GENERAL STANDARD

FOR

PACKING & PACKAGES

ORIGINAL EDITION

MAY 1997

This standard specification is reviewed and updated by the relevant technical committee on Oct. 2003(1) and Apr. 2014(2). The approved modifications are included in the present issue of IPS.

FOREWORD

The Iranian Petroleum Standards (IPS) reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS is based on internationally acceptable standards and includes selections from the items stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement of each project. For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The IPS is reviewed and up-dated approximately every five years. Each standards are subject to amendment or withdrawal, if required, thus the latest edition of IPS shall be applicable

The users of IPS are therefore requested to send their views and comments, including any addendum prepared for particular cases to the following address. These comments and recommendations will be reviewed by the relevant technical committee and in case of approval will be incorporated in the next revision of the standard.

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GENERAL DEFINITIONS:

Throughout this Standard the following definitions shall apply.

COMPANY:

Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company and National Iranian Oil Refinery And Distribution Company.

PURCHASER:

Means the “Company” where this standard is a part of direct purchaser order by the “Company”, and the “Contractor” where this Standard is a part of contract documents.

VENDOR AND SUPPLIER:

Refers to firm or person who will supply and/or fabricate the equipment or material.

CONTRACTOR:

Refers to the persons, firm or company whose tender has been accepted by the company.

EXECUTOR:

Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR:

The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

SHALL:

Is used where a provision is mandatory.

SHOULD:

Is used where a provision is advisory only.

WILL:

Is normally used in connection with the action by the “Company” rather than by a contractor, supplier or vendor.

MAY:

Is used where a provision is completely discretionary.

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1. SCOPE

1.1 This General Standard covers the minimum requirements for packaging, packing, marking, testing and shipment of supplies and equipment for delivery to provide full protection against physical and mechanical damage during transit and multiple handling and possible long periods under adverse storage condition. It also provides for package quantities suitable for redistribution without additional repackaging or marking.

Vendors shall remain fully responsible for selecting suitable packing material, and for efficiency of packaging.

Seller's own experience and practice should be used to decide whether certain items require more than the minimum requirements specified in this Standard.

1.2 Those (IPS) Standards that have packing arrangement, shall have precedence to this Standard.

Note 1:

This standard specification is reviewed and updated by the relevant technical committee on Oct. 2003. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No. 179 on Oct. 2003. These modifications are included in the present issue of IPS.

Note 2:

This standard specification is reviewed and updated by the relevant technical committee on Apr. 2014. The approved modifications by T.C. were sent to IPS users as amendment No. 2 by circular No. 425 on Apr. 2014. These modifications are included in the present issue of IPS.

2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

D 3951: 2010	"Standard Practice for Commercial Packaging"

BSI (BRITISH STANDARDS INSTITUTION)

BS 1133: 1985	"Packaging Code"
BS 2540: 1991	"Silica Gel for Use as Desiccant for Packages"
BS 3177: 1959	"Method for Determining the Permeability to Water Vapour of Flexible Sheet Materials used for Packaging"
BS EN ISO 2873: 2002	"Packaging-Complete, Filled Transport Packages and Unit Loads-Low Pressure Test"
BS EN 2875: 2002	"Packaging - Complete, Filled Transport Packages and Unit Loads-Water-Spray Test"
BS EN ISO 2244: 2002	"Packaging-Complete, Filled Transport Packages and Unit Loads-

Horizontal Impact Tests"

BS EN ISO 2247: 2002 "Packaging – Complete, Filled Transport Packages and Unit Loads- Vibration Test at Fixed Low Frequency"

ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

"Packaging-Complete, Filled Transport Packages"

ISO 3394: 2012 "Packaging-Complete, Filled Transport Packages and Unit Loads-Dimensions of Rigid Rectangular Packages"

ISO 780: 1997 "Packaging-Pictorial Marking for Handling of Goods"

ISO 4180: 2009 "Packaging-Complete, Filled Transport Packages-General Rules for the Compilation of Performance Test Schedules"

Part 2: "Quantitative Data"

ISO 7965/1: 1984 "Packaging Sacks-Drop Test"

Part 1: "Paper Sacks"

ISO 6591/1: 1984 "Packaging-Sacks-Description and Method of Measurement"

Part 1: "Empty Paper Sacks"

ISO 6591/2: 1985 "Packaging-Sacks-Description and Method of Measurement"

Part 2: "Empty Sacks Made from Thermoplastic Flexible Film"

ISO 2233: 2001 "Packaging-Complete, Filled Transport Packages and Unit Loads-Conditioning for Testing"

ISO 2234: 2000 "Packaging-Complete, Filled Transport Packages and Unit Loads-Stacking Tests using a Static Load"

ISO 2248: 1985 "Packaging-Complete Filed Transport Packages-Vertical Impact Test by Dropping"

ISO 12048: 1994 "Packaging-Complete, Filled Transport Packages-Compression and Stacking Tests using a Compression Tester"

ISO 2876: 1985 "Packaging-Complete Filed Transport Packages-Rolling Test"

ISO-6590/1: 1983 "Packaging-Sacks-Vocabulary and Types- Part 1: Paper Sacks"

ISO-6590/2: 1986 " Packaging-Sacks-Vocabulary and Types- Part : Sacks made from thermoplastic flexible film"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-TP-100 "Engineering Standards for Paints"

IPS-E-GN-100 "Engineering Standards for Units"

3. UNITS

This Standard is based on International System of Units (SI), as per IPS-E-GN-100 except where otherwise specified.

4. PACKING

4.1 General Requirements

4.1.1 Equipment must be carefully protected and packed to provide adequate protection during transit to destination and shall be in accordance with any special provision contained in the specification or purchase order. Special attention must be given for protection against corrosion during transit.

4.1.2 Ancillary items forming an integral part of the equipment should be packed preferably in a separate container if the equipment is normally cased or crated.

Alternatively the ancillary items should be fixed securely to the equipment and adequate precaution should be taken to ensure that items do not come loose in transit or be otherwise damaged.

4.1.3 The packing of the equipments and other materials shall be carried out in order to comply with transport conditions.

