NATO STANDARD

APP-25

MATERIALS HANDLING IN THE FIELD

Edition B, Version 1
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NORTH ATLANTIC TREATY ORGANIZATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

[Date]

1. The enclosed Allied Procedural Publication APP-25, Edition B, Version 1, MATERIALS HANDLING IN THE FIELD, which has been approved by the nations in the Military Committee Land Standardization Board (MCLSB), is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 2827.

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CHAPTER	RECORD OF RESERVATION BY NATIONS
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RECORD OF SPECIFIC RESERVATIONS

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CHAPTER 1 INTRODUCTION

1.1. REFERENCES

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

1.2. AIM

The aim of this agreement is to provide for efficient and functional materials handling in the field by NATO forces in both peace and wartime.

1.3. AGREEMENT

Participating nations agree to adopt the general principles for the trans-shipment of military material forward of the corps rear boundary.

1.4. TERMS AND DEFINITIONS

Terms and Definitions that are used in this document can be found at Annex D.

1.5. GENERAL

The general principles do not apply to the operation of depots and static (non-field) supply facilities. The agreement contains information for facilitating co-operation between NATO forces in the fields of transportation, trans-shipment handling and dumps of military material. Participating nations will update the information required by the dedicated Standard Related Document (SRD) annually by 30 November and will send the updated information to the Custodian. (Negative replies are required).

1.6. DETAILS OF THE AGREEMENT

PRINCIPLES OF TRANS-SHIPMENT

a. Supplies are packaged so as to facilitate their delivery and to ensure their protection. To facilitate their transportation and handling at trans-shipment points, packaged supply items should be combined into unit loads. Any unit load are to be packed in accordance with STANAG 4280, STANAG 4281, and the current Cargo Transport Unit (CTU) Code.

b. Supplies are transported and handled as palletized unit loads, containerized unit loads, non-palletized unit loads and bulky goods.

c. In order to enable the handling and transportation of supplies in the various areas of the corps, the division and the brigade, the loads have to be classified.

d. Unit load classifications are based on the assumption that load weights and dimensions are essential for the handling and transportation of supplies. For details: see the dedicated Standard Related Document (SRD).

e. The supplying nation will load the vehicle of the recipient. Thereafter, the recipient will be responsible for handling and movement including the provision of the restraints required. When necessary, assistance for handling, transport and restraint may be requested from the supplying nation.

f. Principles for the organization of trans-shipment points are given in chapter 2 for information.

MATERIALS HANDLING EQUIPMENT (MHE) AND HANDLING CAPABILITIES

g. The characteristics of MHE are stated in STANAG 2829 and STANAG 2830.

h. The national capabilities which are readily available for routine handling in corps, division and brigade areas as classified in paragraph 9 are listed in the dedicated Standard Related Document (SRD).

i. As a general guideline, a formula for approximating the number of MHE (e.g., forklift trucks, container handlers, etc.) for field requirements is in chapter 3. Efficient trans-shipment methods are shown in chapter 4 and 5. Methods of how to sling NATO- and EURO-pallets are shown in chapter 6.

TRANSPORT VEHICLES

j. The national capabilities which are readily available for transporting supplies as classified in paragraph 9 are listed for information in the dedicated Standard Related Document (SRD).

1.7 IMPLEMENTATION

This STANAG will be considered to have been implemented when a nation has issued the necessary orders / instructions to the forces concerned, putting the principles detailed in this agreement into effect.

CHAPTER 2 PRINCIPLES FOR THE ORGANIZATION OF TRANS-SHIPMENT POINTS

2.1. GENERAL

Trans-shipment points (AAP-6) are required in the chain of supply wherever it is necessary to transfer material between vehicles for example:

a. From one form of transport to another (e.g., air to land, water to land, water to rail, rail to land, low mobility to higher mobility trucks, etc.).

b. At supply and distribution points.

c. At storage areas in the field, i.e., dumps.

Note: Some battlefield, distribution, and velocity management concepts emphasize minimizing field storage, dumps, and stockage by applying efficiencies in order-ship time, just-in-time delivery, and visibility of assets for cross-leveling.

2.2. FACTORS

The following factors have to be considered before establishing a trans-shipment point:

a. Mission: This dictates location, size, resources and time available, transport facilities and duration.

b. Terrain: Thorough reconnaissance will result in the selection of the optimum:

(1) Access routes to and from the supply routes including both report points and vehicle waiting areas.

(2) Sites for commodity dumps (or vehicle positions when stocks are to be held on wheels) taking into account requirements for camouflage and local defense.

Reconfiguration of loads that need to be broken down for various consignees and/or assembly of tactical ammunition loads.

(3) Internal routes for trucks, materials handling equipment and personnel. The internal routes for trucks should allow one-way traffic.

(4) Location for the command post of headquarters and the adjacent stock record center.

(5) Use of the communication facilities available.

(6) Administrative area.

2.3. PRINCIPLES

The application of military principles to the organization of trans-shipment points is considered below:

a. Command and Control which includes:

(1) Simple but competent organization.

(2) Dynamic command.

(3) Communications both internal and with its higher HQ, and with transport and other supply facilities.

b. Maintenance of the aim: This assures the requirements of the mission are met at all times.

c. Flexibility or Foresight: This includes the need to be ready to meet exceptional demands or situation.

d. Economy: The use of the minimum of resources (e.g. personnel, mechanical handling, transport, engineers, etc.) required to carry out the mission. It follows that such resources must be employed flexibly to meet the requirements of the time.

e. Security: This includes both concealment and local defense.

f. Administration: Proper care of both personnel and mechanical equipment.

g. Co-operation: With transport units and, for local defense, with any neighboring units.

CHAPTER 3 COMPUTING MATERIALS HANDLING EQUIPMENT REQUIREMENTS

3.1. FACTORS

Several factors must be considered in determining the number of pieces of equipment to do a particular job. The first is the volume (e.g., pallet loads, trailer trains, carloads, etc). The second is the number of units of the volume carried each trip (e.g. pieces, pounds, pallets, etc.). The third is the average time used to accomplish a round trip for the equipment. The fourth factor is the time allotted to do the job.

3.2. FORMULA

As a general guideline, the following formula can be used to make MHE requirements computation:

$$R = V \div C \times T \div AT$$

Explanation:

V	=	Volume or size of the operation to be performed
C	=	Units of volume carried per trip (pieces, pounds, etc.) by equipment
T	=	Average expended time to accomplish a complete equipment trip cycle
AT	=	Allotted time to do the job
R	=	Equipment requirement

3.3. EXAMPLE USE OF THE FORMULA

a. Storage operations require 48 pallet loads of supplies to be relocated a distance of 250 meters. One round trip takes 5 minutes, and 2 hours is the time allotted.
Two pallets are carried each trip.
R = 48 pallets ÷ 2 pallets x 5 minutes ÷ 120 minutes // R = 1 forklift truck

b. In the same operation, a requirement exists to move 192 pallets the same distance in the same time frame.
R = 192 pallets ÷ 2 pallets x 5 minutes ÷ 120 minutes // R = 4 forklift trucks

c. A requirement exists to relocate 4064 pallet loads a distance of 5000 meters. Time allotted is 3 days. Since the distance is too great for forklift truck operations only, trucks are required. One truck carries 8 pallets in a 20 minutes round trip cycle. It takes five minutes for one forklift truck to load a truck and eight minutes to unload a truck.

Remarks:

For the following calculation the duty time for trucks is allotted with 8 hrs/day, means:
AT = 8 hrs/working day x 3 days // AT = 24 hrs.

Step 1: Computation pieces of equipment required:
R = 4064 pallets ÷ 8 pallets/truck x 0.33 hrs (20min) ÷ 24 hrs = 7 trucks

Step 2: Computation number of forklift trucks for loading:
R = 7 trucks ÷ 1 truck x 5 minutes ÷ 20 minutes = 2 forklift trucks for loading

Step 3: Computation number of forklift trucks for unloading:
R = 7 trucks ÷1 truck x 8 minutes ÷20 minutes = 3 forklift trucks for unloading

Result:
The entire operation will require 7 trucks, 5 forklift trucks to complete the job in three days (8 hrs/working day).

16 hrs/working day (AT = 16 hrs/day x 3 days // AT = 48 hrs):
If the duty time for trucks is allotted with 16 hrs/day the results are:
Step 1: R = 4064 pallets ÷ 8 pallets/truck x 0.33 hrs (20min) ÷ 48 hrs = 4 trucks
Step 2: R = 4 trucks ÷ 1 truck x 5 minutes ÷ 20 minutes = 1 forklift truck loading
Step 3: R = 4 trucks ÷ 1 truck x 8 minutes ÷ 20 minutes = 2 forklift trucks unloading

Result:
The entire operation will require 4 trucks, 3 forklift trucks to complete the job in three days (16 hrs/working day).

