BASIC OPERATION FOR CONTAINER SHIPS

I. INTRODUCTION

As most of international trade (including in terms of value) is carried by sea, the maritime traffic should give the most significant contribution to the diminishing transport cost. At present less ships do more work, thanks to the increase of vessel's tonnage and speed, or to a quicker turnaround guaranteeing a higher productivity and still ships have become bigger and bigger.

Containerization is a system of transport whose scope and potential is of all determined by the volume of trade. Trade has always been linked with transport. From the start some five thousand years ago-when sledges carried tools made of flint-till today, all transactions have involved transport. The economic objective of trade has at all times been efficiency: trade arises when it is cheaper to buy from others than to produce oneself, notwithstanding the cost of transportation to be added to the price. As long as this addition is less than the difference in production costs, trade takes place and transport goes.

Through-transport envisages a direct and efficient flow of goods from the exporter to the importing customer, from the point of origin to the final point of sale, with a minimum of interruption and delay, whether on the part of shipper, agent, haulier, custom's officials or any other source. The ideal is an unbroken door-to-door service. This is specially achieved by Unitization, the activity by means of a magnitude of small packages is formed into one large pack, is indispensable here. Unit loads so created can be obtained immediately following the production line: an example would be when tins containing paints are put together on pallet in order to facilitate internal and subsequent transport.

When applied to the preparation of general cargo, unitization combines the various bits and pieces of different shapes, sizes and weights into large units, more or less standardized in dimensions and loads. These uniform lots can then by the fact of their standardization be handled mechanically wherever necessary in the chain of transport, eliminating repetitive expensive manual labor, as containers can bring the packed product from the production line to the consumer's mouth, so going further, from gate-to-gate service.

Containers are used to permit the storage and transport of goods, to protect and preserve them and to ensure their efficient distribution. The packaging industry shows here in miniature what has to be achieved by the big containers, which are said to revolutionize the world of transport. We must separate the definition of these freight containers from the ordinary meaning of the word.

In commercial publicity, containers are physical capsules made of steel, aluminum, plastic or wood – to hold a large number of individual units of shipment and in a publication of the Organization for Economic Co-operation and Development; they are simply described as boxes usually of metal, with doors lifting points. What one description misses, the other one has. The UNO Economic Commission defined a container with characteristics, which as formulated by the Technical Committee of the ISO (International Standard Organization).

A freight container is an article of transport equipment:

a) Of a permanent character and accordingly strong enough to be suitable for repeated use.
b) Specially designed to facilitate the carriage of goods, by one or more modes of transport, without intermediate reloading.
c) Fitted with devices permitting its ready handling, particularly its transfer from one mode of transport to another.
d) So designed as to be easy to fill and empty
e) Having an internal volume of 1 cu. m. (35.3 cu. ft.) or more

The term freight container includes neither vehicles nor conventional packing.

The technology of the twentieth century is indispensable for the existence of containerization. The full advantages of modern science via mechanization and automation – both replacements of certain activities of the human muscles and brains – can solely be obtained when cargo is moved in standardized units by standardized equipment right through the whole chain of transport. Everywhere in the transportation industry, containerization has an impact on everyone and everything. It requires a change of mentality as well as equipment. All participants are involved and but are all aspects of transport techniques, even outside transportation but still within the distribution process. It abolished conventional practices and creates new facilities, for example rendering the quotation of delivered sales prices easier. By shortening transport time by improving reliability because of the regular arrival of the goods, stocks may be reduced.

As early as 1970, containers have become a major means of transportation, bringing the world closer together.

Since then, due to the fast development in technology, many shipping companies has worked to develop advanced techniques for container transportation in the areas of both hardware and software concentrating on transporting customer's cargoes faster, economically and safer.

Today, huge containerships are built that can carry as much as 19,000 TEUs and ports are especially designed to accommodate this large volume of shipments.

II. CONTAINER TYPES AND SERVICES

a) Definitions and Dimensions

While various authorities have slightly different ideas on what constitutes a freight container or transport container, the International Standards Organization (ISO) define a freight container as:

An article of transport equipment.
(a) of a permanent character and accordingly strong enough to be suitable for repealed use;
(b) specially design to facilitate the carriage of goods, by one or more modes of transport, without intermediate reloading;
(c) fitted with devices permitting its ready handling, particularly from one mode of transport to another;
(d) so designed as to be easy to fill and empty;
(e) having an internal volume of $1m^3$ (35.8 cu. Ft) or more.

The term *freight container* includes neither vehicles nor conventional packing. (From ISO Recommendations R668 Revised 1973)

The International Standards Organization goes on to recommend external dimensions together with gross weights. The figures below are also taken from R668.

TABLE 1- Nominal dimensions of series 1 freight containers, intended for Intercontinental traffic

Freight Container Designation	External Height		Series 1 External Width		External Nominal Length		Maximum Gross Weight	
	mm	ft. ins.	mm	Ft	mm	Ft. ins.	Kgs	lbs.
1 A	2438	8 00	2438	8	12000	40 00	30480	67200
1 AA	2591	8 6	2438	8	12000	40 00	30480	67200
1 B	2438	8 00	2438	8	9000	30 00	25400	56000
1 BB	2591	8 6	2438	8	9000	30 00	25400	56000
1 C	2438	8 00	2438	8	6000	20 00	20320	44800
1CC	2591	8 6	2438	8	6000	20 00	20320	44800
1 D	2438	8 00	2438	8	3000	10 00	10160	22400
1 E	2438	8 00	2438	8	2000	6 8	7110	15700
1 F	2438	8 00	2438	8	1500	5 00	5080	11200

The figures in the table below are taken from the ISO Recommendation 1891-1975 (E) which gives *the minimum* internal dimensions for containers listed under Part I (General Cargo Containers).

N.B. The figures in the column under Minimum Capacity do not appear in R1894 but are a product of the internal dimensions.

TABLE 2 – Minimum internal dimensions

Freight Container Designation	Minimum Height	Minimum Width		Minimum Length		Minimum Capacity	
1 A		mm	Ins.	mm 11998	ft. ins. 39 04 3/8	Cum. 61.4	Cu. ft. 2167.5
1 AA	Nominal			11998	39 4 3/8	65.7	2317.9
1 B	Container			8931	29 03 5/8	45.7	1613.5
1 BB	External			8931	29 03 5/8	48.9	1725.4
1 C	Height	2330	91 ¾	5867	19 03	30.0	1060.1
1 CC	Minus			5867	19 03	32.1	1135.1

1 D	241 mm			2802	9 02 5/16	14.3	506.2
1 E	(9 ½ ins.)			1780	5 10 1/16	9.1	321.6
1 F				1273	4 02 1/8	6.5	230.0

The above table and notes concerning Container Types on the following pages, refer to ISO Series 1 containers. Other ISO series (e.g. small containers rated at either 2½ or 5 tons), and containers with ISO recommended external dimensions but not to built to ISO recommendations in other respects (e.g. a Dry Freight containers with side doors but no end doors are not described. However most of the stowage recommendations appearing elsewhere in this book will still apply.

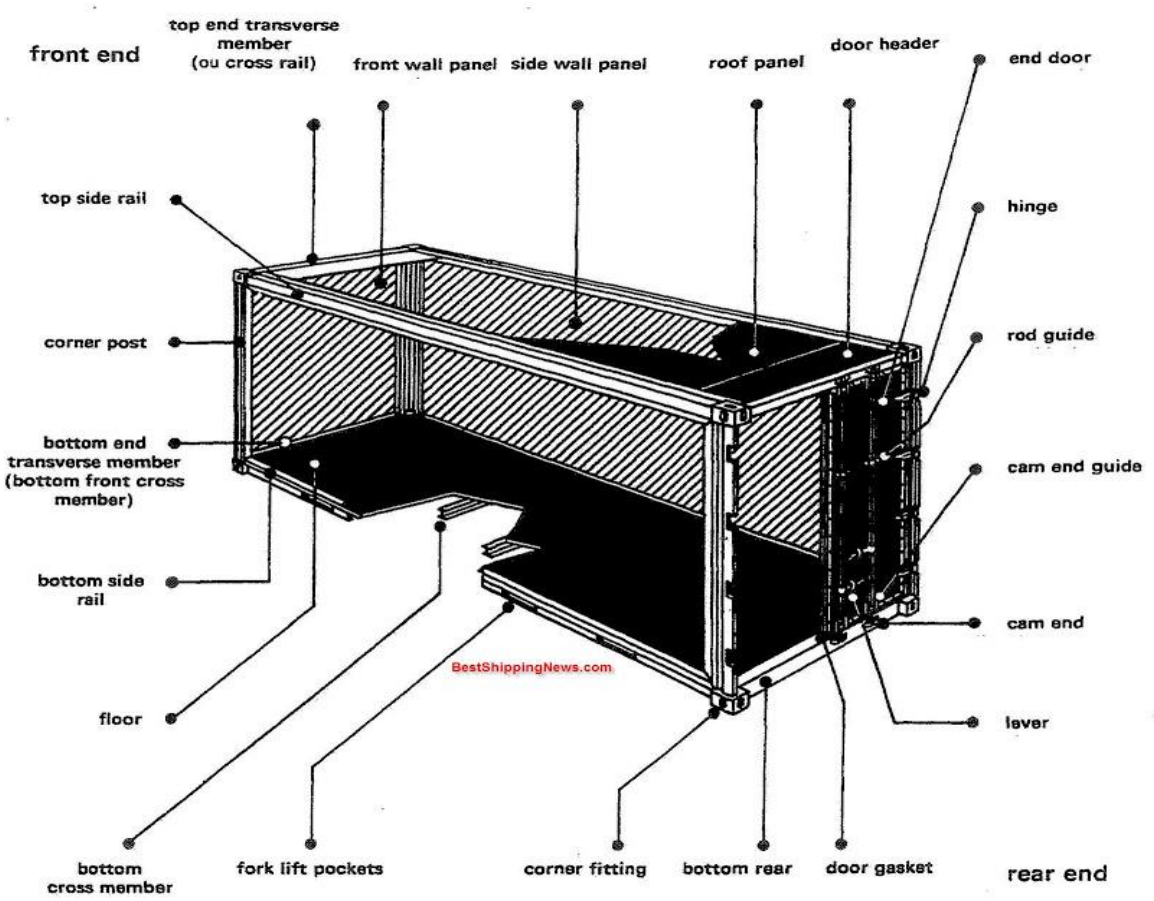
b) The Choice of Container

To achieve the most efficient use of container, whether during packing, unpacking or as protection for the cargo during transit, great care must be taken in selecting the most suitable container. The physical and chemical properties of the cargo have to be taken into account and also the type of packaging. When selecting the container, the following points should be considered:

1. Type of cargo -- physical properties: chemical properties: does it require refrigeration, ventilation etc. See 'Cargo' (I) and (II)
2. Size of cargo – does it require special access (e.g. an open top container). Is it higher or wider than the ISO minimum (see "Oversized Overweight Cargo").
3. Weight of cargo – this must be considered in conjunction with the Tare weight of the container so that regulations governing the gross weight are not exceeded.
4. Density of cargo – high density cargo may be more suitably carried in a half height container with less loss of space. (High density may require specially strengthened floors or bearers – see "Cargo (I) – Heavy Weights")
5. Packing and unpacking facilities – whether the available mechanical handling equipment can cope.
6. Fixing points – whether they are suitable strength, suitably positioned and in adequate numbers for securing the cargo.
7. Internal dimensions – different manufacturer produce varying internal dimensions, usually better than ISO recommended minimum. This may affect a good stowage pattern developed in a previous container. Door apertures may vary in size, but again are usually larger than the ISO recommended minimum; and should ideally be as wide as the internal width of a box container.
8. Small internal obstructions – they could affect planning or packing of a very light slow.
9. Has the container been approved (Customs; Lloyds etc.). In some cases e.g. Tank Containers, these approvals may be required by law. In any case the absence of proper approvals may cause delays and extra cost.

c) Container Types

GENERAL CARGO	Includes closed containers with doors at one end; Closed doors at one end and sides; Open Tops; Open Sided; Open-top Open-sided Open end; Half height containers, Ventilated (not insulated) containers.
THERMAL	Insulated, refrigerated, heated containers.
TANK CONTAINER	Bulk liquid and Compressed Gas.
BULK CONTAINER	For gravity discharge and pressure discharge.
FLAT CONTAINERS	Without any superstructure, and do not belong in a fully automated container system since they cannot be top lifted when loaded.
SPECIAL	Cattle container, Collapsible containers. Air mode



II.1 General Cargo Container

II.1.1 Closed Container

This type of containers are commonly used for dry cargo (see Fig. 1) but sometimes constructed with one or more doors in the sidewall (Side Door Containers see Fig. 2) . This gives the advantage of extra access from the side for packing and unpacking, but increases the Tare weight (and therefore reduces the payload), increases the amount of maintenance necessary, increases the chance of moisture dust and fumes gaining entry, and very often reduces the internal width.

Description: Completely enclosed but with full width doors at one end. (May sometimes have doors in the sides – see below).

Other names: Dry Cargo / Goods Container, General Purpose Container

Figure 1a, 20 ft Dry Container

Figure 1b, 40 ft Dry Container

Suitable Cargo: Most types of dry cargo can be carried in these containers.

Advantages: Comparatively low construction cost. Little maintenance is necessary. Most common type of container therefore can be easily and quickly made available. Good watertight integrity.

Disadvantages: Packing and unpacking can only be achieved through the doors in the rear (but see below). The temperature within the container (depending on its construction – e.g. whether lined) will fluctuate in close response in the ambient conditions (see "Weather: Temperature").

II.1.2 Closed Box Container with Side Doors

Figure 2: Closed Box Container with Side Doors

N.B. (2) Dry Goods Containers may, in some cases, have provision for ventilation. These may be used for cargo with excessive moisture, or cargo which give off gases that need to be dispersed. If the ventilation is by mechanical, means (e.g. an electric fan), then power sources have to be provided during all the various stages of transport. Greater maintenance will be required, and careful packing of the cargo to allow a proper through movement of air (see "Packing Patterns"). Non-mechanical ventilation may be ineffective if the container is stacked or loaded so that it is

completely and closely surrounded by other containers. Ventilation trunking may be inaccessible and allow dirt to collect, with the associate threat of vermin.

II.1.3 Open Top Containers

Description: Constructed with doors at one end and the top completely open. The interior may be protected from the weather by either a solid removable top (Hard Top) see page 16 (N.B.) or canvas cover – tilt – (Soft Top). The Door Header, or main transverse member above the door, may either be swung clear or removed altogether to improve case access.

Other names: Soft-top Container
Removable Roof Container
Top Loading Container

Suitable cargo: Items that is too large or too awkward to be packed in via the end doors. Over-height cargo (e.g. cargo that will protect above the top edges of the container (see "Oversize, over-height") Heavy cargo that requires to be handled by crane. In some instances dry bulk cargo (see "Bulk commodities").

Advantages: Can be entered (and packed) via either the door and/or the roof. Normally have load-bearing sides.

Disadvantages: Greater Tare weight than Dry Freight Container. More maintenance required Soft Tops susceptible to weather, wear and tear damage. Hard Tops sometimes require special equipment to remove and replace top. Top side rails because of the extra strength required: project further into the container (e.g. cargo space) than they would in Closed Box Container. Deflection of sidewalls when packed – or even when stood on slightly uneven ground – sometimes makes the fitting and removal of the roof bows or hardtop difficult. Some containers have devices enabling this sidewall deflection to be corrected – usually in the form of a wire stop and turnbuckle pulling the topside rails towards one another. Some tilt designs are difficult to fit when the container is empty or only part loaded – e.g. if the container on a trailer the tilt has to be spread and buttoned while working at a dangerous height above the ground.

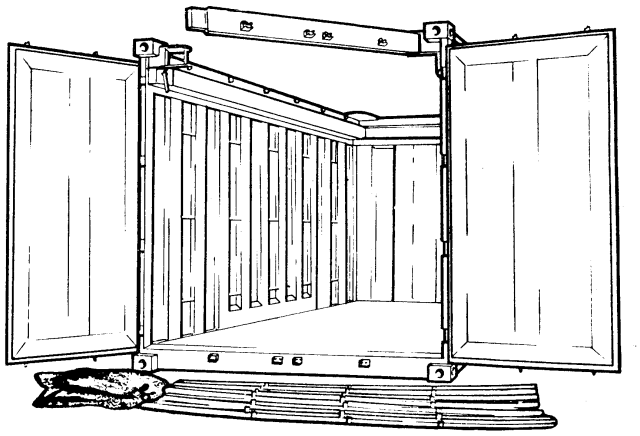
N.B. Containers with solid removable tops are classed by ISO as variants of the Closed Box Containers

Open Top (Soft Top) Container

Figure 3:

Open Top with Tilt, and Roof Bows Removed; Door Header Swung Clear

Figure 4:



OPEN TOP WITH TILT, AND ROOF BOWS REMOVED; DOOR HEADER SWUNG CLEAR

N.B. Containers with solid removable tops are classed by ISO as variants of the Closed Box Containers.

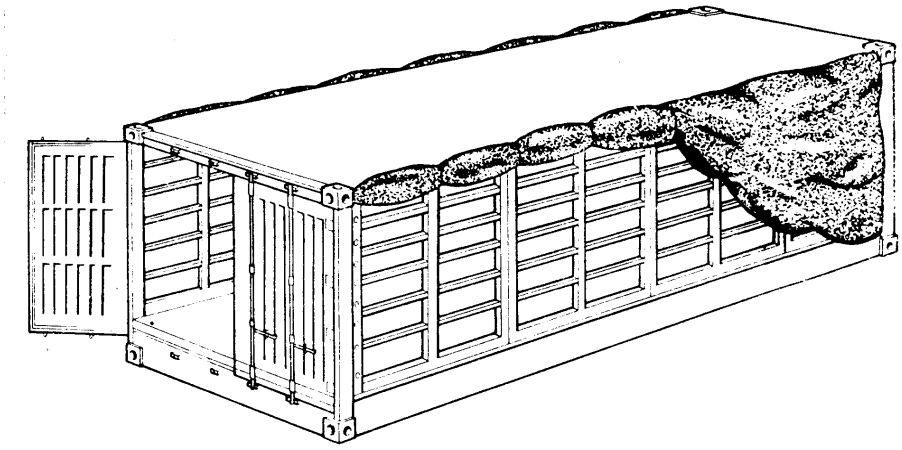
II.1.4 Open Sided Container

Figure 5:

Description:	Has end wall. Roof and end doors and removable sides. These sides are usually covered with a tarpaulin cover or tilt.
Other names:	Side Loading Container Curtain Sided Container Open Wall Container
Suitable Cargo:	Any of such dimensions that it needs to be packed in from the side, yet needs maximum weather protection. Overwidth cargo (see "Oversize and Overweight"). Fruit and vegetables over short distances. Livestock.
Advantages:	May be entered from either side or the door end. Solid roof gives good weather protection.
Disadvantages:	High "Tare weight" (due to deep floor recessing because of lack of side wall, in comparison with closed containers). If the portable sides are not load bearing then the securing of the cargo can prove a problem. Fairly high maintenance cost. If the portable sides are removable there is a risk of parts becoming lost. If the side supports are not being used for a particular cargo, then safe stowage position must be found for them.