4.1.4 Individual packages must be kept as small in bulk as possible.

4.1.5 For non containerized cargo, individual packages exceeding a gross weight of 2000 Kg should be avoided.

4.1.6 Kind and dimensions of packages shall be chosen to suit overseas transport in containers so that the space in the containers can fully be utilized.

4.1.7 If required the contents of cases shall be protected by waterproof and suitable foil according to the nature of material, which shall be sealed properly. An adequate of moisture absorbent (silica gel) shall be added to protect the contents sufficiently a long time from corrosion.

4.1.8 Felt, cellophane paper, polyester cuttings, crepe-cellulose and some equally efficient material may be used for padding or cushioning. The addition of paddings weight shall not jeopardise the case and this shall be avoided.

Wood shavings and other paper shall not be used.

4.1.9 Materials shall be protected against corrosion during transit as necessary. All bright and machined parts shall be coated with a recognized rust preventative suited to the particular application concerned. All internal parts shall be treated with lubricant containing rust and oxidation inhibitors to protect equipment. Such lubricant shall be compatible with those which shall subsequently be used in service and should be identified by appropriate tagging. The coating used shall not deteriorate while material in service and manufacturer shall advise the removal of the coating if required.

4.1.10 When required, packages shall be painted in accordance with the particulars contained in the order and/or requisition.

For Color Coding of pipes, Fittings and Flanges reference is made to IPS-E-TP-100.

4.1.11 All machined working surfaces and threaded parts of all materials shall be suitably protected.

4.1.12 Units or parts belonging to main equipment but separately packed shall be clearly marked for easy identification with the main equipment to which they relate.

4.1.13 Packages containing "Fragile" articles shall be appropriately packed and in addition the words "Fragile" and "Handle With Care" stenciled on two opposite sides, as per Table No. 1 of internationally recognized symbols.

Other packages shall also follow the recognized international symbols.

4.1.14 Spare parts for two years' operation shall be individually tagged. They shall be covered with a suitable preservative and wrapped with greaseproof paper and packed in separate cases from the prime item. The cases shall bear the markings as specified and in addition the words "Spare Parts for Two Years Operation".

4.1.15 Commissioning spares shall be individually tagged and marked "Commissioning Spares" and

shall be packed separately and shipped with the main item.

4.1.16 If required, all export cases, boxes, and bundles shall securely be strapped with a minimum of two suitable steel straps in each of two right angled and opposite directions, or where applicable wood reinforced.

Note:

Should consignments arrive visually damaged at the departure port, the shipping agent shall report and await instructions before onward shipping:

a) All bulk items, lighting fittings, cable glands, switches, etc. shall be packed in batches sufficient for a specific section of work.

b) Cases and crates shall depending on their weight and size, be provided with two or more steel straps made of unannealed steel, applied with a stretching tool and secured with crimped steel seals.

4.1.17 Apparatus and vessels shall, if required, be packed on skid constructions and secured with adjustable steel straps. All unprotected surfaces are to be sprayed with TECTYL. Manholes and other major openings must be protected with either plastic caps or wooden lids, which are to be firmly secured. Smaller openings are to be closed with plastic plugs.

4.1.18 Should any materials be scheduled to be freighted as deck cargo, additional packing instructions may be required of which the Vendor will advise, for vessels and columns, shipment cradles will be used throughout the transportation.

Cradles to be secured to vessels and columns, by strapping.

4.1.19 Paper bags (suitably boxed), or water tight Steel Drums will be used for shipping cement.

4.1.20 Fire bricks, and special tiles shall be boxed after sealing in a polyethylene liner.

Insulation refractories shall be boxed properly.

These boxes should be skid mounted. Instructions regarding storages prior to installation to be stenciled on each box with particular reference to adverse weather/temperature conditions.

4.1.21 All vessel internals and items not installed by the vendor at works including accessories such as small parts, bolts, nuts, gaskets etc. should be packed in wooden cases separately for each vessel or apparatus and marked with the same item number as the vessel/apparatus in order to protect all parts from loss or damage in transit. Internals, bolts and gaskets for service/testing operations shall be supplied with the vessels/item by the vendor for all internals, boxed separately, and marked according to marking procedures of this standard. Each item shall be supplied correctly and identified for field installation by others.

Note:

It is imperative that all these items be clearly listed on the packing-list.

4.1.22 All vessels/heat exchangers or items of such construction shall be dried, thoroughly cleaned inside and be free of all dirt and loose foreign materials.

4.1.23 Pipeline/vessel insulation shall be packed in double water-proof wooden plywood cases and secured to pallets.

4.1.24 All electrical equipment must be suitably protected to withstand 1 year transit conditions and Vendors should give recommendations for a further, 2 years storage under adverse site conditions. Batteries shall be shipped dry with electrolyte packed separately and shall include charging instructions.

4.2 Dimensions of Packages

4.2.1 This Standard sets forth a series of dimensions for rigid rectangular transport packages, based on the standard plan dimension (module) of 600 mm × 400 mm, 600 mm × 500 mm and 550 mm × 366 mm, as outlined in ISO 3676, which defines the plan dimensions of four series (1 219 mm × 1 016 mm, 1 200 mm × 1 000 mm, 1 200 mm × 800 mm, 1 100 mm × 1 100 mm).

4.2.2 Examples of combination multiples and submultiples, arranged to interlock is shown as Fig. 1.

1200 mm × 800 mm Multiple, 400 mm × 200 mm Sub multiple

First Layer **Second Layer**

1200 mm × 1000 mm Multiple, 400 mm × 200 mm Sub multiple

First Layer **Second Layer**

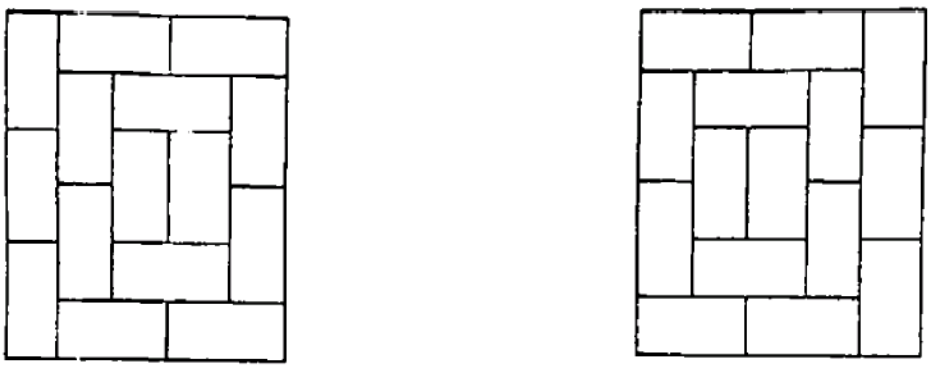


Fig. 1

4.3 Packing Case Materials

4.3.1 Cases and crates shall be made from new, sound and seasoned lumber. Sheathing shall be of min. 24 mm thickness.

If so required for static reasons, thicker sheathing shall be used, in accordance with size and weight

of the package.

