single vehicle whose lift points are compatible with the lift platform. Incompatibility is evident when the loaded vehicle wobbles, appears unstable, and/or does not securely engage the lift platform.

(b) Restraining an incompatible load will not make the load secure and may cause unexpected loss of load.

(c) Never work on, around, or under a load that is not secured and stable.

(d) Keep operator's and bystander's head, hands, and feet away from lift arms when raising and lowering.

(e) No alterations shall be made to this product.

(f) Only attachments, restraints, or adapters supplied by the manufacturer shall be used.

9-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the requirements in paras. 9-4.1 and 9-4.2 apply.

9-4.1 Load Tests

A deadweight load equal to the rated capacity of the lift and configured such that the entire load is upon and above the lift platform shall be centrally located and restrained, and the operational tests specified in paras. 9-4.1.1 through 9-4.1.7 shall be conducted. The mechanical load-holding means may be deactivated to facilitate testing.

9-4.1.1 Load-Sustaining Test. With the lift platform at its maximum height and the mechanical load-holding means disengaged, the lift shall sustain the load and shall not lower more than 0.125 in. (3.18 mm) in the first minute nor more than a total of 0.1875 in. (4.76 mm) in 10 min. The initial measurement shall be taken when the load is applied, and the other measurements at the time period specified.

9-4.1.2 Mobility Test. The lift, with the lift platform at the highest locked height, shall be moved by means of the handle provided in any direction over a smooth, level floor surface. The lift, while loaded as described in para. 9-4.1.1, shall be moved at 1.5 ft/sec to 2.0 ft/sec (457 mm/s to 610 mm/s) across a 0.5-in. (12.7-mm) high, 15-deg-slope rise in the floor and a 0.5-in. (12.7-mm) drop to the floor, at an approach angle that will bring each caster or wheel individually into contact with the rise and drop. The lift shall

traverse the rise and drop without loss of load or functional damage.

9-4.1.3 Load-Limiting Device Test. The load-limiting device in hydraulic vehicle transport lifts shall activate when lifting no less than 100% of rated capacity but no more than 125% of rated capacity. Lifts with multiple-stage hydraulics shall meet these requirements with the final stage extended at least 1.0 in. (25.4 mm) above its low height. Jacks with lift arms shall meet these requirements with the lift arm in the horizontal position.

9-4.1.4 Release Mechanism Test. With the lift fully extended, the release mechanism shall be operated to control the initial rate of descent to no more than 1.0 in./sec (25.4 mm/s). With the release mechanism fully open, the average rate of descent shall not exceed 4.0 in./sec (102 mm/s).

9-4.1.5 Mechanical Load-Holding Means Test. The lift platform shall be raised with the mechanical load-holding means positioned to allow maximum disengaged distance from the nearest downward engagement. The release valve shall be fully opened to allow the maximum rate of descent of the lift. The lift shall be allowed to free fall to the nearest engagement. The lift shall perform to design specifications and no functional damage shall occur, nor shall operational characteristics be detrimentally affected.

9-4.1.6 Horizontal Positioning Test. With the lift raised to its highest locked height and the positioning device activated, a force of 100 lb (444 N) shall be applied centrally in the lateral and longitudinal directions to the load for 10 sec in each direction, without the wheels or casters lifting from the surface.

9-4.1.7 Stability Test. The lift, with the lift platform at the highest locked height, shall be moved by means of the handle provided, while loaded as described in para. 9-4.1, at 1.5 ft/sec to 2.0 ft/sec (457 mm/s to 610 mm/s) against a 2.0-in. (51-mm) high vertical rise 90 deg to the direction of movement at an approach angle that will bring two wheels or casters in simultaneous contact (or the lift base frame in contact) with the rise in the direction of greatest instability. The lift shall not lose the load or tip over.

9-4.2 Proof Load Test

The proof load, as defined in para. 9-2.6, shall be applied centrally across the lift platform. The load shall be lifted to maximum height, and be sustained by engaging the mechanical load holding means with the load still at the maximum height, and then lowered to the lowest position. For purposes of this test, any internal load-limiting device should be deactivated.

Part 10
Vehicle-Moving Dollies

10-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

10-1.1 Scope

This Part applies to fixed-frame and lifting-frame vehicle-moving dollies used as identical pairs for moving or storing a vehicle.

10-1.2 Configuration

Vehicle moving dollies covered by this Part are

(a) fixed-frame dollies requiring the vehicle wheel to be lifted onto the dolly, characterized by a depressed platform or laterally spaced members that contact the vehicle wheels at two areas on the circumference

(b) lifting-frame dollies, having hydraulic or mechanical means to raise the vehicle wheel, characterized by a pair of laterally spaced lifting members that raise and lower in unison and are so arranged as to contact the vehicle wheel at two areas on the circumference

10-1.3 Illustrations

Figure 10-1.3-1 shows typical vehicle-moving dollies covered by this Part; the illustrations are not intended to be all-inclusive.

10-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 10-2.1 through 10-2.4 apply.

10-2.1 Mobility

The force to move the vehicle-moving dollies when loaded to rated capacity with a vehicle shall be accomplished by the operator pushing or pulling the vehicle. Wheels and/or casters shall be configured to allow movement in the desired direction of travel.

10-2.2 Resistance to Roll-Off

Each vehicle-moving dolly shall have an inherent means of resisting vehicle roll-off from the dolly or a means to retain the vehicle wheel.

10-2.3 Locking Devices

10-2.3.1 Load-Holding Means. A means shall be provided to prevent the vehicle from lowering after it is lifted from the floor. If the lifting member is supported by means of a locking pin, the pin shall be secured to the dolly to prevent its loss.

10-2.3.2 Wheel Locks. The dolly shall be prevented from moving when it is placed in its destination location.

10-2.4 Proof Load

Each vehicle-moving dolly shall be capable of performing the proof load test of para. 10-4.2 with a proof load of 150% of rated capacity.

10-3 SAFETY MARKINGS AND MESSAGES

10-3.1 Safety Markings

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating the device.

(b) Do not exceed rated capacity.

(c) Use only on a hard, level surface capable of supporting the load.

(d) Before moving the vehicle, ensure that the vehicle wheels are centered and secure.

(e) Activate the wheel- and/or caster-locking devices after moving a vehicle.

(f) Never work on, around, or under a vehicle supported by vehicle-moving dollies.

(g) Failure to heed and understand these instructions may result in personal injury, property damage, or both.