Open-Sided Container Showing Load Bering Removable Side

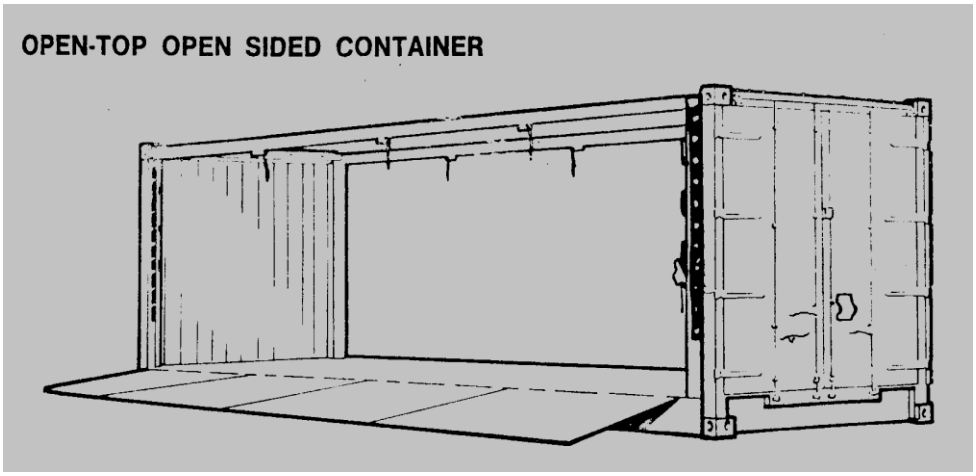
Figure 6:



OPEN SIDED CONTAINER SHOWING LOAD BEARING REMOVABLE SIDE

II.1.5 Open-Top Open Sided Container

Figure 7:



NOTE: TILT REMOVED, SIDE WALLS COLLAPSED

Description: Has end walls with top longitudinal – which distinguishes it from the Flat rack. There may be a framework to allow a tarpaulin or tilt to be spread and secured.

Other names: Full Tilt Containers Flatrack.

Suitable Cargo: Awkward units that cannot easily be stowed in via doors of a Dry Freight Container. Cargo unaffected by the weather or with its own protection.

Advantages: Easy access – can be packed through the doors (if applicable) or from the sides or overhead.

Disadvantages: Greater Tare weight than Dry Freight Container (because of extra strength required from lack of side walls). Can be awkward and time consuming fitting tilt – especially when container is empty of cargo. Sides (if framework or battens are fitted) are not load bearing, so special attention has to be given to securing cargo. Not suitable for cargo requiring special protection from the weather. Tilt vulnerable to damage and a stowage problem when not in use.

Open Top, Open Sided Container Showing Framework and Tilt

Figure 8

Open-Top, Open-Sided, Open Ended Container

Description: A base with skeletal superstructure only. May have wire or frame between the corner posts to support a tilt. May also have boards slotting into the ends.

Other names: Skeletal Container

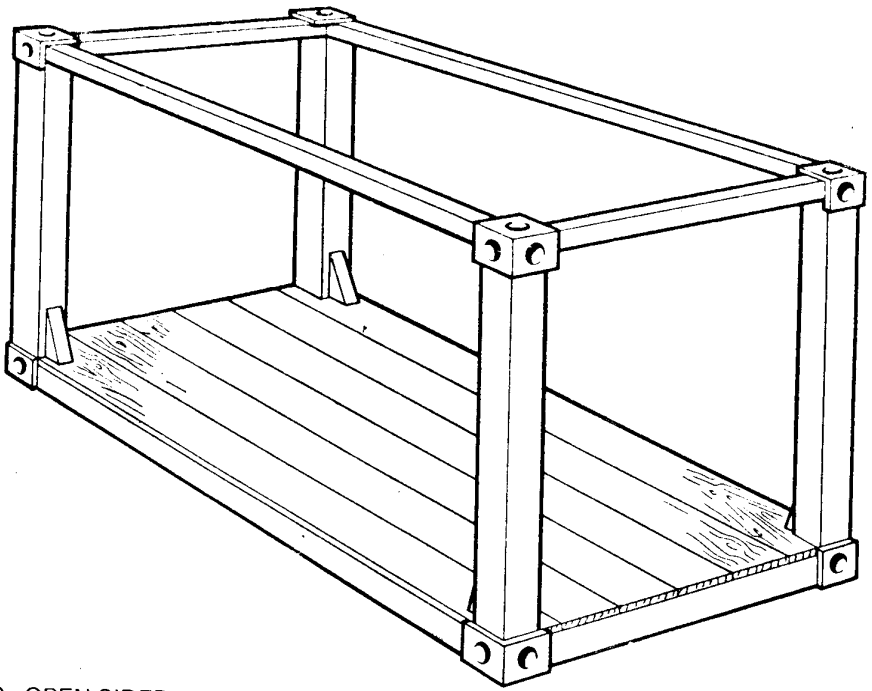
Suitable Cargo: as for Open-Top Open Sided container

Advantages: Can be approached from any direction when packing with cargo. May take oversize cargo (see 'Oversize and Overweight').

Disadvantages: Not weather-proof. With no ends or wall, securing of some cargoes can be a problem. Any extra fittings (portable ends, battens, wires stanchions, and tilts) require special stowage position when not being used – are easily lost.

Open-Top, Open Sided, Open-Ended Skeletal Container

Figure 9:



'EN-TOP, OPEN-SIDED, OPEN-ENDED SKELETAL CONTAINER.

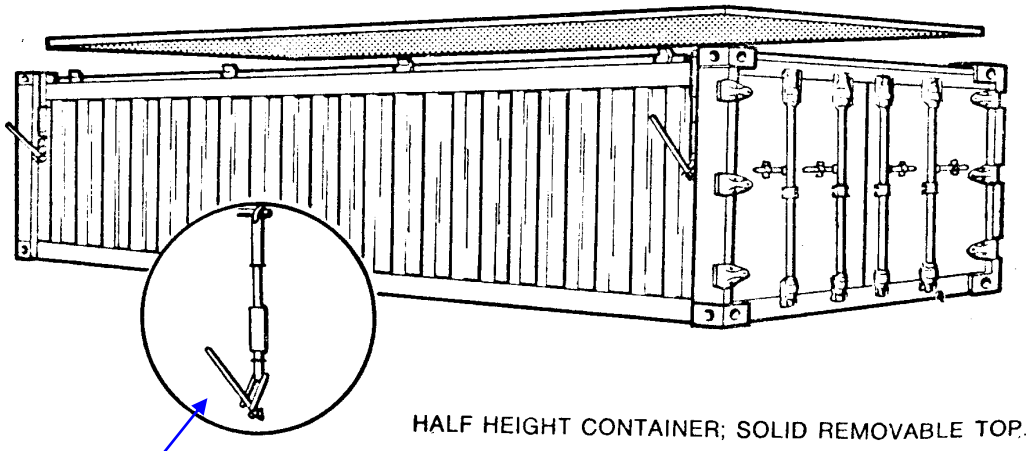
II.1.6 Half-Height Container

Description: Of ISO length and width, but only half the ISO recommended height (e.g. 4 ft. or 4 ft. 3 ins. And not an ISO type). May be built with the characteristics of an ISO type (e.g. open top, half height, tank etc.).

Suitable Cargo: High density (e.g. Ore, iron and steel, liquids with high specific gravity).

Advantages: Occupies less space than a full height container.

Figure 10:



HALF HEIGHT CONTAINER; SOLID REMOVABLE TOP

II.2 Thermal Container

Insulated Containers
Heated Containers
Refrigerated Containers

Figure 11a

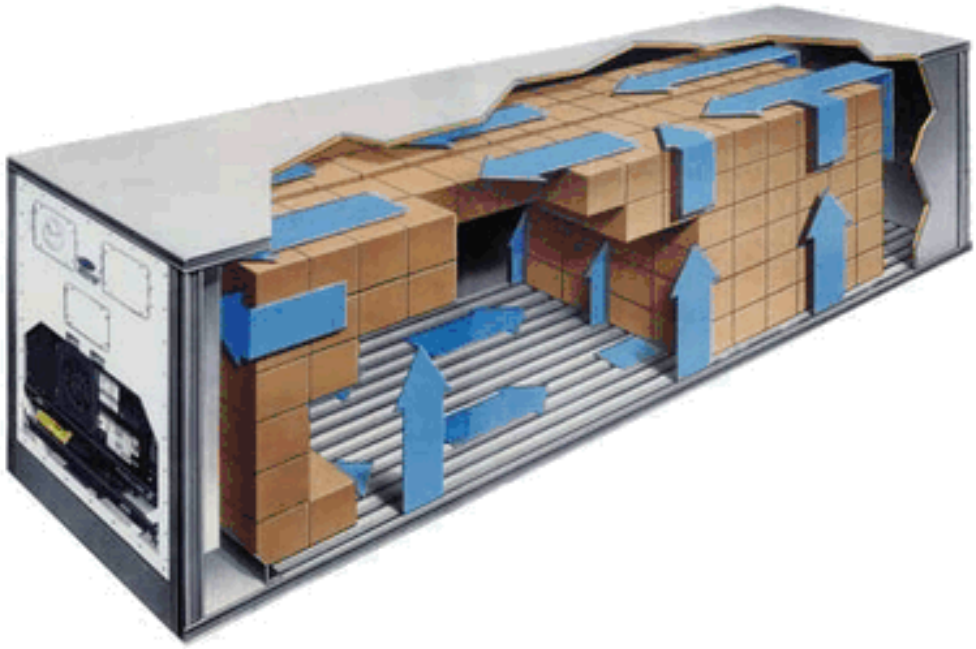


Figure 11b

REFRIGERATED CONTAINERS SHOWING FLOOR EXRUSIONS AND SIDE AIR DELIVERY (See also "Temperature Control")

Description: All have walls, floor, roof, and doors insulated to reduce temperature movement between the inside and outside of the container. Some have mechanical refrigerating equipment and/or heating equipment built into one end or the sides of the container. Others rely for refrigeration on Clip-on Units attached to the front of the container, or central refrigeration systems at Terminal and Ship. Some rely on Cryogenic refrigeration (see "Temperature control"). Some have no means of refrigeration at all.

Other names: Reefer Container
Insulated/Heated Containers.

Suitable Cargo: Perishables. Any that will suffer from variations in temperature. (see "Temperature Control").

Advantages: As per the insulating/refrigerating/heating properties.

Disadvantages: Insulation and (if applicable) the refrigeration unit add to the Tare weight of the container. They also reduce the internal volume available for cargo. Greater maintenance required if mechanical equipment is built in.

II.3 TANK CONTAINER

Figure 12

Description: Steel tanks built within a framework confirming to ISO measurements. Capacity of 20 ft. units usually in the region of 4,000 gallons (15,140 liters). May be heated and insulated.

Suitable cargo: Hazardous (provided necessary approvals etc. have been obtained; see "Dangerous Goods" and "Bulk Cargo"). Containers are usually designed with particular commodities in mind.

Advantages: Minimum labor required to fill and empty. Can be used for temporary storage.

Disadvantages: High initial cost. High upkeep cost. Continual cleaning costs between cargoes. Difficult to transport due to its large ulage, high tare weight.

II.4 Dry-Bulk Container

Figure 13a

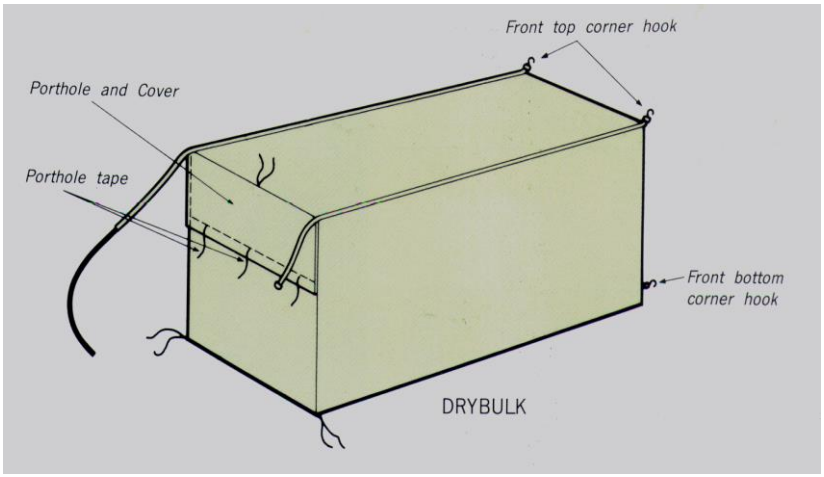
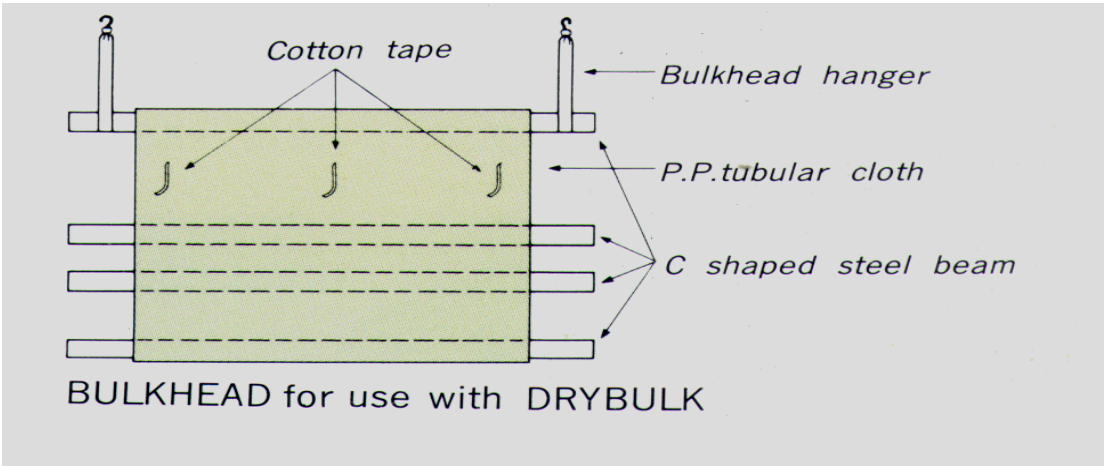


Figure 13b



Description: A new way to use dry containers to transport bulk cargoes such as beans, malt, fertilizer, food, chemicals, from vanning to de-vanning. This equipment is using air pressure delivery for vanning bulk cargoes.

Suitable cargo: Dry Bulk

Advantages: No breakage of cargoes
Equipment is easily movable
Can van 17 tons in 15 minutes
It can be used with a variety of cargoes such as grains and chemicals, including pallets.

II.5 FLAT-RACK CONTAINER

Figure14: **Secured stowage on a flat rack container**

Description: Use to carry certain large cargoes that cannot be loaded into ordinary dry containers due to the size of the doors. Handling certain heavy and long cargoes through container doors can be difficult. The flat rack containers were developed. These are like ordinary dry containers but with the doors, sidewalls, and roof removed.

Suitable cargo: Versatile range of cargoes.

Advantages: 20-foot flat rack containers can have a wooden wall consisting of "Detachable Boards" that can be removed if desired.
Predominant for transportation of heavy cargoes.

Disadvantages: Cargoes that would not be overheight on a 20-foot flat rack container may be overheight on a 40-foot flat rack container that should be given attention.

Special attention to be paid when loading empty foldable flat-racks units!

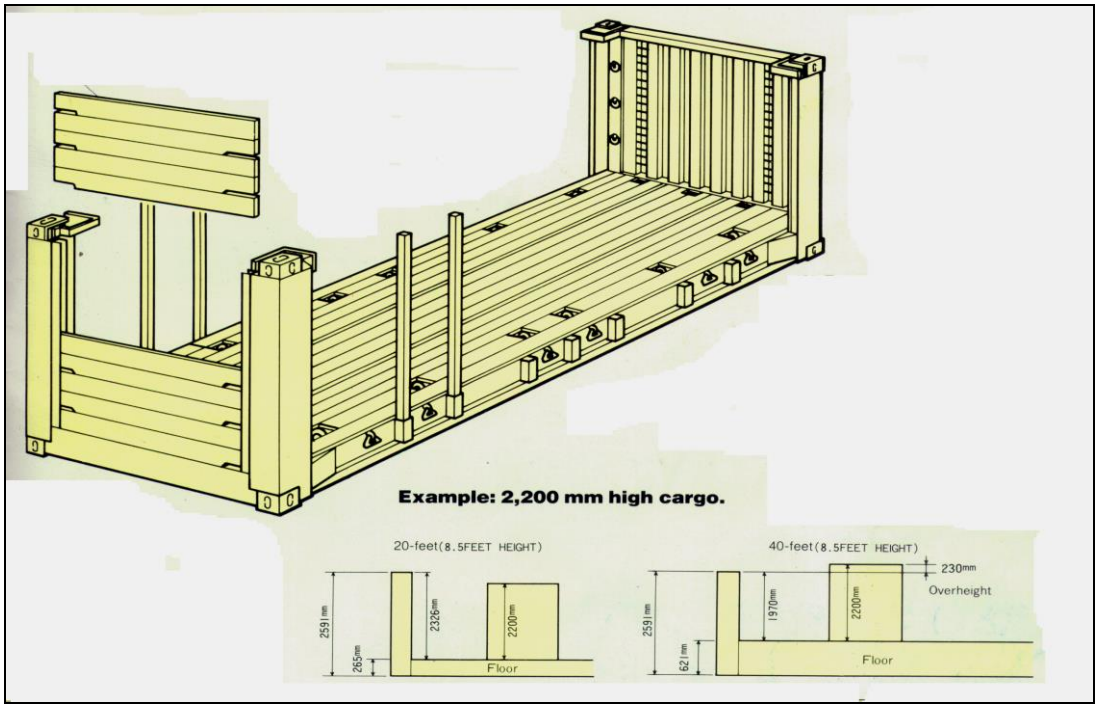
A unit can have 4-5 flat-racks stowed on top of each other, and those units can be loaded only on the last tier – as no container can be loaded on top.

