

CARGO WORK: LOADING, DISCHARGING & STOWING CARGO

Basic terms

<ul style="list-style-type: none">• <i>damage to cargo</i>• <i>deterioration</i>• <i>liability to damage</i>• <i>decay</i>• <i>measurement</i>• <i>methods of packing</i>• <i>stowage</i>• <i>dunnaging</i>• <i>handling</i>• <i>stevedores</i>• <i>safety of the ship</i>	<ul style="list-style-type: none">• <i>stable and seaworthy ship</i>• <i>compartments</i>• <i>shifting</i>• <i>tainting</i>• <i>sweating</i>• <i>broaching of cargo</i>• <i>trim</i>• <i>draught marks</i>• <i>heel-list</i>• <i>load lines</i>
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Introduction

The aim of ship's officers and crewmembers on board should be to **prevent damage** or deterioration whilst the cargo is under their care and to **deliver** it, as far as possible, in as good condition and order as it was when received aboard. If unacquainted with a certain type of cargo you should ascertain as to its nature and any necessary precautions. Therefore, the Master and officers of all vessels require a good working knowledge of the various kinds of cargo they are likely to carry: their peculiar characteristics, liability to damage, decay, or deterioration, their measurement, and the usual methods of packing, loading and discharging, stowage, dunnaging, etc., as the Master is responsible for the safe loading of his vessel and the proper stowage of the cargo.

The actual handling of the cargo in loading and discharging is done by **stevedores**, who are experienced men appointed for this purpose when a vessel arrives at a port. This does not release the Master from the responsibility for the safety of the ship and cargo, and he must supervise the work of the stevedores for general safety.

Therefore, during stowage the first consideration must be given to **safety**, i.e. the cargo must be stowed so that the ship will be stable and seaworthy, and it must be secured in such a manner that it cannot shift if the vessel encounters bad weather.

The type of vessel, the cubic capacity of her compartments destined for the cargo and the appliances on board or on shore for loading or discharging, as well as the nature of the cargo, affect the question of how to stow the cargo in the best

possible manner. The ship must be made neither **stiff** nor too **tender**. The next consideration is for the safety of the cargo itself: it must not be damaged by shifting; certain commodities become easily tainted by others, water might find its way into the hold and condensation or sweating must be prevented. Valuable cargo may be stolen or broached.

Finally, the Chief Officer must bear in mind the various **destinations** of the goods the ship carries, and arrange things, as far as he can, to see that the cargo for a certain place can be lifted out without disturbing the other cargo. The Chief Officer must watch closely the **ship's stability** (i.e. what the ship's trim is or how she is sitting).

Since a ship is supported by fluid pressure she will incline in any direction according to the position of the weights placed on her.

The **trim**, therefore, is the angle that a ship is making, fore and aft, with the water. The levels are read by numbers painted on the ship's stem and stern. These are called draught marks. Another word is heel. This means a list or inclination from one side to another, caused by loading. The Chief Officer must watch the load lines. They are welded or punched on and then painted.

