

MATERIAL AND EQUIPMENT STANDARD
FOR
FORK LIFT TRUCK

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0. INTRODUCTION

This Standard gives the amendment and supplement to ASME/ANSI B 56.1-1988, "Safety Standard for Low Lift and High Lift Trucks". It shall be used in conjunction with data sheets. For ease of reference, the clause (or paragraph) numbering of ANSI B 56.1 has been used throughout this Standard. Clauses in ANSI B 56.1 not mentioned remain unaltered. For the purpose of this Standard the following definitions shall hold:

- Sub.:** The ANSI Std., clause is deleted and replaced by a new clause.
- Del.:** The ANSI Std., clause is deleted without any replacement.
- Add.:** A new clause with a new number is added.
- Mod.:** Part of the ANSI Std., clause is modified and/or a new statement or comment is added to that clause.

1. SCOPE

This Standard contains the minimum requirements relating to the elements of design, construction, and testing of low lift and high lift powered industrial lift trucks controlled by a riding or walking operator for use in refinery services, chemical plants, gas plants, petrochemical plants and where applicable in exploration, production and new ventures.

Compliance by the truck manufacturer with the provisions of this Standard does not relieve him of responsibility of furnishing lift truck and accessories of proper design, mechanically suited to meet guarantees at specified service conditions.

No deviations or exceptions from this Standard shall be permitted without the written prior approval of the Purchaser.

Intended deviations shall be separately listed by the Vendor and supported by reasons thereof for purchaser's consideration.(Mod.)

3. INTERPRETATION

3.6 Classification by Functional Type (Add.)

The classification by the functional type shall be as given in the following:

- 1) Counterbalanced fork lift truck.
- 2) Reach fork lift truck.
- 3) Straddle fork lift truck.
- 4) Side fork lift truck.
- 5) Order picking truck.

3.7 Classification by Power-Source Type (Add.)

3.7.1 Internal combustion engine type

The internal combustion types shall be as follows:

- | | |
|---------------------------------|-----------|
| 1) Gasoline type | symbol FG |
| 2) Diesel type | symbol FD |
| 3) Liquefied petroleum gas type | symbol FL |
| (Add.) | |

3.7.2 Storage battery type (Add.)

The storage battery type shall be as follows:

- | | |
|----------------------|-----------|
| Storage battery type | symbol FB |
|----------------------|-----------|

7. DESIGN AND CONSTRUCTION STANDARDS

7.4 Rated Capacity

7.4.6 The standard lifting height specified for determining the rated capacity shall be 3000 mm. (Add.)

7.4.7 The maximum lifting heights shall generally be as given in Table 13. (Add.)

TABLE - 13

Maximum height (mm.)	2500, 2700, 3000, 3300, 3500, 3700, 4000, 4300, 4500, 5000, 5500, 6000
----------------------	--

7.6 General Stability Criteria-Tilting Platform Tests

7.6.8 Additional tests (Add.)

7.6.8.1 Test conditions

In the tests mentioned in the following, quantities of fuel, cooling water, lubricating oil and working fluid, and the pneumatic pressure of tires shall be those specified values as determined for that fork lift truck concerned. (Add.)

7.6.8.2 Stationary test

7.6.8.2.1 The measurements of principal dimensions shall be carried out on the following respective items:

- 1) Overall length.
- 2) Overall width.
- 3) Overall height.
- 4) Wheel base.
- 5) Track tread (front wheel and rear wheel).
- 6) Front over hang.
- 7) Ground clearance.
- 8) Fork (length, width and thickness).
- 9) Maximum lift lifting height.
- 10) Overall extended height.
- 11) Free lift.
- 12) Tilting angle of mast or fork.

Remark:

The items for measurements of dimensions shall be those specified in the counterbalanced fork lift trucks, and those for other fork lift trucks than the counterbalanced fork lift trucks shall be in accordance with these, as appropriate. (Add.)

7.6.8.2.2 Masses at the standard unloaded condition and standard loaded condition, and front wheel and rear wheel loads shall be measured. (Add.)

