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Changes to the previous version are marked in "*Italic, highlighted in yellow*"

	Name	Date	Signature
Created	Martin Härle-Vqm	_____	_____
Checked	Joachim Mai - pecs	_____	_____
Approved	Markus Straub - zqs	_____	_____

<b>18</b>	<b>Reuse and disposal of packing and/or packing material .....</b>	<b>14</b>
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**Revisions:**

Compared to VN 1577-1 (2019-03), the following changes were devised and made during the course of the improvement project entitled "Packing and transport":

- a) 4. Content adapted, VN 1577-ff.
- b) 5. Added, content general conditions
- c) 5.1.10 Content adapted "...Packing list must be permanently affixed to the outside of each package and/or freight unit in a position that keeps it waterproof and easily legible. Even if laminated or covered in protective foil, it must still be possible to read out all data by means of electronic devices."
- d) 5.1.14 Added, "Stacking"
- e) 5.1.15 Added, "Impacts and accelerations"
- f) 5.1.16 Added, "Protection against environmental factors for a minimum of 6 months"
- g) 5.1.17 Added, "Humidity indicators" 5.1.18 Added, "Aeration of the packaging"
- h) 5.1.19 Added, "Accessibility of fixing and lashing points"
- i) 5.1.10 Added, "Protection against theft and vandalism"
- j) 9. Added, Table: Storage codes in accordance with VN 1576-1
- k) 10.2 Content adapted, "If the standard cardboard box is insufficient for the weight to be packed..."
- l) 10.6.1 Content adapted, Floor, definition, images, dimensions and execution added
- m) 10.6.3 Content adapted, Stack pressure, image for execution added
- n) 10.7 Content adapted "Identification and labeling"
- o) 12. Content adapted "...The storage code is ..."
- p) 13. Content adapted "Handling markings are on the handling unit..."
- q) 14. Added, "Means of transport"
- r) 15. Added, "Unpacking of the goods"
- s) 16. Added, "Storage of components on construction sites and in intermediate storage facilities"
- t) 17. Added, "Repair of packages"
- u) 18. Added, "Reuse and disposal of packing and/or packing materials"
- v) 19. Added, "Further points" including visual packing instruction (can be retrieved by scanning the QR code on the handling unit label)...

## 1 Scope

This standard applies across the group to the entire scope of Voith Paper and its subcontractors.

## 2 Area of Application

This standard is used in the Shipping Department at Voith Paper and its subcontractors.

## 3 Purpose

This standard defines the packing standard which must be applied to Voith Paper and its subcontractors. The necessary packaging type is determined by commodity classes and packaging categories. Conditions for corrosion protection and storage are defined in VN 1576-1. The packing standard for rolls is defined in VN 1577-2.

## 4 Normative references

VN 1576-1	Preservation and Storage, Part 1: General preservation and storage
VN 1577-ff.	Specific packing standard for specific product types
EN 13698-1	Pallet production specification, Part 1: Construction specification for 800 mm x 1200 mm flat wooden pallets
ISO 780	Packaging - Distribution packaging - Graphical symbols for handling and storage of packages

Unless stated otherwise, the most recent version of this standard shall apply.

## 5 General conditions

*The existence of normative specifications of the VN 1577 series for specific product types must be checked in each case. Specific requirements have priority.*