24 hrs/working day (AT = 24 hrs/day x 3 days // AT = 72 hrs):
If the duty time for trucks is allotted with 24 hrs/day the results are:
Step 1: R = 4064 pallets ÷ 8 pallets/truck x 0.33 hrs (20min) ÷ 72 hrs = 3 trucks
Step 2: R = 3 trucks ÷ 1 truck x 5 minutes ÷ 20 minutes = 1 forklift truck loading
Step 3: R = 3 trucks ÷ 1 truck x 8 minutes ÷ 20 minutes = 2 forklift trucks unloading

Result:
The entire operation will require 3 trucks, 3 forklift trucks to complete the job in three days (24 hrs/working day)

CHAPTER 4 STORAGE OF SUPPLIES IN THE FIELD AND EFFICIENT TRANS-SHIPMENT

4.1. PROCEDURES

4.1.1. Supplies are to be stored in the field in such a way that they remain serviceable, are easily accessible, and can be trans-shipped quickly and at any time. If required, they are to be protected against weather influence and ground moisture by means of tarpaulins or footings. Economical trans-shipment requires that the supplies can always be located and collected quickly and without problems.

4.1.2. Storage spaces should have a level and solid ground. Easily flammable vegetation such as dry scrub, underbrush, or grass should be removed.

4.1.3. Environmental damage such as contamination of the soil and of waters should be avoided when storing and handling supplies.

Supplies should be protected by camouflage against enemy reconnaissance. If required, storage spaces in the field should be levelled so that the fork tines of materials handling equipment can safely be guided under pallets or packages. International and national laws, regulations and orders concerning the storage of ammunition and hazardous goods are also binding and to be complied with in the case of field storage. This applies in particular to compliance with safety regulations and quantity-safety distances.

4.2. STORAGE OF BULK SUPPLIES / PALLETS AND PACKAGES

4.2.1. Palletized and packaged bulk supplies should be stored on dumps in stacks.

a The number of stacks depends on the
- type of supplies,
- maximum permissible quantity per dump in the case of hazardous goods,
- condition of the terrain, and
- handling requirements.

b. The transport vehicles or demounted flatracks detached for flexible staging are considered as stacks.

4.2.2 In the area of the dumps trans-shipment points are to be provided for. Trans-shipment points are to be established too in cases where the trans-shipment (e.g. from one vehicle to another vehicle) on the dump is impossible.

4.2.3. When erecting stacks, care should be taken to ensure that the storage space is used to its maximum and that the pallets and packages can be put down and taken up again without any problems.

4.2.4. Pallets and packages can be stored simultaneously next to each other, one behind the other and one on top of the other. Important for the layout is the number of pallets or packages the available MHE can handle in one cycle.

4.2.5. Pallets can be stacked as:

- individual pallets,
- pairs of pallets,
- double pallets, and
- pairs of double pallets.

4.2.6. With their face or their side to the materials handling equipment they are put down in the way they will presumably be loaded (along the travel direction or at right angles to the travel direction). If necessary, the pallets must be rotated prior to loading.

4.3. POSSIBLE STORAGE AND LIFTING OF PALLETS

4.3.1. The height of a stack depends on the:

- load capacity of the pallets or packages,
- the load capacity of the supply item and its packaging,
- the type of palletisation or packaging of the supply item, and
- the bearing strength of the ground.

4.3.2. The size of the stack is determined by the:

- type of the supply item and the packaging,
- available storage space, and
- the type of stack.

4.3.3. As a rule, most supply items should be stacked as pairs of pallets or pairs of double pallets to enable economical trans-shipment.
These form:

(a) Row stacks,
(b) Double row stacks,
(c) In-depth stacks,
(d) Offset stacks, and
(e) Dispersed stacks.

4.3.4. In the case of row stacks (Figure 1) the pallets are placed in pairs in a row side by side with a clearance of minimum 20 cm (8 in). Row stacks are especially suited for narrow, stretched out storage spaces, e.g. along roadsides.

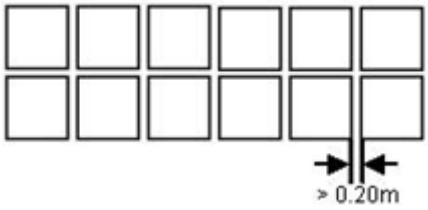


Figure 4-1: Row stack

4.3.5. To form a double row stack (Figure 2), two rows of pallets are placed on the ground one behind the other. Minimum 1 m (3.3 ft) clearance should be kept between the rows so that, if a crane is used, the hoist medium can be slung at the rear.

For the double row stack a storage space of approximately 6 m (19.7 ft) in depth is required.

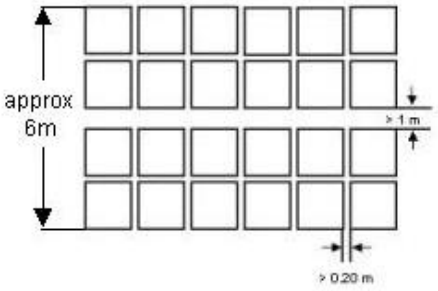


Figure 4-2: Double row stack

4.3.6. The in-depth stack (Figure 3) consists of three or more pallet rows placed one behind the other with minimum 1 meter (3.3 ft) clearance between the rows so that, if a crane is used, the hoist medium can be slung.

The in-depth stack enables the use of storage spaces which have only a narrow access towards the trans-shipment site.

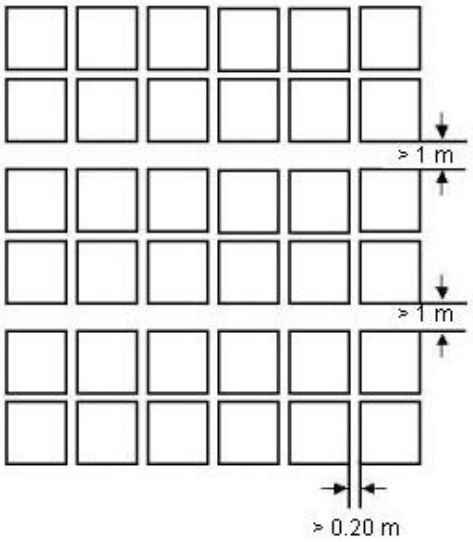


Figure 4-3: In depth-stack

4.3.7. In the case of offset stacks (Figure 4) the pallets are placed along a practicable route in pairs so that the direction of the pickup forms an angle of approximately 30o to the direction of the route.

Offset stacks are used in locations where narrow lanes or riding cuts are to be used for storage which is too narrow for trans-shipment but wide enough for the storage of pallets.

Place of trans-shipment

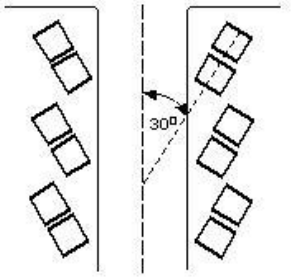


Figure 4-4: Offset stack

4.3.8. Dispersed stacks (Figure 5) are to be erected if another type of stacks is out of the question due to ground conditions or vegetation.

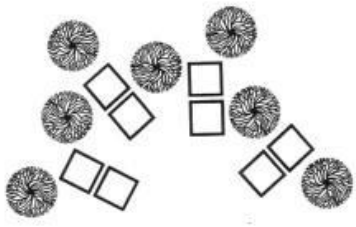


Figure 4-5: Dispersed stack

4.3.9. If the maximum quantity of hazardous goods permissible for the dump is to be concentrated in one stack the storage of pallets – depending on the type of stack – requires the following area which during reconnaissance may serve as guide:

- ammunition (example pallet weight 1000 kg / 2005 lb)		
+ in row stack (7 pairs of pallets)		approximately 10 m x 2 m (width x depth),
+ in double row stack		
(1 x 4 and	1 x 3 pairs of pallets)	approximately 6 m x 5 m,
+ in in-depth stack		
(1 x 3 and	2 x 2 pairs of pallets)	approximately 4 m x 8 m,

- palletised fuel	
+ in row stack	
(18 pairs of double pallets)	approximately 25 m x 2 m,
+ in double row stack	
(2 x 9 pairs of double pallets)	approximately 13 m x 5 m,
+ in in-depth-stack	
(3 x 6 pairs of double pallets)	approximately 9 m x 8 m,
+ in in-depth stack	
(2 x 5 and 2 x 4 pairs of double pallets)	approximately 7 m x 11 m.

4.4. TRANS-SHIPMENT OF PALLETIZED AND PACKAGED SUPPLIES

4.4.1. For the trans-shipment of palletized and packaged supplies in the field general-purpose equipment such as field handling equipment, swing loaders, or forklift trucks and lifting devices such as ruck-mounted loading cranes or cranes are used.

4.4.2. As a forklift the general-purpose equipment is the most simple, effective and safe means for the trans-shipment of palletised or packaged supplies at day or night. As a crane – with fixed or swivelling hoisting device – it is used if the supplies cannot be picked up with fork tines or when no other crane is available.

4.4.3. With the truck-mounted loading crane the crew can load or unload their own vehicle or other transport vehicles.

The crane is to be used for the trans-shipment of loads the weight of which exceeds the weightlifting capacity of general-purpose equipment or loading cranes, if on-site conditions require it, or general-purpose equipment is not available.

