



MINIMUM REQUIREMENTS FOR INDUSTRIAL PACKAGING

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1. Best Practice

Export packing is an integral part of any international commercial transaction. It is however, like many aspects of trade, not a topic that is black or white; a number of variables interact to provide the solution to which type of packing should be applied.

The primary function of an export packer is to ensure that, in the event of encountering the potential hazards of transit and delivery, the product is delivered to the customer in the same condition as when it commenced the journey. Any packing has to be constructed to facilitate handling, protect against the inherent risks in transit and delivery, while offering protection from the environment and unauthorised access.

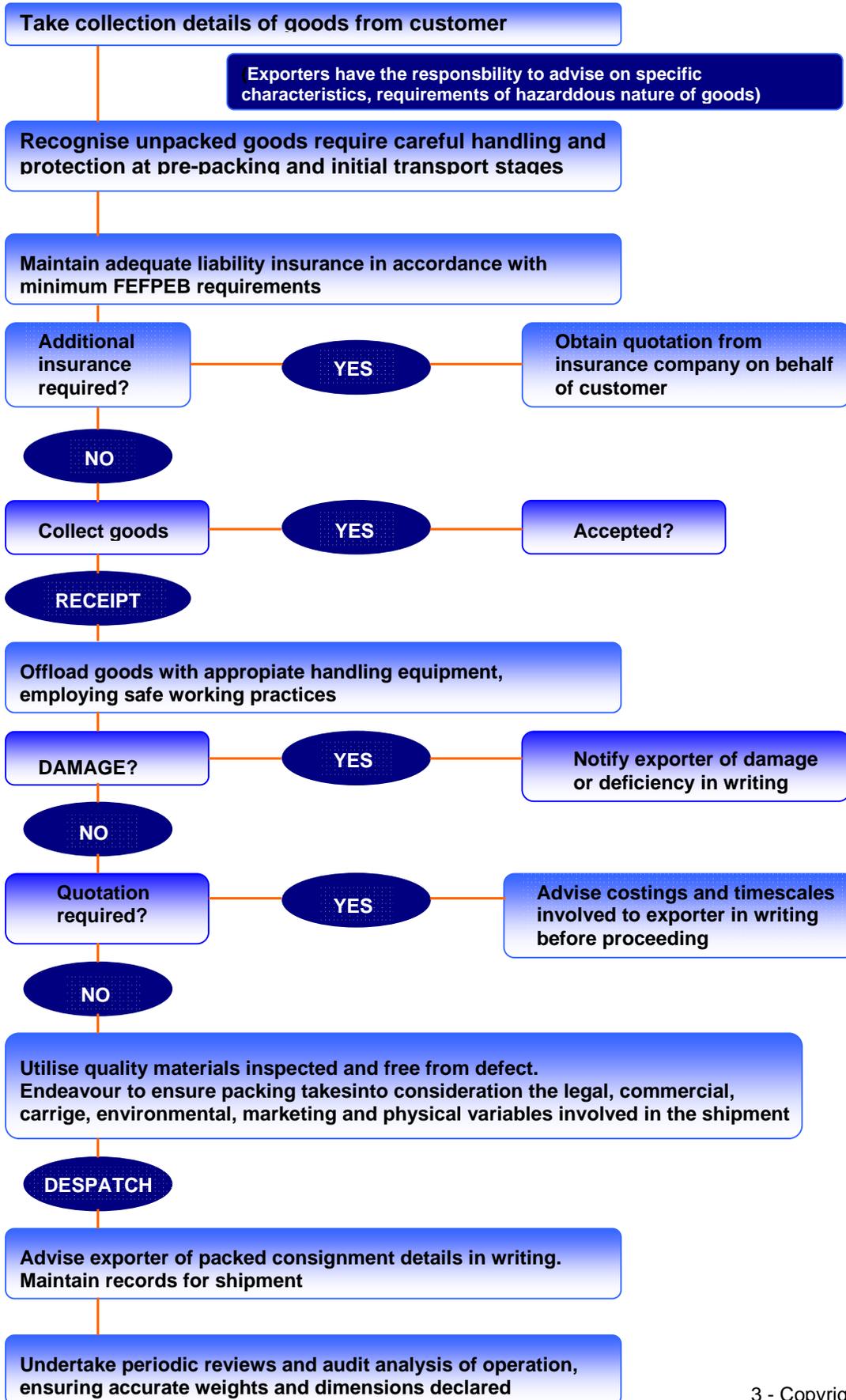
Packing should be seen as an integral part of any international transaction, with variables such as legal, commercial, carriage, environmental, marketing and physical all taken into consideration.

Basic rules in export packing technique

There are some basic rules which should be applied when working out which type of packing is required for the product.

1	Study the product, journey and mode of transport required.
2	Check that destination country regulations do not prohibit certain types of packing material i.e. straw or wood.
3	Consider if goods are to be packed for transit or on-site outdoor storage. Check if treated timber is required.
4	Select the most suitable packing option, e.g. close-boarded case, fibreboard carton, skeleton crate etc. Consideration should be given to climate conditions, with protection against humidity and environmental damage.
5	Goods should be well secured within the package.
6	Consolidate into one load if possible where a number of small packages are concerned, minimising handling and risk of theft and pilferage.
7	Consider the probability of cargo being 'overstowed', or having other cargo put on top of it and multi-handling.
8	Use effective design skills to minimise space occupied by packing.
9	Ensure packing is adequately secured - do not advertise any contained products by using printed sealing tape.
10	Ensure appropriate insurance cover is in effect whilst goods are in the process of being packed.

Flowchart for operational Best Practice Procedures



1. PRINCIPLES AND REQUIREMENTS

Physical-Chemical Protection

Physical-chemical protection may be specified to facilitate insulation against the action of aggressive agents such as:

- ❖ Water
- ❖ Water vapour
- ❖ Saline air
- ❖ Temperature
- ❖ Solar-rays
- ❖ Micro-organisms
- ❖ Electrolysis
- ❖ Corrosive chemicals
- ❖ Radiation of all kinds
- ❖ Agents of a similar nature or effect

1.1 Choice of Method

The choice of the method of physical or chemical protection must, therefore, allow for the following two parameters:

- A. Sensitivity of the goods to aggressive agents
- B. Climatic environment of the goods during the period of handling, transport and storage.

1.1.1 Sensitivity of goods to corrosion

Goods are chemically sensitive to corrosion. This corrosion exists in the form of contamination or oxidation which risks making the goods concerned unfit for use or which may alter their properties. It is a characteristic of the nature of the materials used in the making of the goods or the covers made for their protection.

