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U S A STANDARD

Safety Standard for Powered Industrial Trucks

USAS B56.1 - 1969

Sponsor

The American Society of Mechanical Engineers

Published by

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

United Engineering Center 345 East 47th Street New York, N. Y. 10017

USA STANDARD

This USA Standard is one of nearly 3000 standards approved as American Standards by the American Standards Association. On August 24, 1966, the ASA was reconstituted as the United States of America Standards Institute. Standards approved as American Standards are now designated USA Standards. There is no change in their index indentification or technical content.

Foreword

IN June, 1946, The American Society of Mechanical Engineers adopted a resolution to develop a safety code on powered industrial trucks. On August 7, 1947, the American Standards Association approved ASME's sponsorship of this standard. The organizational meeting was held on May 20, 1948.

Comments from the first draft, dated April, 1949, were incorporated in a final draft, dated November, 1949, which was submitted to sectional committee members for letter ballot vote and was unanimously affirmed. In June, 1950, ASA approved the standard as submitted.

In accordance with ASA procedure to review publications every five years, the first revision was completed on March 8, 1955, and the second revision on August 18, 1959. The third revision was started under the review procedure of ASA. It was completed under the newly constituted (September 1, 1966) United States of America Standards Institute on September 10, 1969.

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Safety Standard for Powered Industrial Trucks

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USA STANDARD

Safety Standard for Powered Industrial Trucks

Part I Introduction

GENERAL

This standard is one of a series that has been formulated under the administrative sponsorship of The American Society of Mechanical Engineers in accordance with the standards committee method and the procedures of the United States of America Standards Institute.

Pursuant to the requirements of USASI, the membership of the standards committee dealing with this Safety Standard includes representatives of:

(a) Manufacturers;
(b) Purchasers or Owners;
(c) Employees affected by the Standard;
(d) Governmental bodies having regulating power or influence in the area;
(e) Specialists, such as consulting experts with no exclusive business affiliations, or educators;
(f) Insurance representatives;
(g) Installers and erectors; and,
(h) Utilities.

In addition, not more than one third of the membership of this committee is from any one category. This standard has been formulated by a consensus of the members of this committee.

SECTION 1
SCOPE

Safety requirements relating to the elements of design, operation and maintenance of powered industrial trucks – not including vehicles intended primarily for earth moving or over the road hauling.

SECTION 2
PURPOSE AND EFFECTIVE DATE

The purpose of this standard is to promote safety in the design, construction, application, operation, and maintenance of powered industrial trucks. This standard may be used as a guide by governmental authorities desiring to formulate safety rules and regulations. This standard is also intended for voluntary use by others associated with manufacturing or utilizing powered industrial trucks.

Questions on the interpretation of this standard should be addressed in writing to – The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, New York 10017 – for referral to the Standards Committee.

This standard shall become effective one year after publication and is intended to have prospective application only.

SECTION 3
INTERPRETATION

To carry out the provision of this Standard, the word "shall" is to be understood as mandatory and the word "should" as advisory.

The word "approved" means acceptable to the inspection authority having jurisdiction.

A glossary of commonly used words and phrases with the meanings normally accorded them in the industry is attached as Appendix A.

Part II

For the Manufacturer

SECTION 4

DESIGN & CONSTRUCTION STANDARDS

401 INTRODUCTION

This part sets forth Safety Standards for the Design and Construction of powered industrial trucks.

402 CAPACITY (Except for Tractors)

A. The capacity of a truck equipped with load carriage and forks, or with attachments is the maximum weight, expressed in pounds, at a specified load center, which a given truck, based on the strength of the various components of the truck and, when applicable, on 406 of this Standard, can lift to the maximum elevation of the load engaging means. Alternate capacities may be established at the same specified load center and at less than maximum elevation of the load engaging means.

B. The capacity of a truck equipped with a platform is the maximum weight, expressed in pounds, at a specified load center which a given truck, based on the strength of the various components of the truck, can lift to the maximum elevation of the load engaging means.

403 RATED CAPACITY OR CAPACITY RATING (Except for Tractors)

Rated capacity for trucks up to and including 20,000 pounds shall be based on the strength of the various components in the truck and for trucks covered in 403C, also on 406 of this Standard, and shall be expressed as follows:

A. Low-Lift and Nonelevating – Platform and Pallet Trucks – The maximum weight, expressed in pounds, with load center near the center of the load engaging means.

B. High-Lift Platform Trucks – The maximum weight, expressed in pounds, at a specified load center that a truck can transport and stack to a height established by the manufacturer. In addition, alternate rated capacities may be established at other load centers and other platform heights.

C. Counterbalanced and noncounterbalanced Fork Lift Trucks and Reach Trucks – The maximum weight, expressed in pounds, of a 48 inches homogeneous cube (24 inches load center) that a truck can transport and stack to a height established by the manufacturer. In addition, alternate rated capacities may be established at other load centers and other fork heights.

If any of the foregoing trucks is equipped with attachments, the rated capacity shall be expressed in pounds at a specified load center and for a specified load elevation.

404 ALTERNATE RATED CAPACITY – ALTERNATE CAPACITY RATING (Except for Tractors)

The maximum weight, expressed in pounds, of a load with a stated horizontal and vertical distance to the center of gravity of the load that a given truck, based on the strength of the various components of the truck and, when applicable also on 406 of this Standard, can transport and stack to a height established by the manufacturer.

405 NAMEPLATES AND MARKINGS (See 402, 403 & 404)

A. On every truck the manufacturer shall install a durable, corrosion resistant, nameplate with the truck model or truck serial number and approximate weight of truck legibly inscribed. The truck serial number shall also be stamped on the frame of the truck. If the truck is accepted by a nationally recognized testing laboratory it should be so marked.

B. On high-lift trucks:

(1) If the truck is equipped with platform or load carriage and forks, the nameplate shall also show the capacity and load center at maximum elevation of the truck load engaging means, and may show rated capacity, alternate rated capacities, and alternate capacities. If alternate capacities are shown for elevations lower than maximum, alternate capacities not shown may be

assumed to fall on a straight line between the capacity and the alternate capacities shown for each load center.

(2) If the truck is originally equipped with front end attachments, the truck nameplate shall also be marked to identify the attachments and show the approximate weight of the truck and attachment combination and capacity of the truck and attachment combination at maximum elevation of the load engaging means with load laterally centered.

C. On Low Lift and Nonelevating trucks the nameplate shall also show rated capacity.

D. On electric trucks the nameplate shall also show the truck weight without battery, the minimum and maximum service weights of the battery to be used, nominal voltage for which truck is arranged, and, where required, identifying number of battery required, and maximum rated ampere hour capacity for which truck is equipped.

(1) Identifying numbers of batteries are E583, EE583, EO583, and EX583 defined as follows:

E583 – A battery assembled as a unit with a cover for use in Type E trucks which do not have a covered battery compartment.

EE583 – A battery assembled as a unit with a cover that can be locked for use in Type EE trucks which do not have an enclosed battery compartment.

EO583 – A battery assembled as a unit without a cover for use in a Type E truck having a covered battery compartment or in a Type EE truck having an enclosed battery compartment with locking means.

EX583 – A battery assembled as a unit with a cover that can be locked. For use in EX trucks which do not have a locked battery compartment.

E. For trucks designated Type EX the class and group of hazardous locations in which they are intended to be used shall be shown.

F. The nameplates for batteries installed in electric trucks shall show manufacturer's name, model, battery identification, and ampere hour capacity.

For batteries installed in electric trucks, battery weight shall be stamped on the battery tray near the lifting means as follows: "Service Weight lbs"

G. On every removable attachment (excluding fork extensions), the attachment manufacturer shall install a durable corrosion resistant nameplate, with the following information legibly and permanently inscribed:

Serial Number
Weight of Attachment
Capacity or Rated Capacity of Attachment
The following instruction (or equivalent): "Capacity of Truck and Attachment combination may be less than capacity shown on attachment – consult truck nameplate."

H. On motorized hand trucks the manufacturer should label in letters at least 1½ inches high, "NO RIDING."

406 STABILITY – TILTING PLATFORM TESTS

A. METHODS OF STABILITY DETERMINATION

Stability determinations may be made by one of the following methods:

1. *Tilting Platform Tests* – The series of tilting platform tests hereinafter described is a basic approach to stability determination. It involves test equipment and a carefully followed test procedure. The results of such tests are valuable for development work and for confirming sound truck design. These tests are intended to be applied to prototype trucks but may also be applied to production trucks on a selective basis as required by the user or manufacturer.

2. *Calculated Stability Factors* – In order to provide a means for handling everyday stability determinations, stability factors as related to the Tilting Platform Tests may be calculated. These calculations take into account variations in design including tire, mast, and other deflections, and provide a means for predicting with reasonable accuracy the stability of fork trucks. Tilting Platform Tests are the basis for establishing factors used in stability calculations. When comparing calculations with actual tilting platform tests, the actual tests are to be considered the true measure of stability.

B. SUMMARY OF TESTS FOR STABILITY – COUNTERBALANCED TRUCKS

Test No.	Tests For:	Platform Slope in Relation to Truck	Fork Height	Loaded or Unloaded	Load Center	Mast or Fork Tilt	Platform Slope Values
1	Forward Stacking	Forward	At max. elevation	Loaded	24"	As specified – see text	4% * 3.5%**
2	Forward Travel	Forward	12"	Loaded	24"	Full Rearward	18%
3	Lateral Stacking	Lateral	At max. elevation	Loaded	24"	Full Rearward	6%
4	Lateral Travel	Lateral	12"	Unloaded	–	Full Rearward	Graph A

* Up to and including 10,000 lb at 24" Load Center.
** Over 10,000 lb up to and including 20,000 lb at 24" Load Center.

C. TILTING PLATFORM TESTS – Counterbalanced Trucks

The following tests are designed to verify rated capacities of counterbalanced trucks having rated capacities up to and including 20,000 lb at 24 inches load center and to determine capacity or alternate rated capacity. If these tests are used to determine capacity or alternate rated capacities, use appropriate loads and load centers instead of those herein specified. If other tests or tests for trucks over 20,000 lb rated capacity are required, the details should be agreed upon between the interested parties.

1. *Test #1 – For Longitudinal Stability – Stacking*

Using the procedure outlined for the test, a truck carrying the rated capacity load at maximum elevation shall not overturn when the platform upon which the truck is standing is tilted to the slope indicated in the following table about an axis parallel to the axis of the load wheels and in a direction to increase the load overhang.

Rated Capacity	Slope
Up to and including 10,000 lb at 24" Load Center	4%
Over 10,000 lb up to and including 20,000 lb at 24" Load Center	3.5%

Procedure for Longitudinal Stability (Stacking) Tilting Platform Test

a. Truck shall be placed on an initially level platform with the axis of the load wheels parallel to the tilting axis of the platform.

b. The test load shall be equivalent to an unrestrained homogeneous cube, the dimensions of which are twice the rated load center dimension, and the weight of which is equal to the rated capacity load of the truck.

c. When placed on the forks the center of mass of the test weight shall be located on the longitudinal centerline of the truck. For trucks with tilting uprights with the test load supported by the forks approximately 12 inches above the platform and in a normal and unrestrained manner with the stationary mast being vertical with the level platform, attach a plumb line at the theoretical intersection of the front and top surfaces of the forks to establish a reference point. This point will be used to indicate the maintaining of the original load overhang when the load is elevated to maximum height. (A transit may be used instead of a plumb line to establish vertical.)

d. With the test load elevated to maximum height, and for trucks with tilting up-

rights without change in the original overhang dimensions, the test platform shall be tipped to the specified slope. During the test there should be no driver on the truck. The truck position on the platform shall be maintained by brakes or other similar means, but not by means of wheel chocks.

e. Where attachments are supplied as original equipment, this same stability test shall apply, except that the plumb line shall be attached to the underside of the carriage, attachment, or load – whichever is lowest. The truck shall be equipped with the attachment and the test load shall be representative of the capacity of the truck and attachment combination.

2. *Test #2 – For Longitudinal Stability – Traveling*

Using the procedure outlined for the test, a truck carrying rated capacity load at full rearward tilt of the mast and with the load elevated 12 inches from the floor, measured at the point of intersection of the load carrying surfaces of the forks, shall not overturn when the platform upon which the truck is standing is tilted to an 18 percent slope about an axis parallel to the axis of the load wheels and in a direction to increase the load overhang.

Procedure for Longitudinal Stability (Traveling) Tilting Platform Test

a. Truck shall be placed on an initially level platform with the axis of the load wheels parallel to the tilting axis of the platform.

b. The test load shall be equivalent to an unrestrained homogeneous cube, the dimensions of which are twice the rated load center dimension and the weight of which is equal to the rated capacity load of the truck.

c. When placed on the forks, the center of the test weight shall be located on the longitudinal centerline of the truck. The mast shall be at full rearward tilt and the load then elevated until the point of intersection of the two load carrying surfaces of the forks is 12 inches from the floor.

d. With the test load elevated as described, the test platform shall be tipped to the specified slope. During the test there shall be no driver on the truck. The truck position of the platform shall be maintained by brakes or other similar means, but not by means of wheel chocks.[1]

It may also be necessary to restrain the load wheels by external means between the wheels and truck, and/or to apply service brakes by external means to hold the truck in place during this test.

e. Where attachments are supplied as original equipment, this same stability test shall apply, except the 12-inch measurement shall be made to the undersurface of the attachment, carriage, or load, whichever is lowest. The truck shall be equipped with the attachment and the test load shall be representative of the capacity of the truck and attachment combination.

3. *Test #3 – Lateral Stability – Stacking*

Using the procedure outlined for the test, a truck carrying the rated capacity load at maximum elevation and at maximum rearward tilt permitted by the truck mechanism at that elevation, shall not overturn when the platform upon which the truck is standing is tilted to a 6 percent slope about an axis parallel to a line connecting the center of either load-wheel tire (or outermost tire where multiple tires are used) and the projection perpendicular to the platform of the point of intersection of the longitudinal centerline of the truck and the centerline of the steering wheels. The steering wheel nearest the tilting axis shall be positioned parallel to the tilting axis of the platform.

Procedure for Lateral Stability (Stacking) Tilting Platform Test

a. Place empty truck on an initially level platform in a position such that a line connecting the center of either load wheel tire (or outermost tire where multiple tires are used) and the projection perpendicular to the platform of the point of intersection of the longitudinal centerline of the truck and the centerline of the steering wheels is parallel to the axis of tilting of the platform. See Sketches "A" and "B" for position.

[1] *If necessary, it is permissible to cover the surface of the tilting platform with a friction increasing material such as liquid paint or adhesive applied tape containing friction material.*

b. The test load shall be equivalent to an unrestrained, homogeneous cube, the dimensions of which are twice the rated load-center dimension and the weight of which is equal to the rated capacity of the truck.

c. When placed on the forks, the center of mass of the test weight shall be located on the longitudinal centerline of the truck. With the test load supported by the forks in a normal and unrestrained manner and the mast at full rearward tilt permitted by the truck mechanism at that elevation, elevate the load to its maximum height. Where tilt restrictions for various elevations are employed, the truck shall be tested at maximum elevation for each tilt restriction permitted by the truck mechanism.

d. With the test load elevated to maximum height, the test platform shall be tipped to the specified slope. During the test there shall be no driver on the truck. The truck position on the platform shall be maintained by brakes or other similar means, but not by means of wheel chocks.

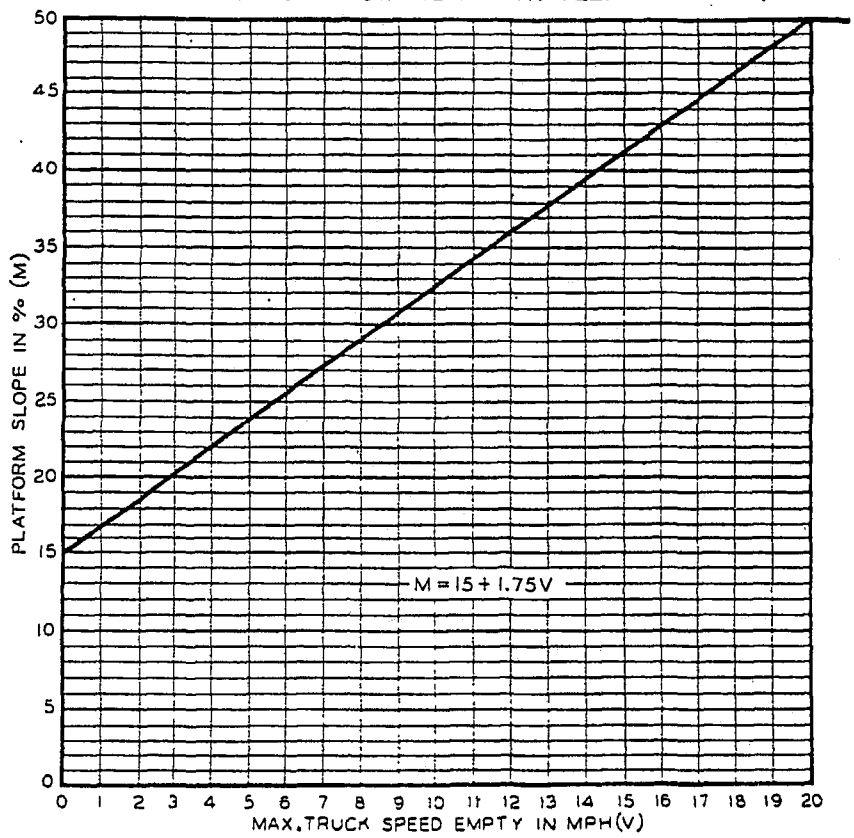
e. Where attachments are supplied as original equipment, this same stability test shall apply. The truck shall be equipped with the attachment and the test load shall be representative of the capacity of the truck and attachment combination.

4. *Test #4 — Lateral Stability — Traveling*

Using the procedure outlined for the test, an empty truck at full rearward tilt of the mast and with the forks elevated 12 inches from the floor, measured at the point of intersection of the load carrying surfaces of the forks, shall not overturn when the platform upon which the truck is standing is tilted to the slope specified in the Graph A, about an axis parallel to a line connecting the center of either load-wheel tire (or outermost tire where multiple tires are used) and the projection perpendicular to the platform of the point of intersection of the longi-

GRAPH A

LATERAL STABILITY – TRAVELING



tudinal centerline of the truck and the centerline of the steering wheels. The steering wheel nearest the tilting axis shall be positioned parallel to the tilting axis of the platform. Values are based on ultimate overturn, not on point where one drive tire leaves the ground.

