INTERNATIONAL STANDARD

ISO 13563-2

First edition
2001-03-01

Single side loading fork-lift trucks —

Part 2: Additional stability tests for trucks handling freight containers of 6 m length and above

Chariots élévateurs à fourche à chargement latéral sur un côté —

Partie 2: Essais de stabilité supplémentaires pour les chariots manutentionnant des conteneurs de fret de 6 m de long et plus

Reference number
ISO 13563-2:2001(E)

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Printed in Switzerland

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 13563 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13563-2 was prepared by Technical Committee ISO/TC 110, *Industrial trucks*, Subcommittee SC 2, *Safety of powered industrial trucks*. It is based on prEN 1551, annex E.

ISO 13563 consists of the following parts, under the general title *Single side loading fork-lift trucks*:

— *Part 1: Stability tests*

— *Part 2: Additional stability tests for trucks handling freight containers of 6 m length and above*

Single side loading fork-lift trucks —

Part 2:
Additional stability tests for trucks handling freight containers of 6 m length and above

1 Scope

This part of ISO 13563 specifies additional tests to verify the stability of single side loading fork-lift trucks when handling empty or laden freight containers of 6 m length and above.

This part of ISO 13563 specifies tests in addition to those specified in ISO 13563-1[1)].

The stability tests contained in this part of ISO 13563 ensure that single side loading fork-lift trucks handling freight containers have satisfactory stability when operating the truck stacking in conditions where wind speed, v, is up to 12,2 m/s (Beaufort Scale 6). Alternative ratings may be used in higher wind speeds with higher values for v in the equation in 3.4.3.

This part of ISO 13563 is not applicable to trucks when

a) they are handling suspended loads that may swing freely, or

b) they are handling a container with a mobile centre of gravity (see ISO 3874).

The tests in this part of ISO 13563 take into account the normal degree of eccentric loading of containers as defined in ISO 3874.

When handling empty refrigerated containers, as specified in ISO 1496-2, with integral refrigeration unit (reefers), account should be taken of the offset of the load.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 13563. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 13563 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1496-2:1996, *Series 1 freight containers — Specification and testing — Part 2: Thermal containers.*

ISO 3874:1997, *Series 1 freight containers — Handling and securing.*

ISO 5353:1995, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point.*

1) ISO 13563-1, *Single side loading fork-lift trucks — Part 1: Stability tests*.

3 Stability tests

3.1 Test requirements

The stability of trucks handling freight containers of 6 m and above shall be verified by one of the procedures specified in 3.2.

3.2 Verification procedure

3.2.1 Tilting platform

Use a test platform that can be tilted about one side. Place the truck being tested for stability on the initially horizontal test platform, in accordance with 3.3 then, successively, in each of the positions described in Table 1.

In each of the tests, slowly tilt the test platform to the slope specified in Table 1. The truck is considered stable if it passes all the tests without overturning.

For the purposes of these tests, overturning is defined as the test platform slope value that, if increased, would cause the truck to overturn.

It is permissible in lateral tests for one load wheel to lose contact with the test platform. It is acceptable for parts of the structure or designed features to make contact with the test platform.

3.2.2 Fixed slope

Use fixed slopes with inclinations equivalent to the specified test slope. The slope surface shall be smooth and capable of supporting the truck mass with no deformation that could affect the test results.

Drive the truck under test onto the fixed slopes with the mast lowered and positioned as specified in Table 1. For each of the truck positions, the load shall be elevated smoothly to the position specified in Table 1.

3.2.3 Calculation

Compliance with the specified stability values may be determined by calculation methods verified by empirical data.

The calculated capacities shall take into account any manufacturing variations and deflections of the mast, tyres, etc.

3.3 Test conditions

3.3.1 Prevailing wind

The tests shall not be performed in a prevailing wind that would significantly affect the test results.

3.3.2 Condition of the truck

The tests shall be carried out on an operational truck.

The operator on rider-controlled trucks shall be simulated by an object having a mass of 90 kg if the stability during a test is thereby decreased. For a truck designed for operation with a standing operator, an object having a mass of 90 kg shall be secured with its centre of gravity 1 000 mm above the floor of the operator's platform at the centre of the position normally occupied by the operator. For a truck designed for operation by a seated operator, the centre of gravity of the object shall be secured 150 mm above the seat index point (SIP) as determined in accordance with ISO 5353, with the seat at the closest position to the midpoint of the adjustments provided. Where the operator's position can be moved relative to the truck, it shall be located for each test in the position that minimizes the stability of the truck.

