Base Load Power Hub (BLPH)

PACKING, SHIPPING HANDLING AND STORAGE PROCEDURES
HYDROGEN VENT

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

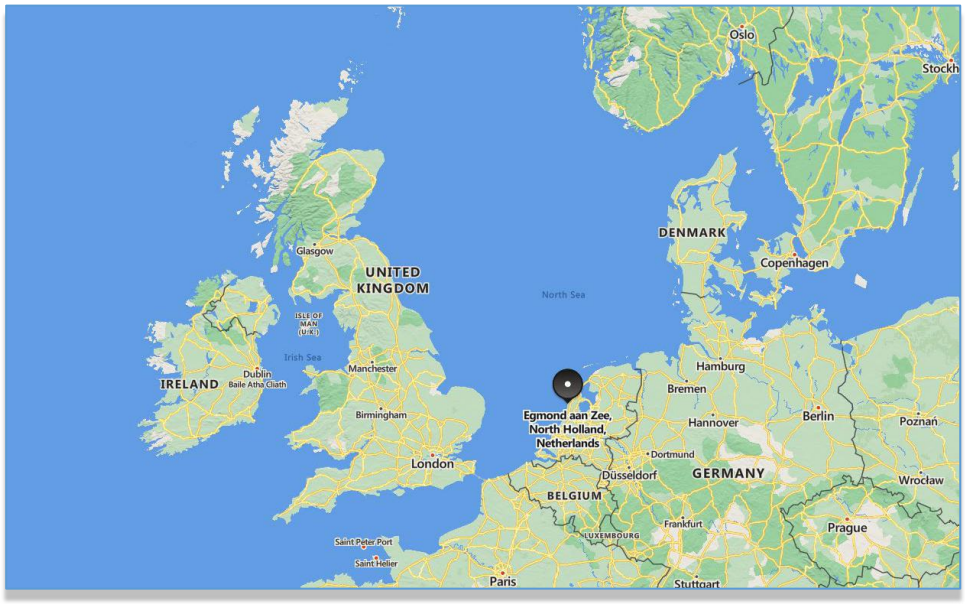


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map



Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

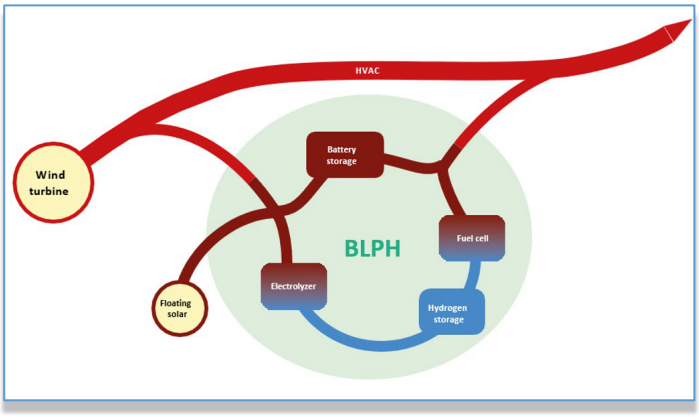


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

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2 DOCUMENT SCOPE

This Document describe in detail the packing, shipping and storage specifications to be followed during the project execution.

2.1 REFERENCES

See chapter 3.3

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	CROSSWIND
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 1 - Definitions and Abbreviations

3 INTRODUCTION

This specification provides an exhaustive and complete general information concerning the packing of industrial equipment and parts composing the supplies produced by Encore Thermoengineering S.r.l. Main purpose of packing is to ensure content to reach the final destination in condition of perfect integrity and efficiency.

In particular, packages must be suitable for:

- Allow their lifting, handling and transportation in safe conditions for the encharged persons;
- Neutralize on packages content all effects deriving from the expectable mechanical, chemical and environmental actions during their handling, transportation and storage, including heavy rain, thermal excursions, , high humidity, sprays of spruzzi di saltiness, sand and dust, as well as long stay on ship decks, barges and transit areas.

3.1 ADDRESSEES

Addressees of the specification contained in the present document are:

- Packing Companies (directly encharged by Encore Thermoengineering S.r.l.);
- Sub-vendors (if encharged by Encore Thermoengineering S.r.l. to deliver items already packed);
- Clients of Encore Thermoengineering S.r.l.

Subvendors, if encharged by Encore Thermoengineering S.r.l. to deliver items already packed, are also, towards Encore Thermoengineering srl, suppliers of the package.

3.2 RESPONSIBILITY OF PACKING SUPPLIER

Packing supplier is responsible for:

- Timely notification of eventual damages to goods detected when taking them in charge or by himself accidentally caused;
- Integrity and conservation of the goods delivered to him;
- Their correct handling;
- Compliance of packings with applicable General and Particular specifications;
- Suitable use of protections (barrier bag, dehydrating salts, etc.);
- Necessary measures to avoid undesired intrusion inside the packages or leak of their content;
- Proper excution of the package, its structural suitability, as well as of the storage of woodden materials and relevant accessories;
- **Conformity of packages to the selected shipping mode (road / sea etc.) including compliance with particular requirements in force in the destination contry of the goods**

If package is to be prepared at a subvendor workshop, subvendors is normally responsible for handling and transportation activity necessary to allow the packing activity.

As a general rule goods to be packed must be stored indoor, in protected areas from atmospheric agents and served by suitable lifting and transportation means.

All possible precautions must be adopted to avoid thefts.

Encore Thermoengineering srl reserves the right to evaluate and approve goods partition between the various package sas well as the foreseen type of package.

In his proposal subvendor can offer alternate solutions to the present specifications if considered, based on his experience more efficient or economical. This alternate proposals must be in anycase approved in writing by Encore Thermoengineering srl.

3.3 REFERENCE CODES

The present document constitutes a guideline for the preparation of the suitable package, but the indication herein contained do not release packing supplier from the correct structual and protection design (sections of beams and frames, type and quantity of anticorrosion products etc.): in fact said design needs to be carried out case by case. Therefore the compliance with the present specification is for packing supplier necessary but not sufficient to grant a safe and suitable packing as far as his responsibility is concerned.

For further and more detailed technical specifications (in particular for design of structural elements), please refer to following norms:

- UNI 10858 – special wooden packages for content between 300 and 10000 kg and maximum dimensions (600 x 250 x 250) cm;
- UNI 9151 - wooden packages for content over 300 kg.
- HPE (Holzpackmittel Paletten Exportverpackung) - PACKAGING GUIDELINES
- DIN 4074 – wooden materials
- CSA0151 / MI978 / DIN 68705 – phenolic plywood elements
- MIL-B131-F – barrier bags
- MIL-D-3464-D AMERICAN STANDARD / DIN 55473 – silicagel
- ISPM 15 – antiparasitic treatments
- IMCO – hazardous goods transportation

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4 SELECTION OF PACKING TYPE

Generally, packages are made of:

- One rigid container or support (i.e. case cage /platform)
- Flexible accessory protections (like polythene/ barrier bag/ anticorrosion oils etc.).

Here below are described selection criteria for packing type, rigid and flexible. With a reasonable choice of the packing type, as well as its correct design, the material optimization can be pursued, together with the maxium possible safetyfor the delivery of the goods at the final destination.

4.1 SELECTION CRITERIA

The type of packing and protection are selected based on the following information:

1 Nature of the contained goods

2 Selected transportation mode

3 Storage duration and conditions

4 Eventual particular requirements

4.2 PRODUCTS

For shipment, equiment supplied by Encore Thermoengineering srl are normally grouped as follows:

- Machinery and equipment (fans, ignition skids, bottles skid, winches, dampers etc.)
- Piping (or piping elements: pipes, flanges, valves, fittings etc.)
- Instrumentation (like pressure/temperature gauges, thermocouples, legel gauges etc.)
- Electrical items (motors, boards, cables, computer, monitor, printers etc.)
- Refractories (bricks etc)
- Insulating materials (insulating panels).
- Steelworks (ladders and stairs, walkways, templates, frames, davit, tip, riser, KO drum and water seal, air ducts, profiled steel bars, stud bolts, supports etc.)

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4.2.1 Shipping mode

Shipping mode is determined by destination place and packages size. In general the choice is between 4 differente shipping modes

Road (trucking) Railway(rail) Seafreight Airfreight



There are the following possible cases:

- Packing is the shipment unit;
- Packing is into a container;
- (unfrequently) goods are shipped loose (without packing).

