NATO STANDARD

APP-23

MATERIALS HANDLING EQUIPMENT

Edition A Version 1

MAY 2016

NORTH ATLANTIC TREATY ORGANIZATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

24 May 2016

1. The enclosed Allied Procedural Publication APP-23, Edition A, Version 1, MATERIALS HANDLING EQUIPMENT, which has been approved by the nations in the MCLSB, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 2829.

2. APP-23, Edition A, Version 1, will come into effect upon receipt.

4. This publication shall be handled in accordance with C-M(2002)60.

Edvardas MAŽEIKIS
Major General, LTUAF
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]

Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.

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TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION 1-1
1.1. REFERENCES 1-1
1.2. AIM 1-1
1.3. AGREEMENT 1-1
1.4. TERMS AND DEFINITIONS 1-1
1.5. GENERAL 1-1
1.5.1. MHE 1-1
1.6. IMPLEMENTATION 1-3
CHAPTER 2 PALLET TRUCKS 2-1
2.1. GENERAL 2-1
2.2. MINIMUM STANDARDS FOR PALLET TRUCKS 2-1
2.2.1. FORK LENGTHS 2-2
2.2.2. FORK WIDTHS 2-3
2.2.3. FORK HEIGHTS 2-3
2.3. MANUFACTURER DATA PLATE 2-4
CHAPTER 3 FORKLIFT TRUCKS 3-1
3.1. GENERAL 3-1
3.2. GENERAL CHARACTERISTICS OF CATEGORY A FORKLIFT TRUCKS 3-1
3.2.1. MINIMUM STANDARDS FOR CATEGORY A FORKLIFT TRUCKS 3-1
3.2.2. DIMENSIONAL CRITERIA 3-1
3.2.3. CARRIAGE PERFORMANCE 3-2
3.2.4. SAFETY 3-2
3.3. GENERAL CHARACTERISTICS OF CATEGORY B FORKLIFT TRUCKS 3-2
3.3.1. MINIMUM STANDARDS FOR CATEGORY A FORKLIFT TRUCKS 3-3
3.3.2. DIMENSIONAL CRITERIA 3-3
3.3.3. CARRIAGE PERFORMANCE 3-4
3.3.4. GRADIENT PERFORMANCE 3-4
3.3.5. FORDING CAPABILITY 3-5
3.3.6. SAFETY 3-5
3.4. BRAKING PERFORMANCE 3-5
3.5. GRAPHICAL SYMBOLS FOR CONTROLS 3-5
3.6. OPERATIONAL ENVIRONMENT 3-5
3.7. MANUFACTURER DATA PLATE 3-6
CHAPTER 4 MOBILE CRANES 4-1
4.1. GENERAL 4-1
4.2. GENERAL CHARACTERISTICS OF CATEGORY A MOBILE CRANES 4-1
4.2.1. MINIMUM STANDARDS FOR CATEGORY A MOBILE CRANES 4-1
4.2.2. RATING CARRYING CAPACITY 4-1
4.2.3. SAFETY 4-2
4.3. GENERAL CHARACTERISTICS OF CATEGORY B MOBILE CRANES 4-2
4.3.1. MINIMUM STANDARDS FOR CATEGORY A MOBILE CRANES 4-2
4.3.2. DIMENSIONAL CRITERIA 4-2
4.3.3 LONGITUDINAL STABILITY 4-3
4.3.3.1. LONGITUDINAL STABILITY STANDARDS 4-3

4.3.4. LATERAL STABILITY 4-3
4.3.4.1 LATERAL STABILITY STANDARDS 4-3
4.3.5. GRADIENT PERFORMANCE STANDARDS 4-3
4.3.6 MOBILITY 4-4
4.3.7. FORDING CAPABILITY 4-4
4.4. BRAKING PERFORMANCE 4-5
4.5. GRAPHICAL SYMBOLS FOR CONTROLS 4-5
4.6. OPERATIONAL ENVIRONMENT 4-5
4.7. MANUFACTURER DATA PLATE 4-5

CHAPTER 5 ISO CONTAINER HANDLERS 5-1

5.1. GENERAL 5-1
5.2. LOAD RATINGS 5-1

CHAPTER 6 SELF-LOADING TRANSPORTERS 6-1

6.1. GENERAL 6-1
6.2. GENERAL CHARACTERISTICS OF SELF-LOADING TRANSPORTER EQUIPPED WITH CRANE 6-1
6.2.1. MINIMUM STANDARDS FOR SELF-LOADING TRANSPORTER EQUIPPED WITH AN ON-BOARD CRANE 6-1
6.2.2. PERFORMANCE CRITERIA 6-1
6.2.3. SAFETY 6-2
6.2.4 GRAPHICAL SYMBOLS FOR CONTROLS 6-2
6.2.5. OPERATIONAL ENVIRONMENT 6-2
6.2.6. MANUFACTURER DATA PLATE 6-3
6.3. GENERAL CHARACTERISTICS OF SELF-LOADING TRANSPORTER EQUIPPED WITH FORKLIFT TRUCK 6-3
6.3.1. MINIMUM STANDARDS FOR SELF-LOADING TRANSPORTER EQUIPPED WITH A FORKLIFT 6-3
6.3.2. SELF-LOADING TRANSPORTER 6-4
6.3.3. SELF-PROPELLED VEHICLE MOUNTED FORKLIFT 6-4
6.3.4. MANUFACTURER DATA PLATE 6-5
6.4. GENERAL CHARACTERISTICS OF SELF-LOADING TRANSPORTER EQUIPPED WITH A UNITIZED LOAD HANDLING SYSTEM 6-6

CHAPTER 7 CARGO TRANSFER EQUIPMENT 7-1

7.1. GENERAL 7-1
7.1.1. GENERAL CHARACTERISTICS OF MOBILE, SELF-PROPELLED CARGO TRANSFER EQUIPMENT 7-1
7.1.2 GENERAL CHARACTERISTICS OF STATIONARY CARGO TRANSFER EQUIPMENT 7-1

CHAPTER 8 GENERAL MATERIALS HANDLING EQUIPMENT SAFETY GUIDANCE 8-1

8.1. GENERAL 8-1

ANNEX A RELATED PUBLICATIONS A-1

ANNEX B GLOSSARY OF TERMS AND DEFINITIONS B-1

ANNEX C MANUFACTURER DATA PLATE C-1

ANNEX D LIST OF ABREVIATIONS D-1

ANNEX E EVALUATION DATA SHEET E-1

CHAPTER 1 INTRODUCTION

1.1. REFERENCES

Publications that are referred to in this document are listed at Annex A.

1.2. AIM

The aim of this standard is to ensure that materials handling equipment (MHE) used by NATO forces is functionally interchangeable.

1.3. AGREEMENT

Participating nations agree to adopt the characteristics for MHE as described in this standard when introducing new equipment.

1.4. TERMS AND DEFINITIONS

Terms and definitions that are used in this document can be found at Annex B.

1.5. GENERAL

1. The provisions of this standard apply to future planning for the introduction of new equipment. The agreement does not aim at eliminating or modifying existing MHE where it would entail considerable expenditure.

2. Throughout this document, dimensions are given in both millimetres (mm) and inches (in). Efforts to provide exact conversions were taken, however due to specific national standards, some conversions between millimetres and inches are not exact. Throughout this document, weights are given in tons. Although the metric ton (tonne) has a value of 2205 lb, non-metric nations may consider their short ton of 2000 lb interchangeable for the purpose of this standard.

1.5.1. MHE

1. For military purposes, the following MHE can be used:

   a. Pallet trucks

   b. Forklift trucks

   c. Mobile cranes

   d. ISO container handlers

   e. Self-loading transporters

   f. Cargo transfer equipment

2. For the purpose of identifying MHE by its operational characteristics, they have been classified into two categories as defined below. Pallet trucks and cargo transfer equipment have only Category A. Mobile cranes, ISO container handlers and forklift trucks have

Category A and B. Self-loading transporters have three (3) types (see chapter 6).

a. Category A, those intended for use on prepared or semi-prepared surfaces.

b. Category B, those intended for use on rough terrain and off-road surfaces and primarily used for loading and unloading material from tactical vehicles.

3. The operational scheme in Figure 1-1 identifies the primary types of MHE required for operational use. For the purpose of this standard, the operational categories identified in Figure 1-1 are defined as follows:

a. Airfield - MHE operations conducted in support of loading and unloading aircraft and handling of materials in and around airfields.

b. Shore - MHE operations conducted in support of Logistics over the Shore (LOTS) and port operations.

c. Land - All other surface materials handling operations.

