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# **BALUCHISTAN ENERGY COMPANY LIMITED**

## **DEVELOPMENT OF LPG TESTING LABORATORY AT TAFTAN**

### **Specification of Packing & Protection of Equipment**



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# SPECIFICATION OF PACKING & PROTECTION OF EQUIPMENT

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# SPECIFICATION OF PACKING & PROTECTION OF EQUIPMENT

## 1.0 GENERAL

### 1.1 Scope

This specification represents the minimum requirements which the Supplier shall follow for the packing and protection of materials and equipment during their transportation, storage and handling.

Supplier shall proceed under his own responsibility and according to the general practice to the sea packing or sea protection of his supply.

This packing shall also be carried out in order to satisfy the transportation conditions.

The packing shall be strong enough to support without damage sea transportation as well as long duration storage in harbor facilities and/or site.

In no case, shall material/equipment belonging to different orders be packed in one single packing.

It shall be mandatory to pack the spare parts in separate packing. The spare parts packages may be included in the main equipment packing.

### 1.2 Definitions

Company	Balochistan Energy Company Limited
Company Representative	A Company designated Engineer, Party/Parties duly authorized by the company to act on behalf of the company with whom the Supplier shall consult at all reasonable times and whose instructions, request and decision shall be binding on Supplier.
Supplier	Entity with whom the Company will execute a Contract for supply of equipment/material as per this document
Project	Development of Feasibility Study of LPG Testing Laboratory at Taftan



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## 1.3 Purpose

All the materials are subject to certain fragility due to physicochemical and mechanical risks of their own.

Therefore, each material shall have its particular protection and packing taking into account:

- Different transportation they shall go through (vibrations, shocks, etc...)
- Transshipment, handling and lifting
- Storage, for more or less long periods, in the open air.
- Every packing should stay reliable for duration of one year minimum

## 2.0 TYPES OF PACKING & PROTECTION RECOMMENDED ACCORDING TO TYPE OF MATERIAL

### 2.1 Sea Packing

The packing shall be strong enough to support without damage during transportation as well as long duration storage in harbor facilities and/or site.

#### 2.1.1 Pallets

Every material delivered in pallets such as certain products in bags, bricks, etc.

##### a) Protection

- i Against Humidity: plastic coating
- ii Mechanical:
  - Corners reinforcement through metallic or iron angles
  - Face protection to be insured by bituminous paper or cardboard.

The whole being secured by stainless steel strips.



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### 2.1.2 Bundles

### (Appendix – A)

Constitution of bundles strapped by metallic strips, or dunnage in order to avoid twisting:

- Either by strips belting the bundle if it is not too heavy
- Or by U bars tied together by threaded rods with nuts and lock nuts
- Or by wedges, intermediate or circular wooden pieces to ensure protection against sharp edges and rigidity of the sets, the wedges being tied together by nails, bolts or strips.

#### a) Concerned Materials

- Straight pipes of 1/4", 20' - 43' long
- Steel bars
- Plain sheets
- Structural steel
- Structures

#### b) Protection

##### Protection Against Corrosion

Protection against corrosion is to be made in accordance with the particular conditions of the order.

##### Protection of Mechanical Items

- Threaded ends shall be protected by screwed bushings.
- If necessary, ends shall be supplied with metallic plastic or wooden protective devices, bevel protectors/companion flanges
- When handling stainless steel pipes:
  - Do not use steel slings
  - Do not hook up pipes by their ends
  - Use leather straps



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### 2.1.3 Reels

(fig. attached as **Appendix – A**)

a) Concerned Materials

Metallic or electric cables, ropes, flexible pipes, etc.

b) Protection

- i Against corrosion: ends to be enveloped or lapped, steel metallic cables must be coated with a film of grease.
- ii Mechanical: cables are to be coiled around wooden or metallic reels and protected by a wooden stave.

### 2.1.4 Cradles

(Fig attached as **Appendix – B**)

a) Concerned Materials

Materials of great dimensions, heavy weight, neither fragile nor needing mechanical or physicochemical protection such as oily water separators, corrosion inhibitor packages, drag reducer packages etc.

b) Protection

- Against Corrosion

Cleaning and coating are to be made in accordance with the particular conditions of the order. A good protection of nozzles, nozzle flanges and machined parts shall be done by plugging or by applying coating process. Utilization of a corrosion inhibitor will be recommended in certain cases.

- Protection Against Mechanical Items



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Wooden or metallic cradles with belts made of flat steel bars attached through turnbuckles to the cradles.

In every case, Supplier shall provide lifting devices (rings, lugs or hooks) in definite and easily spotted points for sling lifting.