Usually in PowerStow those units appear as 1(one) empty flat-rack with weight 4 to 5 tons, when in fact the unit can weight up to 25tons, therefore the real weights must be updated manually in PowerStow, in order to get the true stack-weight and lashing forces.

Failure to do that may lead to serious consequences, as per below photo:

II.6 SPECIAL CONTAINER

Figure 15



Description: Special containers are used for transporting large, shapeless, or break-bulk cargoes such as large machinery, pipes, vehicles, sheet glass, malt, liquids and cattles/livestock.

Suitable cargo: Variety of cargoes as mentioned above.

Advantages: Possible to accept cargoes of any shape, size or weight, livestock.

Disadvantages: Subject to the restrictions of quarantine, traffic laws, safety standards covering transport vehicles, and vehicle restrictions and limits with regards to size and weight that requires permits in some countries.

III. CONTAINER SHIP OPERATION

III.1 Sailing Instruction

III.1.1 Sailing Instruction for a Particular Voyage

For every particular voyage the Charterer or the Owner of the vessel issues a Sailing Instruction to the Master. It is received prior commencement of the voyage in the form of hard copy or via electronic means of communication like e-mail, telex or fax.

The main gist of the Sailing Instruction pertains with the details of the voyage in which the concerned parties must perform during the whole contract of the voyage. The Master must ensure that this instruction is carefully followed and if he has any doubt or misunderstanding, it should be clarified to the Owner or Charterer.

For smooth operation of the vessel, the Master should provide this information to the concerned Officers onboard so that everyone is aware of the requirements for the whole voyage. Usually the Chief Engineer is informed for the bunker/fuel requirements, the Chief Officer for the port rotations and cargo quantity; the other officers for voyage planning and other details.

III.1.2 General Sailing Instruction for Liner Service

When the vessel is assigned to a liner service, the Master will be given a General Sailing Instruction for the intended scope of the trade. It contains the general information that the ship's Master should know for the execution of the voyage in a regular basis.
The instructions contain the standard operational concerns of the vessel as per example:

1. General Information
2. Vessel Deployment
3. Standard Sailing Schedules and Voyage Number
4. Operation and Organization
5. Scheduling
6. ETA Information and Port Schedule
7. Speed and Fuel Consumption
8. Space Capacity and Slot Allocation
9. Bunker Supply
10. Dispute of Bunker Quantity and Quality
11. Monthly Report of Remaining Bunker on Board Vessel
12. Fresh Water Supply
13. Booking Prospects and Stowage
14. Cargo Documents
15. Weather Routing Service (as applicable)

16. Sea Protest
17. Notification of Vessel Delay and Troubles
18. Notification of Cargo Damage and Troubles
19. Reefer Container
20. Other Work of Crew Hands
21. Stevedore Damage
22. VMF (Vessel Movement Filing System) Data Sending
23. Cost Savings
24. Container Lashing Materials
25. Change of Vessel Command
26. Deck and Engine Abstract Log
27. Master's Voyage Memo

III.2 General Instructions

Ship Owners provide the vessel of the General Instructions to Masters. This contains the company policy for ship management. Being the person with the highest authority onboard, the Master is guided by these instructions of his judgment is his day to day works onboard. It he will be deviating from the company's operational procedures, he may do so but he is required to report it to the company to explain his reason.

Being the representative of the company, at all times, the Master have duty to preserve the property and protect the interest of the Owners and its direct Customers. Quick dispatch and turn-around of the vessel should be performed in accordance with the Sailing Instructions by always considering smooth and safe operation of the vessel.

In the shipboard management, the following items should be given careful attention:

- Safety Operation
- Quality Control
- Cost Control

The instruction also contains the accounting matters and on how to handle the ship's money such as:

- Management of Ship's Money
- Requesting for Ship's Money
- Notes When Paying by Ship's Money
- Account of Ship's Money
- Entertainment Expenses
- Slop Chest Management
- Provisions Management
- Entertainment Fee/Watching & Maintenance of Reefer Container
- Crew Extra Overtime

III.3 Hatch Covers

III.3.1 Size and Weight of each hatch cover

(Ref. Container loading and hatch cover lifting manual Drawing NO. F-6-24 of ACX Daisy)

Size, weight and design load of each hatch cover are mentioned below based on the above vessel.

This figure varies with vessels' size:

Sample of Container loading and hatch cover lifting manual extracted from "**ACX DAISY**".

Hatch No.	**Bay No.**	**Cover Size (L x B m/m)**	**Weight (with fitting) K/T**	**Design Load K/T**
1-P.S.	01 03	13,736 X 8,436	30.3	-
2F-P.S	05 06 07	13,736 X 8,447	24.5	20'=45.0 K/T (@15.0x3 tiers 40'=78.0 K/T (@26.0x3 tiers
2A-P.S	09 10 11	12,936 X 11,016	29.5	- " -
3F-P.S	13 14 15	12,936 X 11,016	30.0	- " -
3A-P.S	17 18 19	13,736 X 11,016	30.0	- " -
4F-P.S	21 22 23	12,936 X 11,016	30.0	- " -
4A-P.S	25 26 27	12,936 X 11,016	29.5	- " -
5F-P.S	29 30 31	13,736 X 11,016	30.0	- " -
5A-P.S	31 32 33	12,936 X 11,016	29.5	- " -

III.3.2 Lifting Hatch-cover and Lifting Recess

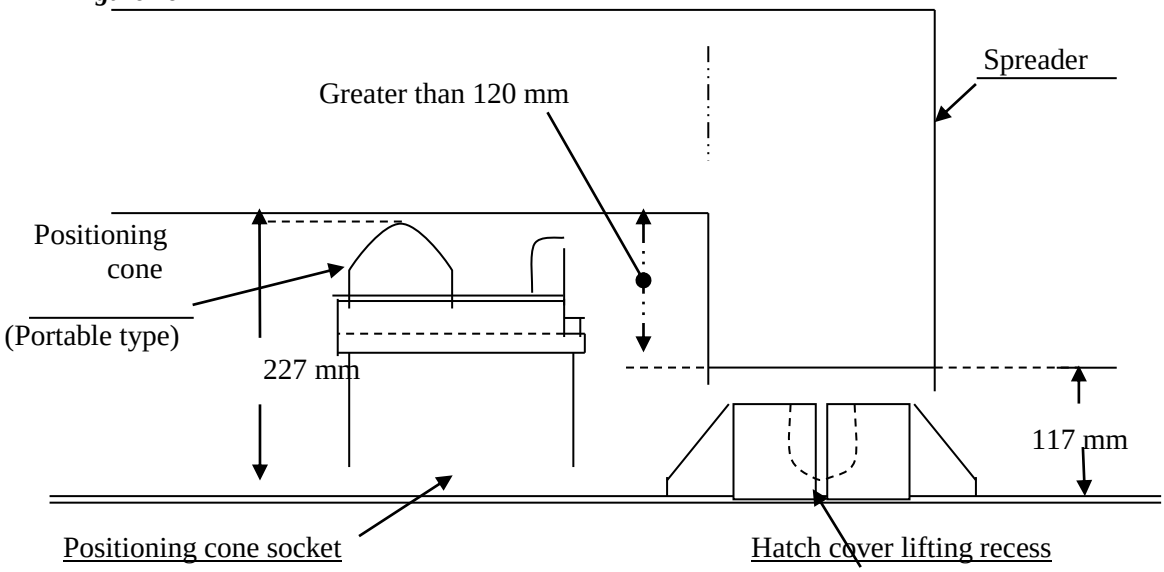
On the hatch cover, there are lifting recesses to lift it either by a 20 foot or a 40 foot ISO type spreader of the crane.

The height of lifting recesses is 117 millimeters on the surface of the hatch cover.

All the hatch covers can be lifted by a crane, which has the lifting capacity of 30 long tons.

Required procedure to be followed when lifting hatch covers by 20 foot or 40 foot spreaders, in case there is a clearance of more than 120 millimeters between underside surface of the hatch cover, the covers can be lifted by the spreader directly without taking away removable positioning cones.

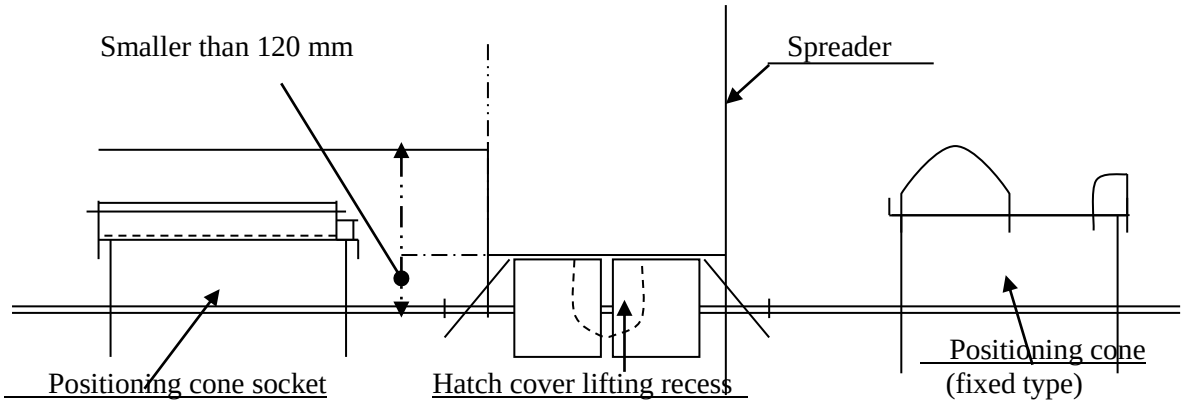
Figure 16



In case the above clearance is less than 120 millimeters, the removable positioning cones between these lifting recesses should be taken away before lifting the hatch covers as the under surface of the spreader may touch the positioning cones which are situated on the hatch cover.

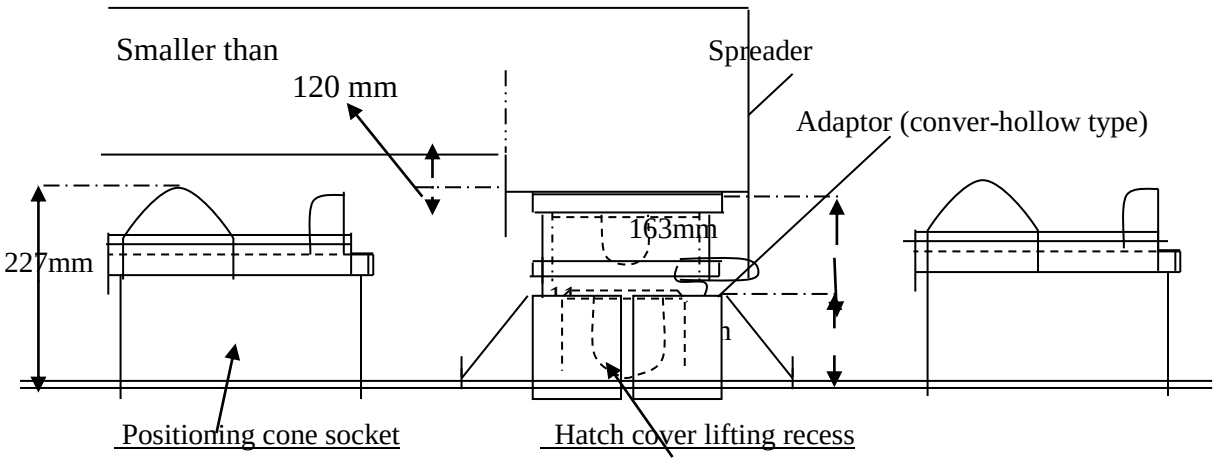
(Refer to the sketch next page)

Figure 17



Otherwise, the Hatch cover lifting adaptors should be used when lifting hatch cover without taking away removable positioning cones. Two sets of the adaptors are on board.

Figure 18



III.3.3 Securing of Hatch Cover

All hatch covers are secured by nine oil cylinders systems per cover spaced equally around the perimeter of the cover. The ship's crews are responsible for locking and unlocking the cover on board while the vessel stays in port.

Hatch cover must always be locked by cylinder pins, jumper pins when at sea.

III.3.4 Stacking of Hatch Cover

There are sockets (named: Hatch Cover Stowage Stool) for stacking hatch covers fitted on the top of each hatch cover and holder on deck.

To stack hatch covers, they should be positioned accurately to rest on the sockets mentioned above.

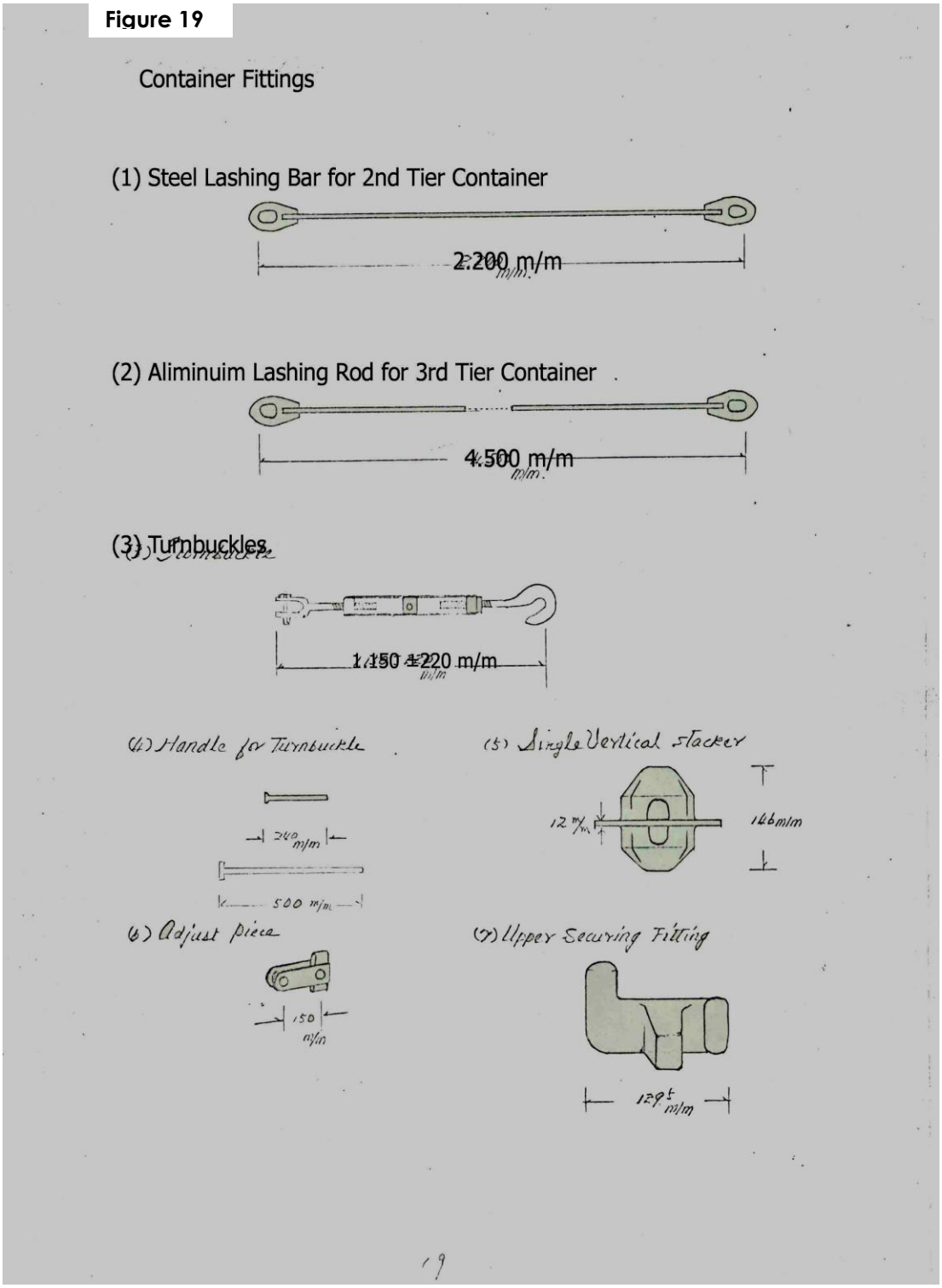
It is important not to stow more than three tiers of hatch cover in any single stack.

When covers are stowed on the wharf, set dunnage on wharf and to be stowed hatch cover, but distance between legs of a crane to be more than 14 meters.