4.4.4. The following trans-shipment methods – named after their movement characteristics are possible:

- Cross method,
- W method,
- V method,
- Swivel method
- Crane method.

Each trans-shipment method is explained in Annex G.

4.4.5. The manager of the trans-shipment point determines the trans-shipment method to be used. The following applies to all methods:

- The available equipment is prepared for the task, the hoisting means are on site as needed.

- The general-purpose equipment is prepared as forklift or crane, the tines are equipped with extensions, if required; the fork tines width is adjusted to the pallet or package entry width.

- The transport vehicles (with or without tarpaulin and bow structure) are prepared for loading or unloading, i.e. the canvas covers have been stowed away or rolled up, stanchions, side boards and poles have been removed, drop sides have been folded back, and available cargo tie down equipment has been prepared.

- The crews of the transport vehicles support the trans-shipment; if required, additional military personnel of the issuing or receiving unit can be detailed.

4.5. EFFICIENT TRANS-SHIPMENT METHODS

4.5.1. Materials handling trans-shipment procedures with the forklift truck used for trans-shipment of palletised or packaged supply items under field conditions.

Advantages:
The load capacity and length of the fork tines enable simultaneous trans-shipment of 2 loaded pallets in one work step. Simultaneous vehicle movements, lifting, lowering or swivelling of the load will be possible.

Disadvantages:
Only head-on pallet (pallet pair) entry with the fork tines for the purpose of lifting and unloading of pallets, i.e. the forklift truck must be at a right angle to the stack or the means of transport during pallet lifting and unloading. For the required vehicle movements of the forklift truck, adequately sized loading points will be necessary.

4.5.2. Trans-shipment using a forklift truck equipped as a crane. The loading of trucks by means of forklift truck used as crane is always carried out front to back. Unloading is carried out in reverse order. Swivelling over the truck cab is prohibited.

Advantages:

- Due to swivelling, fewer vehicle movements are required, resulting in low space requirements for loading points. This is particularly important in case of narrow stack roads, loading points restricted by trees, railroad ramps, etc.
- Little driving and steering movements (mostly forward/backward driving) prevents the soil from being churned, which is especially important in the case of soft soil and during wet weather.
- Cranes allow for pallet pick up and placement even at rough terrain dumps.
- Trans-shipment from trucks is carried out without significant vehicle movements.

Disadvantages:
Personnel will be required to sling the pallets to the lifting/loading gear.

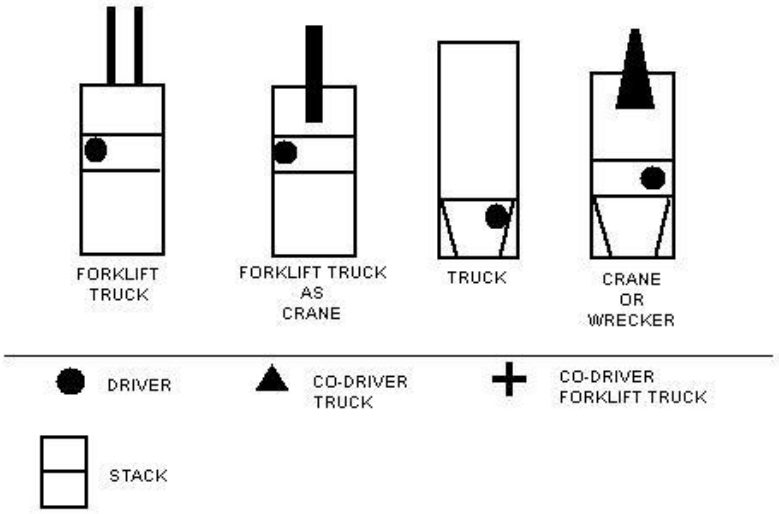
CHAPTER 5 EXEMPLARY PERSONATED TRANS-SHIPMENT METHODS

The trans-shipment methods:

- Cross method,
- W method,
- V method,
- Swivel method,
- Crane method

are exemplary personated.

In Chapter 5 the following signs and symbols are used:



5.1. THE CROSS METHOD

5.1.1. Characteristics:

Forklift trucks interact through simultaneous or alternating vehicle movements during trans-shipment. These vehicle movements will form a cross. Use with the following types of stacks:

- Row stacks.
- Double row stacks.
- Deep stacks (exception).
- Railroad freight cars.

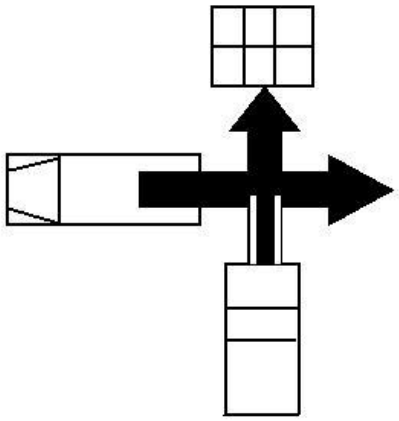


Figure 5-1: Cross method

Equipment required: Forklift truck equipped with fork tines.

Personnel required: Forklift truck driver and co-driver, truck driver and co-driver.

Handling capacity: Loading or unloading of a 5-t-truck with
3 pallet pairs (one- or two-layered) = approx. 3 to 5 minutes.
Loading or unloading of a 10-t-truck with
5 pallet pairs (one- or two-layered) = approx. 6 to 10 minutes.

Advantages:
- Minimum personnel requirements.
- Little time required.
- Simple forward/backward vehicle movements.
- Little steering movements of the forklift truck.

Disadvantages: The loading point must have a great depth to enable forklift truck vehicle movements (approx. 12 to 15 m, see Figure 6).
If the stacks are located in the immediate vicinity of the stack road, the forklift truck will always cross the lane of the through traffic during trans-shipment.

5.1.2. Work process of the Cross Method

Initial position
In initial position the forklift truck stands opposite the 1st pallet pair to be loaded, clear of the truck lane.

Step 1:
Upon hand signal of its guide (co-driver), the truck drives up alongside the stack with a 0.5 m clearance, leaving a 1 m (3.3 ft) distance between the rear panel of the truck and the forklift truck lane. (Figure 5-2)

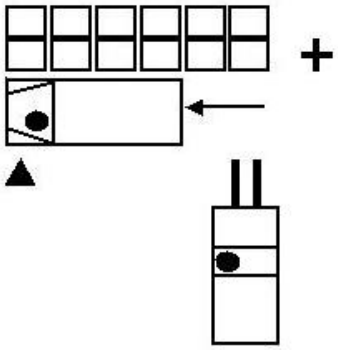


Figure 5-2

Step 2:
Upon hand signal of its guide (co-driver), the forklift truck moves forward, picking up with its fork tines the 1st pallet pair (one- or two-layered). (Figure 5-3)

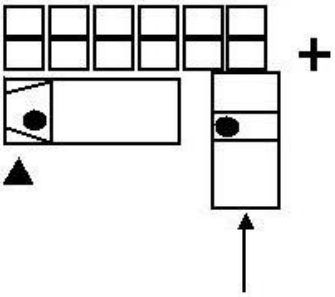


Figure 5-3

Step 3:
With its load, the forklift truck moves backward to a point in its lane where the load on the fork tines is located above the centre of the truck lane. (Figure 5-4)

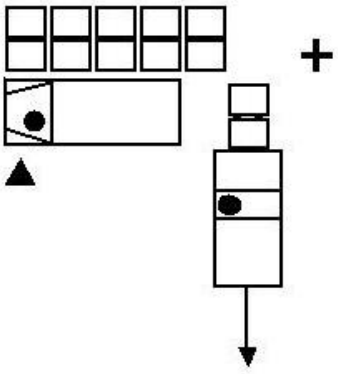


Figure 5-4

During this backward movement, the load will be lifted approximately 10 cm (4 in) above the load platform of the truck.

Step 4:
Upon hand signal of its guide, the truck moves backward in its lane under the loaded fork tines of the forklift truck to a point where the pallets still have about 10 cm (4 in) clearance to the front panel of the truck. The forklift truck and truck guides will work together. (Figure 5-5)

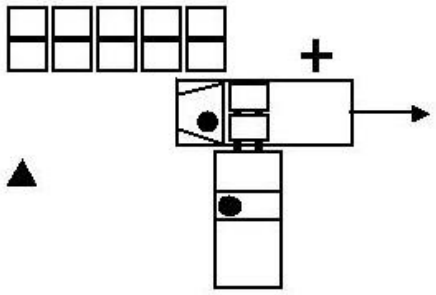


Figure 5-5

Step 5:
The forklift truck unloads the pallets on the load platform of the truck and then moves backward to a point where the fork tines are free. This concludes the first loading cycle. For further loading, the truck– as in Step 1 – moves forward in its lane so that the forklift truck is able to pick up the next pallets. Steps 3 thru 5 will be repeated accordingly. Unloading the truck by means of the cross procedure will be carried out in reverse order.