7.6.8.3 Travelling Test

The travelling test, unless particularly specified, shall be carried out on a flat and dry paved road surface under the standard unloaded condition and the standard loaded condition:

- 1) The maximum speed test shall be conducted in both the advancing and back and forth directions at a measuring interval of 50 m and at an arbitrary entrance length, and their mean value shall be taken.

Furthermore, the required time for travel to the point of 25 m at the center of 50 m interval shall be measured to ascertain that the maximum speed has been attained.

2) The travelling resistance tests shall consist of the two methods as given in the following. However, (a) should preferentially be selected, and (b), selected as required:

- a) A method in which the coasting times are measured.
- b) A method in which the time required until stopping is measured.

Carry out measurements on the advancing and back-and-forth directions and employ their mean value. Let a truck travel at the initial speed of 15 ± 1 km/h (for that of which maximum speed is under 15 km/h, take this maximum speed.) until it reaches the starting point of the coasting, release the clutch at the starting point of the coasting interval, set the speed change gear to the neutral position to start coasting, and measure the times; in the case of (b), measure the distance until it stops.

The measurement of the initial speed shall be obtained by measuring the travelling time of a 20 m interval before the coasting begins.

3) The minimum outside turning radius test shall be carried out, at the time of right and left turnings in an advancing direction, to measure the turning radius r_o of the outermost part of the body, at the maximum steering angle and the minimum speed. In this case, the truck shall be under the standard unloaded condition (see Fig. 7).

Furthermore, the turning radius r_o and r_s of the center of the outermost wheel and the innermost part of the body may also be measured.

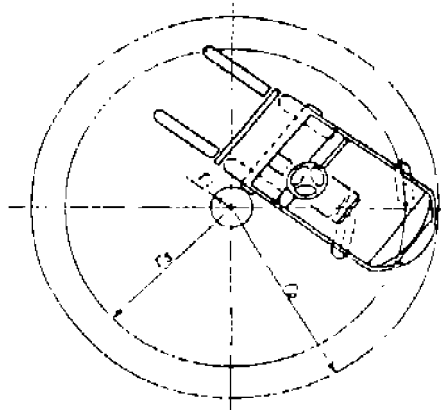


Fig. 7

4) The traction test shall be carried out at the advancing lowest speed step with inserting a tractive force meter between the truck to be drawn which is capable of controlling the tractive force to be drawn smoothly and the test truck. In the testing, the speed and the tractive force shall be measured at the time when the load of the truck to be drawn has been increased gradually. (Add.)

7.6.8.4 Material Handling Test

The material handling test, unless particularly specified, shall be carried out with the masts upright in the case where unloaded and the permissible capacity at rated load center has been loaded on the rated load center. In this case, the oil temperature of the working fluid shall be at about 40 to 50°C.

- 1) The lifting and lowering speed shall be obtained by measuring the time required for a fork lift truck which passes through a defined interval in which the lowering and lifting speed becomes stable.
- 2) The lowering amount and the change in tilting angle, at 15 min. after the prime mover has stopped, shall be measured, with placing the fork at the highest position and with closing the change over valve. In this case, the loads shall be in the state under unloaded condition and loaded condition of the permissible capacity at rated load at the standard load centre. (Add.)

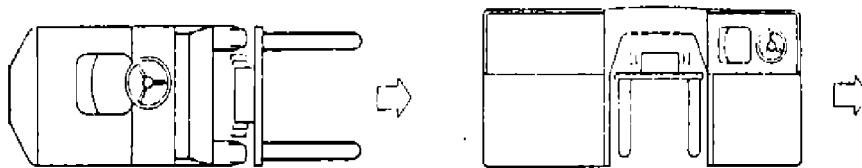
7.15 Parking Brake System Performance for Trucks up to and Including 31750 kg (70,000 lb) Loaded Truck Weight

7.15.3 The parking brake shall actuate when it is pulled to the operator side, in the case of a manual type.

In addition, in the case of a treadle type, it shall be actuated by depressing the pedal, and when the brake is to be released, it shall be operated by other means than the treading. (Mod.)

7.16 Travel Direction Control(s) Marking

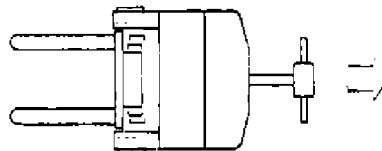
7.16.2 The forward direction of the fork lift truck shall be that direction of an operator. Those arrow mark directions given in Figs. 8 and 9 are the forward directions. (Add.)