Timber crates and boxes shall be strong enough to withstand vertical pressure when stacked without any damage to the materials during the transport on board of ocean steamers and numerous handlings, between the works and the port of departure.

4.3.2 All wood shall be thoroughly seasoned and thoroughly sound without knot, knot holes, shakes and checks. Wane and cross-grained wood shall not be used.

4.3.3 Woods which can cause metallic corrosion, such as oak, western red cedar and sweet chestnut shall not be used.

4.3.4 The case shall be of the sill base type. All sheathing shall be tongued and grooved.

4.4 Packing Case Lining

4.4.1 The packing case as necessitate or required shall be completely lined with multi-layer waterproof paper.

4.4.2 The lining shall have as a few joints as possible. If joints are necessary, the pieces shall be arranged so that any rain water which may penetrate the case is shed out when the case is upright. Over laps shall be 75 mm minimum. Joints shall be made with a suitable sealing.

4.5 Treatment of Packaging Materials

4.5.1 Paper, fiberboard and timber can be effectively treated with anti-microbial agents. Insecticide and insect repellents can be applied to a variety of materials and specific treatments are available to improve the termite resistance timber.

The choice of proofing agents is a complex matter and expert guidance should always be sought in the selection and application of these special processes.

4.5.2 Many processes exist for the chemical treatment against deterioration of commodities and packaging materials.

In the case of latter some are specially designed to prevent penetration by living organisms.

4.6 Packing Instruction for Panels and Instruments

4.6.1 All electronic and pneumatic instruments shall be packed in accordance with given instructions and must be suitably protected to withstand one year transit conditions and to give recommendation for a further two years storage under site conditions.

4.6.2 Electrical panels and instruments for export delivery shall be packed to provide full protection against physical damage and atmospheric attack during transit and possible min. 2 years under adverse storage conditions.

4.6.3 The package seller shall remain fully responsible for selecting suitable materials for packing and for the efficiency of the packaging.

4.6.4 The package seller shall provide written instruction for the removal of protective coatings on devices.

4.7 Method of Packaging

4.7.1 Shroud

The instrument or panel which shall be thoroughly cleaned, dry and free from rust and shall be

totally enclosed in a polyethylene shroud after sharp projections on the instrument or panel have been padded.

Silica gel or other approved desiccant shall be strapped inside the shroud, but shall not come into contact with the paintwork.

After the desiccant is strapped into position, the open ends of the shroud shall be heat sealed, only leaving an opening large enough for the insertion of an air extracting pipe. After extraction, of the air from the shroud, the opening shall be completely sealed.

4.7.2 Securing instruments or panels inside packing case

1) The instrument or panel shall be completely secured by wooden battens faced with suitable rubber or other shock absorbing material.

2) Wood wool and other similar materials shall not be used.

3) Hay and straw shall not be used.

4.7.3 Sealing of packing case

After nailing, joints in the case shall be sealed with suitable sealing compound and the outside bound with steel strapping if required.

4.8 Packing List

4.8.1 Packing lists shall be prepared on buyer's standard forms. The necessary number of forms will be made available to Seller, who shall advise of the quantity required.

4.8.2 Packing list forms shall be filled out in the English Language. Buyer shall supply seller with a specimen packing list showing how it shall be filled out.

At the same seller will be informed of the package numbers required for marking the packages.

4.8.3 One column of the packing list is to be filled out with buyer's item numbers. These item numbers are to be taken from the order form. Special attention must be paid to the order form that the item numbers are correctly attributed to the goods to which they belong. If any question should arise in this respect, seller shall contact the buyer's representative.

4.8.4 Special care shall be taken that all accessory parts, loose or detachable, belonging to the main item under dispatch, shall also individually be listed in the packing list. In the event these accessory parts are not listed in the packing list, they shall be considered by buyer as not delivered.

4.8.5 Two copies of the packing list in a water-proof plastic envelope shall securely be put under a galvanized steel sheet on the outer surface of the package. One copy shall be put inside the case.

4.8.6 The final packing list in 3-fold must be available in buyer representative's office 14 (Fourteen) working days prior to dispatch of the goods from the manufacturer's representative Seller's premises.

4.9 Liability and Guarantee

4.9.1 The packing contractor shall be fully responsible for proper, sufficient and adequate packing, completeness of the contents and shall guarantee the packing for a storage time of Twelve (12) months, and the correct preparation of the packing list.

4.9.2 All cost whatever deriving from inadequate or insufficient packing or discrepancies between the contents and the packing list shall be fully charged to the packing contractor.

5. PAPER AND THERMOPLASTIC SACKS

5.1 Definition

A container made essentially from one or more flattened tubular piles of paper, or thermoplastic flexible film closed at least at one end, possibly in combination with other flexible material to provide the properties required for filling at the chain of distribution of goods.

5.2 Type of Paper and Thermoplastic Sacks

Various designs of sack containing a combination of pasted and sewn ends can be produced. The types are as follows:

a) Flat sacks: From a flat tube

b) Gusseted sacks: From a gusseted tube

c) Sewn sacks: Closed at one or both ends by sewn.

d) Pasted sacks: Closed at one or both ends by pasting.

e) Open mouth sacks: Tube closed at one end only.

For description of parts and construction details of each type of sacks and their variations, reference should be made to ISO-6590/1,2.

5.3 Description and Method of Measurement

5.3.1 Sacks are described by an indication of their type (Open-mouth sewn flat sack, valved sewn flat sack, etc.) followed by the dimensions as indicated in section 4.1 and 4.2 of ISO-6591/1.