	PALLET TRUCKS	FORKLIFT TRUCKS			MOBILE CRANES		ISO CONTAINER HANDLERS	SELF-LOAD TRANSPORTERS			CARGO TRANSFER EQUIPT
NATIONS		≤2t	>2t≤5t	>5t	<20t	≥20t		ON-BOARD CRANE	UNITIZED LOAD	ON-BOARD FORK LIFT	
	CATEGORIES OF MATERIALS HANDLING EQUIPMENT										
	A	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A
ALB																				
BEL/2000	L	L	L,S	L	L,S	A	-	L	L	L	L	L	-	-	A,L	-	L,S			A
BGR																				
CAN/2000	L	*	*	*	*	A,S	A,L	L,S	A,L	S	L,S	L,S	L,S	*	*	*	L,S			-
CZE/2000	A,L	A,L	-	-	A,L	-	-	L	L	L	L	L	-	-	L	L	L			-
DNK/2015	*	*	L	*	L	A,L	A,L	A,S	L	L	L,S	L	A,L	*	A,L	*	L			A
EST																				
FRA/1996	L	L	L	L	*	L	-	L	L	-	L,S	L	-	-	L	L	L			A,L
DEU/2005	A,L	A,L	-	*	*	A,L	-	A,L	*	L	*	A,L	A,L	*	*	*	*	-	-	L
GRC/1996	L	A,L	*	A,L	*	A,L	A,L	L	A,L	A,L	L,S	L,S	L,S	*	*	L,S	L,S			A,L
HRV																				
HUN/2002	A,L	A,L	-	A,L	A,L	A	A	A,L	A,L	L	-	L	L	A,L	A,L	-	-	-	-	-
ITA/2002	*	*	*	*	*	*	*	L,S	L,S	L,S	L,S	A,L	L	L	L	L	L	-	-	-
LVA	A,L	-	-	A,L	A,L	-	-	-	-	-	-	-	-	-	-	-	L	-	-	-
LTU																				
LUX																				
NLD/1996	A,L	*	*	*	*	*	-	-	-	-	*	-	-	L,S	L,S	L,S	L,S			-
NOR/2000	*	*	-	*	-	-	*	*	*	*	*	-	-	A,L	A,L	A,L	A,L			A
POL/2002	*	*	L,S	*	*	A,S	A	*	L,S	S	S	L,S	-	-	-	-	-			A,S
PRT																				
ROU																				
SVK/2009	L	A,L	L		A,L			A,L		A,L	L	L			L	L	A,L			
SVN																				
ESP/1996	L	A,L	A,L	A,L	A,L	-	-	*	A,L	L	*	-	-	L	L	-	L			A
TUR/2002	*	*	-	*	-	-	-	L	-	L	-	L,S	-	L	-	-	-			-
GBR/2003	A,L	*	*	*	*	L,S	-	A,L	L	-	S	L,S	L,S	-	L	-	L,S	*	*	A
USA/2005	L	*	*	*	*	A,L	-	L	A,L	L,S	L,S	A,L	*	*	*	L,S	*	-	-	A,L

Operational Categories:
A = Airfield L = Land S = Shore * = Airfield, Land, and Shore t = tons

Figure 1-1: Operational Scheme of Materials Handling Equipment for Military Purposes

1.6. IMPLEMENTATION

This standard will be considered to have been implemented when the necessary orders and instructions have been issued to the effect that when the equipment covered by this agreement is produced (or ordered by a non-producing nation) it will be produced (or ordered) in accordance with the characteristics laid down in this standard.

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CHAPTER 2 PALLET TRUCKS

2.1. GENERAL

Pallet trucks are manually or battery powered trucks with two elevating forks (e.g., arms, fingers, tines, etc.) for insertion below the top deck of a pallet and used for handling palletized loads. The elevating motion is achieved by mechanical leverage or hydraulic pump that enables the load to be raised clear of the ground for movement. Pallet trucks may be pedestrian or ride on operated and are used for horizontal movements and are not designed for stacking.

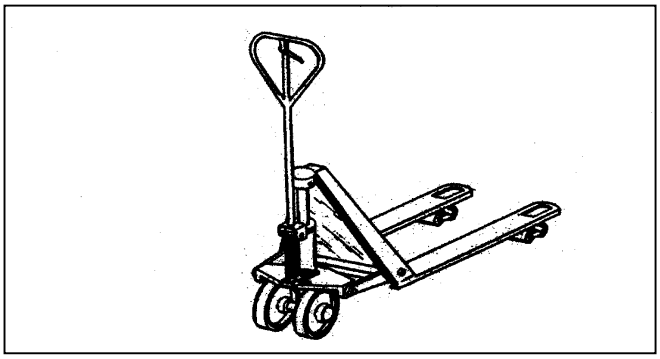

Figure 2-1: Illustration of a Pallet Truck

2.2. MINIMUM STANDARDS FOR PALLET TRUCKS

Minimum standards for pallet trucks are described below, which generally follows ISO 509. Pallet trucks shall be designed to handle four-way entry pallets and petroleum, oils, and lubricants (POL) pallets described in STANAG 2828. The following dimensions apply to the heights, widths, and lengths of pallet truck forks (e.g., arms, fingers, tines, etc.), which may have either single or tandem trail wheels. Figure 2-2 illustrates a pallet truck having tandem trail wheels; the wheels of this type have the greatest overall dimensions. The dimensions of the truck are defined as follows:

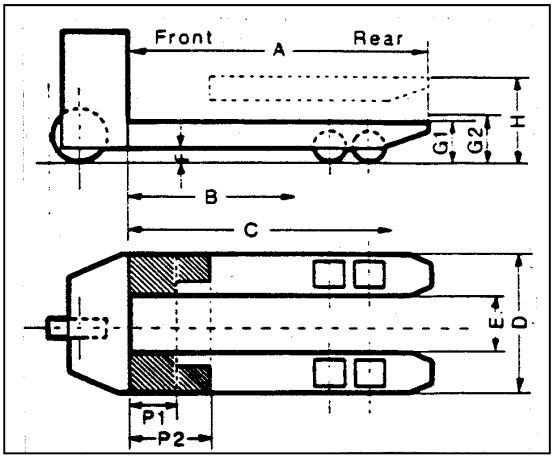

Figure 2-2: Pallet Truck Single and Double Tandem Wheels

Symbol

A Overall length of forks.
B Distance between heel of truck and nearest point to which the tandem trail wheel approaches (forks lowered).
C Distance between heel of truck and farthest point away to which the tandem trail wheel moves.
D Overall width over forks.
E Distance between forks.
F Distance between underside of forks and ground (forks lowered).
G1 Height of forks in lowered position at point of entry.
G2 Height of forks in lowered position at heel of truck.
H Height of forks in raised position.
J Minimum clearance between periphery of tandem trail wheels and edges of openings in bottom deck of pallet (see figure 2-3 and 2-4).
P1 Limitation of depth entry of forks.
P2 Limitation of depth entry of forks.

Note: In most cases, the forks are not horizontal in the lowered position; the reduced height at the rear can facilitate entry of the forks into the pallet.

2.2.1. FORK LENGTHS

1. Dimensions A, B, and C are related to the dimensions of the deck of the pallet and the openings in the bottom deck, which are symmetric about the axes of the pallet (pallet dimensions are described in STANAG 2828).

2. Dimensions B and C control the positioning of the tandem trail wheels relative to the heel of the truck during lifting, and shall be such that when the wheels pass through the minimum size of the opening in the bottom deck of the pallet, a minimum clearance (J) 6 mm (0.25 in) is maintained between the components of the truck and the edges of the deck boards forming the opening (figures 2-3 and 2-4). When the truck is operated so that the distance between the underside of the forks and ground is 34 mm (1.375 in) or greater, clearance (J) shall also be maintained at the upper side of the bottom deck.

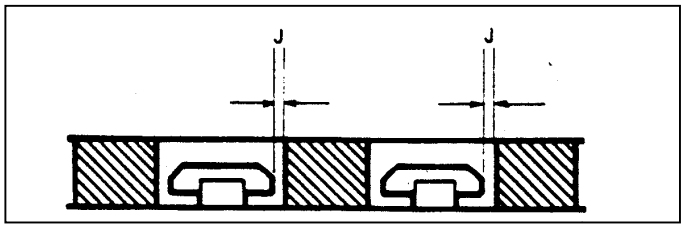

Figure 2-3: Pallet Forks

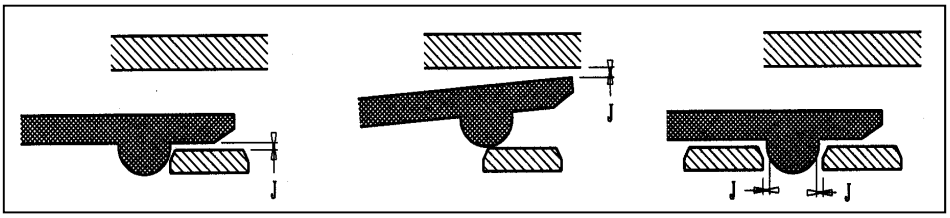

Figure 2-4: “J" Dimension

3. The following standard dimensions for A, B, C, P1, and P2 shall be adopted to enable the pallet truck to handle four-way pallets, as described in STANAG 2828, from any side.

A		B		C				Limitation of Depth of Entry by Stop or Mark	Correlation of Pallet Dimensions			
Maximum		Minimum		Maximum								
				Number of Trail Wheels					800 mm (32 in)		1000 mm (40 in)	
				1		2						
mm	in	mm	in	mm	in	mm	in		mm	in	mm	in
1219	48	809	31 7/8	969	38 7/8	1009	39 3/4	P1			160	6 1/4
								P2	320	12 5/8		

Figure 2-5: Standard Dimensions for A, B, C, P1, and P2

2.2.2. FORK WIDTHS

1. Overall width over forks. The overall width of forks (D) is determined in relation to the corresponding dimensions of standard pallets. The standard dimensions (D) are as follows:

D = 570 mm (22.50 in) maximum, for trucks used in conjunction with pallets having a minimum entry width of 600 mm (24 in).

D = 690 mm (27.25 in) maximum, for trucks used in conjunction with pallets having a minimum entry width of 710 mm (28 in).