### 5.1 Special notes

1. If the goods class is not specified, this must be determined by the contractor itself. If anything is unclear, consult Voith Paper.
2. The contractor is responsible for selecting the packing category, the corrosion protection in accordance with VN 1576-1 and the materials to be used. When pallets, crates, part packing, etc., are fabricated, the packing must be reasonably designed for the weight and properties of the goods.
3. This packing standard should be regarded as the minimum requirement. Should the contractor state that additional measures for protecting the goods are required, these should be taken in consultation with Voith Paper.
4. The contractor is obliged to use economical and space-saving packing. The option of co-packing should be considered and utilized after prior consultation with Voith Paper.
5. Generally, the packing has to be designed so that the packed goods and the packing can be transported and stored without damage. Furthermore, the packing must be able to withstand several transshipments during transportation.
6. Small parts (e.g. screws, nuts, washers, etc.) must be packed in plastic bags, and these in turn in small wooden crates, keeping together components belonging to the same assembly group, in accordance with the order item.
7. The packing of loose parts (machined lots, flanges, pipe sockets, sheet metal parts, etc.) in the form of wooden crates or cardboard boxes shall be carried out in such a way that reciprocal damaging of the parts is prevented by adequate padding and fixing. Common parts with the same dimensions must be packed together in accordance with the order item.
8. Parts located on machines/tanks that are not yet fixed, such as loose flanges and non-closable flaps, must be held in place by means of belts and straps, for example, until the time of installation.
9. Special consideration should be given to the climatic conditions of sea transportation (e.g. contact with salt water, condensation water, salt-laden air, temperature fluctuations, etc.) with regard to corrosion protection and the packing category selected.
10. The labeling and description of the package contents of the package and/or freight units must completely and exactly match the packing lists. *A copy of this packing list must be permanently affixed to the outside of each package and/or freight unit in a position that keeps it waterproof and easily legible. Even if laminated or covered in protective foil, it must still be possible to read out all data by means of electronic devices.* It is important to ensure that no references to the supplier appear (neutral paper or packing list provided by Voith Paper).

11. If the packing is specified for the particular order or product in other documents (e.g. project guidelines, drawing, etc.), compliance with these specifications is mandatory. If applicable, these documents can be found in the order records.
12. When packing, special attention should be paid to keeping together components belonging to the same assembly group.
13. Openings of tanks and piping with high surface requirements are to be closed watertight, for example by means of plastic protective caps or sealing plugs. Alternatively, openings can be closed by means of blind flanges (wood). Between the blind flange and the component, a barrier layer (foil, for example) is to be applied.
14. *Unless specified otherwise, no stacking. If stacking is possible, the stack pressure must be specified in kg/m<sup>2</sup> and the stack height in m.*
15. *Unless specified otherwise, impacts and accelerations of maximum 2g or 19.62 m/s<sup>2</sup> during transportation and handling must not be exceeded.*
16. *Unless specified and labeled otherwise, the packing must offer protection against environmental factors for a minimum of 6 months (see also Item 5.2), such as:*
  - *Corrosion, caused by relative air humidity*
  - *Decomposition and rotting, brought about by factory fumes, saline air, rain, snow, splash water, mildew, etc.*
  - *External temperatures and more severe, brief temperature fluctuations**Additional agreements must be concluded for changed storage conditions and/or storage times.*
17. *Humidity indicators must be used if required, e.g. for sensitive electrical and/or electronic components. A separate agreement is required in this respect.*
18. *The aeration of the packing shall be designed according to need. Holes must be specified in, e.g. crate floors and/or walls accordingly.*
19. *Fixing and lashing points must remain accessible after packing and must not be concealed by the packaging. The packaging must be protected from destruction.*
20. *Protection against theft and vandalism must be agreed separately under the terms of a contract.*

## 5.2 Corrosion protection

Due to the long transportation and storage times, all sensitive equipment must be protected against corrosion in addition to any corrosion protection applied by the manufacturer of the goods. Corrosion protection is done in accordance with VN 1576-1. The processing instructions for the relevant anti-corrosion agent must be strictly followed.

## 5.3 External packing inspections (for direct deliveries)

1. Voith Paper has the right to inspect the packing at any time at the contractor's.
2. If repeated inspections are necessary at the fault of the contractor, the contractor shall bear the resultant costs (e.g. labor, travel expenses, material costs).
3. Packing inspections shall not relieve the contractor of his contractual obligations.

## 5.4 Guarantee

The contractor guarantees contractual design of the packing according to the state of the art, in particular the best quality and suitability of the packing material, as well as the suitability of the packing, taking into account the goods to be packed and the actual stresses, for the guarantee periods set forth in the relevant contracts.

## 6 Packing materials

### 6.1 Wood

All wood used (crates, pallets, dunnage bars, etc.) must be treated in accordance with the IPPC Standard and marked accordingly.

### 6.2 Foils

1. Aluminum composite foil designed as sealing layer foil
2. Shrink-wrap foil transparent
3. VCI foil (volatile corrosion inhibitor)

### 6.3 Padding and filler materials

Padding paper, air bags, air cushion foils, foam foils and foam mats are to be used as filler material.

ATTENTION: Styrofoam chips must never be used.