When belting by flat steel bar or by cradle, it is necessary to place another material avoiding friction such as felt, rubber or plastic in between the material and the belt. Moreover if it is not possible to use a crane hook for handling, Supplier shall supply for the transportation duration, the necessary accessories such as spreader bars, slings, ropes, etc.

### 2.1.5 Frames for Shaped Steel Sheets

(Fig. attached as **Appendix – C**)

In order to avoid shaped steel sheets deformation/twisting during transportation and handling, they are layer on top of the other with intermediate shims inside a rigid frame. Such frame shall have pad eyes for easy handling by hooks and slings.

### 2.1.6 Crates

(Fig. attached as **Appendix – D**)

#### a) Concerned Materials

Vessels with external elements/equipment not allowing the utilization of cradles or the barge transportation such as piping, air coolers, steel structures, etc.

#### b) Protection

Protection against corrosion is to be made in accordance with the particular conditions of the order and in every case:

- Machined parts shall be wrapped with adhesive plastic tape
- Contact surfaces of metallic structural parts shall be protected by a rustproof material.
- Pipe ends shall be coated with Kraft paper or jute cloth or fitted with proper protective devices.



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Protection for Mechanical items (anti-shocks): material shall be steadied either directly on the crate bottom tray or by means of cradles. Another wedging shall be made on the cove tray for complete immobilization.

### 2.1.7 Full Packing Cases

#### a) Concerned Materials

Sets requesting mechanical protection against shocks and eventually physico-chemical protection such as machined pieces, small fragile piping, mechanical parts, valves, fittings, bolts, hand tools, insulation material, glass parts etc.

#### b) Protection

Against corrosion:

- Machined parts shall be wrapped with an adhesive plastic coating
- Tools, valves accessories shall be wrapped in paper with corrosive inhibitor.
- Bolts and nuts shall be greased and wrapped in jute bags according to size.

Mechanical Protection shall be by wooden case with one face planed; joined edge, with bituminous Kraft paper for internal with an overlapping coating. The cover shall be made of 2 layers of wood bituminous Kraft paper in between the 2 layers.

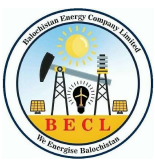
### 2.1.8 Groove & Tongue Wooden Package

#### a) Concerned Materials

Those requiring physicochemical protection such as electric material (motors, panels, equipment) electro-mechanical generators, electronics, electro-pumps, control valves, motorized reducing gears.

#### b) Protection





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- Protection against corrosion is such that material shall be placed inside plastic bags with dehydrating products. Machined parts shall be protected by a waterproof plastic film.
- Protection for Mechanical items: wooden case with both faces planed and grooved, with waterproof paper for internal coating. The cover shall be made of 2 layers of planed and grooved wood with an overlapping bituminous kraft paper in between the two layers. Mobile pieces inside the equipment shall be tightly fixed to structures.

### 2.1.9 Protective Packing

#### a) Concerned Materials

Fragile materials such as:

- Pressure gauges, vacuum meters, thermometers
- Measuring and control equipment
- Control panels, electronic equipment, laboratory equipment, electric material, and glass equipment.

#### b) Protection

- Protection against corrosion and humidity shall be plastic bags and dehydrating products. Cases are to be coated internally with bituminous kraft paper.
- Protection for Mechanical items: material shall be fixed on shock absorbers or in an internal case placed on shock absorbers. Shock absorbers may be springs, wedges, mats, expanded plastics, etc. Mobile pieces and delicate components shall be blocked before packing.

Cases shall be planed, grooved and tongued: cover shall be made of two layers of wood with an overlapping bituminous kraft paper in between the two layers.

### 2.1.10 Steel Barrels

#### a) Concerned Materials



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Chemical products, coal tar, catalysts, powders, chemical reactive, coils, etc.

b) Protection

Sealed closure in order to avoid any loss or moisture penetration

Containers

Containers used for grouping parcels shall be in accordance with ISO 668 standards.

2.1.11 Special Containers

Valuable turbine rotors shall be packed in pressurized hermetic sealed containers filled with low pressure dry air or nitrogen.

2.2 **Types of Packing Case Fabrication**

2.2.1 Quality of Wood

Compact and dry fir wood or any similar wood available in the country shall be used or even phenolic Douglas fir wood reinforced by fir boards.

Wood shall have the following essential characteristics:

- Dyness: about 20%
- Diameter of vicious or unstable knots shall be less than half of the board width
- Free of cracks longer than 12".
- Flaws accepted on condition they do not include bark and within the following limits:
  - Length:  $\frac{1}{5}$  of the length of the wooden piece
  - Width:  $\frac{1}{2}$  of the width of the wooden piece



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- Thickness:  $\frac{1}{4}$  of the thickness of the wooden piece.
- board thickness and rail thickness shall be in accordance with the case weight and dimensions. It shall be in accordance with the type of material packed and the way it is straddled inside the packing.