III.4 Container Fittings :

There are several container fittings to ensure the safe stowage of cargo. Figure 19 will show the different container fittings:

Figure 19

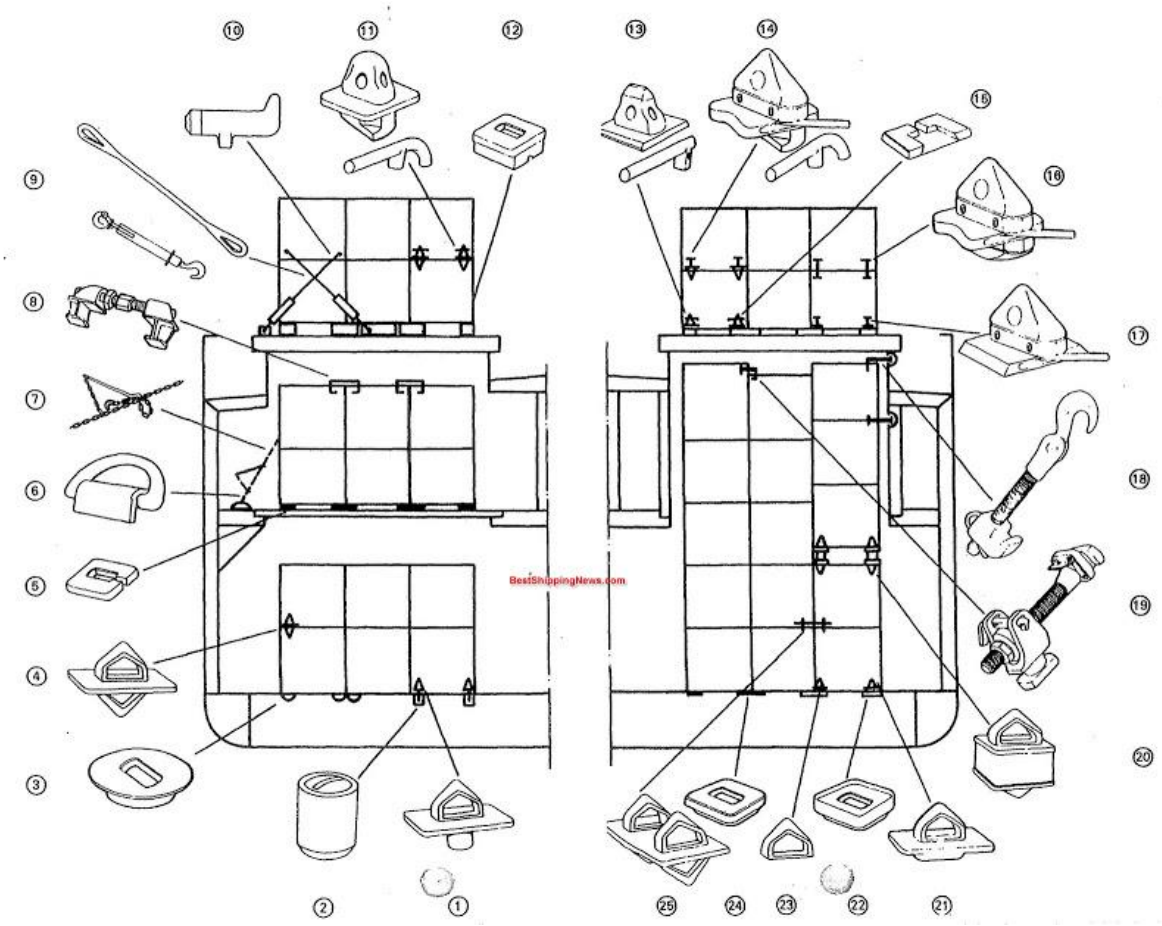


Container fittings and lashing bars

Lashing bars and turn buckles

Twist locks

Corner fittings and single stacker



III.5 Container Handling Equipment

All I.S.Q. containers have top and bottom corner fittings designed to accept lifting attachments. Some containers also have fork pockets for lifting by fork lift truck.

Container Operators prefer the container to remain in the trailer while it is being packed or unpacked. However, there are occasions, e.g. the loading/unloading of heavy or awkward machinery, when it is desirable to dismount the container. Equipments suitable for this purpose include: --

Cranes – Overhead or Mobile

When these form part of the establishment of an installation they are an excellent and economical means of handling the container provided the lifting attachments are suitable. In fact most Container Operators are very particular in this regard, since the use of incorrect lifting gear will almost certainly damage the container even when it is empty. As a guide, containers should only be lifted as follows: --

(a) From the top corner fittings by a Vertical lift using: --

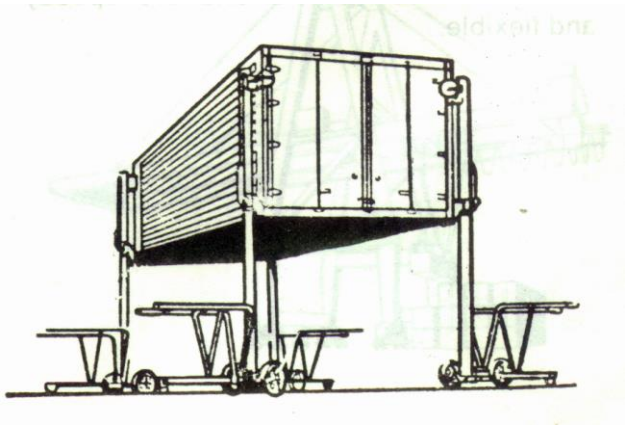
- twist lock mechanisms
- shackles
- hooks to I.S.O. specification.

(b) From the bottom corner fittings using a spreader bar, at least as long as the width of the container, with bridle slings attached to each end. The bridle slings should be fitted with lugs, to a specification approved by the Operator, which will engage into the bottom corner fittings in such a manner that the angles of the bridles are not less than 45*,nor more than 60* to the horizontal.

Power Jacks

Four jacks, which fit into the bottom corner casting of the container, are controlled from a console. They lift and lower individually or in unison by selection and are either electro/hydraulic or electro/mechanical, or manually operated;

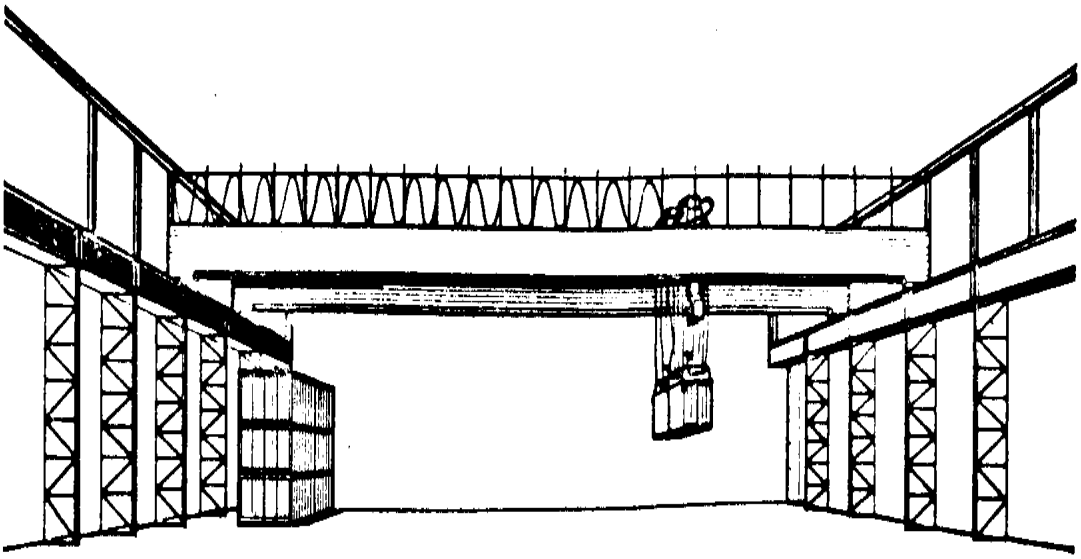
Figure 20



Overhead Traveling Cranes

These are rail-mounted or on an elevated trackway. They straddle the container mounting/dismounting and storage areas and have the possible disadvantage of operating only over a fixed path.

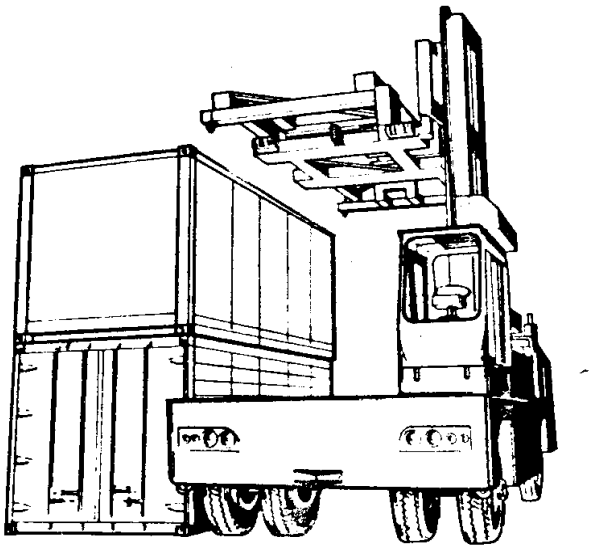
Figure 21



Side-Loading Truck

Large capacity side-loading fork trucks fitted with lifting frames and twist-locks. Front loading fork trucks are also available.

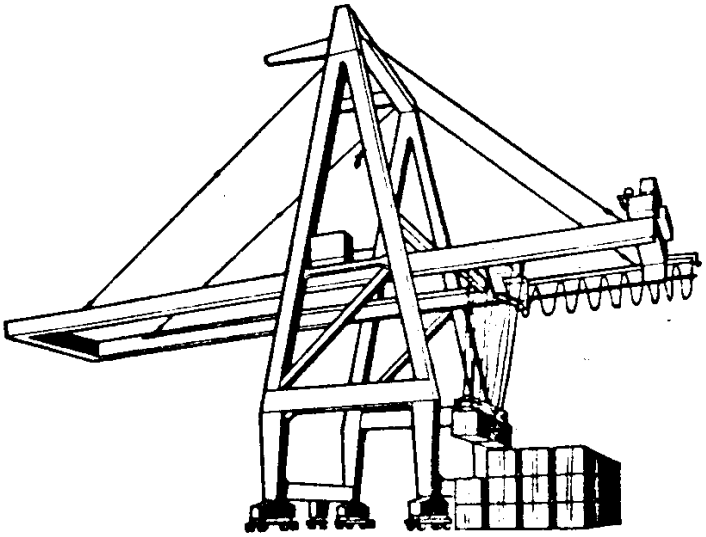
Figure 22



Container Crane

There are a variety of types but all have a horizontal boom which reaches across the width of the ship being worked. Some have the ability to transport handle 40 ft. or two 20 ft. containers at a time.

Figure 23

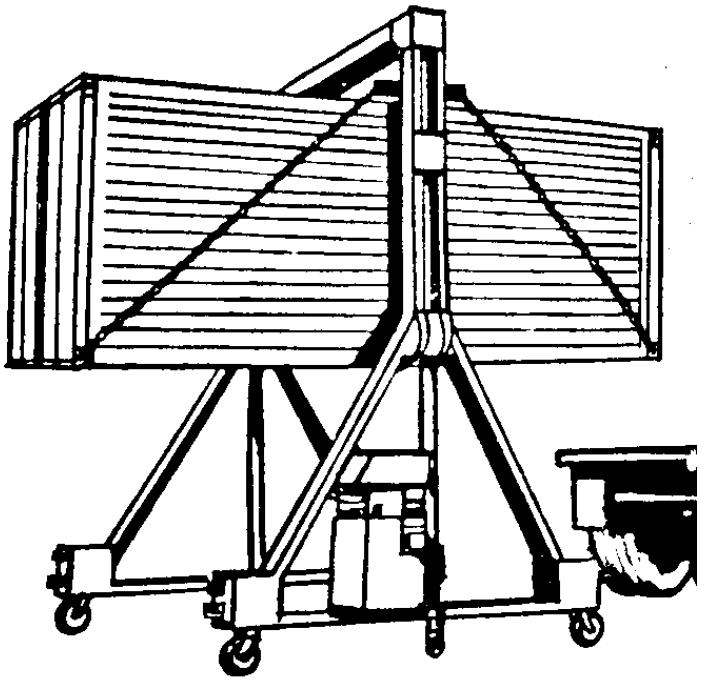


Attention – DO NOT pass under the gantry cranes during cargo operations, as gantry crane may collapse onto the vessel !

Mobile Gantries: 20-40 TON CAPACITY

Electro/hydraulic operated with self-adjusting rams to ensure even lifting. Out-of balance loads are compensated by chain sling adjusters. There are two types, one manually propelled and the other powered by diesel which can be driven and positioned by the rider operator. The manually propelled version, when unladed, can be maneuvered and lowed.

Figure 24



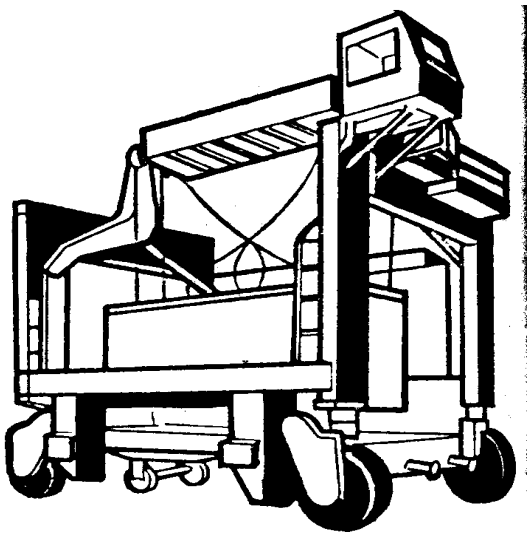
The foregoing equipments are suitable for handling containers, when necessary, at Shippers/Importers' premises and are comparatively cheap: Port terminals, containers bases, depots, freight stations etc. have very large throughputs of containers which, of course, have to be transferred from road and rail and therefore, costly equipments designed to deal with such throughputs and which have the ability to stack, have to be employed.

These include:

- **Straddle Carriers**

Of a variety of designs but essentially consists of a powered mobile portal frame and four-wheel steering. They lift, stack and transfer containers and are speedy and flexible.

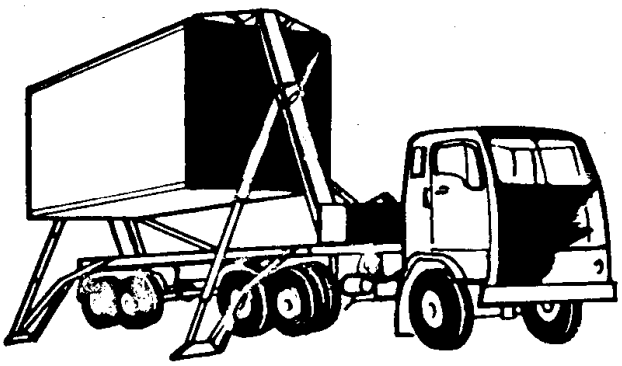
Figure 25



Trailer Mounted Equipment

Basically hydraulically powered "arms" which swing the container from the trailer and place it in the ground or stack it two-high.

Figure 26

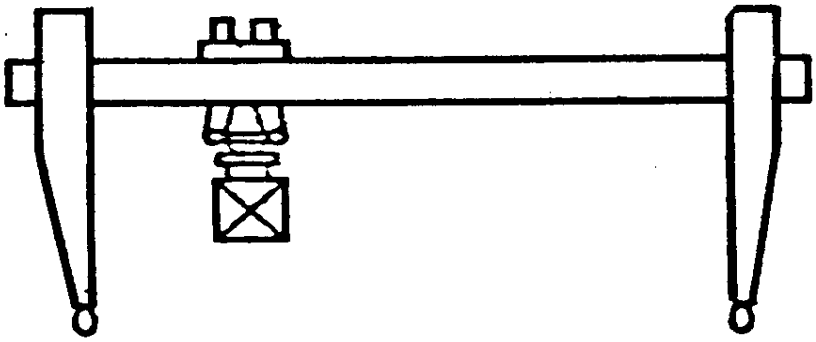


- **Transtainers**

Transtainers can be either rubber wheeled or rail-mounted. The following are its two basic designs:

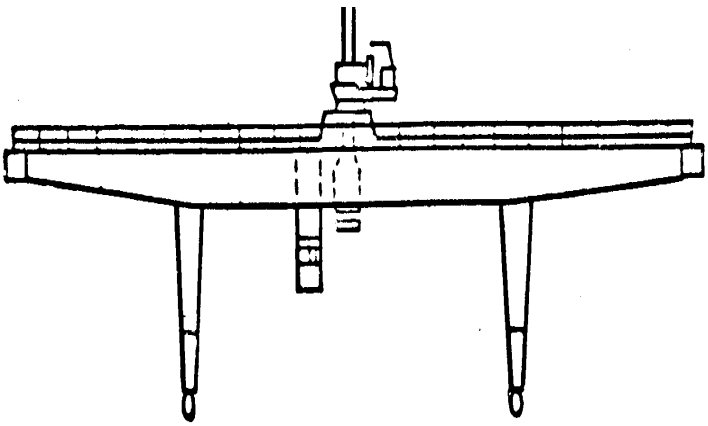
Portal Frame service road vehicles within the area bounded by their own tracks. A proportion of the potential container stacking area is thus required for service roads.

Figure 26



Cantilever is essentially a portal design with an extension on one or both sides which allows vehicles to be serviced away from the stack. Advantages consist of optimum use of stack heights and low downtime records. Disadvantages include comparative inflexibility and considerably reduced throughputs in operating conditions calling for random stacking access. Also requires auxiliary equipment e.g. tractors and trailers, straddles etc. to support operations.

Figure 27



III.6 Lashing Arrangement of Containers

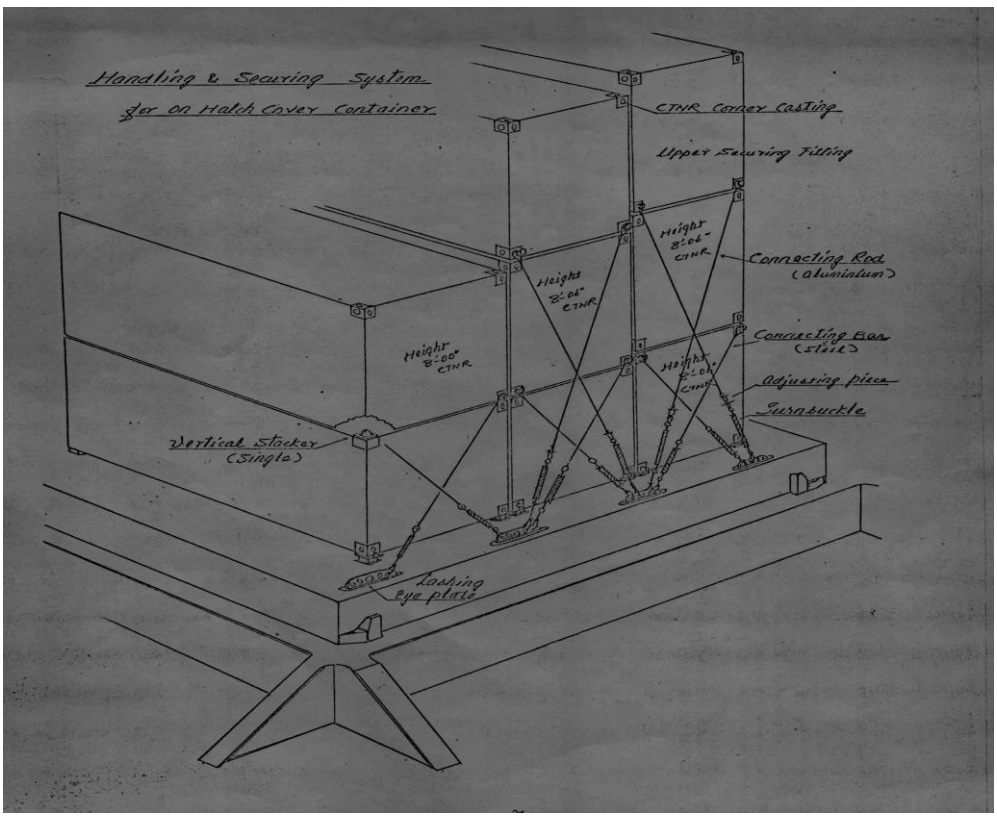
In every case the same lashing patterns are to be used.