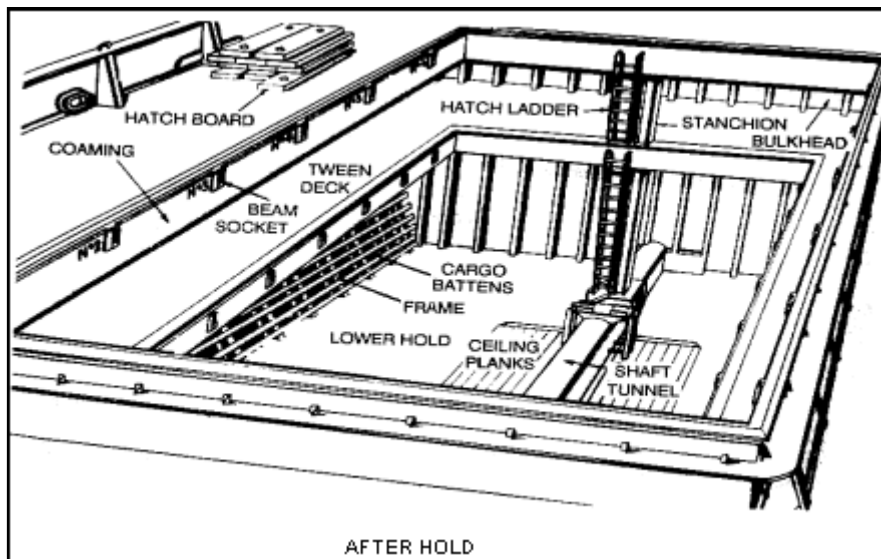
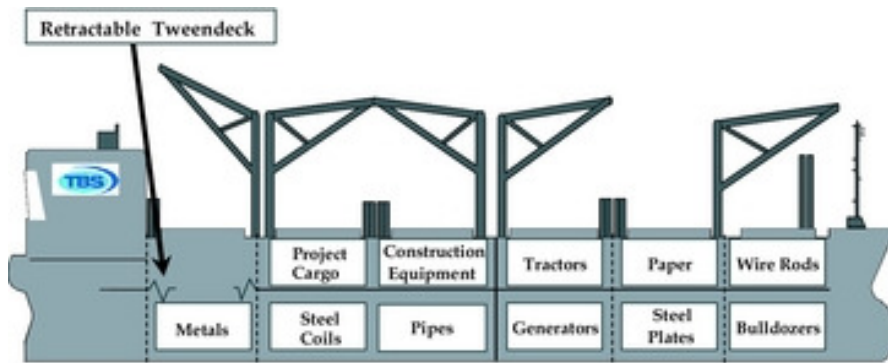
Loading, discharging, stowage, lashing, securing, etc. are the operations and activities specific for each type of ship and cargo and these will be discussed in the following text (adapted from www.solentwaters.co.uk).

GENERAL CARGO



Before containerisation, apart from bulk, most cargoes were handled as general cargoes. Even vehicles were handled as general cargo before the advent of vehicle carriers and ro-ro vessels. Most ships had their **own handling facilities** in the form of derricks. Now the majority of cargo is shipped in containers. Thus there is no need for ships to have their own cargo handling gear and they rely entirely on shore facilities. Much of the general cargo carried now is of a type that cannot be readily packed into containers. General cargo is loaded from the dock by traditional **dockside cranes** except where the weight precludes this. To speed up loading, much of the cargo is **unitised**. The process of unitising consists of strapping together individual items of cargo to form a single unit. Ships designed to carry **heavy cargoes** usually have their own cargo handling gear in the form of heavy duty derricks or cranes.

Most cargo vessels used to have **'tween decks** (in between decks) in the holds but not many cargo ships are fitted with these now.



REFRIGERATED CARGO

Apples, pears, kiwis, grapes and stonefruit (peaches, cherries etc.) are traditionally the main products that dominate this segment of **reefer** transportation. As many of us know from our own gardens, **deciduous fruits** (*bjelogoričan, listopadan*) are highly seasonal. This makes the deciduous trade very different from the banana trade, which is a 12-month business. Optimum transit temperatures for deciduous fruit vary greatly per type and variety, but mostly range between -1 and $+4^{\circ}\text{C}$. The ability of the fruit to resist pressure is indicative of its ripeness and can be measured with a penetrometer.



Stowing bananas in the hold

The appropriate carriage temperature for **bananas** is limited by the susceptibility to chilling injury. Generally a carriage temperature of +13,3°C is to be maintained during the sea voyage. Bananas are a sort of **perishable cargo** (*pokvarljiv teret*) and should arrive in a fresh, green unripe condition. If premature ripening takes place during the voyage, progressive ripening by emission of high amounts of ethylene can hardly be avoided. Bananas may overripe to failure of the vessel's **refrigeration system** during the voyage.

In comparison with the previously mentioned groups of cargo, **citrus fruit** (*južno voće, agrumi*), i.e. oranges, lemons, grapefruit and mandarins, are a relatively simple cargo to carry. A minor fluctuation in the hold temperature will not have disastrous effects. Successful shipments have even been carried out using **ventilation** alone, without refrigeration. Amongst the most familiar fungi (*glivice*) affecting citrus fruit are green and blue penicillium mould growth (shown to the right) which is accelerated by high storage temperatures.

Cargo vessels often carry **timber**, usually sawn construction material such as deals, battens, planks and boards. Vertical timber side members, or stanchions (*stupovi*) , are used to secure the cargo either side. The cargo is often piled high because timber is a relatively light cargo.



Timber carrier



Inflatable dunnage

Inflatable **dunnage** bags (*vreće za podlaganje/zaštitu tereta*) for use in securing sensitive cargo where traditional timber dunnage is inappropriate, for example with pulp cargoes where contamination by wood splinters is unacceptable.

