

Australian Standard[®]

Powered industrial trucks

Part 17: Stability tests for rough terrain trucks (ISO 8379:1998, MOD)



This Australian Standard® was prepared by Committee ME-026, Industrial Trucks. It was approved on behalf of the Council of Standards Australia on 5 May 2008. This Standard was published on 25 June 2008.

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- Australian Chamber of Commerce and Industry
 - Australian Council of Trade Unions
 - Australian Electrical and Electronic Manufacturers Association
 - Australian Industrial Truck Association
 - Australian Industry Group
 - Australian Retailers Association
 - Construction and Mining Equipment Association of Australia
 - Department of Consumer & Employment Protection, WorkSafe Division, WA
 - Department of Defence (Australia)
 - Hire and Rental Industry Association of Australia
 - Safety Institute of Australia
 - Victorian WorkCover Authority
 - WorkCover New South Wales
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PREFACE

This Standard was prepared by the Standards Australia Committee ME-026, Industrial Trucks.

This Standard has been adopted with national modifications and has been reproduced from ISO 8379:1998, *Rough terrain—Stability tests* and Amendment 1:2001. The changes made by Amendment 1 have been incorporated into Appendix ZZ.

Additional requirements for Australia are given in Appendix ZZ.

This Standard is Part 17 of AS 2359, *Powered industrial trucks* which is published in part as follows:

- Part 1: General requirements
- Part 2: Operation
- Part 3: Counterbalanced fork-lift trucks—Stability tests
- Part 4: Reach and straddle fork-lift trucks—Stability tests
- Part 5: Symbols for operator controls and other displays
- Part 6: Safety Code
- Part 7: Terminology
- Part 8: Pallet stackers and high-lift platform trucks—Stability tests
- Part 9: Overhead guards—Specification and testing
- Part 10: Hook-on type fork arms—Vocabulary
- Part 11: Hook-on type fork arms and fork carriers—Mounting dimensions
- Part 12: Hazardous areas
- Part 13: Brake performance and component strength
- Part 14: Fork arms—Technical characteristics and testing
- Part 15: Fork arm extension and telescopic fork arms—Technical characteristics and strength requirements
- Part 16: Safety signs and hazard pictorials—General principles
- Part 17: Stability test for rough terrain trucks (this Standard)
- Part 18: Stability tests for industrial variable-reach trucks
- Part 19: Additional stability tests for industrial variable-reach trucks handling freight containers of length 6 m above

As this Standard is reproduced from an International Standard, the following applies:

- (a) *Terminology* The words ‘this Australian Standard’ should replace the words ‘this International Standard’ whenever they appear.
- (b) *Decimal comma* The decimal point should replace the decimal comma wherever it appears.

None of the normative references in the source document has been adopted as an Australian or Australian/New Zealand Standard.

AUSTRALIAN STANDARD

Powered industrial trucks

Part 17:

Stability tests for rough terrain trucks (ISO 8379:1998, MOD)

1 Scope

This International Standard specifies the basic tests to verify the stability of rough terrain lift trucks and rough terrain variable reach trucks.

It is applicable to the above trucks:

- with a seated operator;
- fitted with fork arms or attachments;
- with fixed or articulated chassis;
- which may have stabilizers, axle-locking or frame-levelling devices;
- with two- or four-wheel or articulated steering systems;
- with masts with or without tilt mechanisms;
- with non-slewing booms or having slewing movement not greater than 5° either side of the longitudinal centre-plane.

This International Standard is not applicable to trucks when handling suspended loads which may swing freely.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standard listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

ISO 5767:1992, *Industrial trucks operating in special conditions of stacking with mast tilted forward — Additional stability test*

ISO 10658:1996, *Industrial trucks operating in special conditions of stacking with load offset by powered devices — Additional stability test*

3 Purpose of tests

3.1 Normal operating conditions

The basic tests specified in this International Standard ensure that a rough terrain truck demonstrates satisfactory stability when reasonably and appropriately used under normal conditions, i.e.:

- a) masted trucks, stacking with the mast approximately vertical and the fork arms reasonably horizontal, on substantially firm, smooth, level and prepared surfaces;
- b) variable reach trucks, stacking with a combination of boom elevation/extension and the fork arms reasonably horizontal, on substantially firm, smooth, level and prepared surfaces;
- c) travelling with the mast or fork arms tilted rearwards and the load in the lowered (travelling) position on unimproved natural terrain and disturbed terrain areas; where applicable, any reaching/telescopic mechanism is to be fully retracted;
- d) operating with the load centre of gravity approximately on the longitudinal centre plane of the truck.
- e) masted trucks, manoeuvring an elevated load with the mast neither tilted rearwards more than 10° nor the centre of gravity of the load displaced rearwards more than 600 mm;
- f) variable reach trucks, manoeuvring an elevated load with the fork arms tilted rearwards.