1. The positioning cones of the first layer of containers stowed on deck should be fixed be their lock pins.
2. The steel lashing bars should be used by diagonal lashing method for second containers.
3. Also, the long aluminum lashing rods should be used by diagonal lashing method for third tier containers.

4. The adjust pieces for lashing rods are able to use for lashing of 20-foot and 40-foot containers (8'-6" height), if necessary.

The number of container lashing equipment supplied to vessel should have 100% on full load condition with about 10% available spare.

Handling & Securing System for Container on Hatch Cover ***Figure 28***



Lashing Method of Containers Stowed on Deck **Figure 29**

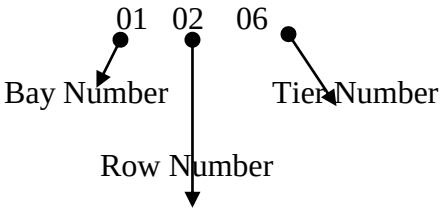
III.7 Stowage Plan

III.7.1 Numbering System for Container positioning

Cell positions are to be identified by the following three factors:

Bay : To be counted in the direction from fore to aft.
Row : To be counted in the direction from the ship's centre line to portside or starboard side.
Tier : In the vertical direction from bottom to upward.

Example:



Bay Numbering

- Bay numbers are indicated by odd numbers starting from Fore to aft., for 20- foot containers.

i.e. odd numbered bays show 20 foot container bays

Example:

01, 03, 05, 07, etc.

1. When a pair of 20 footer bays is used as a 40 footer bay (either fixed or convertible), this 40-footer bay is represented by an even number which is between odd numbers representing 20 footer bays in fore and aft.

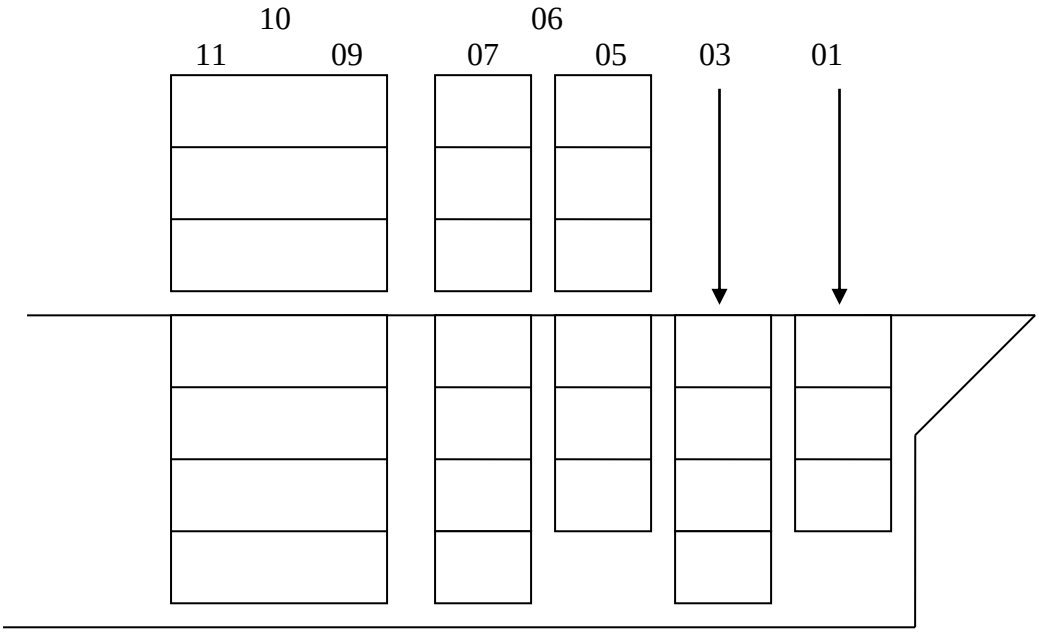
Example:

A 40-footer bay, consisting of, or converted from, two 20-footer bays, 05 and 07, is numbered 06.

2. Therefore, the bay numbers of 20 footer bays and 40 footer bays are as follows respectively:

20 footer bays:01, 03, … 09, 11, … 29, 31, 33, 35
40 footer bays: 10 30 34

Figure 30 Bay Numbering



Row Numbering

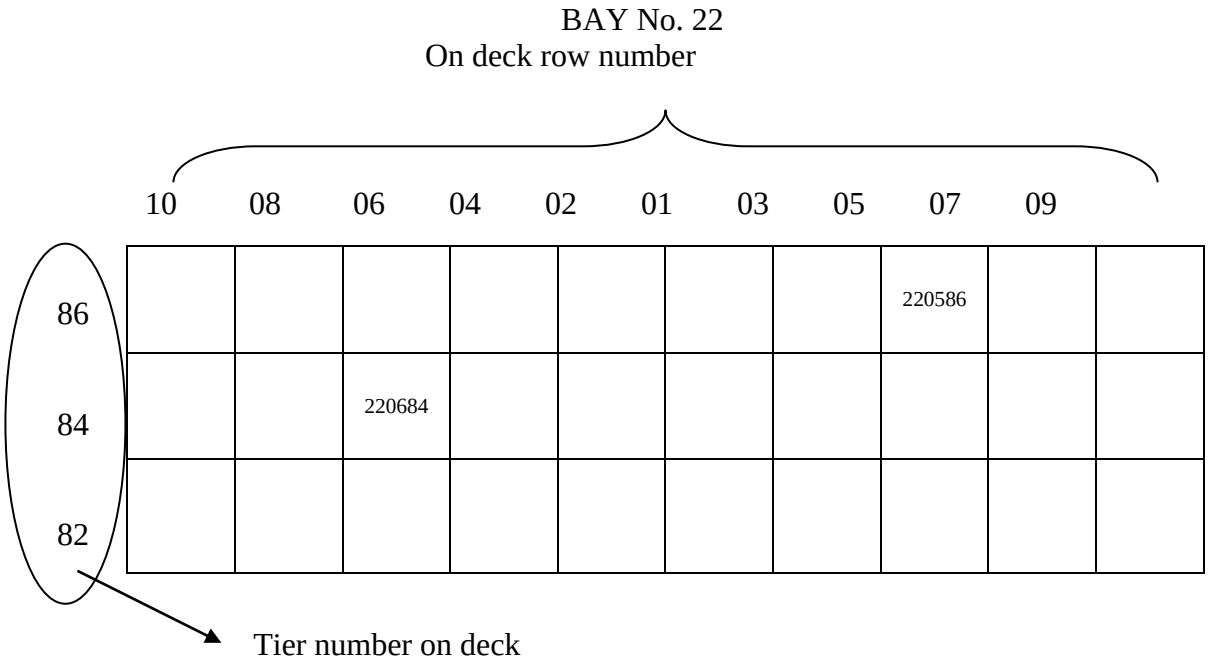
Row numbers are to be counted from the centre line to portside or starboard side.

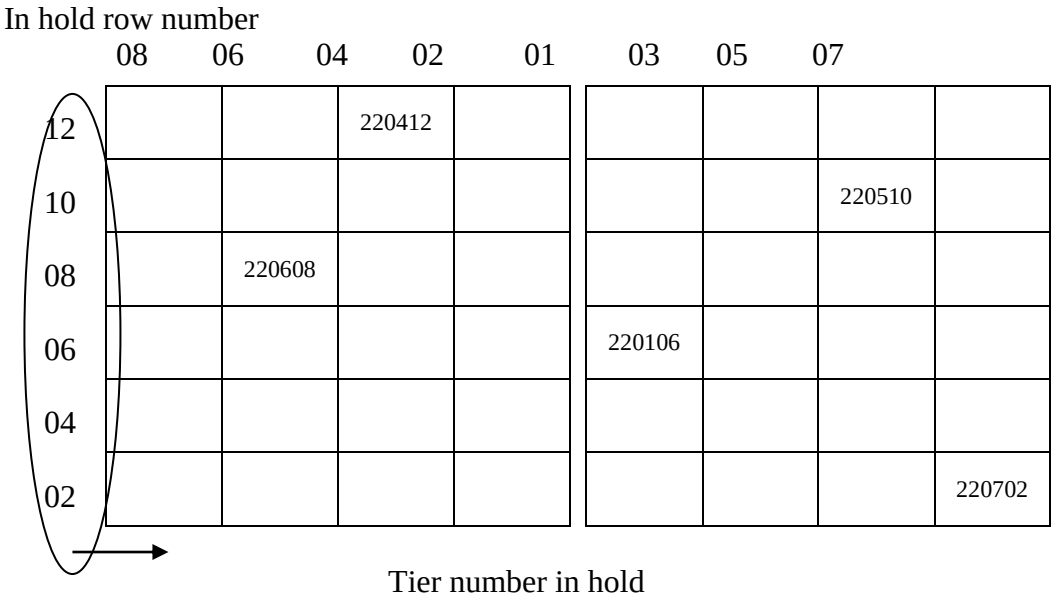
Portside : Even numbers 02, 04, 06, 08
Starboard side : Odd numbers 01, 03, 05, 07, 09

Tier Numbering

- Tier numbers start from 02, which represents a standard height container (8 feet or 8 feet 6 inches for 20 footers, 8 feet 6 inches for 40 footers) in the lowest, location of a bay.
- For ordinary height containers, only even numbers are to be used. When a certain row in a bay lacks the lowest location of the bay, tier numbers starts not from 02 but from a number, which represent the equivalent tier of the central row(s).
- Tier numbers of containers stowed on deck start from 82and are counted from first tier to upward, such as 82, 84, 86, etc.

Figure 31 Example of Cell Numbering System





II.7.2 Abbreviations and Symbols Commonly Used

Every officers and crew members should know how to read and understand the schematic plan given by local cargo planner. The schematic plan is the projection of cargo loading stowage as well discharging information. Knowledge on these symbols and abbreviation are vital for safe cargo operation.

The symbols and abbreviations given below are commonly used in schematic plan for container vessels.

Aside from the symbols and abbreviations, we can have information on container by looking at the number of container and other feature on it. For instance; a high cube

40 and 45-footer container has black and yellow tape on corner post, top rail and rear header as shown on fig.31 a.

fig.31(a). high cube container.

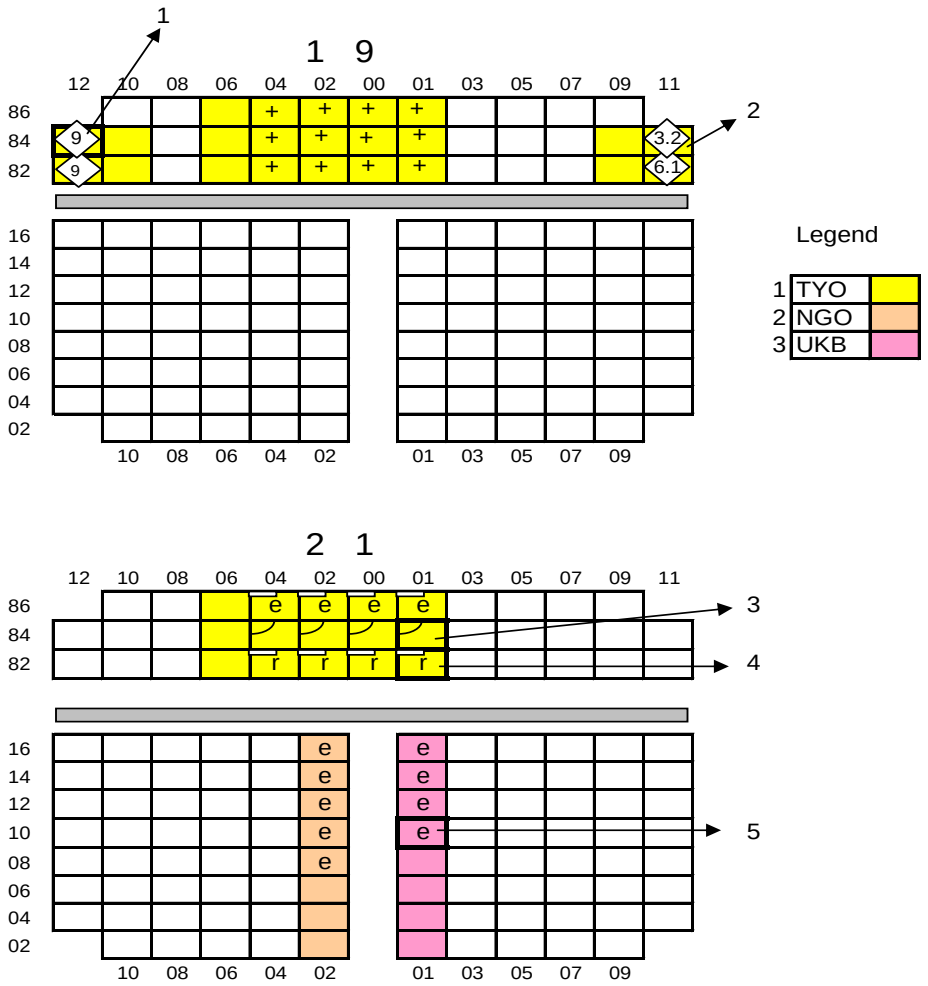
- Finding Location Cargo based on bay plan

1. The location of cargo is based in the order of bay number, row number, and tier number. The bay plan will also give the general description of cargo, such as size (40 or 20-footer), content (hazardous, dry, or reefer), and its destination (port abbreviation).

From the schematic plan in figure 32; identify the given numbers(1-5) and indicate the following:

- Stowage location
- Destination of cargo
- Kind of cargo (e.g: dry, refeer, dangerous, etc.)
- Size (e.g 20-footer, 40-footer, Hi-cube etc.)

Fig. 32 Schematic plan (Exercise)

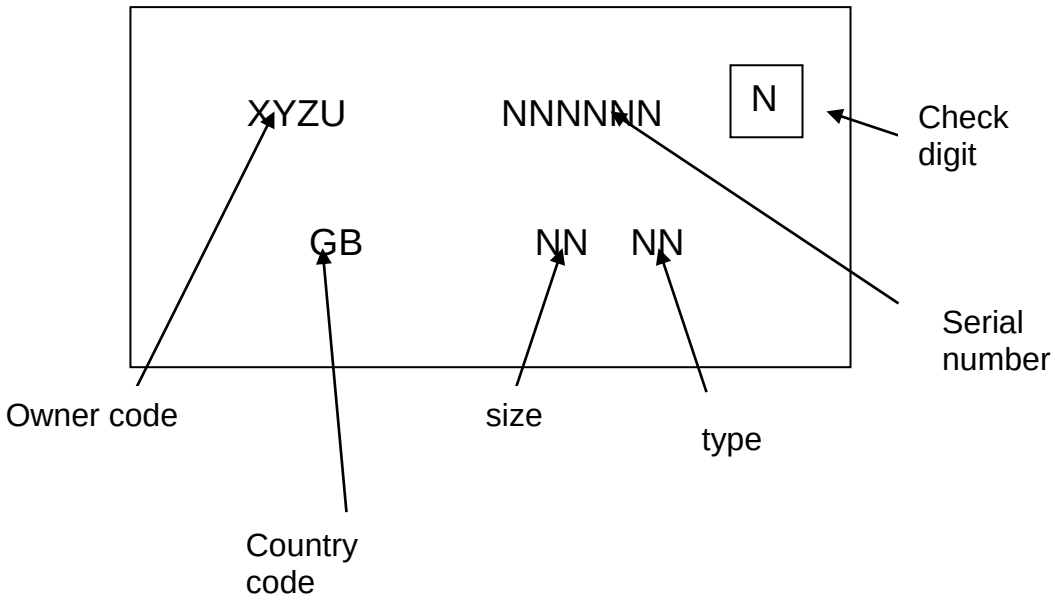


Answers for the above exercise:

1. 191284 (bay 19, row 12, tier 84) destination Tokyo, DG IMO class 9 miscellaneous dangerous substance , 20-footer container
2. 191184 (bay 19, row 11, tier 84) destination Tokyo, DG IMO class 3.2 flammable liquids (flash point at close cup greater than 23°C), 20-footer container
3. 200184 (bay 20, row 01, tier 84) destination Toyo, dry cargo 40-footer and high cube container
4. 200182 (bay 20, row 01, tier 82) destination Tokyo, reefer and 40-footer container but NOT high cube.
5. 210110 (bay21, row 01, tier 10) destination Nagoya, empty, 20-footer container.

The International Standards Organization recommend a numbering system that many major container firms have now adopted (this recommendation is in draft form at

present). From each number can be deduced from the country of origin; owner's name,; sized and type of I.S.O container:-

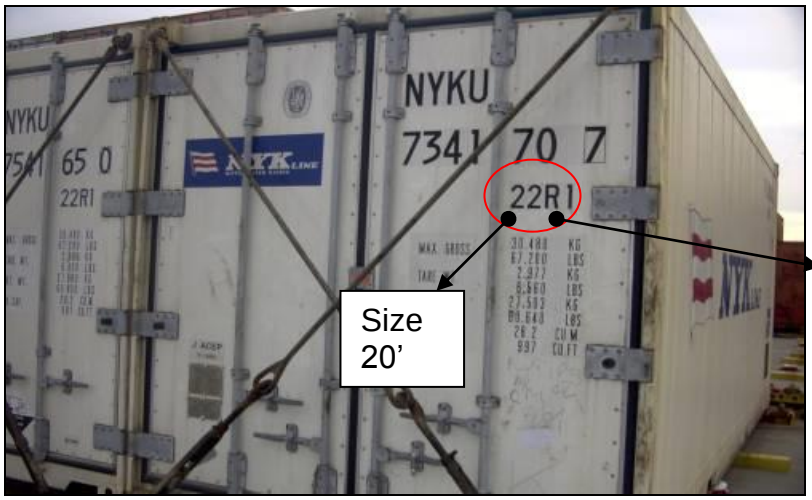


The full key of the codes describing Owner; Country; type and size are detailed to be included. However, the first digit of the "type" code will indicate the group under which the container is listed.