10-3.2 Safety Messages

The following are examples of safety messages:

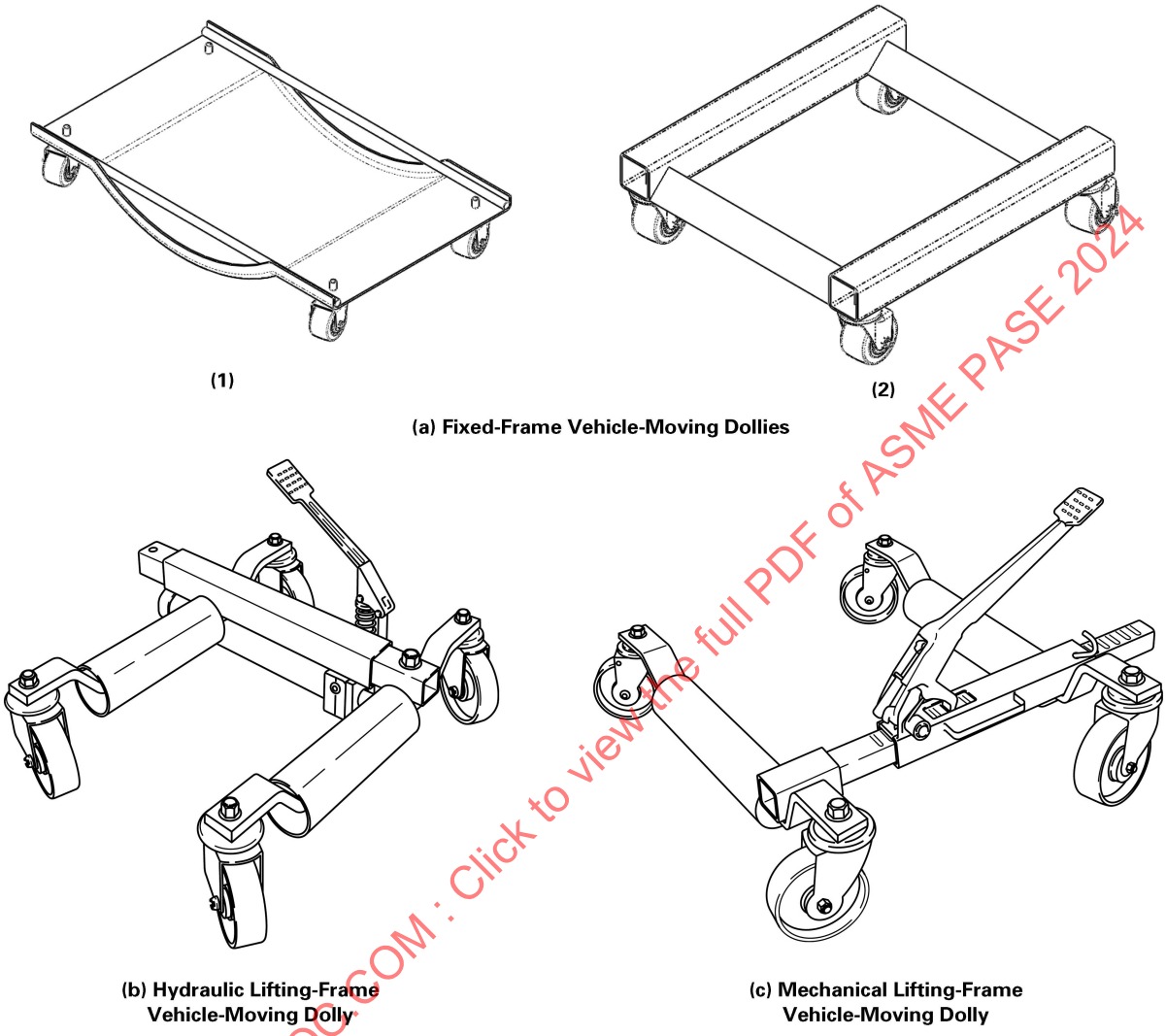
(a) Use of this product is limited to transporting only.

(b) No alterations shall be made to this product.

10-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the requirements in paras. 10-4.1 and 10-4.2 apply.

Figure 10-1.3-1
Typical Vehicle-Moving Dollies



10-4.1 Load Tests

Identical vehicle-moving dollies shall be placed under the wheels of an appropriately loaded vehicle.

10-4.1.1 Mobility Test. The force to move the vehicle shall be accomplished by the operator pushing or pulling the vehicle on the dollies. Wheels and/or casters shall be configured to allow movement in the desired direction of travel.

10-4.1.2 Horizontal Positioning Test. With the vehicle supported at the maximum height of the dollies and the wheel locks actuated, a force of 100 lb (444 N) shall be applied centrally to the vehicle, in the lateral and longitudinal directions, for 10 sec in each direction. The vehicle shall remain on the dollies, and the dollies shall sustain the vehicle without moving.

10-4.2 Proof Load Test

A proof load, as defined in para. 10-2.4, shall be applied centrally to the platform or between the supporting members. Hydraulic and mechanical vehicle-moving dollies shall be lifted throughout the range of travel. A permanent reduction in height, measured after the removal of the load, at the point of load contact shall not exceed 0.125 in. (3.18 mm).

Part 11
Component Dollies and Jacks

11-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

11-1.1 Scope

This Part applies to jacks and dollies that are used to support and stabilize drive line, suspension, or other heavy components during installation or removal from vehicles supported on stands or a lift, and to move them to a workstation.

11-1.2 Configuration

Component dollies and jacks covered by this Part are mobile devices having a lifting member suited to retaining components of drivelines, suspension systems, and wheel assemblies. A typical design consists of a mobile frame with a lifting member, which may include attachment means, that may be positioned to engage, retain, support, and/or stabilize the component during its installation in, or removal from, a vehicle. The lifting member may be actuated by hydraulic, pneumatic, or mechanical means, or a combination thereof. These devices are made in the following two styles:

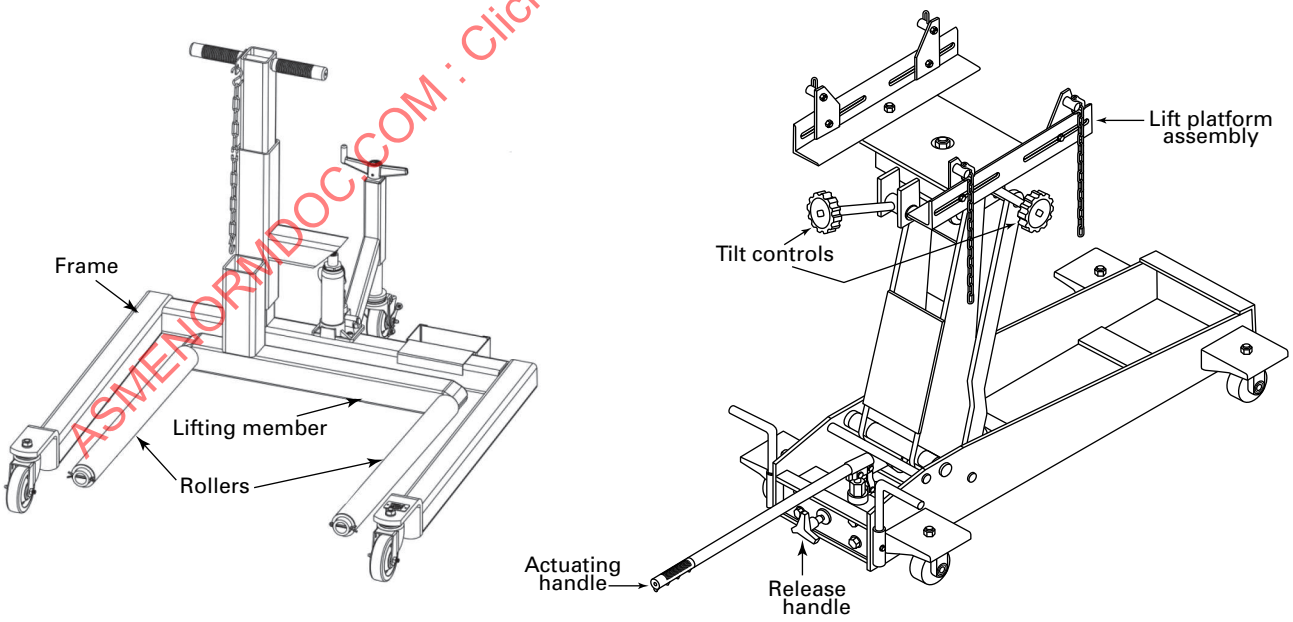
(a) for use on the floor when the vehicle is supported by vehicle stands