5.2. THE “W“ PROCEDURE

5.2.1. Characteristics:

The truck and the forklift truck cooperate during trans-shipment through simultaneous or alternating vehicle movements. The vehicle movements of the forklift truck will form a stylised "W". Used for exclusively "staggered stacks" located in minor roads (paths) or corridors leading up to the stack road.

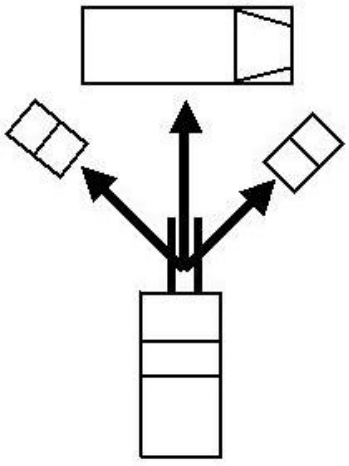


Figure 5-6: „W“ procedure

Equipment required:	Forklift truck equipped with fork tines.
Personnel required:	Forklift truck driver and co-driver, truck driver and co-driver.
Handling capacity:	Loading or unloading of a 5-t-truck with 3 pallet pairs (one- or two-layered) about 6 to 8 minutes. Loading or unloading of a 10-t-truck with 5 pallet pairs (one- or two-layered) about 10 to12 minutes.
Advantages:	- As the stack road is only used by the truck, through-traffic will be possible. - Minimum personnel required. - Minimum time required. - Mainly simple forward/backward movements of the forklift truck, little steering movements.
Disadvantages:	"Staggered stacks" will require more space than row or double row stacks.

5.2.2. Work process of the “W” procedure

Initial position

When trans-loading palletized supply items from "staggered stacks" to trucks, the pallets located at the end of the stack are handled first.The forklift truck stands in initial position at a point in the minor road leading up to the stack road where it can easily pick up with its fork tines the pallet pairs placed at an angle of about 30 degrees to the centre axis.

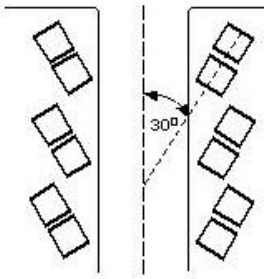


Figure 5-7: Initial position

Step 1:
Upon hand signal of its guide (co-driver), the truck drives up to a point at the junction of the minor road where the forward third of its load platform is level with the centre line of the minor road (Figure 10) and where it does not obstruct the through traffic of the stack road during trans-shipment, if possible.

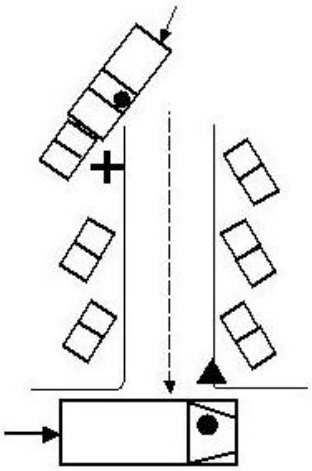


Figure 5-8

Step 2:
Simultaneously, upon hand signal of its guide, the forklift truck picks up the 1st pallet pair (one- or two-layered) with the fork tines and advances along the centre line of the minor road towards the truck to a point where it can unload the pallets on the load platform of the truck at a distance of 10 cm (4 in) from the front panel. During the drive, the fork tines together with the load will be lifted to the required height (about 10 cm / 4 in) above the height of the load platform). (Figure 5-9)

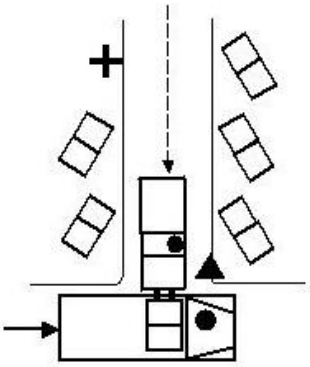


Figure 5-9

Step 3:
After unloading the pallets on the load platform of the truck, the forklift truck moves backward on the centre line of the minor road to pick up the next pallet pair. (Figure 5-10)

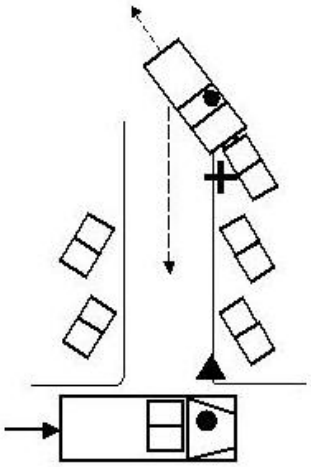


Figure 5-10

Step 4:
While the forklift truck picks up the next pallet pair (one- or two-layered) and advances towards the truck along the centre line of the minor road (Step 1), the truck advances on the stack road by 1.5 m (approx. 4.7 ft) (about pallet width) so that the forklift truck will be able to unload the next pallets onto its load platform. (Figure 5-11)
Further loading of the truck will be carried out by repeating work steps 1 thru 3.
For the purpose of trans-shipment from trucks to stacks (unloading of trucks), the work steps are carried out accordingly in reverse order.

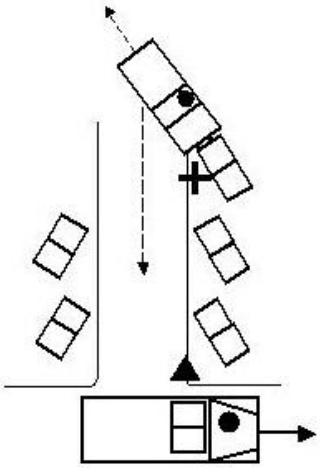


Figure 5-11

5.3. THE „V“ PROCEDURE

5.3.1. Characteristics:

The truck moves backward towards the stack (e.g. in a blind alley). If possible, the truck should be located at an angle of about 45 degrees to the stack. All vehicle movements required

for trans-shipment are carried out by the forklift truck only. They will form a stylised "V". Use with the following types of stacks:

- Row stacks.
- Double row stacks.
- Deep stacks.
- Railroad freight cars.

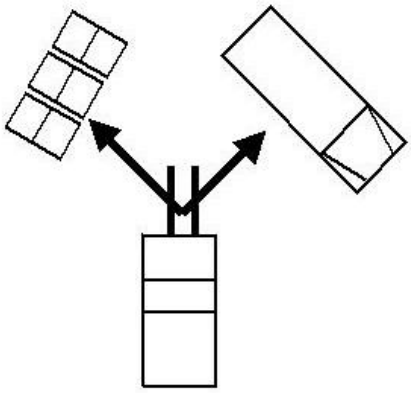


Figure 5-12: “V” procedure

Equipment required:		Forklift truck equipped with fork tines.
Personnel required:		Forklift truck driver and guide (co-driver), truck driver and guide (co-driver).
Handling capacity:		Loading or unloading of a 5-t-truck with 3 pallet pairs (one- or two-layered) about 5 minutes. Loading or unloading of a 10-t-truck with 5 pallet pairs (one- or two-layered) about 10 minutes.
Advantages:	-	Allows for efficient trans-shipment even at constricted (narrow) loading points.
	-	Minimum personnel required.
	-	Minimum time required.
Disadvantages:		Soft soil will be churned up by the steering movements of the forklift truck (curves).

5.3.2. Work process of the “V” procedure

Initial position

In initial position the forklift truck stands opposite the 1st pallet pair to be loaded, clear of the truck lane.

Step 1:
Upon hand signal of its guide (co-driver), the truck moves backward closely to the stack so that its back panel is at an angle of about 45 degrees to the stack, if possible. (Figure 14) The forklift truck advances and, upon hand signal of its guide, picks up the pallet pair (one- or two-layered) closest to the truck.

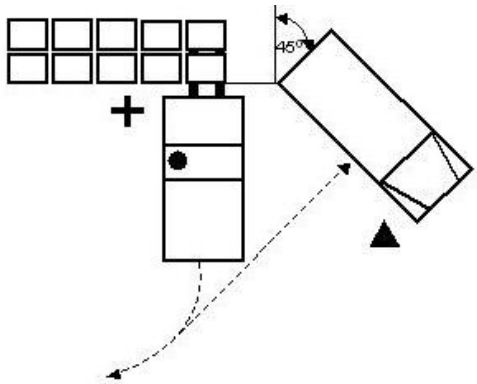


Figure 5-13

Step 2:
With the pallets loaded, the forklift truck moves backward to a point where it will then be able to unload the pallets onto the load platform of the truck, driving forward and observing about 10 cm (4 in) clearance to the front panel. While driving, the fork tines together with the load are lifted to the required height. (Figure 5-14)

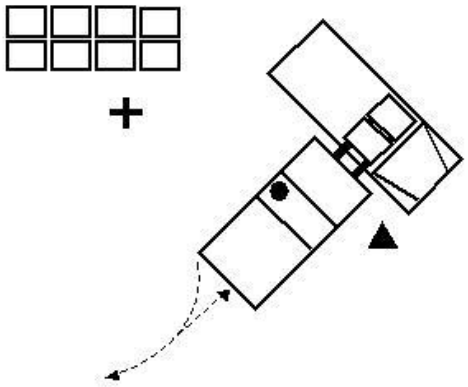


Figure 5-14

Step 3:
After unloading the pallets, the forklift truck moves backwards to a point where it will then be able to pick up the next pallet pair driving in the forward direction, in one movement.
Further loading of the truck is carried out by repeating Steps 2 thru 3.
Unloading the truck by means of the "V" procedure is carried out in reverse order.