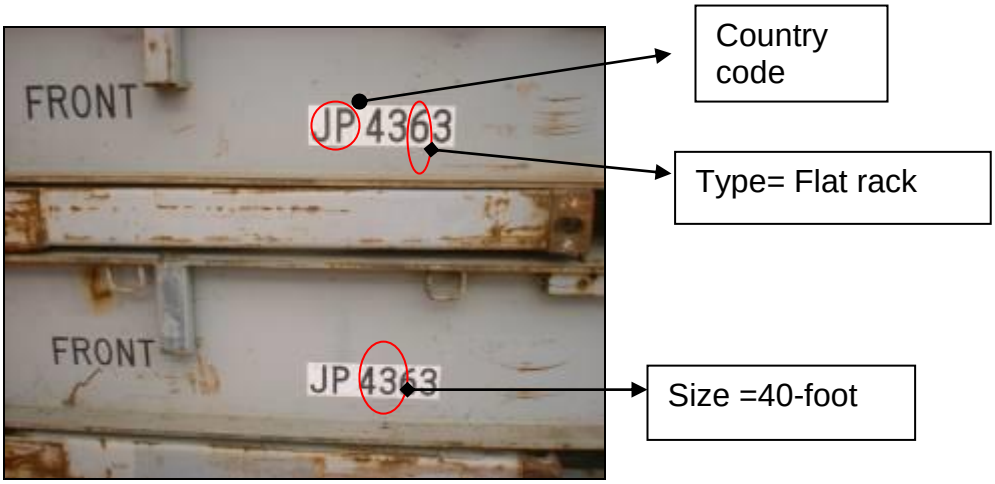
First digit Of the Type code	**Characteristic**
0 or G	Closed container; General cargo
1	Closed container, ventilated
2	Insulated container
3 or R	Refrigerated container
4	Refrigerated container, removable equipment
5	Open Top container
6 or P	Platform; Flat rack
7 or T	Tank container
8	Bulk container, Cattle container, etc.
9	Air container

Example of container code identification

1) Reefer Cargo



2) Platform / Flat rack



III.8 Stowage of Containers

III.8.1 On-Deck Stowage

Containers can be stowed on top of any hatch cover except for the hatch not designated to load cargo as designed by the ship builder. All deck bays are interchangeable for either 20-foot or 40-foot containers. In order to stow containers on deck, the fixed positioning cones and sockets for removable positioning cone are equipped on the hatch covers, therefore, it is important to set the removable positioning cones on the suitable sockets on the hatch covers.

The weight limitation of all hatch covers depends upon quality of steel used. This weight restriction per row is called stack weight. For example; 90T for 40 -foot container and 60T 20 -foot container; total weight of one stack should not exceed the

figures given by manufacturer. All containers, except reefer containers, must be stowed in such a manner as door to face aft to protect it from sea spray.

The pre-planning stowage position of containers are done ashore by the planner of the charterer, such activities does not detract from the Master's responsibility for the safety of his vessel. It is important, therefore, that Ship's Officers pay particular attention to the condition of containers coming aboard, noting the following:

1. Any damage to container that may harm the cargo inside.
2. Stowage position.
3. Labeling of dangerous goods.
4. The securing of cargo (e.g flat racks, break bulk, etc).
5. The declared documents of refrigerated container so that the correct temperature setting may be checked and or set.
6. The seal of container cargo – container cargo without seal should immediately be queried with shore staff; a fresh seal put on and a note made of the number and the circumstances; except for empty container.
7. Half door open container such as garlics, onions, squash, etc. should not be loaded on end slots. – the prevent damage by sea spray.

III.8.2 Stowage of Reefer Containers

- Power points in amount are fitted on-deck for the carriage of temperature-controlled containers. When a stowing reefer containers on- deck, the refrigerated units must always face the end of the bay at which the power points are located.
  This means that the door of 20-foot reefer containers might be facing either forward or aft-ward at some bays depending on the location of power sockets. In case of stowing 40-foot reefer containers the refrigerated units must always face upward.

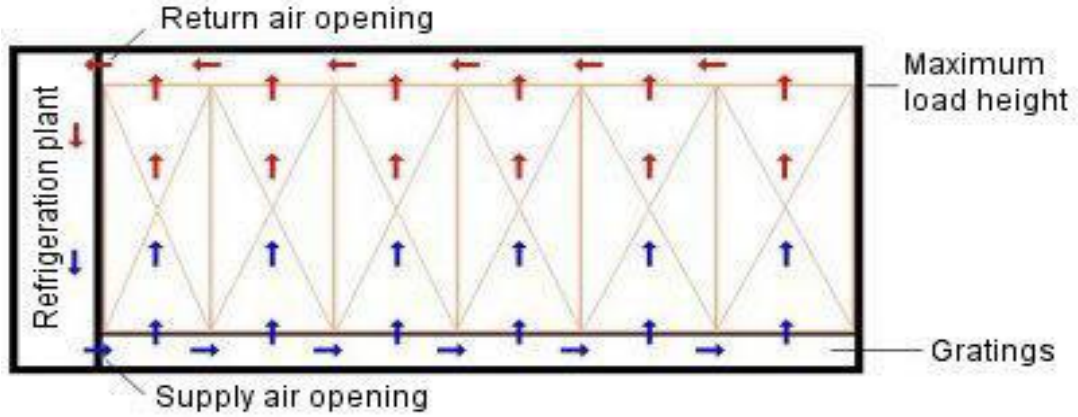
- In principle the reefer containers should not be stowed in the positions of Row or deck that will restrict the room for repairing the refrigerated unit, when required in emergency.

- When reefer containers are stowed, the electric power cable and monitoring cord of the refrigerated units should be connected respectively to the ship's receptacles immediately.

- Before discharging a reefer container, it must be checked whether the cable and cord are disconnected and put back duly into the cable box and ship's store respectively.

- Requirement for Monitoring Loaded Reefer Container in terminal.

When reefer containers loaded with cargo are stacked in the terminal area, electricity should be supplied immediately. After connecting plugs and receptacles, the following points are to be checked:



(a) Whether controller/recorder indicate the set temperature.
(b) Whether the temperature is normal, including frequency of defrost cycle.
(c) Wind the recorder, change the chart as required.
(Don't use an old chart, but place a new one on top.)
(d) Whether the compressor maintains the oil level and whether there is any leakage of oil.
(e) Whether the refrigerant maintains the normal level and whether there is any leakage of refrigerant.
(f) Whether operating light indicate appropriately.
(g) Whether power cables are not damaged and connections are properly made.
(h) Check unusual noise or over-heating.
(i) When working in chill condition, check the delivery air thermostat indicates the set temperature.
(j) Check whether the ventilator is set correctly for the commodity.
(k) Check voltage setting of the container when loading from/to the ship, and when receiving and delivering the container.
(l) Check whether voltage of the motor generator is set correctly.
(m) Check whether all access panels are properly closed.
Securing devices for removable units must be tight.

It is requested to check reefer unit the same procedure as mentioned above at least twice a day and also immediately before cutting off electricity supply for loading or delivery. Records of these checks should be entered in an appropriate form and sent to Shipping Company or its agent.
In the case of export (loading) reefer container, a copy of the above record is to be handed to the ship's master prior to the ship's sailing from the port.

- Reefer Container List

When the loading of reefer containers is completed, Terminal Operator should complete "Reefer Container List" and hand to the ship's Master before the departure.
Information to be entered in this form is as follows:
(a) Container Number
(b) Type of Container
(c) Commodity
(d) Required Temperature
(e) Container Gross Weight
(f) Destination Port
(g) Remarks

- Temperature Ranges

(a) Chilled - normally between -2°C to +13°C
(b) Frozen - normally between -7°C to -15°C
(c) Deep Frozen - normally between -18°C to -30°C

- Stowage Over height Containers

Over height containers mean containers, which are stuffed with cargo protruding from the top level of container (usually, Flat racks or Open top containers are utilized.)

These containers can only be stowed in the top tier of under deck. In this respect, clearance between underneath to the hatch cover and the top level of containers stowed in the top tier of under deck is important.

These clearances can be found on Operation Manual of the Vessel or the Stowage Bay Sheets of the Ship or cargo hold and hatch cover finish plan

In figure 33 we can see an extract from under deck clearance table between Container top and hatch cover (unit in cm).

Figure 33 these clearance are based on 8-foot 6 inches high Container stacked in the every row of container.

Bay		Row			
20’	40’	08 , 07	06 , 05	04 , 03	02 , 01
01		-	79	30	80
03		-	30	80	84
05		-	86	57	43
07		-	74	43	26
	10	73	57	26	17
	~~14~~	~~57~~	~~26~~	~~17~~	~~17~~
17		32	17	17	17
19		32	17	17	17
	22	26	17	17	17
	26	26	17	17	17
29		72	57	42	42
31		73	72	42	42
	34	73	19	73	73

From the above table we can see that in bay 10 row 1 & 2 we can not load high cube cargo (9.5 ft) for we need more than 30 cm clearance, the available clearance is only 17 cm in the said rows. Remember the table is based on standard height of 8.5 ft container.

III.8.3 Stowage of Over-Width Containers

Containers holding cargo, which protrudes, from the side of the container can be accepted in under deck stowage provided that the protrusion is within the limit of clearance between containers in the cells. (Only Flat rack can be used for such cargoes.)

The minimum athwart ship clearances between adjacent containers, and between containers and adjacent structures, are given in the under mentioned table.

In practice, the possible bulging (about 5cm) of containers in adjacent cells must be considered and the maximum acceptable protrusion will be less than 14.1 cm at one side.

Also it must be noted that there are eye-plates fixed on certain parts of the side tank wall and center bulkhead and the clearance between these eyes and containers will be less than the clearance on the above drawing. Therefore, these over width containers should not be stowed in cells adjacent to the side tanks wall of center bulkhead.

It must be noted that over width can only be allowed between the point 30 cm from one end and the point 30 cm from the other end on 20-foot or 40-foot containers.

Fig.34 Cell Guide Clearance Below Deck (extract only)

Actual cell guide clearance of each bays as follows:

Note: Permissible protraction for stowage of over width
Containers should be reduced 5.0 cm from actual clearance.

Clearance Table (cm)

Bay 20' 40'	Side tank wall	Row									Cen-ter bulk head
			07 08		05 06		03 04		01 02		
01		-	-	18.8		19.1		19.1		8.3	
03		-	-	18.8		19.1		19.1		8.3	
05		-	-	18.8		19.1		19.1		8.3	
07		-	-	18.8		19.1		19.1		8.3	
10		9.8		19.1		19.1		19.1		8.3	
14		9.8		19.1		19.1		19.1		8.3	
17		9.8		19.1		19.1		19.1		8.3	
19		9.8		19.1		19.1		19.1		8.3	
22		9.8		19.1		19.1		19.1		8.3	
26		9.8		19.1		19.1		19.1		8.3	
29		9.8		19.1		19.1		19.1		8.3	
31		9.8		19.1		19.1		19.1		8.3	
34		9.8		19.1		19.1		19.1		8.3	

III.8.4 Stowage of 45 foot container

1. Stacking position of 45 foot container must comply with design & construction of the vessel. i.e. clearance between fore and aft of hatches, lashing bridge, reefer stage or lighting equipment.
2. First priority of locations for stowing 45 container are exclusive 45 foot container slots, which should be confirmed by vessel general arrangement

3. when 45 foot containers will be stowed on 40 foot container:

- It is preferable that 40 foot container is standard size as far as possible.
- Stowage of laden 45 foot container should be restricted up to 3 tiers
- In order to avoid damage from the shipping seas to the bottom of 45 foot containers, stowage of 45 foot container on 40 foot containers at end slots must be avoided.

III.8.5 Stowage of Break Bulk and Flat racks

Cargoes that are too big or too heavy to be loaded onto flat rack containers can be loaded directly onto vessel. These are shown as BREAK BULK CARGOES

1. Loading on deck – Cargoes such as boats that are too big to be loaded into the cargo hold and are not harmed or damaged by water can be loaded directly on deck.
2. Loading in the Hold – Usually empty flat rack container are stacked in the second or 3rd tier from the top side-by-side in the cargo hold and cargo is loaded on top of these.

a. Using flatbeds – NYK has 40' x 8' flatbeds. Among these are some with 60 K/T capacity, which is world maximum. These can transport heavy cargoes that conventional Flat rack container cannot handle.
b. Heavy cargo that exceed the weight restriction (max. about 40 tons) on the gantry crane are handled by floating cranes. Since direct loading and direct delivery are the rules in such cases, loading and unloading are coordinated with the vessel's cargo handling schedule. Therefore it is necessary to fully coordinate matters with all concerned beforehand.

III.8.6 Stowage of Un-containerized Cargo

Un-containerized cargoes mean the direct loading cargoes (Break Bulk Cargoes) which are unable to pack into the container caused by the over width or overweight against their permissible loading weight. Usually Flat rack container will be used for such cargoes as floor

Un-containerized cargoes mean the direct loading cargoes (Break Bulk Cargoes) which are unable to pack into the container caused by the over width or overweight against their permissible loading weight. Usually Flat rack container will be used for such cargoes as floor. Cargoes and Flat rack containers must normally be stowed in the top tier position under deck respectively by crane and in this respect, cargoes

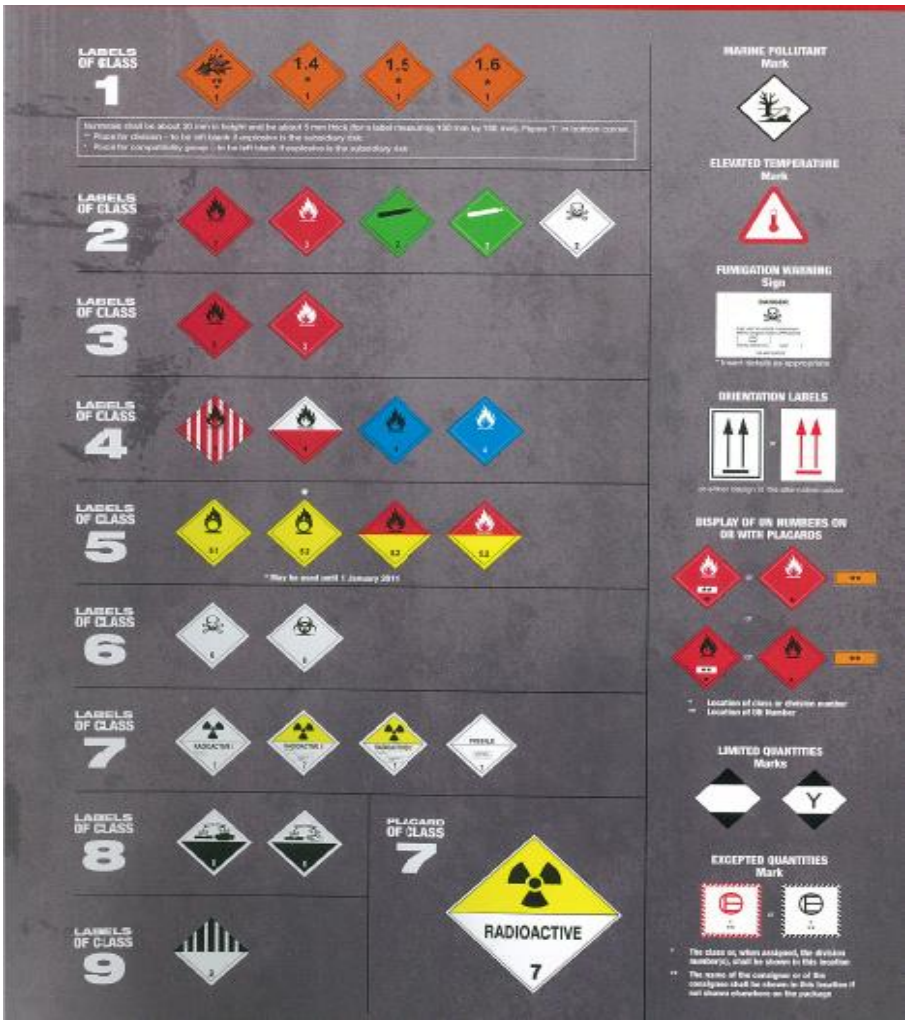
stowed onto flat rack containers directly, then secured tightly on Flat rack container or ship's eye-plate by using lashing materials.

For the purpose of the carriage above cargoes, the eye-plates for lashing are fitted in Bays designed for these types of cargo.

III.8.7 Stowage, segregation and classification of Hazardous Cargo

Most countries have their own legislation to provide for the safe carriage of Dangerous Goods. Most Dangerous Goods are defined as those classed in such Acts, Rules or Bye-Laws or having similar characteristics, properties or hazards.

The classification, packaging and stowage regulations for Dangerous Goods must be in accordance with IMDG Code any legislation which may be in force in **The country of origin, The country of destination, Any countries which are in transit, The country under whose flag the carrying vessel operates.**



CLASS 1 – EXPLOSIVES

Explosive substance – means a solid or liquid substance (or a mixture) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to surroundings. Pyrotechnic substances are included even when they do not evolve gases.

Class 1 – Explosive substances or articles

(No. 1)
Divisions 1.1, 1.2 and 1.3
Symbol (exploding bomb): black. Background: orange. Figure '1' in bottom corner.

(No. 1.4)
Division 1.4

(No. 1.5)
Division 1.5

(No. 1.6)
Division 1.6

Background: orange. Figures: black. Numerals shall be about 30 mm in height and be about 5 mm thick (for a label measuring 100 mm × 100 mm). Figure '1' in bottom corner.
** Place for division – to be left blank if explosive is the subsidiary risk.
* Place for compatibility group – to be left blank if explosive is the subsidiary risk.

Explosive cargo stowed on deck must be carried as close to the vessels center line as practicable.

This cargo may not be stowed within 6 m (20 feet) from any fire, machinery exhaust, galley uptake, locker used for combustible stores or other potential source of ignition.

For more information regarding transport, stowage, segregation and packing, please refer to IMDG Code Vol. 1

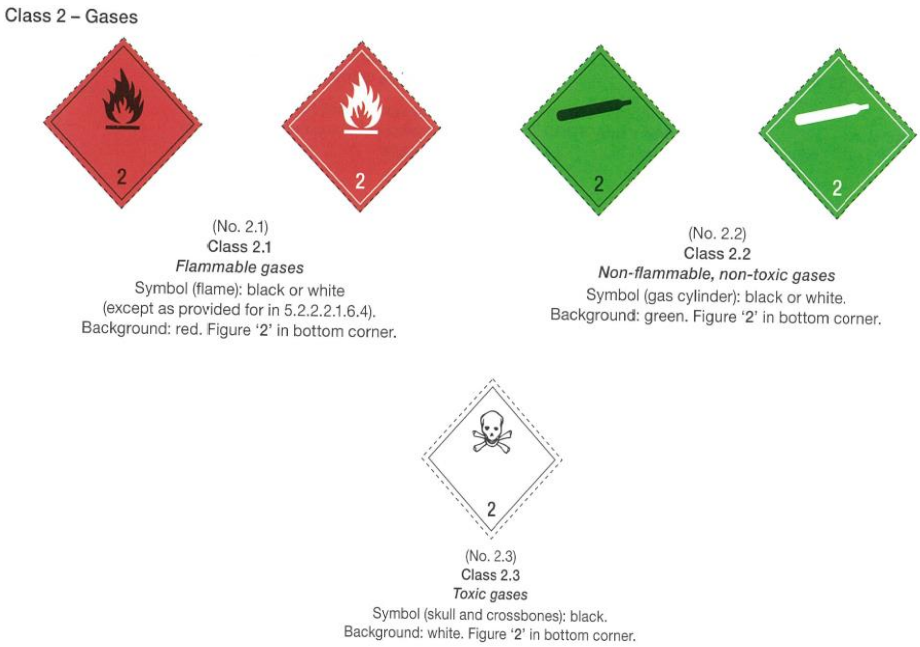
CLASS 2- GASES

A gas is a substance which:
- at 50 Cdeg has a vapour pressure greater than 300 kPa; or
- is completely gaseous at 20 Cdeg at a standard pressure of 101.3 kPa.