(b) for use under the vehicle when it is supported by an automotive lift or high-reach stands

11-1.3 Illustrations

The illustrations show typical component dollies and jacks covered by this Part and are not intended to be all-inclusive. Figure 11-1.3-1 shows floor-style devices for vehicles supported on vehicle stands. Figure 11-1.3-2 shows high-rise dollies and jacks for vehicles supported on an automotive lift.

Figure 11-1.3-1
Typical Floor-Style Component Dolly and Jack

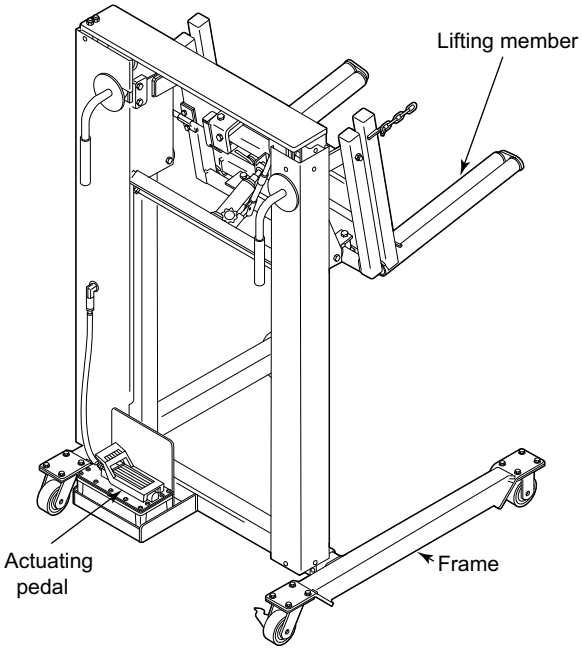


(a) Wheel Dolly

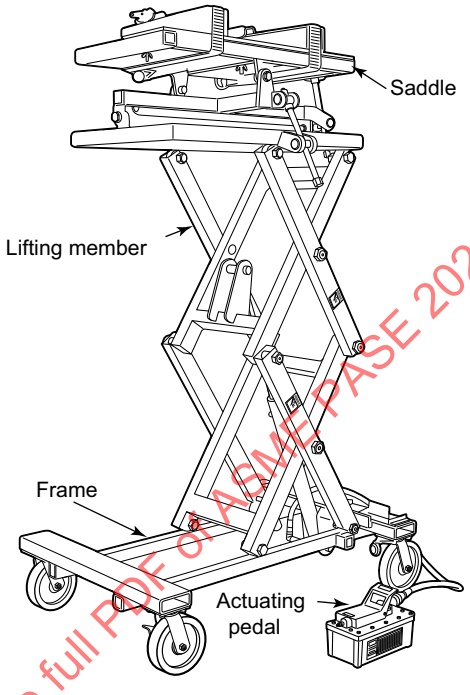
(b) Transmission Jack

(24)

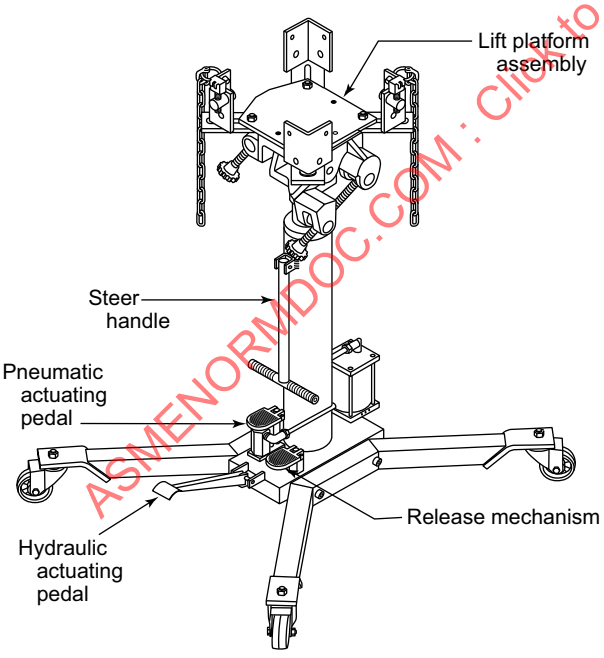
Figure 11-1.3-2
Typical High-Rise Component Dolly and Jacks



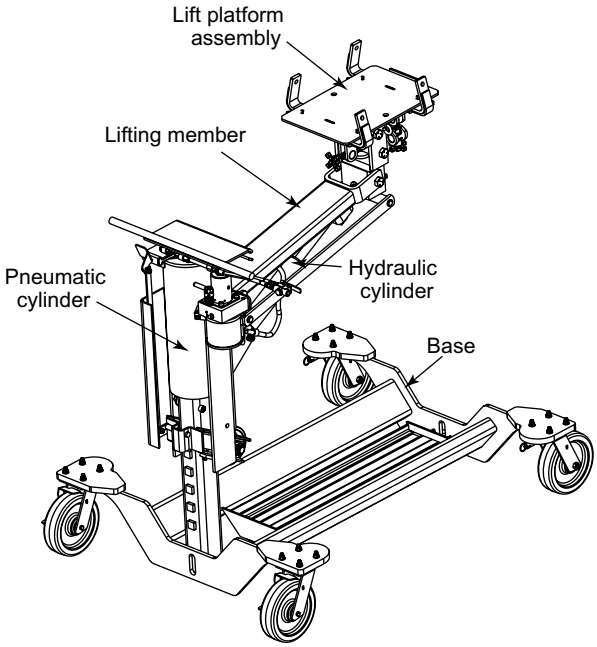
(a) Wheel Dolly



(b) Component Lift Table



(1)



(2)

(c) Transmission Jacks

(24) **Table 11-2.1.4**
Example of Tilt Angle Table

Compound Tilt Angle, deg	Capacity, lb (kg)
10/10	...
20/20	...
30/30	...