For Encore Thermoengineering srl projects normal selection is for seafreight (direct packing or containerised) whilts arirfreight is used mainly for partial shipment (like single items or spares ecc.) o urgent parts.

In any case, shipping mode selection is on Encore Thermoengineering srl that informs packing supplier accordingly.

Shipping mode contributes in the selction of the packing type.

4.2.2 Storage

Information about duration and conditions of the evntual storage period are very useful to select, beyond the main packing type, the most suitable protections (like barrier bags, coatings, anticorrosion oils, etc.).

4.2.3 Special requirements

In the packing type definition it is necessary to consider all the possible special requirements available like for instance:

- Size constraints or limitation for the packages,
- Special requirements of stackability[1-2],
- Number of transhipments,
- Availability of one way containers[3] ecc.

that may influence both the selction of packing and internal protectioN

1. Capacity to support a distributed load on the sides
2. Capacity to support a distributed load on the cover.

container "one way" require generally a limited handling of the goods and this allows to prepare less expensive packings.

4.2.4 Rigid packing – selection table

The following table guide to rigid packing selection based on content, shipping mode and storage information.

MACHINERY AND EQUIPMENT

Seafreight/railway (container)	Case – cage – platform - loose
Road	Case – cage – platform - loose
Airfreight	Case

PIPING

Seafreight/railway (container)	Cage – saddles – bundle - loose
Road	Cage – saddles – bundle
Airfreight	Cage

INSTRUMENTATION

Seafreight/railway (container)	Case
Road	Case - Cage
Airfreight	Case

ELECTRICAL ITEMS

Seafreight/railway (container)	Case
Road	Case - Cage
Airfreight	Case

REFRACTORIES

Seafreight/railway (container)	Cage - platform
Road	Cage - platform
Airfreight	Cage

INSULATING MATERIALS

Seafreight/railway (container)	Case
Road	Case

Airfreight	Case

STEELWORKS

Seafreight/railway (container)	Cage – saddles – bundle - loose
Road	Cage – saddles – bundle
Airfreight	Cage

4.2.5 Rigid packing – execution versions

The following table lists the various versions of rigid packing, with the relavnt indication of applicability. In fact there is the possibility– for instance cases and cages – of different versions as far as execution or size are concerned (i.e cage small/ standard).

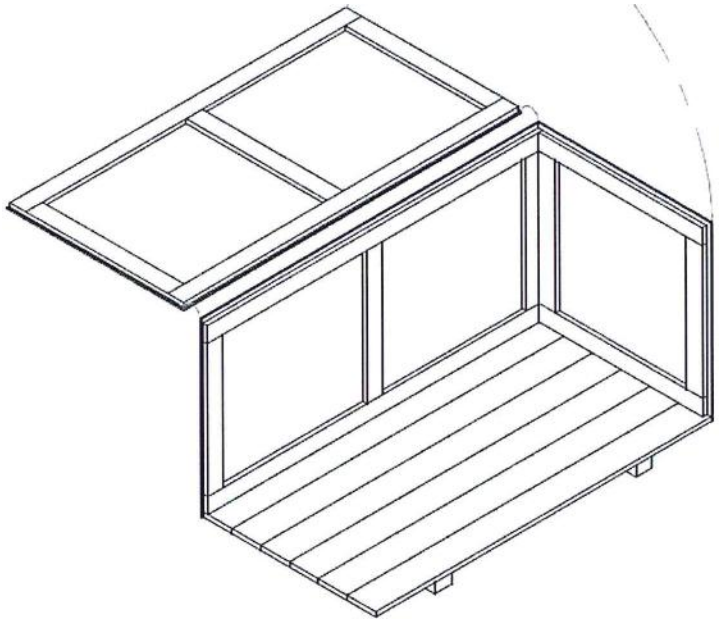
N	PACKING	CONSTRAINTS/SUITABLE FOR:
1	Cage, small, plywood/OSB	Volume upto $3m^3$ Net weight upto 500 kg
2	Case, small, wood	Volume upto 3m3 Net weight upto 500 kg
3	Case, standard, plywood/ OSB	None
4	Cage, small	Volume upto 3m3 Net weight upto 500 kg
5	Cage, reduced	Maximum dimensions upto 800 x 250 x 250 cm Net weight upto 5.000 kg
6	Cage, standard	·None
7	Platform	Loose items
8	Saddle	Equipments or pipes. big diameter
9	Saddle on roller	·Equipments or pipes. big diameter * Frontal containerisation
10	Bundle	Grouped rigid parts (selfsupporting)

In the next chapter will be described in the detail the different execution versions for rigid packing.

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CONSTRUCTION SPECIFICATIONS

4.3 SMALL CASES, PLYWOOD/ OSB



Constraints:

- Volume upto 3 m3
- Netweight upto 500 kg

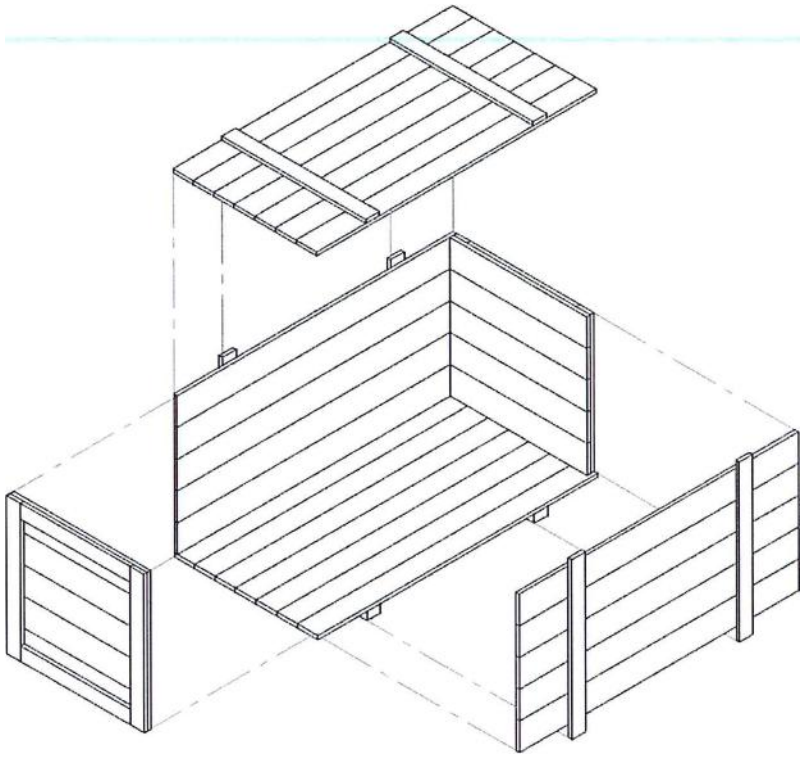
Suitable as main packing or as pre-packing (for instances small items or accessories) before stowing them in bigger packings. Due to lightness, are partcularly suitable for airfreight, the cost of which is essentially based on the weight.

Bottom is made by longitudinal juxtaposed beams, connected by rivetting to two or more transversal sub-beams; Sides and cover are made by an internal frameand by and external casing (see figure in the page). External casing is made by panels wood-based (phenolic plywood or OSB type3) juxtaposed

Cover is waterproofed by means of a poliethyliene film layer (minimum thickness 0,1 mm) put inbetween the frame and the casing. Bottom, on the contrary, must not be waterproofed so to allow and facilitate the drainage of evental liquids and or condensates.

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4.4 SMALL WOODEN CASES



Constraints:

- Volume upto 3 m3
- Netweight upto 500 kg

Suitable as main packing or as pre-packing (for instances small items or accessories) before stowing them in bigger packings. Especially for airfreight, is preferable to use Small cases, plywood/ OSB (see 3.1) so to reduce the overall weight of the packing and consequently the transportation cost.