Procedure for Lateral Stability (Traveling) Tilting Platform Test

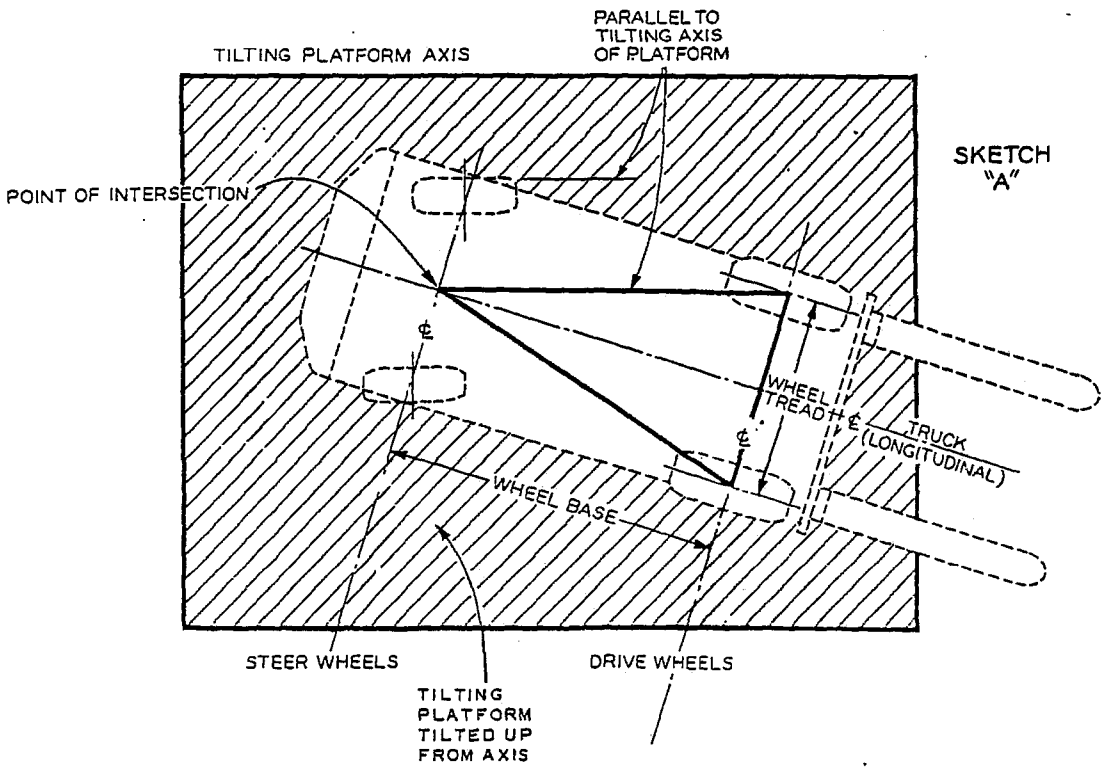
a. Place empty truck on an initially level platform in a position such that a line connecting the center of either load-wheel tire (or outermost tire where multiple tires are used) and the projection perpendicular to the platform of the point of intersection of the longitudinal centerline of the truck and the centerline of the steering wheels is parallel to the axis of the tilting of the platform, and with the steering wheel nearest the tilting axis parallel to the axis. See Sketches "A" and "B" for position.

b. The mast shall be at full rearward tilt and the forks then elevated until the point of intersection of the two load-carrying surfaces of the forks is 12 inches from the floor.

c. With the forks elevated as described, the test platform shall be tipped to the specified slope. During the test there shall be no driver on the truck. The truck position on the platform shall be maintained by brakes or other similar means, but not by means of wheel chocks.[2]

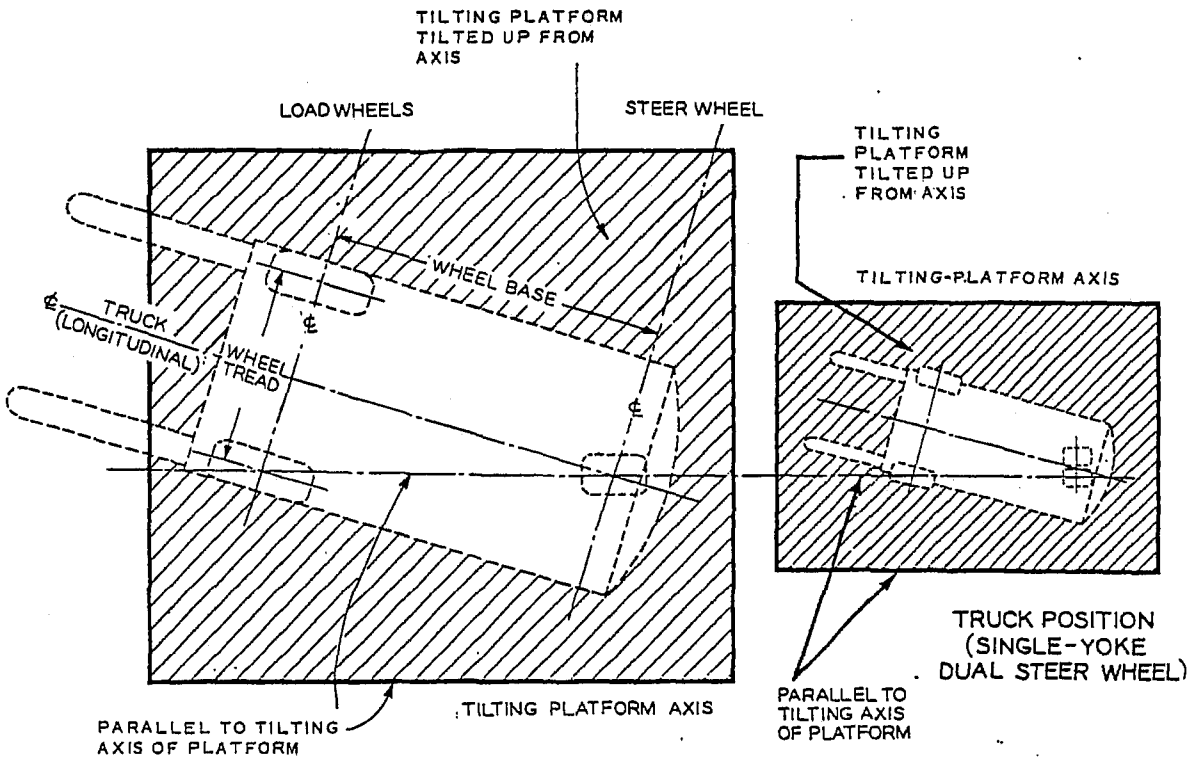
d. When attachments are supplied as original equipment, this same stability test shall apply, except the 12-inch measurement shall be made to the underside of the attachment or carriage – whichever is lower.

[2] *It will probably be necessary to cover the surface of the tilting platform with a friction-increasing material such as liquid paint, adhesive applied tape containing friction material, or safety tread with perforated buttons. It may also be necessary to apply service brakes by external means to hold the truck in place during the test.*



LATERAL-STABILITY TILTING PLATFORM TRUCK POSITION

SKETCH "B"



LATERAL-STABILITY
TILTING PLATFORM
TRUCK POSITION

D. SUMMARY OF TESTS FOR STABILITY – NARROW-AISLE RIDER TRUCKS

These requirements apply to self-loading narrow-aisle rider trucks normally equipped with forks, such as reach or straddle trucks.

Test No.	Test For:	Platform Slope in Relation to Truck	Fork Height	Loaded or Unloaded	Load Center	Reach Extended or Retracted (if reach type)	Mast or Fork Tilt	Platform Slope Values
N1	Forward Stacking	Forward	(Note 1)	Loaded	24"	Extended	As Specified See Text	4%
N2*	Forward Traveling	Forward	(Note 2)	Loaded	24"	Retracted	Full Rearward	18%
N3	Lateral Stacking	Lateral	(Note 1)	Loaded	16" or 24" (whichever is less stable)	Retracted	***	6%
N3A	Lateral Stacking	Lateral	(Note 1)	Unloaded	–	Retracted	***	8%
N4	Lateral Traveling	Lateral	(Note 2)	Unloaded	–	Retracted	***	Graph A
N5**	Rearward Stacking	Rearward	(Note 1)	Loaded	16"	Retracted	***	14%
N5A	Rearward Stacking	Rearward	(Note 1)	Unloaded	–	Retracted	***	14% or 18%****
N6	Rearward Traveling	Rearward	(Note 2)	Unloaded	–	Retracted	***	Graph B

Note 1: At maximum elevation.
Note 2: 6 in. above outrigger and/or load wheels.

*Test #N2 – especially with straddle trucks – stability is usually obvious, in which case test may be waived.
**Test #N5 – both reach and straddle trucks (except with tilting mast) – stability is usually obvious, in which case test may be waived.

*** For trucks with tilting masts the mast shall be vertical or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks shall be horizontal or at full upward tilt, whichever is less stable.

**** Platform slope value of 14 percent applies to trucks with single rear wheel drive (or brake) and 18 percent applies to trucks with dual rear wheel drive (or brakes), respectively.

E. TILTING PLATFORM TESTS – NARROW AISLE RIDER TRUCKS

These tests roughly correspond to tests of the same numbers for Counterbalanced Trucks. The letter "N" has been added to clearly distinguish Narrow Aisle truck tests from Counterbalanced truck tests. Narrow-Aisle-Type Trucks require several tests in addition to those for Counterbalanced trucks.

For some truck configurations, stability may obviously be far in excess of the minimum slope values as required by some of the tests. In such cases, those tests may be omitted. Examples: Tests #N2 and #N5, except for unusual truck proportions.

Trucks may be of the reaching or non-reaching type, equipped with tilting mast, or forks that tilt alone without tilting mast, or without any form of mast or fork tilt.

To simulate an operator, a 200 lb weight

shall be located with the center of gravity centered 10 inches above the compressed operator's seat for sit-down trucks and centered 40 inches above the operator's platform for stand-up trucks. This weight shall be used only when it will worsen the stability condition being tested and omitted when it would help.

Chocks may be used as needed to maintain the truck position of the platform. The use of chocks approximately 10 percent of the diameter of the wheel, but not less than 1 inch nor more than 2 inches high is allowed when necessary.

The critical-balance point of the truck in any test will be that platform slope which if increased further would produce complete overturning of the truck. Effects of frame or structural members in contact with platform are recognized as beneficial and should be included in determining a "critical-balance" slope.

The following tests are designed to verify rated capacities of Narrow-Aisle-Rider fork trucks having rated capacities up to and including 10,000 lb at 24-inch load center and to determine capacity or alternate rated capacities. If these tests are used to determine capacity or alternate rated capacities, use appropriate loads and load centers instead of those herein specified. If other tests or tests for trucks over 10,000 lb rated capacity are required, the details should be agreed upon between the interested parties.

1. *Test #N1 – For Forward Stability – Stacking*

Using the procedure outlined for the test, a truck carrying the rated capacity load at maximum elevation shall not overturn when the platform upon which the truck is standing is tilted to a slope of 4 percent about an axis parallel to the axis of the load wheels, and in a direction to increase the load overhang.

Procedure for Forward Stability (Stacking) Tilting Platform Test #N1

a. Truck shall be placed on an initially level platform with the axis of the load wheels parallel to the tilting axis of the platform. See Sketch "D" for position.

b. The test load shall be equivalent to an unrestrained homogeneous cube, the dimensions of which are twice the rated load center dimension and the weight of which is equal to the rated capacity load of the truck.

c. When placed on the forks, the center of mass of the test weight shall be located on the longitudinal centerline of the truck. With the test load supported by the forks 6 inches above top of the outriggers and/or load wheels, and in a normal and unrestrained manner, the forks shall be fully extended (if extendable), and the nonelevating portion of the mast shall be vertical (if tilting-mast design). For reach trucks and tilting-mast straddle trucks, attach a plumb line at the theoretical intersection of the two load engaging surfaces of the forks to establish a reference point. This point will be used to indicate the maintaining of the original load overhang when the load is elevated to maximum height. (A transit may be used instead of a plumb line to establish vertical).

d. With the test load elevated to maximum height without change in the original load-overhang dimensions (except for fixed-mast straddle trucks), the test platform shall be tipped to the specified slope. During the test there shall be no driver on the truck. The truck position on the platform may be maintained by brakes and/or wheel chocks.

e. Where attachments are supplied as original equipment, this same stability test shall apply, except that the plumb line shall be attached to the underside of the carriage, attachment, or load – whichever is lowest. The truck shall be equipped with the attachment and the test load shall be representative of the capacity of the truck and attachment combination.

2. *Test #N2 – For Forward Stability – Traveling*

Using the procedure outlined for the test, a truck carrying rated capacity load at full rearward tilt of the mast and/or upward tilt of forks, and with the load elevated 6 inches above top of the outrigger and/or load wheels, measured at the point of intersection of the two load engaging surfaces of the forks, shall not overturn when the platform upon which the truck is standing is tilted to an 18 percent slope about an axis parallel to the axis of the load wheels and in a direction to increase the load overhang.

Procedure for Forward Stability (Traveling) Tilting Platform Test #2

a. Truck shall be placed on an initially level platform with the axis of the load wheels parallel to the tilting axis of the platform. See Sketch "D" for position.

b. The test load shall be equivalent to an unrestrained homogeneous cube, the dimensions of which are twice the rated load-center dimension and the weight of which is equal to the rated capacity load of the truck.

c. When placed on the forks, the center of the test weight shall be located on the longitudinal centerline of the truck. The mast shall be at full rearward tilt and/or the forks at full upward tilt, and the load then elevated until the point of intersection of the two load engaging surfaces of the forks is 6 inches above top of the outriggers and/or load wheels, and the forks shall be fully retracted (if retractable).

d. With the test load positioned as described, the test platform shall be tipped to the specified slope. During the test there shall be no driver on the truck. The truck position on the platform may be maintained by brakes and/or wheel chocks.

e. Where attachments are supplied as original equipment, this same stability test shall apply, except the 6-inch measurement from top of outrigger and/or load wheels shall be made to the undersurface of the attachment, carriage, or load – whichever is lower. The truck shall be equipped with the attachment and the test load shall be representative of the capacity of the truck and attachment combination.

3. *Tests #N3 and #N3A – Lateral Stability – Stacking, Loaded and Unloaded*[3]

Using the procedure outlined for these tests, a truck shall not overturn when the platform upon which the truck is standing is tilted to a 6 percent slope for loaded truck (Test #N3), or an 8 percent slope for unloaded truck (Test #N3A).

Slope values are based on ultimate overturn, not on point where one or more wheels leave the platform.

Procedure for Lateral Stability (Stacking, Loaded) Tilting Platform Test #N3

a. Place empty truck on an initially level platform in a position that the least stable lateral axis of initial tipping of the truck[4], running through the center of either load wheel (outermost and/or rearmost wheel where dual or tandem wheels are used, respectively) is parallel to the axis of tilting of the platform, and with the rear wheels placed in their least stable position. See Sketch "E" for position.

b. The test load shall be equivalent to an unrestrained homogeneous cube, the dimensions of which are twice the test load center dimension and the weight of which is equal to the rated capacity load of the truck.

c. When placed on the forks, the center of mass of the test weight shall be located on the longitudinal centerline of the truck. With the test load supported by the forks in a normal and unrestrained manner, the forks in fully retracted position (if retractable), elevate the load to its maximum height. For trucks with tilting masts, the mast shall be vertical as defined in Test #N1, or at full rearward tilt permitted by the truck mechanism at that elevation, whichever is less stable. Where tilt restrictions for various elevations are employed and the rearward tilt

[3] *Tests #N3 and #N3A are identical except that in Test #N3 the truck is loaded and in Test #N3A the truck is unloaded.*

Although trucks are rated at 24 inches load center, the load center for Test #N3 should be either 24 or 16 inches – whichever would produce the less stable condition. This decreased load center is specified, recognizing that loads may be handled which have a higher density and therefore, shorter load center than the truck rating. Decreasing load center distance is usually in the direction of decreasing lateral stability, hence should be recognized in Test #N3.

[4] *It will usually be found that this axis runs through one of the following: a) one of the rear wheels, or b) a pivot point of support for trucks having a laterally articulating rear wheel mounting.*

position is determined to be less stable, the truck shall be tested at maximum elevation for each tilt restriction permitted by the truck mechanism. For trucks with tilting forks, the forks shall be horizontal or at full upward tilt, whichever is less stable.

d. With test load positioned as described, the test platform shall be tipped to the specified slope. The truck position on the platform may be maintained by brakes and/or chocks.

e. Where attachments are supplied as original equipment, this same stability test shall apply. The truck shall be equipped with the attachment and the test load shall be representative of the capacity of the truck and attachment combination.

Procedure for Lateral-Stability (Stacking, Unloaded) Tilting-Platform Test #3A

a. Place empty truck on an initially level platform in a position such that the least stable lateral axis of initial tipping of the truck[5], running through the center of either load wheel (outermost and/or rearmost wheel where dual or tandem wheels are used, respectively) is parallel to the axis of tilting of the platform, and with the rear wheels placed in their least stable position. See Sketch "E" for position.

b. The forks shall be fully retracted (if retractable), and elevated to maximum height. For trucks with tilting masts, the mast shall be vertical as defined in Test #N1, or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks shall be horizontal or at full upward tilt, whichever is less stable.

c. With forks positioned as described, the test platform shall be tipped to the specified slope. The truck position on the platform may be maintained by brakes and/or chocks.

d. When attachments are supplied as original equipment, this same stability test shall apply.

[5] *It will usually be found that this axis runs through one of the following: a) one of the rear wheels, or b) a pivot point of support for trucks having a laterally articulating rear-wheel mounting.*

4. *Test #N4 – Lateral Stability – Traveling*

Using the procedure outlined for the test, an empty truck with the forks elevated 6 inches above top of the outriggers and/or load wheels, measured at the point of intersection of the two load engaging surfaces of the forks, shall not overturn when the platform upon which the truck is standing is tilted to the slope specified in Graph A.

Slope values are based on ultimate overturn, not on point where one or more wheels leave the platform.

Procedure for Lateral-Stability (Traveling) Tilting-Platform Test #N4

a. Place empty truck on an initially level platform in a position such that the least stable lateral axis of initial tipping of the truck[5], running through the center of either load wheel (outermost and/or rearmost wheel where dual or tandem wheels are used, respectively) is parallel to the axis of tilting of the platform, and with the rear wheels placed in their least stable position. See Sketch "E" for position.

b. The forks shall be fully retracted (if retractable) and elevated until the carrying surfaces are 6 inches above top of the outriggers and/or load wheels, measured at the point of intersection of the two load engaging surfaces of the forks. For trucks with tilting masts, the mast shall be vertical or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks shall be horizontal or at full upward tilt, whichever is less stable.

c. With the forks positioned as described, the test platform shall be tipped to the specified slope. The truck position on the platform may be maintained by brakes and/or chocks.

d. When attachments are supplied as original equipment, this same stability test shall apply, except the 6 inches measurement from top of outriggers and/or load wheels shall be made to

the underside of the attachment or carriage – whichever is lower.

5. *Tests #N5 and #N5A – Rearward Stability – Stacking, loaded and unloaded*[6]

Using the procedure outlined for these tests, a truck shall not overturn when the platform upon which the truck is standing is tilted to a 14 per cent slope for loaded truck (Test #N5), and a 14 percent or 18 percent slope for unloaded truck (Test #N5A), depending on whether the truck has single rear-wheel drive (or brake) or dual rear-wheel drive (or brakes), respectively.

Slope values are based on ultimate overturn, not on point where one or more wheels leave the platform.

Procedure for Rearward-Stability (Stacking, Loaded) Tilting-Platform Test #N5

a. Place empty truck on an initially level platform in a position such that the centerline of the truck is perpendicular to the axis of tilting of the platform, and with the rear wheels placed in their least stable position. See Sketch "F" for position.

b. The test load shall be equivalent to an unrestrained homogeneous cube the dimensions of which are twice the test load center dimension and the weight of which is equal to the rated capacity of the truck.

c. When placed on the forks, the center of mass of the test weight shall be located on the longitudinal centerline of the truck. With the test load supported by the forks in a normal and unrestrained manner, the forks in fully retracted position (if retractable), and the mast at full rearward tilt permitted by the truck mechanism, elevate the load to its maximum height. Where tilt restrictions for various elevations are employed, the truck shall be tested at maximum elevation for each tilt restriction permitted by the truck mechanism. For trucks with tilting forks, the forks shall be horizontal or at full upward tilt, whichever is less stable.

d. With test load positioned as described, the test platform shall be tipped to the specified slope. The truck position on the platform may be maintained by brakes and/or chocks.

e. Where attachments are supplied as original equipment, this same stability test shall apply. The truck shall be equipped with the attachment and the test load shall be representative of the capacity of the truck and attachment combination.

Procedure for Rearward-Stability (Stacking, Unloaded) Tilting-Platform Test #N5A

a. Place empty truck on an initially level platform in a position such that the centerline of the truck is perpendicular to the axis of tilting of the platform, and with the rear wheels placed in their least stable position. See Sketch "F" for position.

b. The forks shall be fully retracted (if retractable), and elevated to maximum height. For trucks with tilting masts, the mast shall be at full rearward tilt. For trucks with tilting forks, the forks shall be horizontal or at full upward tilt, whichever is less stable.

c. With the forks positioned as described, the test platform shall be tipped to the specified slope. The truck position on the platform may be maintained by brakes and/or chocks.

d. When attachments are supplied as original equipment, this same stability test shall apply.

6. *Test #N6 – Rearward Stability – Traveling*

Using the procedure outlined for the test, an empty truck with the forks

[6] *Tests #N5 and #N5A are identical except that in Test #N5 the truck is loaded and in Test #N5A the truck is unloaded.*

Although trucks are rated at 24-in. load center, a load center distance of 16 inches should be used for Test #N5. This decreased load center is specified, recognizing that loads may be handled which have a higher density and, therefore, shorter load center than the truck rating. Decreasing load center distance is in the direction of decreasing rearward stability, hence should be recognized in Test #N5.

elevated 6 inches above top of the outriggers and/or load wheels, measured at the point of intersection of the two load engaging surfaces of the forks, shall not overturn when the platform upon which the truck is standing is tilted to the slope specified in Graph B.

Slope values are based on ultimate overturn, not on point where one or more wheels leave the platform.