Relative electrochemical reactivities of some common metals and alloys in contact with salt water in order of decreasing corrosion activity:

Magnesium	Tin
Magnesium alloys	Bronzes Nickel
Zinc	Brasses Copper
Aluminium Duralumin	Silicon bronze
Mild steel Wrought	Nickel (passive)
iron Cast iron	Stainless steel
Lead (passive)	Titanium

The above list is an appropriate guide to corrosion in saline and industrial atmospheres and takes no account of the much greater protection that may be afforded by good quality painted surfaces.

This list is neither exhaustive nor intended as a comparison of the corrosion characteristics of metals and alloys. It is merely presented according to a basic order - which may be subject to change - for the information and attention of those who may be unfamiliar with the general characteristics or corrosion of most current materials when selecting a protection method.

As a general rule, the nearer a material is to the head of the list, the greater must be its degree of protection against corrosion for storage and transport.

As a result, it is important that the customer notifies the member company of the composition of his equipment and the risks involved, particularly if it contains readily corrodible materials.

1.1.2 Climatic environment of the equipment

The packed goods may be subject to the climatic conditions of their storage location and mode of transport for very varied periods of time. Places of storage or modes of transport may be:

- a. Under air-conditioned cover;
- b. European conditions (eg. temperate): under non-air conditioned cover; outdoors
- c. Maritime conditions (corresponding to conditions of maritime transport);
- d. Tropical conditions: in increasing order of stress.

The effective period of protection will normally be 180 days for temperate conditions unless otherwise specified. Classes of packaging will, therefore, be selected according to the parameters detailed in paragraphs 1.1.1 and 1.1.2

1.2 Ensuring physical-chemical protection

Physical-chemical protection may be ensured by:

- a. Contact protection;
- b. Impermeability to run off water in combination with adequate ventilation;
- c. Protection of waterproof barrier.

1.2.1 Contact protection

Prior to the application of any contact protection it is essential that the goods are cleaned; that it is free from pollution by oil, dust, damp, oxides, finger marks etc. Contact protection is subsequently carried out with the following products according to use:

- ❖ Anti-corrosion agent leaving a flexible heavy-duty, protective film after evaporation of a solvent. Use preferred for parts put into long-term storage.
- ❖ Ant-corrosion agent leaving a film of grease after evaporation of a solvent. Used for machined parts, compatible with subsequent lubrication. May be accompanied by a greaseproof covering if applied to vulnerable, accessible surface.
- ❖ Anti-corrosion agent leaving adhesive wax film after evaporation of a solvent. Must be removed with the use of a petroleum agent prior to use of the equipment.
- ❖ Anti-corrosive protection oil having inhibitor properties in the vapour condition. Used inside sealed systems, gear housings, engines, tanks etc.
- ❖ Anti-corrosive protection film, emitters, liquids having inhibitors properties in the vapour condition. Vapor Corrosion Inhibitors must have a direct contact with the goods to protect. Used for transport and storage up to 2 years.

This list is not exhaustive -other products may be used as the case may be. Contact protection may or may not be accompanied by a waterproof seal or covering applied locally

1.2.2 Impermeability to run off water in combination with adequate ventilation

Since condensation may be caused by both variations in temperature and changes in humidity (inside and out) it is essential that external packaging (protecting equipment subject to corrosion) is impermeable to run off water and is ventilated to eliminate internal humidity.

The body of packages made with jointed timber must be internally lined with an impermeable material that is resistant to humidity. Any lid must be impermeable to the ingress of water (e.g. lined with an impermeable barrier that is resistant to humidity and held in place by a panel of plywood, fibre board or chipboard).

It is also vital that vents that will not let in rainwater aerate the package. The bottom of cases must allow the escape of condensation (e.g. by boring floors made of plywood or grooved planks).

Ventilation is not required with a VCI protection
Ventilation is not necessary for a full loaded box.

1.2.3 Protection by waterproof barrier

The aim of this method is to reduce humidity inside the barrier below a certain level (40% relative humidity) during transport and storage.

This humidity may:

- ❖ Come from fixtures, stays, props, padding, stuffing, suspension, shockabsorbing materials, dunnage, etc.;
- ❖ Come from the goods themselves;
- ❖ Be present in the package at the moment of sealing;
- ❖ Penetrate to the inside through the walls of the package.

Penetration of humidity depends on the permeability of the barrier material and climatic characteristics. The type of waterproof barrier and the amount of drying agent must, therefore, be chosen and calculated accordingly.

2. Classification of the goods and packing classes

We first have to define the goods to be packed and then find the packing class and the protection.

2. Classifications of Goods		Nature:	Packing classes:	
2.1	reactors, pillars, condensers, reservoirs, exceptional dimensions	Not sensitive to shock	2.1	saddles, skids see drawing 1.
2.2	straight tubes bearing constructions, steel profiles	same	2.2	bundling see drawing 2a + 2b.
2.3	cable	same	2.3	cladding cable reels see drawing 3.
2.4	reservoirs with construction elements, thin metals, coated pipes, etc.	same	2.4	Crates
2.5	non-hygroscopic material, plastics, coated steel	same	2.5	crates of cases
2.6	machinery and / or parts, gearboxes, mechanical parts, fasteners, electro motors	sensitive to corrosion	2.6	cases barriers + desiccants see drawing 4.
2.7	switch panels, computers electronic measuring items etc	sensitive to shock and corrosion	2.7	cases, cushioning and aluminium barriers + desiccants, VCI, PE barriers and dessicants.
2.8	chemicals, fuel, radioactive Materials, paint, glue, acids	IMCO	2.8	according to IMCO-rules
2.9	liquid- and bulk materials in drums	NON-IMCO	2.9	Crates

2.1 Class 1

Reservoirs and blocks or metal parts of construction (drawing 1).

2.1.1. Every opening has to be plugged with a metal or plastic cover, or to be sealed off with aluminium foil and covered with a triplex lid.

2.1.2. Reservoirs and machinery of special steel.

Welding, in order to ease the transport, can only be done after dialogue with an on agreement from the client.

Metal strapping, used to attach goods to the saddle, is not allowed to come into direct contact with the goods.

2.1.3. Reservoirs, of which the internal walls or parts are sensitive to corrosion, have to be provided with sufficient moisture absorbent materials or other corrosion inhibitors.