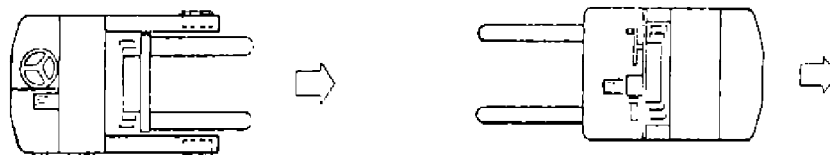
(a) Counterbalanced Fork Lift Truck

(b) Side Fork Lift Truck

FORK LIFT TRUCKS OPERATED BY SITTING ORATOR
Fig. 8



Informative Reference Fig. 8 Pedestrian Controlled Truck



(a) Reach Fork Lift Truck and
Straddle Fork lift Truck

(b) Order Picking Truck

FORK LIFT TRUCKS OPERATED BY STANDING OPERATOR
Fig. 9

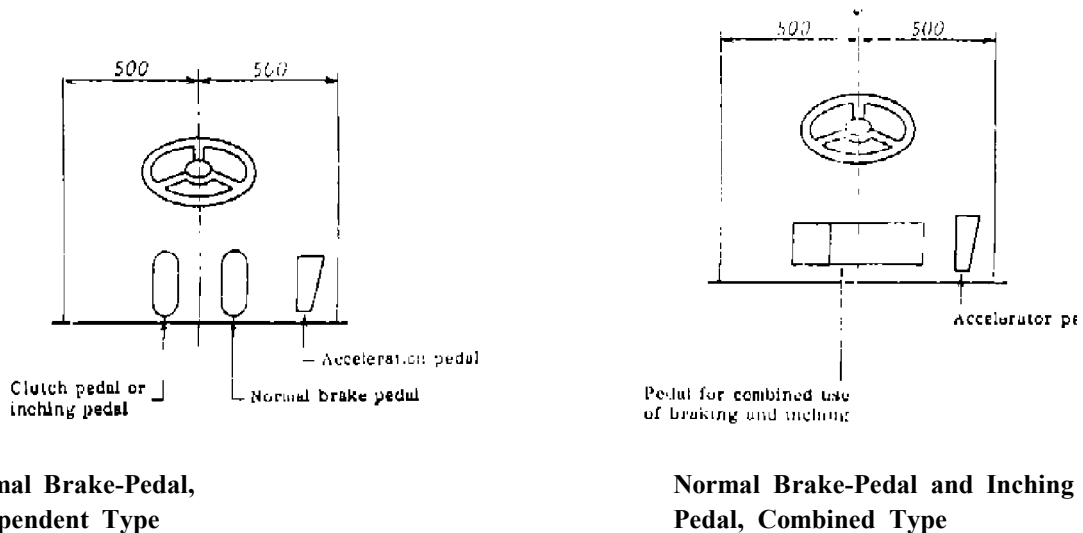
Informative Reference:

Fork Lift Truck operated by Walking operator The mounting side of the steering device is defined as forward direction .The arrow mark direction given in Informative Reference Fig. 8 is the forward direction.

7.19 Travel Control-Internal Combustion-Powered Industrial Trucks, Sit-Down Rider

7.19.1 The pedals for the travel controls, being arranged as given in Fig. 10, shall satisfy the following items: (Mod.)

- These shall be arranged within 500 mm each in the right and left from the center of the steering wheel so that the operator can operate easily at a fixed position.
- The interval between the pedals or the interval between the pedals and surroundings shall be arranged suitably so that there is no impediment in operation.



ARRANGEMENT DIAGRAMS OF PEDALS
Fig. 10

Note:

All dimensions are in mm.

7.19.10 Gear change lever (Add.)

7.19.10.1 The arrangement of the gear change lever shall be in accordance with 7.19.1(a), as appropriate. (Add.)

7.19.10.2 Operating mechanism

- Forward and backward gear change lever shall be adjusted so that the advancing direction of the fork lift truck aligns with the operating direction of the lever.
- It should preferably be provided with a device which actuates to alarm automatically when the forward and backward gear change lever has been operated to the backward. (Add.)