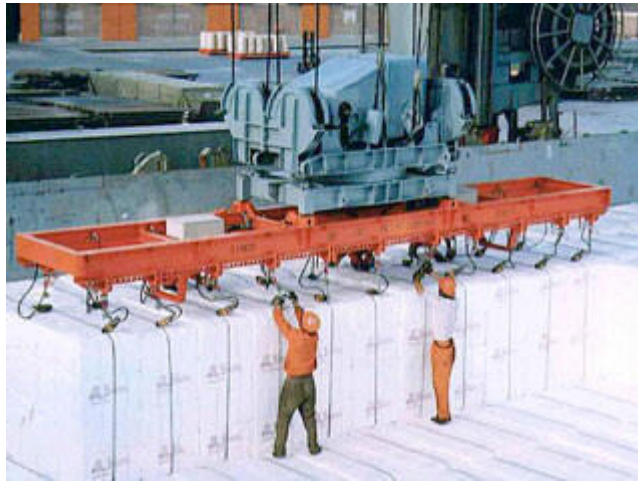
Vacuum clamps were primarily designed to lift newsprint, but are now also used with other types of reeled paper. A frame carrying suction pads is lowered onto the reels, and vacuum is applied. This allows the reels to be lifted without damage being inflicted.



Some cargoes are **unitised**. The process of unitising consists of strapping together individual bales or bundles into a unit. Unitised commodities include paper, pulp, plywood, hardboard, lumber, aluminium, lead, steel pipes and many more.



Pipe lifting frames are used to handle an increasing diversity of pipes. Various types of **pipe hooks** are utilised to match the shippers requirements for the varied types of pipe, some coated, some flanged, others **strapped** in bundles



Semi-Automatic **Lifting Frames** (beams) carry an air pressure system, operating on pneumatic release hooks. This means that once hooked up to the load, no further intervention is required to release the hooks as the crane driver has a control system in the crane cab. Used to lift a wide range of commodities including unitised pulp, timber, plywood, aluminium, copper, and lead, as well as non-unitised commodities such as slung timber, tissue reels and big bags of bulk commodities.



Lifting frame (beam)



Head clamps are used to lift **reels** (*koluti*) of **paper** where the quality of paper does not warrant the considerable investment in vacuum clamps, where local technology does not support the maintenance of these complex machines, or where reels are not suitable for core probe lifting.

Cargo Stowage Plan (*Plan krcanja*)

CONVENTIONAL CARGO VESSELS. Conventional cargo vessels are constructed with several hatch openings on the weather deck into the holds below. In the deck arrangement of a conventional cargo ship, cargo is lowered through the main deck hatch opening into one of the between deck levels in the hold. It is landed in the hatch square and moved forward, aft, or into the wings by machine or by hand, where it is stowed. The hatches are numbered in order from bow to stern and the various deck levels are normally designated as upper tween deck, lower tween deck, and hold.

BREAK-BULK VESSEL STOWAGE PLANS. The break-bulk vessel cargo stowage plan is a complete diagram of a vessel's cargo space showing the location (both on and below deck) of all cargo aboard ship.

a. **General.** The stowage plan looks like a vessel when viewed from the side. It contains information about cargo stowed in the vessel's hold, tween decks, and forecastle deck. The cargo shown in the tween decks is shown from the birds-eye view. Only the lower hold is shown from the side or profile view. The cargo stowage plan is prepared by the loading terminal after the ship has been loaded and is used to facilitate the subsequent loading and discharge of cargo at all ports along the voyage. The cargo stowage plan contains—

- A summary of cargo to be discharged at each port.
- A summary and location of heavy lifts.
- Information on the capacity and location of heavy lifts.
- Information on the capacity and location of the ship's boom.
- General information such as the location of special items of cargo (protected, controlled, sensitive, mail, high-value, and so forth).

