INTERNATIONAL STANDARD **ISO** 5766

Pallet stackers and high lift platform trucks — Stability tests

Chariots à fourche recouvrante et chariots à plate-forme à grande levée — Essais de stabilité

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation
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International Standards is carried out through ISO technical committees. Every
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governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated
to the member bodies for approval before their acceptance as International
Standards by the ISO Council.

International Standard ISO 5766 was developed by Technical Committee
ISO/TC 110, *Industrial trucks*, and was circulated to the member bodies in
July 1977.

It has been approved by the member bodies of the following countries :

Austria	India	South Africa, Rep. of
Belgium	Italy	Spain
Bulgaria	Japan	Sweden
Chile	Korea, Rep. of	Switzerland
Czechoslovakia	Mexico	United Kingdom
Denmark	Netherlands	U.S.A.
Finland	New Zealand	U.S.S.R.
France	Poland	Yugoslavia
Germany, F. R.	Romania	

The member body of the following country expressed disapproval of the document
on technical grounds :

Australia

Pallet stackers and high lift platform trucks — Stability tests

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies tests for verification of the stability of pedestrian and rider controlled pallet stackers and high lift platform trucks of rated capacity up to and including 5 000 kg (10 000 lb), with tilting or non-tilting masts.

2 CONDITIONS OF VALIDITY

2.1 Normal operating conditions

The tests specified in this International Standard ensure that the type of truck under consideration has satisfactory stability for operation under general operating conditions :

a) operating on substantially level surfaces,

b) travelling with the load in the lowered position,

c) stacking with the mast substantially vertical.

2.2 Other conditions

When the operating conditions differ from the conditions defined in 2.1, it is necessary to use either

a) a truck with a higher rated capacity, or

b) a truck having design modifications which are agreed upon between the interested parties, or

c) a truck complying with any existing International Standard(s) covering the different conditions (for example ISO 5767, when forward tilt is required during stacking with full load at full elevation.)

2.3 Complementary tests

In the case where tests other than the six tests as specified would be necessary, the details should be agreed between the interested parties.

3 STABILITY TESTS FOR PEDESTRIAN AND RIDER CONTROLLED PALLET STACKERS AND HIGH LIFT PLATFORM TRUCKS

3.1 Specification of tests

The stability of these trucks shall be verified by means of the tests described below, using a test platform which can be tilted about one side.

The tests shall be carried out on an operational truck but without the operator.

For rider controlled trucks, the operator shall be represented by an object of corresponding mass, if the stability during a test is thereby decreased. For this purpose a unit mass of 90 kg (200 lb) shall be provided, and it shall be secured and centred 250 mm (10 in) above the operator's seat on sit-on trucks, and 1 000 mm (40 in) above the foot plate on stand-on trucks.

A truck being tested for stability is placed on the test platform, which is initially horizontal, in the conditions specified in 3.2, and, successively, in each of the positions described in the table of tests.

In each of these tests, the test platform shall be tilted slowly to the slope indicated in the table. The truck is considered stable if it passes all tests without overturning.

In the case of tests Nos. 3 and 4, it is permissible for one wheel to rise from the test platform and for the outer edges of the truck to come into contact with the test platform, provided that the truck does not overturn under the prescribed test platform inclination.

3.2 Conditions for carrying out the tests

3.2.1 *Position of truck on test platform*

For tests Nos. 1 and 2, the truck shall be placed on the test platform with the drive (steer) axle and the axle of the outrigger wheels parallel to the tilt axis, XY, of the test platform, the side nearest this axis being the one of the mast (see figures 4 and 5).

For tests Nos. 3 and 4, the truck shall be placed on the test platform with line MN parallel to the tilt axis, XY, of the test platform (see figures 8 to 13 inclusive).

In the case of figure 10, the steerable wheel nearest to the tilt axis shall be parallel with it. Positions of steerable wheels on other designs are shown in figures 8, 9, 11, 12 and 13.

Point N is the centre point of the area of contact between the test platform surface and the outrigger wheel nearest to the tilt axis XY (figures 8 to 13 inclusive).

Point M is defined as follows :

a) For trucks with articulating steering axle (figure 10) or pivoting single point support steering (figure 12), M is the vertical projection on the test platform of the point of intersection between the centre line AB of the truck and the centre line of the axle.

b) Figures 8, 9, 11 and 13 indicate positions for trucks of other designs.

