

BUREAU OF INDIAN STANDARDS

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*भारतीय मानक मसौदा*

**10 000 किलोग्राम से 50 000 किलोग्राम तक क्षमता के साथ फोर्कलिफ्ट ट्रकों के लिए सामान्य  
आवश्यकताएं और स्वीकृति मानदंड  
(पहला पुनरीक्षण)**

*Draft Indian Standard*

**GENERAL REQUIREMENTS AND ACCEPTANCE CRITERIA FOR  
FORKLIFT TRUCKS WITH CAPACITY FROM 10 000 kg TO 50 000 kg  
(First Revision)**

ICS: 53.060

Transport Tractors, Trailers and Industrial Trucks Sectional Committee, TED 22

## FOREWORD

*(Formal clause to be added later)*

Heavy capacity forklift trucks are generally used for handling freight containers and this standard is prepared keeping in view the heavy traffic of containers in our country. Standardization of such forklift trucks would ensure safe and correct interchangeability of heavy materials

In the preparation of this standard, the considerable assistance has been, derived from FEM Section IV Industrial trucks ‘Safety code for powered industrial trucks’, issued by Federation Europeenne de la Manutention (FEM)

In this first revision following changes have been incorporated:

- a) References, ICS No. have been updated; and
- b) Other editorial changes have been done to bring the standard in the latest style and format of Indian Standards

The composition of the Committee responsible for the formulation of this standard is given at Annex A **(Will be added later)**.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off it shall be done in accordance with IS 2: 2022 ‘Rules for rounding off numerical values (*second revision*)’.

*Draft Indian Standard*

**GENERAL REQUIREMENTS AND ACCEPTANCE CRITERIA FOR FORKLIFT  
TRUCKS WITH CAPACITY FROM 10 000 kg TO 50000 kg**  
(*First Revision*)

**1 SCOPE**

This standard covers the general requirements and tests for verification of stability of forklift trucks with capacity varying from 10 000 kg to 50 000 kg.

**2 REFERENCE**

The standards given below contain provisions which, through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

<i>IS No</i>	<i>Title</i>
IS 7570: 1975	Glossary of terms relating to fork arms and attachments of fork lift trucks
IS 6876: 2019	Fork - Lift trucks - Fork arms - Technical characteristics and testing (Second Revision)
IS 3703 : 2004	Recommended practice for magnetic particle flaw detection (Third Revision)
IS 3664: 1981	Code of practice for ultrasonic pulse echo testing by contact and immersion methods (first revision)
IS 14770 : 1999	Industrial trucks - Inspection and repair of fork arms in service on fork - Lift trucks
IS 7496 : 1974	Specification for direction of travel - Controls for industrial tractors and powered industrial trucks
IS 7553: 2003	Control symbols for powered industrial trucks - Specification (First Revision)
IS 6305 (Part 2): 1980	Safety code for powered industrial trucks: Part 2 manufacture
IS 9701: 2019	Powered industrial trucks and tractors - Brake performance and component strength (Second Revision)
IS 10517: 2019	Acceptance criteria for fork - Lift trucks (First Revision)

### 3 TERMINOLOGY

**3.1** For the purpose of this standard, the terms and definitions given in IS 7570 along with the following shall apply.

**3.2** The rated capacity of a forklift truck is the load, permitted by the manufacturer, that the truck type is capable of transporting or lifting in normal operation under specific conditions.

**3.3** The actual capacity of a forklift truck is the maximum load in kg (depending upon its elevating height and/or attachment), permitted by the manufacturer (usually by stability testing), that the subject truck is capable of transporting or lifting in normal operation under specific conditions.