5.4. THE SWIVELLING PROCEDURE

5.4.1. Trans-shipment from stack to truck

5.4.1.1. Characteristics:

During trans-shipment, forklift truck, truck and stack are located in parallel position, next to each other. Trans-shipment is carried out exclusively by swivelling of the crane without or with only little forward/backward driving of the forklift truck (1 to 2 m). All vehicle movements during trans-shipment are carried out exclusively by the forklift truck. Use with the following types of stacks:

- Row stacks.
- Railroad freight car (gondola cars and flatcars).
- From truck to truck (from board to board).
- Staggered stack.
- Possibly, dispersed stack.

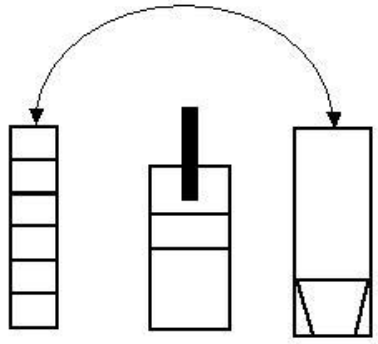


Figure 5-15: Swivelling procedure

Equipment required:	Forklift truck equipped as a crane with 4-strap loading gear and 1 or 2 sets of loading rails, pallets up to 2 t.
Personnel required:	Forklift truck driver and co-driver, truck driver and co-driver 2 military personnel from the supply activity if 2 sets of loading rails are used.
Handling capacity:	Loading or unloading of a 5-t-truck with 3 pallet pairs (one- or two-layered) about 6 minutes. Loading or unloading of a 10-t-truck with 5 pallet pairs (one- or two-layered) about 10 to 12 minutes.
Advantages:	- Minimum space required, - No churning up of the soil by vehicle/steering movements, - Pallet pick up and placement is possible even in case of rough terrain, - Careful treatment of the supply items.

Disadvantages: More personnel required (2 military personnel) for slinging the loading gear.

G.4.1.2. Work process of the swivelling procedure

Initial position
The forklift truck is positioned alongside the stack with 0.5 m (20 in) clearance, the swivelling point of the crane being level with the center of the first pallet pair of the stack. (Figure G-16)

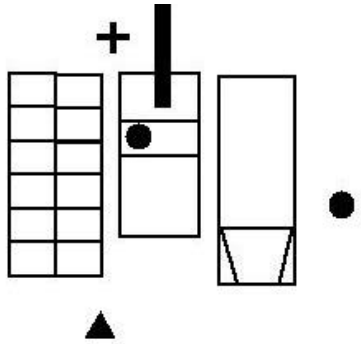


Figure 5-16

Step 1:
Upon hand signal of its guide (co-driver), the truck (leaving 0.5 m / 20 in clearance) moves in opposite travel direction to the forklift truck to a point alongside the forklift truck where its back panel is level with the beginning of the stack. (Figure 5-17)

Step 2:
The driver and the co-driver of the truck move to the outside of the 1st pallet pair of the stack. (Figure 5-17) The forklift truck swivels with the crane and the 4-strap gear (2.2 m / 7.3 ft long) over the center of the 1st pallet pair of the stack. The driver and the co-driver of the truck push the loading rails from the outside to the inside under the 1st pallet pair. The co-driver moves to the inside of the pallet pair between forklift truck and stack. The driver and the co-driver sling the gear. When they are ready, they report their function numbers to the guide: "One" (driver) and "Two" (co-driver).

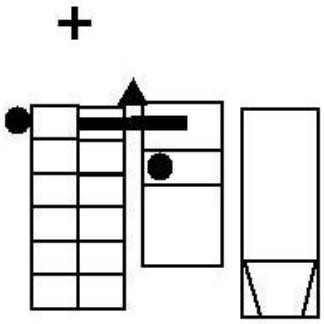


Figure 5-17

Step 3:
Upon hand signal of its guide, the forklift truck lifts the load and swivels over the load platform of the truck. The forklift truck then moves backward to a point where the load can be unloaded about 10 cm (4 in) behind the front panel of the truck.
To avoid swinging and swaying of the load, swivelling while driving is prohibited. The driver moves to the inside and the co-driver to the outside of the truck. During lowering, each of them grabs the pallet pair from his respective side, leading it to the load platform while it is unloaded. (Figure 18)
Release both straps from the load to the side to avoid tangling.
When they are ready, they report their function numbers to the guide of the loader/excavator: "One" (driver) "Two" (co-driver).

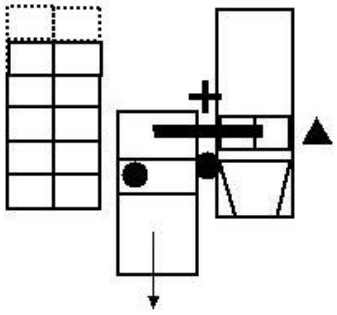


Figure 5-18

Step 4:
Upon hand signal of the guide, the forklift truck swivels over the stack to pick up the next pallet pair. The driver and the co-driver release the straps as soon as they hang loosely.
The co-driver drags the rear loading rail to the outside of the stack so that it can take on the next pallet pair (see Step 2).
Further loading of the truck is carried out accordingly.
Unloading of the truck is carried out in reverse order.
If two sets of 2 t loading rails and two more military personnel of the supply activity are employed, the loading / unloading time can be reduced.
As soon as the first pallet pair has been placed onto the load platform of the truck, the second pair of loading rails will be pushed under the next pallet pair.

5.4.2. Trans-shipment from vehicle to vehicle

For vehicle to vehicle trans-shipment, the same work process as for stack to truck trans-shipment applies. Here, the vehicle to be unloaded acts as the stack. (Figures 5-19 and 5-20)
To guide the straps over the pallet pair to be handled on the load platform of the truck during swivelling of the crane, one additional supply personnel will, however, be required.

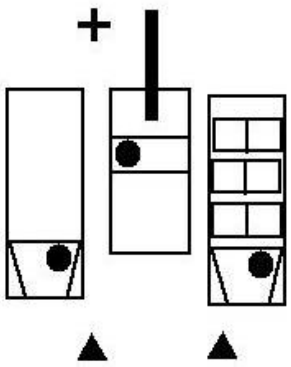


Figure 5-19

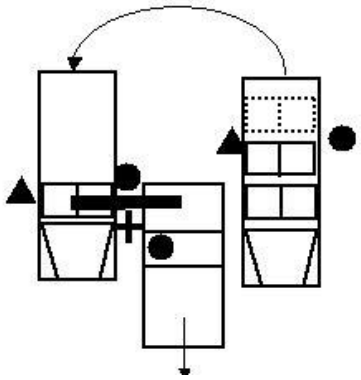


Figure 5-20

5.4.3. Trans-shipment of row stacks to truck from narrow minor roads to the stack road

In minor roads to the stack road that are only 3 to 4 m wide, the forklift truck can only be used as a crane and not as a forklift truck. Therefore, row stacks shall be prepared (no "staggered stacks" as with the "W" procedure). Trans-shipment is carried out through swivelling from stack to truck with little forward and backward driving of the forklift truck. The travel direction of the truck depends on which side of the minor road the stack has been prepared. The truck drives up to a point at the junction of the minor road where the swivelling procedure will not lead over the driver's cab of the truck. (Figures 5-21 and 5-22)

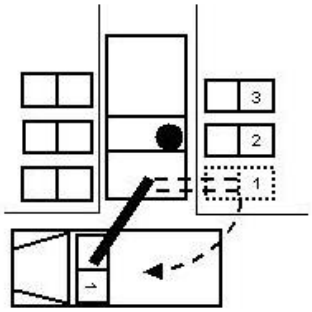


Figure 5-21

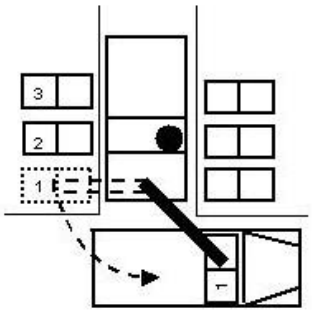


Figure 5-22

5.5. THE CRANE METHOD

5.5.1. Characteristics:

The truck moves backward to the stack. Trans-shipment is carried out with full use of the swivelling range in connection with the vehicle movements of the forklift truck. Use with the following types of stacks:

- Loose stacks.
- Railroad freight cars (flatcars and gondola cars).