For tests Nos. 5 and 6, the truck shall be placed on the test platform with the drive (steer) axle and the axle of the outrigger wheels parallel to the tilt axis, XY, of the test platform, the side nearest this axis being the one opposite to the mast (see figures 16 and 17).

3.2.2 Test load

The test load shall be such that it simulates an unrestrained homogeneous cube the mass of which is equal to the maximum load Q and the dimensions of which are equal to twice the rated load centre distance D, the values of Q and D corresponding to the manufacturer's rated capacity of the truck (see figure 1).
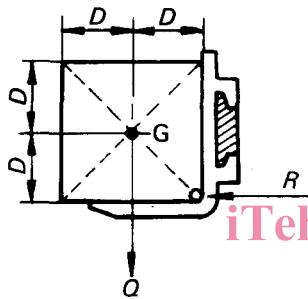
FIGURE 1

For trucks having a lift height greater than 2,5 m (100 in) or 3,3 m (130 in), the test load shall be equal to the load that the truck is able to carry in the stability conditions set out in the following table of tests.

The distance D for the respective tests is found in the table of tests.

The centre of gravity G of the test load (see figure 1) shall be located in the vertical plane of symmetry AB of the truck (see figures 4, 5, 16 and 17).

3.2.3 Location of truck on the test platform

It is essential that the initial position of the truck on the test platform be maintained during testing.

This may be achieved by application of hand or service brakes, which can be secured in the "on" position, or by wedging the wheels against the truck frame.

The use of chocks or blocks between the wheels and the test platform is allowed, if their height does not exceed the values indicated in the following table :

Wheel diameter d mm	Maximum height of chocks or blocks
up to 250	25 mm
250 to 500	0,1 d
over 500	50 mm

3.2.4 Verification of the vertical position of the mast

Before proceeding with test No. 1, the vertical position of the mast shall be verified by means of a plumb-line.

The projection on the horizontal test platform of the reference point R (inner corner of the fork arm, see figure 1), shall be the same for the lift height depending on the test load as for the lift height with lowered fork arms (i.e. in transporting position).

Deviations caused by deflections shall be corrected by varying the tilt of the mast or fork arm, within the limits imposed by the design of the truck.

NOTE — These conditions do not apply to trucks where the design does not allow such corrections.

3.2.5 Height of truck platform or fork arms

Tests Nos. 2, 4 and 6 (travelling) shall be carried out with the upper face of the load platform or fork arms 300 mm (12 in) above the ground, or at the minimum height for transporting the load, whichever is the greater.
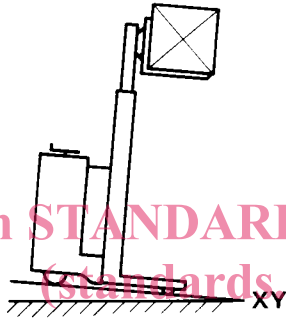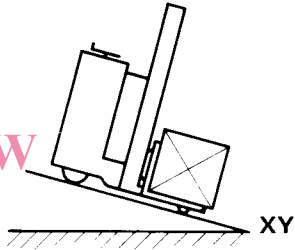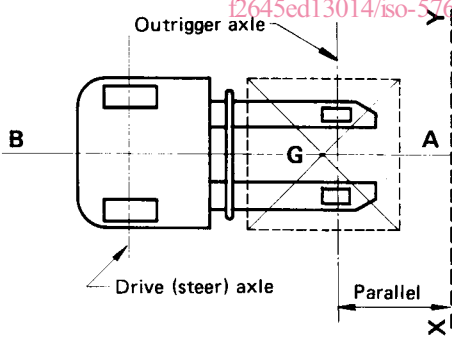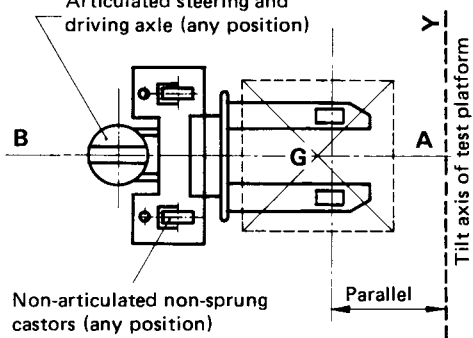
4 STABILITY TESTS FOR TRUCKS WITH OTHER ATTACHMENTS

Pallet stackers and high lift platform trucks fitted with attachments other than fork arms or platforms shall be subjected to the same stability tests, except in cases where the attachment can bring the centre of gravity of the load out of the plane of symmetry AB of the truck.