7.19.10.3 Marking for discrimination

On the gear change lever or its vicinity, a durable marking shall be attached so that an operator can discriminate the operating positions of forward and backward and transmission-steps respectively at his seat. (Add.)

7.25 Forks

7.25.3 Strength of fork

The safety factor of the static strength of the fork shall be not less than 3. (Mod.)

Note:

The safety factor shall be that value obtained by dividing the yield point of the material used for a fork by the stress when the maximum load is applied to the load center of the fork.

7.25.5 The lengths and the maximum thickness of the forks shall generally be as given in the Table-14, according to the types of the permissible capacities at rated load center. (Add.)

TABLE - 14

Permissible capacity at rated load center t		0.5	1	1.5	2	2.5	3	3.5	5	10	13.6
Maximum thickness of fork mm		30	40	40	50	55	60	65	80	90	**
	770	c	c								
	(850)*	c	c	c							
	920	c	c	c	c	c					
	1070	c	c	c	c	c	c	c			
	1220		c	c	c	c	c	c	c	c	c
Length of fork mm	1370		c	c	c	c	c	c	c	c	c
	1520			c	c	c	c	c	c	c	c
	1670				c	c	c	c	c	c	c
	1820						c	c	c	c	c
	1970							c	c	c	c
	2120							c	c	c	c
	2270								c	c	c
	2420								c	c	c

* The numerical values in the parentheses may be used as required.

** To be calculated by manufacturer and reviewed by purchaser.

7.36 Tilting Angles of Mast or Fork (Add.)

The tilting angles of the mast or fork, under dismounted condition of attachments, shall generally be as given in Table 15. (Add.)

TABLE - 15

Tilting Angles of Mast or Fork	CLASSIFICATION		FORWARD TILTING ANGLE	BACKWARD TILTING ANGLE
	Counterbalanced	Pneumatic tyre	6	12
	fork lift truck	Solid tyre	5	10
	Reach and straddle fork lift truck		3	5
	Side fork lift truck	Pneumatic tyre	5	5
		Solid tyre	3	5
	Order picking truck		0	0

Note:

Where the maximum lifting exceeds 3500 mm, the tilting angles of the mast or the fork may be decreased.

7.37 Strength of Lifting Chain (Add.)

The safety factor of the static strength of the chain used for the lifting mechanism shall be not less than 5. (Add.)

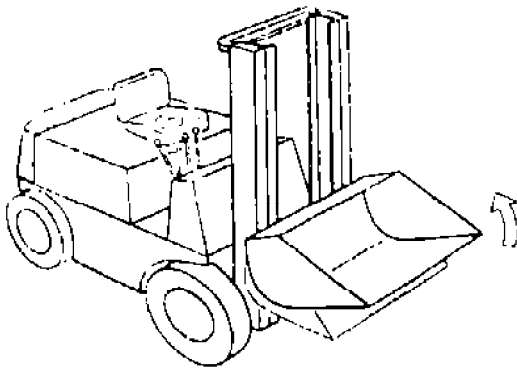
Note:

The safety factor shall be that value obtained by dividing the breaking load of a chain by the load being applied to the chain at the time when loaded with the permissible capacity at rated load center.

APPENDICES

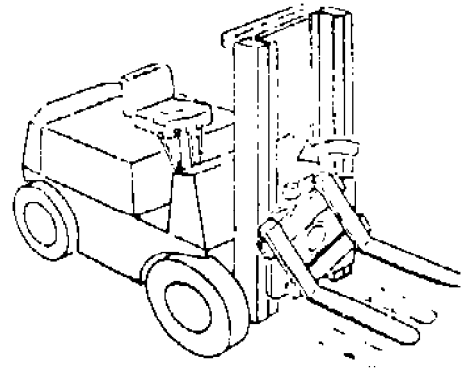
APPENDIX B

GLOSSARY OF COMMONLY USED WORDS AND PHRASES (Mod.)