Fuel tanks of internal combustion engine trucks shall be full if the stability is thereby decreased. All other tanks shall be filled to their correct operating levels, as applicable.

Tyres shall be inflated to the pressure specified by the truck manufacturer. Where tyre ballast is incorporated in the truck design, the use of ballast shall be in accordance with the truck manufacturer's instructions.

3.3.3 Verification of verticality of the lift of the load-engaging means

Test 1 shall be conducted with the horizontal position of a load datum point (e.g. point E) unchanged when elevated from its lowered position (see Figure 3).

By means of a plumb line or other suitable equipment, set the mast vertical. Elevate the fork arms and specified test load to approximately 300 mm above the test platform. With the front face of the fork arm shank vertical, establish a point E (see Figure 1) on the fork arm, fork carrier or attachment with a fixed relationship to the centre of gravity, G, of the test load (see Figures 2 and 3). This point E shall be used to provide a reference datum, F, on the test platform (see Figure 1). When the mast is elevated, a new point F_1 on the test platform may occur (see Figure 2). By making the following adjustments this new point F_1 can be returned to the original location F (see Figure 3).

For trucks with tiltable masts, changes in the location of F_1 shall be corrected by varying the tilt of the mast within the limits provided by the design of the truck.

For trucks with fixed masts, adjustments in the fork arms or fork carrier tilt (where provided) may be used to correct for changes in location of point F_1 within the limits of tilt provided by the design of the truck.

Adjustments cannot be made on trucks having non-tiltable masts, fork arms or fork carrier.

3.3.4 Lift height for tests simulating stacking

For tests simulating stacking, the load shall be at the maximum height as determined by the manufacturer. The mast shall be vertical for test 1 and at maximum backward tilt for test 2.

3.3.5 Position of truck on platform

The truck shall be placed on the test platform or slope with the line MN parallel to the tilt axis, XY, of the test platform.

Tests shall be conducted on the side of the truck which is the less stable.

NOTE Points M and N are the centre point of the area of contact between the test platform surface and the load wheels or stabilizer pad nearest to the tilting axis, XY, of the test platform.

When the truck rating is related to the use of stabilizers, suspension locks, etc., these devices shall be used during tests. If the truck can be used without their engagement, an additional test shall be carried out in this condition.

3.4 Test load

3.4.1 General

The test load shall consist of a basic load corresponding to the weight of the freight container, and a load or force simulating the effect of the wind on the container.

3.4.2 Basic load

The basic test load shall be equivalent to an internationally standardized 2 590 mm high container, in either the laden or unladen condition, with a mass equivalent to the rated load Q, as specified by the manufacturer, acting through its centre of gravity, G (see Figures 4 and 5).

When using fork arms, the basic test load shall be positioned using the container fork pockets with one side of the load touching the front face of the fork arm shank (see Figure 4).

When using other handling means such as a top lift or side lift spreader, the position of the centre of gravity, G, shall be determined by the connection points to the test load, for example twist locks into the corner fittings (see Figure 5).

Where the load-handling means has positional adjustment capability lateral to the truck longitudinal centreline, the lateral adjustment shall be at its midpoint.

3.4.3 Wind force

For the tests, the critical wind force acting on the freight container shall be calculated by the following formula:

$$F = k\,h\,L\,v^2\,C_{f1}$$

where

F is the wind force, in newtons [N];

k is the constant for wind pressure, $k = 0{,}613 \left[\frac{N \cdot s^2}{m^4}\right]$

h is the freight container height, in metres, h = 2,59 m;

L is the freight container length, in metres [m];

v is the wind speed, in metres per second, v = 12,2 m/s (Beaufort Scale 6);

C_{f1} is the shape coefficient, C_{f1} = 1,3.

NOTE Reference sources (e.g. crane and building standards) confirm that a value of 1,3 for C_{f1} is appropriate for a wind acting normal to the longitudinal axis of freight containers.

The effect of this force can be simulated in the test by one of the following methods:

a) apply this force in the direction of lateral overturn acting horizontally through the centre of gravity of the test load; or

b) apply a vertical load, in addition to the test load, giving an equivalent moment to the wind force acting when the slope is at the required tilt angle as specified in Table 1.

3.5 Location of the truck on the test platform

The location of the truck on the test platform or slope shall be maintained during each test.

This may be achieved by application of parking or service brakes which can be secured in the “on” position, or by wedging the wheels against the truck frame, ensuring, however, that the articulation is not affected.

Blocks (chocks) with a maximum height not exceeding 0,1d (where d is the outside diameter of the wheel) may be used, if required, to maintain the initial position of the truck on the test platform. Blocks (chocks), if used, shall not artificially improve stability.