The use of hygroscopic filler and padding materials (e.g. wood wool, hay, straw, waste paper, etc.) to fill out empty spaces and/or for padding is not allowed.

## 7 Instructions for shrink-wrapping

### 1. Aluminum composite foil designed as sealing layer foil

Shrink-wrap the goods in aluminum foil. Edges or projecting parts must be sufficiently padded.

When using foils in a crate, a distance between the foil and the crate wall of 30 - 50 mm must be observed.

Direct contact of the aluminum foil with the crate bottom or wooden structure must be avoided (putting-in of air cushion foil, foam, etc.).

After the foil is processed, the trapped air must be drawn off (vacuum approx. 6 mbar). Place adequate quantities of desiccants (silica gel) inside to absorb the air humidity, or take suitable measures to create a room climate that prevents corrosion. In order to prevent contact corrosion, position the desiccants so that there is no direct contact with the packed goods. The desiccant bags must be guaranteed to be dustproof and sufficiently stable to prevent them from opening if dropped.

### 2. Shrink-wrap foil transparent

The parts must be shrink-wrapped in polymer foil. If possible, this should be attached to the support beams of the pallet/wooden structure or to the crate bottom.

Make sure that the foil fits snugly. Edges and projecting parts should be padded with foam, for example, to prevent damage to the foil.

### 3. VCI foil (volatile corrosion inhibitor)

The parts must be shrink-wrapped in VCI foil. During packing, pay attention to a clean surface of the component.

The VCI foil should not be more than 30 cm from the metal surface. For a packing volume of more than one cubic meter, additional VCI dispensers (e.g. VCI powder, VCI paper, etc.) are to be placed in the package. The packing space must be sealed so that the VCI molecules cannot escape. It must be ensured that the foil is not damaged by sharp edges and protruding parts.

When using VCI products, the protective effect and compatibility must be agreed with the manufacturer. In addition, VCI products from different manufacturers are often incompatible and should therefore not be combined.

## 8 Goods classes (GK)

As the materials to be packed are of different physical and chemical sensitivities, they are classified in the following goods classes, depending on their properties.

### 8.1 Goods class GK 0

Semi-finished products.

Examples of materials/goods of GK 0:

- Plates, pipes, rods, etc.

### 8.2 Goods class GK 1

Shock and corrosion-resistant parts.

Examples of materials/goods of GK 1:

- Piping, supporting structures
- Steel structures
- Sections
- Shaped pipes
- Scaffolding

### 8.3 Goods class GK 2

Shock and corrosion-resistant, heavy, bulky parts.

Examples of materials/goods of GK 2:

- Framing parts
- Walkways
- Parts with cooling ribs, robust machines, equipment
- Containers with external elements, thin-walled sheet metal parts (channels, wire pits, troughs)
- Liquids and bulk goods in drums and other containers (not included in GK 6)

**8.4 Goods class GK 3**

Corrosion-resistant parts requiring physical protection or due to their size (small parts) are not classified in goods class GK 2.

Examples of materials/goods of GK 3:

- Plastics
- Small coated steel parts
- Painted parts

**8.5 Goods class GK 4**

Materials and goods that are corrosion-sensitive and/or require chemical protection. The goods also require physical protection.

Examples of materials/goods of GK 4:

**Corrosion-sensitive, physical protection is required:**

- Machine elements (gearwheels, couplings, axles, shafts, etc.)
- Fasteners (screws, wedges, springs, bolts, etc.)
- Structural parts (flanges, brackets, etc.)
- Simplest and insensitive parts of general mechanics
- Fire-resistant materials

**Physical and chemical protection is required:**

- Materials with superfinishing
- Parts of general mechanics, (gear units, machines, bearings, fittings, etc.)

For rolls and covered rolls see VN 1577-2

**8.6 Goods class GK 5**

Materials and goods that are corrosion-sensitive and/or require chemical protection. The goods also require physical protection and/or are shock and vibration-sensitive.

Examples of materials/goods of GK 5:

**Physical and chemical protection is required:**

- Precision mechanical, electrical, electromechanical and electronic materials (control cabinets, automatic units, motors, etc.)