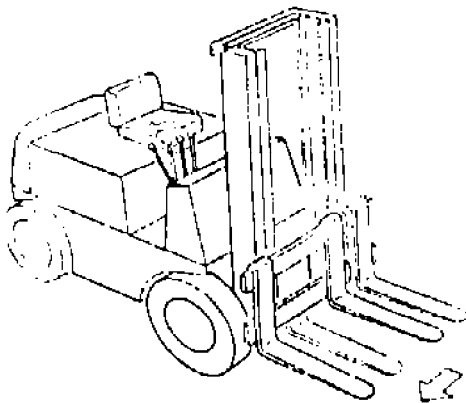
**HINGED FORK LIFT AND
BUCKET**

Fig. B.11



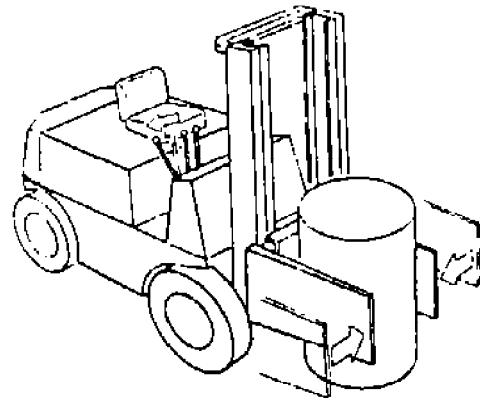
ROTATING FORK

Fig. B.12



SIDE SHIFTER

Fig. B.13

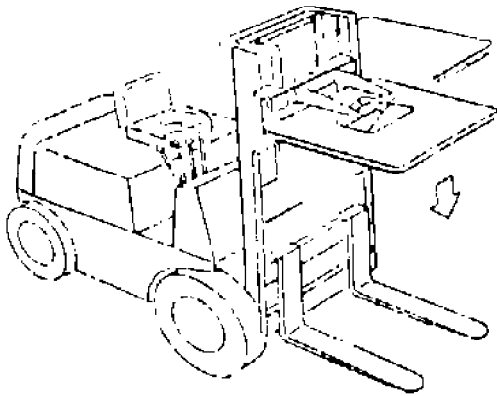


LOAD CLAMP

Fig. B 14

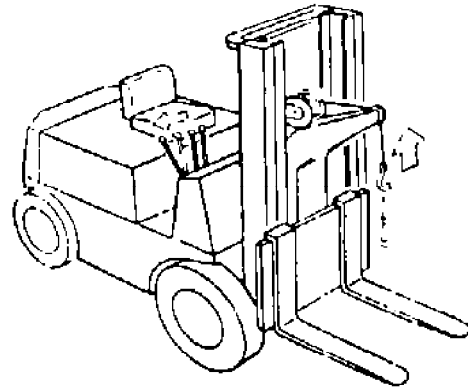
(to be continued)

APPENDIX B (continued)