In accordance with these parameters, the following parameters are given as guidance:

GROSS WEIGHT	BOARD THICKNESS BEFORE PLANNING	RAIL THICKNESS BEFORE PLANNING
Up to 1100 lbs	$\frac{3}{4}$ " to $\frac{7}{8}$ "	$\frac{3}{4}$ " to $\frac{7}{8}$ "
From 1100 to 4400 lbs	$\frac{3}{4}$ " to $\frac{7}{8}$ "	$\frac{7}{8}$ " to $1\frac{1}{16}$ "
From 4400 to 11000 lbs	$\frac{7}{8}$ " to $1\frac{1}{16}$ "	$1\frac{1}{16}$ " to $1\frac{1}{4}$ "
From 11000 to 22000 lbs	$1\frac{1}{16}$ "	$1\frac{1}{16}$ " to $1\frac{1}{4}$ " or $1\frac{1}{2}$ "
From 22000 to 48500 lbs	$1\frac{1}{16}$ " to $1\frac{1}{4}$ "	$1\frac{1}{4}$ " to $1\frac{1}{2}$ "
From 48500 lbs and over	$1\frac{1}{4}$ " or $1\frac{1}{2}$ "	$1\frac{1}{2}$ "

### 2.2.2 Case Fabrication

#### a) Crates

(Fig. attached as **Appendix – D**)

Crates shall be erected in such a way that empty surfaces shall match filled surfaces.

Material placed inside the cases or crates shall be covered with a polyethylene bag specially treated to fight against sun and heat and to prevent rain or water jet infiltration.

#### b) Full Packing Cases

Boards must be placed side by side or jointed by male and female interlocking having a minimum depth of  $\frac{1}{2}$ " especially if sea traveling is forecast through



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traditional ships where several handlings are expected. Board's width shall not exceed 10" or be less than 5".

Up to 1100 lbs weight and if the length is limited to 8'-2" and if the contained material allows it, cases may be built without bottom timber beam. Such beams shall be replaced by supporting rails 1" thick for the walls and 1½" thick for the bottom. Distance between rails shall be one meter along case length.

Supporting rails shall have a minimum width of 3". Bottom boards shall have 1¼" thickness.

Over a net weight of 1100 lbs, cases shall be provided with longitudinal timber beams at their bottom. Their cross section shall be in accordance with the type of packed material and its weight.

Concerning timber beams and reinforcing bars the following data is used:

- up to a net weight of 2200 lbs, use pieces of 3" × 3" cross section
- from 2200 lbs up to 3370 lbs, use pieces of 4" × 4" cross section
- from 3370 lbs to 13200 lbs, use pieces of 5" × 5" cross section
- from 13200 lbs up to 19850 lbs, use pieces of 8" × 8" cross section
- From 19850 lbs up to 44100 lbs, use pieces of 8" × 8" cross section.

Spacing between bars shall be from 2'-8" to 6'-6". This spacing shall nevertheless be in accordance with the dimensional, qualitative and constructive characteristics of the contained material.

Ends of reinforcing elements shall be beveled at 45 deg to facilitate lifting slings insertion.

Beneath the case, small rails 1½" to 2" thick shall be placed as spacing pieces to protect the case against the lifting slings.

Position and length of such rails shall be established in accordance with the case length and its center of gravity.

### c) Cases for More Than 11,000 lbs



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For cases weighing more than 11,000 lbs net weight, it is recommended to place angle irons where the lifting slings are to be applied.

The walls and the cover may also be made out of Douglas fir phenolic marine plywood but shall have a fir structure of  $1\frac{1}{2}" \times 5"$  minimum.

Cases shall always be internally coated with bituminous paper of high impermeability and capable of withstanding strong temperature variation, whatever be the protection adopted for the contained material.