The coefficient of friction of the platform surface may be increased, if required, by an appropriate friction-increasing material.

3.6 Safety precautions

Precautions shall be taken to prevent the truck overturning or displacement of the load during the tests. If the truck is prevented from overturning by rope lashing or chain, this shall be sufficiently slack to impose no appreciable restriction on the truck until the overturning point is reached.

Displacement of the test load shall be prevented by means such as

a) firmly securing the test load to the load carrier or equivalent structure, or

b) suspending the test load near to the ground from an appropriate support placed on the fork arms so that the suspension point is at the point where the centre of gravity, G, of the test load would be if the test load were placed on the fork arms.

4 Schedule of tests

For all trucks, additional stability tests shall be carried out based on the standard wind speed or a higher wind speed than that stated in clause 1.

5 Marking

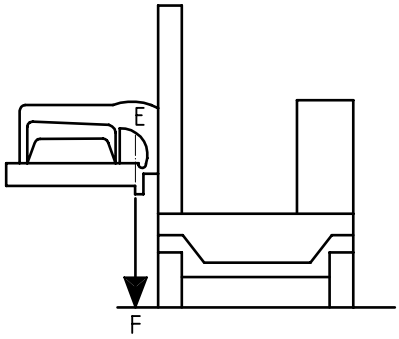
The additional capacity as determined by these stability tests shall be indicated on a capacity plate.

The plate shall specify the container handling attachment used for the tests.

The wind speed used for the calculations in 3.4.3 shall be indicated.

Table 1 — Summary of tests

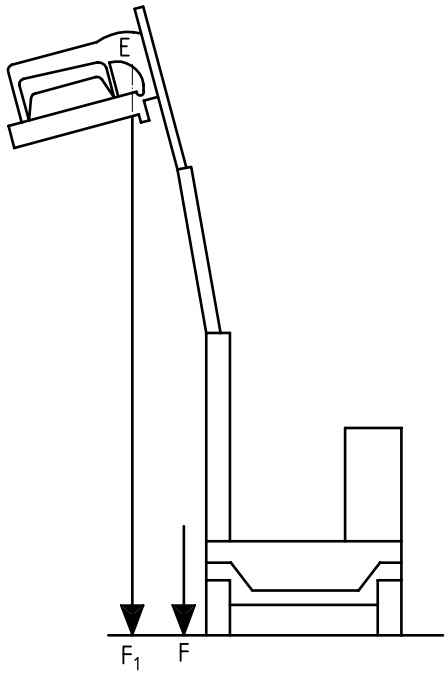
	Tests for lateral stability	
	Test 1	**Test 2**
Test of stability when	stacking	stacking
Test load	see 3.4	
Load centre distance	see 3.4	
Lifting height	as specified by the truck manufacturer	
Position of lifting group	moved forward	retracted
Tilt of mast or fork arms	vertical	maximum backwards
Position of test slope	Figures 6 and 9 or Figures 7 and 10	Figures 8 and 11
Test slope	3,5 %	6 %
XY is the test platform tilt axis. MN is the truck axis of original tilt.		



E is a point on the inside heel of the fork arm.

F is the reference datum on the test platform.

Figure 1

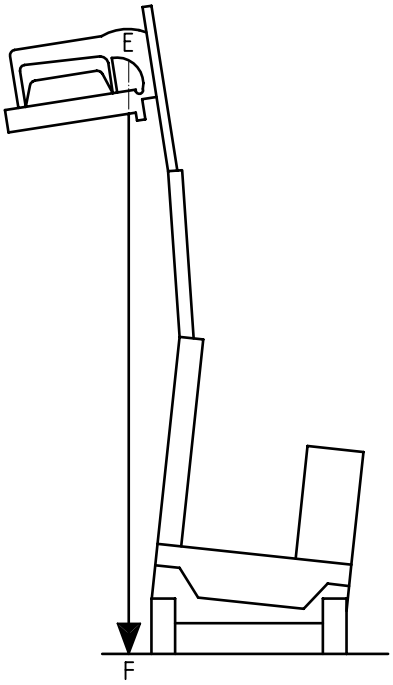


E is a point on the inside heel of the fork arm.

F is the reference datum on the test platform.

F_1 is a new point on the test platform.