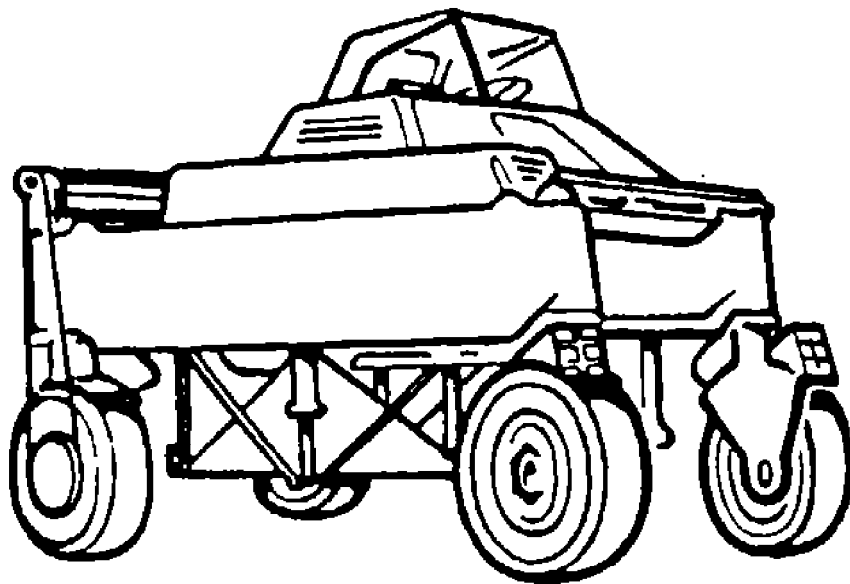
LOAD STABILIZER

Fig. B.15



WINCH

Fig. B.16



NON-STACKING LOW-LIFT STRADDLE CARRIER

Fig. B.17

APPENDIX C (Add.)
DIMENSIONS

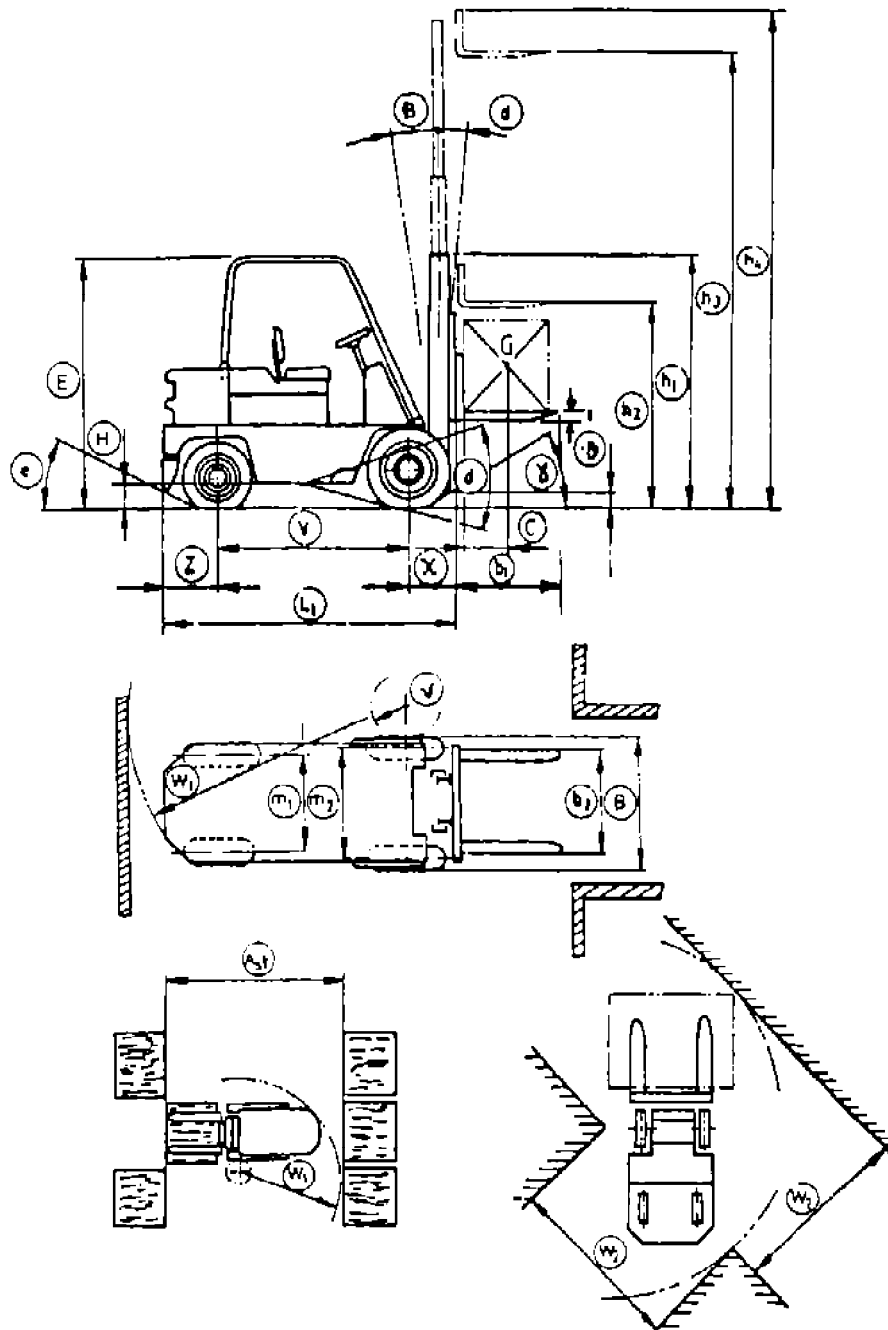


Fig. C.1

TRUCK DATA AND DIMENSION

h_4	Overall maximum height
h_3	Maximum lift height
h_1	Height mast closed
h_2	Free lift height
D	Ground clearance under mast
H	Ground clearance at centre of wheel-base
E	Height over cab or of overhead guard
B	Width
b_1	Fork length including fork heel
b_2	Outside spread of fork arms
m_2	Track, front
m_1	Track, rear
C	Load centre distance
X	Overhang, front
Y	Wheel-base
Z	Overhang, rear
L_1	Length without fork arms
δ	Approach angle
d	Ramp angle
e	Departure angle
α	Forward tilt
β	Backward tilt
v	Minimum inside turning radius
W_1	Minimum outside turning radius
W_2	Width of theoretical minimum intersecting aisle
$A_s t$	Width of theoretical minimum aisle for right-angle stacking (for given pallet)

APPENDIX D (Add.) DATA SHEET

FORK LIFT TRUCK
DATA SHEET

JOB No. ITEM No.
PURCH. ORDER No. DATE
REQUISITION No.
INQUIRY No.

SITE		SERIAL No.	
SERVICE		No. REQUIRED	
MANUFACTURER		MODEL DRIVER	
CHARACTERISTICS	USEFUL LOAD	Q CAPACITY	kgf
	LOAD CENTRE	C DISTANCE	mm
	POWER UNIT	ELECTRIC (BATTERY), DIESEL, GAS ENGINE	