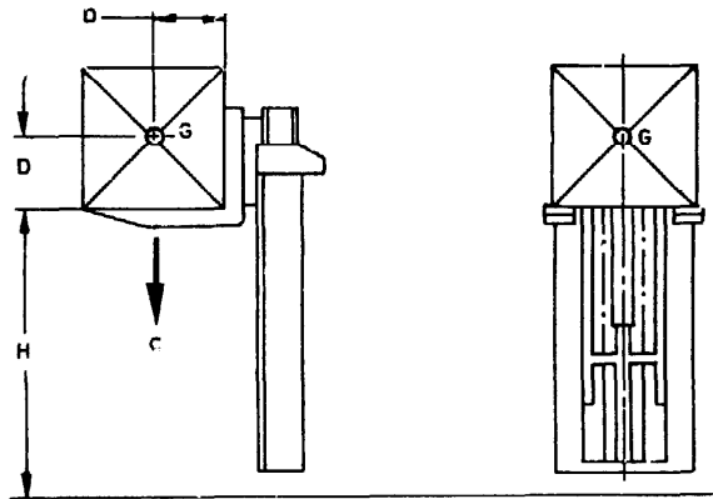
### 4 DESIGN AND CONSTRUCTION

#### 4.1 Rated Capacity

**4.1.1** The manufacturer's rated capacity of a truck facilitates the comparison of manufacturer's basic models and is related to a standardized lift height. It shall correspond to the maximum load,  $C$ , which it is designed to carry and stock on fork arms or platform, with a vertical double mast, the maximum lift height of which is equal to the standard lift height,  $H$ , as specified in **4.1.2** and with a load centre distance,  $D$ , as specified in **4.1.3** measured horizontally and vertically between the centre of gravity of the load and:

- a) The front face of the fork shank or equivalent dimensions in the case of trucks fitted with a platform;
- b) The upper face of the fork shank or equivalent dimensions in the case of trucks fitted with a platform (*see* Fig. 1).

NOTE — Even if the truck does not utilize a double mast or does not lift to the standard lift height,  $H$ , it shall still be given a rated capacity as if the mast was available.



$D$  = Standard load centre distance;  
 $G$  = Centre of gravity, positioned in the longitudinal plane of symmetry between the mast uprights;  
 $H$  = Standard lift height; and  
 $C$  = Load.

FIG. 1 Position of Centre of Loads for Counterbalanced Forklift Trucks

#### 4.1.2 Life Height

The lift height shall be fixed as mutually agreed between the manufacturer and the purchaser.

#### 4.1.3 Standardized Load Centre Distance

The standardized load centre distance,  $D$ , used for rating shall be as follows:

Rated Load, $C$ kg		Standardized Distance, $D$ mm		
From (included)	To (excluded)	600	900	1200
10000	16000	×	+	+
16000	20000	+	×	+
20000	25000	–	+	×
25000	50000 (included)	–	–	×

**4.1.3.1** The standard load centre distances are designated by ‘×’. Load centre distances designated by ‘+’ are optional.

**4.1.3.2** It is permissible to rate trucks for special applications with load centre distances related to the application.

#### 4.2 Actual Capacity

**4.2.1** The actual capacity of a truck is derived from the appropriate stability tests and shall vary with different types and heights of mast fitted and different load centre distances (*see 4.1.3*) used in the rating. The rating shall be determined with fork arms or platform provided by the manufacturer. Additional actual capacity ratings with removable attachments may also be established where permitted by the appropriate stability specification.

**4.2.2** The forklift trucks (travelling with the load at normal travelling height and stacking) handling freight containers shall have satisfactory stability when reasonably and appropriately used in conditions where the wind speed is up to 45 km/h (Beaufort Scale Force 6).