The test load, however, shall be the specified load at the specified distance indicated for the attachment when used on the truck being tested.
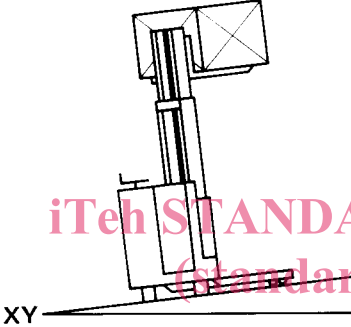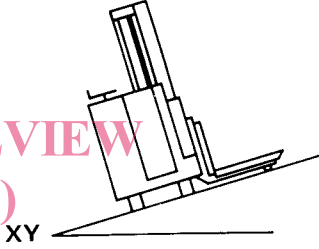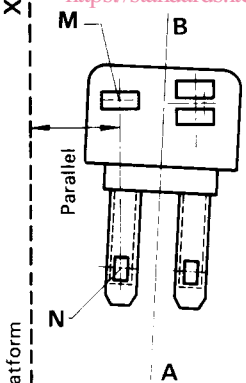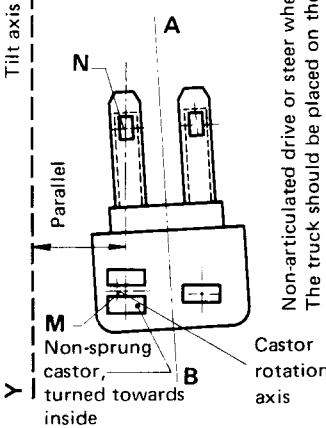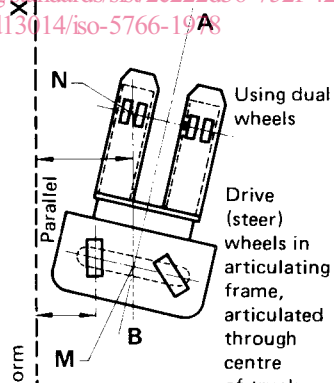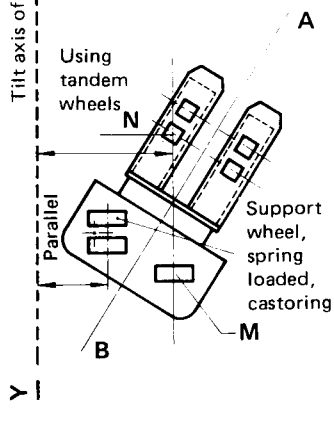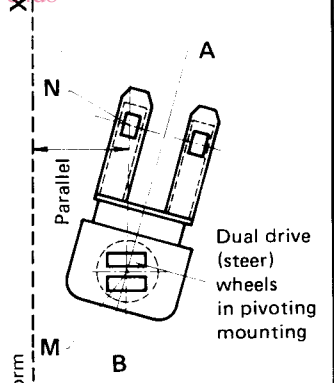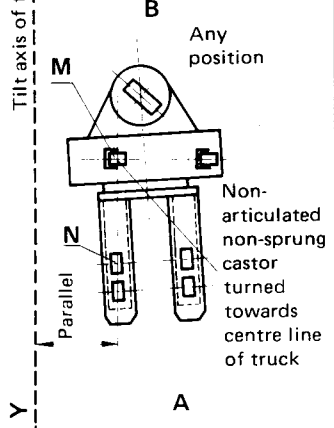
The lift height for tests Nos. 2, 4 and 6 shall be measured between the tilting platform or the upper part of the outriggers and the underside of the load or attachment, whichever is the smaller.
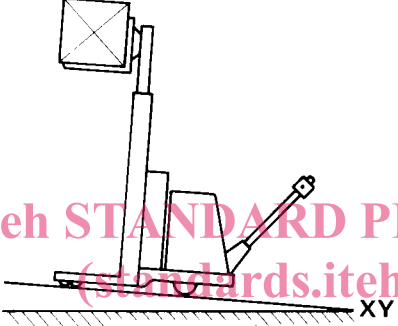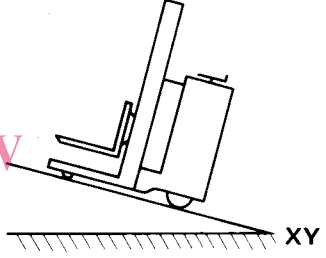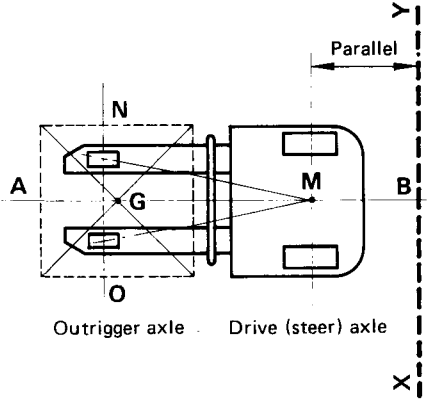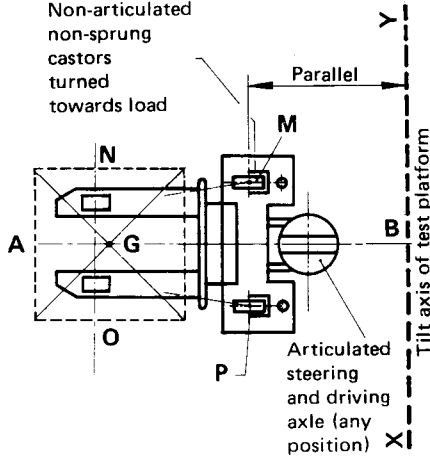
TABLE OF TESTS