2. Distance between forks. For all pallet trucks, the distance between the forks (E) is 180 mm (7 in) minimum.

2.2.3. FORK HEIGHTS

For all pallet trucks in an unladen condition, the fork heights are as follows:

a. In the lowered position: F = 30 mm (1.25 in) minimum.
G1 = 86 mm (3.375 in) maximum.
G2 = 90 mm (3.50 in) maximum.

b. In the raised position: H = 185 mm (7.25 in) minimum.

2.3. MANUFACTURER DATA PLATE

A manufacturer data plate[1] shall be furnished and attached permanently to the equipment in a conspicuous location. Pallet trucks shall be marked legibly and indelibly with the following minimum items:

a. Rated capacity marked in kg (lb).

b. Pallet truck (empty) weight marked in kg (lb).

[1] An example of a manufacturer data plate is at Annex C.

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CHAPTER 3 FORKLIFT TRUCKS

3.1. GENERAL

Forklift trucks are rider operator, counterbalanced trucks fitted with vertical mast, fixed length boom, or variable reach boom assembly to which two forks are connected via the fork carriage. These trucks are used for lifting, relocating, and stacking of palletized loads. Forklift trucks may be powered by battery, gasoline, diesel, or propane. The rated capacity of forklift trucks shall be a specified load at a specified load center (e.g., 2 tons (4,000 lb) at 600 mm (24 in), etc.).

3.2. GENERAL CHARACTERISTICS OF CATEGORY A FORKLIFT TRUCKS

Category A forklift trucks are generally referred to as warehouse forklift trucks. They are characterized as counterbalanced, mast-type forklifts and are normally used inside buildings or on prepared surfaces.

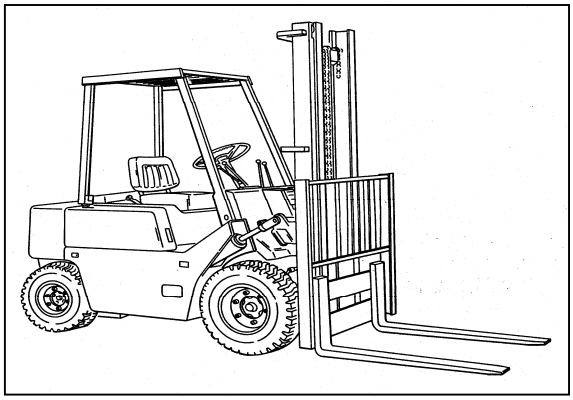

Figure 3-1: Forklift Truck, Category A

3.2.1. MINIMUM STANDARDS FOR CATEGORY A FORKLIFT TRUCKS

Category A forklift trucks are required to satisfy the dimensional and minimum performance standards set out below to ensure that they are capable of effective operation. Forklift trucks up to and including 3-ton rated capacity shall be designed to handle four-way entry pallets and POL pallets described in STANAG 2828. Forklift trucks shall comply with the stability requirements detailed in ISO 22915-2 or similar national requirement. Slinging and tie-down facilities shall be provided in accordance with STANAG 4062.

3.2.2. DIMENSIONAL CRITERIA

1. Forklift trucks up to and including 2-ton capacity, used for stuffing and unstuffing ISO containers or other covered means of transport, shall have the following:

   a. Maximum overall height of 2125 mm (85 in) with the overhead protective guard in place and mast fully lowered.

   b. Minimum free lift of 600 mm (24 in).

c. Lift height of the forks of not less than 3660 mm (144 in).

d. For forklift trucks loading and unloading covered railway cars, the maximum overall height with the mast fully lowered should be 1800 mm (72 in). The overhead protective guard may be removed to meet this requirement.

2. Forklift trucks with a rated capacity of 2 tons or greater and including 5-ton capacity used in depots and warehouse operations shall have the following:

a. Maximum overall height of 2600 mm (104 in) with the overhead protective guard in place and mast fully lowered.

b. Minimum free lift of 150 mm (6 in).

c. Lift height of the forks of not less than 3660 mm (144 in).

3.2.3. CARRIAGE PERFORMANCE

a. It is desirable that forklift trucks be equipped with powered fork, side shifting capabilities.

b. Fork carriages shall be capable of allowing the fork spacing to be altered. It is desirable that forklift trucks with a rated capacity of 3 tons or greater have a powered fork-spacing capability.

3.2.4. SAFETY

Forklift trucks shall be equipped with a Falling Object Protection Structure (FOPS).

3.3. GENERAL CHARACTERISTICS OF CATEGORY B FORKLIFT TRUCKS

Category B forklift trucks are generally referred to as rough terrain or all terrain forklift trucks. They are counter-balanced vehicles that may be mast, fixed length boom, or variable length boom-type trucks. Category B forklift trucks are characterized by all-wheel drive and larger off-road tires, which are necessary to obtain the mobility for working on rough terrain, and are generally larger than a comparable capacity Category A forklift truck. Diesel engines are the predominant power source for this type of forklift truck.

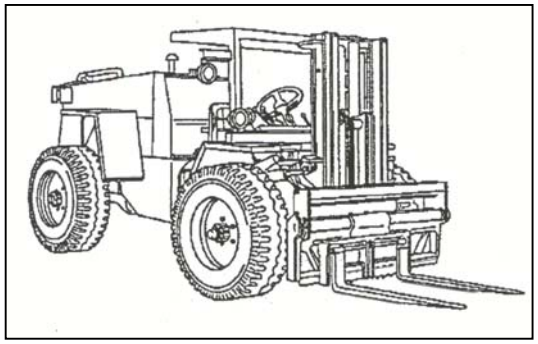

Figure 3-2: Forklift Truck, Category B

3.3.1. MINIMUM STANDARDS FOR CATEGORY B FORKLIFT TRUCKS

Category B forklift trucks are required to satisfy the dimensional and performance standards set out below to ensure that they shall be capable of effective interoperability in any area accessible to general purpose tactical cargo vehicles. Forklift trucks up to and including 3-ton rated capacity shall be designed to handle four-way entry pallets and POL pallets described in STANAG 2828. Forklift trucks designated for use at the airfield with a capacity of 5 tons or greater shall be designed for use in unloading cargo from both short-range and medium-range tactical transport aircraft. Forklift trucks shall comply with the stability requirements detailed in ISO 22915:13 or similar national requirement. Slinging and tie-down facilities shall be provided in accordance with STANAG 4062. Forklift trucks shall be equipped with the standard NATO 24-volt slave receptacle.

3.3.2. DIMENSIONAL CRITERIA

a. Minimum ground clearance:

(1) Forklift trucks up to and including a rated capacity of 2 tons. 250 mm (10 in)

(2) Forklift trucks with rated capacity greater than 2 tons. 300 mm (12 in)

b. Minimum angle of approach with rated load. 25 degrees

c. Minimum angle of departure. 25 degrees

d. Maximum angle of a peak, which the vehicle can pass over (break over angle). 155 degrees

e.	Minimum angle of fork tilt:	forward	10 degrees
		rearward	20 degrees
f.	Minimum angle of fork oscillation:	left	6 degrees
		right	6 degrees

g. Minimum low engagement height (depth from ground level to level forks): 102 mm (4 in)

h. Minimum reach (from foremost part of forklift chassis to heel of forks with forks level). 102 mm (4 in)

i. Minimum lift height:

(1) Forklift trucks up and including 2-ton capacity. 2134 mm (84 in)

(2) Forklift trucks greater than 2-ton capacity. 3660 mm (144 in)

j. Maximum overall widths and heights when prepared for transport by aircraft must not exceed the following:

	Maximum Allowed Width	Height
(1) Tactical transport aircraft (short range). (See below note)	2030 mm (80 in)	1830 mm (72 in)
(2) Tactical transport aircraft (medium range) (See below note)	2590 mm (102 in)	2590 mm (102 in)

Note: For the purpose of this standard: Short-range aircraft includes all those designed to operate over radius of action of less than 500 nautical miles (NM). Medium-range aircraft are those designed to operate at radius of action of 500 NM and over.

k. Forklift trucks with a rated capacity of 2 tons or less shall be able to stuff and unstuff ISO containers.

l. For transport by rail, the overall dimensions must not exceed those laid down in STANAG 2468.

3.3.3. CARRIAGE PERFORMANCE

a. Forklift trucks shall be equipped with powered-fork, side-shifting capabilities.

b. Fork carriages shall be capable of allowing the fork spacing to be altered. It is desirable that forklift trucks with a rated capacity of 3 tons or greater have a powered fork-spacing capability.

c. Fork carriages with a rated capacity of 5 tons or greater shall be rated at not less than 1200 mm (48 in) load center and be equipped with forks equal to or greater than 1750 mm (72 in).

3.3.4. GRADIENT PERFORMANCE

1. The forklift truck shall be capable of negotiating the side slopes for the rated capacities specified below with and without rated load in full circle operations at both maximum steer angles.

	Side slope
a. Five tons or less:	16.7 degrees (30 %)
b. Over five tons:	8.5 degrees (15 %)

2. The forklift truck shall be capable of ascending and descending the longitudinal slopes as specified for the appropriate load capacity, in forward gear range at a controlled speed of not less than 3.2 kph (2 mph) with a rated load. The forklift truck with rated load shall be capable of being stopped with the service brake and held with the parking brake, without load, on the applicable longitudinal slope, both in the ascending and descending position.