### d) Plywood Utilization

Plywood panels may be used for pickings instead of sawn wood. Panel thickness will depend on the cases dimensions and weight and will depend also on the density of the goods, the structure of the case and the way it is steadied. Plywood quality shall be that one which can withstand humidity. In accordance, following data is given as guidance:

- Gross weight up to 1100 lbs      thickness  $\frac{1}{4}"$  to  $\frac{5}{16}"$
- From 1100 lbs to 11000 lbs      thickness  $\frac{3}{8}"$
- From 11000 lbs to 33000 lbs      thickness  $\frac{1}{2}"$
- Over 33000 lbs      thickness  $\frac{5}{8}"$

## 2.3 Modules/Packages/Assemblies

### 2.3.1 Weight & Dimensions of a Module

- a) Available Transportation Capacities
- b) Available Lifting Capacities

For onshore locations, modules up to 150 tons may be carried out if roads with hard coating are available. Limit shall be brought down to 50 tons if only tracks are available. It is even preferable to bring down this limit to  $36' \times 8'-2" \times 13'$  in order to take into account classical obstacles such as bridges, electric lines, tunnels, etc. afford only this lower limit.



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For offshore locations, modules up to 400 tons and more may be carried out. However, this last tonnage can be shipped only on specialized ships of 10,000 or 15,000 tons.

Exceptional weight may go up to 2,000 tons derrick barges or lifting means are consequently forecast.

### 2.3.2 Module Structures

A module constitutes a lift able and transportable assembly. Bearing structures will, therefore, be made up of standard rolled sections or box girders.

Structure calculation basis shall take into account the whole module life, especially the very short and stressful periods that constitute transshipment.

Module shall be provided with the necessary slings, lifting beams, shackles, etc. for crane handling.

#### a) Close Modules

These modules shall be closed by simple wind cutter partitions of fireproof separators according to request.

They shall be mechanically ventilated and even air conditioned if requested for safety reasons or weather conditions.

#### b) Cage modules

Cage modules shall be adopted when modules have to be piled up.

#### c) Skids

Skids shall be used preferably for mechanical equipment such as diesel generating sets, motor pumps, filters, separators, etc.

### 2.3.3 Shipping Preparation



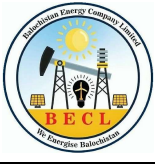
## SPECIFICATION OF PACKING & PROTECTION OF EQUIPMENT

Mobile elements (spring supports, etc.) shall be immobilized. Equipment shall be protected as follows:

- a) Measuring and control equipment, which are too fragile for transportation, shall be dismantled, packed separately, carefully marked and shipped with the module.
- b) Valves, control valves and other equipment, dismantled for the hydraulic tests and replaced by plugs, shall stay dismantled but will be packed separately, carefully marked and shipped with the module.
- c) Tanks and pipes shall be emptied and dried.
- d) Stainless steel elements shall be coated with a coating which shall be in accordance with the steel grade.
- e) All the openings shall be closed.
- f) Flanges and screwed fittings shall be mechanically protected and also rust proof protected.
- g) Equipment such as electric motors, relay, panels, MCC shall be heated by their own equipment or by provisional means.
- h) If the internal equipment request an inert atmosphere, this atmosphere shall be introduced and maintained in the module or in the compartment of the module where these equipment are housed.
- i) In the same way, if the equipment inside the module requests air conditioning, this air conditioning shall be maintained through an external source of energy.
- j) Enough desiccant material shall be placed inside certain equipment such as motors, pumps, valves, etc.

### 2.3.4 Slings & Lifting Accessories

As soon as the module get a certain weight (over a few tens of tons), it is recommended to fit the module with its slings, shackles, with the pins blocked or even welded and eventually with the lifting beam as soon as it leaves for the field. This necessitates that



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the structure and the sea fastening be designed to this effect. This arrangement will prove to be most efficient especially when there will be several crane handlings.

This construction shall provide the calculating notes of the lifting elements and especially for the cables (test load, deflection angle between the strands, safety factor, etc.).

### 2.3.5 Center of Gravity

It will be determined through calculation but verified through weighing. In certain cases the lifting ears will be welded only after the practical determination of the center of gravity.

### 2.3.6 Orientation

In order to facilitate handling operations on the job site, the orientations marks North South or East West shall be marked, when possible, on the module, in the manufacturing plant, in accordance with the layout drawing.

## 2.4 Special Regulations

### 2.4.1 Steadying

All packed material shall be internally steadied in an adequate manner in order to avoid any displacement during transportation.

### 2.4.2 Protective Products

When transporting material coated with protective products. Supplier and/or company in charge of the packing shall indicate the effective duration of the protective material and give all information concerning a good transportation of the merchandise.

### 2.4.3 Protection against Humidity

Hot sealed plastic bags, composed of cloth, aluminum and a double layer of polyethylene, shall be used for material such as panels, electric gears, hydraulic gears and similar ones which are much affected by humidity. Introduction of dehydrating





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products shall maintain above mentioned material in an atmosphere having less than 35% humidity. Polyethylene bags must not be used.

Polyethylene bags can be used only as open covers to allow free air circulation. These covers shall be special for protection against heat and sun and will serve only to protect material against rain and water jets.