Test No.	1	2 (see note 2)
Stability	Longitudinal	
Operation	Stacking	Travelling
Load	Test load	Test load
Centre of gravity distance	*D*	*D*
Lift height	Maximum	Lowered (see 3.2.5)
Platform slope	4 %	18 %
Tilt of forks or mast	Vertical (see 3.2.4)	Maximum backward tilt

Position of the truck on the tilting platform (see 3.2.1)	FIGURE 2
	  FIGURE 4
		FIGURE 3
		  FIGURE 5

NOTES

1 If the truck is equipped with a device which automatically limits the travel speed when the fork arms are elevated, this reduced speed shall be used when determining the tilt of the test platform in the formula of figure 18.

2 In tests Nos. 2, 4 and 6, when the outrigger legs can be raised relative to the ground, the test shall be carried out with the outriggers in the raised position.

3 The positioning of vehicles on the test platform for lateral tests depends on the type of truck to be tested (see figures 8 to 13). The true tip line between points M and N must be parallel to tilt axis XY of the test platform, test being conducted towards the side on which truck is least stable.

4 Nominal distance *D* or 400 mm (16 in) if this latter distance corresponds to minimum stability and if the truck has been designed for this distance.

If the truck is designed only for distance *D* this shall be mentioned on the load plate.

5 When the truck is equipped with tilting mast or tilting forks they shall be so positioned that the truck is in the condition of least stability.

Test No.	3 (see note 3)	4 (see notes 2 and 3)
Stability	Lateral	
Operation	Stacking	Travelling
Load	Test load	Unladen
Centre of gravity distance	D or 400 mm (16 in) (see note 4)	—
Lift height	Maximum	Lowered (see 3.2.5)
Platform slope	See figure 18 See note 1	See figure 19
Tilt of forks or mast	See note 5	See note 5

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XY ————— FIGURE 6

XY ————— FIGURE 7

Position of the truck on the tilting platform (see 3.2.1)

Tilt axis of test platform

X

Parallel

M B

N

A

FIGURE 8

Non-articulated drive or steer wheels, fitted to the frame.
The truck should be placed on the platform in the position of least stability

A

N

Parallel

M

Non-sprung castor, turned towards inside

B

Castor rotation axis

FIGURE 9

Y

Tilt axis of test platform

X

N

Using dual wheels

Parallel

M B

Drive (steer) wheels in articulating frame, articulated through centre of truck

FIGURE 10

Using tandem wheels

A

N

Parallel

B M

Support wheel, spring loaded, castoring

FIGURE 11

Y

Tilt axis of test platform

X

N

A

Parallel

M B

Dual drive (steer) wheels in pivoting mounting

FIGURE 12

B

M

Any position

N

Parallel

Non-articulated non-sprung castor turned towards centre line of truck

A

FIGURE 13

Y

Test No.	5	6 (see note 2)
Stability	Longitudinal rearward	
Operation	Stacking	Travelling
Load	Test load	Unladen
Centre of gravity distance	*D* or 400 mm (16 in) (sse note 4)	—
Lift height	Maximum	Lowered (see 3.2.5)
Platform slope	10 %	See figure 20
Tilt of forks or mast	See note 5	See note 5
Position of the truck on the tilting platform (see 3.2.1)		

FIGURE 14

FIGURE 15

Every safety precaution shall be taken when tilting toward the drivers side during stability tests. To prevent any danger of overturning at the tilting limit, right of axis MN or left of axis MO, the articulation of the drive (steer) axle may be locked on trucks with centre-articulated axle.