11-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 11-2.1 through 11-2.3 apply.

11-2.1 Lifting Member

The lifting member shall be designed to retain the component by specific means such as an adjustable saddle, adapters, or a combination, either fastened to, or an integral part of, the lifting member, and shall be capable of sustaining a proof load, as defined in para. 11-2.3. Provision shall be made to prohibit separation of the lifting member assembly from the device when loaded. Typical designs are

(a) an adjustable saddle with a positioning mechanism

(b) a pair of laterally spaced lifting members with rollers and a positioning mechanism

(c) an adapter specific to a component, with or without a positioning mechanism

11-2.1.1 Positioning Mechanism. When positioning mechanism adjustments are provided, they shall require intentional positive action by the operator to change the position. Positioning mechanisms typically

(a) adjust the angular position of the lifting member assembly about two principal independent axes (longitudinal and lateral), and shall be capable of sustaining a proof load, as defined in para. 11-2.3, at any angle within the desired angular range to a maximum of 10 deg in all directions

(b) adjust the component relative to the lifting member

11-2.1.2 Rollers. Rollers are required to permit the rotation of component assemblies for the purpose of aligning bolt holes.

(24) **11-2.1.3 Load Restraint.** The load restraint shall be so designed and positioned as to prevent the inadvertent release of the load during operation and movement.

(24) **11-2.1.4 Capacity vs. Tilt Angle.** Any jack with a lifting member assembly that can be positioned beyond 10 deg in any direction but not sustain the proof load as defined in para. 11-2.3 shall provide a means of indicating the tilt angles and the corresponding reduced capacity ratings. As a minimum, the jack or its instructions shall include a table indicating the jack capacity at each 10-deg compound tilt increment (simultaneously longitudinal and lateral) up to and including the maximum compound tilt permitted by the mechanism.

See Table 11-2.1.4 for an example of a tilt angle table.

11-2.2 Mobility

The force to move the device when loaded to rated capacity shall be accomplished by the operator pushing or pulling the dolly or jack. Wheels and/or casters shall be configured to allow movement in the desired direction of travel.

11-2.3 Proof Load

All component dollies and jacks shall be capable of performing the proof load test of para. 11-4.2 with a proof load of 150% of rated capacity.

11-3 SAFETY MARKINGS AND MESSAGES

11-3.1 Safety Markings (24)

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating this device.

(b) Adequately support the vehicle before starting repairs.

(c) Do not exceed rated capacity.

(d) Use only on a hard, level surface capable of supporting the load.

(e) Before moving, lower the load to the lowest possible height.

(f) The capacity of this jack may be reduced when the lift member assembly is tilted.

(g) Failure to heed these markings may result in personal injury, property damage, or both.

11-3.2 Safety Messages (24)

The following are examples of safety messages:

(a) Before moving the jack or tilting the load, ensure that the center of gravity of the load is established and centered and the load is secured with a load-restraint device.

(b) Only attachments and/or adapters supplied by the manufacturer shall be used.

(c) No alterations shall be made to this product.

11-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, it is required that each dolly or jack's ability to sustain and retain a load shall be tested by applying a load on the lifting member. The load placement is determined by the lifting member configuration as follows:

(a) On devices with an adjustable saddle and a positioning mechanism, a load not less than the rated capacity, and configured such that the entire load is centrally located above and retained by the lifting member, shall

be placed with the center of gravity (CG) of the load as listed in the following table, defined by the rated capacity:

Capacity, lb (kg)	CG of Load Above Lift Member, in. (mm)
500 (227)	5.5 (139.7)
1,000 (454)	7.5 (190.5)
2,000 (907)	10.0 (254.0)
4,000 (1814)	13.0 (330.2)

(b) On devices with a pair of laterally spaced lifting members with rollers, a load not less than the rated capacity shall be applied centrally between the rollers, with the load center of gravity approximately 1.0 ft (305 mm) from the vertical portion of the lifting member. The load center of gravity shall be not less than 27.0 in. (686 mm) from the floor.

(c) On devices with an adapter specific to a component, a load not less than the rated capacity shall be centrally placed on the lifting member.

11-4.1 Load Tests

Load tests shall be conducted with a dead-weight load not less than the rated capacity of the device. The load shall be centrally located and configured such that the entire load is above the lifting member.

11-4.1.1 Load-Sustaining Test. With the lifting member at its maximum height, the load shall be sustained and shall not lower more than 0.125 in. (3.18 mm) in the first minute nor more than a total of 0.1875 in. (4.76 mm) in 10 min. The initial measurement shall be taken when the load is applied, and the other measurements at the time period specified.

11-4.1.2 Load-Limiting Device Test. The load-limiting device in hydraulic devices shall activate when lifting no less than 100% of rated capacity but no more than 125% of rated capacity. Devices with multiple-stage hydraulics shall meet these requirements with the final stage extended at least 1.0 in. (25.4 mm) above its low height. Devices with lift arms shall meet these requirements with the lift arm in the horizontal position.

11-4.1.3 Release Mechanism Test. With the lifting member fully extended, the release mechanism shall be operated to control the rate of descent to no more than 1.0 in./sec (25.4 mm/s).

11-4.1.4 Mobility Test. With the lifting member at the lowest possible lift height, the device, while loaded, shall be moved in any direction over the floor surface at 1.5 ft/sec to 2.0 ft/sec (457 mm/s to 610 mm/s) across a 0.5-in. (12.7-mm) high, 15-deg-slope rise in the floor and a 0.5-in. (12.7-mm) drop to the floor, at an approach angle that will bring only one caster or wheel at a time in contact with the rise and drop. The device shall traverse the rise and drop without loss of load or functional damage.

11-4.1.5 Stability Test. With the lifting member at the lowest possible lift height, the device shall be moved at 1.5 ft/sec to 2.0 ft/sec (457 mm/s to 610 mm/s) against a 2.0-in. (51-mm) high vertical rise 90 deg to the direction of movement at an approach angle that will bring two wheels or casters in contact with the rise at the point of greatest instability. The jack shall not lose the load or tip over.

11-4.1.6 Tipping Test. Devices shall support the maximum load corresponding to each identified compound tilt angle with the lifting member at maximum height. The device shall be moved forward and backward at least 1 ft (305 mm) and shall not lose the load or tip over. The force to move the jack shall be applied closely beneath the lifting member. (24)

11-4.2 Proof Load Test

A proof load, as defined in para. 11-2.3, shall be applied centrally to the lifting member. The load shall be lifted and sustained throughout the lifting range. For purposes of this test, any internal load-limiting device should be deactivated.

Part 12
Shop Cranes

12-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

12-1.1 Scope

This Part applies to shop cranes for removing, installing, and transporting vehicle engines, transmissions, and other components. It applies to shop cranes of 8,000-lb (3 636-kg) capacity or less.