### 2.4.4 Fork Pockets

For all parcels, which cannot be manually handled, especially those exceeding 1100 lbs, special pockets shall be provided to allow the handling with fork lift trucks.

### 2.4.5 Trimming Points

As far as possible and particularly for parcels uneasy to handle manually, trimming points shall be provided preferably at the higher angles of the parcels in order to avoid damage to the pickings when trimming operations are carried out for transportation.

## 3.0 PACKING FOR AIR TRANSPORT

Packing for air-transported goods shall be identical to that provided for above sea-transported goods. Anyway the following features shall be taken into account when packing:

- Many handlings on site by means of motorized equipment (lift trucks, transpallets, etc)
- Extended storage (at least one year) in the open air, sea environment, tropical climate.

Consequently, cases or packages shall be conditioned accordingly.

Each part contained in the said package shall be protected to take the above conditions into account so as to allow partial unpacking of cases or packages.



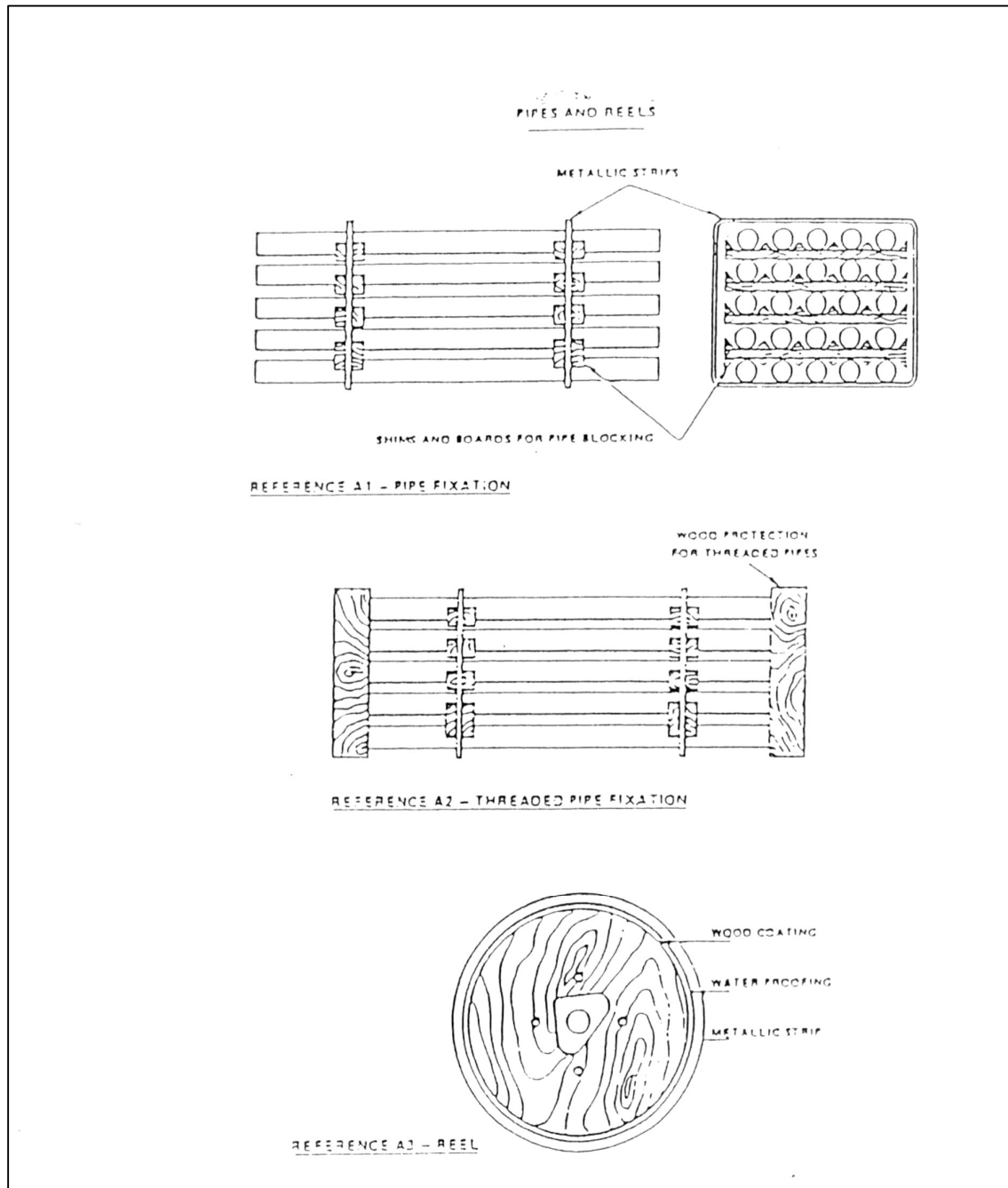
## SPECIFICATION OF PACKING & PROTECTION OF EQUIPMENT