2.1.4. Preformed tin or metal work has to be fixed on the saddle with clamps.

2.2 Class 2

Bundling according to drawing 2

- 2.2.1.** The under- and overcross steel beams are to be U-profiled and tensioned against the goods. The tension rods between the cross beams are not to extend above the top of the U-profiles.
- 2.2.2.** Constructions which are difficult to handle should be provided with lifting rings. Here also, in case of welding is thought of, dialogue should take place with the client.
- 2.2.3.** From 6 tons of dead-weight up, one should use vertical steel profile instead of tension rod, and, if necessary, with lifting rings.
- 2.2.4.** 10 mm. Multiplex and/ or boards in between.
- 2.2.5.** After tensioning the nuts have to be secured with, e.g. a contra-nut or a spot-welding.
- 2.2.6.** If there is a danger that the bundle can be pulled apart, action should be taken to prevent this. (steel - sheet or such like).

2.3 Class 3

Cable and cable hose-reels according to drawing 3.

- 2.3.1.** On the sidewalls of the hose-reels, boards have to be fixed with a minimum thickness of 22 mm. The hose - reels also have to be provided with metal strapping, minimal 30 mm. wide and 1 mm. thick.
The strapping has to be fixed as close as possible to the nailed rim.

The ends of the cables have to be preserved and quided inwards.

2.4 Class 4

Crates.

2.4.1. Sides:

Vertically placed, the frame and diagonal clamps have to be placed on the outside of the crate. The distance between the boards may not exceed 10 cm.

2.4.2. End Panels:

The boards are vertically placed, the frame and diagonal clamps on the outside. Above gross weight of 5 tons or longer than 3.50 meters diagonal clamps have to be used.

2.4.3. Lid:

Boards over the width. To withstand stacking pressure the lid has to rest on the wooden beams. The dimensions of the beams are the same as the longitudinal beams of the floor construction, also the vertical supporting beams. The pressure beams that rest in the framework have to be fixed every 60 or 70 cm.
See 4.8

2.4.4. If there is a danger that the load can be pulled out the crate, on the front sides a closed panel should be used.

2.4.5. Skids:

See 6.7

2.5 Class 5

Cases / crates, if necessary goods covered by open polyethylene barrier, but if susceptible to moisture damage then the polyethylene barrier should be hermetically sealed.

2.5.1. Side panels:

Boards are placed vertically, framework and diagonals on the outside or inside of the case, clad with micro perforated polyethylene sheets.

2.5.2. End panels:

Board are placed vertically, framework and diagonals on the outside of the case, clad with micro perforated polyethylene sheets.

2.5.3. Lid:

Boards clad with micro perforated polyethylene sheets. Nails may not pierce the framework. The framework of the lid must rest on the framework of the end- and side panels.

Boards over the width. To withstand stacking pressure the lid has to rest on the wooden beams. The dimensions of the beams are the same as the longitudinal beams of the floor construction, also the vertical supporting beams.

The pressure beams that rest in the framework have to be fixed every 60 or 70 cm.

See 6.8

2.5.4. Skids:

See 6.7

2.6 Class 6

Cases with cladding and sealed with aluminium barrier.

2.6.1. Case construction as in 2.5

2.6.2. The goods are to be sealed in aluminium, sharp ends have to be padded by foam. The distance between foil and case minimal 4 cm.
See: 6.9

2.6.3. After fixing the foil, the air has to be taken out (vacuum about 8Mbar) and check has to be made if the bag is airtight. In order to absorb the moisture in the bag, adequate drying agent has to be provided. The packing of the drying agent has to be firm and dust-proof and is not to come in direct contact with the goods.

2.6.4. The packing of sensitive and ultra-sensitive apparatus has to be carried out in such a way that the goods and the case should survive a free fall, by use of the correct cushioning materials dependant upon density and weight.

2.6.5. The packed goods should be secured within the case, to protect them against vertical and horizontal impacts, by way of cushioning or bracing. Again this is dependant upon weight and fragility.

2.6.6. If equipment has to be bolted to the bottom, see drawing no. 4

2.7 Class 7

Cases, the same as class 6

Barriers + shock absorbing materials (cushioning) see 6.9 and 6.10

2.8 Class 8

IMCO goods

2.11.1. IMCO-goods rules are to be packed according to the IMCO specifications.

2.9 Class 9

2.9.1 Liquids and bulkmaterials (NON-IMCO) in drums are to be packed in crates according Class 2.4

3.1. Protection against corrosion

Because of the duration of transport and the period of storage, sensitive machinery has to be protected against corrosion by the packer, even if the producer has already made some provisions. The protection limit itself to outside treatment, such as cleaning and preserving. The instruction, laid down for the use of anti-corrosion agent, has to be strictly adhered to. The use of VCI's has always to be discussed with the client.
See schedule 6.9

4. Packing materials, lifting provisions:

4.1 Minimum packing materials

4.1.1 Quality of the wood: North European of kiln dried (KD) or Mid European heat treated in heat chamber.

Boards for seafreight cases/crates require minimum thickness: 18 mm. or 9 mm. plywood.

Boards for airfreight cases/crates require minimum thickness: 16 mm. or 6 mm. plywood.

Wood:

Moisture content at the time of packing: 18-24%

Heat treated according to IPPC – ISPM-15 this also counts for wooden beams.

Quality of plywood: CCX,CDX or comparable quality.

Quality of OSB: OSB/3 or OSB/4 according to international standards.

4.1.2. Foil:

Polyethylene foil minimal 0,12 mm vtl. 8105.

Aluminium foil according MIL-B-131 and international standards.

4.1.3. Blanket and filling materials:

The use of hygroscope filling or/ and protective materials such as woodwool, paper, hay and straw is not allowed.

4.2 Heavy lift provisions:

Cases and crates with a gross weight of more than 3 tons are to have steel lifting angles, depending on the weight, can vary, but should 3 mm. at least.

5. Marking and labelling instructions:

- 5.1.** Before marking is commenced, the marking area has to be smooth or treated with a neutralising paint. In case of metal, the area needs to be degreased. Metal or plastic marking plates are allowed to be used as long as they are colour-fast and can withstand climate influences, such as seawater, U.V. radiation etc.
Marking ink has to be waterproof and also not sensitive to the climate influence as mentioned above.
The markings have to be concise, clear and easily visible, parallel with the floor beams of the case and have to be legible during the complete transport and storage period.
The text, form and place of the markings are extensively given in the shipping instructions. The international marking symbols are to be used according to ISO 780 (see appendix).
- 5.2.** In case there are more orders packed in one collo, every collo in such a case have its individual markings, e.g. stickers as mentioned under 5.1. The same goes for spares, replacements or part deliveries.