12-1.2 Configuration

Shop cranes covered by this Part are characterized by a pair of laterally spaced legs, an upright mast, a pivoting boom with a boom extension, and a hook that is used to raise and remove automotive components for service. A typical design consists of a base with wheels and casters, to which the leg extensions, upright mast, boom, and hydraulic unit are attached. The hydraulic unit may be actuated by pneumatic or mechanical means, or a combination thereof.

12-1.3 Illustrations

Figure 12-1.3-1 shows typical shop cranes covered by this Part; the illustrations are not intended to be all-inclusive.

12-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 12-2.1 through 12-2.4 apply.

12-2.1 Mobility

The force to move the shop crane when loaded to rated capacity shall be accomplished by the operator pushing or pulling the crane. Wheels and/or casters shall be configured to allow movement in the desired direction of travel.

12-2.2 Load Hook

The shop crane shall be provided with a load hook and/or chain at the end of the boom extension that is capable of sustaining the proof loads of the unit. The load hook shall be provided with a latching mechanism.

12-2.3 Load Restraint

All shop cranes shall be equipped with restraints to minimize the load from swinging while the shop crane is moved, after the engine or component is removed from the vehicle.

12-2.4 Proof Load

All shop cranes shall be capable of performing the proof load test of para. 12-4.2 with a proof load of 150% of rated capacity.

12-3 SAFETY MARKINGS AND MESSAGES

12-3.1 Safety Markings

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating this device.

(b) Do not exceed rated capacity.

(c) Use only on a hard, level surface capable of supporting the load.

(d) Before moving, lower the load to the lowest possible height.

(e) Failure to heed these markings may result in personal injury, property damage, or both.

12-3.2 Safety Messages

The following are examples of safety messages:

(a) Use only slings or chains with a rated capacity greater than the weight of the load being lifted.

(b) Do not allow load to swing or drop violently while lowering or moving.

(c) No alterations shall be made to this product.

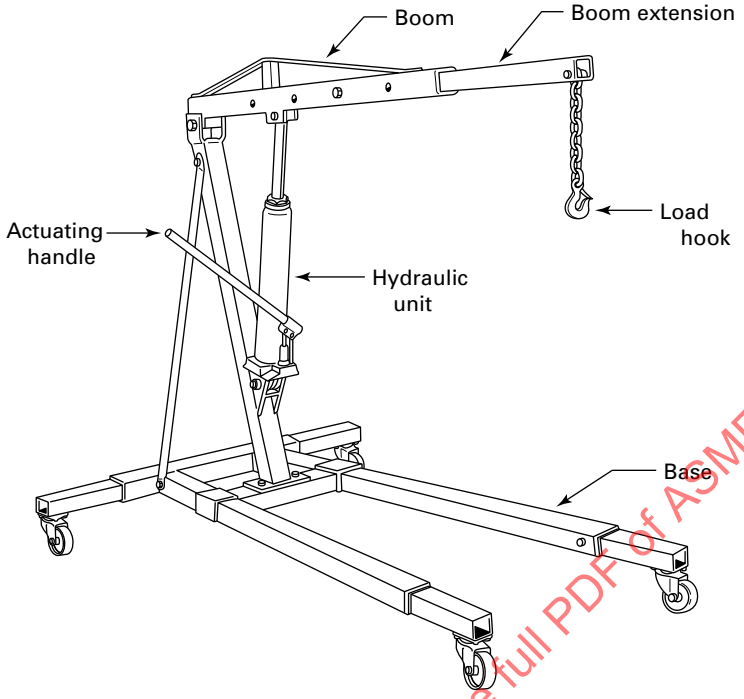
12-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the following requirements apply.

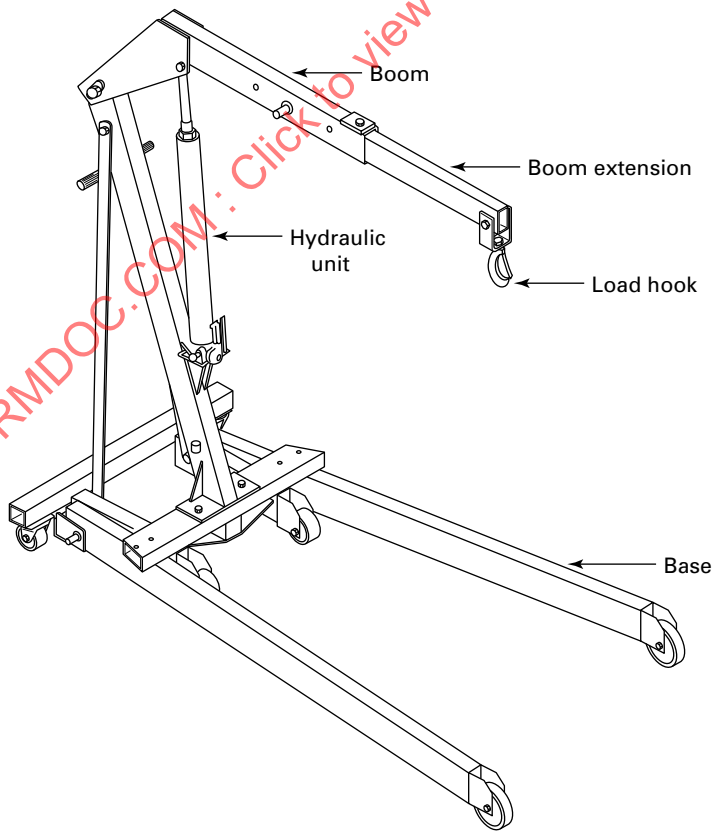
12-4.1 Load Tests

The tests described in paras. 12-4.1.1 through 12-4.1.5 shall be performed with the boom at the fully extended and fully retracted positions.

Figure 12-1.3-1
Typical Shop Cranes



(a)



(b)

12-4.1.1 Load-Sustaining Test. A load not less than the rated capacity shall be applied to the hook with the boom in the horizontal position. The load shall not lower more than 0.125 in. (3.18 mm) in the first minute nor more than a total of 0.1875 in. (4.76 mm) in 10 min. The initial measurement shall be taken when the load is applied, and the other measurements at the time period specified.

12-4.1.2 Release Mechanism Test. A load not less than the rated capacity shall be applied to the hook with the boom at its maximum lifting height. The release mechanism shall be operated to control the rate of descent to no more than 3.0 in./sec (76.2 mm/s).

12-4.1.3 Load-Limiting Device Test. With the boom in the horizontal position, the load-limiting device shall activate when lifting no less than 100% of rated capacity but no more than 125% of rated capacity.

12-4.1.4 Mobility Test. The shop crane, with rated-load center of gravity 2.0 ft (610 mm) off the floor and the boom in the horizontal position, shall be moved forward in a direction parallel to the boom at a minimum of 1.5 ft/sec to 2.0 ft/sec (457 mm/s to 610 mm/s) across a 0.5-in. (12.7-mm) high, 15-deg-slope rise in the floor and a 0.5-in. (12.7-mm) drop to the floor, at an approach angle that will bring only one caster or wheel at a time in contact with the rise and drop. The shop crane shall traverse the rise and drop without loss of load or functional damage.