	STEERING SYSTEM	POSITION OF DRIVER	
	TYRES	V-SOLID RUBBER, L-PNEUMATIC, FRONT/REAR	
	WHEELS (X-DRIVE)	NUMBER, FRONT/REAR	
DIMENSIONS	LIFT	h ₃ LIFT HEIGHT, max.	mm
		h ₂ NORMAL FREE LIFT	mm
	TILT	OF MAST, FORWARD X/BACKWARD β	
	OVERALL DIMENSIONS	L ₁ LENGTH WITHOUT FORK ARMS	mm
		B WIDTH	mm
		h ₁ HEIGHT, MAST CLOSED	mm
		h ₄ OVERALL MAXIMUM HEIGHT	mm
		E HEIGHT OVER CAB OR OF OVERHEAD GUARD	mm
	FORK DIMENSIONS	S THICKNESS	mm
		b ₁ FORK LENGTH INCL. FORK HEEL	mm
		b ₂ OUTSIDE SPREAD OF FORK ARMS	mm
	TURNING RADIUS	W1 OUTER	mm
OVERHANG, FRONT	X	mm	
AISLE WIDTH	A _s t		
PERFORMANCE	STABILITY		
	SPEEDS	TRAVEL, LADEN/UNLADEN	km/h
		LIFTING, LADEN/UNLADEN	cm/s
		LOWERING, LADEN/UNLADEN	cm/s
GRADIENT PERFORMANCE	LADEN	%	
Wts.	DEAD MASS	BATTERY INCL.	kg
	AXLE WEIGHT	LADEN, FRONT/REAR	kgf
CHASSIS	TYRES	No. FRONT/REAR	
		DIMENSIONS	FRONT
			REAR
	WHEELBASE	Y	mm
	TRACK	CENTRE OF TYRE, FRONT/REAR	
	GROUND CLEARANCE	WITH RATED LOAD	AT LOWEST POINT
			H AT WHEELBASE CENTER
	BRAKES	SERVICE, PARKING	
HYDRAULIC MECHANICAL			
DRIVE	STORAGE BATTERY	TYPE	
		VOLTAGE/CAPACITY @ 5h DISCHARGE RAT	V/kC
		WEIGHT	kg
	INTERNAL COMBUSTION ENGINE	MANUFACTURER, TYPE	
		OUTPUT	hp
		SPEED	t/min.
	SWITCHING-IN	STROKES/CYLINDERS/DISPLACEMENT	cm³
	TRANSMISSION	NUMBER OF GEARS, FORWARD/REVERSE	
	TYPE		
REMARKS:			