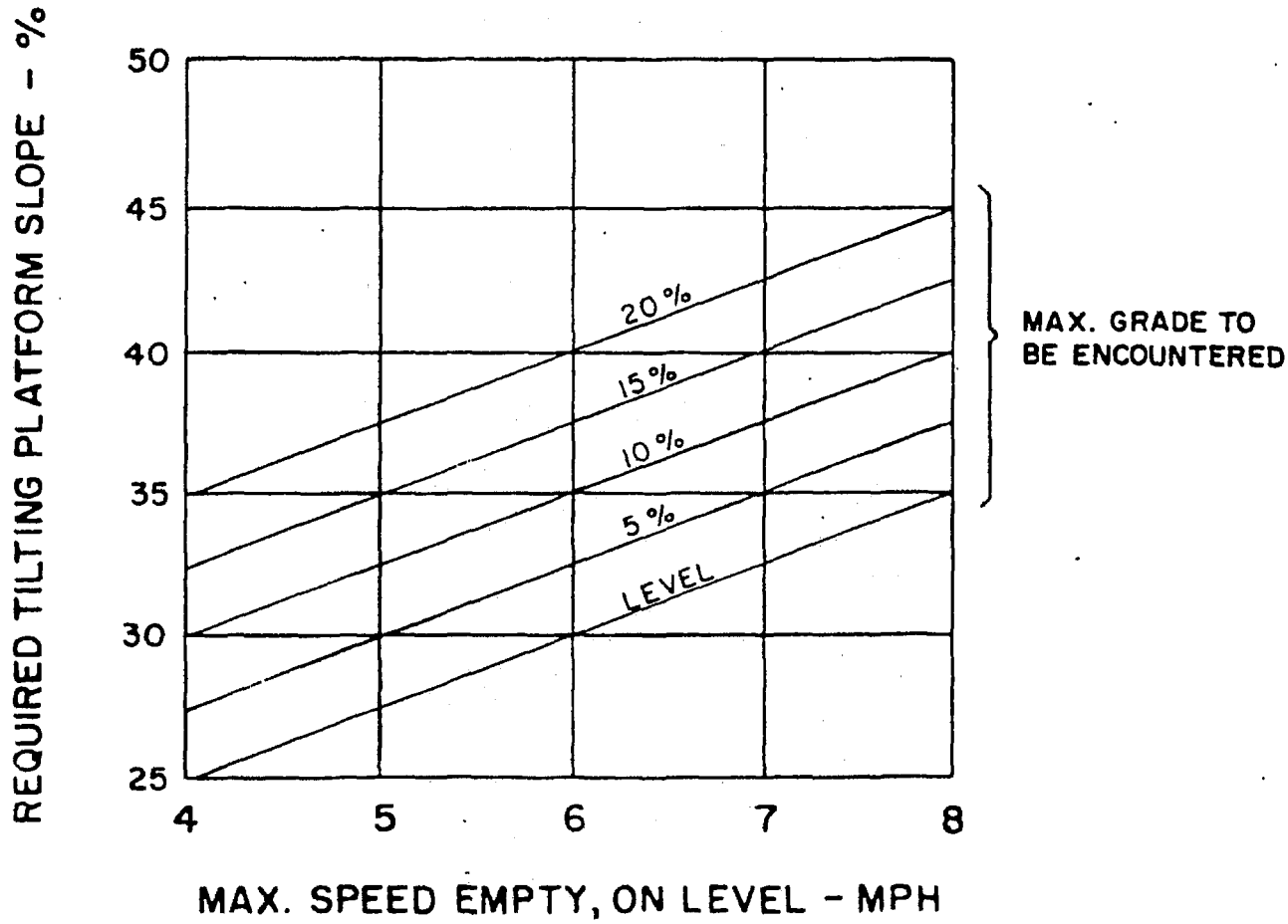
Procedure for Rearward Stability (Traveling) Tilting Platform Test #N6

a. Place empty truck on initially level platform in a position such that the centerline of the truck is perpendicular to the axis of tilting of the platform, and with the rear wheels placed in their least stable position. See Sketch "F" for position.

b. The forks shall be fully retracted (if retractable) and elevated until the carrying surfaces are 6 inches above top of outriggers and/or load wheels measured at the point of intersection of the two load engaging surfaces of the forks. For trucks with a tilting mast, the mast shall be vertical or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks shall be horizontal or at full upward tilt, whichever is less stable.

c. With the forks positioned as described, the test platform shall be tipped to the specified slope. The truck position on the platform may be maintained by brakes and/or chocks.

d. When attachments are supplied as original equipment, this same stability test shall apply, except the 6 inches measurement from top of outriggers and/or load wheels shall be made to the underside of the attachment or carriage, whichever is lower.

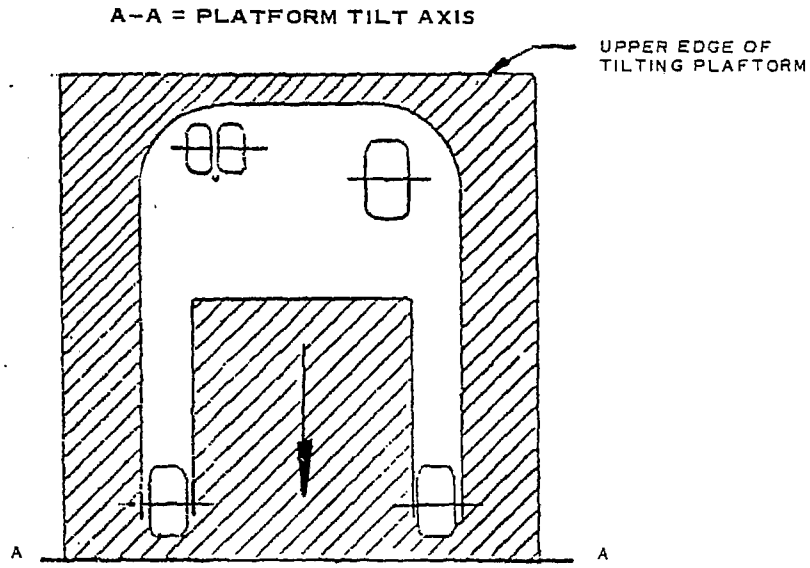


GRAPH B

TILTING PLATFORM TESTS

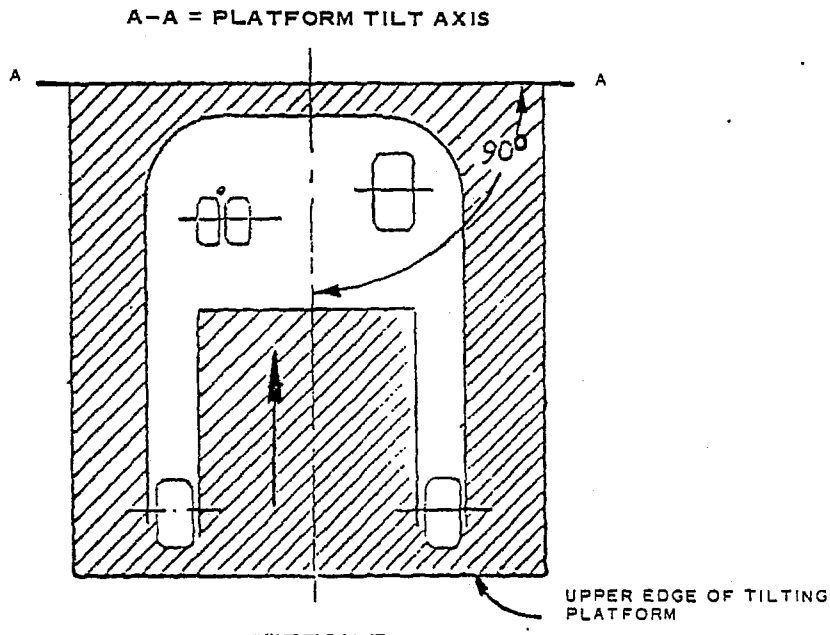
NARROW AISLE TYPE – TRUCKS

POSITIONING FOR FORWARD TESTS #N1 &#N2



SKETCH D

POSITIONING FOR REARWARD TESTS #N5,#N5A, &#N6

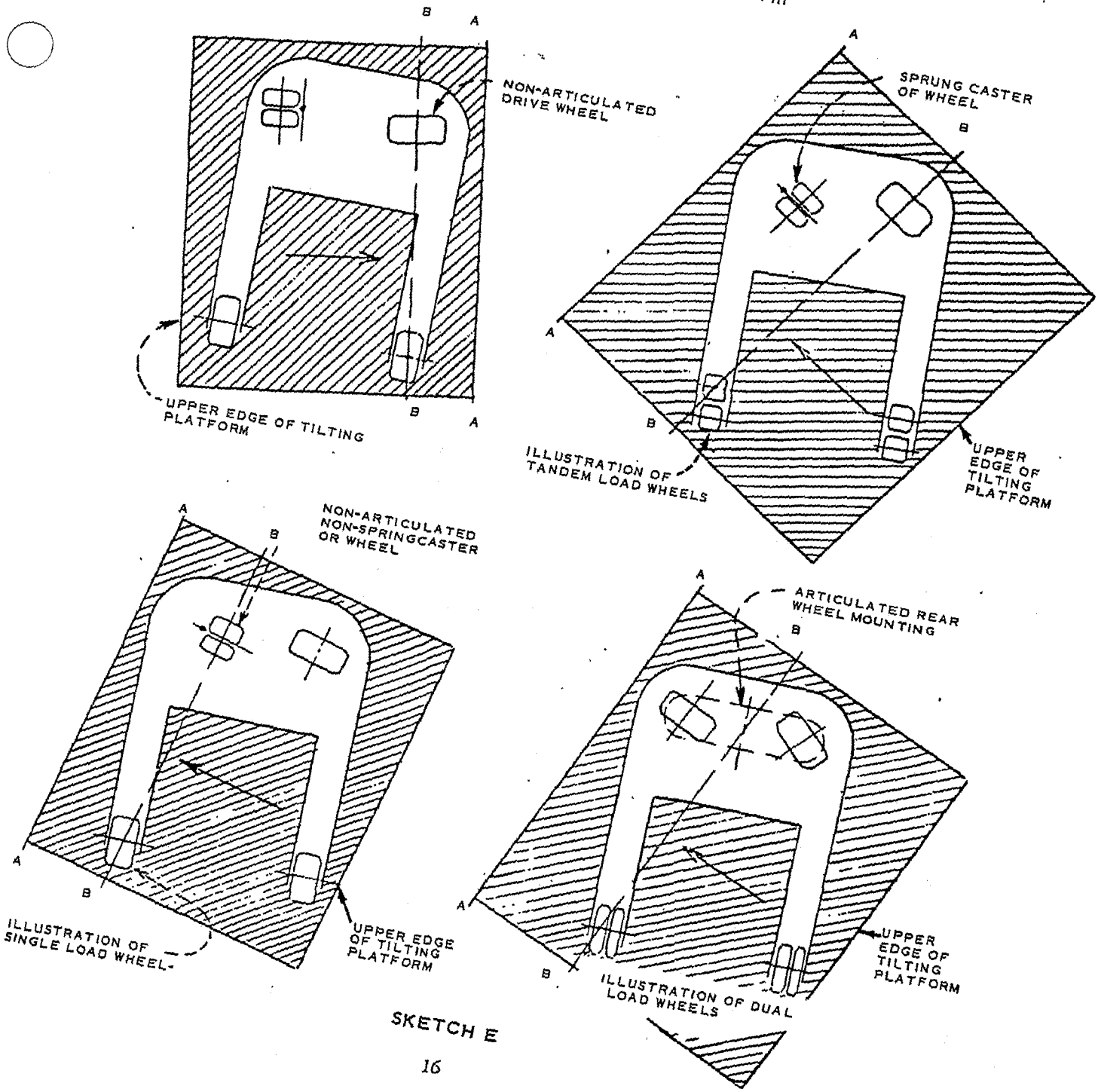


SKETCH F

POSITIONING FOR LATERAL TESTS #N3,#N3A, &#N4

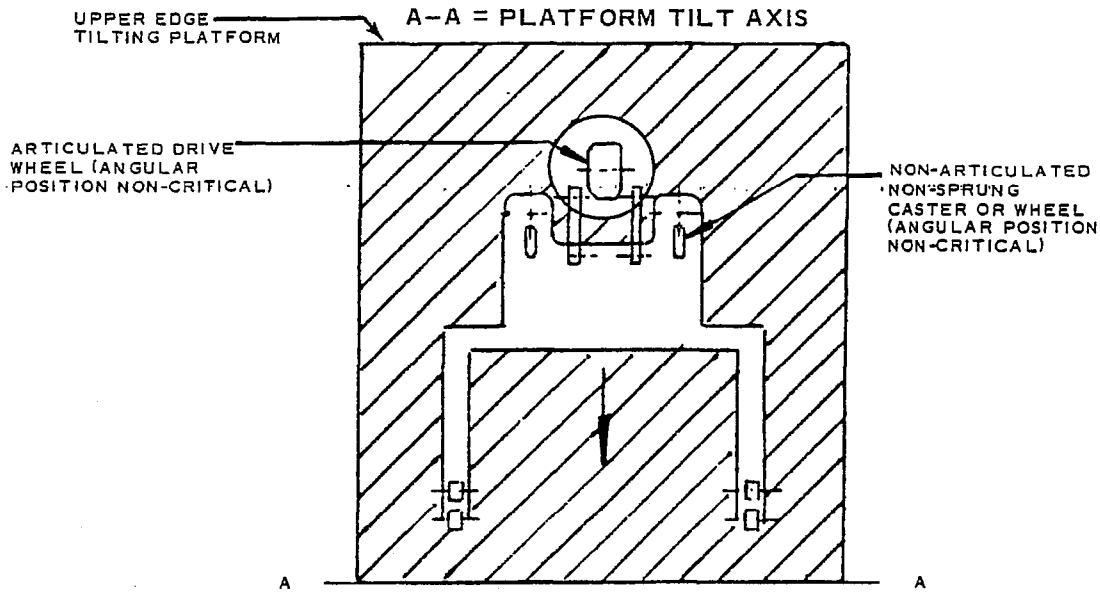
These are typical examples of various axes of original tilt, showing corresponding platform tilt axis. Still other axes may be possible

A–A = Platform Tilt Axis
B–B = Truck Axis of Original Tilt



SKETCH E

TILTING PLATFORM TESTS
NON-COUNTERBALANCED, ARTICULATED DRIVE TRUCKS
POSITIONING FOR FORWARD TESTS #N1 & #N2



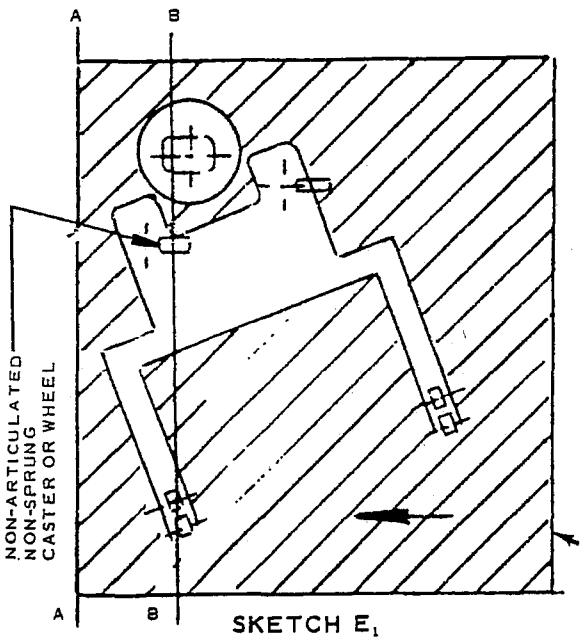
SKETCH D_1

POSITIONING FOR LATERAL TESTS
#N3, #N3A & #N4

Truck is symmetrical and may be positioned either right or left hand

A–A = Platform Tilt Axis

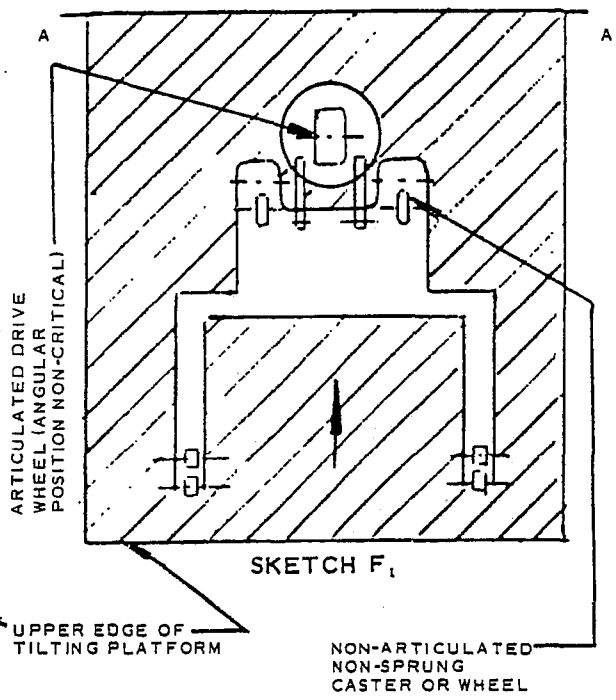
B–B = Truck Axis of Original Tilt



SKETCH E_1

POSITIONING FOR REARWARD TESTS
#N5, #N5A & #N6

A–A = Platform Tilting axis



SKETCH F_1

F. SUMMARY OF TESTS FOR STABILITY – ORDER-PICKER TRUCKS HIGH-LIFT WITH CONTROLS ON LIFTING DEVICE AND NOT RESTRAINED BY EXTERNAL MEANS

For some trucks the results of the test(s) may be obvious. In these cases the test(s) may be waived.

Test No.	Tests For	Platform Slope in Relation To Truck	Fork Height	Loaded or Unloaded	Load Center	Mast or Fork Tilt	Platform Slope Values
OP1	Long. Stack	Sketch "G"	Max. for limit of travel speed	Loaded	24"	None	Graph C
OP2	Long. Travel	Sketch "G"	12"	Loaded	24"	Full Rearward	18%
OP3	Lateral Stack	Sketch "H"	Max./Travel	Loaded	16" or 24" (whichever is less stable)	**	6%
OP4	Lateral Stack	Sketch "H"	Maximum	Unloaded		**	8%
OP4A	Lateral Travel	Sketch "H"	Max./Travel	Unloaded		**	Graph D*** (Curves 1 & 2)
OP5	Lateral Travel	Sketch "H"	12"	Unloaded		**	Graph D (Curve 1)
OP6	Long. Stack	Sketch "J"	Max./Travel	Loaded	16"	**	Graph D (Curve 1)
OP6A	Long. Stack.	Sketch "J"	Maximum	Loaded	16"	**	14%
OP7	Long. Stack	Sketch "J"	Max./Travel	Unloaded		**	Graph D (Curve 1)
OP7A	Long. Stack	Sketch "J"	Maximum	Unloaded		**	14 – 18% *
OP8	Long. Travel	Sketch "J"	12"	Unloaded		**	Graph E

* Platform slope value of 14 percent applies to trucks with single rear wheel drive (or brake) and 18 percent applies to trucks with dual rear wheel drive (or brakes) respectively.

** For trucks with tilting masts, the mast should be vertical or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks should be horizontal or at full upward tilt, whichever is less stable.

*** Curves 1 and 2 refer to travel with unrestricted turning and to straight forward and reverse travel, no turning. Under the conditions specified for positioning in the test procedure, ± 10 degrees from straight forward and reverse is considered as no turning.

G. TILTING PLATFORM TESTS – ORDER-PICKER TRUCKS WITH TRACTION CONTROL ON LIFTING DEVICE AND NOT RESTRAINED BY EXTERNAL MEANS

The following tests represent minimum stability requirements for order picker trucks with traction control on the lifting device, and not restrained by external means, having rated capacities up to and including 10,000 pounds at a 24 inch load center.

To simulate an operator, a 200 pound weight should be located with the center of gravity centered 40 inches above the operator's platform. This weight should be used only when it will worsen the stability condition being tested and omitted when it would help.

It may be necessary to cover the surface of the tilting platform with a friction increasing material such as paint containing friction material, adhesive tape coated with friction material, or metallic "safety tread" with perforated buttons.

It may also be necessary to restrain the load wheels by external means between the wheels and truck, and/or to apply brake(s) by external means to hold the truck in place during testing. The use of chocks approximately 10 percent of the diameter of the wheel, but not less than 1 inch nor more than 2 inches high is allowed when necessary.

The critical-balance point of the truck in any test will be that test platform slope which if increased further would produce complete overturning of the truck. Effects of frame or structural members contact with the test platform are recognized as beneficial and should be included in determining a "critical-balance" slope.

When attachments are supplied as original equipment, the same stability tests should apply, except the plumb line (for Test #OP1) should be attached to, and the 12 inch measurement (for Tests #OP2, #OP5, and #OP8) should be made to the underside of the carriage, attachment, or load – whichever is lower. The truck should be equipped with the attachment and the test load (when required) should be representative of the capacity of the truck and attachment combination.

If these tests are used to determine capacity or alternate rated capacities, use appropriate loads and load centers instead of those herein specified. If other tests or tests for trucks over 10,000 pounds rated capacity are required, the details should be agreed upon between the interested parties.

1. *Test #OP1 – For Longitudinal Stability – Stacking, Maximum Fork Height For Limit of Travel Speed – Loaded*

Using the procedure outlined for the test, a truck carrying the rated capacity load elevated to the maximum height for the limit of travel speed, should not overturn when the test platform upon which the truck is standing is tilted to the slope specified by Graph C about an axis parallel to the axis of the load wheels and in a direction to increase the load overhang.

Procedure for Longitudinal Stability (Stacking) Tilting Platform Test

a. Truck should be placed on an initially level test platform with the axis of the load wheels parallel to the tilting axis of the test platform. See Sketch "G" for position.

b. The test load should be equivalent to an unrestrained, homogeneous cube, the dimensions of which are twice the rated load center dimension, and should equal in weight to the rated capacity of the truck.

c. When placed on the forks the center of mass of the test weight should be located on the longitudinal centerline of the truck. The test load should be supported by the forks approximately 12 inches above the test platform, and in a normal and unrestrained manner. For tilting mast trucks the nonelevating portion of the mast should be vertical. Attach a plumb line at the theoretical intersection of the two load-engaging surfaces of the forks to establish a reference point. This point will be used to indicate the maintaining of the original load overhang when the load is elevated to maximum height. (A transit may be used instead of a plumb line to establish vertical.)

d. With the test load elevated to the maximum height for the limit of travel speed without change in the original load overhang dimensions, the test platform should be tilted to the specified slope in Graph C.

e. With the test load elevated to maximum height, without change in the original

load overhang dimensions, the test platform should be titled to a minimum of 4 percent, without overturning the truck.

2. *Test #OP2 – For Longitudinal Stability – Traveling – Fork Height 12 Inches Loaded*

Using the procedure outlined for the test, a truck carrying rated capacity load, and with the load elevated 12 inches from the test platform, measured at the point of intersection of the load carrying surfaces of the forks, should not overturn when the test platform upon which the truck is standing is tilted to an 18 percent slope about an axis parallel to the axis of the load wheels, and in a direction to increase the load overhang.