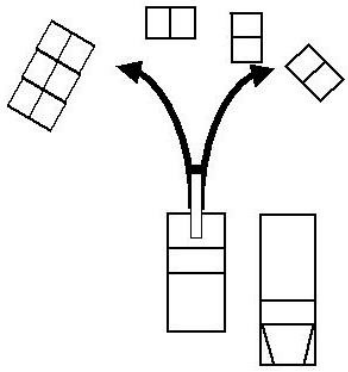


Figure 5-23: Crane Method

Equipment required:	Forklift truck equipped as a crane with 4-strap loading gear and 1 set of loading rails, pallets up to 2 t.
Personnel required:	Forklift truck driver and co-driver, truck driver and co-driver.
Handling capacity:	Loading or unloading of a 5-t-truck with 3 pallet pairs (one- or two-layered) about 6 to 10 minutes. Loading or unloading of a 10-t-truck with 5 pallet pairs (one- or two-layered) about 10 to 15 minutes.
Advantages:	- Allows for trans-shipment on unfavourable terrain and at narrow loading points. - Even pallet pairs located in narrow, dispersed, unequal and uneven places can be picked up with the crane. - Full use of the swivelling range (105 degrees to each side) reduces extensive vehicle and steering movements.
Disadvantages:	More time will be required depending both on how loose the stack is and on the terrain conditions.

5.5.2. Work process of the crane method

Initial position

The forklift truck equipped as a crane with a 4-strap gear stands at the centre of the loading point near the loose stack so that it can easily pick up the pallet pair placed in the most favourable position for the start of trans-shipment. (Figure 5-24)

Step 1:

Upon hand signals of its guide (co-driver), the truck moves backward closely to the stack, almost parallel to the forklift truck. (Figure 5-24)

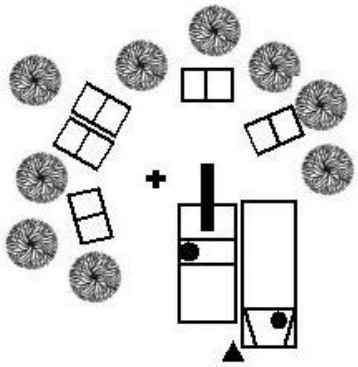


Figure 5-24

Step 2:
The forklift truck advances to a point where the crane gear hangs over the 1st pallet pair. (Figure 5-25) The driver and co-driver of the truck sling the load. (see swivelling procedure, Step 2)

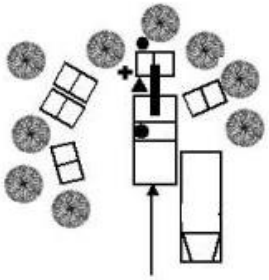


Figure 5-25

Step 3:
Upon hand signal of its guide, the forklift truck lifts the load. The forklift truck moves backward alongside the truck with 0.5 m (1.6 ft) clearance so that the pallet pair can be placed onto the load platform about 10 cm (4 in) behind the front panel of the truck by swivelling (see swivelling procedure, Step 3). If the pallet pair (as in Figure 5-25 / 26, diverging from the rule due to local conditions) is not located with its broadside facing the forklift truck, it will be turned into the correct position by the driver and the co-driver of the truck prior to placement. (Figure 5-26)

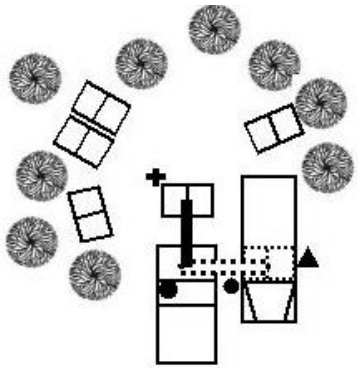


Figure 5-26

Step 4:
After setting the load, the crane swivels to straight position. Upon hand signals of its guide, the forklift truck approaches the next pallet pair to be picked up.
Full use of the swivelling range will reduce unnecessary vehicle movements. (Figure 5-27)

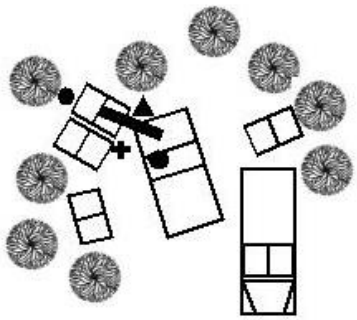


Figure 5-27

Step 5:
Upon lifting the pallets, the crane swivels to straight position and moves backward to a point alongside the truck where the load can be unloaded onto the platform of the truck through swivelling. (Figure 5-28)

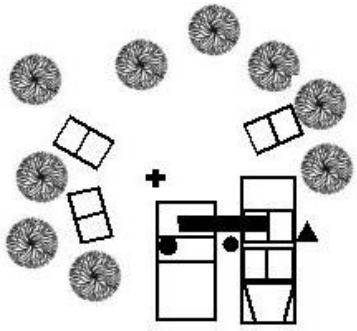


Figure 5-28

Further loading will be carried out accordingly.
In which order the pallet pairs are handled will depend on the local conditions.

Using a crane truck (wrecker) allows loading without movements:

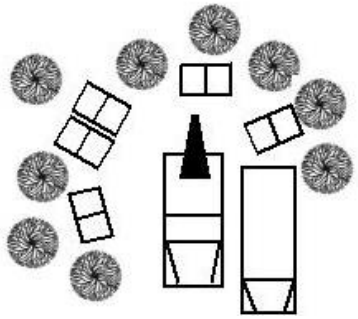


Figure 5-29

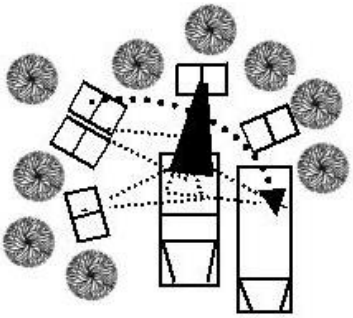


Figure 5-30

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CHAPTER 6 SLINGING OF NATO-AND EURO-PALLETS

6.1. GENERAL

Security device: The following slinging is not to be used for helicopter sling loads! The regulations referring STANAG 4062 (AEP-93) are to consider.
Whenever possible pallets should be moved and handled by materials handling equipment (e.g. forklift truck) or with materials handling aids (e.g. C-hook). Other situation could dictate using slings. Because of security reasons the methods shown below should only be used if no other way is possible. Before slinging and lifting pallets the pallet has to be examined with regard to its condition. Only pallets in suitable condition are to be handled by slings.

In addition to using slings, the usage of cargo nets (e.g. rated at 10,000 lb) is an efficient way to expedite the movement and the transportation of pallets when conducting slinging operations.

6.2. SECURITY DEVICES

Slinging of pallets (EURO and NATO) has to be well prepared. For EURO pallets take care of the following directions during preparation for slinging operations:

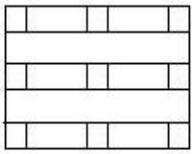

Figure 6-1: Euro pallet

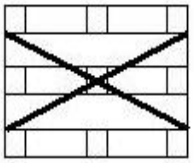

Figure 6-2: Step 1 - slinging

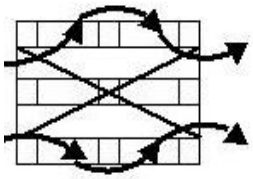

Figure 6-3: Step 2 - slinging

or

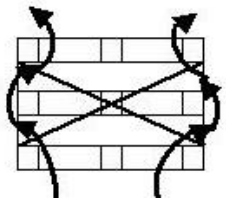

Figure 6-4: Step 2 - slinging

6.3. SLINGING METHODS

a. EURO-PALLET (1)

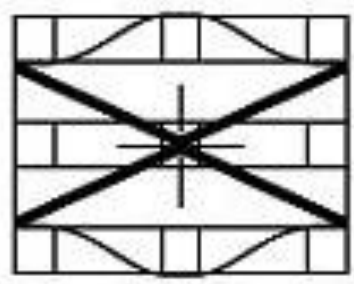

Figure 6-5: Plan view
Top 2 layers of pallet slats removed to show sling

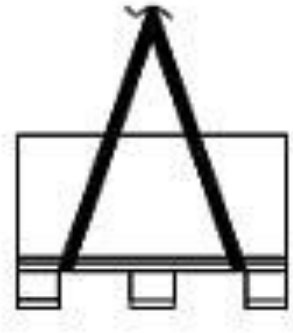

Figure 6-6: Side view

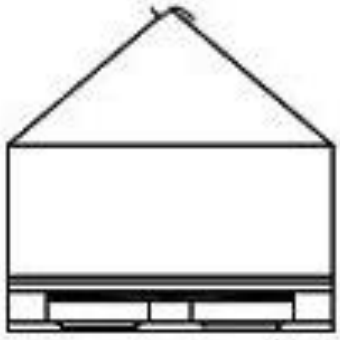

Figure 6-7: Front view

b. EURO-PALLET (2)

