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**General Packing Specification for Shipment Of
Heavy and Oversize Cargo**

1. **PURPOSE:** This specification provides vendors, suppliers, transportation/erection contractors, and Saudi Aramco personnel general guidelines for shipment of heavy and oversize cargo.
2. **USE:** This specification is a statement of minimum requirements. The vendor's own experience and practice should be used to determine whether certain items require more than the minimum standards in this specification to ensure safe delivery to their final destination. The specification may also be used by Saudi Aramco receiving staff at loading ports to determine if the goods are adequately packed, marked, and handled.
3. **REQUIREMENTS:** These requirements provide vendors, suppliers, and transportation/erection contractors with Saudi Aramco's minimum requirements for the protection of heavy and oversize material against damage and deterioration caused by improper handling and environmental factors. These are in addition to those in Saudi Aramco Master Number Specifications, the material descriptions, or other Saudi Aramco specifications and apply only to the material indicated. The specification covers packaging, packing, and marking requirements for heavy/oversize shipments during all stages of movement and storage from the vendor's plant to their final destination. Deviation from these specifications must be approved in writing Materials Logistics Department, through the applicable procurement office. Additional specifications for products with special packing and handling requirements such as boilers, heat exchangers, transformers, and turbines will be determined by the responsible design office and be specified in the purchase order.

3.1 Definitions:

- 3.1.1 **Heavy lift:** A single piece of cargo that is 45,000 kg or heavier; requires long-term planning and special handling.
- 3.1.2 **Intermediate lift:** A single piece of cargo that is 20,000 kg or heavier but less than 45,000 kg; requires short-term planning (within 6 months before shipment) and special handling.
- 3.1.3 **Oversize:** A single piece of cargo that is equal to or greater than 15.25 m long by 3.35 m wide by 3.65 m high; includes heavy and intermediate lifts and their integral components (material shipped as a separate entity and whose structural integrity requires special handling arrangements).

- 3.1.4 **Cradle:** Any support which partially encloses an object mounted on it. Such support will be either:
- a. An integral cradle for horizontal vessels which forms part of the vessel's basic design; or
 - b. Transportation saddles for column items which provide support during all stages of movement.
- 3.2 Shipping preparation procedures: Before starting fabrication, develop packing and shipping preparation procedures for review by Saudi Aramco. These procedures must accommodate all operational constraints that may be encountered during each stage of movement.
- 3.3 Cradle design: Saudi Aramco is responsible for the design of integral cradles. Vendors are responsible for designing transportation cradles unless otherwise specified in the purchase order. Design considerations for all cradles must include stability, weight, and compatibility with transportation equipment. The minimum distance between cradles is to be:

16.155 m (53 ft) for items over 350 tons
13.105 m (43 ft) for items from 180 to 350 tons
10.060 m (33 ft) for items below 180 tons

In borderline cases, use the longer distance. Provide rubbing strips for all cradles. Secure each transportation cradle to the item by bolting, strapping, or welding in a manner consistent with good engineering practices and the ship's dynamics (as specified in Chart "A"). Provide jacking pockets for transportation cradles in accordance with purchase order requirements.

- 3.4 Crate design and material: Crates must have skids with lifting points and must be secured in such a way that the secured item cannot move while in transit. Use common construction grade "No. 1" lumber or better, except for cradle construction. Use new material made from recognized brands broadly accepted in the geographical areas in which packing is carried out. (For cradle construction, use hard- or semi-hardwoods, not green or dry softwoods, except for rubbing strips.)
- 3.5 Self-supporting items: Self-supporting items must be provided with a skid or cradle to give adequate clearance during all phases of handling. If the cradle is not high enough to permit clearance during lifting or movement when the heavy lift is 10° of the horizontal axes, compensate by providing additional timber support, securely fastened. Submit 5 copies of the design plans, including details of support, lifting method, weight and dimensions, to the Saudi Aramco Design Office for approval.

For those items which are supported on permanent or temporarily fixed cradles, provide each item with a maximum of 2 approved cradles capable of supporting the item's weight, as well as allowing for dynamic constraints during each stage of movement. If crating is required, each crate must be able to withstand its own tare weight.

Note: To use more than 2 cradles to support items requires prior written approval by the Saudi Aramco.