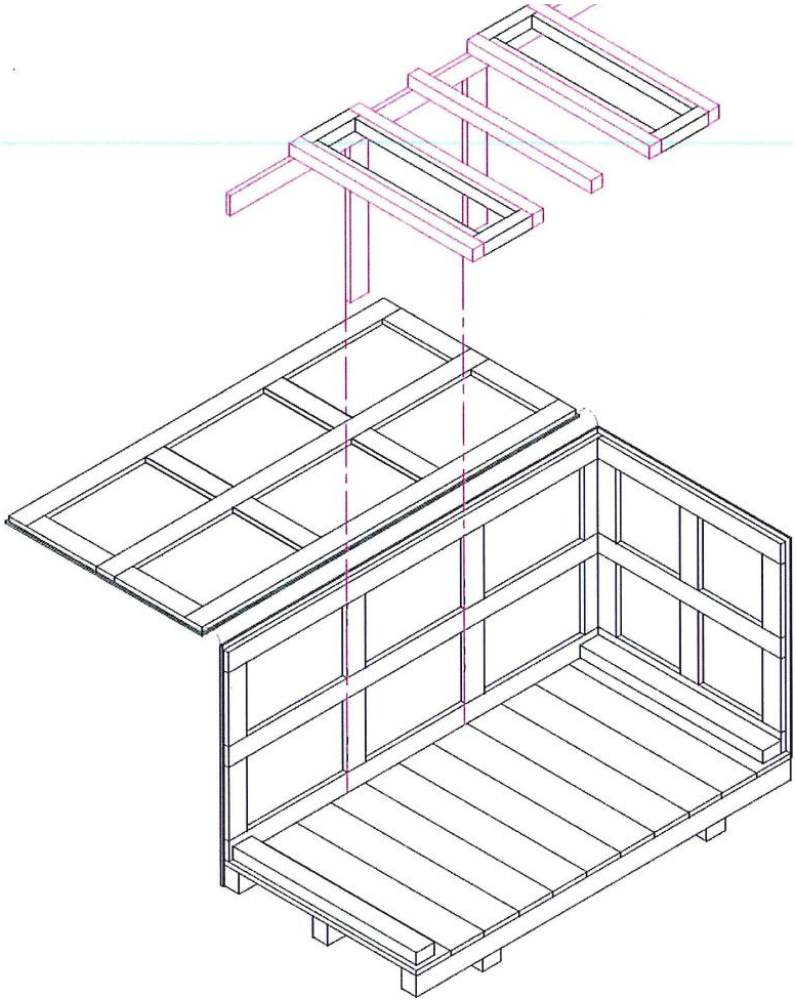
Bottom is made by longitudinal juxtaposed beams, connected by rivetting to two or more transversal sub-beams; Sides and cover are made by external transversal beams rivetted to an internal casing (see figure in the page) made by beams lingitudinally juxtaposed.

Cover is waterproofed by means of a poliethyliene film layer (minimum thickness 0,1 mm) put in between the frame and the casing. Waterproofing layers are only applied on the internal sides.Bottom, on the contrary, must not be waterproofed so to allow and facilitate the drainage of evental liquids and or condensates.

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4.5 STANDARD CASES, PLYWOOD/ OSB



Constraints:

- None

BOTTOM

Bottom is made by juxtaposed wooden beams, transversally fixed to two or more underneath longitudinal beams.

Under the longitudinal beams are installed adequate under-beams, longitudinal or transversal, and fixed to them by riveting. The under-beams, spacing the bottom from ground, allow the passage and the posizioning of the lifting ropes or forks.

In necessary, the bottom is strenghtened through two transversal head-beams, fixed by riveting (maximum thickness upto 6 cm) or bolting (higher thicknesses).

Further possible elements of transversal reinforcement of the bottom are the dispatchers and the distributors of load: the dispatchers of load locally strengthen the base of the box in correspondence of the two lifting points; the distributors of load divide the load of support on the longitudinal beams.

The section of the possible dispatchers of load must be calculated considering the solicitation produced in the base during lifting.

SIDES AND COVER

The walls (sides and headings) and the cover are made by an inside framework and an external covering. The framework of the walls is made by horizontal transversal beams and vertical beams; the framework of the cover is made by longitudinal transversal beams and clips. The covering, both of the walls and of the cover, is made by juxtaposed panels, multilayer phenolic plywood or OSB type 3 (see figure in the previous page).

Inside the sides an auxiliary structure must be applied, composed by an upper horizontal transversal beam and from vertical beams; this structure has the purpose to strengthen the walls with the purpose to confer to the box a suitable stackability.

UNDERCOVER BEAMS AND REINFORCEMENTS ("TIES")

All cases must be provided with undercover beams, transversally installed, riveted to the sides and supported to the auxiliary structure. These structural elements play a double role:

- in collaboration with the cover and with the possible ties they bear the hold of the ropes during lifting ;
- they give to the box a suitable stackability and walkability;

If necessary finally the boxes must be equipped of additional structures in wood ("ties") suitable to bear the hold of the ropes during lifting.

Every tie consists in a frame inserted among two beams of undercover (see figure in the previous page).

WATERPROOFING

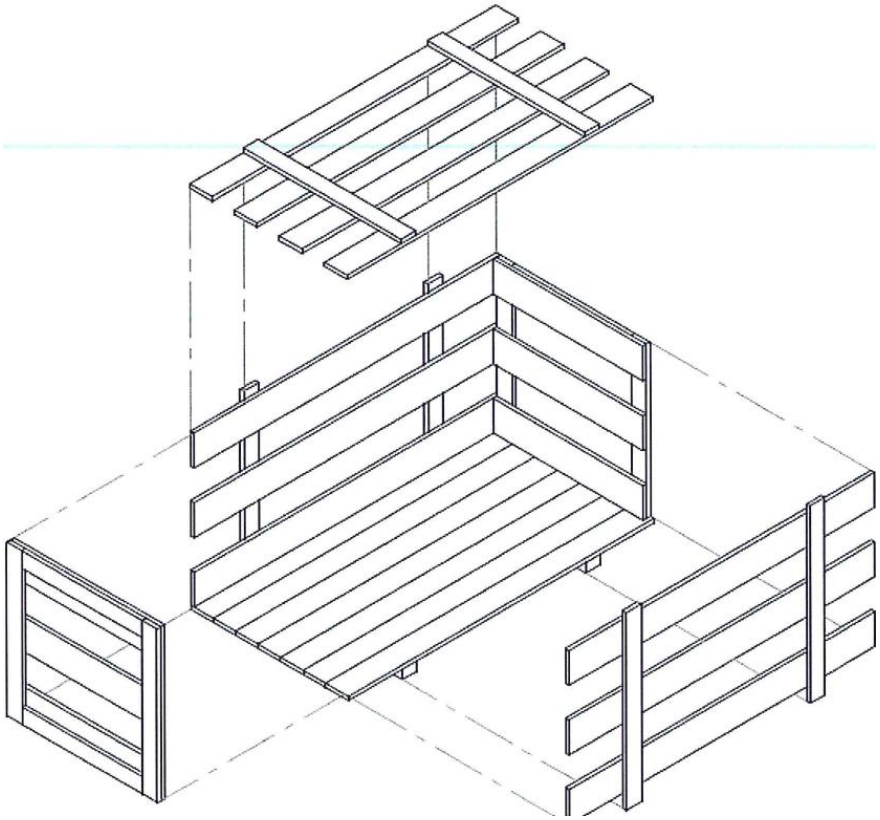
The cover is waterproofed through an intermediate layer of polyethilene film (minimum thickness 0,1 mm) between the frame and the covering. When, because of dimensions, the case cannot be

protected against the atmospheric agents during the transportation,an additonal layer in COEX is to be added on the top side being COEX a waterproof material resistant to UV rays.

Same COEX additional layer is necessary when known the case to remain for long periods exposed to the atmosferic agentsbefore being unpacked.