6. Special notes:

- 6.1. In case the packer can not identify the goods-category, dialogue with the client is necessary, and the packing classification has to be accepted by the customer.
- 6.2. The packer has to pack as economical and volume saving as possible. In case the possibility exists that in certain cases other goods can be packed within the outgoing case: check with the client. If pieces can be dismantled to reduce the volume it has to be agreed with the customer.
- 6.3. Special attention has to be given to small items, which are easy to disappear, have to be repacked.
- 6.4. As a rule the packing has to be executed in such a way, that the goods and the case should survive a free fall by use of the correct cushioning dependant on density and weight.
- 6.5. The packing has to be able to withstand tipping, pushing, lifting etc, as far as it is part of common transport or handling.
- 6.6. Drawings and descriptions on packinglists are to be complete and exact to the content of the cases.
- 6.7. **Skid construction for crates and cases:**
Bottomconstruction must be according to the national norms and standards.

6.8 Stacking pressure:

When cases are stored on a plane, horizontal surface with the load evenly distributed on the top of the case, the compressing stress to be assumed for the static vertical strain is based on the formula:
 $P = 10 \text{ Kn} / \text{M}^2$ (= 1 ton per / M^2)

6.9 Airtight barriers:

The following materials have to be used:

	6 months:	12 months:	24 months:
1. europe	polyethylene	polyethylene	aluminium
2. marine + other conditions	aluminium	aluminium	aluminium
3. tropical areas	aluminium	aluminium	aluminium

For transport and storage periods more than 12 months humidity indicators have to be used, checking after 12 months, and furthermore every 6 months. If the indicators shows the pink colour, the desiccants have to be renewed.

If the to be packed goods have to be bolted through the bottom of the case, it has to be carried out according to the drawing nr.4

Note:

1. Never pack wood or hydroscopic materials inside a sealed barrier.
2. The manufacturer is responsible for corrosion preservation of the bare and innerparts of the goods (machinery etc.)

6.10 Cushioning

Cushioning has to be carried out by using rubberised hair (cocolock) or bonded foam.
Density depends on weight of the equipment.

7. INTERNATIONAL AND NATIONAL STANDARDS / NORMS

These common guidelines for industrial packing are an outline of the underlying basic principles to all national norms for industrial packing. These guidelines do not attempt to combine them, but they are to be regarded as a set of minimum requirements, a guideline for the European industrial packaging industry.

These guidelines are only at the disposal of those companies, member of any national trade association affiliated to FEFPEB. In some cases members will follow their own national standards, from which these guidelines are derived. These common guidelines however cover about 90% of the essential principles of all the worldwide norms for industrial packing.

Adherence to these guiding rules is voluntarily, the combined and vast long-time experience of all European packing companies involved in this guideline tells you that using it will greatly increase the odds for being able to move goods worldwide without damage.

The industrial packer should check the compliance with ISPM 15 in the country of destination.

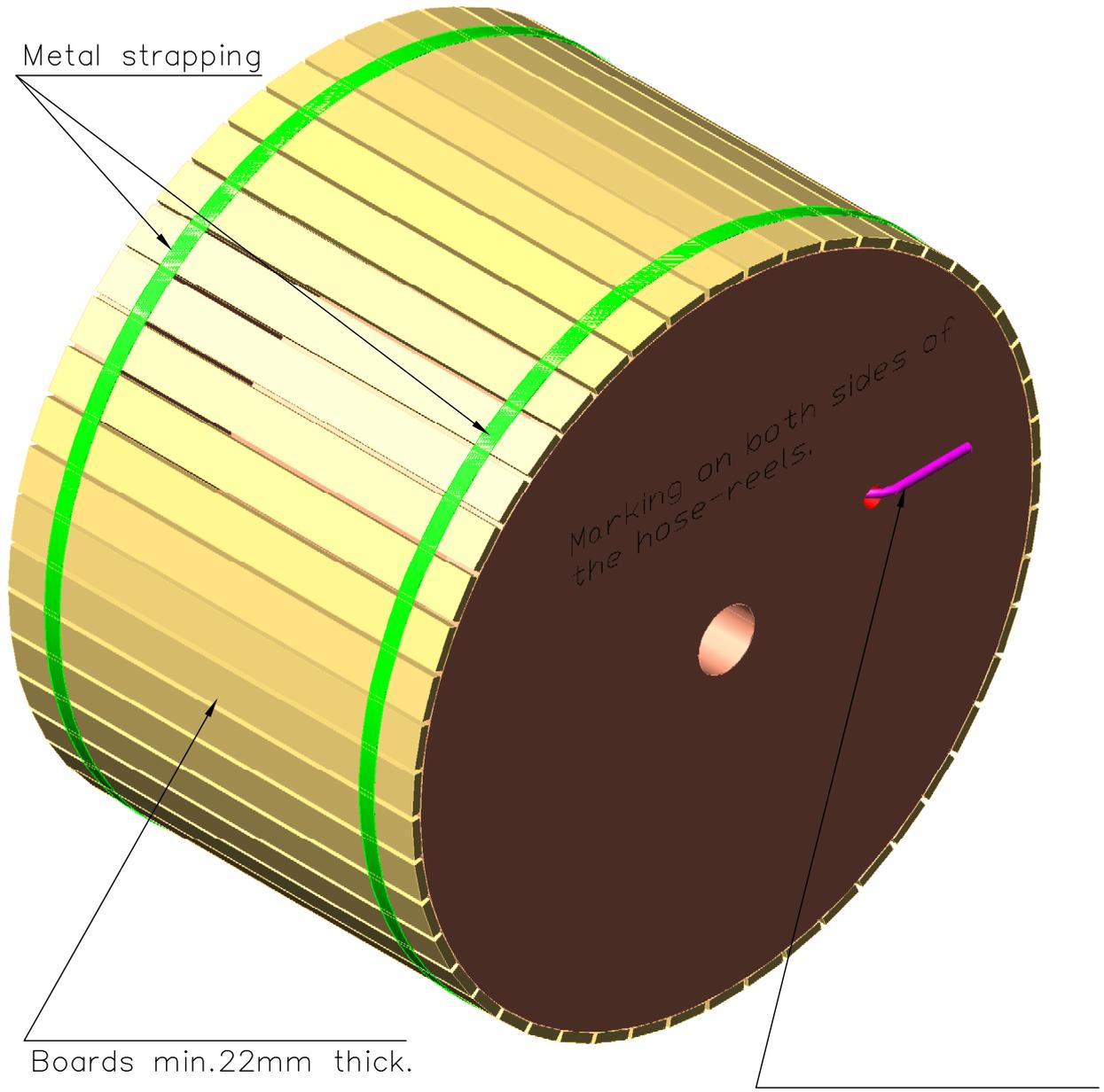


ASSY-INFO



CHANGE-REQUEST

Packing of cables / cable hose-reels.