### APPENDICES



# SPECIFICATION OF PACKING & PROTECTION OF EQUIPMENT

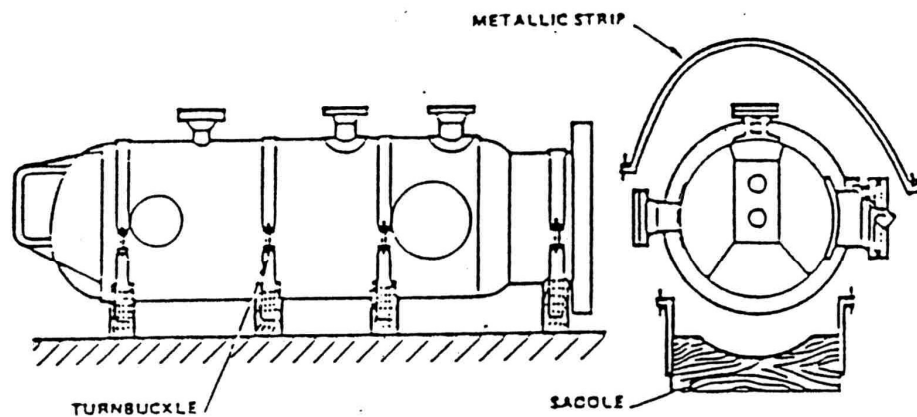
## APPENDIX – A



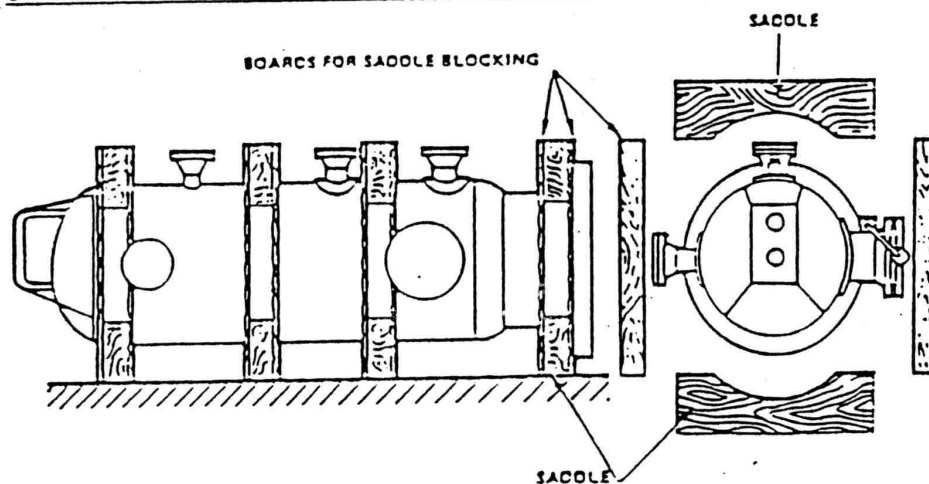