5.3.2 The dimension of the sacks shall be expressed in millimeters to the nearest 1 mm. Unless otherwise stated, all dimensions are external.

5.3.3 For measurement of dimensions of sacks, each sack shall be placed on flat horizontal surface, and smoothed out any wrinkles.

The dimensions at the measuring points shall be measured for the type of sack concerned, to an accuracy of 1 mm. A ruler or instrument graduated in millimeters, and capable of measuring dimensions of the sack, shall be used.

5.4 Drop Testing of Paper Sacks

5.4.1 The filled sack shall be raised above a rigid plane surface and released to strike this surface after a free fall. The atmospheric conditions, the height of drop and the position of the package shall be set in advance, according to ISO 7965/1.

5.4.2 The various drop test methods as described in ISO 7965/1 shall be carried out in the same atmospheric conditions as used for conditioning of empty sacks.

5.5 Dropping Procedure

5.5.1 The sack shall be placed under test centrally on the platform which is then raised to a height that is within ±2% of the predetermined drop height as defined by the distance between the lowest point of the sack at the time of release and the nearest point of the impact surface.

5.5.2 The sack shall be released from its predetermined position within the following tolerances:

- For drops on any side or edge: there shall be no variation of more than 2° between the impacting surface of the sack, and the horizontal surface;

- For edge or corner drops: the angle between a prescribed surface of the sack and the horizontal surface shall be 45 ±5°;

- The velocity at impact shall be within ±1% of that which would be achieved by a free fall.

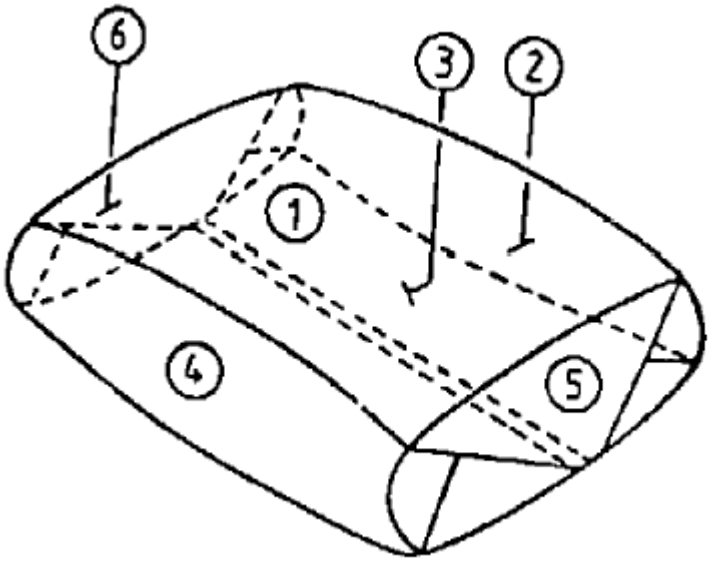
5.6 Identification of Surfaces of Filled Sacks for Testing

5.6.1 The sack shall be placed on the back side (3) (i.e., the side containing the longitudinal seam) downwards, and the top (6) (i.e., the filling end) of the sack positioned away from the observer, as Fig. 2 the different surfaces are identified as:

Surface 1: Face side

Surface 2: Right side

Surface 3: Back side (longitudinal seam)
Surface 4: Left side
Surface 5: Bottom
Surface 6: Top (filling end)



SURFACE IDENTIFICATION
Fig. 2

5.7 Dropping Types of Sacks

5.7.1 The following types of dropping shall be carried out and the sacks shall be dropped successively on the various surfaces of the filled sacks (Fig. 2).

- Flat dropping: Surfaces (1), (3)
- Side dropping: Surfaces (2), (4)
- Butt dropping: Surface (5), (6)
- Edge and corner dropping: Any corner or any edge.

5.7.2 For dropping height, number of drops to breakage and the type of drops (i.e. flat, side or butt drops) shall be calculated as per ISO-7965/1.

5.7.3 The test report shall include full details of size, construction and type of all sacks tested together with information on type and weight of contents and type of closure.

All results shall be given and shall include details of position and type of failures.

5.7.4 Typical examples of apparatus for drop testing are shown in the following Figures 3 and 4.

6. MARKING

6.1 Marking of Packages

6.1.1 Minimum markings shall include the name and address of manufacturer and purchaser and any applicable precautionary markings. The indent number, port of destination and project number shall also be marked on the packages.

6.1.2 Marking shall be adequate for identifying a particular equipment in the event that a recall or inspection becomes necessary.

6.1.3 Identification should remain intact from the time of initial dispatch at work to the final destination.

6.1.4 The marking and labels of products should be legible, durable and in accordance to specification.

6.1.5 All packages are to be clearly stenciled on three sides with black, indelible and sea waterproof paint. Whenever possible, the stenciled character should be 80 mm height.

In case the surface of a package are too small to permit stenciling, sheet metal tags are to be embossed with the above marking and to be securely fixed on two opposite upright sides of package.

6.1.6 If necessary, packages are to be additionally marked with cautionary symbols on two opposite ends. These symbols are to be in accordance with the specification, table1.

6.1.7 Packages which may be stored in the open, but under a tarpaulin shall be marked with a red "single roof" symbol.

6.1.8 Packages which are to be stored in closed and dry places must be marked with a red "double roof" symbol.

6.1.9 The gross weight shall be determined by the Seller who is responsible for the packing.

6.1.10 Spare-parts for two years operation shall be marked:

"Spare Parts for Two Year Operation"

6.1.11 Commissioning spare parts shall be marked:

"Commissioning Spare Parts"

6.1.12 Equipment items, exceeding a gross weight of 1000 kg each shall be marked with the international Centre of Gravity symbol as per Table 1.

6.2 Marking of Packing Cases

6.2.1 Cases which are for carriage by sea shall be marked "Hold Storage".

6.2.2 All cases which are carried by sea shall be marked to indicate the correct way up and bear the marking "Hold Storage" plus the general marking as mentioned in 6.3.

6.2.3 Cases and crates with a gross weight up to 1000 kg shall be provided with bottom cleats of min. 40 mm thickness to ensure clearance for handling by fork-lift.