Both cable-ends have to be preserved and guided inwards.

GENERAL ROUGHNESS 1.6	UNIT mm	TOLERANCES UNLESS OTHERWISE STATED		ISO 1302	ISO 1101
		DIMENSION ± 0.3	ANGLE $\pm 1^\circ$		
SCALE X:X	PROJECTION	MATERIAL			
		TREATMENT Packing cables			



Packing specification

DRAWING NR.
Dwg.nr. 03

ARCHIVE DATE	17.05.06	REVISION DATE	00.00.00
REF. FILE	ATW	DRAWING DATE	19.04.05

NAME	H.KOTTKAMP	DESCR.	SPEC.NO	4 SH	SHEET 3 - 4	SIZE	A4
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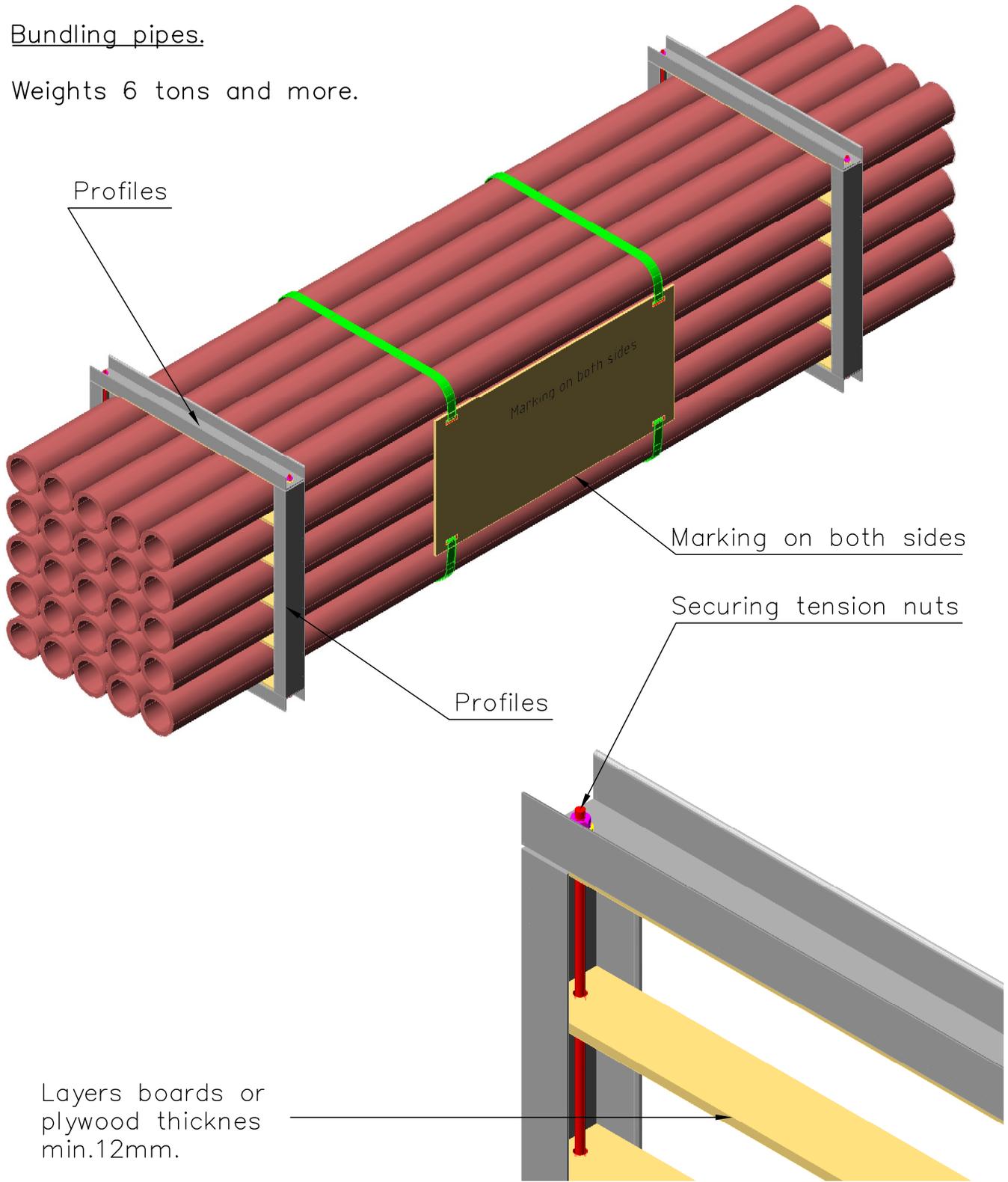
ASSY-INFO



CHANGE-REQUEST

Bundling pipes.

Weights 6 tons and more.



GENERAL ROUGHNESS 1.6 ▽	UNIT mm	TOLERANCES UNLESS OTHERWISE STATED		ISO 1302	ISO 1101
		DIMENSION	±0.3		

SCALE X:X	PROJECTION 	MATERIAL	TREATMENT
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Bundling of pipes		DRAWING NR. Dwg.nr. 2A
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ARCHIVE DATE	17.05.06	REVISION DATE	00.00.00
REF. FILE	ATW	DRAWING DATE	19.04.05