**Corrosion-sensitive and/or extremely shock/vibration-sensitive:**

- Electronic and precision mechanical measuring instruments
- Computers

**8.7 Goods class GK 6**

Hazardous goods:

Examples of materials/goods of GK 6:

- Paints, adhesives, chemicals, acids, solvents, fuels, etc.

It is mandatory to observe the legal regulations.

**9 Packing matrix**

Should several carriers be deployed for shipment of the goods, the packing must be in accordance with the highest packing category/transport class.

If the order does not specify the transport type, road or air transport via truck, rail or aircraft must be assumed.

The method of stowage of goods on ships (shipping containers or flat) depends on the package size. This must be taken into account when selecting the packing.

If the packing for catalog parts does not meet the requirements defined in this standard, the goods concerned must be suitably repacked.

GK	Transport route				Storage in accordance with VN 1576-1
	Road/Air		Sea		
	VK	Shrink-wrapping	VK	Shrink-wrapping	
0	0	-	0	-	C, D <sup>1)</sup>
1	1	-	1	PE foil	C, D <sup>1)</sup>
	2	PE foil	2		
	3		3		
	5	-	5		
2	2	PE foil	2	PE foil	C, D <sup>1)</sup>
	3		3		
	4	-	4	-	
	5	-	5	PE foil	
3	1	-	1	PE foil	B
	5		5		
4	1	VCI foil	4	-	A, B
	3				
	4	-	5	VCI foil / aluminum foil	
	5	VCI foil			
5	Packing according to manufacturer		Packing according to manufacturer		A <sup>2)</sup>
6	6	-	6	-	

Table: Packing matrix

<sup>1)</sup> Storage according to the characteristic letter D may only take place if the packing and the component are not damaged by influence of weather.

<sup>2)</sup> If necessary, reference must also be made to air-conditioning.

Characteristic letter	Storage
A	Internal storage area - temperature-controlled building (+10 °C to +35 °C)
B	Internal storage area - unheated, dry building
C	Open-air storage area - covered or protected with a tarpaulin and consolidated foundation
D	Open air-storage area with consolidated foundation (permitted only if damage to the packing and to the component by the influence of weather can be ruled out)

Table: Storage codes according to VN 1576-1

## 10 Packing categories (VK)

### 10.1 Packing category VK 0: Unpacked

Components are not packed. However, transportation by means of crane/forklift must be possible.

### 10.2 Packing category VK 1: Cardboard box

Small and spare parts for transportation within Europe or air cargo shipment should, if their dimensions allow, be packed in stable cardboard boxes of standard design. *If the standard cardboard box is insufficient for the weight to be packed, a more stable design shall be used.*



From a gross weight of 5 kg, the cardboard boxes must be strapped with steel or polyester bands.  
 From 30 to 1000 kg gross weight, disposable or euro pallets must be placed under the cardboard boxes.  
 For weights over 1000 kg, special pallets with the required load-bearing capacity must be used.  
 As a rule, pallets or special pallets that have undergone treatment as specified in the IPPC standard have to be used.

### 10.3 Packing category VK 2: Wooden supports with shrink-wrapping

Wooden supports can be used for the packing of cylindrical vessels, carriers or similar goods.  
 Every opening must be sealed watertight, e.g. by means of plugs, protective caps made of metal or plastic, and larger openings by means of blind flanges made of wood or steel.  
 Vessels and apparatus with their own support bearings must be provided with a wooden support of at least 30 mm thick to prevent sliding. The timber bolsters must be fastened by means of plastic strapping.  
 Existing branches should, where possible, be turned into dead space to prevent damage.

### 10.4 Packing category VK 3: Pallets/wooden structures with shrink-wrapping

For goods which, due to their size, cannot be packed in cardboard boxes, pallets or suitable wooden structures must be fabricated to enable handling by forklifts.  
 Preferably four-way flat pallets of wood 800 x 1200 mm (Euro pallet) in accordance with EN 13698-1 should be used.  
 The pallets or wooden structures must extend at least 20 mm beyond the component on all sides to prevent damage.



Figure: Correct pallet packing



Figure: Incorrect pallet packing

The recommended minimum number of longitudinal skids based on bottom width for wooden/pallet structures can be found in table 1.