### **4.3 Lifting and Tilting Mechanism**

#### **4.3.1 Chains**

Only leaf and roller mechanism chains shall be used. When the lifting mechanism includes a chain or chains, the truck manufacturer shall select chain, which in relation to the minimum breaking load certified by the manufacturer of the chain, shall provide a factor, *K* (as given by the following formula) in relation to the static load that would exist in a single chain or in equally loaded chains when the maximum rated load is in the transport position, assuming no friction in the mast structure.

$$K = 5 - 0.2 (C-10) \text{ with } K \geq 3.8$$

where

*C* = truck rated capacity in tonnes; and

$$K = \frac{\text{Minimum breaking load per lift chain or wire rope} \times \text{Number of lift chains or wire ropes}}{\text{Carrying capacity of truck} + \text{Dead weight of lifting device}}$$

**4.3.1.1** Pulley diameter shall be at least 3 times the pitch of the chain.

#### **4.3.2 Wire Ropes**

When the lifting mechanism includes a wire rope or wire ropes, the truck manufacturer shall select a wire rope which, in relation to the minimum breaking load certified by the manufacturer of the wire rope, shall provide a factor, *K* (*see 4.3.1*) of at least 6/1 in relation to the static load that would exist in a single wire rope or in equally loaded wire ropes when the maximum rated load is in the transporting position, assuming no friction in the mast structure.

**4.3.2.1** The minimum diameter of the wire rope guide pulleys, measured from the bottom of the groove shall be equal to 22 times the diameter of the wire rope.

#### **4.3.3 Hydraulic Lifting System**

The descent of the rated load due to leakage in the hydraulic system shall not exceed 100 mm in the first 10 minutes with the hydraulic oil at normal working temperature.

#### **4.3.4 Lowering Speed Limitation**

A control device shall be incorporated in the lift circuit which even in the event of a failure of the hydraulic supply circuit shall restrict the rate of descent speed of the lifting mechanism with its rated load not more than 0.6 m/s.

#### **4.3.5 Hydraulic Tilting System**

The mean forward tilting speed due to leakage in the complete hydraulic tilting system shall not exceed 0.5° per minute from the vertical mast position with the rated load raised to a height of 2.5 m or in the case of trucks with a lift height of less than 2.5 m, at their maximum height.

### **4.4 Fork Arms**

**4.4.1** The dimensions and tolerances of fork arms shall be as given in IS6876 along with the following changes:

<b>Table 1</b>	<b>Table 2</b>	<b>Table 3</b>
Add 100, 120, 140	Add 250, 300 in 'b' Add 2 200, 2 400 in 'T'	Add 250 × 100 300 × 100 300 × 120 300 × 140

#### **4.4.2 Testing**

The testing shall be done in accordance with IS 6876 but the test load shall be:

$$F_t = fQ$$

where

$f$  = factor of safety, and

$Q$  = fork arm capacity as specified by the manufacturer.

In addition, the tests given in **4.4.2.1** to **4.4.2.4** shall also be carried out.

NOTE — For trucks with capacity  $C > 10$  and equipped with atleast two fork arms, the factor of safety may be set to:

$$f = 3 - 0.08(C - 10)$$

with  $f \geq 2.5$

where

$f$  = factor of safety, and

$C$  = rated capacity of the trucks in tonnes.

**4.4.2.1** All fork arms shall be tested for flaws on the surface as well as for internal flaws.

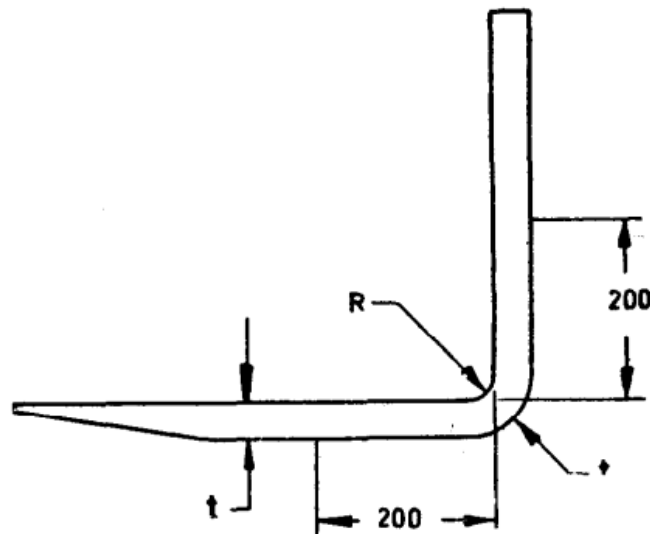
**4.4.2.2** Surface flaws shall be tested in the area around the bend and at welds by magnetic particle flaw detection test in accordance with IS 3703

**4.4.2.3** Internal flaws shall be tested by ultrasonic testing in accordance with IS 3664.

4.4.2.4 The ultrasonic testing shall be made with normal probe from perpendicular sides in the same cross-section of the tested object.