NAME	H.KOTTKAMP	DESCR.	SPEC.NO	4 SH	SHEET 2A - 4	SIZE	A4
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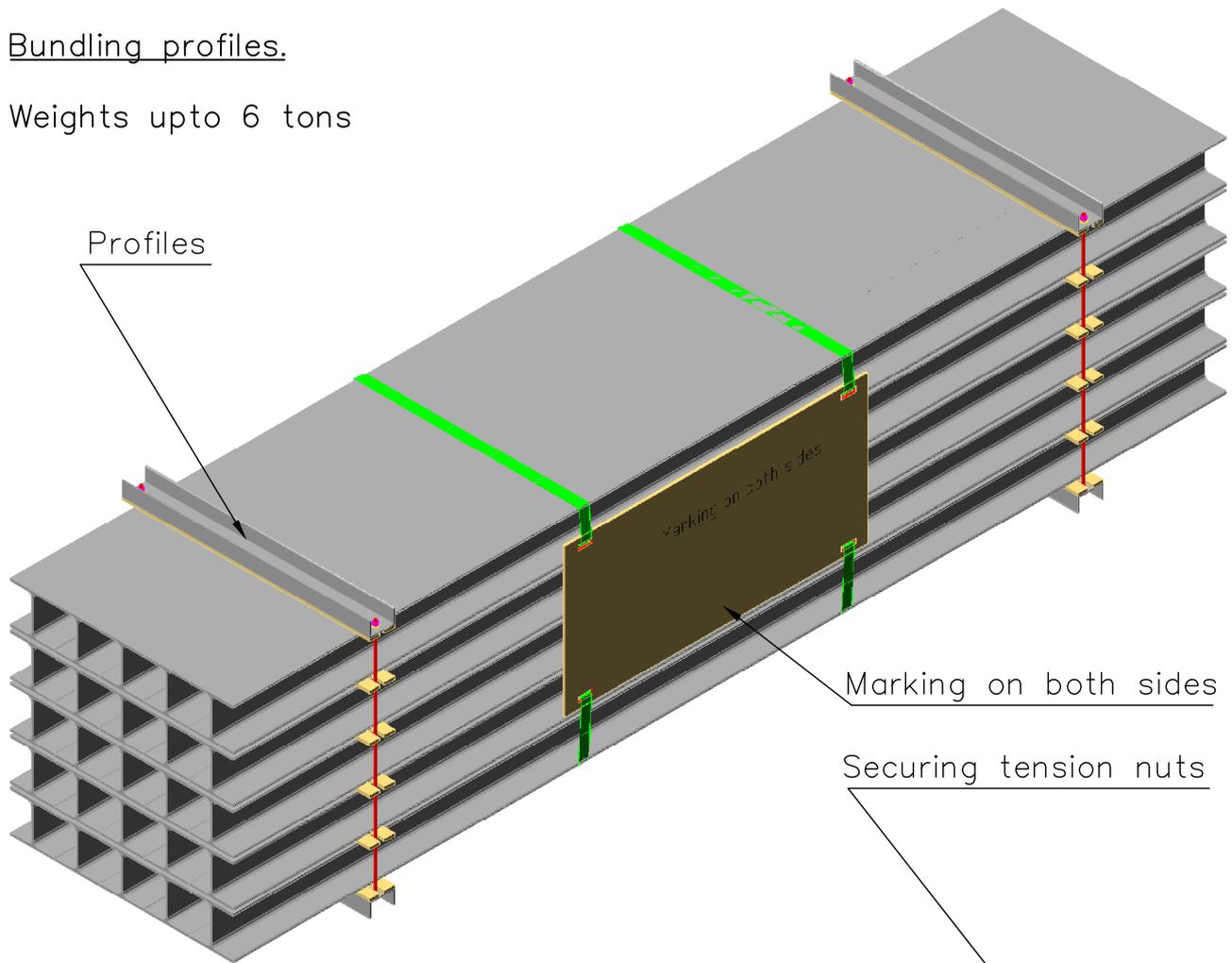
ASSY-INFO



CHANGE-REQUEST

Bundling profiles.