Procedure for Longitudinal Stability (Traveling) Tilting-Platform Test

a. Truck should be placed on an initially level test platform with the axis of the load wheels parallel to the tilting axis of the platform. See Sketch "G" for position.

b. The test load should be equivalent to an unrestrained, homogeneous cube, the dimensions of which are twice the rated load center dimension, and should equal in weight the rated capacity of the truck.

c. When placed on the forks, the center of mass of the test weight should be located on the longitudinal centerline of the truck. The mast should be at full rearward tilt and/or the forks at full upward tilt, and the load then elevated until the point of intersection of the two load engaging surfaces of the forks is 12 inches above the test platform.

d. With test load positioned as described, the test platform should be tilted to the specified slope.

3. *Test #OP3 – Lateral Stability – Stacking – Maximum Fork Height with Travel – Loaded*

Using the procedure outlined for the test, a truck carrying the rated capacity load elevated to the maximum height at which unrestricted horizontal travel is permitted, should not overturn when the test platform upon which the truck is standing is tilted to a 6 percent slope.

Slope values are based on ultimate overturn, not on point where one or more wheels leave the platform.

Procedure for Lateral Stability (Stacking) Tilting Platform Test

a. Place truck on an initially level platform in a position that the least stable lateral axis of initial tipping of the truck[7], running through the center of either load wheel (outermost and/or rearmost wheel where dual or tandem wheels are used, respectively) is parallel to the axis of tilting of the platform, and with the rear wheels placed in their least stable position. See Sketch "H" for position.

b. The test load should be equivalent to an unrestrained, homogeneous cube, the dimensions of which are twice the rated load center dimension, and should equal in weight the rated capacity of the truck.

c. When placed on the forks, the center of mass of the test weight should be located on the longitudinal centerline of the truck. With the test load supported by the forks in a normal and unrestrained manner, elevate the load to its maximum height. For trucks with tilting masts, the mast should be vertical as defined in Test #OP1, or at full rearward tilt permitted by the truck mechanism at that elevation, whichever is less stable. Where tilt restrictions for various elevations are employed, and the rearward tilt position is determined to be less stable, the truck should be tested at maximum elevation for each tilt restriction permitted by the truck mechanism. For trucks with tilting forks, the forks should be horizontal or at full upward tilt, whichever is less stable.

d. With test load positioned as described, the test platform should be tilted to the specified slope.

4. *Test #OP4 – Lateral Stability – Stacking – Maximum Fork Height – Unloaded*

Using the procedure outlined for the test, an empty truck with the forks elevated to the maximum height should not overturn when the test platform upon

[7] *It will usually be found that this axis runs through one of the following: (a) one of the rear wheels or (b) a pivot point of support for trucks having a laterally articulating rear wheel mounting.*

which the truck is standing is tilted to an 8 percent slope.

Slope values are based on ultimate overturn, not on point where one or more wheels leave the platform.

Procedure for Lateral Stability (Stacking) Tilting Platform Test

a. Place empty truck on an initially level platform in a position that the least stable lateral axis of initial tipping of the truck[8], running through the center of either load wheel (outermost and/or rearmost wheel where dual or tandem wheels are used, respectively) is parallel to the axis of tilting of the platform, and with the rear wheels placed in their least stable position. See Sketch "H" for position.

b. The forks should be elevated to the maximum height. For trucks with tilting masts, the mast should be vertical as defined in Test #OP1 or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks should be horizontal or at full upward tilt, whichever is less stable.

c. With the forks positioned as described, the test platform should be tilted to the specified slope.

5. *Test #OP4A – Lateral Stability – Traveling – Maximum Fork Height with Travel Unloaded*

Using the procedure outlined for the test, an empty truck with the forks elevated to any height up to the maximum height at which horizontal travel is permitted, and for the travel speed allowable at that height, should not overturn when the test platform upon which the truck is standing is tilted to the slope specified by Graph D, Curve 1, for unrestricted turning and by Graph D, Curve 2, for straight forward and reverse travel, travel, no turning ± 10 degrees.

Slope values are based on ultimate overturn, not on point where one or more wheels leave the platform.

Procedure for Lateral Stability (Traveling) Tilting Platform Test

a. Place empty truck on an initially level platform in a position that the least stable lateral axis of initial tipping of the truck[8], running through the center of either load wheel (outermost and/or rearmost wheel where dual or tandem wheels are used, respectively) is parallel to the axis of tilting of the platform, and with the rear wheels placed in their least stable position. See Sketch "H" for position.

b. The forks should be elevated to the maximum height at which horizontal travel speed is permitted. For trucks with tilting masts, the mast should be vertical as defined in Test #OP1 or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks should be horizontal or at full upward tilt, whichever is less stable.

c. With the forks positioned as described, the test platform should be tilted to the specified slope.

6. *Test #OP5 – Lateral Stability – Traveling – Fork Height 12 Inches – Unloaded*

Using the procedure outlined for the test, an empty truck with the forks elevated 12 inches from the test platform measured at the point of intersection of the load carrying surfaces of the forks, should not overturn when the test platform upon which the truck is standing is tilted to the slope specified in Graph D, Curve 1.

Slope values are based on ultimate overturn, not on point where one or more wheels leave the platform

Procedure for Lateral Stability (Traveling) Tilting Platform Test

a. Place empty truck on an initially level platform in a position that the least stable lateral axis of initial tipping of the truck[8], running through the center of either load wheel (outermost and/or rearmost wheel where dual or tandem wheels are used, respectively) is parallel to the axis of tilting of the platform, and with the rear wheels placed in their least stable position. See Sketch "H" for position.

[8] *It will usually be found that this axis runs through one of the following: (a) one of the rear wheels or (b) a pivot point of support for trucks having a laterally articulating rear wheel mounting.*

b. The forks should be elevated until the point of intersection of the two carrying surfaces of the forks is elevated 12 inches from the test platform to the point of intersection of the load carrying surfaces of the forks. For trucks with tilting masts, the mast should be vertical as defined in Test #OP1 or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks should be horizontal or at full upward tilt, whichever is less stable.

c. With the forks positioned as described, the test platform should be tilted to the specified slope.

7. *Test #OP6 – Longitudinal Stability – Stacking – Maximum Fork Height with Travel, Loaded*

Using the procedure outlined for this test, a truck carrying the rated capacity load elevated to the maximum height at which horizontal travel with unrestricted turning is permitted, should not overturn when the test platform upon which the truck is standing is tilted to the slope specified in Graph D, Curve 1.

Procedure for Stability (Stacking, Loaded) Tilting Platform Test

a. Truck should be placed on an initially level test platform in a position that the center line of the truck is perperpendicular the axis of tilting of the test platform, and with the rear wheels placed in their least stable position. See Sketch "J" for position.

b. The test load should be equivalent to an unrestrained, homogeneous cube, the dimensions of which are twice the rated load center dimension, and should equal in weight the rated capacity of the truck.

c. When placed on the forks, the center of mass of the test weight should be located on the longitudinal centerline of the truck. With the test load supported by the forks in a normal and unrestrained manner, elevate the load to the maximum height at which unrestrained, horizontal travel is permitted. For trucks with tilting masts, the mast should be vertical as defined in Test OP1, or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks should be horizontal or at full upward tilt, whichever is less stable.

d. With test load positioned as described, the test platform should be tilted to the specified slope.

8. *Test #OP6A – Longitudinal Stability – Stacking – Maximum Fork Height – Loaded*

Using the procedure outlined for this test the truck carrying rated capacity load elevated to the maximum height should not overturn when the test platform upon which the truck is standing is tilted to a 14 percent slope.

Procedure for Stability (Stacking, Loaded) Tilting Platform Test

a. Truck should be placed on an initially level test platform in a position that the centerline of the truck is perpendicular to the axis of tilting of the test platform and with the rear wheels placed in their least stable position. See Sketch "J" for position.

b. The test load should be equivalent to an unrestrained, homogeneous cube, the dimensions of which are twice the rated load center dimension and should equal in weight the rated capacity of the truck.

c. When placed on the forks, the center of mass of the test weight should be located on the longitudinal centerline of the truck. With the test load supported by the forks in a normal and unrestrained manner elevate the load to its maximum height. For trucks with tilting masts, the mast should be vertical as defined in Test OP1, or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks should be horizontal or at full upward tilt, whichever is less stable.

d. With test load positioned as described, the test platform should be tilted to the specified slope.

9. *Test #OP7 – Longitudinal Stability – Stacking, Maximum Fork Height with Travel – Unloaded*

Using the procedure outlined for the test, an empty truck with the forks elevated to the maximum height at which horizontal travel is permitted and for the travel speed allowable at that height, should not overturn when the test platform upon which the truck is standing is tilted to the slope specified in Graph D, Curve 1.

Procedure for Stability (Stacking, Unloaded) Tilting Platform Test

a. Place empty truck on an initially level test platform in a position that the centerline of the truck is perpendicular to the axis of tilting of the test platform, and with the rear wheels placed in their least stable position. See Sketch "J" for position.

b. The forks should be elevated to the maximum height at which horizontal travel is permitted. For trucks with tilting masts, the mast should be vertical as defined Test #OP1, or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks should be horizontal or at full upward tilt, whichever is less stable.

c. With the test load positioned as described, the test platform should be tilted to the specified slope.

10. *Test #OP7A – Longitudinal Stability – Stacking – Maximum Fork Height – Unloaded*

Using the procedure outlined for this test an empty truck with the forks elevated to the maximum height should not overturn when the test platform upon which the truck is standing is tilted to a 14 percent or 18 percent slope depending on whether the truck has single, rear-wheel drive (or brake) or dual wheel drive (or brakes), respectively.

Procedure for Stability (Stacking, Unloaded) Tilting Platform Test

a. Place empty truck on an initially level test platform in a position that the centerline of the truck is perpendicular to the axis of tilting of the test platform and with the rear wheels placed in their least stable position. See Sketch "J" for position.

b. The forks should be elevated to maximum height. For trucks with tilting masts, the mast should be vertical as defined in Test OP1, or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks should be horizontal or at full upward tilt, whichever is less stable.

c. With the forks positioned as described, the test platform should be tilted to the specified slope.

11. *Test #OP8 – Longitudinal Stability – Traveling – Fork Height 12 Inches – Unloaded*

Using the procedure outlined for the test, an empty truck with the forks elevated 12 inches from the test platform, measured at the point of intersection of the load carrying surfaces of the forks, should not overturn when the test platform upon which the truck is standing is tilted to the slope specified in Graph E.

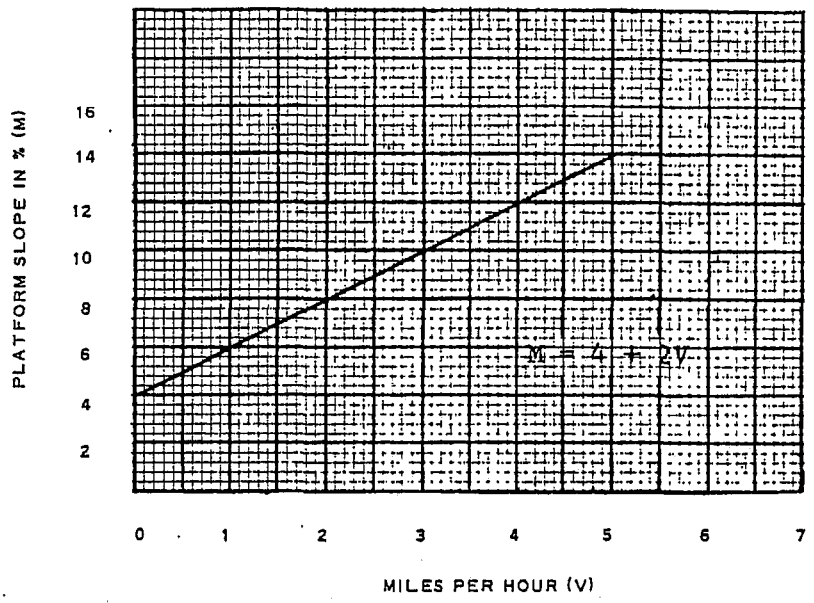
Procedure for Stability (Traveling) Tilting Platform Test

a. Place empty truck on initially level test platform in a position that the centerline of the truck is perpendicular to the axis of tilting of the test platform, and with the rear wheels placed in their least stable position. See Sketch "J" for position.

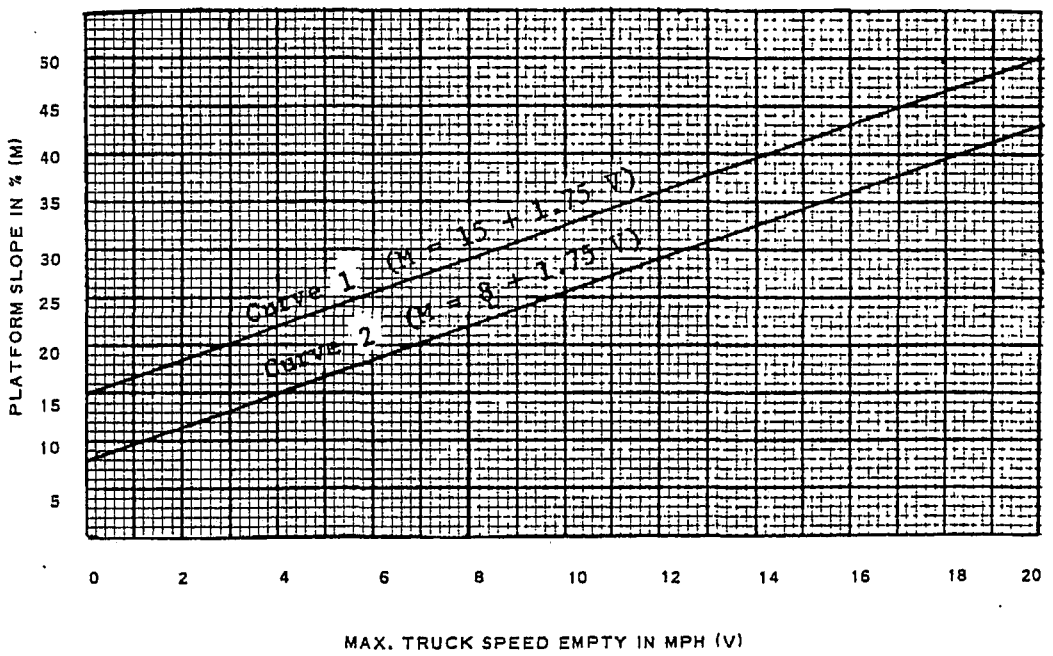
b. The forks should be elevated until the carrying surfaces are 12 inches from the test platform measured at the point of intersection of the load carrying surfaces of the forks. For trucks with tilting masts, the mast should be vertical as defined in Test #OP1 or at full rearward tilt, whichever is less stable. For trucks with tilting forks, the forks should be horizontal or at full upward tilt, whichever is less stable.

c. With the forks positioned as described, the test platform should be tilted to the specified slope.

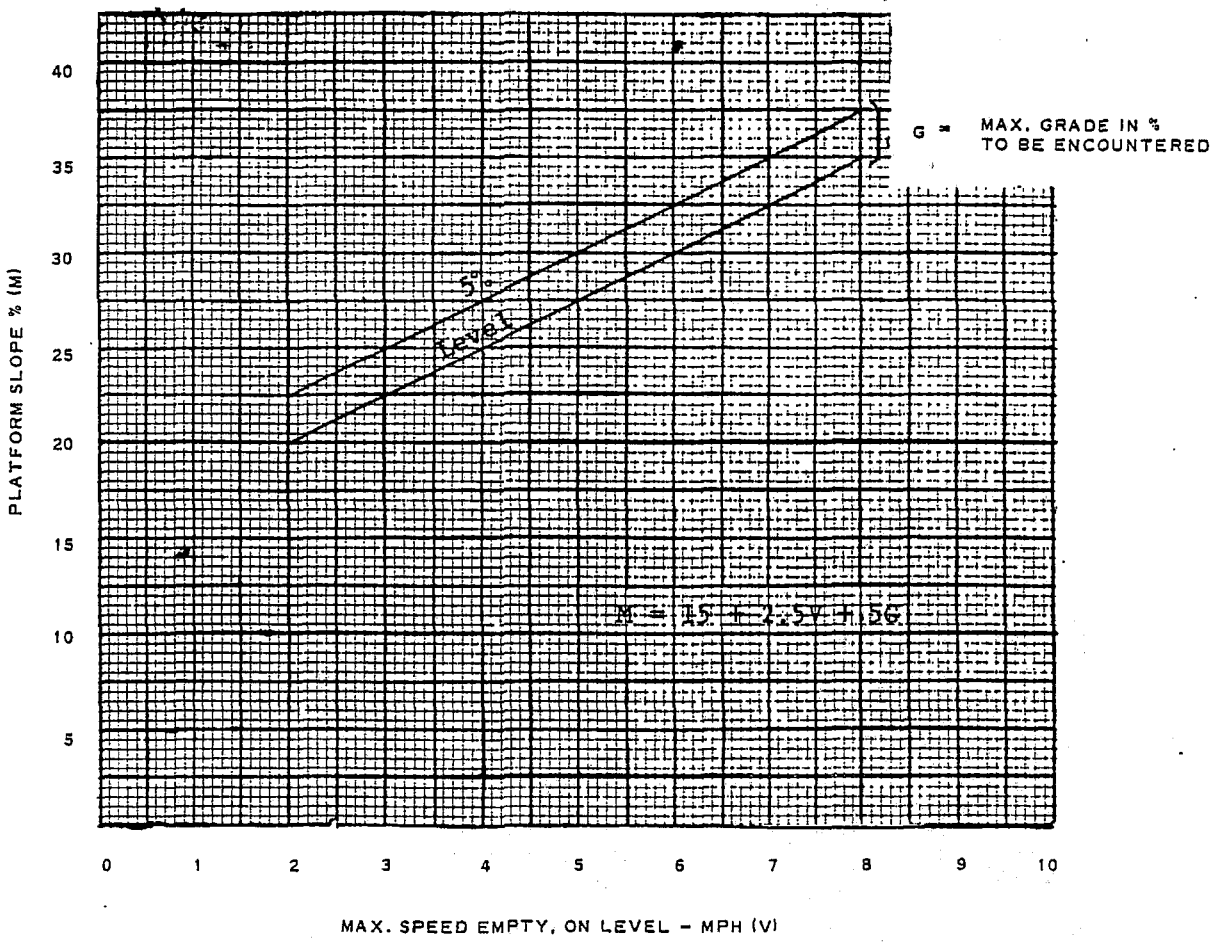
GRAPH C



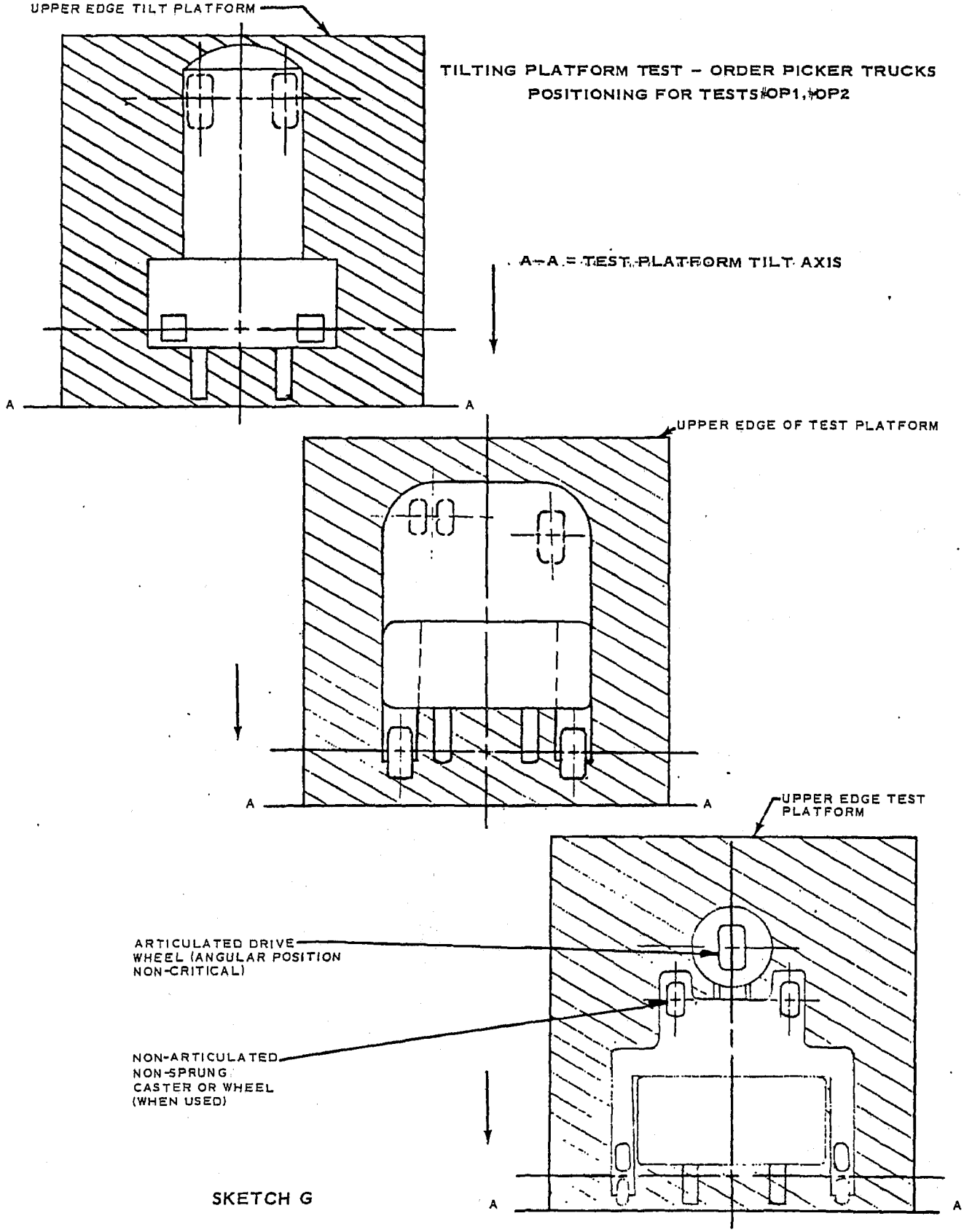
GRAPH D



GRAPH E


PLATFORM SLOPE % (M)
40
35
30
25
20
15
10
5
0
1
2
3
4
5
6
7
8
9
10
5°
Level
M = 15 + 2.5V + .5G
G = MAX. GRADE IN %
TO BE ENCOUNTERED
MAX. SPEED EMPTY, ON LEVEL – MPH (V)