		Slope
a.	Three tons or less:	
	ascending only	24.2 degrees (45 %)
	descending and braking	16.7 degrees (30 %)

		Slope
b.	Over 3 tons:	
	ascending only	24.2 degrees (45 %)
	descending and braking	14.0 degrees (25 %)

3.3.5. FORDING CAPABILITY

Forklifts shall conform to the following fording requirements:

1. For beach operations or soft soil conditions:

   a. Forklift trucks with capacities up to and including 3 tons shall be able to ford a minimum depth of 750 mm (30 in).

   b. Forklift trucks with capacities greater than 3 tons shall be able to ford a minimum depth of 750 mm (30 in).

2. For other operations (non-beach operations), a minimum depth of 750 mm (30 in) is required.

3.3.6. SAFETY

Category B forklifts shall be equipped with a FOPS and Roll-Over Protective Structure (ROPS).

3.4. BRAKING PERFORMANCE

It is essential that the brakes ensure adequate and safe control of the vehicle under all operational conditions and meet national requirements.

3.5. GRAPHICAL SYMBOLS FOR CONTROLS

Graphical symbols for controls and displays shall be clearly marked in accordance with ISO 3287. Labels shall be easily visible to the operator and shall not be vulnerable to damage or defacement.

3.6. OPERATIONAL ENVIRONMENT

It is desirable that forklift trucks shall be capable of starting and operating in ambient temperatures from -32 degrees Celsius (-25 degrees Fahrenheit) to 49 degrees Celsius (120 degrees Fahrenheit). As a minimum, forklift trucks shall be capable of starting and operating in ambient temperatures from -19 degrees Celsius (-2 degrees Fahrenheit) to 44 degrees Celsius (111 degrees Fahrenheit).

3.7. MANUFACTURER DATA PLATE

A manufacturer data plate[2] shall be furnished and attached permanently to the equipment in a conspicuous location. Forklift trucks shall be marked legibly and indelibly with the following minimum items:

a. Rated capacity marked in kg (lb).

b. Load center marked in mm (in).

c. Forklift truck (empty) weight marked in kg (lb).

d. Overall height marked in mm (in).

[2] An example of a manufacturer data plate is at Annex C.

CHAPTER 4 MOBILE CRANES

4.1. GENERAL

Mobile cranes are characterized by a crane superstructure mounted on a mobile platform. Mobile platforms can be either tire mounted or crawler mounted. The mobile crane is primarily powered by diesel. The boom of the crane can be either a lattice-type, fixed length, or a hydraulically telescoping boom. To allow for greater lifting capacities and greater stability, mobile cranes are equipped with outriggers or stabilizers. While these outriggers or stabilizers increase the capacity, they also prevent movement of the platform while they are being used.

4.2. GENERAL CHARACTERISTICS OF CATEGORY A MOBILE CRANES

Category A mobile cranes are generally referred to as truck-mounted cranes. They are mounted on a truck-type chassis and can only operate on roadways or prepared surfaces.

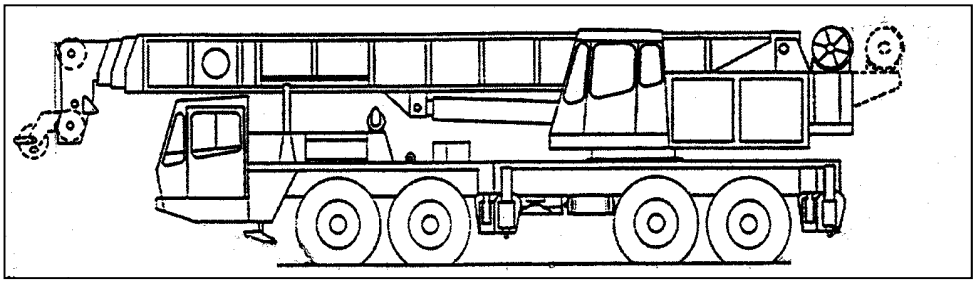

Figure 4-1: Mobile Crane, Category A

4.2.1. MINIMUM STANDARDS FOR CATEGORY A MOBILE CRANES

Category A mobile cranes shall meet the following standard requirements. They are to ensure the effective use of this equipment both in fixed depot sites and on improved surface handling sites. Slinging and tie-down facilities shall be provided in accordance with STANAG 4062. It is desirable that Category A mobile cranes be equipped with the standard NATO 24-volt slave receptacle.

4.2.2. RATING CARRYING CAPACITY

Each crane shall have a durable rating chart for the respective carrying capacity of the crane. The data and information, as a minimum, depends on height, operating radius, reach, and if required, ballast.

4.2.3. SAFETY

a. To ensure that mobile cranes may be used effectively and safely in fixed depot sites and improved surface handling sites, these cranes should meet the requirements of Fédération Européenne de la Manutention (FEM) V/1 or similar national requirement.

b. To signify conformance with this standard, mobile cranes of NATO nations should display the FEM plate illustrated in the FEM document. Should any crane of any country of origin for any reason other than safety not be entitled to display the FEM

plate, it will be the responsibility of the NATO nation introducing such equipment to display a plate, which will state that the criteria against which the crane has been accepted are equivalent to those in this standard.

c. Where in FEM V/1, or other equivalent national documents, minimum safety limits such as speed are left to the manufacturer; such limits are to be displayed prominently in an appropriate position.

4.3. GENERAL CHARACTERISTICS OF CATEGORY B MOBILE CRANES

Category B mobile cranes are generally referred to as rough terrain or all terrain cranes. This type of crane is almost entirely equipped with hydraulically telescoping booms and is characterized by all-wheel drive and larger off-road tires necessary to obtain the mobility for working on rough terrain. Diesel engines are the predominant power source for this type of mobile crane.

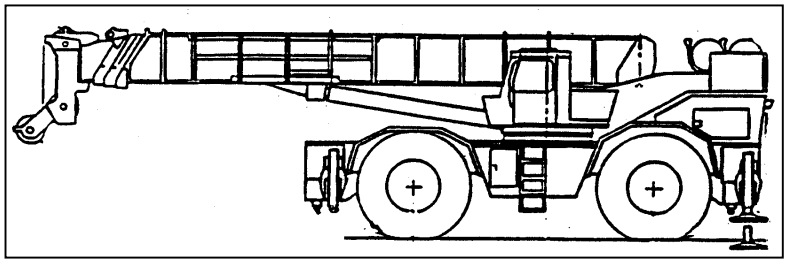

Figure 4-2: Mobile Crane, Category B

4.3.1. MINIMUM STANDARDS FOR CATEGORY B MOBILE CRANES

Category B mobile cranes are required to satisfy the dimensional and performance standards set out below to ensure that they shall be capable of effective operation in any area accessible to general purpose tactical cargo vehicles. Slinging and tie-down facilities shall be provided in accordance with STANAG 4062. Mobile cranes shall be equipped with the standard NATO 24-volt slave receptacle.

4.3.2. DIMENSIONAL CRITERIA

a.	Minimum ground clearance.	380 mm (15 in)
b.	Minimum angle of approach and departure with maximum mobile load.	30 degrees desired 23 degrees acceptable
c.	Maximum angle of peak (ramp angle) vehicle can pass over.	150 degrees desired 157 degrees acceptable
d.	Maximum overall height, in traveling condition (after removal of nonpermanent structural components).	4000 mm (157 in)

e. Maximum overall width dimension, in traveling condition, including the laden tires for cranes with the following capacities:

Up to 10 tons	2500 mm (98.5 in)
10 tons up to 20 tons	2750 mm (108.5 in)
20 tons up to 30 tons	3250 mm (128 in)

4.3.3. LONGITUDINAL STABILITY

The equipment must satisfy the requirements detailed for mobile cranes in addition to the following standards without structural failure or tipping. The following tilt platform testing shall be performed with the axis of the tilt platform at 90 degrees to the longitudinal centerline of the crane. The crane is considered to have tipped when the load on any of the wheels on the platform falls to zero.

4.3.3.1. LONGITUDINAL STABILITY STANDARDS

		Minimum Acceptable
a.	Unladen condition (traveling). Crane chassis facing down and up slope. Jib in traveling position.	16 degrees (30 %)
b.	Laden condition (traveling). Crane chassis and load facing down the gradient with the maximum mobile load as near the ground as possible and suspended at the rated reach (telescopic jibs shall be fully closed).	8 degrees (15 %)

4.3.4. LATERAL STABILITY

The crane must satisfy the requirements detailed for mobile cranes and also meet the following standards without structural failure or tipping. The axis of platform tilt is to be parallel to the longitudinal axis of the crane. When a pivoting swing axle suspension is used, align the crane on the tilting platform as depicted in the figure below:

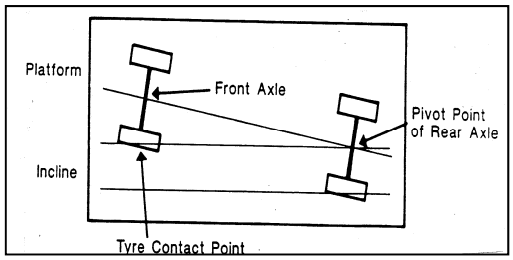

Figure 4-3: Lateral Stability

4.3.4.1. LATERAL STABILITY STANDARDS

		Minimum Acceptable
a.	Unladen condition (traveling). Crane in traveling condition.	15 degrees (25 %)
b.	Laden condition (traveling). Maximum mobile load suspended behind crane at rated outreach (the crane shall also be capable of slewing the load 45 degrees to the left and right and holding the load to ascertain that slewing locks or brakes are adequate).	5.5 degrees (10 %)
c.	Working condition (laden - boom down slope)	
	(1) Maximum safe working load suspended at the rated reach with the boom at 90 degrees to the crane's longitudinal center line.	4 degrees (8 %)
	(2) The maximum safe working load, blocked (on outriggers) at maximum outreach and boom at 90 degrees to the crane's longitudinal center line.	4 degrees (8 %)

Note: Standard operational tests of equivalent severity to those above (paragraphs a, b, and c) are suitable for determining acceptability of equipment when tilt table testing is not used.