3.2 Operating conditions — Other than normal

When the operating conditions differ from those stated in 3.1 use either:

- a) a truck complying with other International Standard(s) covering the different conditions (e.g. ISO 5767), or
- b) a truck whose stability performance is agreed upon between the interested parties. This performance shall not be less than that required by the test specified for normal operating conditions in 3.1.

4 Stability tests

4.1 Specification of tests

The stability of rough terrain trucks shall be verified by means of one of the procedures described in 4.2. The tilting platform test shall be used to verify stability in the event of a dispute.

4.2 Verification procedure

4.2.1 Tilting platform

A test platform which can be tilted about one side shall be used. The truck under test shall be placed on the platform, which is initially in the horizontal plane, sequentially in the positions described in table 1.

For each of the truck positions, the platform shall be tilted slowly and smoothly to the slope indicated 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 which, if increased, would cause overturning of the truck.

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

The momentum gained by a truck adopting a change in attitude is additive to that produced by the tilting platform and overturning of the truck caused by the added momentum is to be taken as evidence of instability at that slope angle.

4.2.2 Fixed slope

Fixed slopes, with inclinations equivalent to the prescribed test slopes, shall be used. The slope surface shall be smooth and capable of supporting the truck mass with no deformation likely to affect the test results.

The truck under test shall be driven onto the fixed slopes and positioned according to table 1. For each of the truck positions, the load shall be elevated slowly and smoothly to the height indicated in table 1.

4.2.3 Calculation

Calculation may be used to predict stability. Such calculations shall take into account structural and tyre deflections. Calculation methods shall be confirmed by test data.

Calculations are typically used to predict payloads for alternative attachments and/or alternative tyre options.

Calculations shall not be used to type test new models of trucks.

4.3 Test conditions

4.3.1 Condition of the truck

The tests shall be carried out on an operational truck.

The operator shall be represented by an object having a mass of 90 kg if the stability during a test is thereby decreased. 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 mid-point of the adjustments provided.

Fuel tanks of engined trucks shall be full if stability is thereby reduced; all other tanks shall be filled to their correct operating levels.

Tyres shall be inflated to their correct 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.

4.3.2 Position of the truck on the platform

For tests 1 and 2 (see table 1), the truck shall be placed on the test platform so that the load axle is parallel to the tilt axis, XY, of the test platform [see figures 1c), 2d) and 2e)].

Stabilizers or axle locking may only be used for tests 1 and 3.

For tests 3, 4 and 5 (see table 1), the truck shall be positioned on the test platform in a turning position with line MN parallel to the tilt axis, XY, of the test platform [see figures 2c) to 2f)].

Trucks positioned as shown in figure 2c), d), f) and g) shall have the steer wheel nearest to the tilt axis parallel with the tilt axis.

Lateral stability tests shall be conducted to the side of the truck which is the least stable.

Point N is the centre point of the area of contact between the test platform surface and the front wheel or the stabilizer contact pad nearest the tilting axis [see figures 2c) to 2g)].

Point M is defined as follows:

- a) for trucks having an oscillating steering axle: the projection onto the test platform of the intersection of the longitudinal centre-plane AB of the truck with the axis of this axle [see figures 2c), 2d) and 2f)];
- b) for trucks with articulated chassis: the projection onto the test platform of the intersection of the longitudinal centre plane EF of rear chassis module and the axis of the rear axle when fully articulated [see figure 2e)];
- c) for trucks with axle locking: the centre point of the area of contact between the test platform and the rear wheel nearest the tilting axis [see figure 2g)].

4.3.3 Test load

The test load shall be a mass equivalent to the maximum load Q , as indicated on the information plate of the truck, which the truck can elevate to its maximum lift height acting through the centre of gravity, G , nominally positioned at the standard load centre distance, D , both horizontally from the front face of the fork arm shank and vertically from the upper face of the fork arm blade (see figure 3 and table 2).

When additional lift heights, loads, and load centre distances are to be indicated on the information plate, the truck shall meet the requirements established by the tests specified in this International Standard for these additional ratings.

The centre of gravity, G , of the test load (see figure 3) shall be located in the longitudinal centre plane, AB, of the truck [see figures 1c), 1d) and 1e), 2c) to 2g), and 6c) and 6d)].

4.3.4 Location of the truck on the platform

The truck shall be positioned in accordance with table of tests, see table 1.

The initial position of the truck on the test platform shall be maintained during each test. This may be achieved by application of the parking or service brakes, which may be secured in the 'on' position, or by wedging the wheels against the truck frame, ensuring however that articulation is not affected.

Blocks (chocks) having a maximum height not exceeding the value indicated in table 3 may be used, if necessary, to maintain the initial position of the truck on the test platform. Blocks (chocks), if used, shall not artificially improve stability.

Stabilizers or axle locking may only be used for tests 1 and 3.

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