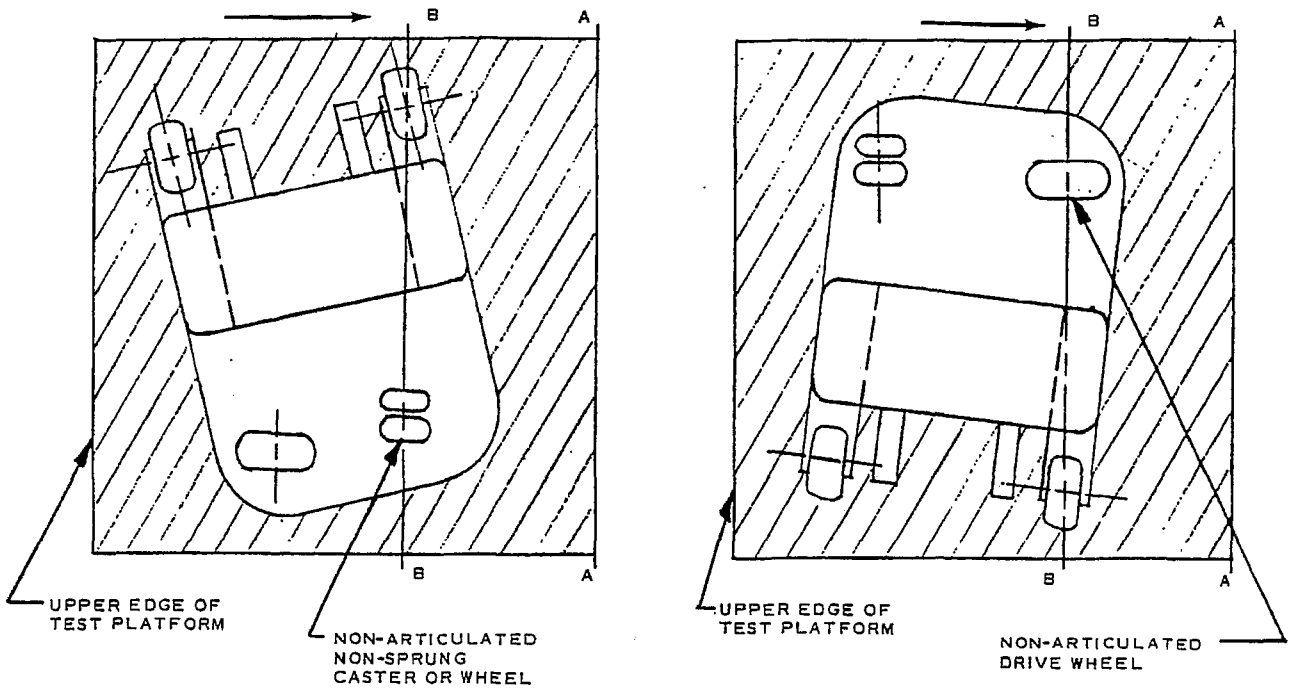
TILTING PLATFORM TEST – ORDER PICKER TRUCKS
POSITIONING FOR TESTS OP1, OP2



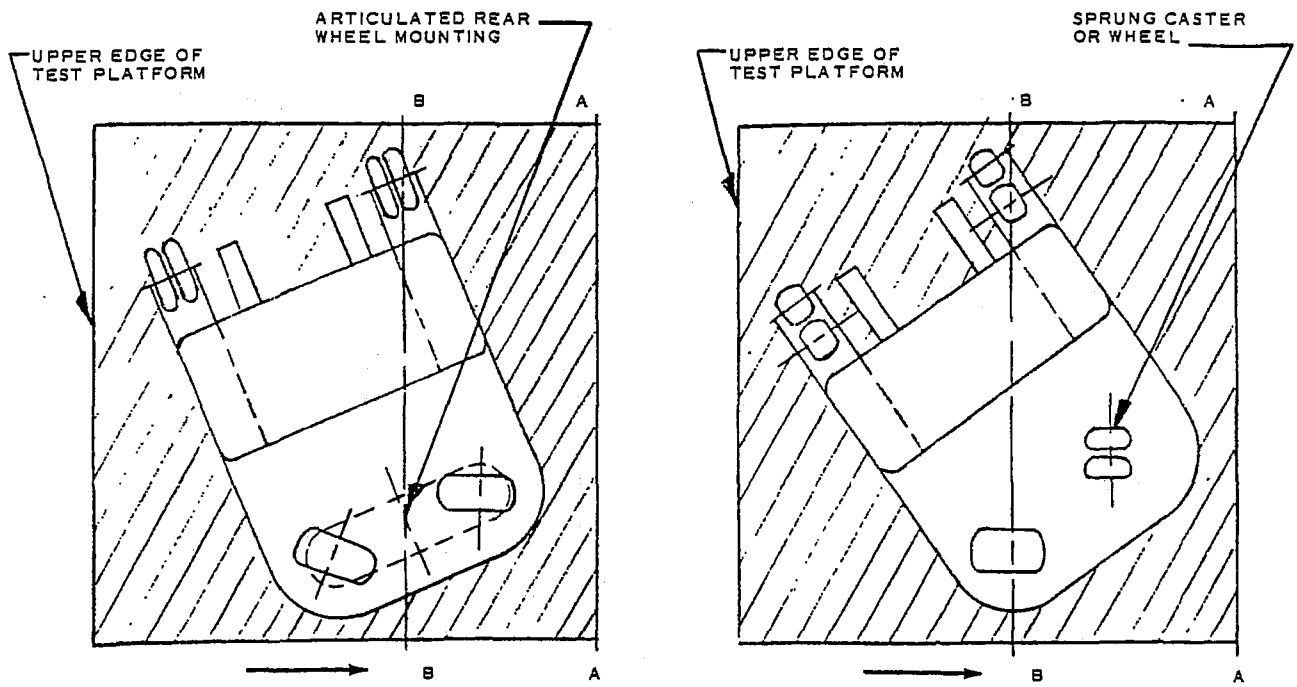
SKETCH G

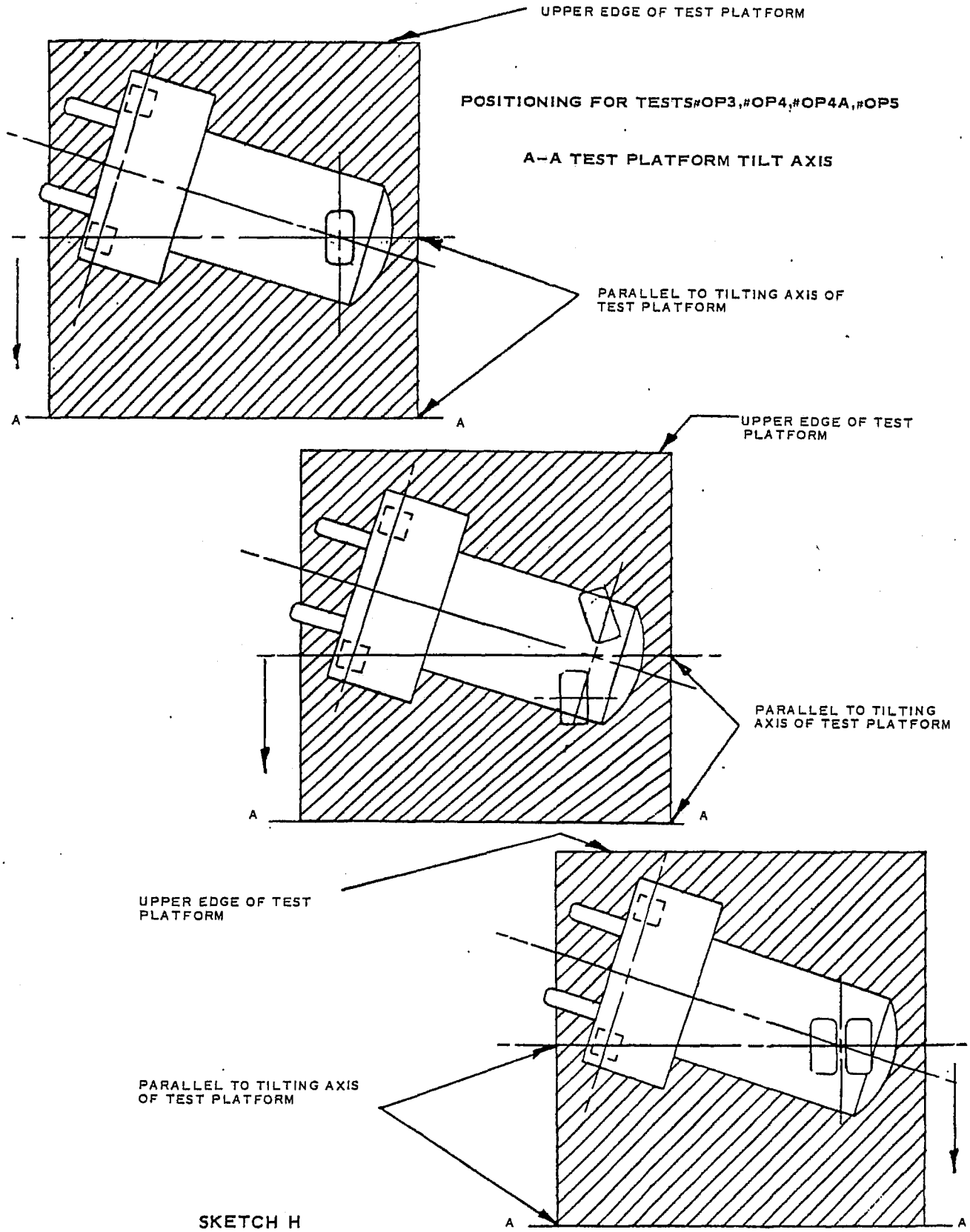
POSITIONING FOR TESTS #OP3, #OP4, #OP4A, #OP5

A–A = TEST PLATFORM TILT AXIS
B–B = TRUCK AXIS OF ORIGINAL TILT



SKETCH H



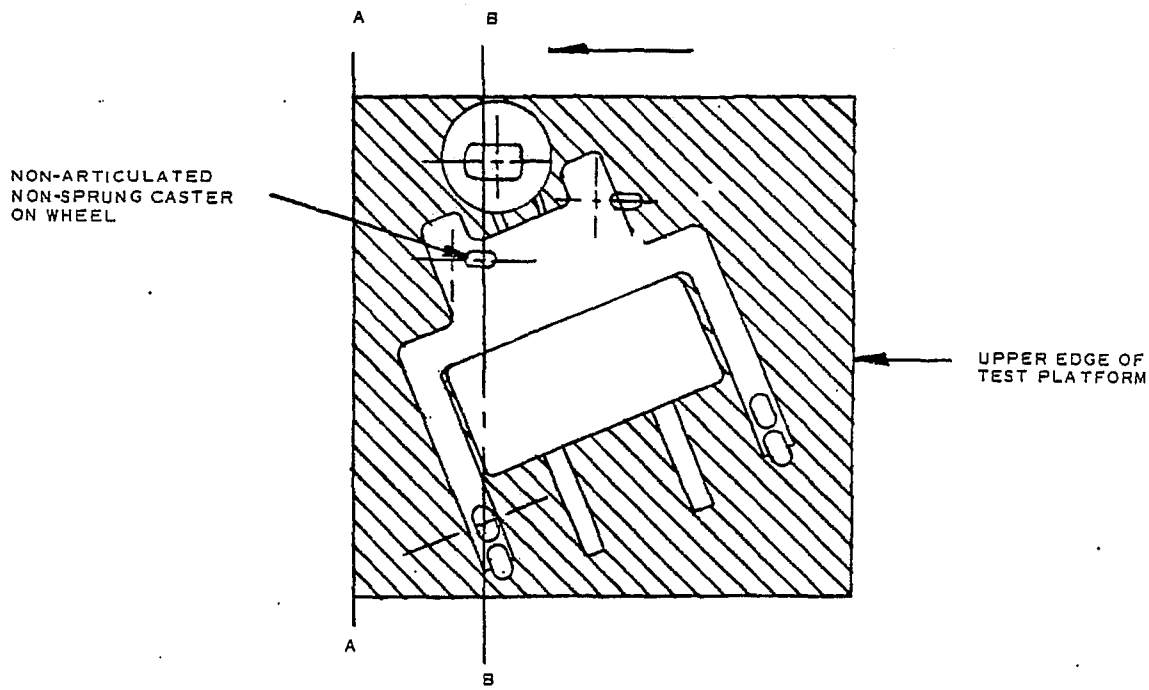

UPPER EDGE OF TEST PLATFORM
POSITIONING FOR TESTS#OP3,#OP4,#OP4A,#OP5
A–A TEST PLATFORM TILT AXIS
PARALLEL TO TILTING AXIS OF TEST PLATFORM
A
A
UPPER EDGE OF TEST PLATFORM
PARALLEL TO TILTING AXIS OF TEST PLATFORM
A
A
UPPER EDGE OF TEST PLATFORM
PARALLEL TO TILTING AXIS OF TEST PLATFORM
A
A

SKETCH H

POSITIONING FOR TESTS#OP3,#OP4,#OP4A,#OP5

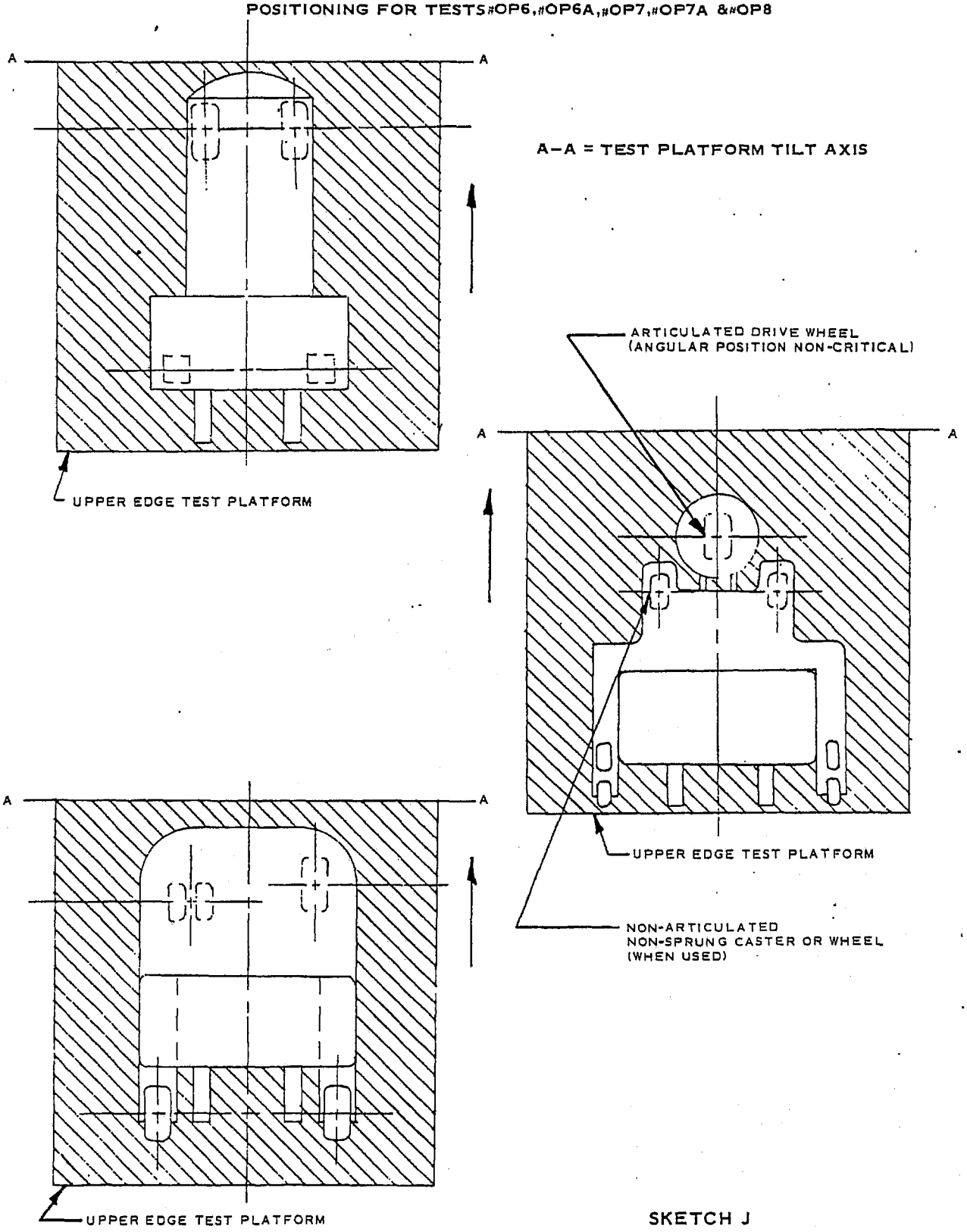
Truck is symmetrical and may be positioned either right or left hand

A–A = TEST PLATFORM TILT AXIS
B–B = TRUCK AXIS OF ORIGINAL TILT



SKETCH H

POSITIONING FOR TESTS #OP6, #OP6A, #OP7, #OP7A & #OP8



SKETCH J

H. ADDITIONAL SUGGESTIONS FOR CONDUCTING TILTING PLATFORM TESTS

1. Test platform must have a rigid, flat surface; otherwise, measurements or effect of slope may be erratic.

2. Use an accurate load center.

3. Although the test load must not be restrained in any manner that will affect the deflection of the forks or mast, or free movement of truck, as the platform is tilted, the test load should be secured against possible sliding on the forks in order to sustain an accurate load center and for safety reasons in case the truck tips past the balance point.

4. For tests requiring an elevated load, it may be more convenient to simulate a load by hanging the test load from a framework supported by the forks in the manner described in item 3. This point of suspension, of course, must be on centerline of truck and at a height above forks and at a distance from front face of forks equal to rated load center dimension before weight of test load has caused forks to deflect. The point of suspension must be free to pivot in any direction, such as by use of chain or cable.

   It is also permissible to use two test loads of equal weight suspended from the ends of a transverse beam fastened to a framework supported by the forks as described in item 3, provided the loads are suspended from points equidistance from centerline of trucks, and provided that a straight line from one point to the other passes at a height above the forks and at a distance from front face of forks equal to the rated load center dimension before weight of test load has caused forks to deflect. The points of suspension must be free to pivot in any direction, such as by use of chain or cable. The transverse beam should be adequately braced to prevent deflection that would shift the load center.

5. If test load is to be supported on top of forks, care should be taken to see that it contacts front faces of forks adjacent to heel. For this purpose, edge of test load should be chamfered to clear radius at heel of fork.

6. If a sheet of paper or thin metal is placed initially under the appropriate wheel, incipient tilting can be determined by the point where the paper or metal slides freely on application of a slight pulling force on the sheet.

7. Upon completion of tests, checks should be made to make sure the center of gravity of the load has not changed from the original position. Forward drift may be prevented during test by means of a positive shut-off valve in hydraulic tilt lines, or equivalent.

8. On pneumatic-tired trucks, inflation of all tires should be checked before starting and after finishing test to make sure they are in accordance with truck manufacturer's rating throughout test.

407 STEERING ARRANGEMENTS – RIDER TRUCKS

A. Stand-up rider trucks employing a horizontal (vertical motion) lever or pump-handle steering control shall steer as follows:

   The handle shall be mounted in such manner that the operator will steer with his left hand when facing the load end of the truck. An upward movement of the handle from the horizontal position shall steer the truck to the operator's right when moving with load foremost.

B. Trucks of the stand-up type employing a horizontal lever (horizontal motion) or tiller bar steering control shall steer as follows:

   The handle shall be mounted in such a manner that the operator will steer with his left hand when facing the load end of the truck. Movement of the handle to the right shall steer the truck to the operator's right when moving the load foremost.

C. Trucks employing a handwheel with the operator facing the direction of normal forward travel shall steer as follows:

   The handwheel shall be located to permit convenient operation with the left hand.

   Clockwise rotation of the handwheel shall steer the truck to the operator's right when the truck is moving forward. This is defined as "directional-forward steer."

   Exception: In the past, considerable numbers of stand-up end-control rider

trucks employing a horizontal (vertical axis) handwheel have been built with directional-reverse steer (i.e. a control that causes a truck to turn to the operator's right on clockwise rotation of the steering handwheel when the operator is facing away from the direction of normal forward travel.) For this reason directional-reverse steer is permissible for this type of truck.