4.3.5. GRADIENT PERFORMANCE STANDARDS

		Minimum Acceptable
a.	Unladen (on prepared surfaces), ascending and descending, facing in either direction.	22 degrees (38 %)
b.	Laden (on unprepared surfaces), with maximum mobile load suspended initially with the load facing up the slope ascend and descend, subsequently with the load down the slope ascend and descend.	6 degrees (11 %)

Note: Longitudinal stability standards should be satisfied first.

4.3.6. MOBILITY

a. The mobile crane must be capable of handling loads on unprepared rough ground and soils.

b. Mobile cranes required for beach operations or soft soil conditions must also be able to negotiate (load in traveling position) slopes of 8 degrees on loose pebbles, sand, and other beach materials. It must be able to stop, restart, and maneuver on these materials.

4.3.7. FORDING CAPABILITY

Mobile cranes should conform to the following fording requirements:

a. For beach operations or soft soil conditions: a depth of 1500 mm (60 in) minimum.

b. For other operations: a depth of 750 mm (30 in) minimum.

4.4. BRAKING PERFORMANCE

It is essential that the brakes ensure adequate and safe control of the mobile crane under all operational conditions and also meet national requirements.

4.5. GRAPHICAL SYMBOLS FOR CONTROLS

Graphical symbols for controls and displays shall be clearly marked in accordance with ISO 7296. Labels shall be easily visible to the operator and shall not be vulnerable to damage or defacement.

4.6. OPERATIONAL ENVIRONMENT

It is desirable that as a minimum, mobile crane shall be capable of starting and operating in ambient temperatures from -32 degrees Celsius (-25 degrees Fahrenheit) to 49 degrees Celsius (120 degrees Fahrenheit). As a minimum, mobile cranes shall be capable of starting and operating in ambient temperatures from -19 degrees Celsius (-2 degrees Fahrenheit) to 44 degrees Celsius (111 degrees Fahrenheit).

4.7. MANUFACTURER DATA PLATE

A manufacturer data plate[3] shall be furnished and attached permanently to the equipment in a conspicuous location. Mobile cranes shall be marked legibly and indelibly with the following minimum items:

a. Rated capacity marked in kg (lb).

b. Load chart or carrying capacity chart (lifting capacity at varying extensions).

c. Vehicle weight (empty) marked in kg (lb).

d. Overall height marked in mm (in).

[3] An example of a manufacturer data plate is presented in Annex C.

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CHAPTER 5 ISO CONTAINER HANDLERS

5.1. GENERAL

An ISO container handler is MHE, which is capable of engaging the corner fittings and/or fork pockets of 6058 mm (20 ft) ISO freight containers and the corner fittings of 12,192 mm (40 ft) ISO freight containers and capable of lifting the container from the ground or from a stack to a suitable trailer or railcar and unloading them respectively. The dimensions and ratings of ISO containers are defined in ISO 668. There are several different types of ISO container handlers. Examples of container handlers are straddle trucks, mast-type forklifts equipped with a top handler or with 2450 mm (96-inch-long) forks, reach stackers (large variable reach forklifts outfitted with a top handler), cranes equipped with a spreader bar with sufficient capacity (20 tons or greater under the spreader bar), side-load trailers, dolly sets with self-loading capability, and rear-loading trucks. While side-load trailers could be considered self-loading transporters, they are categorized as ISO container handlers in this standard. For transportability, slinging and tie-down facilities shall be provided and shall conform to STANAG 4062. Cranes equipped with a multi-leg sling with hooks capable of being attached to the corner fittings of a container are not considered container handlers. Gantry-type cranes which are utilized at port facilities for loading and unloading container ships are not within the purview of this standard.

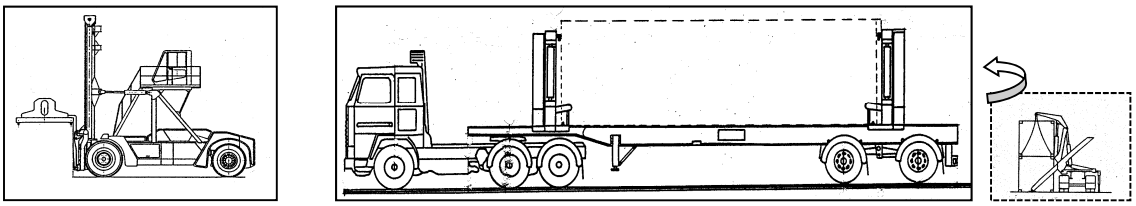

Figure 5-1: ISO Container Handlers, Category A

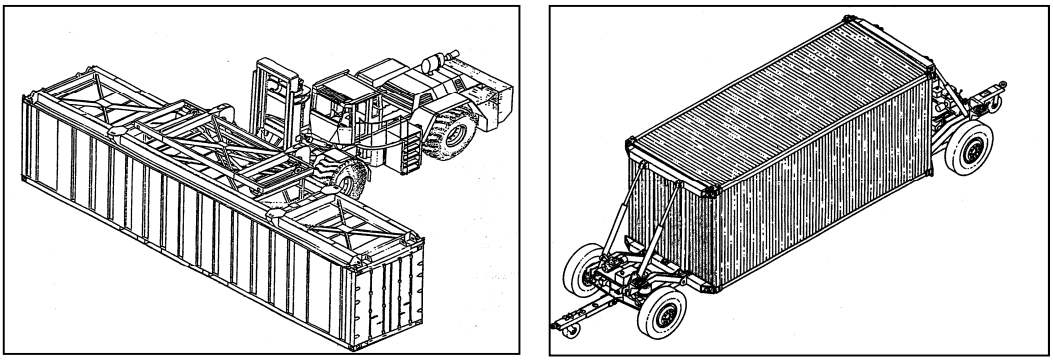

Figure 5-2: ISO Container Handlers, Category B (Loaded)

5.2. LOAD RATINGS

It is essential that the rated capacity of the container handler ensures adequate and safe operation for its intended operational conditions and meets national requirements.

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CHAPTER 6 SELF-LOADING TRANSPORTERS

6.1. GENERAL

A self-loading transporter is a truck (lorry) or semi-trailer equipped with a load handling system, which is capable of loading and unloading itself without the need for additional MHE. Self-loading transporters can be divided into three types:

a. Transporter equipped with an on-board crane.

b. Transporter equipped with self-loading forklift truck, where the forklift truck is transported by the truck or trailer and is capable of lifting itself on or off the transport vehicle using its own power.

c. Transporter equipped with a load handling system, which will self load and unload a single complete unitized load onto itself.

6.2. GENERAL CHARACTERISTICS OF SELF-LOADING TRANSPORTER EQUIPPED WITH CRANE

The mounted crane is intended to load and unload the carrying truck to which it is mounted as well as cross-load supplies to and from other transport vehicles.

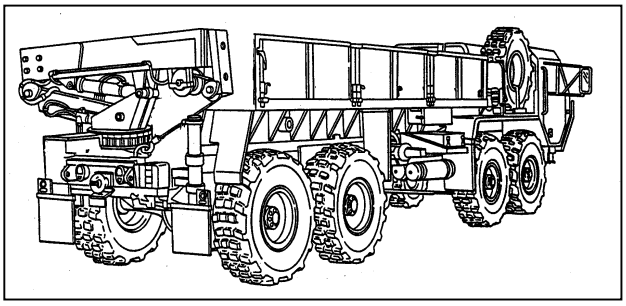

Figure 6-1: Self-Loading Transporter Equipped with Crane

6.2.1. MINIMUM STANDARDS FOR SELF-LOADING TRANSPORTER EQUIPPED WITH AN ON-BOARD CRANE

A medium or heavy-duty truck chassis equipped with a telescoping boom crane or an articulated joint crane. The crane is designed to load and unload its own transport vehicle, independent of other MHE. Also, it is to be capable of cross-loading and trans-shipping supplies on other transport vehicles. Slinging and tie-down facilities shall be provided in accordance with STANAG 4062. Transporters shall be equipped with the standard NATO 24-volt slave receptacle.

6.2.2. PERFORMANCE CRITERIA

a. The capacity and stability of the crane shall be sufficient to allow for the cross loading and trans-shipment of a load equal to or greater than 1 ton under the following conditions:

(1) Loading of the transporter's own loading space with supplies originally standing on the ground.

(2) Cross-loading and trans-shipment of supplies from load carrying vehicles positioned alongside the transporter.

(3) Cross-loading and trans-shipment of supplies from railway flatcars having approximately the same deck level.

Note: In performing the above tasks, the crane will have to handle not less than 1.2 tons at a distance of 3500 mm (138 in) from the point of rotation of the crane. The 0.2-ton increase is due to the dead weight of the handling aids required.

b. A plate, visible to the operator during operation of the crane, must indicate the permissible payload under the following conditions:

(1) Different boom lengths.

(2) Different boom angles.

(3) Different field of traverse.

(4) With and without stabilizers employed.

c. The handling aids required for cross-loading and trans-shipment by means of the loading crane are normally to be part of the basic equipment of the vehicle.

d. The field of traverse shall be such that it provides access to all parts of the vehicle load surface. If necessary, the transport vehicles are to be equipped with stabilizers to increase lateral stability.