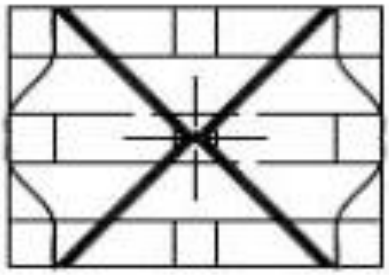

Figure 6-8: Plan view
Top 2 layers of pallet slats removed to show sling

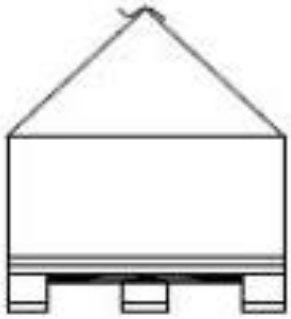

Figure 6-9: Side view

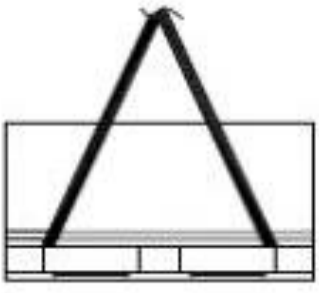

Figure 6-10: Front view

c. NATO-PALLET (1)

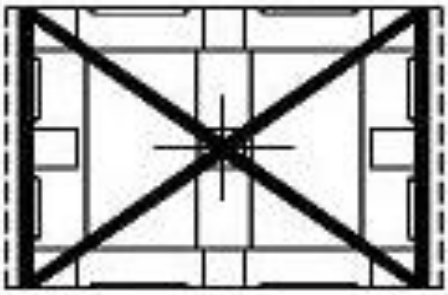

Figure 6-11: Plan view
Top 2 layers of pallet slats removed to show sling

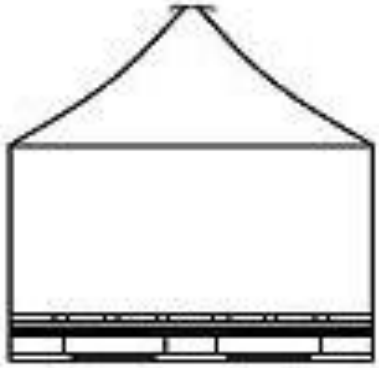

Figure 6-12: Side view

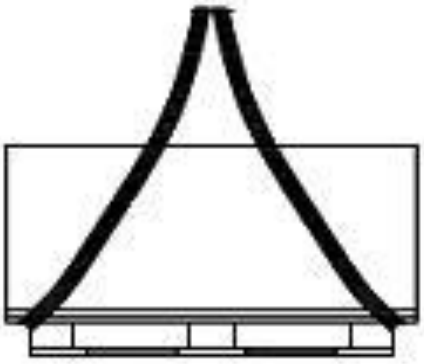

Figure 6-13: Front view

d. NATO-PALLET (2)

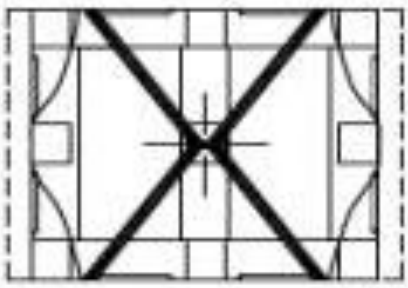

Figure 6-14: Plan view
Top 2 layers of pallet slats removed to show sling

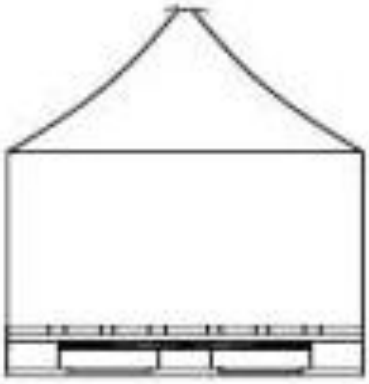

Figure 6-15: Side View

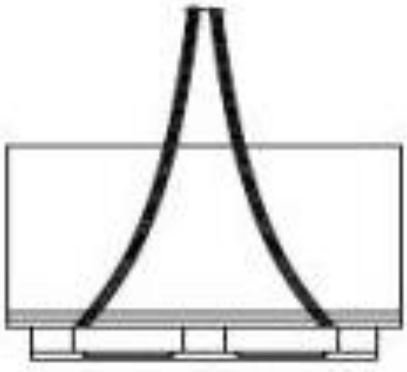

Figure 6-16: Front View

e. NATO-PALLET (3)

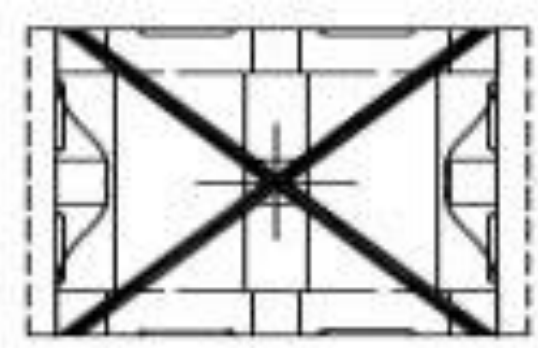

Figure 6-17: Plan view
Top 2 layers of pallet slats removed to show sling

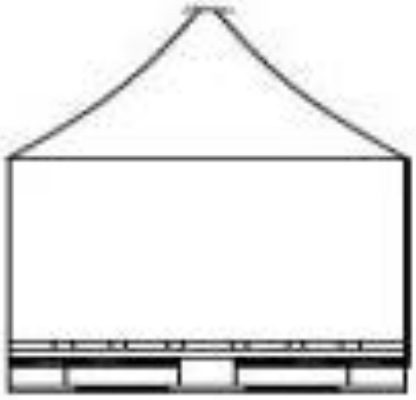

Figure 6-18: Side View

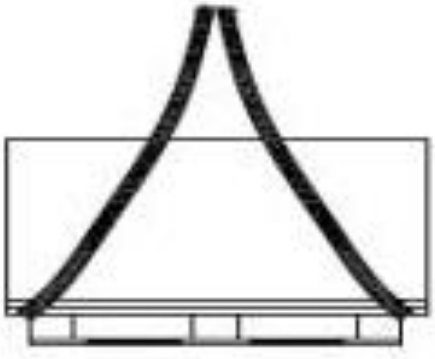

Figure 6-19: Front View

ANNEX A HANDLING AND TRANS-SHIPMENT OF CONTAINERS

A.1. HANDLING OF CONTAINERS

The handling of containers is described relative the issues “stuffing, stripping, lifting and stacking of containers” into STANAG 2236 (AMovP-5).

A.2. TRANS-SHIPMENT OF CONTAINERS

The trans-shipment of containers is described relative the issues “loading, unloading, entrainment and detrainment of containers” into STANAG 2468 (AMovP-4A).

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ANNEX B EVALUATION DATA SHEET

B.1. OBJECTIVE

The objective is to determine the trans-shipment of standardized unit loads by means of MHE. The following is an outline that should be used during interoperability exercises.

B.2. EVALUATION AREAS

a. Large level improved surface area.
b. Large off-road area.

B.3. EVALUATION EQUIPMENT

Each participating nation shall provide:

a. Packaged Category A unit loads. Each nation shall provide enough Category A unit loads to fully load a carrier.

b. One Category B unit load (10 ft and 20 ft ISO-Container each) loaded with 50% of its maximum gross weight and packed in accordance with AMovP-5.

c. One Category B unit load (Demountable Load Carrying Platform (Flatrack)) loaded to a gross weight of 15000 kg (33070 lb).

d. MHE and operator(s) to handle Category A and B unit loads on improved surface and off-road areas, in accordance with STANAG 2829.

B.4. EVALUATION PROCEDURE

a. Each nation shall trans-ship Category A unit loads onto carriers, and then return unit loads to original positions.

b. The MHE shall then move to the next location.

c. The sequence shall follow the evaluation matrix data sheet until completed.

d. Repeat step 4a. to step 4d. on appropriate surfaces for the type of MHE defined in STANAG 2829 (Category A forklift trucks shall operate on improved surface areas and Category B forklift trucks shall operate on off-road areas).

e. The evaluation officer shall evaluate / analyze each problem to determine if the cause was operator induced or hardware included. If hardware included record the reasons on the evaluation data sheet.

f. Repeat the evaluation procedure with Category B unit loads.

B.5. DATA COLLECTION TABLE

Instructions: After completing each of the steps in the evaluation procedure, place an “X” in the appropriate box if there was no problem. If there was a problem encountered, place the subsequent number of the “Note” in the appropriate box and explain the problem in the “Note” section below.