## APPENDIX – B

### CRADLES FOR CYLINDRICAL EQUIPMENT

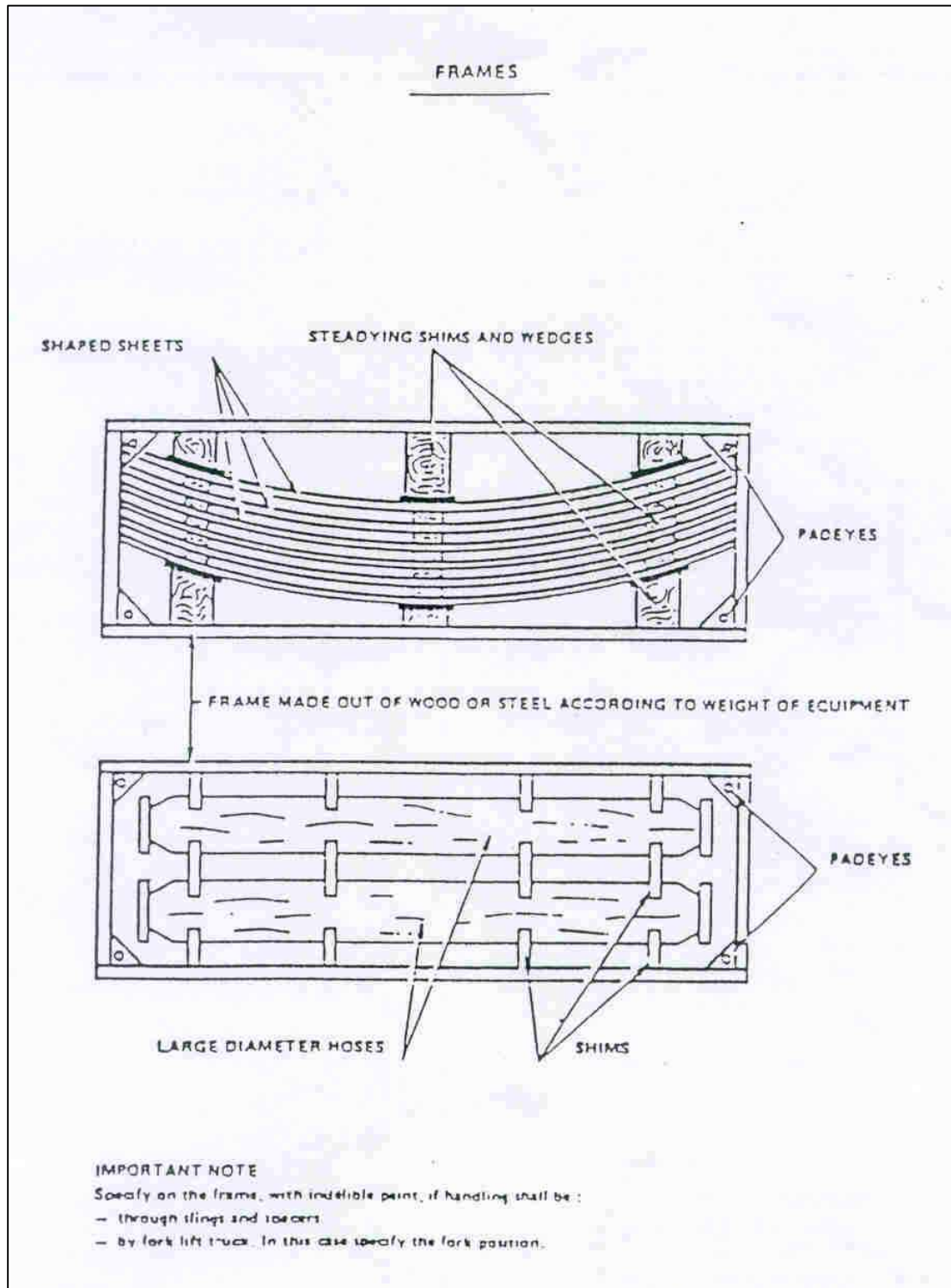
#### B<sub>1</sub> CRADLE FOR TANKS COLUMNS AND HEAT EXCHANGERS