6.2.3. SAFETY

a. Where in FEM V/1, or other equivalent national documents, minimum safety limits such as speed are left to the manufacturer, such limits are to be displayed prominently in an appropriate position.

b. There shall be switching devices for load movement limitation or visual and/or acoustical devices to prevent overloading of the crane, in accordance with national regulations.

6.2.4. GRAPHIC SYMBOLS FOR CONTROLS

Graphical symbols for controls and displays shall be clearly marked in accordance with ISO 7296. Labels shall be easily visible to the operator and shall not be vulnerable to damage or defacement.

6.2.5. OPERATIONAL ENVIRONMENT

It is desirable that crane equipped self-loading transporters shall be capable of starting and operating in ambient temperatures from -32 degrees Celsius (-25 degrees Fahrenheit) to 49 degrees Celsius (120 degrees Fahrenheit). As a minimum, crane equipped self-loading

transporters shall be capable of starting and operating in ambient temperatures from -19 degrees Celsius (-2 degrees Fahrenheit) to 44 degrees Celsius (111 degrees Fahrenheit).

6.2.6. MANUFACTURER DATA PLATE

A manufacturer data plate[4] shall be furnished and attached permanently to the equipment in a conspicuous location. The crane shall be marked legibly and indelibly with the following minimum items:

a. Rated capacity marked in kg (lb).

b. Load chart (lifting capacity at varying extensions).

c. Overall height marked in mm (in).

6.3. GENERAL CHARACTERISTICS OF SELF-LOADING TRANSPORTER EQUIPPED WITH FORKLIFT TRUCK

The forklift truck is intended to load and unload the carrying truck to which it is mounted as well as cross-load supplies to and from other transport vehicles.

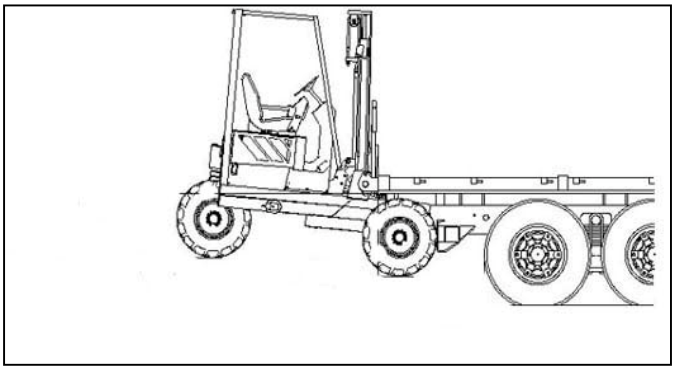

Figure 6-2: Self-Loading Transporter Equipped with Forklift

6.3.1. MINIMUM STANDARDS FOR SELF-LOADING TRANSPORTER EQUIPPED WITH A FORKLIFT

A self-loading transporter equipped with forklift consists of a self-propelled vehicle mounted forklift (SPVMF) and a medium or heavy-duty truck chassis, which may be equipped with a mounting frame for the SPVMF. The SPVMF is capable of lifting itself on or off the transport vehicle using its own power and capable of loading and unloading cargo from its own transport vehicle, independent of other MHE. Also, the SPVMF is capable of cross loading and trans-shipping supplies onto other transport vehicles and is typically designed for off-road use.

[4] An example of a manufacturer data plate is at Annex C.

6.3.2. SELF-LOADING TRANSPORTER

The self-loading transporter shall provide for transport of the SPVMF. Transport shall either be on the load carrying deck of the transporter or mounted on rear of transporter. If rear-mounted, the transporter shall be equipped with a fork-pocket mounting frame, meeting the following criteria to allow all SPVMFs to interface with the fork pockets of other nations' self-loading transport vehicles. Attempts should be made to keep the dimensions of the fork pockets as close to the required dimensions as practical in order to optimize the stability of the vehicle mounted SPVMF.

a. The inside-to-inside spacing of the pockets shall not be less than 500 mm (19.7 in) and not greater than 700 mm (27.6 in).

b. The height of the fork pockets shall not be less than 68 mm (2.67 in).

c. The width of the fork pockets shall not be less than 200 mm (7.9 in).

d. The length of the fork pocket shall allow for the insertion of a 2000 mm (78.7 in) long fork.

6.3.3. SELF-PROPELLED VEHICLE MOUNTED FORKLIFT

SPVMFs shall be capable of effective interoperability in any area accessible to general purpose tactical cargo vehicles and are required to satisfy the dimensional and performance characteristics identified below:

a. Dimensional Criteria.

(1) Minimum lift height shall not be less than 2080 mm (82 in) in order to allow the forklift to load and unload trucks and trailers that are 1980 mm (77.9 in) high.

(2) When in the transport configuration, the height of the forklift shall not exceed 2020 mm (79.5 in) measured from the bottom of the tires to the highest portion of the forklift. This allows transport vehicles to remain under 4 meters (13.12ft) while transporting the forklift.

b. SPVMF Performance Criteria.

(1) SPVMFs shall be capable of handling four-way entry pallets and POL pallets described in STANAG 2828. The rated capacity shall not be less than 1130 kg (2500 lb) at 600 mm (24 in) load centers.

(2) In order to interface with the transport vehicle's fork pockets and allow for interoperability between nations' transport vehicle, fork carriages shall have the following performance characteristics:

(a) Forks shall not be thicker than 65 mm (2.6 in).

(b) Forks shall not be wider than 170 mm (6.7 in).

(c) The carriage shall allow for the forks to have a maximum fork spread of greater than 720 mm (28.4 in) measured from the inside on one fork to the inside of the other fork.

(d) The carriage shall allow for the forks to have a minimum fork spread of less than 250 mm (10 in) measured from the inside on one fork to the inside of the other fork.

(3) SPVMF shall have the following gradient performance:

(a) Side slope. The forklift shall be capable of traversing a 23.6 degrees (40%) side slope. The forklift shall meet this without load or stabilizers deployed, and while oriented in its least stable orientation relative to the tilt axis.

(b) Longitudinal stability. The forklift shall be capable of traveling without load on a 12.7 degrees (22%) gradient. The forklift shall be in a maximum rearward tilt configuration and without stabilizers deployed. The tilt axis shall be parallel to the front axle.

(4) SPVMF shall be able to ford a minimum depth of 250 mm (10 in).

(5) SPVMF shall be equipped with FOPS.

(6) All operator controls shall be clearly marked in accordance with ISO 3287. Labels shall be easily visible to the operator and shall not be vulnerable to damage or defacement.

(7) It is desirable that SPVMFs shall be capable of starting and operating in ambient temperatures from -32 degrees Celsius (-25 degrees Fahrenheit) to 49 degrees Celsius (120 degrees Fahrenheit). As a minimum, SPVMFs shall be capable of starting and operating in ambient temperatures from -19 degrees Celsius (-2 degrees Fahrenheit) to 44 degrees Celsius (111 degrees Fahrenheit).

c. SPVMF Restraint Facilities. For the purpose of restraining the forklift to the rear of the transport vehicle, not less than one tie-down facilities shall be provided on each side of the forklift located rearward of the center of gravity of the forklifts, as far to the rear as practicable. There shall be no structure of the forklift that will interfere with the restraint of the forklift to the transport vehicle when the points of tie-down are located on the rearmost portion of the transport vehicle and are spaced as far apart as 2590 mm (102 in) and as close as 1905 mm (75 in).

d. Slinging and tie-down facilities shall be provided in accordance with STANAG 4062.

e. It is desired that SPVMFs are equipped with the standard NATO 24-volt slave receptacle.

6.3.4. MANUFACTURER DATA PLATE

A manufacturer data plate[5] shall be furnished and attached permanently to the equipment in a conspicuous location. SPVMFs shall be marked legibly and indelibly with the following minimum items:

a. Rated capacity marked in kg (lb).

b. Load center marked in mm (in).

c. Vehicle weight marked in kg (lb).

d. Overall height marked in mm (in).

6.4. GENERAL CHARACTERISTICS OF SELF-LOADING TRANSPORTER EQUIPPED WITH A UNITIZED LOAD HANDLING SYSTEM

This transporter system typically consists of a heavy truck chassis with an integral, hydraulic, load handling mechanism; demountable load carrying platforms (flatracks); and may include a system-compatible trailer. The transporter is capable of self loading and self unloading the flatracks from the ground onto the truck chassis and trailer, using the integral load handling mechanism. The flatrack interfaces shall be in accordance with STANAG 2413.

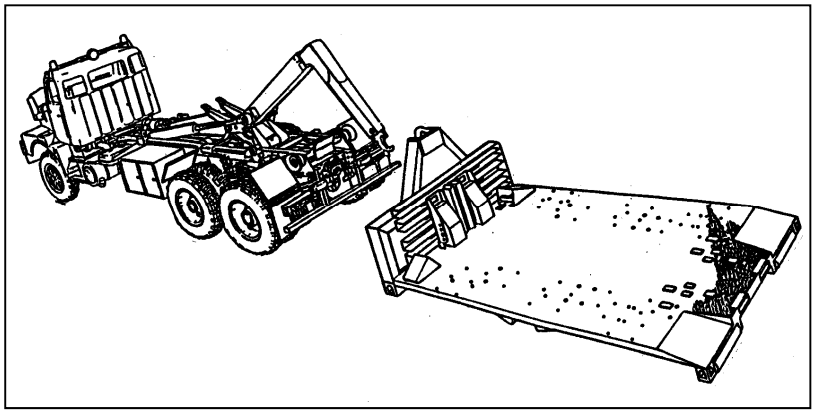

Figure 6-3: Self-Loading Transporter Equipped with Unitized Load Handling System (with Flatrack)

[5] An example of a manufacturer data plate is at Annex C.