Bottom, on the contrary, must not be waterproofed so to allow and facilitate the drainage of evental liquids and or condensates

4.6 CAGES



Constraints:

- Volume upto 3 m3
- Netweight upto 500 kg

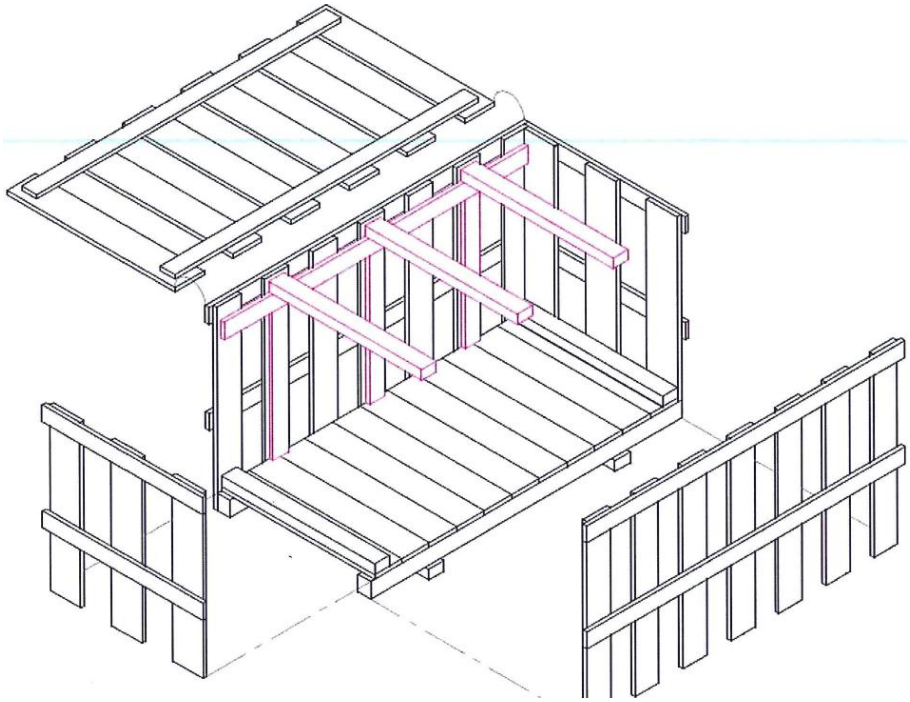
Bottom is made by longitudinal juxtaposed or spaced beams, connected by rivetting to two or more transversal sub-beams; Sides and cover are made by external beams riveted to an internal casing made by wooden beams installed longitudinally and spaced between them (see figure).

Beams of internal casing must generate a full surface not less than 33% of the total; when allowed by the nature of the content, also the bottom could be spaced (cage type) with a full surface not less than 50%.

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4.7 REDUCED CAGES



Constraints

- Maximum dimensions upto 800 x 250 x 250 cm
- Net weight upto 5.000 kg

BOTTOM

Bottom is made by longitudinal juxtaposed wooden beams, connected by rivetting to two or more transversal sub-beams; when allowed by the nature of the content, also the bottom could be spaced (cage type) with a full surface not less than 60% of the total.

Under the longitudinal beams are positioned some under-beams, transversal or longitudinal, fixed to the longitudinal beams through riveting. The under-beams, spacing the bottom from ground, allow the passage and the posizioning of the lifting ropes or forks.

The bottom is normally strengthened by two transversal head-beams riveted to the boards.

Further possible transversal reinforcement elements for the bottom are the dispatchers and the distributors of load: the dispatchers of load locally strengthen the base of the cage in correspondence of the two lifting points; the distributors of load divide the load of support on the longitudinal beams.

SIDES AND COVER

The walls (sides and headings) and the cover are an inside covering made by wooden vertical beams spaced between them, and by external transversal connecting beams installed horizontally.

The covering is made by and external covering of transversally juxtaposed wooden beams , and by internal transversal connecting beams installed longitudinally.

Boards must have a constant width between 12 and 18 cm, they must have a full surface not less that 45% of the total

Inside the sides an auxiliary structure must be applied, composed by an upper horizontal transversal beam and from vertical beams; this structure has the purpose to strengthen the walls with the purpose to confer to the box a suitable stackability.

In case of stowing of loose parts with size less that the casing boards spacing, header must have full surface.

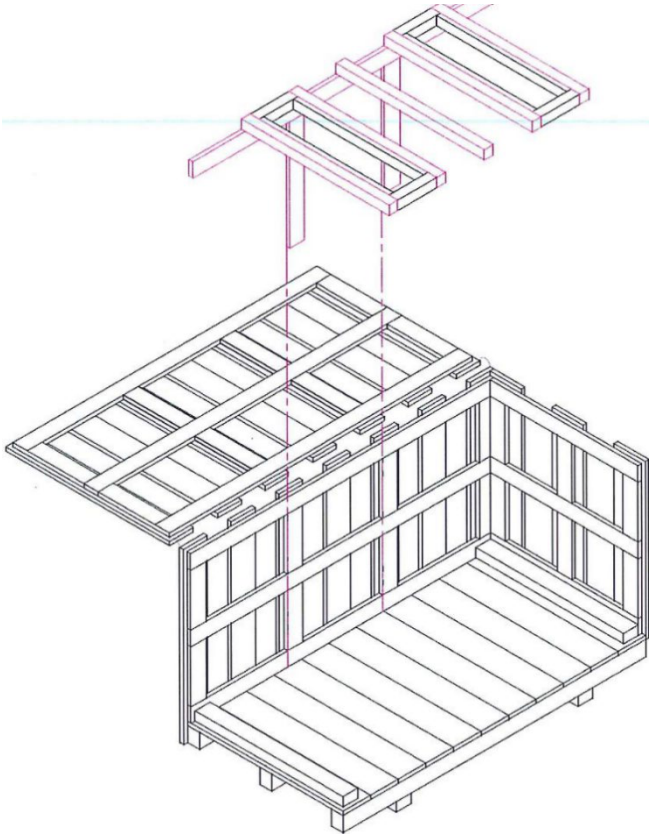
UNDERCOVER BEAMS

All cases must be provided with undercover beams, transversally installed, riveted to the top part of the sides and supported to the auxiliary structure. These structural elements play a double role:

- in collaboration with the cover and with the possible ties they bear the hold of the ropes during lifting ;
- they give to the box a suitable stackability and walkability;

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4.8 STANDARD CAGES



Constraints:

- None

BOTTOM

Bottom is made by longitudinal juxtaposed wooden beams, connected by rivetting to two or more transversal sub-beams; when allowed by the nature of the content, also the bottom could be spaced (cage type) with a full surface not less than 60% of the total.

Under the longitudinal beams are positioned some under-beams, transversal or longitudinal, fixed to the longitudinal beams through riveting. The under-beams, spacing the bottom from ground, allow the passage and the posizioning of the lifting ropes or forks.

The bottom is normally strengthened by two transversal head-beams riveted (maximum thickness 6 cm) or bolted (higher thicknesses) to the boards

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Further possible transversal reinforcement elements for the bottom are the dispatchers and the distributors of load: the dispatchers of load locally strengthen the base of the cage in correspondence of the two lifting points; the distributors of load divide the load of support on the longitudinal beams.

The section of the possible dispatchers of load must be calculated considering the solicitation produced in the base during lifting.

SIDES AND COVER

The walls (sides and headings) and the cover are made by The walls (sides and headings) and the cover are made by an inside framework and an external covering. The framework of the walls is made by horizontal transversal beams and vertical beams; the framework of the cover is made by longitudinal transversal beams and clips. The covering, both of the walls and of the cover, is made by spaced panels (see figure). Boards must have a constant width between 12 and 18 cm, they must have a full surface not less than 45% of the total

Inside the sides an auxiliary structure must be applied, composed by an upper horizontal transversal beam and from vertical beams; this structure has the purpose to strengthen the walls with the purpose to confer to the box a suitable stackability.

In case of stowing of loose parts with size less that the casing boards spacing, header must have full surface.