Bottom width in mm	1000	1200	1700	2100	2400
Number	2	3	4	5	6

Table 1: Number of longitudinal skids based on bottom width

The parts are fastened with suitable steel band, plastic band or preferably with screws so that slipping cannot occur.  
 The parts are to be appropriately protected against damage by the fastener. If a screw connection is possible, screw the screws into the longitudinal skids. When using bands, make sure that they are not destroyed by the forks of forklift during handling.  
 Between the goods and the wooden packing, a suitable sealing layer should in any case be laid, such as aluminum foil, anti-skid mat or similar material.

### 10.5 Packing category VK 4: Sheathing

The sheathing can be made with lamella packing or wooden laths.

#### 10.5.1 Lamella packaging

Lamella packaging must be fixed by means of adhesive tapes.

#### 10.5.2 Wooden laths

If wooden laths are used, care must be taken to ensure that a watertight sealing layer is installed between the wooden laths and the component.

The lath width must be selected according to the respective component diameter, but max. 70 mm.

The wooden laths must be fixed by means of zinc anodized steel band or plastic bands.

**10.6 Packing category VK 5: Crate with lining**

Basically, the crate design has to be suitable for the total gross weight.

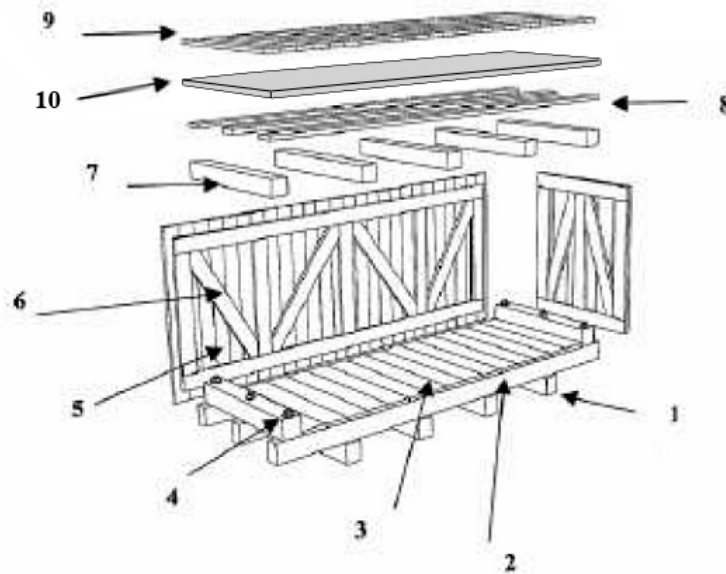


Figure : Crate and cover design

Description of the components in figure	
1 Transverse skids	6 Diagonal/stiffening boards
2 Longitudinal skids	7 Lid compression timber
3 Floorboards	8 Lid laths
4 Front-end beam	9 Lid boards
5 Side wall boards	10 Sealing layer

**10.6.1 Crate bottoms**

Longitudinal skids min. 80 mm thick (number according to tab. 1), bottom boards min. 24 mm thick.

For crates > 5 t and/or width > 2000 mm: front-end beam bolted to longitudinal skid (through bolt with washer + nut). Transverse bottom skids up to 5 t, 100 x 100 mm thick, from 5 t, 100 x 120 mm thick (mount upright), have to be bolted to the longitudinal skids or securely nailed several times. The arrangement must be carried out according to the center of gravity of the goods, so that lifting with a forklift is possible. If necessary, lifting options depending on the center of gravity for a crane are required.

Special instructions for heavy-lift packing ≥ 5 t: For heavy-lift packing, the crates must be provided with special heavy-lift hardware and/or crate angles.

The parts should preferably be secured to the crate bottom with screws fastened into the longitudinal skids. If there is no possibility of attaching screws, tie down the part with tension band. In addition, squared timbers must be installed to prevent slipping.