#### 4.4.3 Acceptance Criteria

4.4.3.1 The hardness shall be with the tolerance required to give stated ultimate tensile strength for the fork arm material.



All dimensions in millimetres

FIG. 2 Fork Arm

4.4.3.2 Fork arm that at inspection for surface flaws shows linear flaws of a length exceeding 3 mm, shall be not accepted.

4.4.3.3 Linear flaws with a length less than 3 mm shall be considered as continuous.

4.4.3.4 Fork arm with more than 5 indications per  $\text{dm}^2$  shall not be accepted.

4.4.3.5 If fork arms inspected by ultrasonic testing at the bend and 200 mm outwards on the blade and the shank (*see* Fig. 2) for internal flaws, give indications corresponding to a flat-bottomed hole with a diameter  $>6$  mm and/or reductions of bottom response  $>30$  percent, they shall not be accepted. Acceptance criteria applicable for other parts of the fork arm shall be as follows:

- a) Indications corresponding to flat-bottomed holes with diameter  $>8$  mm shall not be accepted;
- b) Indications corresponding to a flat-bottomed hole with diameter 6 to 8 mm and a propagation 200 mm shall not be accepted; and



c) Reduction of bottom response  $>50\%$  shall be accepted.

#### 4.4.4 Marking of Fork Arms

4.4.4.1 Each fork arm shall be permanently marked with its specified capacity,  $Q$ , and the specified load centre distance,  $D$ .

Example: 18000 kg X 900 mm

4.4.4.2 For fork arm, with safety factor  $f < 3$ , the specified capacity,  $Q$ , shall be given for both  $f = 3$  and  $f < 3$ .

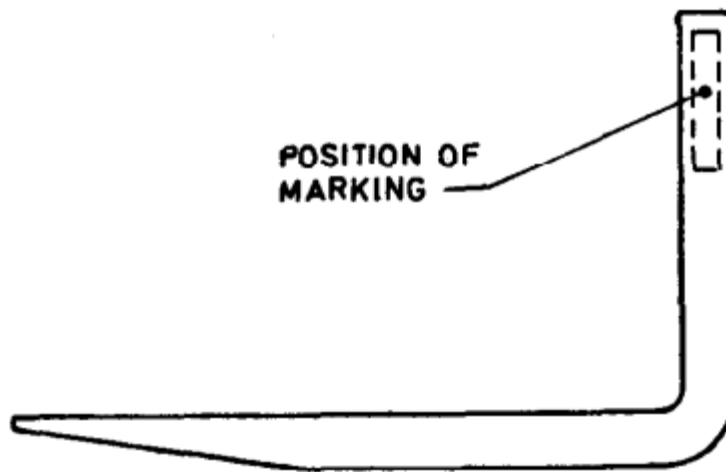


FIG. 3 Position of Marking on Fork-Arms

#### 4.4.5 Maintenance

Repair of fork arms in service on fork lift trucks shall be carried out in accordance with IS 7617.

#### 4.5 Controls and Control Symbols

4.5.1 Controls and control symbols shall be as given in IS 7496 and IS 7553 respectively.

## **4.6 Power System and Accessories**

**4.6.1** General requirements for internal combustion engine trucks using diesel/petrol or liquid petroleum gas (LPG) shall be as given in IS 6305 Part 2.

**4.7 Service Brakes** - The service brake performance shall be in accordance with IS 9701 with the changes as given in Tables 1 and 2.

**4.7.1** Service brakes shall be tested either by minimum drawbar pull as given in Table 1 or by stopping distance as given in Table 2.