UNDERCOVER BEAMS AND REINFORCEMENTS ("TIES")

All cases must be provided with undercover beams, transversally installed, riveted to the top part of the sides and supported to the auxiliary structure. These structural elements play a double role:

· in collaboration with the cover and with the possible ties they bear the hold of the ropes during lifting ;

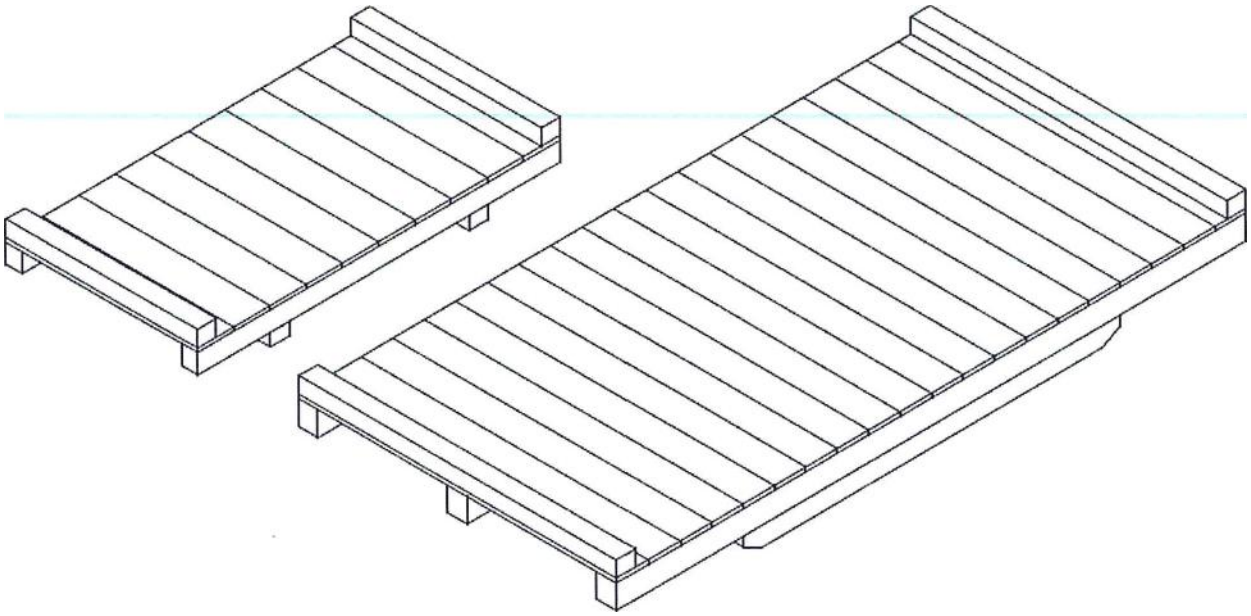
· they give to the box a suitable stackability and walkability;

If necessary finally the boxes must be equipped of additional structures in wood ("ties") suitable to bear the hold of the ropes during lifting.

Every tie consists in a frame inserted among two beams of undercover (see figure in the previous page).

Longitudinal clips, solicited to bending, have same section of under-covers; the transversal fillets, riveted to the under-covers and solicited to compression, can be of iminor (not less than half of the under-covers) section

4.9 PLATFORMS



Suitable for:

- Loose parts

The platforms are wood bases conceived for the stowage and the transportation of goods that require either a distributed support (loose parts) or however a separation from ground but don't require particular mechanical protections. From the constructive point of view can be considered cases without walls and cover.

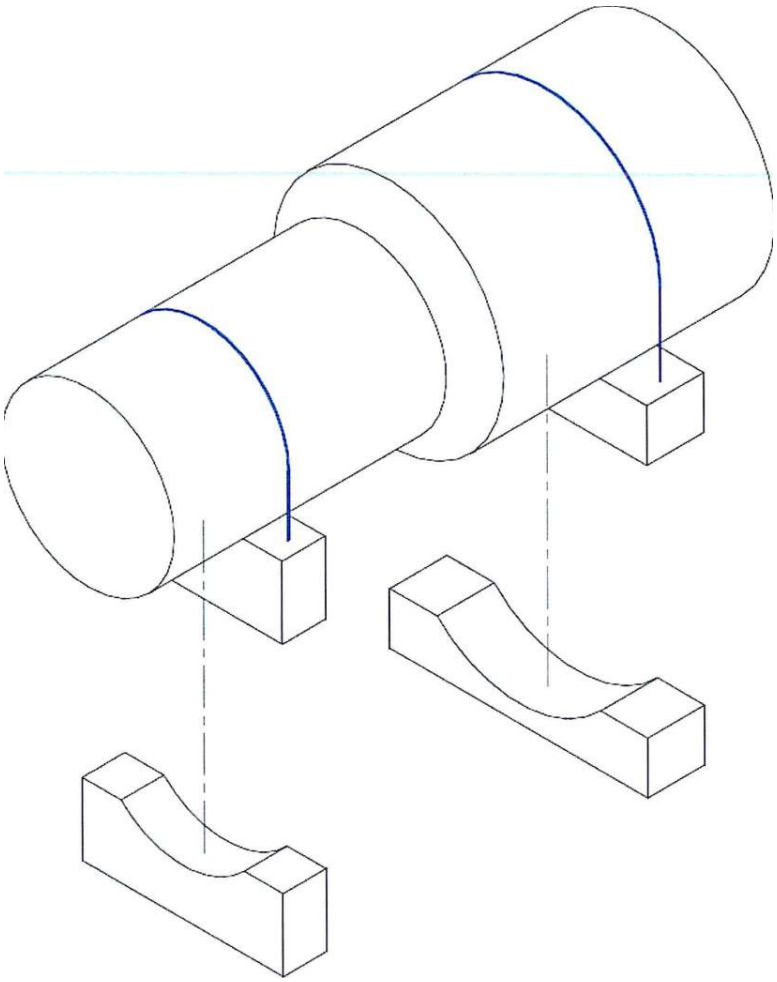
The platform is - if necessary - strengthened by two head-beams, transversal, fixed on the boards through riveting (for thicknesses up to 6 cms) or bolting (for higher thicknesses).

Further possible transversal reinforcement elements for the bottom are the dispatchers and the distributors of load: the dispatchers of load locally strengthen the base of the cage in correspondence of the two lifting points; the distributors of load divide the load of support on the longitudinal beams.

All goods must be adequately tied up among them and fixed to the platform through strapping and - if necessary - wrapped with extensible film or barrier bag.

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4.10 SADDLE



Suitable for:

- · Equipments or pipes. big diameter

Saddles are shaped structures, normally concave, wood or steel made fixed to the equipment to pack; they play a simple role of support to ground, but they don't ensure other types of protection (against shocks, dust, humidity etc.).

Saddles are suitable to pack equipment self-supporting, metallic - without instrumentation or insulation - and non metallic - provided that transportation mode is nor air or conventional seafreight.

If instead the equipment is already complete with proper structures of support, it will be enough complete them with thicknesser in wood (supports) fixed through bolts or threaded bars.

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Construction notes:

The indicative minimum length of the saddles must be at least equal to the external diameter of the equipment (D) to allow the fixing of the saddles to the equipment itself.

The following table recommends the width of the saddles; the supports are normally of the same length and width of the plates to which they are fixed length and width coincident with the plates to which they are fixed.

WIDTH OF THE SADDLES	
NET WEIGHT [kg]	WIDHT [cm]
Upto 2.000	15
From 2.001 to 6.000	20
From 6.001 to 10.000	30
From 10.001 to 20.000	40
Over 20.000	50

The depth of the cradle (or of the shaped part) - measured in vertical one - must be at least equal to the 15% of the diameter D.

For instance for equipment of 2 m diameter, the depth of the cradle must be than at least 30 cms (200 x 015). To be noticeds that to such minimum depth corresponds to an arc of support of around 90°, normally enough to ensure the stability of the equipment.

The elevation of the equipment on saddles must be the minimum possible, maintaining the strenght of the saddles themselves and the passage of the lifting ropes (unless a different lifting is anticipated i.e. through lugs etc.).

The number of saddles to be provided (2, 3 or more) must be determined based on the technical information by the Manufacturer. Specifically the number will depend on the weight and the rigidity of the equipment; furthermore, the transportation mode must be considered, to assure a correct division of the weight on the plan of load.

The combination of the measures of length and width, the number of the saddles or the supports and the overall (equipment + saddles) weight must generate a maximum pressure of support on ground not exceeding 10.000 kg / m

For instance 2 saddles 200 x 50 cm are suitable to support a maximum overall weight of 20.000 kg (2 x 0,5 x 2 x 10.000).

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The saddles are built with one wooden beam or overlapping more layers of beams; in this second case must be maintained in one piece the full- length beams (from the base up to the lowest point of the cradle) not to compromise the strength of the saddles themselves.

Saddles must be firmly anchored to the equipment, alternatively through:

- steel ropes, of suitable section, sheated with protective rubber;
- bands with buckles correctly sized and certified.