*The bottom can be created as a pure bottom in an "open design" or in a "closed design" for a closed crate, depending on the requirement. The design must be agreed for assignment.*

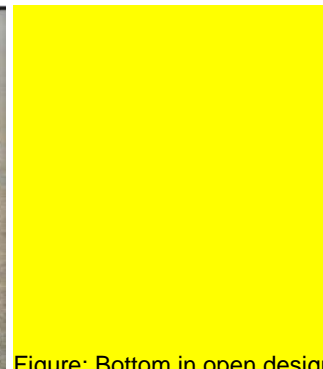
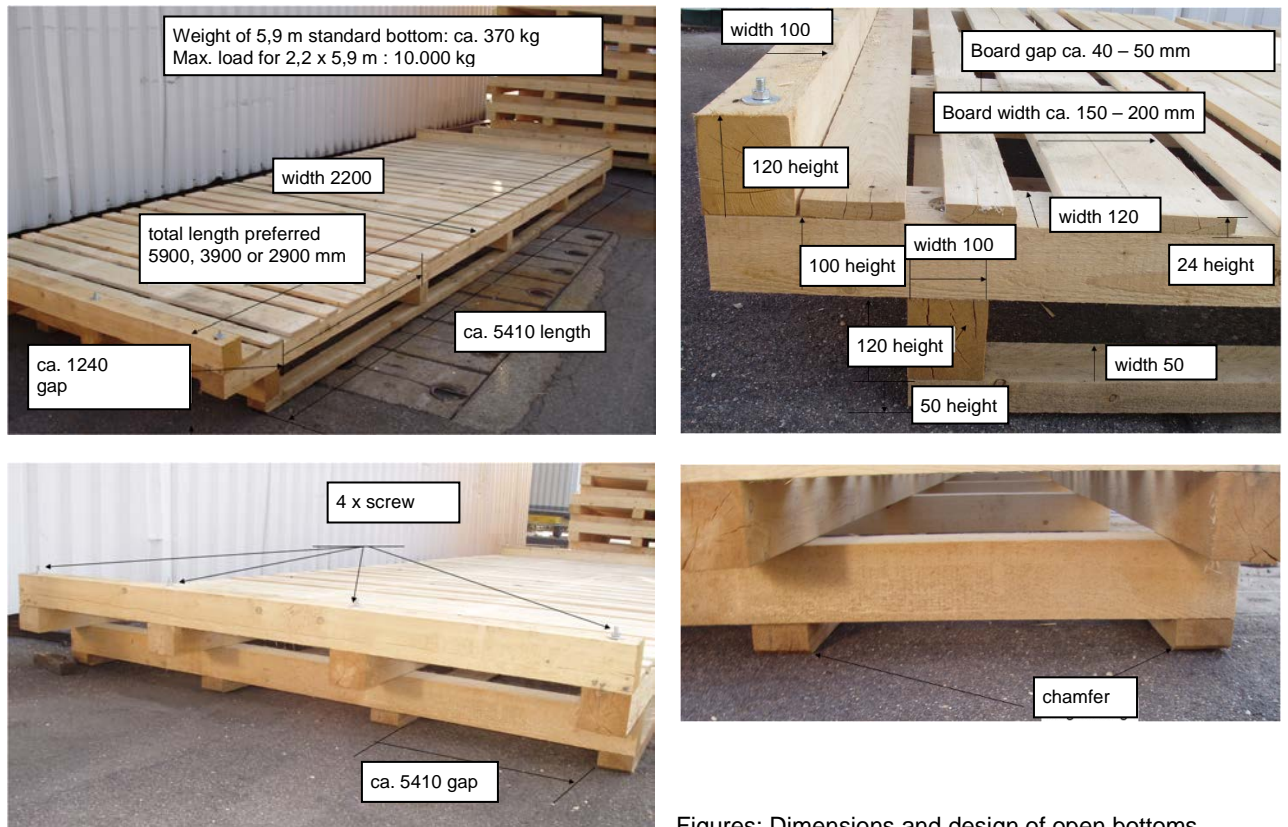


Figure: Bottom in open design



Figures: Dimensions and design of open bottoms

### 10.6.2 Side walls, front walls and cover

The distance of the vertical laths of the side and front walls should not exceed 1 m. The front wall should have one vertical lath per longitudinal skid. The distance between the component and the side wall must not be less than 50 mm. For crates > 2 t and/or length > 3000 mm and/or crate height > 1500 mm truss-type stiffening is required. The cover and the corresponding design of the support for the lid compression timbers must be made according to the requirements of the stack pressure. Between the lid laths and lid boards, a sealing layer composed of a hardboard and PE foil must be fitted.