Figure 2

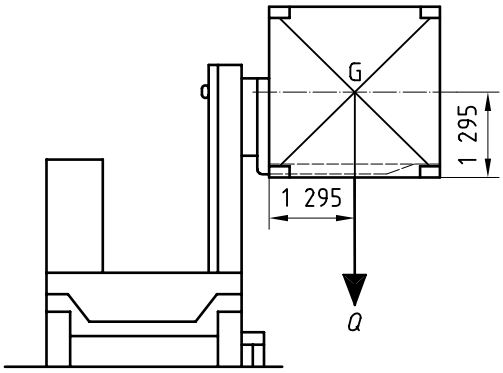


E is a point on the inside heel of the fork arm.

F is the reference datum on the test platform.

Figure 3

Dimensions in millimetres

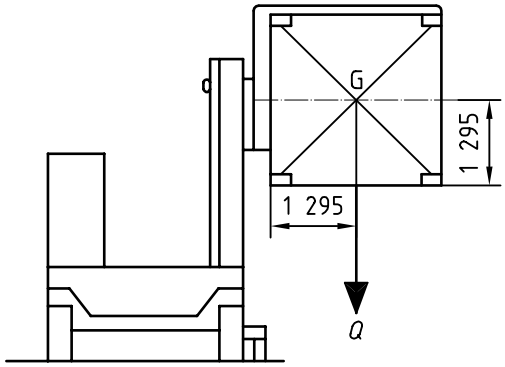


G is the centre of gravity of the test load.

Q is the rated load.

Figure 4

Dimensions in millimetres



G is the centre of gravity of the test load.

Q is the rated load.

Figure 5

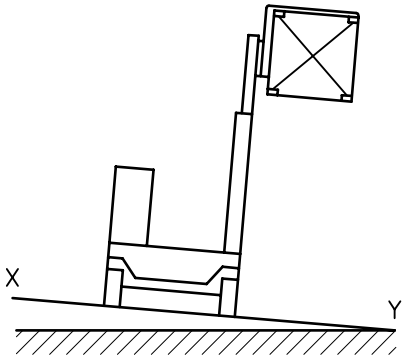


Figure 6

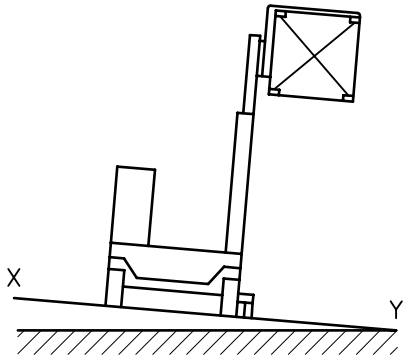


Figure 7

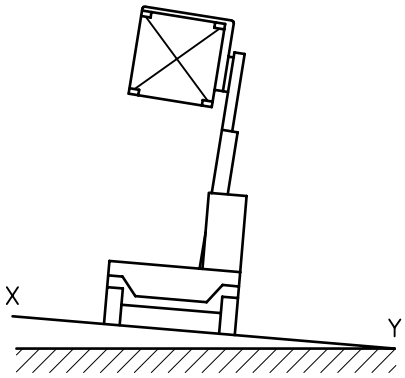


Figure 8

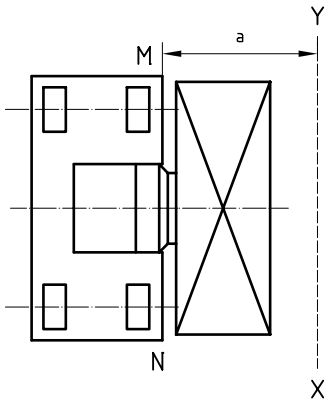


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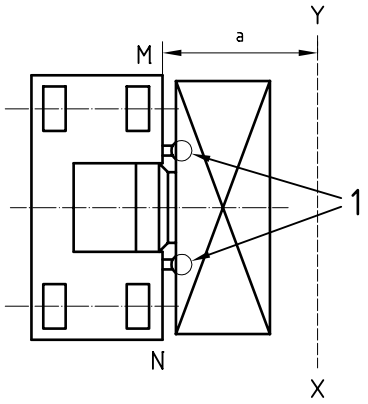
Figure 9



Key

1 Stabilizers

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Figure 10

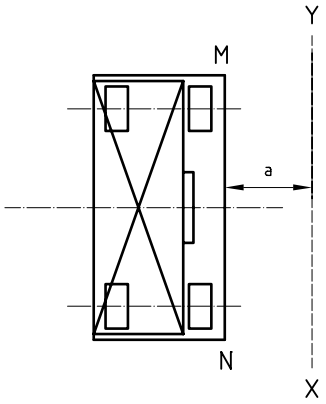

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Figure 11

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