Cases and crates exceeding a gross weight of 1000 kg shall be marked with numbers and sizes and weights of packages and the marking symbols indicating how and where package can be lifted.

6.3 Pictorial Marking for Handling of Goods

6.3.1 This Standard specifies a set of symbols, conventionally used for marking of transport packages to convey handling instructions.

6.3.2 Symbols may appear on a label or should preferably be stenciled directly on the package. It is recommended that the symbols be painted, printed or otherwise reproduced as specified in the followings.

6.3.3 The overall size of the symbols shall be 100, 150 or 200 mm, for normal purposes.

6.4 Number, Location, and Position of the Symbols

6.4.1 The number of identical symbols to be affixed to any package depends on its size and shape, for symbols numbering 1, 3, 6 and 8 (see the Table 1), the following rules are to be applied.

- Symbol 1 "fragile" shall be shown near the left-hand upper corner on all four upright sides of the packages (see example of display No. 1 in the table 1).

- Symbol 3 "this way up" shall appear in the same position as required for symbol 1 [see example of display a) under No. 3 in the table]. Where both symbols are required, symbol 3 shall appear nearer to the corner [see example of display b) under No. 3 in the table 1].

- Symbol 6 "sling here" shall be placed on at least two opposite faces (see example of display No. 6 in the table 1).

- Symbol 8 "centre of gravity" shall be placed on all six sides relating to the real position of the centre of gravity (see example of display No. 8 in the table 1).

6.4.2 When transport packages are formed into a unit load, symbols should be located so as to ensure they are visible [(see example of display c) under No. 3 in the table 1].

6.4.3 Particular attention shall be paid to the correct application of the marks, as faulty application may lead to misinterpretation.

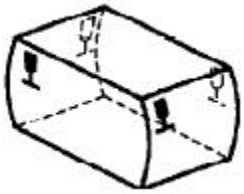
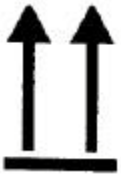
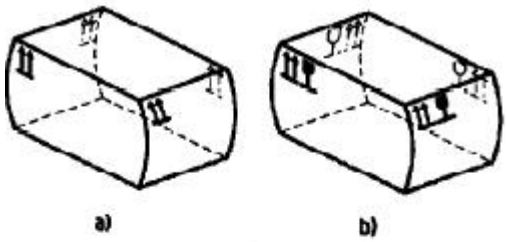
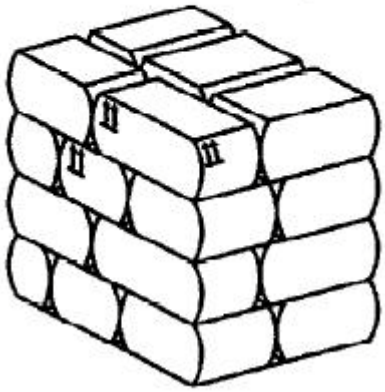
Symbols 6 and 8 shall be applied in their correct respective positions and in appropriate respective places in order to convey their meanings clearly and fully.

6.5 Handling Instructions

Handling instructions shall be indicated on transport packages by using the corresponding symbols given in the table 1.

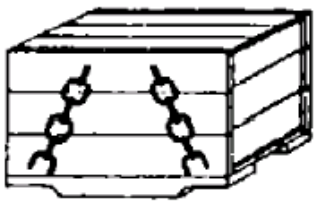
If necessary or required the cautionary basic text may appear below the symbol in the national language of the country of origin and/or destination. However, as far as possible, instructions should be written in English.

TABLE 1 - SYMBOLS AND THEIR FUNCTIONS

NO.	IMPLICATION OF SYMBOL	SYMBOL	FUNCTION
1	FRAGILE HANDLE WITH CARE	 Example of display: 	To indicate: a) That the contents of the transport package are fragile; b) That it has to be handled with care.
2	USE NO HOOKS		To indicate that hooks are Prohibited for lifting the transport package.
3	THIS WAY UP	 Example of display:  	To indicate the correct upright position of the transport package.

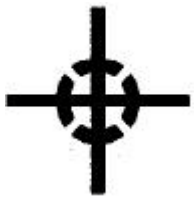
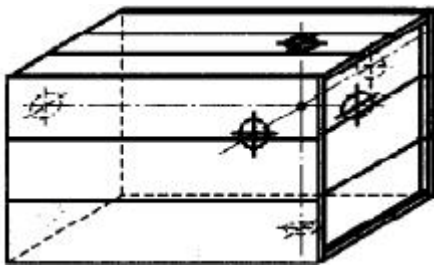
(to be continued)

TABLE 1 (continued)

NO.	IMPLICATION OF SYMBOL	SYMBOL	FUNCTION
4	KEEP AWAY FROM HEAT		To indicate that the transport package shall be kept away from heat.
5	PROTEC FROM HEAT AND RADIOACTIVE SOURCES		To indicate that the contents of the package may deteriorate or be rendered totally unusable by heat or penetrating radiation.
6	SLING HERE	 Example of display: 	To indicate where the slings shall be placed for lifting the transport Package.
7	KEEP DRY		To indicate that the transport package shall be kept in a dry environment.

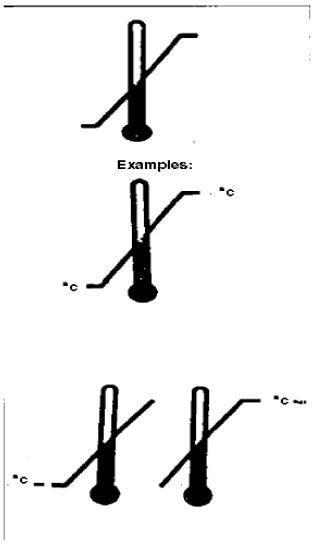
(to be continued)

TABLE 1 (continued)

NO.	IMPLICATION OF SYMBOL	SYMBOL	FUNCTION
8	CENTER OF GRAVITY	 Example of display: 	To indicate the center of Gravity of the transport package Note: example for display of symbol 8 to indicate the center of gravity of a transport package; in this case not identical with the center of gravity assumed by the geometrical shape of package but situated at the intersection points of the users of the three symbols.
9	DO NOT ROLL		To indicate that the transport package shall not be rolled.
10	NO HAND TRAUCK HERE		To indicate where band Trucks or dollies shall no t be Placed where handling the Transport package.
11	STACKING LIMITATION		To indicate the limited Stacking possibilities of the Transport package.
12	CLAMP HERE		To indicate where clamps Shall be placed for handling the Transport package.