### 10.6.3 Stack pressure

Unless agreed otherwise, strap frames, diagonals and lid supports must be designed for a stack pressure of at least 1 t/m<sup>2</sup>. The lid compression timbers, including lid compression timber supports, must be installed at distances of 600-700 mm and nailed to the side walls. The distance of the lid supports to the front walls should be approx. 400 mm in each case.



Figure: Crate design for stack pressure

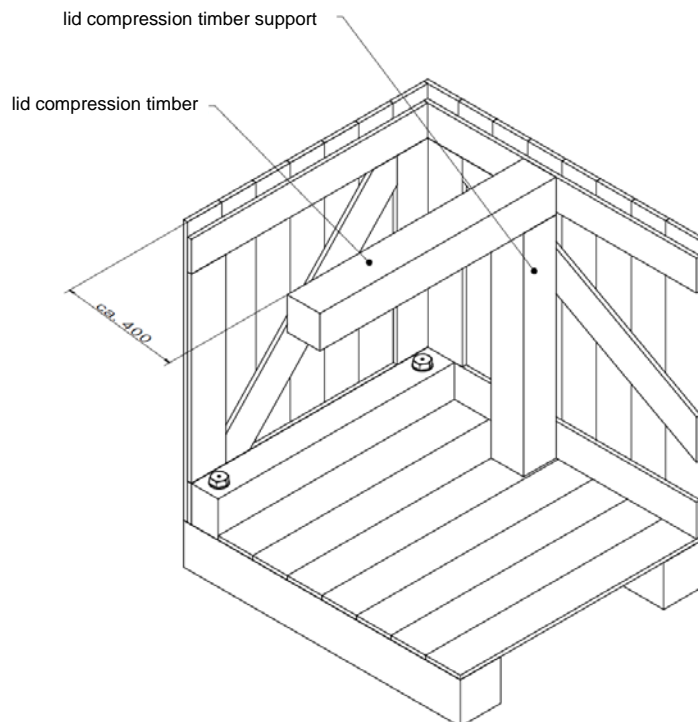


Figure: Lid compression timber and lid compression timber supports

#### 10.6.4 Lining

The inside walls and the cover of the crate must be lined with an overlapping waterproof specialty paper or equivalent material. The lining must not be pierced or damaged.

#### 10.7 Packing category VK 6: Packing for hazardous goods

Only goods in suitable and approved packing are allowed to be transported.

*For selecting suitable and approved packing and ensuring marking and labeling in accordance with the specifications, the following regulations must be observed:*

- UN number (or national system)
- Hazardous goods class
- Packing group
- Released quantity

- **and other factors, such as the national laws and regulations, as well as the relevant international regulations must be applied. Examples include:**
  - ADR (road)
  - RID (rail)
  - ADN (inland waterways)
  - IMDG (sea)
  - IATA (air)

#### 11 Heavy-lift hardware (suspension plates and crate angles)

Crates with a gross weight of more than 5 t shall have hardware of steel on the bottom and top edges in cable position (sheet metal thickness depending on weight, but minimum of 3 mm).

Suspension plates appropriate for the total weight of the loaded crate are to be selected and attached.

The crate angles serve to protect the crate from damage during slinging with ropes, chains, etc., on a crane.