- 3.6 Blinded apertures: Seal all apertures with plugs, caps, or steel-plate-bolted flanges. Use covers commensurate in thickness with the diameter of the aperture, applied so that the whole unit is watertight.
- 3.7 Painting and coating: Paint or coat all external surfaces with material that will protect the item from corrosion, especially caused by salt water, water, heat, and industrial fumes.
- 3.8 Blinds and coatings: Use new blinds and coatings made from recognized brands that conform to the standards broadly accepted in the geographical area in which packing is done.
- 3.9 Lifting/sling points: Provide each item with lifting or sling points that will distribute the load equally and keep the item in a stable horizontal position when lifted by one hook. Note that it is a Transportation Engineering requirement that all items up to 125 tons be designed for a single-point lifting system.
- 3.10 Lashing points: Provide each item with appropriate lashing points to secure the load during handling and transport.
- 3.11 Surface protection in lifting: Cover all of the item's surface areas which may come in contact with slings during lifting with timber boards or similar material that will prevent scratches, dents, and other damage.
- 3.12 **Marking:**
 - 3.12.1 Use red or contrasting paint to mark lifting points and lateral and vertical centers of gravity.
 - 3.12.2 Stencil precautionary markings on each item for proper handling and storage; for example, "Do not weld this vessel."; "Do not burn on this vessel."
 - 3.12.3 Mark the tag number from the purchase order.
 - 3.12.4 Mark the Saudi Aramco Master Number, if applicable.

CHART "A" CRITERIA FOR SHIP DYNAMICS

(to be included in design of all heavy lifts) Values must resist

accelerations caused by:

Roll plus heave
Pitch plus heave
Overhang (if applicable) hitting water

Maximum roll and pitch to be calculated separately

	Single Amplitude 10-Second Period		
	Roll	Pitch	Heave
Ships	30°	15°	0.2 g
Barges <76.2 m (250-ft) LOA (offshore)	25°	12°	0.2 g
Or <22.85m (75-ft) beam			
Barge Others	20°	10°	0.2 g
Barge* (inland tows)	5°	5°**	0.1 g

*Consider impact forces in case of collision.

**Use static angle corresponding to worst damage stability conditions.

TRANSPORTATION CRITERIA METHOD OF CALCULATION

All structures of items of equipment to be transported by sea must be capable of accepting the following loads:

1. $1.5 \times W$ acting downwards; W = self-weight of the item
2.
 - a. Horizontal force of $(0.61 + 0.021 \times H) \times W$ acting longitudinally; H = height of center of gravity above transport baseline in meters
 - b. Horizontal force of $(0.61 + 0.021 \times H) \times W$ acting transversely
3.
 - a. Forces caused by a rotation of plus or minus 30° in a 10-second full cycle period, about a horizontal transverse axis through the center of gravity
 - b. Forces caused by a rotation of plus or minus 30° in a 10-second full cycle period, about a horizontal longitudinal axis through the center of gravity

4. Combinations of loads arising from 1, 2a, and 3a, or 1, 2b, and 3b, acting simultaneously.
5. Lifting from installed pad-eyes or defined sling points. When 4 lifting points are provided, 75 percent of the weight is assumed to fall on either diagonally opposite pair.

- Notes:**
1. The terms "longitudinal" and "transverse" refer to the axes of the equipment and do not necessarily refer to directions relative to the ship.
 2. The weights of concentrated masses may be considered to act at their center of gravity. The correct horizontal and vertical weight distributions should be considered for other items.
 3. Where compliance with the above criteria would require a significant change in the design or a significant cost increase, Saudi Aramco/ASC/AOC offices are to be notified before design changes are implemented.

CHART "B" REPORT

MARKINGS

All export markings must be done in accordance with marking instructions issued with the purchase order.

Markings must agree with the shipping documentation.

MARKING ASSEMBLY

STANDARD MARKING ASSEMBLY		EXAMPLE	
ORDER NUMBER	PACK NUMBER	EN-R63-32-0010TA	No. 1 of 4
Inland Destination			
Symbol		EN	
Port mark		Saudi Aramco Dammam	
Net Weight (kg)		202,400 kg	
Gross Weight (kg)		202,700 kg	
Outside Dimensions		5,054 cm x 537 cm x 590 cm	
Material Master Number		As applicable	
Tag Number		As applicable	

Apply all markings with black moisture-resistant ink, using characters at least 5 cm (2 inches) high.

Stencil the standard marking assembly on the middle of both sides of the crate, no more than 3.058 m (10 ft) above ground level

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