## **4.8 Stability Requirements**

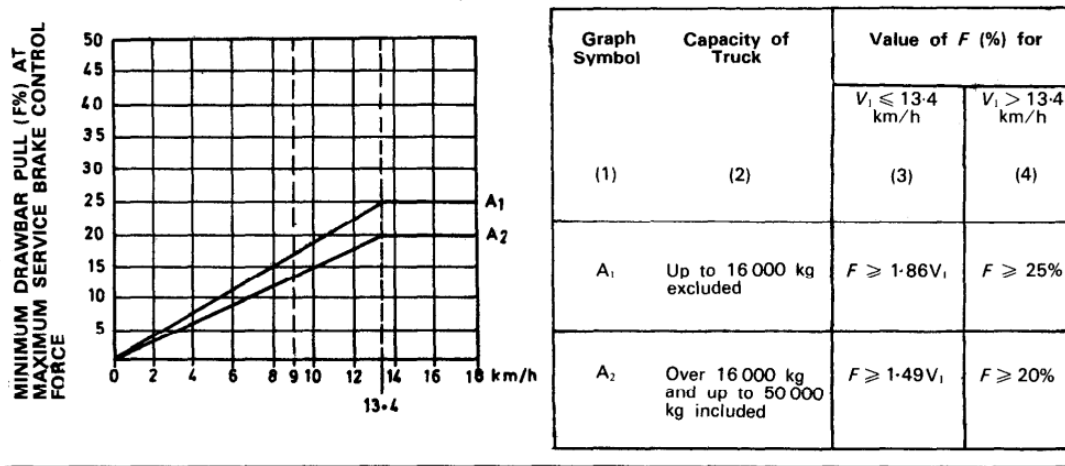
**4.8.1** For each series of trucks, the tests shall be carried out by the manufacturer on a sample and shall thus ensure that all trucks of that series embody similar minimum stability characteristics.

### **4.8.2** *Calculated Stability Value*

Calculated values for stability may be used for stability determination to avoid extensive repetitive testing. Calculated values which include allowance for manufacturing variations, tyre, mast, carriage and other deflections shall provide a means for predicting stability with reasonable accuracy. When comparing calculated and test values, the test values are considered the true measure of stability. Due to the difficulty and danger of testing trucks above 10 000 kg at 600 mm rated capacity, calculated values are acceptable in lieu of actual tilt platform tests.

**TABLE 1 MINIMUM DRAWBAR PULL (F) PERCENTAGE OF GROSS VEHICLE WEIGHT AT MAXIMUM SERVICE BRAKE CONTROL FORCE**

(Clause 4.7)



**TABLE 2 BRAKE PERFORMANCE**

(Clause 4.7)

Truck Speed with Rated Load, km/h	Approx Theoretical Distance After Brake Stop from Full Speed, m
2	0.43
3	0.64
4	0.85
5	1.06
6	1.27
8	1.70
10	2.12
12	2.54
14	3.09
16	4.03

#### 4.9 Lifting Capability

Lifting capability of hook, eye and members, if provided, shall be as per the agreement between the manufacturer and the purchaser.

#### 4.10 Warning Devices

**4.10.1** The truck shall be equipped with a warning horn, whistle gong or other sound producing devices. Visual warning devices such as lights or blinkers may also be installed when requested by the purchaser.

## **5 PROTECTIVE DEVICES**

**5.1** Protective devices of forklift trucks shall be in accordance with IS 6305 (Part 2).

## **6 ACCEPTANCE CRITERIA**

**6.1** The forklift trucks of capacity 10 000 to 50 000 kg shall meet with the requirements as laid down in IS 10517 except the requirements laid down in **3.4 (e)** and **3.5**.

**ANNEX A**  
*(Foreword)*

**COMMITTEE COMPOSITION**

Transport Tractors, Trailers and Industrial Trucks Sectional Committee, TED 22

Will be Added Later.