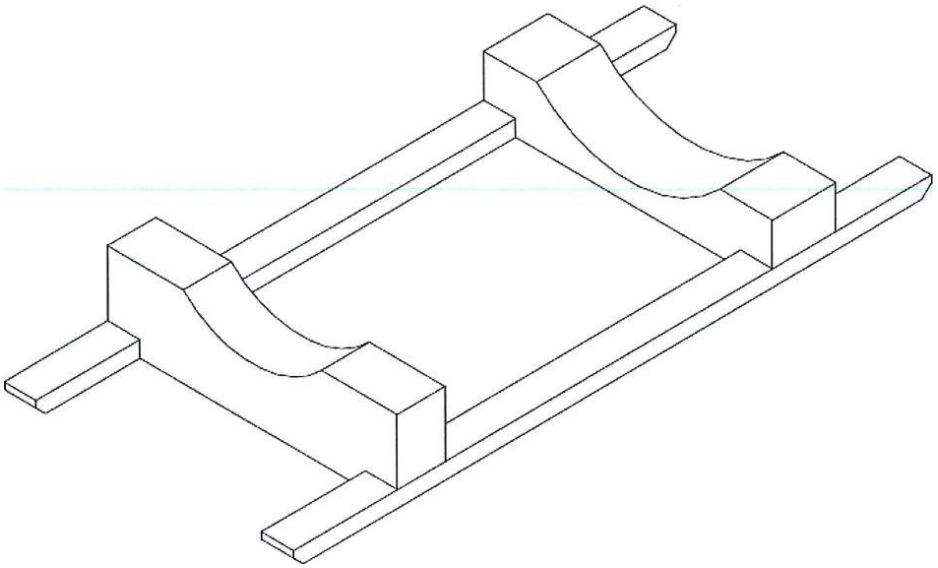
In case of rope anchorage, the connection with the saddle can be realized through threaded bars and lugs or through screwed head-plate, always interposing a tension regulating device with closed eyelet.

In case of anchorage to framework, the connection with the saddle is realized through passing threaded bars that acts on a bracket placed at every extremity of the framework; the regulation of the torque to made through the coupling nut-counter nut.

The supplier propose steel saddles. In such case, they must be equipped of:

- intermediate rubber spacer

4.11 SADDLE ON ROLLERS



Suitable for:

- Equipments or pipes. big diameter
- Frontal containerisation

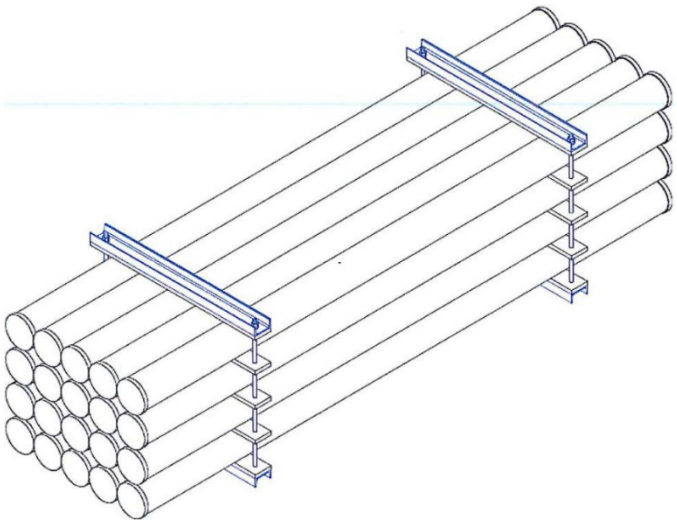
Saddles on rollers are normal saddles, as already described above, connected by longitudinal boards (roller - see figure). The roller facilitate the frontal containerisation.

For this type of packing the construction notes are same as for saddles, exception made for the pressure on ground, that in this case, can be higher;

Regarding the rollers, they must be made in one piece and have a bevel to facilitate the slipping inside the container.

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4.12 BUNDLE



Suitable for:

- Grouped rigid parts (self-supporting)

Bundles are grouped rigid parts (self-supporting) stacked and fixed between them through suitable fixings or binding (see figure They are typically used for the packing of pipes, of parts of heavy steelworks and you easily stackable supports.

The bundles are suitable to pack pipes of diameter from DN80 to 250 mm (or even more, if convenient in terms of handling or marking), while the pipes of greater dimensions are normally packed individually on saddles.

The number of the fixings essentially depends on the length of the bundle. Indicatively must be foreseen :

- · for bundles of length 5_ 6 ms: two fixings;
- · for bundles of length > 6 ms: three or more fixings.

In case of road transport without intermediate storage and gross weight up to 1.500 kg, the bundles can be tied up with simple metallic straps, of suitable section; the distance among two following bindings must not exceed the measure of 1,5 m

If in the formation of the bundles some void areas are detected in correspondence of the points of fixing, originated from the different size of the stacked elements, such voids must be filled with wood thicknesser, to ensure a suitable torque of the fixings.

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The fixings can be realized with bands and certified buckles or using wood beams connected among them through connecting rods.The profiles used for the realization of the fixings must be galvanized or painted with rust protection coat to avoid dirtying the transported material.

The extremities of the pipes must be covered as described in the paragraph 4.1.

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5 PROTECTIONS

5.1 CAPPING

If not otherwise specified, nozzles, pipes ends or openings must be properly be covered.

The nozzles must be covered with gasket in rubber + disk in plywood, completed by a suitable number of bolts.

The extremities of the pipes packed in bundles must be covered:

- individually, through plastic caps, fixed to the pipe through linen ribbon
- altogether, through double layer of polyethylene film (minimumt thickness 0,1 mm) fixed to the bundle through linen ribbon.

The ends of pipes shipped individually must be covered:

- through plastic caps, fixed to the pipe through linen ribbon;
- if - for big diameters - the aforesaid plastic caps are not available, through suitable plywood caps fixed to the pipe.

Openings on goods packed in boxes or in cages must always be covered with caps in plastics or disks in plywood, fixed with linen ribbon.

5.2 WATERPROOFING OF THE PACKAGES

The cover of boxes and cages must always be waterproofed, through film in polyethylene of suitable thickness (minimum 0,1 mm). The waterproofing layers must be applied inside the panels (or of the boards) of the casing.

Same is for the waterproofing of the walls of wooden boxes, while the walls of plywood boxes can also be waterproofed sealing the escapes among the panels of covering through special adhesive (type Vinavil).

Bottom, on the contrary, must not be waterproofed so to allow and facilitate the drainage of evental liquids and or condensates.

5.3 WATER PROOFING OF THE CONTENT

5.3.1 VCI protections

All oxidable parts

- machined surfaces,
- shatfs,
- hubs,
- supports,

- electrical equipment etc.

must be protected through covers or antioxidants.

In fact many products identified as VCI (Vapor Corrosion Inhibitor) are available on the market and they release protective agents with rustproof action.

The products VCIs are available in various forms, as

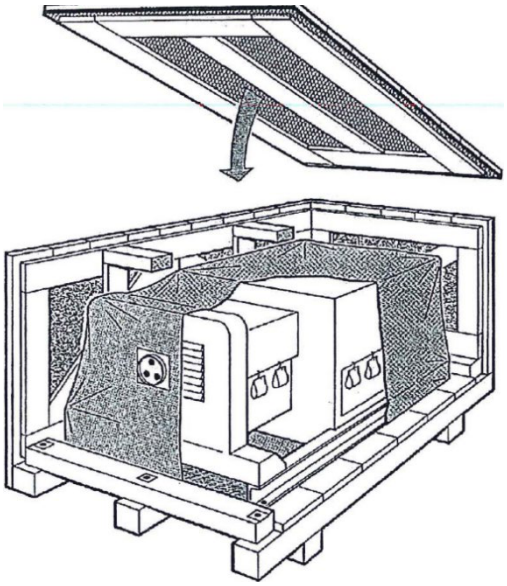
- powders,
- papers,
- sponges,
- oils,
- emitter,
- sackets,
- film,

suitable for the more various applications.

Before applying VCI all parts to be protected must be adequately cleaned, so that not to compromise the effectiveness and the duration of the adopted treatments.

Different indications excepted it is asked for a protection that has a validity of at least 6 months beginning from the date of closing of the I pack.