#### B<sub>2</sub> CRADLE FOR TANKS COLUMNS HEAT EXCHANGERS AND EQUIPMENT OF CYLINDRICAL FORM



## APPENDIX – C



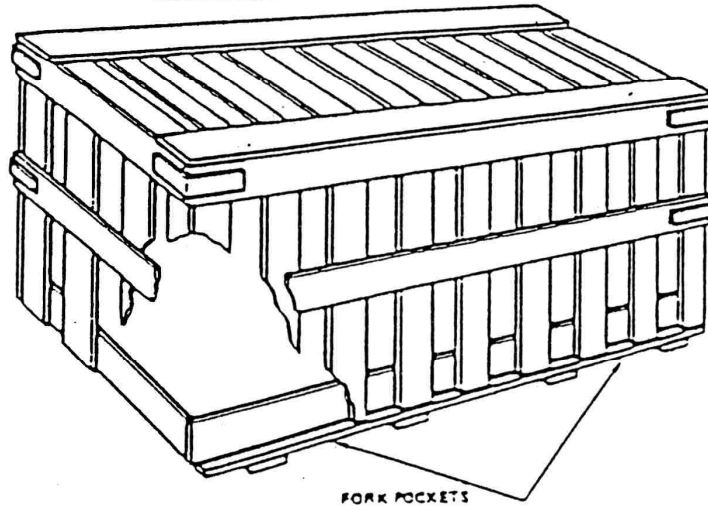


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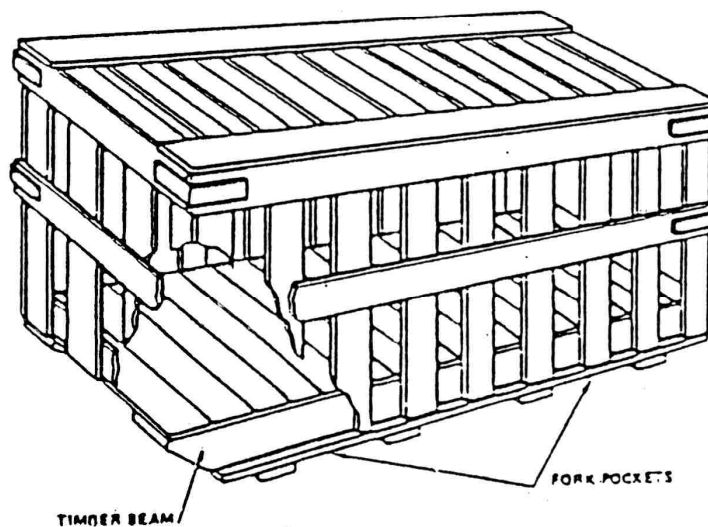
## APPENDIX – D

### CRATES

REFERENCE 01 – UP TO 500 KG  
(WITHOUT TIMBER BEAM AT THE BOTTOM)



REFERENCE 02 – OVER 500 KG  
(WITH TIMBER BEAM AT THE BOTTOM)





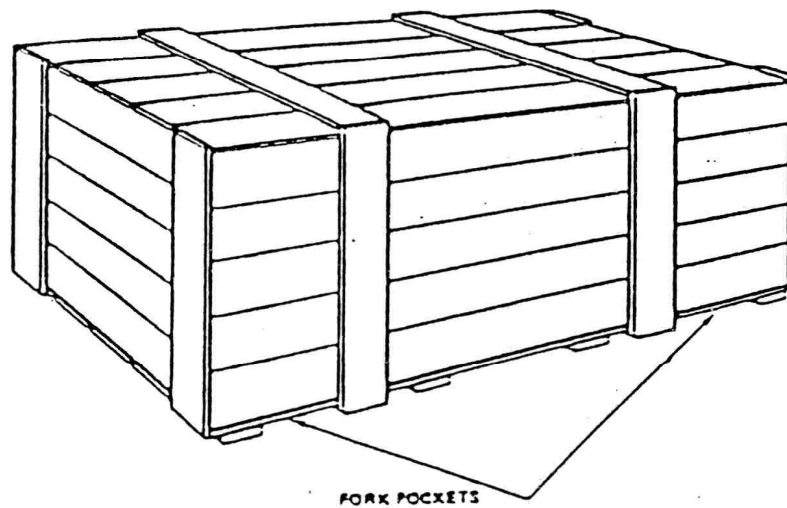


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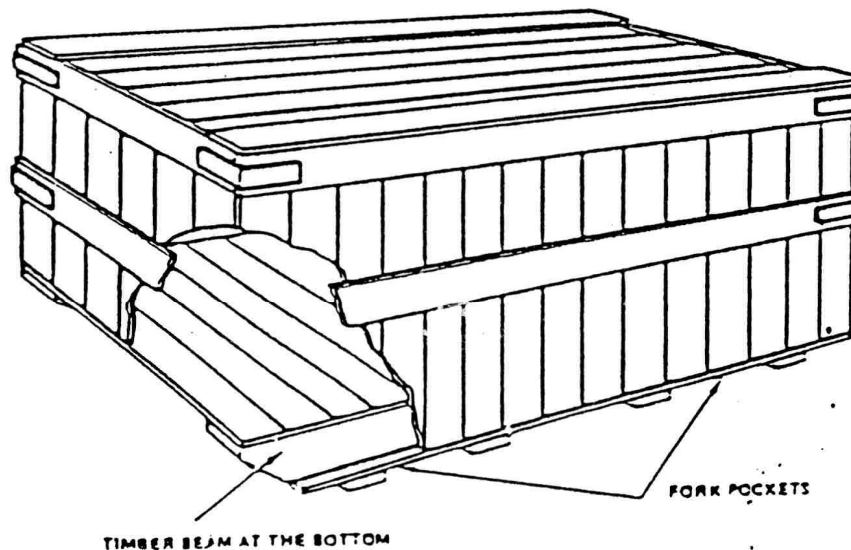
## APPENDIX – E

### FULL PACKING CASES

REFERENCE E1 – CASE FOR LOADS UP TO 500 KG  
(WITHOUT TIMBER BEAM AT THE BOTTOM)



REFERENCE E2 – CASE FOR LOADS OVER 500 KG  
(WITH TIMBER BEAM AT THE BOTTOM)





## SPECIFICATION OF PACKING & PROTECTION OF EQUIPMENT

CASES FOR LOADS OVER 5 TONS

GROVE AND TONGUE WOODEN CASE OR PLY WOOD CASE