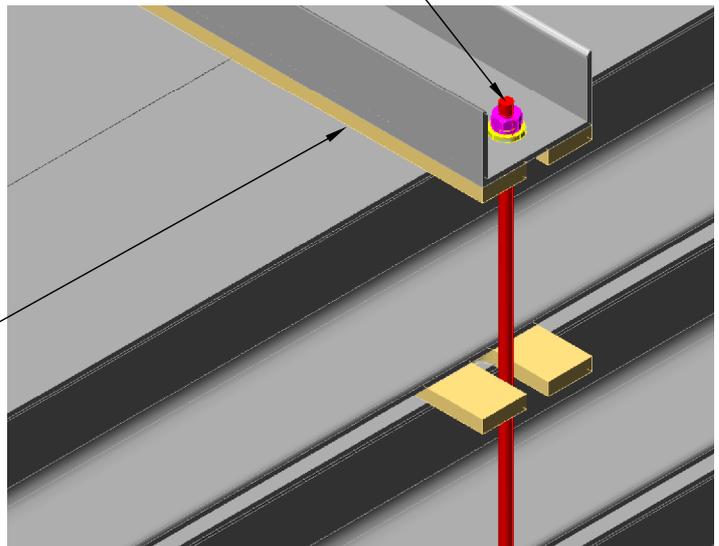
Weights upto 6 tons



Marking on both sides

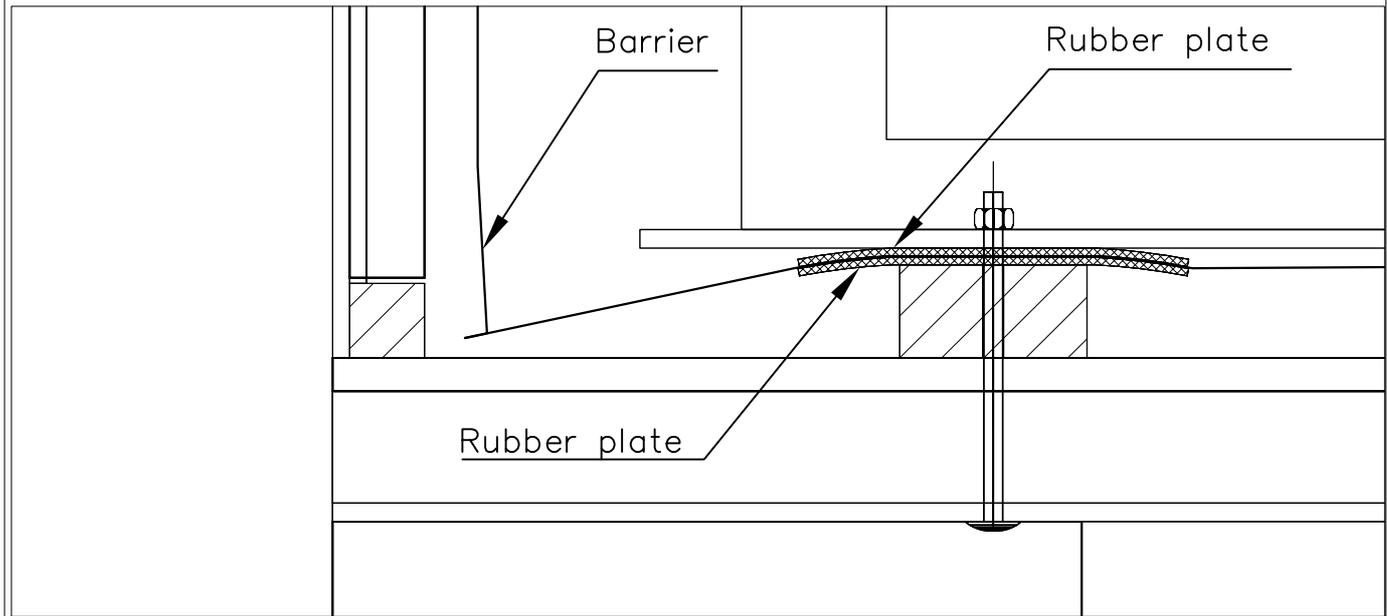
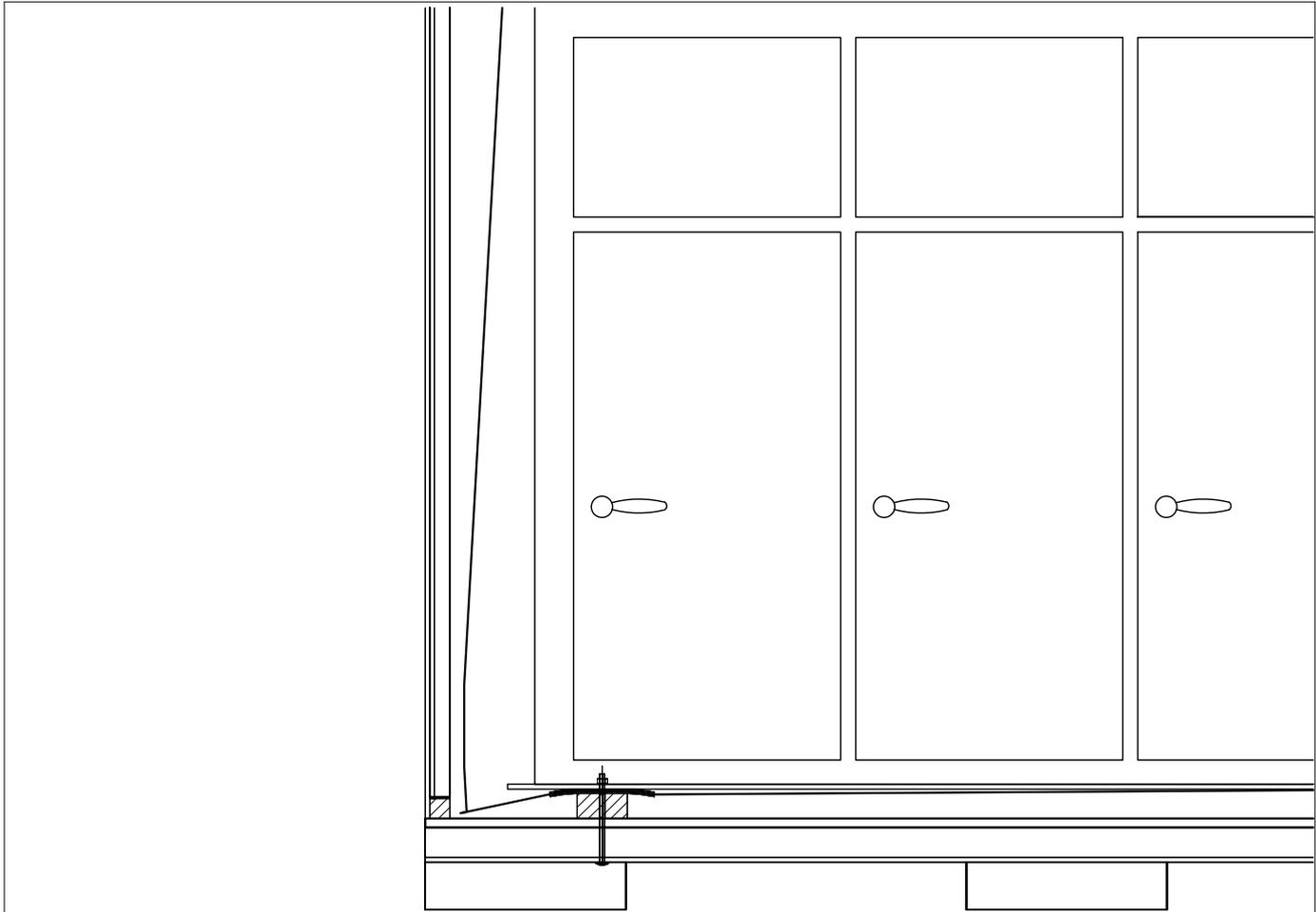
Securing tension nuts

Layers boards or plywood thicknes min.12mm.



GENERAL ROUGHNESS $\sqrt{1.6}$	UNIT mm	TOLERANCES UNLESS OTHERWISE STATED		ISO 1302 Ra in um	ISO 1101
		DIMENSION ± 0.3	ANGLE $\pm 1^\circ$		
SCALE X:X	PROJECTION 	MATERIAL			
TREATMENT		Bundling of profiles			
	Packing specification			DRAWING NR. Dwg.nr. 2B	
	ARCHIVE DATE 17.05.06		REVISION DATE 00.00.00		REF. FILE ATW
NAME H.KOTTKAMP		DESCR. SPEC.NO		DRAWING DATE 19.04.05	
SHEET 2B - 4		SIZE A4		4 SH	

○	ASSY-INFO	○	CHANGE-REQUEST



GENERAL ROUGHNESS 1.6	UNIT mm	TOLERANCES UNLESS OTHERWISE STATED		ISO 1302 Ra in um	ISO 1101
		DIMENSION	± 0.3		
SCALE X:X	PROJECTION 	MATERIAL			
		TREATMENT Handeling by sealings			

	Packing specification		DRAWING NR. Dwg.nr. 04	
	ARCHIVE DATE	17.05.06	REVISION DATE	00.00.00
NAME	H.KOTTKAMP	DESCR.	SPEC.NO	4 SH SHEET 4 - 4
				SIZE A4