CHAPTER 7 CARGO TRANSFER EQUIPMENT

7.1. GENERAL

Cargo transfer equipment is either mobile, self-propelled, or stationary MHE equipped with a conveyor platform used to accept and transfer loads. The purpose of transfer equipment is to receive and transfer palletized loads from one means of transport to another.

7.1.1. GENERAL CHARACTERISTICS OF MOBILE, SELF-PROPELLED CARGOTRANSFER EQUIPMENT

This type of equipment is typically used to load and unload cargo aircraft at airfields. The conveyor shall be powered and shall interface with the aircraft's cargo conveyor system. The conveyor shall be capable of handling one or more 5-ton palletized loads configured for air transport.

7.1.2. GENERAL CHARACTERISTICS OF STATIONARY CARGO TRANSFER EQUIPMENT

This type of equipment is typically used in warehousing applications for the transfer of boxed or palletized loads. The conveyors may be powered or non-powered and may have a conveying surface of rollers, skate wheels, chains, or belts.

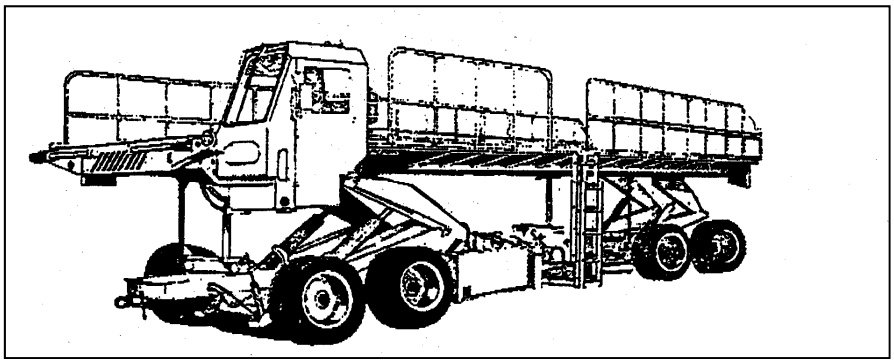

Figure 7-1: Self-propelled Cargo Transfer Equipment

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CHAPTER 8 GENERAL MATERIALS HANDLING EQUIPMENT SAFETY GUIDANCE

8.1. GENERAL

1. To ensure safe and efficient operation of MHE, the following guidelines are provided. In addition, use visual hand signals for MH operations as shown in STANAG 2284 and, if required, use a ground guide and/or slinger.

2. General instructions for safe forklift truck operations. The forklift truck in its various sizes and capacities is a basic piece of cargo-handling equipment and will be operated at all times only by licensed drivers. General forklift maneuvers and guidelines include:

a. During start-up, operators should check foot brakes and hand brakes for effective operation and check steer, lift, and lower functions. In addition, operators will wear seatbelts when operating equipment.

b. When operating forklift trucks, operators need to be aware of overhead obstructions and watch overhead clearances.

c. Always stay within the rated capacity of the forklift truck and/or equipment.

d. When maneuvering forklift trucks close to aircraft, use a ground guide/slinger/marshaller to help the driver determine safe clearances. Never operate a forklift at a speed greater than 8 kilometers per hour (5 miles per hour) around aircraft.

e. Before lifting or lowering a load, completely stop the forklift truck. Carry all loads tilted back slightly and approximately 150 mm (6 in) above the running surface on level ground, and higher on uneven surfaces. Never travel with a load tilted forward and never raise, lower, or tilt a load while the forklift truck is in motion.

f. Always face the direction that you travel. This means looking over your shoulder if you must drive in reverse. When long distances must be traveled or when bulky loads are carried, the forklift truck will be driven in reverse so the operator has a less obstructed field of vision.

g. Be sure large and irregular shape objects are securely chained to the forklift frame before being raised lowered or moved. Normally, place large irregularly shaped objects on a pallet for stability before raising or transporting them. If the load blocks your view, drive the forklift truck in reverse.

h. The forks of parked forklift trucks will be lowered flat on the ground to prevent injury to personnel working or walking in the area.

i. On parked and unattended forklift trucks, the operating levers will be in neutral, the ignition switched off, keys should be removed, and the hand brake set. This will be done whenever the forklift is unattended.

j. Lift with mast vertical or tilted slightly back, never forward.

k. Keep loaded fork tines as low as practicable while moving.

l. Operators need to be aware of and watch rear-end swinging and if necessary, use a signal guide (or slinger/marshaller). Be careful when handling long lengths of materials, lumber, and so forth.

m. Operators need to proceed slowly and cautiously around corners; watch blind corners; and signal with horn when cornering or coming to a blind spot or intersection. Always come to a full stop before changing directions. Use caution when traveling through intersections.

n. Select lower gears before descending ramps or inclines and always back down ramps slowly instead of going forward with the load in front of you.

o. Operators should avoid sudden stops or starts.

p. When operating equipment on floors, especially on rough terrain, operators need to ensure strength is adequate to support both vehicle and load.

q. Use care in double- and high-stacking of materials and/or pallet unit loads and watch for potential leaning or falling materials and/or pallet unit loads.

r. Keep load against carriage; keep load balanced laterally; and spread fork tines according to load width.

s. Lower heavy loads slowly; stop them slowly.

t. Keep clear of loading dock edges; check bridge plates between loading docks, trucks, and cars for sufficient width, strength, and security.

u. When loading or unloading road trucks or trailers, be sure vehicle brakes are set and/or wheels chocked and support vehicle body with jacks or braces if springs are weak.

v. Keep an adequate fire extinguisher available.

w. Operate equipment with adequate lighting (except if required during night operations).

x. Remove ice and snow from area before loading and unloading or make the area safe by using appropriate materials. Use extreme care when operating on loading docks that are wet and slippery.

y. Operating forklift trucks with fork extensions will change the center of balance and lessen the weight that can be safely lifted. If used, fork extensions should not be longer than 150% of the supporting fork's length (e.g., 1.83 m (72 in) for 1.22 m (48 in) long forks).

z. Do not allow passengers anywhere on the truck unless a passenger seat is fitted.

aa. Check the weight of the load before lifting.

bb. Only charge electric equipment in the designated areas, which shall be well ventilated.

3. General instructions for safe mobile crane operations. The mobile crane in its various sizes and capacities is a basic piece of cargo-handling equipment and will be operated at all times only by licensed drivers. General mobile crane maneuvers and minimum guidelines include portions of guidance outlined in paragraph 2 and the following:

a. Operators need to understand the crane's lifting capacity in order to use one safely and efficiently. While operators cannot increase capacity beyond the limit set by the manufacturer, they must take into account changes in capacity. These changes are caused by changes in the length or angle of the boom and in the resulting boom radius. Boom angles are measured in degrees, starting at zero, with the boom parallel to the ground. Boom radius is the horizontal distance between the center of rotation (the center of the turntable or the center pin) and vertical line through the center of the hook. Do not lift weights greater than the rated capacity of the crane for the boom radius you must use.

b. Operators should always check the crane and all slings, cables, chains, and hooks before starting an operation to avoid possible damage to the machine or injury to personnel.

c. Keep the crane level once motion is started. Never swing a crane rapidly because centrifugal force can get the mechanism out of control or even upset the crane.

d. Operating a mobile crane near power (electrical) lines is extremely dangerous and can cause serious injury or fatality. Keep the boom a minimum of 3.1 m (10 feet) away from power (electrical) lines, high voltage lines require increased safety clearance minimums, check with the local and/or national safety office for all regulations and guidance prior any operations and movements near power lines.

e. Put all controls in neutral before servicing a crane or making repairs or adjustments, including troubleshooting.

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ANNEX A RELATED PUBLICATIONS

A.1. GENERAL

This annex contains publications that are referred to in this document as well as others that are useful to logisticians. NATO Allied Publications (APs) and Standardization Agreements (STANAGs) are available on the NATO Standardization Office protected web site http://nso.nato.int/nso/

SHORT NAME	TITLE
STANAG 4329	NATO Standard Bar Code Symbologies – AAP-44
STANAG 1414	Guidelines to Ensure that Contractors Design and Supply New Equipment Capable of Using Standardized Fuels, Lubricants and Associated Products
STANAG 2284	Land Compendium of Hand Signals (APP-14)
STANAG 2828	Military Pallets, Packages and Containers (APP-22)
STANAG 2413	Demountable Load Carrying Platforms
STANAG 2468	Technical Aspects of the Transport of Military Materials by Railroad (AMovP-4)
STANAG 4062	Slinging and Tie-down Facilities for Lifting and Tying Down Military Equipment for Movement by Land and Sea
AAP-6	NATO Glossary of Terms and Definitions

International Organization for Standardization (ISO)

ISO 509	Pallet trucks – Principal dimensions
ISO 668	Series 1 freight containers – Classification, dimensions and Ratings
ISO 1496	Series I, freight containers – Specifications and testing
ISO 3287	Powered industrial trucks - Symbols for operator controls and other displays
ISO 7296	Cranes - Graphic symbols
ISO 22915	Industrial Trucks – Verification of Stability Part 2: Counterbalanced trucks with mast Part 13: Rough-terrain trucks with mast
ISO 15870	Powered industrial trucks - Safety signs and hazard pictorials – General principles