D. Trucks employing a handwheel with the operator facing at a right angle to the normal line of travel, shall steer as follows:

When the truck is traveling with load trailing, clockwise rotation of the handwheel should steer the truck clockwise.

E. Tractors employing a horizontal or tillerbar steering control shall steer as follows:

The handle shall be mounted in such a manner that the operator will steer with his left hand when sitting on and facing the front of the tractor. Clockwise movement of the handle shall steer the tractor to the operator's right.

F. Tractors employing a handwheel steering control shall steer as follows:

With the operator sitting on and facing the front of the tractor, clockwise rotation of the handwheel shall steer the tractor to the right.

G. Motorized hand/rider trucks employing a steering tongue control which extends beyond the confines of the truck shall steer as follows:

With the walking operator facing in the direction of travel, with the load trailing, clockwise movement of the steering tongue shall steer the truck clockwise.

With the riding operator facing in the direction of travel, with the load trailing, clockwise movement of the steering tongue shall steer the truck clockwise.

408 STEERING – RIDER TRUCKS

A. Except for Hand/Rider Trucks, all steering controls shall be confined within the plan view outline of the truck, or guarded to prevent injury to the operator during movement of the controls when passing obstacles, walls, columns, etc.

B. Where steering must be accomplished with one hand, steering knobs are necessary for safe operation. Steering knobs, when used, shall be mounted within the periphery of the steering handwheel.

409 STEERING HANDLE – MOTORIZED HAND, AND HAND/RIDER TRUCKS

Steering handle shall be provided with suitable means to protect operator's hands against injury from swinging doors, walls, columns, etc.

410 BRAKING PERFORMANCE, ALL POWERED INDUSTRIAL TRUCKS EXCEPT INDUSTRIAL TRACTORS

Service brakes shall enable the truck to develop a drawbar drag equal to a percent of the gross vehicle weight (with rated capacity load) per the second column of the table on next page, while the truck is being towed slowly in either direction. For brake pedals having a downward movement to apply brakes, the required brake performance shall be attained with a pedal force of not more than 125 pounds. For brake pedals having an upward movement to apply brakes, the required brake performance shall be attained with the normal upward force; however the brake linkage shall be such that the pedal will be fully depressed and the brakes released by a force of not more than 65 pounds.

For intermediate speeds, interpolate between values shown.

The above braking requirements are based on level floor operation. For safe operation on grades, the braking drawbar drag, as a percent of gross vehicle weight, must be at least equal to the percent of slope. This will provide enough braking force to hold the truck stationary on the grade, or to prevent it from gaining speed after starting down the grade.

Greater braking force is required to bring a truck to a stop on a down grade. The determination of what is safe stopping distance on a downgrade depends on many factors – such as, amount of clear space at bottom of grade, width of grade for evasive action, and possible traffic.

After deciding the required stopping distance on a down grade for safe operation, and a maximum speed that drivers will be permitted to operate when going down grade, the required braking force can be determined from Graph F for grades of 5, 10, 15, and 20 percent. Values for intermediate grades can be interpolated or calculated from the formula:

$$D = \frac{3.34\, v^2}{s} + G$$

where D = Drawbar Drag as a percent of gross vehicle weight
v = Velocity in miles per hour
s = Distance in feet to stop
G = Percent grade

Maximum rated truck speed with rated capacity load in miles per hour on level surface	Required drawbar drag as percent of gross vehicle weight (with rated capacity load)	Approx. theoretical distance in feet, after brake has been applied, to stop from full speed on level surface
v	D	s
1	3%	1.1
2	6%	2.2
3	9%	3.3
4	12%	4.5
5	15%	5.6
6	18%	6.7
7	21%	7.8
8	24%	8.9
9	27%	10.0
10	30%	11.1
Over 10	30%	Use formula $s = \frac{3.34\,v^2}{30}$

(This formula is reasonably accurate for grades up to 20 percent, since in this range the sine and tangent of the grade angle are approximately equal. The variation introduced by this simplification gives answers which are slightly conservative. For grades steeper than 20 percent, a more complicated formula may be used.)

Example 1: If a truck is to be permitted to operate down a 5 percent grade at a speed of 4 miles per hour, how much drawbar drag must be developed to stop the truck in a distance of 10 feet while still on the grade?

From Graph F for 5 percent grade, read from the 10 foot mark at bottom of graph up to the curve labeled 4 mph. Then read horizontally to left to find answer, 10.3 percent. This means that the service brake must be strong enough to enable the truck to develop a drawbar drag equal to 10.3 percent of the gross vehicle weight.

The answer may also be figured by means of the formula, as follows:

$$D = \frac{3.34 \times 4^2}{10} + 5$$

$$= 5.3 + 5$$

$$= 10.3$$

Answer: Brakes must be capable of developing a drawbar drag equal to 10.3 percent of the gross vehicle weight (with rated load).

Example 2: If a truck is to be permitted to operate down a 10 percent grade at a speed of 8 miles per hour, how much drawbar drag must be developed to stop the truck in a distance of 15 feet while still on the grade?

From Graph F for 10 percent grade, read from the 15 foot mark at bottom of graph up to curve labeled 8 mph. Then read horizontally to left to find answer, 24.2 percent of the gross vehicle weight (with rated load).

On certain types of trucks, the weight on the braking wheel(s) may be insufficient to attain drawbar drag values required for higher combinations of ramp and speed. In such cases, the truck involved should be limited to use and speeds within the limits of the drawbar drag attainable by test.

411 SAFETY CONTROL AND BRAKES, ELECTRIC TRUCKS, SIT-DOWN RIDER

Means shall be provided to open the travel circuit when the operator leaves the truck.

Travel control shall be so arranged that the truck will move only when the direction control is actuated and will not move at a speed greater than inching speed unless control has been actuated for both speed and direction.

Accelerator, if foot operated, shall increase speed when depressed with the right foot.

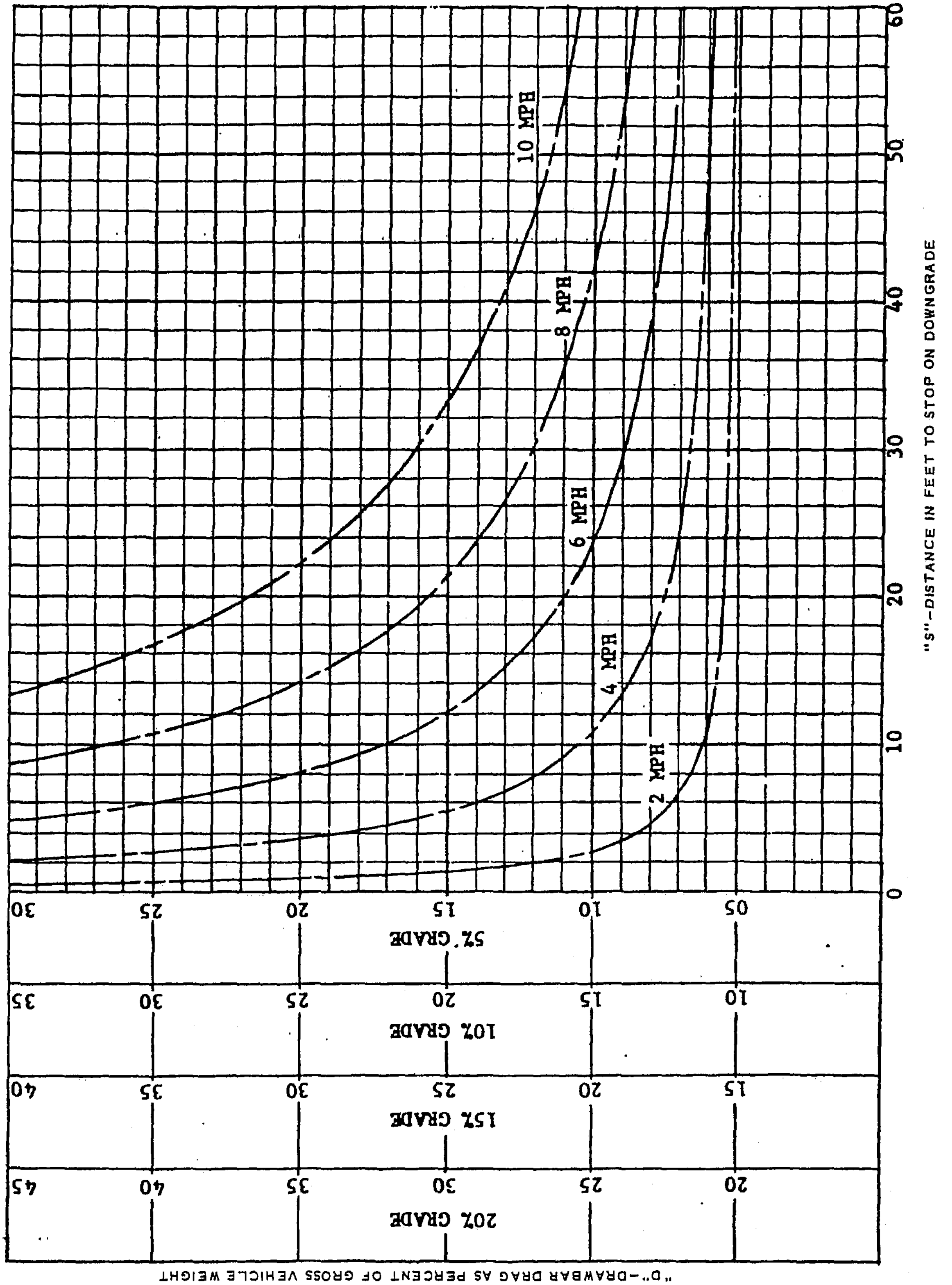
Service brakes, if foot operated, shall be energized by depressing the control.

If a single pedal controls both acceleration and braking, depressing pedal should increase speed and releasing pedal should apply brakes, and the pedal shall be operated by the right foot.

Provision shall be made for locking control circuit(s) with a key to prevent unauthorized operation.

The service brake(s) shall be capable of

GRAPH F


10 MPH
8 MPH
6 MPH
4 MPH
2 MPH
"S"–DISTANCE IN FEET TO STOP ON DOWNGRADE
0
10
20
30
40
50
60
5% GRADE
05
10
15
20
25
30
10% GRADE
10
15
20
25
30
35
15% GRADE
15
20
25
30
35
40
20% GRADE
20
25
30
35
40
45
"D"–DRAWBAR DRAG AS PERCENT OF GROSS VEHICLE WEIGHT

withstanding a brake pedal force of 250 pounds without failure of any component.

A parking brake (or mechanism) shall be provided and capable of holding the truck on the maximum grade which the truck can negotiate with rated load, or on a 15 percent grade, whichever is is the lesser.

The parking brake (or mechanism) shall be manually or automatically applied and shall remain applied until released by the operator.

Trucks having only manually operated parking brakes shall have a permanent marking "Warning – Apply Hand Brake (or Foot Brake) – Parking Brakes are not automatically applied."

412 SAFETY CONTROL AND BRAKES, ELECTRIC TRUCKS, STAND-UP RIDER

Means shall be provided to automatically open the travel circuit when the parking brake (or mechanism) is applied.

Means shall be provided so that the travel circuit can be activated only by releasing the parking brake and resetting the speed and/or directional control(s) when the operator assumes the driving position.

Provision shall be made for locking control circuit(s) with a key to prevent unauthorized operation.

For trucks having a downward movement of brake pedal to apply the service brake(s), the system shall be capable of withstanding a brake pedal force of 250 pounds without failure of any component.

For trucks having an upward movement of the brake pedal to apply the service brake(s), a force of 200 percent of the maximum possible setting of the spring shall not cause failure of any component.

A parking brake (or mechanism) shall be provided and capable of holding the truck on the maximum grade which the truck can negotiate with rated capacity load or on a 15 percent grade, whichever is the lesser.

The parking brake (or mechanism) shall be manually or automatically applied and shall remain applied until released by the operator.

Trucks having only manually operated parking brakes shall have a permanent marking "Warning – Apply Hand Brake (or Foot Brake) – Parking Brakes are not automatically applied."

413 SAFETY CONTROL AND BRAKES, INTERNAL COMBUSTION POWERED INDUSTRIAL TRUCKS, SIT-DOWN RIDER

Travel control shall be so arranged that the truck will move only when the direction control is actuated and will not move at a speed greater than inching speed, unless control has been actuated for both speed and direction.

Service brakes, if foot operated, shall be energized by depressing the control.

If a combination clutch and brake pedal is used, the initial pedal movement shall disengage the clutch and the final pedal movement shall apply the brakes and the pedal shall be operated by the left foot.

Accelerator, if foot operated, shall increase speed when depressed with the right foot.

If a combination pedal controls both acceleration and brakes, depressing the accelerator portion shall increase speed and depressing the brake portion shall apply the brakes, and the combination pedal shall be operated by the right foot.

Clutch pedal, if used, shall release clutch by depressing with left foot.

Provision shall be made for locking ignition with a key to prevent unauthorized operation.

The services brake shall be capable of withstanding a brake pedal force of 250 pounds without failure of any component.

A parking brake (or mechanism) shall be provided and capable of holding the truck on the maximum grade which the truck can negotiate with rated capacity load, or on a 15 percent grade, whichever is the lesser.

The parking brake (or mechanism) shall be manually or automatically applied and shall remain applied until released by the operator.

414 SAFETY CONTROL AND BRAKES, INTERNAL COMBUSTION POWERED INDUSTRIAL TRUCKS, STAND-UP RIDER

Accelerator, if foot operated, shall increase speed when depressed with the right foot.

Travel control shall be so arranged that the truck will not move until the direction control has been actuated and will not move, at a speed greater than inching speed, unless control has been actuated for both speed and direction.

Provision shall be made for locking ignition with a key to prevent unauthorized operation.

For trucks having a downward movement of brake pedal to apply the service brakes, the system shall be capable of withstanding a brake pedal force of 250 pounds without failure of any component.

For trucks having an upward movement of the brake pedal to apply the service brakes, a force of 200 percent of the maximum possible setting of the spring shall not cause failure o any component.

A parking mechanism shall be provided and capable of holding the truck on the maximum grade which the truck can negotiate with rated capacity load, or on a 15 percent grade, whichever is the lesser.

The parking mechanism shall be manually or automatically applied and shall remain applied until released by the operator.

415 SAFETY CONTROL AND BRAKES, ELECTRIC HAND, AND HAND/RIDER TRUCKS

Forward and reverse motion of the truck shall be controlled or selected by means of a control device readily accessible when grasping handle grip on steering tongue. This control device shall operate directionally in one of the following manners:

1. The control shall have a forward motion for forward travel and a rearward motion for reverse travel, or
2. The control shall consist of two buttons located at top of control handle when steering tongue is approximately vertical, arranged so that the forward one is for forward travel and vice versa, or
3. The control shall have rotary motion, the rotation being in same direction as drive wheel rotation.

The travel control shall be clearly and durably identified to indicate function and direction of motion.

Brake shall be applied and current to drive motor shall be cut off whenever the steering tongue is in approximately a vertical position, and the same conditions shall exist whenever the steering tongue is in approximately a horizontal position, or the brake shall be applied and current to drive motor cut off by release of the device normally used to control travel motion of the truck.

A parking brake (or mechanism) which may be a part of, or include the service brake(s), shall be provided and be capable of holding the truck on the maximum grade which the truck can negotiate with rated capacity load, or on a 10% grade, whichever is the lesser.

On a truck meeting the above requirements, provision may be made to permit the truck to be operated under control in a direction away from the control end of the truck when the steering tongue is in any position.

416 SAFETY CONTROL AND BRAKES, ORDER PICKER TRUCKS, HIGH LIFT

Controls (including remote) shall be provided which will de-activate travel controls when the operator leaves the truck. Travel controls shall be so arranged that the truck will move only when the direction control is actuated and will not move, at a speed greater than inching speed, unless control has been actuated for both direction and speed.

Automatic means should be provided to restrict the travel speed in accordance with good operating practices when the occupied operator platform is elevated above 24 inches.

Provision shall be made for locking controls with a key to prevent unauthorized operation.

Means shall be provided to render inoperative all operating controls other than those on the elevatable platform when the controls on the elevatable platform have been selected for use. Only one location of controls shall be capable of being operated at one time.

Means shall be provided for an operator on the elevatable platform to shut off the power to the truck.

A parking brake (or mechanism) shall be provided capable of holding the truck with rated capacity load on a 5 percent grade.

The parking brake (or mechanism) shall be manually or automatically applied and shall remain applied until released by the operator.

For trucks having a downward movement of brake pedal to apply the service brakes, the system shall be capable of withstanding a brake pedal force of 250 pounds without failure of any component.

For trucks having an upward movement of the brake pedal to apply the service brakes, a force of 200 percent of the maximum possible setting of the spring shall not cause failure of any component.

417 LOAD HANDLING CONTROLS

A. Load handling control(s) should preferably be:

1. Located for right hand operation.
2. Arranged in order of: speed, hoist, reach, tilt, and auxiliary devices, where individual handles are required and used. A single lever may be used to perform more than one function.
3. Clearly and durably identified to indicate function(s) and direction of motion of load or equipment.
4. Self centering.

B. Lever or handle type controls (including toggle switches) should preferably be in accordance with the following table.

Function	DIRECTION OF MOTION	
	of load or equipment	Predominant motion of the operator's hand when actuating the control handle while facing the load
Hoist	up	rearward or up
	down	forward or down
Tilt	rearward	rearward or up*
	forward	forward or down
Reach	retract	rearward*
	extend	forward
Clamp	clamp	rearward or up
	release	forward or down
Side Shift	right	rearward or up
	left	forward or down
Rotate Laterally	clockwise	rearward or up
	counterclockwise	forward or down
Rotate Longitudinally	rearward	rearward or up*
	forward	forward or down

*The sense of rotation of the control handle is intended to be in the same direction as the desired motion of the mast or load.

C. Where the operation of lifting, lowering, tilting and/or auxiliary devices is controlled by a pair of push buttons, they should operate in the same sense as described above. For example, actuation of the button that is located to the rear (relative to the operator's position) should serve the same function as motion of a control lever to the rear.

D. The upper surface of a rotary control device should move in the same sense direction as levers.

E. Special controls (such as for preselective or automatic devices) shall be identified and should preferably be in accordance with the above recommendations.

418 TILT MECHANISM

To maintain stability with the lifting mechanism elevated, tilting should be controllable, smooth, and at reasonable speed. Consideration should be given to reducing tilt speeds on trucks with extra high lift.

419 FORKS

A. Forks shall be secured to the carriage so that unintentional lifting of the toe shall not occur where this lifting may create a hazard.

B. The factor of safety of forks shall be at least 3 to 1 based on the yield point of the material.

420 FORK EXTENSIONS

Fork extensions or other attachments shall be suitably secured to prevent unintentional lifting or displacement on primary forks.

421 OVERHEAD GUARD

High-lift rider trucks shall be fitted with an overhead guard unless the customer otherwise requests. The overhead guard shall be of sufficient strength to support a uniformly distributed static load in accordance with the following table and Graph G, but it is not intended to withstand the impact of a falling capacity load.

Truck Capacity Rating	Static Test Load as a % of Truck Capacity Rating
Up to 5,000 lb	200% of truck rating
Over 5,000 lb, up to 10,000 lb	10,000 lb plus 100% of increment rating over 5,000 lb
Over 10,000 lb, up to 20,000 lb	15,000 lb plus 50% of increment rating over 10,000 lb
Over 20,000 lb	Consult the Manufacturer

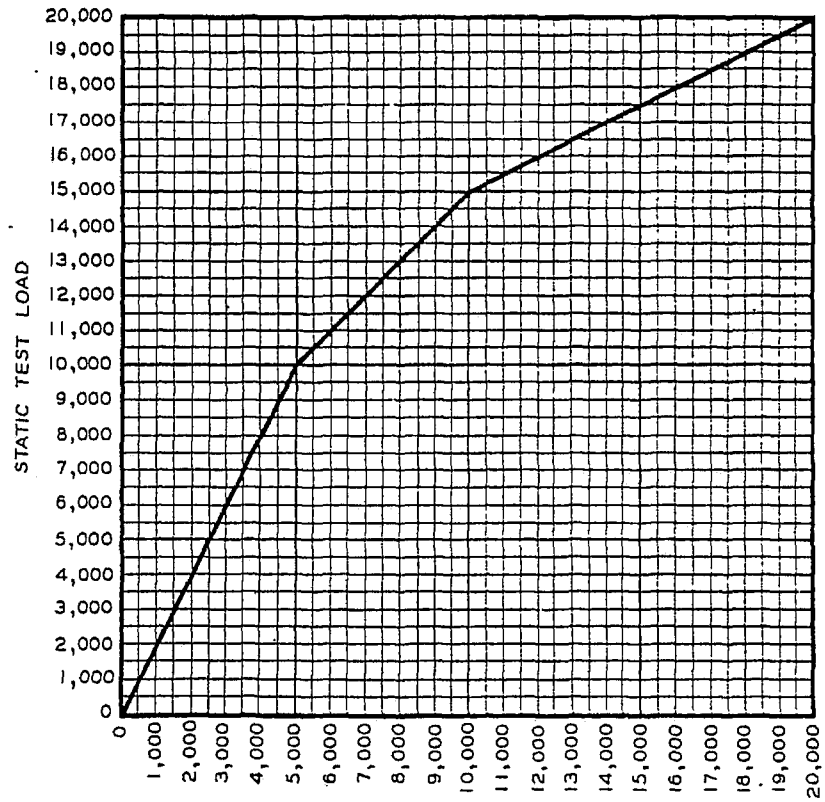
It shall be capable of withstanding the impact of a 100 pound solid hardwood cube (or equivalent) dropped at random from a distance of 5 feet, 10 times, without fracture or without permanent deflection exceeding ¾ inch.