5.3.2 Barrier bag



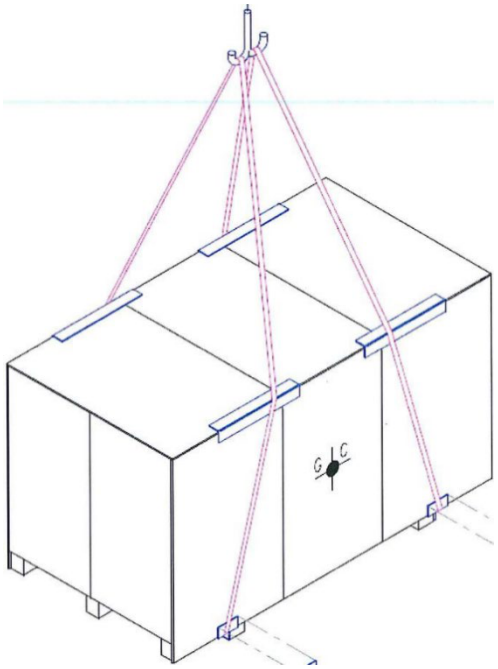
An integral protection of the transported goods can be achieved containing them in a special barrier bag - MIL B131 E Class 1 - that, with a suitable quantity of dehydrating salt, it is able to maintain a low humidity for a long period. The barrier bag is effective only if intact. For this reasons it is not recommended with cages and road transport (the bag risks to tear because of the wind); it is typically used for protecting goods packed in cases.

It can be employed in alternative or additionally to the protections VCI.

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6 MISCELLANEA

6.1 REINFORCEMENTS



Over the 1.000 kg of gross weight, boxes and cages must be equipped with stirrups and angular reinforcement in steel, respectively fixed to the base and the upper edges of the sides in correspondence of the ropes passing points and sized so that to avoid abrasions and damages provoked by the action of the ropes or chains during lifting

6.2 MARKING

The marking of the packages must allow a sure identification (ID, reference packing list, place of destination etc.), net and gross weights, dimensions (length, width and height) and to provide the necessary instructions to correctly perform the operations of lifting, transport and storage (slinging points, dimensions, weights, etc.).

Marking must be clear, permanent, water-resistant and proportioned to packeg size. It can be made with

- plasticized poster compiled with black fonts on white background, or
- directly on the package with black fonts on clear background.

On every package 2 positions must be marked(one on a side and one on a head)

Marking to make always:

- top, vertical arrows on each one of the 4 walls of the package;

- protect from rain, umbrella;
- ·fragile, glass
- Forking or slinging points (cases and cages), chain;
- Center of gravity, on heads and sides - viewfinder.
- For cages marking to be put on dedicated rigid panel.
- Marking always to be in accordance with international standard sas per following table.

6.2.1 International symbology

SYMBOL	DESCRIPTION	NOTES
	ATTENTION! FRAGILE	AT LEAST ON ONE SIDE ON TOP (PREFERABLY ON ALL SIDES)
	TOP	ON TOP PART OF THE 4 SIDES OF PACKAGE
	SLING HERE	ON THE SLINGING POINT DEPENDING ON CENTER OF GRAVITY
	PROTECT FROM RAIN	ON ALL SIDES
	CENTER OF GRAVITY	ON SIDES
	DON'T USE HOOKS	TO MEAN THAT USE OF HOOKS IS PROHIBITED FOR LIFTING
	KEEP AWAY FROM HEAT SOURCES	TO MEAN THAT PACKAGE MUST BE KEPT FAR AWAY FROM HEAT SOURCES
	DON'T USE FORKLIFT	TO MEAN THAT USE OF FORKLIFT IS PROHIBITED FOR LIFTING

6.3 PACKING LIST

Every shipment must be carefully documented through a summary "packing list" that contains all the useful information to a general management of the shipment itself, particularly:

- Purcahse order number, ID of the single package;
- Type of package (case/ cage/ platform, ecc.);
- Adopted protection type;
- Gross and net weight;
- Dimensions and volume;
- Content description;
- Total number of packages;
- Total net and gross weight;
- Total volume.

A copy of the general packing list must be iput in a transparent envelope and fixed to the outside of every package covered by a metallic plaquette.

6.4 STOWAGE

Goods must be firmly fixed to the package, so to avoid falls or displacements, dangerous especially during lifting and transportation.

Normally package content must be fixed directly to the base bu bolting, threaded bars , stirrups or brackets or other suitable fixings.

Fixings to the walls can eventually be predisposed either with auxiliary function (to contribute to hold up the loads produced by the manouvres of lifting and transport) or to stop light material.

In the following table the main dynamic loads, to which the package might be subjected during the manouvres of transport, are listed:

TRANSPORTATIONNN	MANOUVRES	DYNAMIC LOADS
Road	Rough braking Turns routing Uphill or downhill	inertia centrifugal force imbalance
Railway	Rough braking Crash on bumpers during manouvre	inertia concussive force

Seafreight	roll (transversal oscillation) pitch (longitudinal oscillation)	imbalance imbalance
Airfreight	take off landing	imbalance inertia

Where possible, it is preferable to place the heaviest parts in the bottom part of the package, so to increase the stability. Small items should be pre-packed in wood cases or cardboard and put into the main package.In case of transport in container, are in charge to the supplier containerization and fixing of packages inside it.

6.4.1 Maxium sizes of packages

For road and rail transportation, normally are in force the following size limits:

TRASPORTATION	SIZES - W. x H. x L. [mm]
ROAD	2.500 x 2.500 x 13.600
RAILWAY	3.100 x 2.100 x 14.000

For the maximum sizes allowed in the foreign Countries of transit and destination of the packages, reference must be done to possible specific regulations in force

6.4.2 Containers

Listed in the following table are the sizes of containers box type (frontal opening) - in carbon steel by 20 and 40 feet (the most commonly used). Inner sizes are particularly useful to prepare the loading lay out:

SIZES [mm]	20 ft	40 ft
OUTER W. x H. x L	2.500 x 2.500 x 6.000	2.500 x 2.500 x 12.000
INNER W. x H. x L	2.300 x 2.300 x 5.900	2.300 x 2.300 x 11.900
OPENING W. x H. x L	2.250 x 2.280	2.250 x 2.280

The stowage within containers must have operated in the respect of the following dispositions:

- The heaviest goods must be possibly stowed in the low part and you uniformly distributed;
- Load must have placed close to the walls of the container;
- Goods must be fixed on the base of the container through the use of bands, beams, wedges etc.

The containers must be watertight and in good conditions of maintenance and painting. In case of use of second-hand containers, countersign and number of the previous owner must be cancelled.

6.4.3 Testing

Encore Thermoengineering the right reserves him to check the suitability of the packages, of the stowage, of the marking and of the documentation. If any detail will be in deviation from the present specification, the supplier will be binded to completion, remake, partial or total, of the involved packing activity, at his own care and expenses and in useful time for the respect of the date of required delivery

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7 STORAGE AND PRESERVATION

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7.1 SCOPE

This section covers the minimum requirements to be applied for check activities and preservation against corrosion of all shop manufactured/assembled equipment and materials at ETE workshop during the storage period before site installation and ensure therefore their preservation.

7.2 DEFINITIONS AND TERMS

For the purpose of this specification, the following definitions and abbreviations shall apply:

CRA: Corrosion resistant alloy, an alloy with minimum content of chromium of 12% (such as stainless steel AISI 300 series, duplex stainless steels), Ni alloys, titanium alloys, etc.

EQUIPMENT: includes Machinery and Static items like vessels, heat exchangers, tanks, etc. The equipment, depending on dimensions and transportability, can be shop or site fabricated / assembled

FERRITIC STEEL: means carbon steel, low temperature carbon steel, low alloy steel with max content of chromium of 12-30%

INITIAL PRESERVATION: means the application of specified preservatives and fitting of specified protection to any material/system by uncasing or installation at site, to maintain the equipment/system unimpaired

MACHINERY: includes Rotary machines (such as pumps and compressors), packages (skid or site assembled), blowers etc

MISCELLANEOUS: includes instruments valves, instrumentation, electrical and electronic equipment, bulk material etc

ETE: Encore Thermoenginering S.r.l.

7.3 REFERENCE DOCUMENTS

- This document

7.4 SUBJECT

Details for check activities on goods upon receipt at site and during the period at site before goods are put in any kind of operation.

7.5 GENERALITIES

The following instructions cover storage phases.