12-4.1.5 Stability Test. The shop crane, with rated-load center of gravity 2.0 ft (610 mm) below the hook and the boom in the fully raised position, shall be moved forward in a direction parallel to the boom at 5.0 in./sec to 7.0 in./sec (127 mm/s to 178 mm/s) against a 2.0-in. (51-mm) high vertical rise 90 deg to the direction of movement that will bring the front wheels or casters in contact with the vertical rise. The shop crane shall not lose the load or tip over. The test shall be repeated with the movement in the opposite direction.

12-4.2 Proof Load Test

A proof load, as defined in para. 12-2.4, shall be applied to the boom extension. The load shall be lifted throughout the range of travel with the load located on the hook at the end of the boom extension. For this test, any internal load-limiting device should be deactivated.

Part 13
Engine Stands

13-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

13-1.1 Scope

This Part applies to self-contained portable engine stands designed primarily to support an automobile engine while the engine is being rebuilt or repaired. This Part does not apply to permanently mounted engine stands.

13-1.2 Configuration

Engine stands covered by this Part are engine mounting devices equipped with suitable means to support, rotate, and lock the engine in a working position. A typical design consists of at least one upright column equipped to accept a mechanical rotating mechanism, with adjustable arms and adapters that fasten to a mounting plate for various automotive components and engine bolt patterns.

13-1.3 Illustrations

Figures 13-1.3-1 and 13-1.3-2 show typical engine stands covered by this Part; the illustrations are not intended to be all-inclusive.

13-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 13-2.1 through 13-2.5 apply.

13-2.1 Mechanical Rotating Mechanism

The stand shall be equipped with a rotating mounting plate for attaching the engine. Controlled rotation shall be provided by a handle or other device, which shall be retained to prevent loss. An antifriction method utilizing lubrication, bearings, or other means shall be used to ensure the operator can rotate the engine with the rotational device provided. Heavy-duty stands may employ a device to elevate the engine for clearance of the frame while rotating the engine.

13-2.2 Rotational Locking Device

The stand shall be equipped with a means to prevent rotation of the mounting plate and shall require intentional positive action by the operator to activate the device. The locking device shall be functional in at least six equal rotational increments. The loaded rotational locking device shall remain functional in any position provided during the test of para. 13-4.1.2.

13-2.3 Mobility

The force to move the engine stand when loaded to rated capacity shall be accomplished by the operator pushing or pulling the stand. Wheels and/or casters shall be configured to allow movement in the desired direction of travel without veering sideways and shall have locking means to prevent movement during repair operations.

13-2.4 Stability

Wheels and/or casters shall be positioned to provide four points of contact with the floor and meet the requirements of para. 13-4.1.3.

13-2.5 Proof Load

Engine stands shall be capable of performing the proof load test of para. 13-4.2 with a proof load of 200% of rated capacity.

13-3 SAFETY MARKINGS AND MESSAGES

13-3.1 Safety Markings

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating this device.

(b) Do not exceed rated capacity.

(c) Use only on a hard, level surface capable of supporting the load.

(d) Lock mounting-plate rotating mechanism before applying a load.

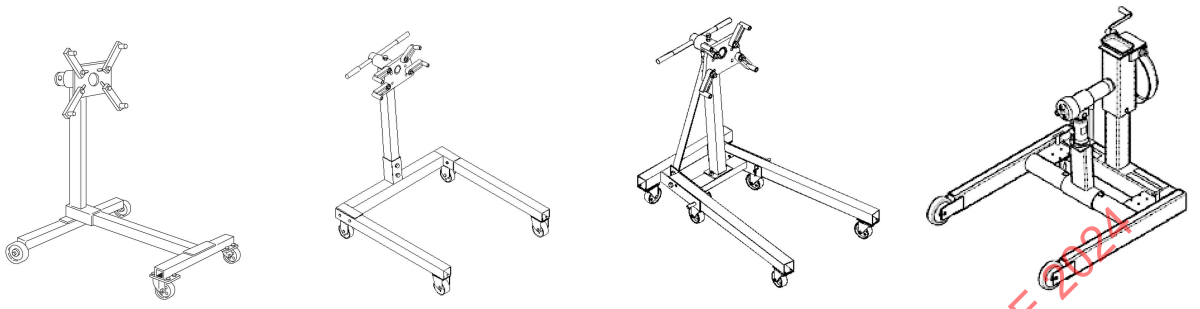
(e) Ensure load is centered and secured to attachments.

(f) Lock the wheels and/or casters before working on the engine.

(g) Rotate the engine using the handle or device provided.

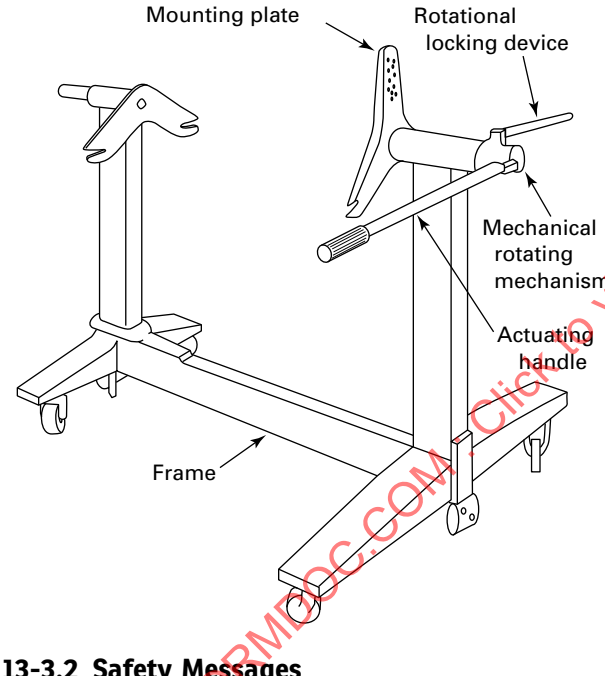
(h) Failure to heed these markings may result in personal injury, property damage, or both.

Figure 13-1.3-1
Typical Single-Post Engine Stands



(a) Typical "H" Style (b) Typical "U" Style (c) Typical "V" Style (d) Typical Heavy-Duty Stand

Figure 13-1.3-2
Typical Twin-Post Engine Stand



13-3.2 Safety Messages

The following are examples of safety messages:

(a) Off-center loads may make the load and handle rotate in either direction when the rotational locking device is released.

(b) Release rotational locking devices slowly and carefully.

(c) No alterations shall be made to this product.

(d) Only attachments and/or adapters supplied by the manufacturer shall be used.

13-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the requirements in paras. 13-4.1 and 13-4.2 apply.

13-4.1 Load Tests

The load shall be positioned a minimum of 14.5 in. (368 mm) from the mounting plate and offset 1.0 in. (25.4 mm) from the rotational axis of the mounting plate. To conform to this Standard, the stands shall perform to design specifications and no functional damage shall occur, nor shall operational characteristics be detrimentally affected.