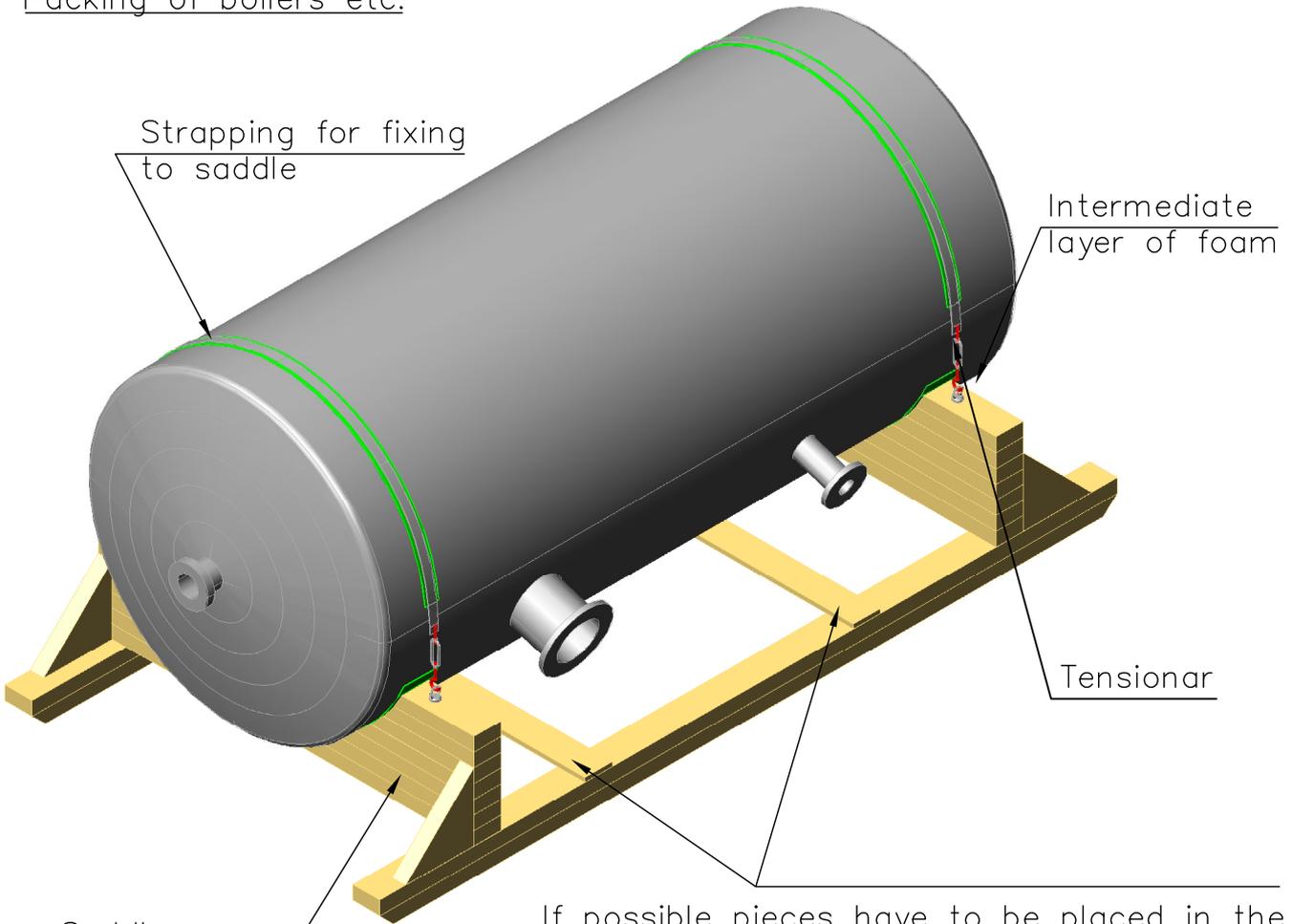


ASSY-INFO	

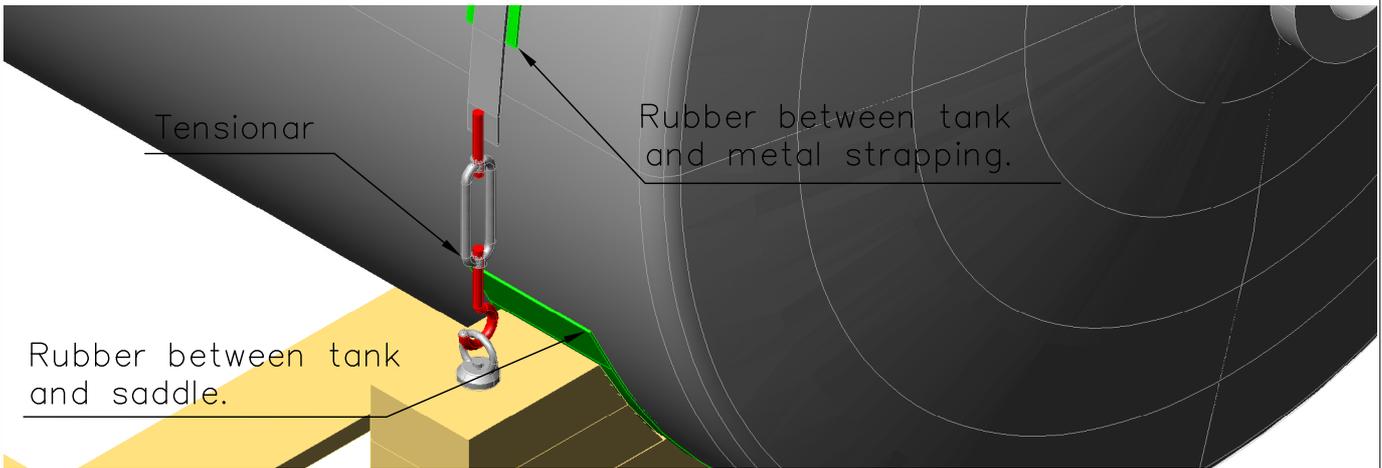


CHANGE-REQUEST	

Packing of boilers etc.



If possible pieces have to be placed in the space between boiler and saddle to prevent damage.



GENERAL ROUGHNESS 1.6 ▽	UNIT mm	TOLERANCES UNLESS OTHERWISE STATED		ISO 1302	ISO 1101
		DIMENSION ±0.3	ANGLE ±1°		
SCALE X:X	PROJECTION ⊕	MATERIAL			
TREATMENT		Packing boilers			
	Packing specification		DRAWING NR. Dwg.nr. 01		
	NAME H.KOTTKAMP	DESCR. SPEC.NO	ARCHIVE DATE 17.05.06	REVISION DATE 00.00.00	DRAWING DATE 19.04.05
REF. FILE ATW			SHEET 1 - 4		
SIZE A4					