(to be continued)

TABLE 1 (continued)

NO.	IMPLICATION OF SYMBOL	SYMBOL	FUNCTIONS
13	TEPMPRATURE LIMITATIONS		To indicate the temperature Limitation within which the Transport package shall be and handled.
14	USE NO FORKS		To indicate: Transport package should not be handled by forklift trucks.
15	DO NOT CLAMP AS INDICATED		To indicate: Transport package should not be handled by the clamps on the sides indicated.
16	STACKING LIMIT BY NUMBER		To indicate: Maximum number of identical packages which may be stacked on one another, where “n” is the limiting number.
17	DO NOT STACK		To indicate: Stacking of the transport package is not allowed and no load should be placed on the transport package.

EXAMPLES FOR SYMBOLS WITH BARS FOR APPLICATION BY STANCILLING

7. TESTING

7.1 General

For compilation of performance test schedules for complete field transport package within any distribution system whether transported by road, rail, sea or air or by combination of these modes of transport, the following shall be considered.

7.1.1 Distribution system exist in great variety and complexity, they may be considered to be combinations of a numbers of simple elements. These simple elements are:

a) Transport of packages from one point to another, with or without change of mode of transport. Transport shall be considered to include the loading and unloading operations;

b) Storage.

7.1.2 During distribution, a transport package is subjected to a number of hazards which may cause damage.

These hazards are the result of number of factors, the most important of which are:

a) The characteristics of the distribution system, i.e. the carrier, the mode of transport, the geographic area;

b) The design of the package, i.e. its dimensions, mass and shape, and integral handling aids (for example handles).

7.1.3 Packaging used shall successfully pass the test levels of following test methods.

7.2 COMPILATIONS OF TEST SCHEDULES

7.2.1 Case 1: Distribution system well defined and intensity of hazards determined

In this case, the performance test schedule shall be written using the experimental test data acquired in accordance with ISO 4178. Applicable tests shall be chosen depending on the distribution system. Appropriate test sequence and test intensity shall be chosen.

The steps of the procedure are as follows:

a) Identify the simple elements in the distribution system;
b) Decide what hazards these elements involve;
c) Decide which tests are necessary to represent or simulate these hazards (including, for example, decisions concerning appropriate conditioning, package attitude, interposed hazards, duration of vibration and number of impacts);
d) Decide the test sequence;
e) Decide what are the test intensities associated with the particular package and distribution system combination concerned.

7.2.2 Case 2: Distribution system undefined and intensity of hazards unknown

Very often, the package manufacturer does not have a clear knowledge of the distribution system, and the intensities of the hazards are unknown.

In this case, this International Standard provides *recommended* performance test schedules. Choice criteria are the mass and the destination of the package.

8. CASES 1

8.1 Preferred Test Sequence

A typical test sequence is:

a) Conditioning for testing;
b) Climatic treatment;
c) Vibration;
d) Stacking;
e) Impacts.

Other tests may be interposed in the test schedule as appropriate. When circumstances require a different order, this should be reported.

8.2 Preferred Test Parameters

To allow repeatability and reproducibility, test levels and parameters should be chosen among those proposed in this paragraph and should comply with the included recommendations.

8.3 Atmospheric Conditioning (Performed in accordance with ISO 2233)

TABLE 2 - PREFERRED TEST PARAMETERS

Temperature		Relative humidity
°C	°K	%
-55	218	—
-35	238	—
-18	255	—
+5	278	85
+20	293	65
+20	293	90
+23	296	50
+27	300	65
+30	303	65
+30	303	90
+35	308	65
+35	308	90
+40	313	65
+40	313	90
+55	328	30

8.4 Low Pressure Tests (Performed in accordance with ISO 2873)

TABLE 3 - PREFERRED TEST PRESSURES

Pressure hPa	Corresponding altitude m
800	about 2 000 (a pass through the Alps)
650	about 3 500 (aircraft)
550	about 5 000 (the city of La Paz, Bolivia)
360	about 8 000 (unpressurized aircraft)
190	about 12 000 (unpressurized aircraft)

8.5 Horizontal Impact (Performed in accordance with ISO 2244)

The test can be defined using an impact velocity chosen from Table 4.

TABLE 4 - PREFERRED IMPACT TEST VELOCITIES

Preferred test velocities m/s
1.0
1.3
1.5
1.8
2.2
2.7
3.3
4.0
5.0
7.0

These shocks can also be defined in terms of wave shape, peak acceleration and duration. This method of defining shocks is only possible where a test lab has a sophisticated acquisition system and suitable accelerometers. Recording these data improves the quality of the test. The severity is well determined and the reproducibility is assured.

In this case, test parameters are given in Tables 5 to 7.

TABLE 5 - SHOCK DEFINITIONS: PREFERRED WAVE SHAPES

Preferred wave shapes
Half sine
Sawtooth
Trapezium

TABLE 6 - SHOCK DEFINITIONS: PREFERRED DURATION

Preferred duration ms
6
11
20
30
40
50
100

TABLE 7 - SHOCK DEFINITIONS: PREFERRED PEAK ACCELERATION

Preferred peak acceleration m/s^2
50
100
150
200
300
400
500
600
800
1 000

The horizontal impact test is defined by choosing an impact velocity or duration and peak acceleration from Table 4, Table 6 or Table 7 for the type of waveform desired (see Table 5).

8.6 Vertical Impact (Performed in accordance with ISO 2248)

The fall height shall be chosen from Table 8.

TABLE 8 - PREFERRED TEST HEIGHTS

Preferred test heights mm
50
100
150
200
300
400
500
600
800
1 000
1 200
1 500
1 800
2 100

These shocks can also be defined in terms of wave shape, duration and peak acceleration. This method of defining shocks is only possible where a test lab has a sophisticated acquisition system and suitable accelerometers. Recording these data improves the quality of the test. The severity is well determined and the reproducibility is assured.