13-4.1.1 Mobility Test. The stand, while loaded to rated capacity with the load offset parallel to the floor, shall be moved in any direction for which the stand was designed. The stand, while loaded as described above, shall be moved at 1.5 ft/sec to 2.0 ft/sec (457 mm/s to 610 mm/s) across a 0.5-in. (12.7-mm) high, 15-deg-slope rise in the floor and a 0.5-in. (12.7-mm) drop in the floor, at an approach angle that will bring only one caster or wheel at a time in contact with the rise and drop. The stand shall traverse the rise and drop without loss of load or functional damage.

13-4.1.2 Rotating Mechanism Test. The rotating mechanism, while loaded to rated capacity, shall be rotated throughout the range of rotation, without the wheels or casters lifting from the floor. This shall be performed using the supplied handle or device used for rotation. If the stand has a means to elevate the engine, the load shall be placed in the maximum elevated position.

13-4.1.3 Rotational Locking Device Test. The rotational locking device, while fully engaged, shall be subjected to a torsional load not less than 150 lb-ft (203 N-mm). The device shall sustain the load without radial movement.

13-4.1.4 Stability Test. The stand, while loaded to rated capacity with the load offset parallel to the floor, shall be moved at 1.5 ft/sec to 2.0 ft/sec (457 mm/s to 610 mm/s) against a 2.0-in. (51-mm) high vertical rise 90 deg to the direction of movement at an approach angle that will bring two wheels or casters into contact

with the rise at the point of greatest instability. The stand shall not lose the load or tip over.

13-4.2 Proof Load Test

A horizontally constrained vertical load, as described in para. 13-2.4, shall be applied to the stand for 10 min. The centerline of the rotational axis shall not exceed a total of 1 deg permanent deformation from the initially established angle of the rotational axis. A preload of no more than 100% of rated capacity may be applied to establish the initial condition.

Part 14
Shop Presses

14-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

14-1.1 Scope

This Part applies to shop presses used for vehicle service and maintenance. This Part does not apply to presses that are covered under ANSI B11.2, or presses that use manual power, e.g., a manual screw press.

14-1.2 Configuration

This Part covers shop presses for removal and installation of vehicle components and other uses. They are typically designed with a frame that comprises two uprights with mounting feet (or rails), a lower bolster, and an upper bolster with a hydraulic cylinder. The lower bolster supports the workpiece and is usually adjustable to accommodate different openings between the bottom of the retracted cylinder and the top of the lower bolster. A winch may be mounted to the outside of the upright and used in conjunction with cables to raise and lower the lower bolster of the press. An upper bolster is typically fixed in position to the uprights usually housing the hydraulic cylinder, connected by a hose to a pump that may be manual, pneumatic, or electrically powered. Representative devices covered by this Part include shop presses that range from 4 to 200 tons of force. A guard or scatter shield should be used that surrounds the work area of the press, to inhibit flying objects caused by pushing on work that may break, separate, or be ejected by the high compressive forces developed.

14-1.3 Illustrations

Figures 14-1.3-1 through 14-1.3-3 show typical shop presses; the illustrations are not intended to be all-inclusive.

14-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 14-2.1 through 14-2.6 apply.

14-2.1 Frame

The frame may be of any configuration that incorporates uprights and an upper and lower bolster arrangement wherein one of the bolsters is adjustable. Normally the upper bolster houses or contains the cylinder. There are mounting feet to secure the press to a floor or table.

14-2.2 Load Gauge

A gauge shall be provided to show the user the load being generated.

14-2.3 Locking Device

The locking device, normally a pin, shall be designed to hold the movable bolster in place during operation of the press when it is performing work.

14-2.4 Stability

Mounting feet or rails shall be provided to firmly anchor the press to the floor or table.

14-2.5 Guarding

14-2.5.1 Manufacturer's Responsibility. A point-of-operation guard shall be available from the manufacturer, and shall meet the following design, construction, application, and adjustment requirements:

(a) The guard shall prevent entry of hands or other body parts into the point of operation by reaching through, over, under, or around the guard.

(b) The guard shall create no pinch point between itself and moving parts.

(c) The guard shall offer visibility of the point of operation consistent with the operation being performed.

(d) The guard shall be of such design and strength so as to protect the operator and others from the hazards associated with the point of operation.

Figure 14-1.3-1
Shop Press, Air or Hydraulic

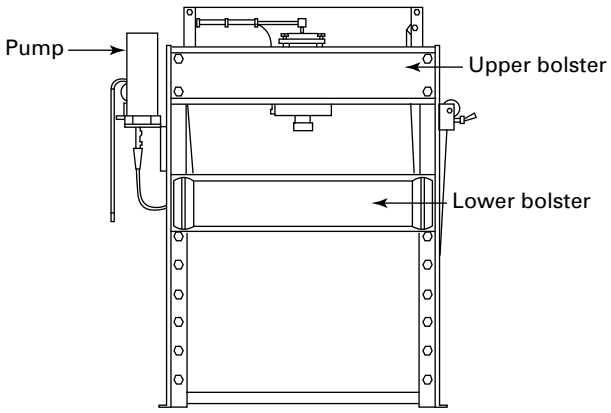


Figure 14-1.3-2
Shop Press, Manual Hydraulic

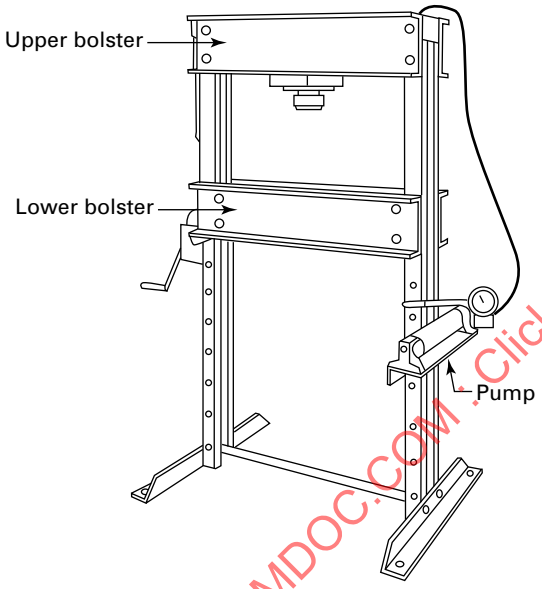
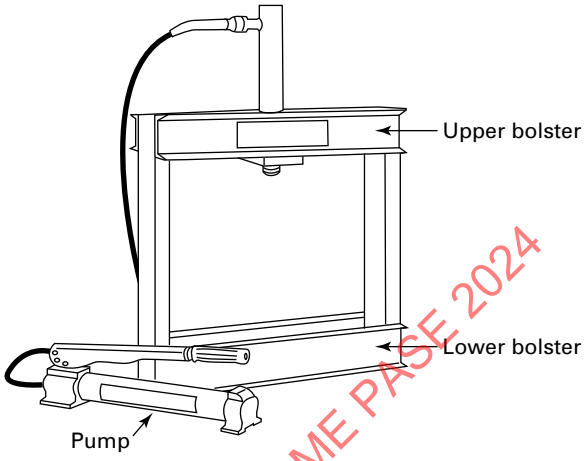


Figure 14-1.3-3
Shop Press, Manual Hydraulic Bench



14-2.5.2 Owner's Responsibility. The owner shall be responsible for making sure the operator is trained in the use of the guarding and that the operator wears the required personal protective equipment (PPE) as described in Occupational Safety and Health Administration (OSHA) regulations.