It shall be constructed in a manner that does not interfere with good visibility, but openings in top shall not exceed 6 inches in one of the two dimensions, width or length. User should specify other size openings for special applications. It shall be large enough to extend over the operator under all normal circumstances of truck operation, including forward tilt.

In fork trucks equipped with a single tilt cylinder, provision shall be made to avoid injury to the operator by the overhead guard resulting from failure of this cylinder or associated parts.

In trucks where the operator is seated, a vertical clearance of at least 39 inches should be maintained from the point of maximum depression of the seat under the operator to the underside of the section of the guard under which the operator's head moves during normal operation.

In trucks where the operator stands, a vertical clearance of at least 74 inches should be maintained from the platform where he stands to the underside of the section of the guard under which the operator's head moves during normal operation.



GRAPH G

Under certain unusual operating conditions a stronger guard may be required. It is impractical to build a guard of sufficient strength to withstand the impact of a falling capacity load since such a guard would constitute a safety hazard because its structure would be so large that it might interfere with good visibility, and would weigh so much that it might make the truck top-heavy and unstable.

422 LOAD BACKREST EXTENSION

Load Backrest Extension should have height, width, and size of openings (not to exceed 6 inches in one of the two dimensions) sufficient to minimize the possibility of the load from falling toward the mast when the mast is in a position of maximum rearward tilt. It shall be constructed in a manner that does not interfere with good visibility.

423 PEDAL AND PLATFORM SURFACES

Control pedals and control platforms stood on or engaged by the operator's feet should have non-skid surfaces.

424 OPERATOR PLATFORMS (including removable)

A. End Control, Reach, Narrow Aisle, Order Picker High Lift, and Motorized Hand/Rider Trucks should be equipped with platforms extending beyond the operator's position, strong enough to withstand a compression load equal to the weight of the loaded vehicle applied along the longitudinal axis of the truck with the outermost projection of the platform against a flat vertical surface.

B. End Control Trucks

Operator enclosures are not recommended because rapid and unobstructed ingress or egress for the operator is considered more desirable.

On double-end control baggage-type trucks or trucks which may be transported on short elevators, means should be provided to prevent unintentional folding of the operator's folding platform.

C. Reach and Narrow Aisle Trucks

Additional operator enclosures may be provided in conjunction with the platform. If provided, they should permit easy ingress and egress from the platform.

D. Motorized Hand/Rider Trucks

Additional guards in conjunction with the platform are not recommended because of interference with the steering handle and with rapid and unobstructed egress for the operator.

E. Order Picker Trucks High Lift

1. Removable operator platforms should be provided with a means for attaching to the lifting device.
2. Operator platform should be equipped with guard rails or means for securing an operator tether.

425 OVERTRAVEL LIMITS

Provision shall be made to prevent mechanical overtravel of motions such as hoist, tilt, boom, etc.

426 WHEEL GUARDS

Tires extending beyond the confines of the truck should be provided with guards to prevent the tires from throwing particles at the operator.

427 WARNING DEVICE

Every truck or tractor shall be equipped with a warning horn, whistle, or gong, or other device

428 GUARDS FOR MOVING CHAINS, CABLE ETC.

Moving parts that represent a hazard should be protected by suitable guards wherever possible. Moving parts that represent a hazard to the operator in normal operating position, shall be protected by suitable guards.

Part III
For the User

SECTION 5

GENERAL SAFETY PRACTICES

501 INTRODUCTION

Like other vehicles, powered industrial trucks can cause injury if improperly used or maintained.

Part III contains broad safety standards applicable to users and operators. If peculiar or unusual operating conditions indicate, plant safety departments should rewrite the applicable sections of Part III for the use of their employees.

502 STABILITY

Experience has shown that high lift trucks which comply with the stability standard stated in Part II are stable when properly operated. However, improper operation or faulty maintenance – both of which are beyond the control of the manufacturer or seller – may produce a condition of instability and defeat the purpose of the standard.

Some of the conditions which may affect stability are, ground and floor conditions, grade, speed, loading (trucks equipped with attachments behave as partially loaded trucks even when operated without a load on the attachment), battery weight, dynamic and static forces, and the judgment exercised by the operator.

Operators should be trained to adhere strictly to the operating instructions stated in Section 6 of this Part III and users should keep aisles, roadways, passageways, floors, and ramps in first class condition and free of loose objects.

Users shall give consideration to special operating conditions. The amount of forward and rearward tilt to be used is governed by the application involved. Although the use of maximum rearward tilt is allowable under certain conditions traveling with the load lowered, the stability of a truck as determined by the stability tests outlined in Part II, 406, does not encompass consideration for those operations involving excessive forward tilt at high elevations, nor the operation of trucks with off-center loads and/or excessive rearward tilt at high elevations.

Some users may decide to establish, for their own use, stability requirements which will vary from those in Part II, 406. It is expected the requirements in Part II, 406, will serve as a guide for the user, working with the manufacturer, in establishing his own specialized requirements.

503 MODIFICATIONS, NAMEPLATES, MARKINGS, AND CAPACITY

A. Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without manufacturers prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

B. If the truck is equipped with front-end attachments other than factory installed attachments, the user shall request that the truck be marked to identify the attachments, show the approximate weight of the truck and attachment combination, and the capacity of the truck and attachment combination at maximum elevation with load laterally centered.

C. The user shall see that all nameplates and markings are in place and are maintained in a legible condition.

D. The user should mark, on the sides of the truck, in letters at least 1½ in. high, the actual vehicle weight, the maximum load and the combined weight of the vehicle and capacity load.

E. The user should consider that changes in load dimension may affect truck capacities.

504 SAFETY GUARDS

A. Overhead Guards

High Lift Rider trucks shall be fitted with an overhead guard manufactured in accordance with Part II, 421, of this standard, unless operating conditions do not permit.

An overhead guard is intended to offer protection from the impact of small packages, boxes, bagged material, etc., representative of the job application, but not to withstand the impact of a falling capacity load. Where head room conditions limit the overall lowered height of the truck, normal overhead guard heights may be reduced or the overhead guard may be omitted. When it is necessary to omit the overhead guard, special attention should be given by the user and operator to conditions such as height and stability of loads and stacks, weight of individual units, and operating space including overhead obstructions.

B. Load Backrest Extension

If the type of load presents a hazard, the user shall equip fork trucks with a vertical load backrest extension manufactured in accordance with Part II, 422, of this standard.

505 FUEL HANDLING AND STORAGE

A. The storage and handling of liquid fuels such as gasoline and diesel fuel) shall be in accordance with paragraph 601 of NFPA 505 – Type Designations, Areas of Use, Maintenance, & Operation of Powered Industrial Trucks 1968, and NFPA Flammable and Combustible Liquids Code (NFPA No. 30 – 1966.)

B. The storage and handling of liquefied petroleum gas fuel shall be in accordance with paragraph 602 of NFPA 505 – Type Designations, Areas of Use, Maintenance, & Operation of Powered Industrial Trucks 1968, and NFPA Standards for Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58, USA Standard Z106.1 – 1967.)

506 CHANGING AND CHARGING STORAGE BATTERIES

A. Battery charging installations shall be located in areas designated for that purpose. Facilities shall be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation for dispersal of fumes from gassing batteries.

B. When racks are used for support of batteries, they should be made of materials non conductive to spark generation or be coated or covered to achieve this objective.

C. A conveyor, overhead hoist, or equivalent material handling equipment shall be provided for handling batteries.

Chain hoists should be equipped with load-chain containers. When hand hoist is used, uncovered batteries should be covered with a sheet of plywood or other non-conducting material to prevent the hand chain from shorting on cell connectors or terminals. A properly insulated spreader bar should be used with any overhead hoist.

Reinstalled batteries shall be properly positioned and secured in the truck.

D. A carboy tilter or siphon shall be provided for handling electrolyte.

Always pour acid into water; not water into acid.

Personnel maintaining batteries should wear protective clothing such as face shield, long sleeves, and gauntlet gloves.

E. Electrical installations shall conform to the National Electrical Code (NFPA No. 70 USA Standard C1 – 1968) and any local ordinances.

F. Trained and authorized personnel should change or charge batteries.

G. Trucks shall be properly positioned and brake applied before attempting to change or charge batteries.

H. When charging batteries, the vent caps should be kept in place to avoid electrolyte spray. Care shall be taken to assure that vent caps are functioning.

The battery (or compartment) cover(s) shall be open to dissipate heat.

I. Smoking shall be prohibited in the charging area.

J. Precautions shall be taken to prevent open flames, sparks, or electric arcs in battery charging areas.

K. Tools and other metallic objects shall be kept away from the top of uncovered batteries.

507 HAZARDOUS ATMOSPHERES

Powered industrial trucks for operation in hazardous areas shall be of the type as recommended in NFPA Standard No. 505 – Type Designations, Areas of Use, Maintenance, & Operation of Powered Industrial Trucks 1968, Part A

and Part B. Trucks should be recognized as being built in accord with paragraphs 7 through 143 of UL Standards for Safety 558, Second Edition, September 1961 "Internal Combustion Engine-Powered Industrial Trucks" and paragraphs 7 through 130 and 132 through 187 of UL Standards for Safety 583, Fourth Edition, November 1956, Revised September 1960 "Power-Operated Industrial Trucks." Trucks and areas of use should be marked in accordance with NFPA Standard No. 505 – 1968, Section 800.

508 AISLES AND OBSTRUCTIONS

Whenever aisles, roadways or passageways, floors and ramps are marked or defined, it is recommended that the suggestions contained in the USA Standard Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment Z53.1-1967 be followed.

509 PAINT COLOR

It is suggested that powered industrial trucks be painted a color which will comply with the USA Standard Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment, Z53.1-1967.

510 LIGHTING FOR OPERATING AREAS

A. Controlled lighting of adequate intensity should be provided in operating areas. (See USA Standard Practice for Industrial Lightning, A11.1-1965.)

B. Where general lighting is less than 2 lumens per square foot, auxiliary directional lighting shall be provided on the truck.

511 CONTROL OF NOXIOUS GASES AND FUMES

A. Concentration levels of carbon monoxide gas created by powered industrial truck operations shall not exceed the levels specified in USA Standard Allowable Concentration of Carbon Monoxide, Z37.1-1941.

B. Questions concerning degree of concentration and methods of sampling to ascertain the conditions should be referred to a qualified industrial hygienist.

C. The user should provide adequate ventilation in enclosed areas to maintain a clean atmosphere since products of combustion from devices which use oxygen create a health hazard unless diluted by ventilation. Even though devices are used to complete the combustion of fuel and are maintained properly, the hazard still exists in enclosed areas.

512 DOCKBOARDS (BRIDGE PLATES[9])

A. Portable and powered dockboards shall be strong enough to carry the load imposed on them. The carrying capacity should be plainly marked.

B. Portable dockboards shall be secured in position, either by being anchored or equipped with devices which will prevent their slipping.

C. Powered dockboards shall be designed and constructed in accordance with Commercial Standard CS202-56–1961 "Industrial Lifts and Hinged Loading Ramps" published by the U.S. Department of Commerce.

D. Hand holds, or other effective means, shall be provided on portable dockboards to permit safe handling. Where possible, fork loops or lugs should be provided for handling by fork trucks.

E. All types of dockboards should have a high friction surface, designed to prevent employees or trucks from slipping.

F. All types of dockboards should be designed and maintained so the end edges will have a substantial contact with the dock (or loading platform) and the carrier to prevent the dockboard from rocking or sliding.

G. The sides of all dockboards should be turned up at right angles, or other means provided, to prevent trucks from running over the edge.

H. Positive protection shall be provided to prevent railroad cars from being moved while dockboards or bridge plates are in position. Adequate warning methods should be established with local railroad authorities to provide protection against moving railroad cars during loading or unloading operations.

[9] *Dockboard recommendations also apply to bridge plates.*

513 TRUCKS AND RAILROAD CARS

A. The brakes of highway trucks shall be set and wheel chocks placed under the rear wheels to prevent the trucks from rolling while they are boarded with powered industrial trucks.

B. Wheel stops or other recognized positive protection shall be provided to prevent railroad cars from moving during loading or unloading operations.

C. Fixed jacks may be necessary to support a semitrailer and prevent up-ending during the loading or unloading when the trailer is not coupled to a tractor.

D. Positive protection shall be provided to prevent railroad cars from being moved while dockboards or bridge plates are in position. Adequate warning methods should be established with local railroad authorities to provide protection against moving railroad cars during loading or unloading operations.

514 WARNING DEVICE

When operating conditions dictate, the user should request the manufacturer to equip the trucks or tractors with visual warning devices such as lights or blinkers. Where noise levels are high, combinations of these may be required to insure adequate warning.

SECTION 6

OPERATING SAFETY RULES AND PRACTICES

601 OPERATOR QUALIFICATIONS

Operators of powered industrial trucks shall be physically qualified. An examination should be made on an annual basis and include such things as field of vision, hearing, depth perception, and reaction timing.

602 OPERATOR TRAINING

Only trained and authorized operators shall be permitted to operate a powered industrial truck. Methods shall be devised to train operators in the safe operation of powered industrial trucks. Badges or other visual indication of the operators' authorization should be displayed at all times during work period.

603 GENERAL

A. Safeguard the pedestrians at all times. Do not drive a truck up to anyone standing in front of a bench or other fixed object.

B. Do not allow anyone to stand or pass under the elevated portion of any truck, whether loaded or empty.

C. Unauthorized personnel shall not be permitted to ride on powered industrial trucks. A safe place to ride shall be provided where riding of trucks is authorized.

D. Do not put arms or legs between the uprights of the mast or outside the running lines of the truck.

E. When leaving a powered industrial truck unattended, load engaging means shall be fully lowered, controls shall be neutralized, power shut off, brakes set, key or connector plug removed. Block wheels if truck is parked on an incline.

F. Maintain a safe distance from the edge of ramps or platforms and do not, while on any elevated dock or platform, push freight cars. Do not use trucks for opening or closing freight doors.

G. Have brakes set and wheel blocks in place to prevent movement of trucks, trailers, or railroad cars while loading or unloading. Fixed jacks may be necessary to support a semitrailer during loading or unloading when the trailer is not coupled to a tractor. Check the flooring of trucks, trailers, and railroad cars for breaks and weakness before driving onto them.

H. Be sure of sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc.

I. Use an overhead guard as protection against falling objects.

Warning: An overhead guard is intended to offer protection from the impact of small packages, boxes, bagged material, etc., representative of the job application, but not to withstand the impact of a falling capacity load.

J. Use a load backrest extension whenever necessary to minimize the possibility of the load or part of it from falling rearward.

K. Use only approved industrial trucks in hazardous locations.

L. Whenever a truck is equipped with vertical only, or vertical and horizontal travel controls elevatable with the lifting carriage or forks for lifting personnel, the following additional precautions should be taken for the protection of personnel being elevated.

(a) Use of a safety platform firmly secured to the lifting carriage and/or forks.

(b) Provide means whereby personnel on the platform can shut off power to the truck.

(c) Provide such protection from falling

objects as indicated necessary by the operating conditions.

M. Report all accidents involving personnel, building structures, and equipment.

N. Spinner knobs must not be attached to steering handwheels of trucks not originally equipped with such, without approval of of the safety department.

O. Fire aisles, access to stairways, and fire equipment shall be kept clear.

604 TRAVELING

A. Observe all traffic regulations including authorized plant speed limits. Under normal traffic conditions, keep to the right. Maintain a safe distance, approximately three truck lengths from the truck ahead, and keep the truck under control at all times. Use of trucks on public roads shall conform to local traffic regulations.

B. Yield the right of way to ambulances, fire trucks, or other vehicles in emergency situations.

C. Do not pass another truck traveling in the same direction at intersections, blind sports, or at other dangerous locations.

D. Slow down and sound horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, travel with the load trailing.

E. Cross railroad tracks diagonally wherever possible. Do not park closer than 8 feet from center of railroad tracks.

F. Look in the direction of, and keep a clear view of the path of travel.

G. Ascend or descend grades slowly.

1. When ascending or descending grades in excess of 10 percent, loaded trucks shall be driven with the load upgrade.

2. Unloaded trucks should be operated on all grades with the load engaging means downgrade.[10]

3. On all grades the load and load engaging means shall be tilted back if applicable, and raised only as far as necessary to clear the road surface.

H. Under all travel conditions the truck shall be operated at a speed that will permit it to be brought to a stop in a safe manner.

I. Travel with load engaging means or load low and, where possible, tilted back. Do not elevate the load except during stacking.

J. Make starts, stops, turns, or direction reversals in a smooth manner so as not to shift load and/or overturn the truck.

K. Stunt driving and horseplay shall not be permitted.

L. Slow down for wet and slippery floors.

M. Before driving over a dockboard or bridgeplate, be sure that it is properly secured. Drive carefully and slowly across the dockboard or bridge plate and never exceed its rated capacity.

N. Do not run vehicles onto any elevator unless specifically authorized to do so. Approach elevators slowly, and then enter squarely after the elevator car is properly leveled. Once on the elevator, neutralize the controls, shut off power, and set brakes. It is advisable that all personnel leave the elevator before a truck is allowed to enter or leave.

O. Motorized hand trucks must enter elevator or other confined areas with load end forward.

P. Avoid running over loose objects on the roadway surface.

Q. While negotiating turns, reduce speed to a safe level, turning hand steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, turn the hand steering wheel at a moderate, even rate.

605 LOADING

A. Handle only stable or safely arranged loads. When handling off-center loads which cannot be centered, operate with caution.

B. Handle only loads within the rated capacity of the truck.

C. Adjust the long or high (including multiple-tiered) loads which may affect capacity.

D. When attachments are used, particular care should be taken in securing, manipulating, positioning, and transporting the load. Operate trucks equipped with attachments as partially loaded trucks when not handling a load.

E. Place load engaging means under the load as far as possible and carefully tilt the mast backward to stabilize the load. Caution should be used in tilting backward with high or segmented loads. (See 603 I & J)

[10] *High lift order picker trucks are not normally intended for steep grade operation. Consult manufacturers operating instructions for recommended operating procedures.*

F. Use extreme care when tilting load forward or backward particularly when high tiering. Do not tilt forward with load engaging means elevated except to pick up a load. Do not tilt an elevated load forward except when the load is in a deposit position over a rack or stack. When stacking or tiering use only enough backward tilt to stabilize the load.

606 OPERATOR CARE OF THE TRUCK

A. Give special consideration to the proper functioning of tires, horn, lights, battery, controller, lift system (including load engaging means, chains, cable, and limit switches), brakes and steering mechanism. If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the matter shall be reported immediately to the designated authority, and the truck shall be taken out of service until it has been restored to safe operating condition.

B. Do not make repairs or adjustments unless specifically authorized to do so.

C. Do not fill fuel tanks while engine is running and avoid spillage.

D. Spillage of oil or fuel shall be carefully washed away or completely evaporated and fuel tank cap replaced before restarting engine.

E. Do not operate a truck with a leak in the fuel system until the leak has been corrected.

F. Do not use open flames for checking electrolyte level in storage batteries or gasoline level in fuel tanks.

SECTION 7

MAINTENANCE PRACTICES

701 Powered industrial trucks may become hazardous if adequate maintenance is neglected. Therefore, adequate maintenance facilities, personnel, and procedures should be provided.

702 Maintenance and inspection of all powered industrial trucks shall be performed in conformance with the manufacturers recommendations and the following practices:

A. A scheduled preventive maintenance, lubrication, and inspection system shall be followed.

B. Only qualified and authorized personnel shall be permitted to maintain, repair, adjust, and inspect industrial trucks.

C. Before leaving the truck –

1. Stop truck
2. Fully lower the load engaging means
3. Place directional controls in neutral
4. Apply the parking brake
5. Stop the engine or turn off power
6. Lock the control or ignition circuit
7. Block the wheels if truck is on a ramp, or being worked on

D. Before working on truck –

1. Raise wheels free of floor or disconnect power source.
2. Use chocks or other positive truck positioning devices.
3. Block load engaging means, innermast(s), or chassis before working under them
4. Before working on engine fuel system of gasoline powered trucks with gravity-feed fuel systems, be sure shutoff is closed
5. Before working on engine fuel system of LP gas-powered trucks, close LP gas-cylinder valve and run engine until fuel in system is depleted and engine stops running
6. Operation to check performance of the truck or attachments shall be conducted in an authorized safe clearance area.

E. Before starting to operate the truck –

1. Be in operating position
2. Depress clutch (or brake pedal on automatic transmissions).
3. Place directional controls in neutral
4. Start engine.
5. Before operating truck, check functioning of lift and tilt systems, directional and speed controls, steering, warning devices, brakes, and any attachment (if used)

F. Avoid fire hazards and have fire protection equipment present. Do not use an open flame to check level, or for leakage, of fuel, electrolyte or coolant. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.

G. Properly ventilate work area, vent exhaust fumes, and keep shop clean and dry.

H. Handle LP gas cylinders with care. Do not drop, dent, or damage in any way.

I. Brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, lift overload devices, guard, and safety devices shall be inspected regularly and maintained in a safe operating condition.