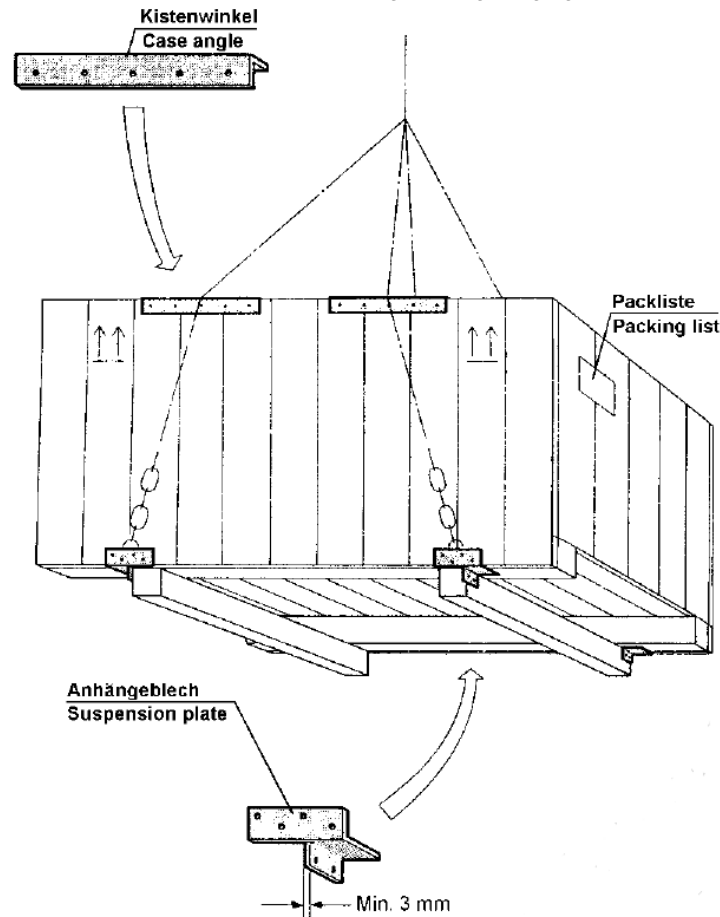


Figure: Fitting of heavy-lift hardware

#### 12 Marking and signing instructions

Necessary labeling and marking is specified according to order.

For machine width components, the front side and drive side must be identified and clearly visible on the packing.

**The storage code must be affixed on the outside of the handling unit package in a readily visible position.**

#### 13 Handling marking

The symbol corresponding to the required storage instructions must be attached to the package in accordance with the packing list.

The symbols are made known for the specific order.

The "center of gravity" symbol must be put on at least two adjacent sides of the package as soon as the weight of the package exceeds 1 t or the center of gravity is decentralized/off-center.

The corresponding symbols for the handling and storage of packages must be designed in accordance with ISO 780.

*Handling markings must be affixed to the handling unit using spray paint. If this is not possible, it must be ensured that the markings are securely affixed and cannot work loose or become lost during transportation.*

#### **14 Means of transport**

*This instruction and the interpretations thereof shall be applied with respect to the various requirements for the different means of transport. As a rule, the products are transported by truck, train, ship or by air freight in an aircraft. Various transport methods for the same means of transport, e.g. by train as special transport or by train as standard freight, must be considered. The handling of the components and the associated loads occurring as a result can vary significantly. For example, acceleration (g forces) when maneuvering.*

#### **15 Unpacking the goods**

*When individual parts are removed from the packages, it must be ensured that the remaining parts are not damaged and that the packing is sealed tight again afterwards. (Outdoor, indoor storage)*

*Partial removals are to be documented.*

*For removing the preservation, the specifications and recommendations of VN 1576 must be applied.*

#### **16 Storage of components on construction sites and in intermediate storage facilities**

*The method of handing over consignments from one partner to the next must be specified and documented. (transfer of risk, handshake). The documentation is carried out in and with the existing systems (e.g. VP shipping package list, packing list and LMS system).*

#### **17 Repairs to packages**

*The following repairs must be carried out by the shipping company employee as required.*

- *Damage to the foil (up to approx. 30 cm in size)*
- *Loose planks on crates if these can be repaired simply using a hammer (and nails).*

*Generally, all damage must be reported to the appointed contact at Voith, and documented with a picture, immediately on occurrence and before a repair is carried out.*

#### **18 Reuse and disposal of packing and/or packing material**

*Basically, reusable and/or recyclable materials are used.*

*Packing materials (e.g. pallets, transportation rack) are taken back wherever possible.*

*If taking back is possible, this shall be agreed separately.*

*If packing materials are disposed of, they must be correctly sorted in accordance with the relevant instructions.*

*Packing that has to be disposed of as special waste should be avoided and proof of proper disposal must be furnished.*

*Basically, it is important to ensure that the packing is designed in the most environmentally and resource friendly manner possible.*

#### **19 Further points**

*Any other specific packing requirements for components and products shall be set out in separate VNs or addressed as part of the project VQS. In the absence of any specific requirements, the general VN packing instructions shall apply. If anything is unclear, the relevant contact (e.g. in purchasing) at Voith must be approached.*

*Visual packaging instructions can be called up with a QR code on the handling unit label and downloaded from the Voith supplier portal in the download area.*

*<http://voith.com/corp-en/about-us/supplier-ecosystem.html>*