14-2.6 Proof Load

Each press shall be tested to a proof load of 150% of rated capacity without functional damage.

14-3 SAFETY MARKINGS AND MESSAGES

14-3.1 Safety Markings

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating the device.

(b) Do not exceed rated capacity.

(c) Keep hands, arms, feet, and legs out of the work area.

(d) Wear eye protection.

(e) Avoid off-center loads.

(f) Failure to heed and understand these instructions and markings may result in personal injury, property damage, or both.

14-3.2 Safety Messages

The following are examples of safety messages:

(a) The press shall be installed and operated in accordance with federal (OSHA), state, and local safety standards.

(b) Use appropriate guarding to contain any pieces that may break or fly apart when applying force.

(c) When attachments and adapters are used, the rated capacity of the system shall be no greater than the rated capacity of the lowest-rated component or combination of components that make up the system.

(d) Operators and observers shall wear eye protection that meets ANSI/ISEA Z87.1 and OSHA standards.

(e) Prior to use, make sure the press is securely anchored.

(f) Verify lift cables are slack before pressing on the bolster.

(g) No alterations shall be made to the product.

14-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the requirements in paras. 14-4.1 and 14-4.2 apply.

14-4.1 Load Tests

A platen or bolster plate shall be used when the cylinder applies a load to the lower bolster. The width of the platen or bolster plate shall not exceed 3 times the diameter of the cylinder ram, and the platen or bolster plate shall be long enough to engage the top portion of the lower bolster bearing surfaces and thick enough to withstand the proof load without sustaining permanent deformation.

14-4.1.1 Off-Center Load Test. A compressive load equal to the rated capacity of the press shall be applied to the press between the upper and lower bolsters, with the cylinder set at maximum left and right offset from the center of the press if the press is equipped with a sliding cylinder feature. In each test, a centered preload of no more than 100% of rated capacity should be applied and then released to obtain the initial measurement. The measurement shall be taken between the bottom of the upper bolster and the top of the lower bolster. The comprehensive load equal to the rated capacity of the press shall be applied for 10 min and then released, at which time a second measurement shall be taken. The press's ability to retain the load shall not be adversely affected. Permanent increase in dimension between the bottom of the upper bolster and the top of the lower bolster shall not exceed 0.125 in. (3.18 mm). The same test protocol shall be conducted with the movable bolster in its minimum and maximum height positions.

14-4.1.2 Load-Limiting Test. Presses employing a hydraulic power source shall be pumped against a measured load until the load-limiting device is activated, at which time the force applied to the upper and lower bolsters shall be no less than 100% of the press's rated capacity but no more than 125% of its rated capacity.

14-4.2 Proof Load Test

A preload of no more than 100% of the rated capacity shall be applied centrally between the upper and lower bolsters. After the preload is removed, a measurement shall be taken between the bottom of the upper bolster and the top of the lower bolster to establish the initial dimension. A proof load, as defined in para. 14-2.6, shall be applied centrally between the upper and lower bolsters for at least 10 min, after which time the load shall be removed and a second measurement taken. Permanent increase in the dimension between the bottom of the upper bolster and the top of the lower bolster shall not exceed 0.125 in. (3.18 mm). The same test protocol shall be conducted with the movable bolster in its minimum and maximum height positions. Any load-limiting device should be deactivated for purposes of this test. Should the originally supplied pump handle or foot pump pedal not be capable of activating the pump mechanism, a substitute handle or pedal may be used for the performance of the test.

Part 15
Oil-Filter Crushers

15-1 SCOPE, CONFIGURATION, AND ILLUSTRATIONS

15-1.1 Scope

This Part applies to oil-filter crushers used to extract excess oil from used engine oil filters and to reduce the filters' size for ease of recycling.

15-1.2 Configuration

Oil-filter crushers covered by this Part utilize an enclosure where force is applied to crush the oil filter. They are typically constructed with an enclosure that rigidly holds the means for applying force. An access door allows insertion and removal of oil filters when open. Force to crush the oil filter is supplied by pneumatic or hydraulic pressure. A drain transfers waste oil extracted from the oil filter during the crushing process to a drum or other waste container. Oil-filter crushers may be mounted on the floor, wall, bench, or a waste container. Mounting hardware may be required.

15-1.3 Illustrations

Figure 15-1.3-1 shows typical oil-filter crushers; the illustrations are not intended to be all-inclusive.

15-2 DESIGN

In addition to Parts 2 and 3, the requirements in paras. 15-2.1 through 15-2.4 apply.

15-2.1 Frame

The frame may be of any configuration that incorporates the enclosure and cylinder. Mounting means are required to secure the oil-filter crusher to a collecting drum, table, or floor.

15-2.2 Enclosure

The oil-filter crusher shall include an enclosure that surrounds the crushing area, providing the mechanical strength to withstand the forces required to crush the filter. The enclosure shall contain ejected fluids and objects that may break, separate, or be ejected during the crushing cycle. Typically the enclosure houses the cylinder and reaction plates for crushing the filter.

15-2.3 Access Door

The access door shall contain ejected fluids and objects that may break, separate, or be ejected during the crushing cycle. The access door shall have mechanical interlocks to prevent initiation of the crushing cycle until it is securely closed and to prevent opening the access door until after the crushing cycle is complete.

15-2.4 Proof Load

Each filter crusher shall be tested to a proof load of 150% of rated capacity without functional damage.

15-3 SAFETY MARKINGS AND MESSAGES

15-3.1 Safety Markings

The following are examples of safety markings:

(a) Study, understand, and follow all instructions before operating this device.

(b) Do not exceed rated capacity.

(c) Do not disable or modify the safety lockout device.

(d) Use of this product is limited to crushing oil filters.

(e) Failure to heed and understand these instructions and markings may result in personal injury, property damage, or both.

15-3.2 Safety Messages

The following are examples of safety messages:

(a) No alterations shall be made to this product.

(b) Only accessories supplied by the manufacturer shall be used.

(c) To avoid sharp edges and foreign materials, exercise care when handling filters.

15-4 DESIGN QUALIFICATION TESTING

In addition to Parts 2 and 3, the requirements in paras. 15-4.1 and 15-4.2 apply.

15-4.1 Operational Tests

15-4.1.1 Load-Limiting Test. Oil-filter crushers having an overload protection circuit shall be tested until the load-limiting device is activated, at which time the force applied to the crusher shall be no less than