J. All parts of lift and tilt mechanisms and frame members shall be carefully and regularly inspected and maintained in a safe operating condition.

K. Special trucks or devices designed and approved for hazardous area operation shall receive special attention to ensure that maintenance preserves the original approved safe operating features.

L. Fuel systems shall be checked for leaks and condition of parts. Extra special consideration shall be given in the case of a leak in the fuel system. Action shall be taken to prevent the use of the truck until the leak has been corrected.

M. All hydraulic systems shall be regularly inspected and maintained in conformance with good practice. Tilt cylinders, valves, and other similar parts shall be checked to assure that "drift" has not developed to the extent that it would create a hazard.

N. Capacity, operation and maintenance instruction plates, tags, or decals shall be maintained in legible condition.

O. Batteries, motors, controllers, limit switches, protective devices, electrical conductors, and connections shall be inspected and maintained in conformance with good practice. Special attention shall be paid to the condition of electrical insulation.

P. Industrial trucks shall be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.

Q. Modifications and additions which affect capacity and safe truck operation shall not be performed by the customer or user without manufacturers prior written approval. Capacity, operation, and maintenance instruction plates, tags or decals shall be changed accordingly.

R. Care shall be taken to assure that all replacement parts are interchangeable with the original parts and of a quality equal to that provided in the original equipment.

Appendix A

Glossary of Commonly Used Words and Phrases

ATTACHMENT: A device other than conventional forks or load backrest extension, mounted permanently or removably on the elevating mechanism of a truck for handling the load. Popular types are fork extension clamps, rotating devices, side shifters, load stabilizers, rams, and booms.

BATTERY-ELECTRIC TRUCK: An electric truck in which the power source is a storage battery.

BRIDGE PLATE: A portable device for spanning the gap between two rail cars.

CANTILEVER TRUCK: A self-loading counterbalanced or noncounterbalanced truck, equipped with cantilever load engaging means such as forks (Fig. 1).

CARRIAGE: A support structure for forks or attachments, generally roller mounted traveling vertically within the mast of a cantilever truck.

CENTER CONTROL: The operator control position is located near the center of the truck.

COUNTERBALANCED TRUCK: A truck equipped with load engaging means wherein all the load during normal transporting is external to the polygon formed by the wheel contacts (Fig. 1).

DIESEL-ELECTRIC TRUCK: An electric truck in which the power source is a diesel engine driven generator.

DOCKBOARD: A portable or fixed device for spanning the gap or compensating for difference in level between loading platforms and carriers.

ELECTRIC TRUCK: A truck in which the principal energy is transmitted from power source to motor(s) in the form of electricity.

END CONTROL: The operator control position is located at the end opposite the load end of the truck.

FORKS: Horizontal tine-line projections, normally suspended from the carriage, for engaging and supporting loads.

FORK HEIGHT: The vertical distance from the floor to the load carrying surface adjacent to the heel of the forks with mast vertical, and in the case of Reach Trucks, with the forks extended.

FORK LIFT TRUCK: A high lift self-loading truck, equipped with load carriage and forks for transporting and tiering loads.

GAS-ELECTRIC TRUCK: An electric truck in which the power source is a gasoline or LP gas-engine-driven generator.

HIGH-LIFT TRUCK: A self-loading truck equipped with an elevating mechanism designed to permit tiering. Popular types are high-lift fork truck, high-lift ram truck, high-lift boom truck, high-lift clamp truck, and high-lift platform truck (Fig. 1).

HIGH-LIFT PLATFORM TRUCK: A self-loading truck equipped with a load platform, intended primarily for transporting and tiering loaded skid platforms (Fig. 2).

INDUSTRIAL TRACTOR: A powered industrial vehicle designed primarily to draw one or more nonpowered trucks, trailers, or other mobile loads (Fig. 5).

INTERNAL COMBUSTION ENGINE TRUCK: A truck in which the power source is a gas or diesel engine.

LIFT TRUCK: See fork lift truck.

LOAD BACKREST EXTENSION: A device extending vertically from the fork carriage frame.

LOAD CENTER: The horizontal longitudinal distance from the intersection of the horizontal load-carrying surfaces and vertical load-engaging faces of the forks (or equivalent load positioning structure) to the center of gravity of the load.

LOW-LIFT TRUCK: A self-loading truck equipped with an elevating mechanism designed to raise the load sufficiently to permit horizontal movement. Popular types are low-lift platform truck and pallet truck (Fig. 3).

LOW-LIFT PLATFORM TRUCK: A self-loading truck equipped with a load platform intended primarily for transporting loaded skid platforms (Fig. 3).

MAST: The support member providing the guideways permitting vertical movement of the carriage. It is usually constructed in the form of channels or similar sections providing the supporting pathway for the carriage rollers.

MAXIMUM FORK HEIGHT: The fork height attainable in fully raised position when loaded.

MOTORIZED HAND TRUCK: A truck that is designed to be controlled by a pedestrian (Fig. 4).

MOTORIZED HAND/RIDER TRUCK: A dual purpose truck that is designed to be con-

trolled by a pedestrian or by a riding operator (Fig. 6).

NARROW-AISLE TRUCK: A self-loading truck primarily intended for right-angle stacking in aisles narrower than those normally required by counterbalanced trucks of the same capacity (Fig. 10).

ORDER PICKER TRUCK, HIGH LIFT: A high-lift truck controllable by the operator stationed on a platform movable with the load-engaging means and intended for (manual) stock selection. The truck may be capable of self-loading and/or tiering.

OVERHEAD GUARD: A framework fitted to a truck over the head of a riding operator.

PALLET TRUCK: A self-loading, low-lift truck equipped with wheeled forks of dimensions to go between the top and bottom boards of a double-faced pallet and having wheels capable of lowering into spaces between the bottom boards so as to raise the pallet off the floor for transporting (Fig. 4).

PARKING BRAKE: A device to prevent the movement of a stationary vehicle.

POWERED INDUSTRIAL TRUCK: A mobile, power-driven vehicle used to carry, push, pull, lift, stack, or tier material.

REACH TRUCK: A self-loading truck, generally high-lift, having load-engaging means mounted so it can be extended forwardly under control to permit a load to be picked up and deposited in the extended position and transported in the retracted position (Fig. 7).

RIDER TRUCK: A truck that is designed to be controlled by a riding operator (Fig. 1).

SIDE LOADER: A self-loading truck, generally high-lift, having load engaging means mounted in such a manner that it can be extended laterally under control to permit a load to be picked up and deposited in the extended position and transported in the retracted position (Fig. 8).

STRADDLE TRUCK: A general class of cantilever truck with horizontal, structural wheel-supported members extending forward from the main body of the truck, generally high-lift, for picking up and hauling loads between its outrigger arms. (Fig. 10)

TRUCK: See Powered Industrial Truck.

TIERING: The process of placing one load on or above another.

TYPES OF TRUCKS

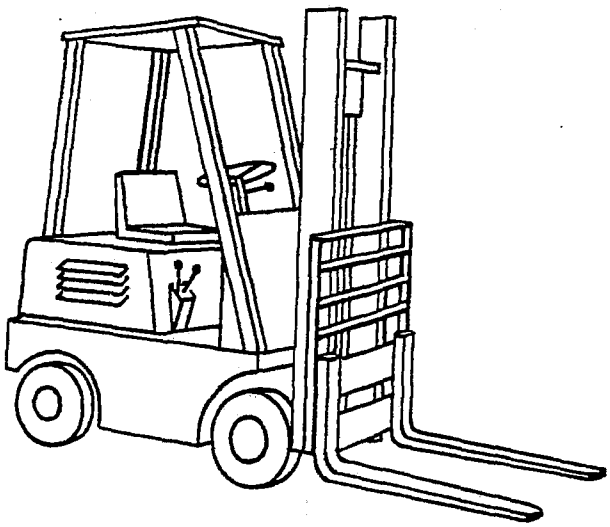


FIG. 1 – HIGH-LIFT TRUCK
– COUNTERBALANCED TRUCK
– CANTILEVER TRUCK
– RIDER TRUCK
– FORK LIFT TRUCK

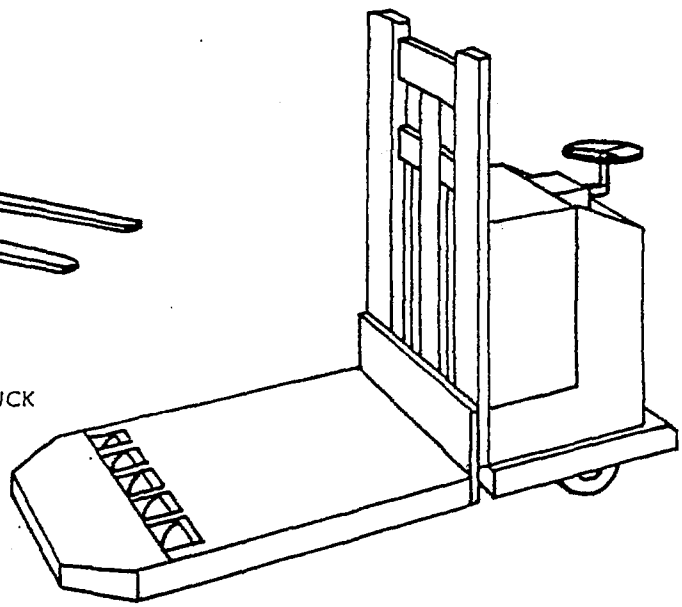


FIG. 2 – HIGH-LIFT TRUCK
– HIGH-LIFT PLATFORM TRUCK

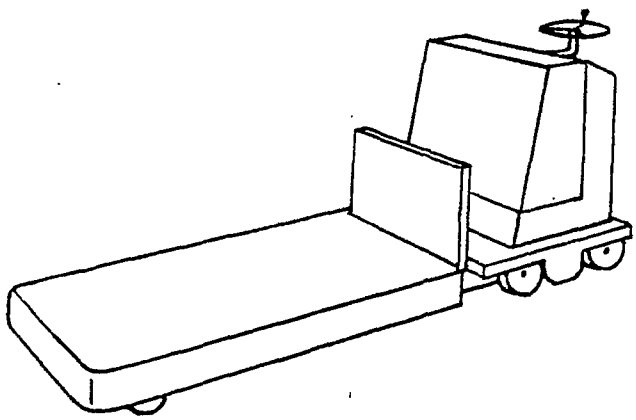


FIG. 3 – LOW-LIFT TRUCK
– LOW-LIFT PLATFORM TRUCK

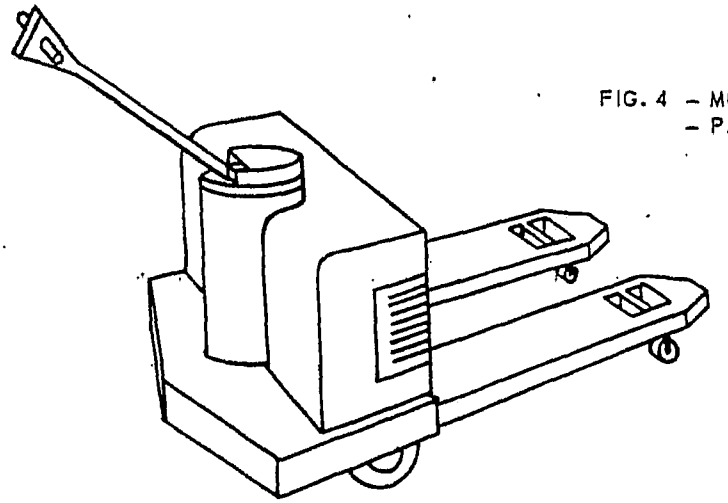


FIG. 4 – MOTORIZED HAND TRUCK
– PALLET TRUCK

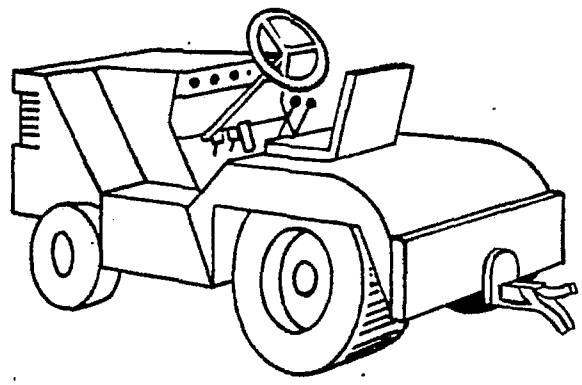


FIG. 5 – INDUSTRIAL TRACTOR

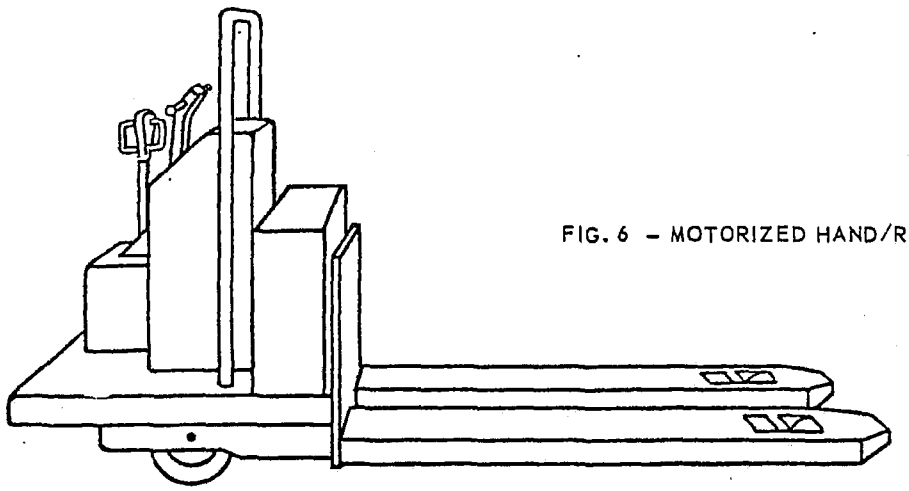


FIG. 6 – MOTORIZED HAND/RIDER TRUCK

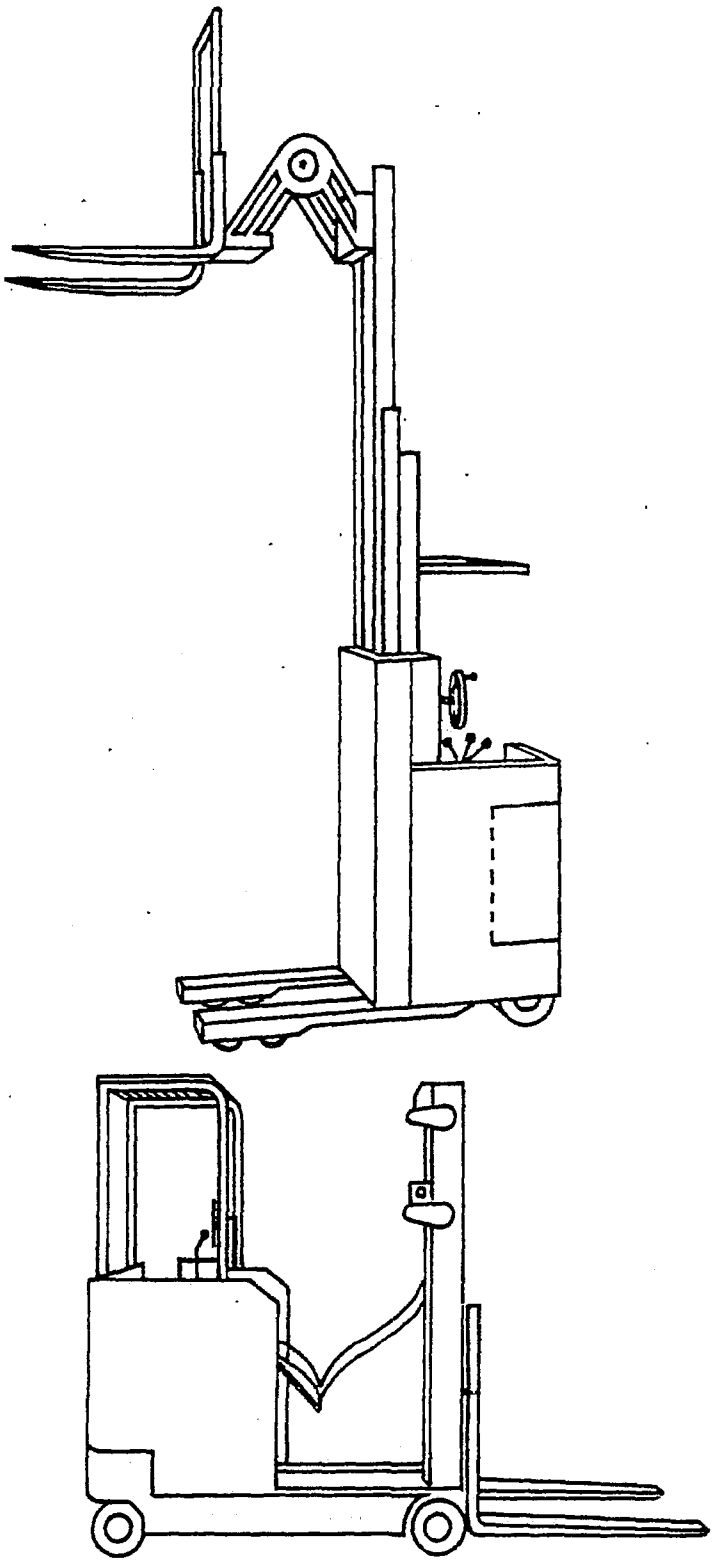


FIG. 7 – REACH TRUCK

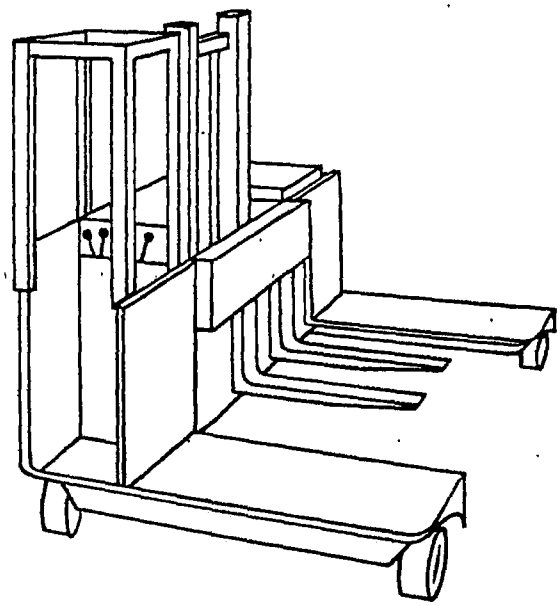


FIG. 8 – SIDE-LOADER TRUCK

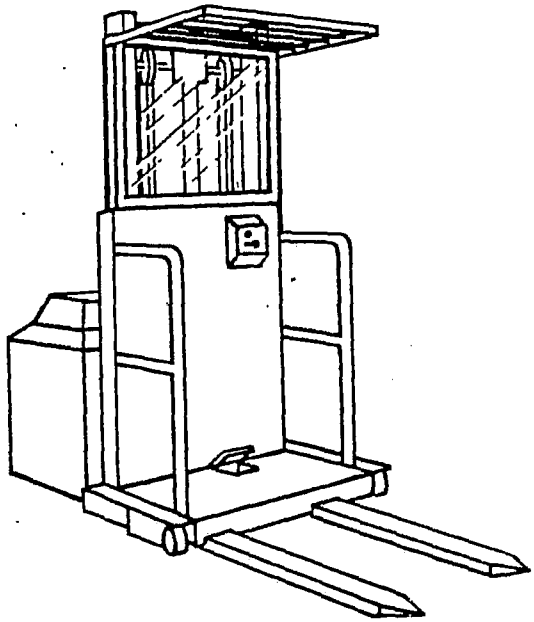


FIG. 9 – ORDER PICKER TRUCK, HIGH LIFT

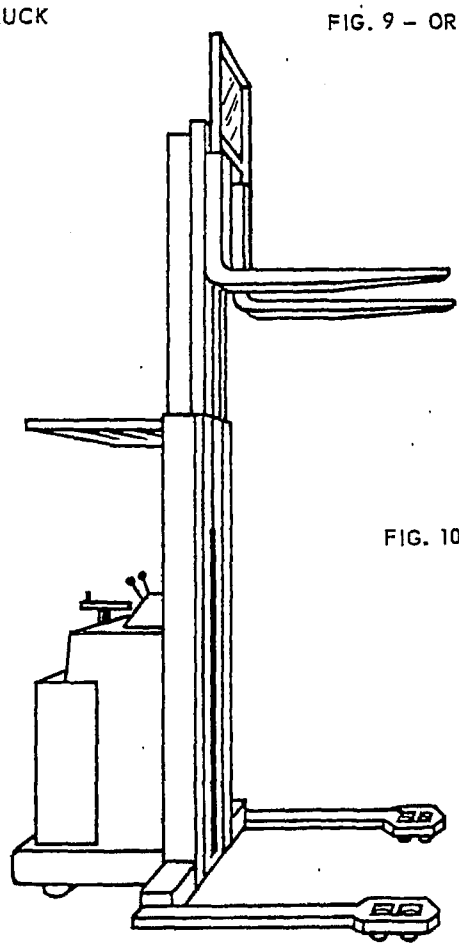


FIG. 10 – NARROW-AISLE TRUCK
– STRADDLE TRUCK