The transport condition of a gas is described according to its physical state:

- Compressed gas: when packed under pressure for transport is entirely gaseous at -50 Cdeg; are included all gases with a critical temperature less or equal to -50 Cdeg;
- Liquefied gas: when packed under pressure for transport is partially liquid above -50 Cdeg → high pressure liquefied gas (critical temperature -50 Cdeg ~ +65 Cdeg) and low pressure liquefied gas (critical temperature above +65 Cdeg);
- Refrigerated liquefied gas: when packed for transport is made partially liquid because of its low temperature;
- Dissolved gas: when packed under pressure for transport is dissolved in a liquid phase solvent.

- Gases are normally transported under pressure: from high pressure (compressed gas) to low pressure (refrigerated gas);
- Gases may be: flammable, non-flammable; toxic, non-toxic; supporters of combustion; corrosive; or may posses a combination of these properties simultaneously.



Any package containing Division 2.3 (Toxic gas) materials must be stowed separated from all foodstuff.

When Class 2 (compress gas) is stowed below deck, it must be stowed in a mechanical ventilated cargo space with no source of artificial heat and clear of living quarters.

For more information regarding transport, stowage, segregation and packing, please refer to IMDG Code Vol. 1

CLASS 3 – FLAMMABLE LIQUIDS

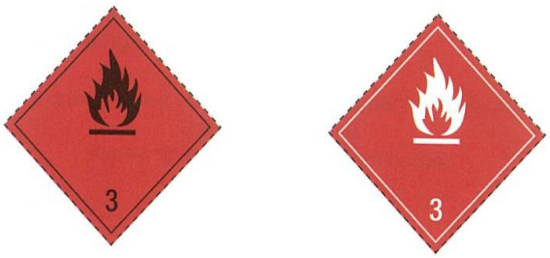
Flammable liquids are liquids, or mixture of liquids, or liquids containing solids in solutions or suspension (paints, varnish, lacquers, etc), which give off a flammable vapour at or below +60 Cdeg closed-cup test (or +65.6 Cdeg open-cup test), normally referred to as the "Flashpoint".

May give off flammable favors (particularly if of low flashpoint and therefore naturally volatile) which, if allowed to escape from the carrying receptacle, may:

- Form an explosive mixture with air.
- Become ignited by a spark or flame.
- Be toxic.

Stowage of IMO Class 3 within 6 meters of a bulkhead which forms a boundary or deck of a boiler room, engine room, coal bunker, galley or boiler room uptake is not permitted.

Class 3 – Flammable liquids



(No. 3)
Symbol (flame): black or white.
Background: red. Figure '3' in bottom corner.

For more information regarding transport, stowage, segregation and packing, please refer to IMDG Code Vol. 1

CLASS 4 – FLAMABLE SOLIDS

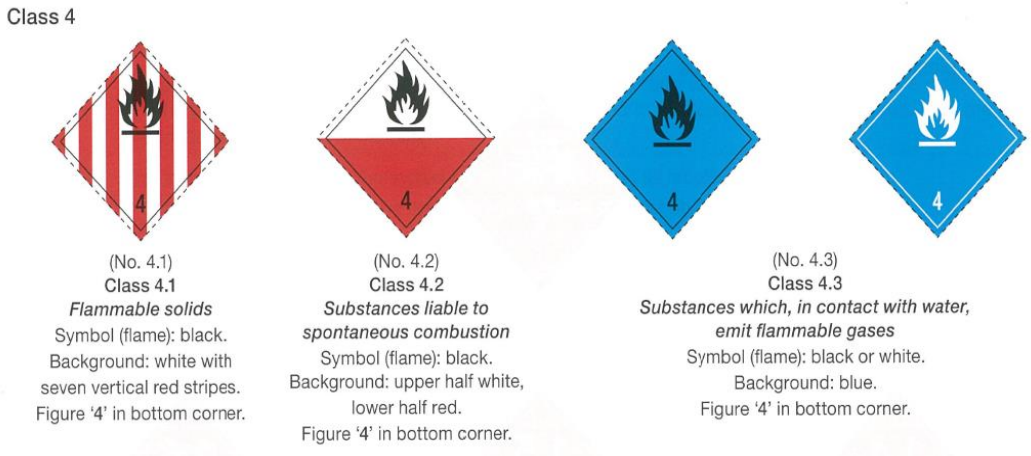
Class 4.1 – Flammable solids: solids which, under transport conditions, are readily combustible or may cause or contribute to fire through friction; self-reactive substances (solids and liquids) which are liable to undergo a strongly exothermic reaction; solid desensitized explosives which may explode of not diluted sufficiently.

Class 4.2 – Substances liable to spontaneous combustion: (solids and liquids) which are liable to spontaneous heating under normal transport conditions, or to heat up in contact with air, and being then liable to catch fire.

This class should be carefully watched for any rise in temperature. They may:

- Ignite immediately in contact with water (these substances are particularly dangerous)
- Be subject to self-heating if contaminated by oil and water (e.g vegetable fibers). They should be packed if so contaminated, since any self-heating may commence some days or even weeks later.

Class 4.3 – Substances which, in contact with water, emit flammable gases: (solids and liquids) which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.



(No. 4.1)
Class 4.1
Flammable solids
Symbol (flame): black.
Background: white with seven vertical red stripes.
Figure '4' in bottom corner.

(No. 4.2)
Class 4.2
Substances liable to spontaneous combustion
Symbol (flame): black.
Background: upper half white, lower half red.
Figure '4' in bottom corner.

(No. 4.3)
Class 4.3
Substances which, in contact with water, emit flammable gases
Symbol (flame): black or white.
Background: blue.
Figure '4' in bottom corner.

For more information regarding transport, stowage, segregation and packing, please refer to IMDG Code Vol. 1

CLASS 5 – OXIDIZING SUBSTANCES and ORGANIC PEROXIDES

Class 5.1 – oxidizing substances (solids and liquids): substances which, while themselves not necessarily combustible, may – generally by yielding oxygen, cause, or contribute to, the combustion of other material. Such substances may be contained in an article.

- Emit oxygen when involve in a fire, thus increasing its intensity
- If mixed with certain combustible materials, become easily ignited – sometimes even by friction or impact. (such substances may burn with explosive force).

- Violently react and evolve highly toxic gases if allowed to come into contact with strong liquid acids.
- Give off toxic gases if involve in a fire.

Class 5.2 – organic peroxides: substances which contain the bivalent -O-O- structure and may be considered derivates of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. Organic peroxides are thermally unstable substances which may undergo exothermic self-accelerating decomposition. In addition, they may have one or more of the following properties:
- be liable to explosive decomposition;
- burn rapidly;
- be sensitive to impact or friction;
- react dangerously with other substances;
- cause damage to eyes.

Class 5

(No. 5.1)
Class 5.1
Oxidizing substances
Symbol (flame over circle): black;
Background: yellow.
Figure '5.1' in bottom corner.

(No. 5.2)
Class 5.2
Organic peroxides
Symbol (flame): black or white;
Background: upper half red; lower half yellow;
Figure '5.2' in bottom corner

For more information regarding transport, stowage, segregation and packing, please refer to IMDG Code Vol. 1

CLASS 6 – TOXIC AND INFECTIOUS SUBSTANCES

Class 6.1 – Toxic (poisonous) substances: substances liable to cause death or serious injury or to harm human health if swallowed, or inhaled, or by skin contact.

Class 6.2 – Infectious substances: substances known or reasonably expected to contain pathogens – pathogens are micro-organism (including bacteria, viruses, parasites, fungi, etc) and other agents which can cause disease in human or animals.

(No. 6.1)
Class 6.1
Toxic substances
Symbol (skull and crossbones): black.
Background: white. Figure '6' in bottom corner.

(No. 6.2)
Class 6.2
Infectious substances
The lower half of the label may bear the inscriptions INFECTIOUS SUBSTANCE and
In case of damage or leakage immediately notify Public Health Authority.
Symbol (three crescents superimposed on a circle) and inscriptions: black.
Background: white. Figure '6' in bottom corner.

For more information regarding transport, stowage, segregation and packing, please refer to IMDG Code Vol. 1

CLASS 7 – RADIOACTIVE MATERIAL

Radioactive material means any material containing radionuclides where both, the activity concentration and the total activity in the consignment, exceeds the specified values as per IMDG Code (Vol.1, Chapter 2.7).

The care and handling of radio active substances varies widely. Very stringent precautions are taken to ensure the safe packaging of such substances and these are all within internally agreed standards. All relevant National and Port Regulations should be carefully studied before shipping radioactive substances.

For more information regarding transport, stowage, segregation and packing, please refer to IMDG Code Vol. 1

Class 7 – Radioactive material

(No. 7A)
Category I – White

Symbol (trefoil): black.
Background: white.
Text (mandatory): black in lower half of label:
RADIOACTIVE
CONTENTS ...
ACTIVITY ...
One red bar shall follow the word RADIOACTIVE.
Figure '7' in bottom corner.

(No. 7B)
Category II – Yellow

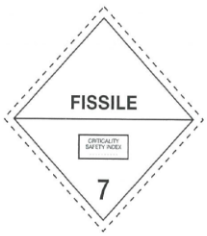
(No. 7C)
Category III – Yellow

Symbol (trefoil): black.
Background: upper half yellow with white border, lower half white.
Text (mandatory): black in lower half of label:
RADIOACTIVE
CONTENTS ...
ACTIVITY ...
In a black outlined box: TRANSPORT INDEX ...

Two red vertical bars shall follow the word RADIOACTIVE.

Three red vertical bars shall follow the word RADIOACTIVE.

Figure '7' in bottom corner.



(No. 7E)
Class 7 fissile material
Background: white.
Text (mandatory): black in upper half of label: FISSILE.
In a black outlined box in the lower half of the label: CRITICALITY SAFETY INDEX ...
Figure '7' in bottom corner.

CLASS 8 – CORROSIVE SUBSTANCES

Corrosive substances means substances which, by chemical reaction, will cause severe damage when in contact with living tissue or, in case of leakage, will materially damage, or even destroy, other goods or the means of transport.

The substances in this class are solids or liquids possessing, in their original state, the common property of being able to damage living tissue. They may:

- Be sufficiently volatile to evolve irritation to the nose and eyes.
- Be toxic.
- Produce toxic gas when decomposed by high temperatures.
- Cause poisoning if swallowed or their vapors inhaled. Some may penetrate the skin.

- Have destructive effect on materials such as metals and textiles, (i.e other cargo in the same container, or even the container itself, bulkheads of the ship when in bulk, etc).

Class 8 – Corrosive substances

(No. 8)
Symbol (liquids, spilling from two glass vessels and attacking a hand and a metal): black.
Background: upper half white;
lower half black with white border.
Figure '8' in bottom corner.*

* A class 8 label with a shaded hand may also be used.

For more information regarding transport, stowage, segregation and packing, please refer to IMDG Code Vol. 1

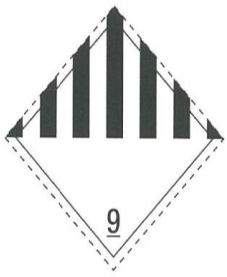
CLASS 9 – MISCELANEOUS DANGEROUS SUBSTANCES AND ARTICLES AND ENVIRONMENTALLY HAZARDOUS SUBSTANCES

Class 9 - are substances and articles which, during transport, present a danger not covered by other classes.

Class 9 substances and articles are subdivided as follows:

- Substances which, on inhalation as fine dust, may endanger health, such as asbestos.
- Substances evolving flammable vapours, such as polymeric beads, plastic moulding compound, etc.
- Lithium batteries.
- Life-saving appliances.
- Substances which may form dioxins in event of fire.
- Substances transported at high temperatures (above 100 Cdeg)
- Environmentally hazardous substances (solids and liquids) – Marine pollutants.
- Genetically modified microorganism (GMMOs) and organism (GMOs).
- Other substances

Class 9 – Miscellaneous dangerous substances and articles



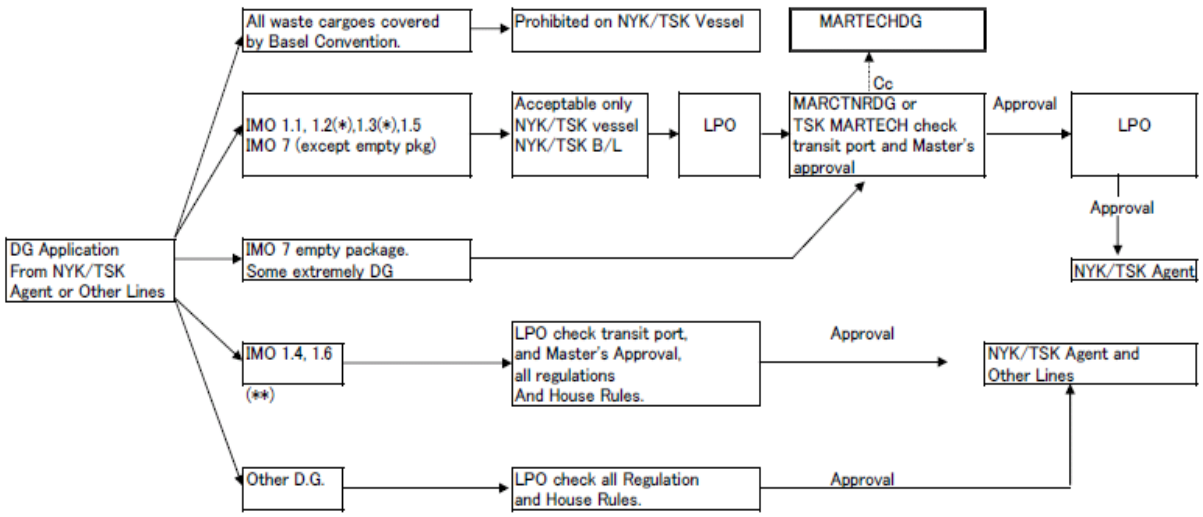
(No. 9)
Symbol (seven vertical stripes in upper half): black.
Background: white.
Figure '9' underlined in bottom corner.

For more information regarding transport, stowage, segregation and packing, please refer to IMDG Code Vol. 1

NYK Line's General Acceptance for Dangerous Goods: NYK will accept dangerous goods packed according to IMDG Code. When there is discrepancy between IMO and Local Rule, Local Rule will apply when the vessel calls in relevant ports.

See Appendix 2 for NYK Line Instructions regarding DG Cargo

See Appendix 3 for NYK Line Instructions regarding Reefer Cargo



Remarks (*) : Except for Fireworks (UN0334, 0335) which will be considered on a case by case basis.
(**) : When sending application message, send copy to MARCTNRDG and MARTECHDG. In case of TSK vessel, send copy to TSK MARTECH

Table of segregation of containers on board containerships with closed cargo holds

Segregation requirement	Vertical			Horizontal						
	Closed versus closed	Closed versus open	Open versus open		Closed versus closed		Closed versus open		Open versus open	
					On deck	Under deck	On deck	Under deck	On deck	Under deck
"Away from" .1	One on top of the other permitted	Open on top of closed permitted Otherwise as for "open versus open"	Not in the same vertical line unless segregated by a deck	Fore and aft	No restriction	No restriction	No restriction	No restriction	One container space	One container space or one bulkhead
				Athwartships	No restriction	No restriction	No restriction	No restriction	One container space	One container space
"Separated from" .2	Not in the same vertical line unless segregated by a deck	As for "open versus open"		Fore and aft	One container space	One container space or one bulkhead	One container space	One container space or one bulkhead	One container space	One bulkhead
				Athwartships	One container space	One container space	One container space	Two container spaces	Two container spaces	One bulkhead
"Separated by a complete compartment or hold from" .3				Fore and aft	One container space	One bulkhead	One container space	One bulkhead	Two container spaces	Two bulkheads
				Athwartships	Two container spaces	One bulkhead	Two container spaces	One bulkhead	Three container spaces	Two bulkheads
"Separated longitudinally by an intervening complete compartment or hold from" .4*	Prohibited			Fore and aft	Minimum horizontal distance of 24 m	One bulkhead and minimum horizontal distance of 24 m	Minimum horizontal distance of 24 m	Two bulkheads	Minimum horizontal distance of 24 m	Two bulkheads
				Athwartships	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited

* Containers not less than 6 m from intervening bulkhead.

Note: All bulkheads and decks shall be resistant to fire and liquids.

IMPORTANT: The crew on board must check the actual (physical) position of ALL DG and RFR containers on board, against Power Stow positions; any discrepancy must be reported and checked for proper segregation.