National ownership of loading units : _____

Name of unit : _____

Name, rank of operator : _____

Tasks / Nations →	ALB	BEL	BGR	CAN	CZE	DEU	DNK	ESP	EST	FRA	GBR	GRC	HRV	HUN	ITA	LTU	LUX	LVA	MKD	MNE	NLD	NOR	POL	PRT	ROU	SVK	SVN	TUR	USA
Packaged supplies <u>Category A</u> Trans-ship to truck *On improved surface area*																													
Packaged supplies <u>Category A</u> Trans-ship to truck *On off-road surface area*																													
Packaged supplies <u>Category A</u> (exceptional limits) Trans-ship to truck *On improved surface area*																													
Packaged supplies <u>Category A</u> (exceptional limits) Trans-ship to truck *On off-road surface area*																													

Tasks / Nations ⟶	ALB	BEL	BGR	CAN	CZE	DEU	DNK	ESP	EST	FRA	GBR	GRC	HRV	HUN	ITA	LTU	LUX	LVA	MKD	MNE	NLD	NOR	POL	PRT	ROU	SVK	SVN	TUR	USA
Category B **Container ISO 10'** Trans-ship to truck *On improved surface area*																													
Category B **Container ISO 10'** Trans-ship to truck *On off-road surface area*																													
Category B **Container ISO 20'** Trans-ship to truck *On improved surface area*																													
Category B **Container ISO 20'** Trans-ship to truck *On off-road surface area*																													
Category B **Container ISO 40'** Trans-ship to truck *On improved surface area*																													
Category B **Container ISO 40'** Trans-ship to truck *On off-road surface area*																													
Category B **DLCP (flatrack)** Trans-ship to truck *On improved surface area*																													
Category B **DLCP (flatrack)** Trans-ship to truck *On off-road surface area*																													

ANNEX B TO
APP-25

National ownership of loading units : _____

Name of unit : _____

Name, rank of operator : _____

NOTES:

1. .....

2. .....

3. .....

4. .....

5. .....

6. .....

7. .....

8. .....

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ANNEX C RELATED PUBLICATIONS

C.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.

SHORT NAME	TITLE
AAP-06	NATO Glossary of Terms and Definitions
STANAG 2034	NATO Standard Procedures for Mutual Logistic Assistance
STANAG 2236	Multi Modal Transport Issues (AMovP–05)
STANAG 2284	Land Compendium of Hand Signals (APP-14)
STANAG 2413	Demountable Load Carrying Platforms (DLCP/ Flatracks)
STANAG 2468	Technical Aspects of the Transport of Military Materials by Railroad (AMovP-04)
STANAG 2828	Military Pallets, Packages and Containers (APP-22)
STANAG 2829	Materials Handling Equipment
STANAG 2830	Materials Handling Aids
STANAG 4280	NATO Packaging and Preservation (APP-21)
STANAG 4281	NATO Standard Marking for Shipment and Storage
ISO 668	Series 1 freight containers - Classification, dimensions and ratings
CTU Code	IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units

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ANNEX D GLOSSARY, TERMS AND DEFINITION

D.1. GENERAL

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

abnormal load / chargement exceptionnel
A vehicle and load together which exceed the limitations on movement by road imposed by statutory or other regulations and for which special authority has to be obtained.

blocking / dispositif de calage
Devices used to hold articles or sections of loads in position (whether or not of compressible material).

bracing / dispositif d'arrimage
Materials or devices used as strengthening and/or locating constraints to hold articles and prevent shifting.

breakbulk cargo / cargaison fractionnée
Any commodity that because of its weight, dimensions, or non-compatibility with other cargo must be shipped by mode other than container.

bulky goods / marchandises volumineuses
Loose or packaged goods, the size or weight of which prevent their unitisation.

container / conteneur
emballage
Any box or receptacle which holds, restrains, or encloses any article(s)/or commodity(ies) to be stored or transported.

container stuffing plan / plan de chargement d'un conteneur
The plan for stuffing a cargo into an ISO container to achieve proper distribution of cargo weight and optimum utilisation of the container's weight and cube capacity.

containerization / conteneurisation
1. A shipping method in which material is packaged together in one container.
2. The use of transport containers to unitize cargo for transportation supply and storage.

containerized unit load / conteneur pour charge unitaire
A containerized unit load is a quantity of items, packed or unpacked, placed in a container provided with devices for handling mechanically.

dump / dépôt temporaire
A temporary storage area, usually in the open, for bombs, ammunition, equipment or supplies. (Agréé OTAN)

dunnage / capitonnage
Material used to block and brace cargo in an ISO or other container, or on any cargo carrying system.

handling capability / capacité de manutention
Volume or weight of the load which can be handled and transloaded.

handling capacity / capacité de manutention
Quantity of goods handled in a specific time period with a specific handling tool or in a specific area. Handling capacity is given in number, weight, or volumetric measure per unit of time.

inflatable dunnage / capitonnage gonflable
Airtight bags that are inflated to hold a load steady in transit, and deflated to provide space for loading and unloading.

load planning for a container / plan d'arrimage dans un conteneur
The plan for stuffing and dunnaging cargo in a container to achieve proper distribution of cargo weight and optimum utilisation of the container's weight and cube capacity, and to provide the necessary restraint required to protect the cargo and container.

loading ramp / rampe de chargement
A sloping access platform of fixed gradient for loading/ unloading stores and equipment. The ramp may be fixed or portable.

man transportable / matériel transportable à la main
Term that applies to an item normally transported by a vehicle but if needed can be carried by one or more individuals within certain limits (approximately 500m) and weight (approximately 30 kg or 65 lbs. per individual).

materiel / matériel
The items used to equip, maintain and support military forces in their activities.
(Agréé OTAN)

materials handling / manutention de matériels
The movement of materials, whether raw, semi-finished, finished or scrap before, during and after their production, in warehouses and storage sites as well as in receiving and shipping areas.
(Agréé OTAN)

multipack / groupage
A consolidation of packages containing non-identical items.

non-palletized unit load / charge unitaire non palettisée
An assembled load provided with devices to permit mechanical handling from at least two opposite sides by fork lift or pallet trucks and the handling by overhead lifting devices.

palletized unit load / charge palettisée
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. (Agréé OTAN)

pack / emballer
To place materials into a container for handling, storage or transport.

package / lot ou paquet
1. One or more articles or pieces contained or secured into a single unit.
2. The product of a complete series of packaging operations.

packing list / liste de colisage
A list of contents within a package or container.

shipping container / emballage d'expédition
A container which meets minimum carrier regulations and is of sufficient strength by reason of material, design, and construction to be shipped safely without further packing.

seal / fermeture étanche
Means of securing a container to prevent undetected loss or deterioration of contents.

serial number / numero de série
The number appearing on the items as assigned by the manufacturer or the government for identification or control purposes.

stripping / dépotage
The removal of cargo and cargo bracing materiel (dunnage) from the container. Also referred to as destuffing, unloading or unstuffing.

self-loading capacity / capacité d'autochargement
Rated capacity of the loading device of a self-loading transporter.

stack / pile
Combination of several possibly racked pallets or packages at a location on the ground (ground storage). Stacks of bulk supplies must be assembled homogenously.

stack road / route d'engerbage
A road (byway) in logistic facilities where transport vehicles can go and along which bulk supplies are stored.

storage site / site de stockage
An area next to a stack road in a supply point for bulk supplies in which several stack sites are established or planned. The quantity of hazardous goods that may be stored at a storage site is limited.

store / dépôt
Facilities for the storage of materiel. Depending on their purpose they are installed and operated in differing sizes and combinations.

supply point / point de ravitaillement
A supply point is a store that can rapidly be deployed and serves as the immediate supply of the troops.

tomming (vertical tie-down) / arrimage vertical
Cargo tie-down having the effect of preventing movement upwards and of providing indirect tie-down by increasing the pressure of the load on the platform of the means of transport. Restraining cargo from vertical upward movement.

transport capability / capacité de transport
Transport capability is the volume or weight of the load which can be carried by means of transport.

trans-shipment / transbordement
Loading of supplies from a storage site to a means of transportation, unloading from a means of transportation to a storage site or reloading of supplies from one means of transportation to another.

trans-shipment point / point de transbordement
A location where material is transferred between vehicles.
(Agréé OTAN6).

underhang / creux de chargement
The distance the edges of the pallet extend beyond the vertical edges of the components of a unit load. Note. For ammunition unit loads underhang is not permitted.

unloading a container / dépotage d'un conteneur
The removal of cargo and cargo bracing materiel (dunnage) from an ISO container.

unitized load / charge regroupée
A type of unit load consisting of articles or containers secured together so as to be handled as an entity.

unit load / charge unitaire
A load designed to be carried, stored and handled as a separate unit and able to withstand the conditions with the appropriate modes of transport.
Notes:
1. Such a load comprises a number of packages or articles which are either placed or stacked on and secured by strapping, shrink-wrapping or other suitable means to a load board such as a pallet; or placed in a protective outer packaging such as a pallet box; or permanently secured together in a sling.
2. A single large package such as a tank-container, intermediate bulk container or freight container is specifically excluded.
(Agréé OTAN)

vertical tie-down (tomming) / arrimage vertical
Cargo tie-down having the effect of preventing movement upwards and of providing indirect tie-down by increasing pressure of the load on the platform of the means of transport.

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Edition B Version 1

APP-25(B)(1)