FIGURE 16

FIGURE 17

FIGURE 18 — Test No. 3

Metric system

$(2 + 0.3\, v_Q)$ %
min. : 3,5 %
max. : 6 %

v_Q = maximum speed of truck, in kilometres per hour, on level ground laden with rated load Q.

Inch system

$(2 + 0.48\, v'_Q)$ %
v'_Q = maximum speed of truck, in miles per hour, on level ground laden with rated load Q.

FIGURE 19 — Test No. 4

Metric system

$(15 + 1.1\, v)$ %
max. 26%

v = maximum speed of truck, in kilometres per hour, unladen, on level ground.

Inch system

$(15 + 1.75\, v')$ %

v' = maximum speed of truck, in miles per hour, unladen, on level ground.

6
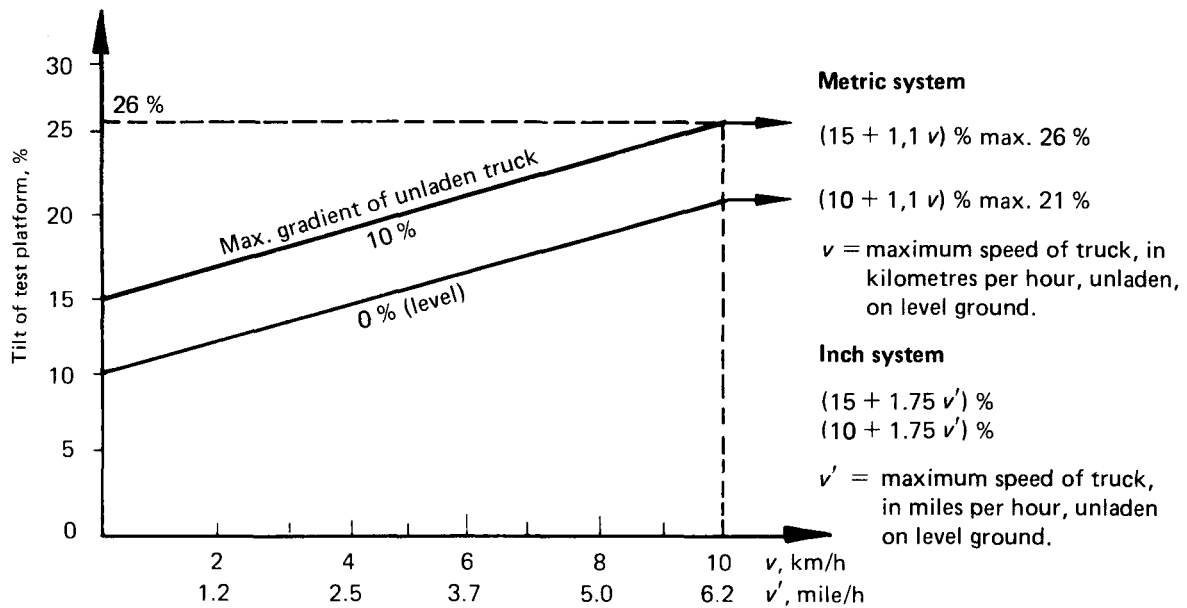
FIGURE 20 – **Test No. 6**

NOTE — **Test No. 6** : Calculation of required tilt for intermediate gradients — Minimum platform tilt formula.

Metric system

For v = 0 to 10 km/h, $\alpha = 10 + 0,5\,i + 1,1\,v$ } max. 26%
For v > 10 km/h, $\alpha = 21 + 0,5\,i$

Inch system

For v' = 0 to 6.2 mile/h, $\alpha = 10 + 0.5\,i + 1.75\,v'$ } max. 26 %
For v' > 6.2 mile/h, $\alpha = 21 + 0.5\,i$

where

α is the required test platform tilt expressed as a percentage (%) (maximum 26 %);

i is the maximum gradient of unladen truck (maximum 10 %);

v or v' is the maximum speed of an unladen truck on level ground (v max. = 10 km/h; v' max. = 6.2 mile/h).