CLASS		1.1 1.2 1.5	1.3 1.6	1.4	2.1	2.2	2.3	3	4.1	4.2	4.3	5.1	5.2	6.1	6.2	7	8	9
Explosives	1.1, 1.2, 1.5	*	*	*	4	2	2	4	4	4	4	4	4	2	4	2	4	X
Explosives	1.3, 1.6	*	*	*	4	2	2	4	3	3	4	4	4	2	4	2	2	X
Explosives	1.4	*	*	*	2	1	1	2	2	2	2	2	2	X	4	2	2	X
Flammable gases	2.1	4	4	2	X	X	X	2	1	2	X	2	2	X	4	2	1	X
Non-toxic, non-flammable gases	2.2	2	2	1	X	X	X	1	X	1	X	X	1	X	2	1	X	X
Toxic gases	2.3	2	2	1	X	X	X	2	X	2	X	X	2	X	2	1	X	X
Flammable liquids	3	4	4	2	2	1	2	X	X	2	1	2	2	X	3	2	X	X
Flammable solids (including self-reactive substances and solid desensitized explosives)	4.1	4	3	2	1	X	X	X	X	1	X	1	2	X	3	2	1	X
Substances liable to spontaneous combustion	4.2	4	3	2	2	1	2	2	1	X	1	2	2	1	3	2	1	X
Substances which, in contact with water, emit flammable gases	4.3	4	4	2	X	X	X	1	X	1	X	2	2	X	2	2	1	X
Oxidizing substances (agents)	5.1	4	4	2	2	X	X	2	1	2	2	X	2	1	3	1	2	X
Organic peroxides	5.2	4	4	2	2	1	2	2	2	2	2	2	X	1	3	2	2	X
Toxic substances	6.1	2	2	X	X	X	X	X	X	1	X	1	1	X	1	X	X	X
Infectious substances	6.2	4	4	4	4	2	2	3	3	3	2	3	3	1	X	3	3	X
Radioactive material	7	2	2	2	2	1	1	2	2	2	2	1	2	X	3	X	2	X
Corrosive substances	8	4	2	2	1	X	X	X	1	1	1	2	2	X	3	2	X	X
Miscellaneous dangerous substances and articles	9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

The numbers and symbols in the table have the following meanings:

1 – "away from"

2 – "separated from"

3 – "separated by a complete compartment or hold from"

4 – "separated longitudinally by an intervening complete compartment or hold from"

X – the Dangerous Goods List has to be consulted to verify whether there are specific segregation provisions

* – see 7.2.7.1 of this chapter for the segregation provisions between class 1 substances or articles

III.9 Cargo Watch

III.9.1 General Precautions During Cargo Watch

(a) Control of ship's draft, trim, and list.
(b) Ample illumination of work place at night time.
(c) Achieving safety work environment such as setting up stanchions and ropes when hatch covers are opened etc.

(d) Check of stowage locations of special cargoes, dangerous goods, and reefers, in accordance with pre-stowage plan, and whether there is no damage to containers.
(e) Appropriate progress of cargo operations and estimation of completed time.
(f) Check container lashing in accordance with CSM (Cargo Securing Manual).
(g) Attendance at hatch cover during opening and closing ensure that hatch covers are free from any obstructions.
(h) When gantry crane is traveling, be careful with the possible contact with mast, funnel, gangways, etc.
(i) Any discrepancy between the bay plan and actual loading or discharging, the chief officer should immediately inform the shore planner, and obtain revised bay plan before ship's departure.

See Appendix 1 – Cargo Stowage

III.9.2 Cargo Work Documents

The Chief Officer shall, before departure, obtain the following cargo work documents from the terminal.

(a) Bay plan
(b) Dangerous Cargo List
(c) Reefer Container List
(d) Exception List
(e) Special Cargo List
(f) Others

The Chief Officer shall prepare a certificate stating that no member of the stevedores suffered any injuries while the ship was berthed and have it validated by both the shipping agents and stevedores.

III.9.3 Lashing Check

After leaving harbor, at the earliest opportunity, check the lashings of the containers and special cargoes. Tight any slacks or loosening in lashing wires and rods, etc. uniformly re-tighten their respective turn buckles. During the voyage, periodically check the lashings. Particularly before and after heavy weather, always make careful check of the lashings.

Lashing should be in accordance with the Class-approved "Cargo Securing Manual" on board the ship.

See Appendix 4 regarding Lashing check
See Appendix 5 regarding Special Cargo on board

IV. CONTAINER TERMS AND BASIC DEFINITIONS

A

Adjusting loading wall- Sheet lining which allows the dunnage bars to be fitted into the container at any point

ADR- European agreement concerning the international Carriage of Dangerous Goods by road.

Ambient temperature- The temperature of a substance surrounding a body. Thus the ambient temperature of a container holding a refrigerated cargo would be the temperature of the air to which it is exposed outside.

Anti nose-dive leg- Support provided at the front end of a container chassis used to support that end during loading operations i.e. for when the initial weight of the cargo or FLT is at the front and beyond, the point of balance.

A.S.A. - American Standards Association.

Axle loading- The total downward pressure exerted by a vehicle through any given axle. This may then be transmitted through two or four wheels.

B

Blades (chisel forks)- Extremely thin wide forks on a fork lift used for sliding beneath loads which are not on pallets.

Bonded goods- Dutiable goods upon which duty has not been paid i.e. goods in transit or warehoused pending customs clearance.

Box- American term for a container.

B.S.I.- British Standards Institution.

Bulk freight container- Any container, which by its own peculiar design i.e. roof loading hatches and door or front wall discharge hatch, will allow bulk handling of commodities.

Bulkhead- Sometimes used to denote the front wall i.e. opposite the doors of a container.

C

C.A. - Controlled atmosphere. Sometimes used in addition to temperature control to prolong the storage life of fruit.

Car pallet- Flat tray with corner posts for transporting cars on Container ships.

Cattle container- Partly open container equipped with rails, boxes and cribs for livestock transportation.

Celcure A- Trade name for a Copper Chrome Arsenate solution, used to treat timber against wood boring insects.

Cells - The guidance system enabling containers to be carried in a vertical line in the ship, each container supporting the one above it.

Cellular vessel Ship especially designed for carrying containers. The holds have vertical guides into which the containers are lowered to form secure stacks restrained at all four corners.

Centre of gravity - The point at which a load will balance or is in equilibrium.

C.F.S. - Container Freight Station. Other names: container base; consolidation depot; Depot - where parcels of cargo are grouped and packed into containers.

Chisel forks - See Blades.

C.K.D. - Cars knocked down. P.K.D. Part knocked down, i.e. cars partly assembled and packed into cases.

Clip-on-Units - Portable refrigeration units designed to clip on to insulated containers which normally rely on a central refrigeration system for their cold air supply.

Closed container - Container that can only be packed through one or more doors in the end or side walls.

Collapsible container - Container with the main parts hinged or removable so that its effective volume may be reduced for transporting in an empty condition.

Container freight station - See C.F.S.

Container head - Sometimes used to describe the end opposite to the doors.

Container load - Consignment which, in a container, fully occupies the internal capacity or conversely reaches maximum payload for that particular unit.

Container Part load - Consignment which does not occupy the full capacity of a container nor equals the maximum payload and will, therefore, allow the inclusion of another or other part loads.

Container pool - Agreement between various transport carriers and/or container leasing companies concerning the exchange of containers.

Corner casting - Hardware located on top and bottom of each container corner post used for handling and securing a container.

Corrugated container - Container with corrugated walls and ends which gives added strength.

Cryogenic - Using a freezing mixture to administer refrigeration.

Cushion tyres - Solid rubber tyres made of fairly soft rubber or composition.

C.W.E - (Customs) Cleared without examination.

D

Data plate - Plate affixed to a container giving details of gross and fare weights and external dimensions.

Demurrage - Compensation payable to a container or truck owner for the detention of his equipment beyond a certain time limit.

Depot -	See C.F.S.
Despatch bays -	The point from which containers are physically loaded or unloaded.
Devanning -	Term sometimes used to describe unpacking a container.
Dew point -	The temperature of a glass or metal object just cold enough to cause dew to appear upon it when exposed to that air.
Dock leveler -	A device to span the difference in level between the loading bank and the container floor. It also bridges the gap between the bank and the container.
Document holder -	May be located on the container door or front wall and sealed. Contains the customs certificate of container approval.
Dolly -	Set of wheels set under front of container to provide support when motive unit is disconnected.
Door-to-door -	Through transport of container and its contents from consignor to consignee.
Down-rated -	The amount by which the lifting capacity of a fork lift is reduced as a result of fitting attachments/increasing load centres, etc.
Down time -	The period during which equipment or piece of machinery is not operating or producing.
Dricon -	For the treatment of timber against wood boring insects.
Dry bulk container -	Container especially built for carrying grain, powder, sand, and other free flowing solids in bulk.
Dry freight -	Any dry cargo not requiring controlled temperature protection.
Dry ice -	Solid CO_2 (Carbon Dioxide).
D.T.I. -	Department of Trade and Industry.

Dunnage - Material (usually disposable) used to secure cargo or protect it from chafe. Also in some instances for fabricating temporary floors to allow spillage to drain away.

Dunnage bag - See "Inflatable Dunnage".

E

Emptying - Unpacking goods from containers.

F

Feeder ship - Container vessel used in short sea trade to serve ports at which deep sea container ships do not call.

Flash point - The temperature at which a liquid produces enough vapour to form an inflammable mixture with air.

Floor loading - The static and dynamic loads imposed on the floor by the payload and the wheels of handling equipment when used.

F.L.T. - Fork Lift Truck.

Foot print - The area of the tyre measured in square inches which actually comes into contact with the surface on which it is operating under a given load. For purposes of design of container floors, the footprint of a pneumatic and cushion tyre is estimated at 22 square inches.

Fork pockets- Recesses sometimes provided in the sides of a container for the entry of the forks of fork lift trucks.

F.C.R. - Forwarder's certificate of receipt; the forwarding agent's through document for goods, negotiable worldwide.

Four-way pallet - Pallet so constructed that the forks of a FLT may enter from any side.

Free lift - The distance the forks of a FLT can rise without the overall collapsed height of the mast increasing.

F.C.L. - Full Container Load. Usually loaded by the shipper for one consignee.

Full tilt container - Container with the full sides and roof, maybe also the ends, covered by tarpaulin, drop sides notwithstanding.

F.W.C. - Fully Loaded Weight and Capacity. A container ideally loaded to its fullest capacity of weight and volume.

G

g factor - In this book indicates the constant multiplying factors when considering the effects of acceleration on mass e.g. a force of 6g in relation to a 2 ton load would be equivalent to 12 tons.

Genoa corner fitting - A container corner fitting made to I.S.O. recommended design sometimes called "corner casting", and used by the lifting apparatus to grip the container by interlocking.

G.R.P. - Glass reinforced plastic.

Grabomatic - Fork Lift Truck attachment that will grip and lift drums, 2 at a time, by the top rims.

G.V.W. - Gross Vehicle Weight – the combined total weight of a vehicle and its container inclusive of prime mover.

Gross weight - Total weight of a container, that is the container, its payload, and any loose internal fittings.

Groupage - A service providing facilities for small consignments to be consolidated and transported in a container.

Groupage depot - Area where container contents can be consolidated or disseminated.

H

Half height - A container, open top with or without soft or hard cover, between 4 ft. and 4 ft. 3 ins. high.

Half tilt container - Container with larger part of sides, or sides and roof, covered by tarpaulin or similar material.

Hard top container - Closed container with roof that opens or lifts off.

Header bar - Beam or bar (usually above the end doors of on Open Top Container) which may be swung to one side or removed to improve access.

Heated container - Container built with insulated walls, doors, floor and roof, fitted or capable of being fitted with a heating appliance which is capable of raising and maintaining the temperature inside the container at a required level.

House-to-house - Same as Door-to-door.

House-to-pier - Container packed inland but unpacked at the pier of destination port.

Humidity - See relative humidity.

Hygroscopic substance - A substance which is capable, under the right conditions, of absorbing water vapour from the surrounding atmosphere. Such a substance will continue to absorb moisture until the vapour pressure of the absorbed water is equal to that of the water vapour in the air. It is then said to be in equilibrium. The equilibrium moisture content of the substance is dependent on both its temperature and the relative humidity and temperature of the surrounding air. If the moisture content is above the equilibrium value the substance will give up water until equilibrium conditions are reached.

I

I.M.C.O.- International Maritime Consultative Organisation. Not all countries are signatories to this organisation, but most of the major maritime nations are. It is the vehicle through which Dangerous Goods and other regulations can become internationally acceptable.

Inflatable Dunnage - Flexible bags positioned within the stow and inflated so that movement of cargo might be prevented. (See Appendix)

Inlets - Collapsible inlets made of rubber or synthetic materials, used in containers for the transport of liquids or free-flowing solids.

Insulated container - A container with the walls, roof, floor and doors insulated to reduce the effect of external temperature on the cargo.

Insulated tank container - Container frame holding one or more thermally insulated tanks for liquids.

Interface - Point at which two systems meet i.e. road transport and terminal – terminal and ship.

Internal unobstructed - Dimensions determined upon the greatest unobstructed dimension rectangular parallel edges that can be inscribed in the container, excluding corner fittings.

I.S.O. - International Standards Organisation.

J

Joinable containers - Containers whose dimensions and specifications are fixed so as to permit the loading of the containers on to a container-flat, so that the whole unit can be handled as one ISO container.

L

Lancashire flat - Type of flat with head-board at one end.

Land bridge - Descriptive term for an overland transit coming between two ocean passages during a container's journey from starting point to destination.

Latticed sided - Open or closed container with at least one side consisting container of elements with openings between them.

L.C.L. - Less than Container Load. That is, a container which is filled with consignments of cargo for more than one consignee or from more than shipper. A container may be packed with L.C.L. cargo (at a C.F.S.) for F.C.L. delivery to one consignee. It may be packed as an F.C.L. by one shipper for L.C.L. (unpacked at a C.F.S.)

delivery. Or, it may be packed as L.C.L. for L.C.L. delivery.

Lo-Lo - Load on load off. Describes ocean transport to differentiate from Ro-Ro.

L.P. gas - Liquid Petroleum Gas.

L.P.G. - Liquid Propane Gas. One type of fuel for mechanical handling equipment.

M

Mechanically - Closed container equipped with means of forced ventilated container air ventilation.

Methyl bromide - Fumigant used to kill infestation in various commodities. May occasion be used to fumigate in the container. An odourless and potentially dangerous poison. (See Appendix A)

Module - A volume described in multiples of similar measurements to that of the container. Altering a module can under some circumstances improve the utilisation of a container.

Multi-tank container - Container frame enclosing two or more separate tanks for liquids.

N

Net weight (payload) - Difference between the gross weight and the Tare weight of the container.

O

One-way lease - Lease of a container for the forward voyage only; the container being returned to lessor at or near destination.

Open container - A container with sides and/or ends of bars, grills, mesh or entirely open, with or without roof.

Open-side container - Doors, shutters or tarpaulin allowing one or both sides to open up completely.

Open top container - Container with tarpaulin roof or solid removable roof that can be loaded and unloaded from above.

Open topped reefer - Open topped container that is temporarily protected by a removable insulated cover.

Open wall container - Container without one or more side end walls but having at least a base, end structures and a top frame with corner castings.

Overheight cargo - Cargo loaded into an open-top container so that the level of the cargo rises above the normal level of the roof struts. This type of stowage can be accepted by certain operators under certain conditions.

P

Payload - Cargo weight/measurement on which freight is paid.

Pier-to-house - Transport of containers packed at port of loading and unpacked at an inland destination.

Pier-to-pier - Transport of containers packed at port of loading and unpacked at port of destination, i.e. use of container restricted to ship operation.

Piggy-back - Hauling trailer mounted containers, on railway flat cars. Sometimes known as TOFC (Trailer On Flat Car).

Pillow tanks - Collapsible inlets for transport of liquids, free-flowing solids etc. in containers.

Plain flat container - Container base and corner posts, loose stanchions or runners for sides and ends notwithstanding.

Plain van container - Another name for a General Purpose container.

Polarstream - The name for a liquid Nitrogen refrigeration system.

Polyurethane - Insulation which can be in "block" or "poured" or "frothed". Made up of minute cells containing Freon Gas.

Protim salts - For treatment of timber against wood boring insects. (See Appendix)

Push Pull - A fork lift truck attachment which, with the use of slip boards, allows the handling of unit loads without the need for pallets.

Q

Quoin - Shaped timber wedge used to secure barrels against movement.

R

Rating - Maximum permissible combined weight of the freight container and its contents.

Reefer (or refrigerated) - An insulated container with provision for controlling the container air space temperature within.

Relatively humidity - The ratio (expressed as percentage) of the amount of moisture in the air to that in saturated air at the same temperature.

Rolling - The side to side rocking movement of a ship.

Ro-Ro - Roll on Roll off. Type of ship than can take containers while still on their trailers and other rolling stock.

S

Satellite - A powered pallet truck remotely controlled from a fork lift truck and designed to handle unit loads in containers.

Scissor lift - Platform device, usually power operated, which can lift a load from ground, or any intermediate level, to container floor height.

Sheathing -	Materials forming outside roof, sides ends and doors. These act as restraints to help prevent the main frame from racking.
Shrink wrapping -	Heating treatment that shrinks an envelope of polythene or similar substance around several units, thus binding them into a single whole. May be used to secure items into small presentation packs, or secure packages on to p pallet.
Side door container -	Closed container with tear door and at least one side door.
Side loader -	A lift truck with the lifting equipment operating to one side – for handling containers.
Skeletal trailer -	A trailer constructed specifically for the safe carriage of I.S.O. containers.
Skids -	Battens filled beneath stillage, boxes or packages to raise them clear of the floor and allow easy access of fork lift trucks, slings, or other handling equipment.
Sling -	Endless rope wire or strap used for lifting cargo.
Sno flo -	Trade name for a liquid CO Refrigeration system.
Soft top container -	Container with a removable waterproof ‘tilt’. Also known as a Top-loader or Open-top.
Solo tank container -	Tank for liquids enclosed in container frame.
Special container -	Container specially designed and built for carrying a special cargo.
Steel container -	Usually has a ribbed configuration, or a double skin construction if used without secondary posts.
Straddle carrier -	Truck capable of lifting a container within its own framework.
Stripping -	American term sometimes used for unpacking a container.
Stuffing -	American term sometimes used for packing a container.

T

Tank container - Container especially built for transporting liquids and gases in bulk.

Tanolith C - Trade name for Copper Chrome Arsenate solution used in immunising timber against wood boring insects.

Tanolith U - A fluoride Chrome Arsenate Pentachlorophil solution used for immunising timber against wood boring insects.

Tare weight - Weight of a container without its cargo.

Terminal - The area where Containers are stacked ready to be loaded into the vessel; or are stacked immediately after discharge from the vessel.

Thermal conductivity - The quantity of heat (British Thermal Units) transferred through one inch of material per square foot of surface, per hour, per degree Fahrenheit. Generally referred to in terms of K-Factor, which is determined by the equation.

$$\text{K Factor} = \frac{\text{BTU Inch}}{\text{Sq. Ft., Hour F}}$$

Tilt - Canvas or other waterproof material used to cover or protect the interior of an open-top or open-sided container.

T.I.R. - Transports Internationaux par la Route. Road transport operating agreement teached by European governments and the USA for the international movement of goods by road. Generally remits sealed loads to cross national frontiers without inspection or tariff penalties.