Additional to detailed instructions, the following site activities shall be carried out after uncasing/installation

Part / item	Preservation by
Door hinges, grease nipples and fasteners	To be lubricated
Threaded openings	To have metal plugs compatible with the metallurgy of the component being capped or plugged. If IP rating is maintained, plastic plugs are acceptable for non-hydraulic/pneumatic systems
Gaskets of door covers	To apply thin layer of non-acid vaseline
Ball valves	To be locked in open position
Exposed valve spindles	To be protected with denso tape
Flexible hoses	Open sides must be plugged
Bearings	To be greased or oiled
Insulation	Where the insulation can be exposed to damage during storage or installation, the insulation shall be protected with 10 mm plywood sheets.
Vent holes	After testing they must be filled with stiff grease or equivalent material not capable to sustain pressure.
Partially fabricated vessels	To be suitably braced to prevent deformation. Open ends shall be covered to prevent ingress of dirt and

	foreign matter during shipment. Shipment drawings shall be submitted prior to shipment for approval.
Instrument or panel glasses	To apply 6 mm plywood
Panel fronts	Apply wooden frame (or another effective device/s) for corners protection
Various instrumentation, JB, buttons	Envelope them in aluminium sheeted glass fibre cloth, if necessary
Flanges	To be fitted with protective covers.
Straight pipe spools	To be fitted with water resistant medium density fibreboard blanks using a minimum of 4xM6 bolts.
Pressure & temperature gauges,controllers, panels, and junction boxes, temp. Instruments, telecom. equipment, detectors, transmitters, heaters, pushbutton stands and connection boxes	Aluminium sheeted glass fibre cloth, min. 0,3 kg per m^2, shall be used to envelope. Or Shock absorber,

Moreover:

•Preservation labels shall be attached to equipment, clearly visible, as soon as the Initial preservation is carried out.

•For all supplied spare parts ETE shall specify required preservation instructions.

Tie-on labels can be used. Stick-on type labels can be used on non-waxed equipment if required and sustainable for long time without getting damage

7.6 PRESERVATION FOR EQUIPMENT

Equipment shall be preserved as follows:

Equipment in ferritic steel	Preservation by
Equipment (e.g.: pressure vessels, heat exchangers, etc.)	Preservative coating, VCI fogging/ emitter, along with Silica Gel bags. The min quantity of silica gel shall be 0.5 kg/m3 and able to keep the relative humidity below 50% (design factor)
Machined surfaces (e. g.: flanges)	Application of a temporary protection having expected durability in outdoor exposure not less than 6 months.

All flanged openings Shall be sealed. Metallic covers shall be 6 mm min thickness. The external side of the metallic covers shall be painted with a primer. Wood or plastic flanges are not allowed.

Nozzles with non-permanent blind flanges and/or gaskets shall be labeled on the exterior surface with the following marking: "TEMPORARY GASKET - REPLACE BEFORE OPERATION".

7.7 PRESERVATION FOR MACHINERY

Machinery shall be preserved as follows:

Machinery in ferritic steel	Preservation by
Packaged machinery	As minimum: Closed box with a barrier bag and silica gel. The min quantity of silica gel shall be 0.5 kg/m3 of barrier bag volume and able to keep the relative humidity below 50% (design factor). Soft materials shall be added for mechanical protection of instrumentation.
Machined surfaces	Application of a temporary protection having expected durability in outdoor exposure not less than 6 months.

Threaded orifices shall be protected with metal plugs. The plugs that have to be eliminated prior to commissioning shall be painted with a different color to the rest of the equipment. Cast iron plugs are not allowed.

External shafts, stems, gears, grips, skids and sliders, other than anticorrosive treatment, shall be protected with waterproof paper or plastic sheet well fastened with adhesive tape. For CRA material adhesive tape and plastic sheet shall be chloride free.

Dry silica gel bags may be placed also inside the rotating parts of the machine.

7.8 PROCEDURE FOR PIPING

Piping has been divided in the following categories:

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Ferritic steel (bulk material):

Piping shall be coated with a temporary protection free from low melting point metal having min 6 months of expected durability in outdoor environment. The external surface of piping shall be free from exogenous compounds such as rust, debris and metal particles.

Ferritic steel already coated (i.e.: immersion or underground installation, spools, etc.)

The coating shall be applied as per contractual specification.

The pipe fittings shall be supplied only with temporary protection free from low melting point metal having min 6 months of expected durability in outdoor environment.

Flanges

Coating damaging shall be avoided: no chains or metallic cords shall be used for handling these materials.

CRA:

Superficial iron contamination is forbidden: no chains or metallic cords shall be used for handling these materials, storing in separated area from ferritic steel piping is mandatory. These materials shall be preserved internally and externally until_installation has been completed and any precaution shall be taken for avoiding surface contamination.

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7.9 PRESERVATION FOR PIPING

Piping shall be preserved as follow

Piping	Preservation by
Pipes, regardless material of construction	Plastic caps, placed at the ends of pipes, when pipes are not packaged inside a closed box.
Pipes (threaded ends); Flanges (coupling surfaces, threaded parts)	Plastic caps, placed at the ends of pipes, when pipes are not packaged inside a closed box. Flanges shall be packaged in closed box with barrier bag. The threaded surface shall be temporary protected by oil or grease free from low melting point metal having expected durability in outdoor exposure not less than 6 months.
Coated piping	Plastic caps, placed at the ends of pipes, when pipes are not packaged inside a closed box.
Additional requirements for CRA	The packaging shall be chloride free and stored in a separated area from carbon steel piping in order to avoid surface contamination

7.10 PROCEDURE FOR MISCELLANEOUS ITEMS

All electrical and electronic equipment exposed to humidity shall be protected with silica gel or vapour corrosion inhibitor VCI (Cortec VCI 100 or equivalent

All openings in hydraulic/pneumatic tubing shall be provided with steel caps or solid shank steel plugs compatible with the metallurgy of the component being capped or plugged. Non-metallic plugs shall not be used.

Gaskets/O-rings on instrument equipment to be greased with acid free Vaseline.

Hydraulic-Pneumatic tubing: All openings provided with steel caps or solid shank steel plugs (metallurgy compatible with the capped/plugged part)

Gasket/O-Ring: To be greased with non-acid Vaseline.

7.11 SITE INSPECTION

Site person in charge shall record the initial preservation status

A detail record of preservation activities, preserved parts, preservatives used and date shall be prepared and content will be as follows:

- date of preservation;

- grade of preservation material;

- interior packaging option;

- storage conditions;

- protection term without preservation;

- preservation term;

- depreservation methods.

7.12 CHECK LIST AFTER ARRIVAL AT SITE STORAGE

Visual check of packages and goods integrity with a thorough attention to the goods packed on saddles and bundles

EXTERNAL PAINTING

- Any damages on painting shall be immediately repaired
- For this scope, please refer to the Painting Procedure.

CLEANING

- Verify that all the stainless steel parts (flare tips, service piping and ignition panels) do not show

oxidations and/or contaminated areas.

- In case of oxidation and/or contaminated areas, is necessary clean accurately using:

Inox brush, Detergents & Degreasing cleaner polishing based degreasing solvents (for eg. E-NOX Clean INOX-CLEAN - @ bio-chem Surface Technology) and surfactants (for eg. STAR 100 Metal STAR - @ bio-chem Surface Technology) in polishing effect rapid evaporation for cleaning and polishing of stainless steel surfaces.

7.13 MAINTENANCE & PRESERVATION DURING STORAGE & LONG TERM STORAGE (6 MONTHS MIN.)

During the storage period before the equipment installation, the user shall carry out the following tests:

#	Action	Periodic Check
1	Visual check of packages and goods integrity with a thorough attention to the goods packed or saddles and bundles. In case of damages on packages, please carry out any necessary repairing actions immediately	Every month
2	Visual check of the painting integrity. In case of damages, please carry out any necessary repairing actions immediately.	Every month
3	Visual check of stainless steel parts. In case of oxidation and/or contaminated areas, is necessary clean accurately using: Inox brush, Detergents & Degreasing cleaner polishing based degreasing solvents (for eg. E-NOX Clean INOX-CLEAN - @ bio-chem Surface Technology) and surfactants (for eg. STAR 100 Meta STAR - @ bio-chem Surface Technology) in polishing effect rapid evaporation for cleaning and polishing of stainless steel surfaces.	Every month
4	Access to the storage area of non authorized personnel must be limited	Always