ANNEX B GLOSSARY OF TERMS AND DEFINITIONS

B.1 GENERAL

This annex contains terms and definitions that are used in this document for the purpose of this agreement:

boom (forklift truck): A projecting arm which will enable hollow objects to be carried without the need for pallets, stillages or bins.

boom (crane): A moveable steel arm installed on certain types of cranes or derricks to support hoisting lines that must carry loads.

crane: A machine for hoisting and lowering heavy weights.

container crane: A crane which has a horizontal boom which reaches across the width of the ship being worked. Some have the ability to transport one 40ft or two 20ft containers at a time.

container stacker/loader: A motorized container crane, road wheel mounted, for use at a container depot or dockside area.

fork extension: Metal sleeves that slide onto forks and lock in position. These extend the effective length of the forks for use with oversized uniformly distributed loads.

fork extension sleeves: Metal sleeves that slide onto standard forks and lock in position. These extend the effective length of the forks for use with abnormal sized loads.

forklift truck (FLT): A truck, on which the driver stands or sits, fitted with a mast that may be telescopic. Forks of various lengths are attached to a carriage on the mast, which can be raised and lowered within the limits of the mast design. The mast together with the forks is generally designed to tilt forwards or backwards.

forklift truck attachment: An attachment fitted to the lifting carriage of a FLT to enable non-standard loads to be lifted.

forks: horizontal tine-like projections (e.g., arms, fingers, etc.) normally suspended from a carriage, for engaging and supporting loads.

materials handling equipment (MHE): Equipment designed for moving, lifting and stacking material.

pallet truck: A truck with two elevating type forks for insertion below the top deck of a pallet. The elevating motion is achieved by mechanical leverage or hydraulic pump, to enable the load to be raised just clear of the ground for movement.

palletized unit load: Quantity of any item, packaged or unpackaged, which is arranged on a pallet in a specified manner and securely strapped or fastened thereto so that the whole is handled as a unit.

rough terrain forklift truck: A forklift truck designed specifically to operate on rough terrain.

Such trucks may have a fixed mast or some form of reach capability. They may be of the rear wheel steer, two-/four-wheel steer or articulated steer type.

side shift: A type of fork truck carriage designed to provide limited transverse movement of the load to assist in accurate positioning.

standard forks: Forks that usually have a taper to the tip. The upper lifting surface is horizontal for lifting palletised or other suitable loads.

standard load center: A standard load center distance is the distance from the center of gravity of the load measured horizontally to the front face of the fork arm shank and vertically to the upper face of the fork arm blade.

stillage: A box like container for transporting goods. Styles can vary.

ANNEX C MANUFACTURER DATA PLATE

This annex presents an example of a manufacturer data plate[6] with several data fields. A manufacturer data plate shall be furnished and attached permanently to the equipment in a conspicuous location. The manufacturer data plate shall be marked legibly and indelibly.

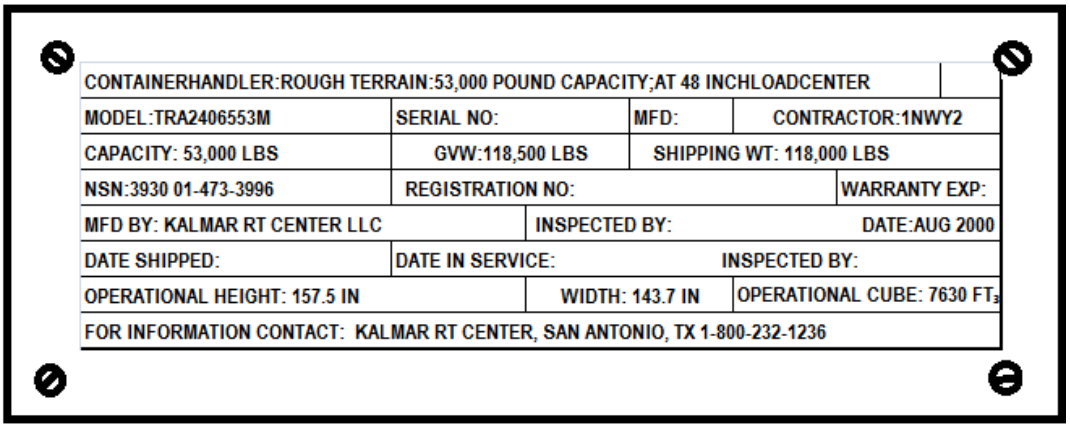

Figure 2-6: Example of a manufacturer data plate with several data fields.

[6] Reference STANAG 4062 for information on a shipping data plate.

ANNEX D LIST OF ABBREVIATIONS

D.1. GENERAL

This annex contains abbreviations used in this document.

ABBREVIATION	FULL MEANING
AP	Allied Publication
FEM	Fédération Européenne de la Manutention
FLT	Forklift truck
FOPS	Falling Object Protection Structure
ISO	International Organization of Standardization
LOTS	Logistics over the Shore
MHE	Materials Handling Equipment
NM	Nautical mile
POL	Petroleum, oil, and lubricants
ROPS	Roll-Over Protective Structure
SPVMF	Self-propelled Vehicle Mounted Forklift
STANAG	Standardization Agreement

ANNEX E EVALUATION DATA SHEET

1. OBJECTIVE. The objective of the evaluation is to assess conformance of MHE and materials to APP-23 requirements and to serve as a guide to nations in determining compliance to APP-23 requirements.

2. EVALUATION COURSE.

   a. Category A MHE. Roadway or prepared surface.

   b. Category B MHE. Rough terrain.

3. FORKLIFT TRUCKS.

   a. Forklift Trucks (FLTs) Characteristics.

      (1) Type FLT/Category (e.g., counter balance, reach, rough terrain, etc.):

      (2) Lift capacity and load center (kg/mm or lb/in):

      (3) Manufacturer/model:

      (4) National ownership of equipment:

   b. Criteria.

   Note: Basic criteria listed below is applicable to specific types of FLTs. The requirement taken from APP-23 is shown in parenthesis.

   c. Category A, Warehouse Operation.
   Result/Measurement

      (1) Lift height (top face of fork to ground).

      (FLTs 2 to 5 tons, 3660 mm (144 in) or greater) _____

      (2) Maximum overall height of FLT (mast lowered).

      (FLTs 2 to 5 tons, 2600 mm (104 in)) _____

      (3) Minimum free lift (maximum height of forks from

      ground before mast height increased).

      (FLTs 2 to 5 tons, 150 mm (6 in)) _____

   d. Railcar Operation.

      (1) Maximum overall height (with mast lowered, overhead guard may be removed, 1800 mm (72 in) _____

EVALUATION DATA SHEET (continued)

(2) Minimum free lift (see above, 600 mm (24 in)) _____

(3) Minimum lift height of forks 3660 mm (144 in) or greater) _____

e. Category B, Rough Terrain.

(1) Minimum ground clearance.

(a) FLTs 2 tons or less, 250 mm (10 in). _____

(b) FLTs greater than 2 tons, 300 mm (12 in). _____

(2) Minimum lift height.

(a) FLTs 2 tons or less, 2134 mm (84 in). _____

(b) FLTs greater than 2 to 5 tons, 3660 mm (144 in). _____

(3) List lessons-learned.

_____
_____
_____
_____
_____
_____

4. CRANES.

a. Crane Characteristics.

(1) Type Crane/Category:

(2) Lift capacity (kg/mm or lb/in):

(3) Manufacturer/model:

(4) National ownership of equipment:

b. Equipment. Each participating nation shall provide an operator and one type of crane listed in STANAG 2829 to be tested. Types of cranes tested will depend upon availability of MHE at the exercise site. Measuring equipment shall consist of a 10-m (25-ft) measuring tape.

c. Procedure(s). Test procedures are indicated on individual test data sheets.

d. Criteria.

EVALUATION DATA SHEET (continued)

Note: Basic criteria listed below are applicable to specific types of cranes. The requirement taken from APP-23 is shown in parenthesis.

e. Category A, Truck Mounted.

Result/Measurement

(1) Working radius, 3050 mm (120 in) jib longitudinal. _____

(2) FEM plate attached to crane. YES NO
(Signifies conformance to APP-23 and/or other specification plate equal to or greater than FEM specifications (or similar national requirements)).

f. Category B, Rough Terrain.

Result/Measurement

(1) Minimum ground clearance (380 mm (15 in)). _____

(2) Maximum overall height (traveling condition after removal of nonpermanent structural components, 4000 mm (157 in)). _____

(3) Maximum overall width (taking into account the bulge of tires due to the load). _____

(a) Up to 10 tons, 2500 mm (98.5 in). _____

(b) Greater than 10 to 20 tons, 2750 mm (108.5 in). _____

(c) Greater than 20 to 30 tons, 3250 mm (128 in). _____

(4) Mobility. The crane must be capable of handling loads on unprepared rough ground or soil.
YES NO

(5) Cranes used for beach operations or soft soil conditions must be able to negotiate (load in traveling position) slopes of 8 degrees on loose pebbles and beach materials, and stop, restart and maneuver on these materials.
YES NO

(6) Fording capability.

(a) Beach operations or soft soil conditions, 750 mm (30 in) minimum fording depth).
_____

EVALUATION DATA SHEET (continued)

(b) Other operations, 750 mm (30 in) minimum fording depth).

_____

5. List lessons-learned: This section is provided to identify interoperability features not currently addressed within APP-23.

_____
_____
_____
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