In this case, test parameters shall be from Table 5, Table 9 and Table 10.

TABLE 9 - SHOCK DEFINITIONS: PREFERRED DURATIONS

Preferred durations ms
6
11
20
30
40
50
70
100

TABLE 10 - SHOCK DEFINITIONS: PREFERRED PEAK ACCELERATIONS

Preferred peak accelerations m/s^2
50
100
150
200
300
400
500
600
800
1 000
1 200
1 500

The vertical impact test is defined by choosing a fall height (i.e. impact velocity) or duration and peak acceleration from Tables 8 to 10, for the type of waveform desired (see Table 5).

8.7 Random Vibration Tests (Performed in accordance with ISO 13355)

8.7.1 Mounting of package on the test vibration table

If the method of fastening the packaged product to a transportation vehicle is known, that method shall, where practicable, be replicated.

If the packaged product is capable of being fastened to a transportation vehicle in a number of known ways then, from engineering knowledge of the dynamic behaviour of the product, the worst case shall be selected so that faults are most likely to be revealed. If this is not apparent, a selection of worst cases shall be made from amongst the various possibilities.

Where the packaged product is fastened to a transportation vehicle but the method varies in an unpredictable way, it shall be mechanically connected to the test apparatus as detailed in the relevant specification. This may be in a manner which only engineering judgement can decide and shall be based upon faults considered most likely to be revealed.

If the packaged product is intended, or is likely, to be carried in a transportation vehicle without being fastened down, or with some degree of freedom, that method shall, where practicable, be replicated.

If the packaged product is intended to be fastened to a transportation vehicle but it is considered likely that, in practice, it might not be fastened down the relevant specification may require the test without clamping to the test table. This may be in addition to the appropriate test where the product is fastened down.

8.7.2 Test power spectral densities (PSD)

When performing the random vibration test, use the spectrum given in ISO 13355:2001, Annex A. If another spectrum is desired, the criteria to determine test power spectral densities (PSD) shall be as follows.

When recordings relevant to the distribution system are available, the test spectrum derived from the recordings shall not have a number of break points exceeding 15.

The preferred test parameters are given in Tables 12 to 15.

TABLE 12 - PREFERRED RANDOM TEST PARAMETERS: TEST FREQUENCY RANGES

Preferred test frequency ranges
3 to 200
5 to 300
5 to 500

TABLE 13 - PREFERRED RANDOM TEST PARAMETERS: ROOT MEAN SQUARE ACCELERATIONS

Preferred root mean square accelerations m/s^2
3
5
7.5
10
12.5
15

TABLE 14 - PREFERRED RANDOM TEST PARAMETERS: TEST DURATIONS

Preferred test durations min
10
20
30
40
60
90
120

TABLE 15 - PREFERRED RANDOM TEST PARAMETERS: STACK HEIGHT FOR SUPERIMPOSED LOADS

Height of the stack m
1.50
1.80
2.50
3.50

8.8 Stacking

8.8.1 Stacking (Performed in accordance with ISO 2234)

TABLE 16 - STACKS: PREFERRED HEIGHTS OF STACK

Preferred heights of stack m
1.50
2.00
2.50
3.50
5.00
7.00

TABLE 17 - STACKS: DURATION UNDER LOAD

Duration under load
1 day
2 days
3 days
1 week
2 weeks
3 weeks
4 weeks

8.8.2 Stacking test using a compression tester (Performed in accordance with ISO 12048)

TABLE 18 - PREFERRED LOADS

Preferred loads N
250
500
750
1 000
1 500
2 000
2 500
3 000
multiples of 1 000

8.9 Test Simulating Different Hazards

In some cases the distribution system can include different hazards described in the relevant International Standards, such as the repetitive shocks test (ISO 2247), the toppling test (ISO 8768), the rolling test (ISO 2876), the stability test (ISO 10531) and the water spray test (ISO 2875).

In this case, a test representing these conditions should be added to the test schedules to fully reproduce the environmental conditions.

In case a compression of the sides is possible (package that can be clamped), a compression test on the sides interested by the clamp is necessary.

9. CASE 2

For the reasons given in 7.2.2, this clause provides recommended performance test schedules.

The test schedules may be changed as agreed by the involved stakeholders. In this case, the change and the reason should be added to the test report. Drop heights for these test schedules are given in Table 20.

Choice criteria are the mass and the destination of the package.

The following three classes of packages exist, depending on the mass of the package.

a) Gross mass ≤ 30 kg (see Table 19).

b) Gross mass > 30 kg and ≤ 100 kg (see Table 21).

c) Gross mass > 100 kg (see Table 22).

The following three classes of severities exist, depending on the destination of the package.

- Level 1: Very long range transportations (> 2500 km), or expected poor conditions of transport infrastructures.
- Level 2: Long range national transportations or international transportations, with adequate roads and rails, in a temperate climate.
- Level 3: Short range national transportations (< 200 km), without particular hazards.

TABLE 19 - TEST SCHEDULES AND INTENSITIES FOR PACKAGES OF MASS LESS THAN 30 kg

			Intensity			Notes
Basic sequence	**Test type**	**Reference standard**	**lowest 3**	**2**	**highest 1**	
Conditioning	Atmospheric	ISO 2233	23°C at 50% relative humidity			If other conditions are desired choose atmospheric conditioning from Table 2
Shock	Drop tests	ISO 2248	See Table 10			Choose drop height depending upon package mass. Perform drops on three faces: 3, 2 and 5, in accordance with ISO 2206, four edges and four corners surrounding the base
Compression	Static load	ISO 12048	Maximum load	Maximum load ×2	Maximum load ×3	Maximum load [package mass × (number of stacked elements − 1)] Apply load and release
Transport vibration	Vibration	Random PSD ISO 13355	Nominal PSD ISO 13355 15 min	Nominal PSD ISO 13355 90 min	Nominal PSD ISO 13355 180 min	PREFERRED TEST Perform the test along the vertical axis If the vertical axis is undefined and the orientation of the package during transportation is unpredictable, perform the test along three axis (the test time along each axis is 5 min, 30 min or 60 min)
		ISO 8318 Sinusoidal	7 m/s^2 15 min	7 m/s^2 90 min	7 m/s^2 180 min	It is recommended to conduct the test with variable frequency
Transport vibration	Repetitive shock	Random PSD ISO 13355	Nominal PSD ISO 13355 10 min	Nominal PSD ISO 13355 20 min	Nominal PSD ISO 13355 30 min	Use random PSD with no clamping of units to table surface
Compression	Static load	ISO 12048	Apply maximum load for 24 h			Impose maximum expected load [package mass × (number of stacked elements − 1)]
Shock	Drop tests	ISO 2248	See Table 10			Choose drop height depending upon package mass. Perform drops on three faces: 3, 2 and 5 in accordance with ISO 2206, four edges and four corners surrounding the base

TABLE 20 - DROP HEIGHT

	Test intensity (height in cm)		
Mass (kg)	**3**	**2**	**1**
0 to 10	60	80	100
10.1 to 20	45	60	80
20.1 to 30	30	45	60

TABLE 21 - TEST SCHEDULES AND INTENSITIES FOR PACKAGES OF GROSS MASS > 30 kg AND ≤ 100 kg

			Intensity			Notes
Basic sequence	**Test type**	**Reference standard**	**lowest 3**	**2**	**highest 1**	
Conditioning	Atmospheric	ISO 2233	23°C at 50% relative humidity			If other conditions are desired choose atmospheric conditioning from Table 2
Shock	Horizontal impact test	ISO 2244	1 m/s	1,5 m/s	2 m/s	Apply impact once on each side face
Compression	Static load	ISO 12048	Maximum load	Maximum load × 2	Maximum load ×3	Maximum load [package mass × (number of stacked elements − 1)] Apply load and release
Transport vibration	Vibration	Random PSD ISO 13355	Nominal PSD ISO 13355 15 min	Nominal PSD ISO 13355 90 min	Nominal PSD ISO 13355 180 min	PREFERRED TEST Perform the test along the vertical axis. If the vertical axis is undefined and the orientation of the package during transportation unpredictable, perform the test along three axis (the test time along each axis is 5 min, 30 min
		ISO 8318 Sinusoidal	7 m/s^2 15 min	7 m/s^2 90 min	7 m/s^2 180 min	It is recommended to conduct the test with variable frequency
Transport vibration	Repetitive shock	Random PSD ISO 13355	Nominal PSD ISO 13355 10 min	Nominal PSD ISO 13355 20 min	Nominal PSD ISO 13355 30 min	Use random PSD with no clamping of units to table surface
Compression	Static load	ISO 12048	Apply maximum load for 24 h			Impose maximum expected load [package mass × (number of stacked elements − 1)]
Shock	For package ≤70 Kg	ISO 2248 Vertical impact	15 cm	30 cm	40 cm	Perform one drop on the base, one drop on each edge of the base and one drop on each corner of the base
Shock	Drop tests for package > 70 Kg	EN 14149 Rotational drop	10 cm	20 cm	30 cm	Perform drop on two adjacent edges of the base of the package from the prescribed height

TABLE 22 - TEST SCHEDULES AND INTENSITIES FOR PACKAGES OF GROSS MASS > 100 kg

			Intensity			Notes
Basic sequence	**Test type**	**Reference standard**	**lowest 3**	**2**	**highest 1**	
Conditioning	Atmospheric	ISO 2233	23 °C at 50 % Relative Humidity			If other conditions are desired choose atmospheric conditioning from Table 2
Shock	Horizontal impact test	ISO 2244	1 m/s	1,5 m/s	2 m/s	Apply impact once on each side face
Compression	Static load	ISO 12048	Maximum load	Maximum load ×2	Maximum load ×3	Maximum load [package mass × (number of stacked elements − 1)] Apply load and release
Transport vibration	Vibration	Random PSD ISO 13355	Nominal PSD ISO 13355 15 min	Nominal PSD ISO 13355 90 min	Nominal PSD ISO 13355 180 min	PREFERRED TEST Perform test in vertical direction only
		ISO 8318 sinusoidal	7 m/s^2 15 min	7 m/s^2 90 min	7 m/s^2 180 min	It is recommended to conduct the test with variable frequency
Transport vibration	Repetitive shock	Random PSD ISO 13355	Nominal PSD ISO 13355 10 min	Nominal PSD ISO 13355 20 min	Nominal PSD ISO 13355 30 min	Use random PSD with no clamping of units to table surface
Compression	Static load	ISO 12048	Apply maximum load for 24 h			Impose maximum expected load [package mass ×(number of stacked elements − 1)] In case a compression of the sides is possible (package that can be clamped), a compression test on the sides affected by the clamp is necessary
Shock	Drop tests	ISO 14149 Rotational drop	10 cm	20 cm	30 cm	Perform drop on two adjacent edges of the base of the package from the prescribed height

10. SHIPPING

Preparation for shipment shall be in accordance with manufacturer's standards unless otherwise noted on the request for Quotations and/or purchase order.

10.1 The manufacturer shall be solely responsible for adequacy of the preparation for shipment provisions employed in respect of material and application, to provide materials to their destination in ex-works condition by commercial carrier systems.

10.2 The preparation shall be suitable for at least one years of outdoor storage from the time of shipment in a manner requiring no disassembly prior to operation.

10.3 All materials shipped in separate crates shall be suitably identified with securely affixed corrosion resistant metal tags indicating the items and serial number of the equipment for which it is intended.

10.4 The greatest care must be taken to ensure that shipping description of packages for custom release are accompanied with the shipment.

10.5 Unit packages and intermediate packages not meeting the requirements for a shipping containers, shall be packed in shipping containers.

10.6 Items requiring protection from physical and mechanical damage or which are fragile in nature shall be protected by wrapping, cushioning of other means to prevent shock and vibration during handling and shipment.

10.7 The shipping container (including any necessary blocking, bracing, cushioning, or waterproofing) shall comply with the regulations of the carrier used and shall provide safe delivery to the destination at the lowest tariff cost. It shall be capable of multiple handling and storage under favorable conditions for a minimum of two years.

10.8 The requirements of above items shall not relieve the supplier/contractor of any of his responsibilities and his obligations for delivery of equipment in a sound undamaged and operable conditions at site.