Source: <http://www.globalsecurity.org/index.html>

LIQUID BULK CARGO – Oil Tankers



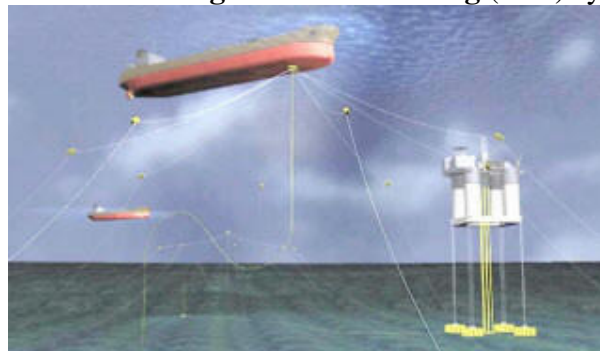
Many tankers now load from oilfields at sea. To do this they moor up (usually by the bow) to a **gantry**, **buoy** or **turret** (*toranj*). Tankers on the North Sea run

(often called **shuttle tankers**) have been specially designed to load at the bow from a **single point mooring** at sea.

Volatile organic compounds (VOCs) are emitted when loading and have to be removed, this being done with equipment on deck. It is estimated that 4 to 7 million of tons of cargo is lost due to VOC emission yearly versus 25,000 tons due to **spillage**. Economically as well environmentally it is unacceptable. Emissions produced by venting during loading and transit are in the range of 0.1 to 0.3 percent, depending on tanker design and cargo characteristics. Losses can reach two percent or more when the cargo has not been stripped of its most volatile components before loading aboard the tanker. **Double hull tankers** may produce higher VOC emission than **single hull tankers**, because of the **insulation** (*izolacija*) of the hot oil from the surrounding cooler temperatures. VOCs are condensed in a process plant and stored in separate tanks on the ship's deck.



Crude oil can be loaded into a tanker from a variety of **offshore facilities** or from a conventional **oil terminal** through the midship **manifold** (*glavni ventil, ventilska jedinica, 'manifold'*). M/T Navion Britannia shown above is equipped with the most advanced loading systems, combining a **Bow Loading** (BL) system and the ship's part of the **Submerged Turret Loading** (STL) system.



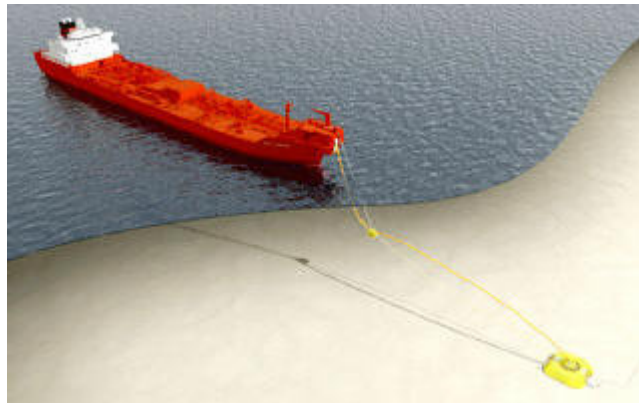
Submerged Turret Loading system

The basis of the Submerged Turret Loading system is the buoy moored to the seabed. The buoy is pulled into and secured in a mating cone in the bottom of the vessel and thus connecting the mooring system. Internal in the buoy is the **turret connection** (*toranj*) to the mooring and riser systems. The outer buoy hull can rotate freely with the vessel around the turret by means of internal turret bearings. Oil is transferred through an in-line swivel via the **loading manifold** to the **pipng system** of the vessel. Disconnected, the buoy will float in an equilibrium position ready for new connection.

The Floating turret system enables the vessel to be easily moored at the bow and oil transferred conventionally to the **midship manifold**.



single point mooring



Single anchor loading system

Floating production, storage and offloading systems (FPSO) can offer significant advantages over fixed production platforms particularly in remote offshore locations where deep water, strong ocean currents and harsh weather conditions may occur, or where export pipelines are difficult to install or uneconomic to run..

Single point mooring and loading



Turret & buoy



loading arm

Liquid cargo is nowadays usually transferred using an **articulated arm loading/discharge systems**, and groups of arms are often found on a **shore refineries** or on **offshore loading facilities**. It connects to the **tanker's manifold** usually located near the centre of the ship. As well as used for loading petroleum products, these **loading arms** (*'manige'*) are also used to load a wide range of chemicals. Some arms are designed to handle chemicals and gases at cryogenic temperatures such as liquefied natural gas, ethylene, refrigerated anhydrous ammonia and refrigerated LPG and LNG. The first marine loading arm came into operation in 1956, and before that **hoses** (*fleksibilne/elastične cijevi*) were manually connected using derricks and cranes.



Cargo is **offloaded** at the manifold, usually located amidships. All the tanks are connected to this point via **valves**. Modern vessels have the capability of simultaneously off loading several **grades** or types of cargo.



LNG loading arms.

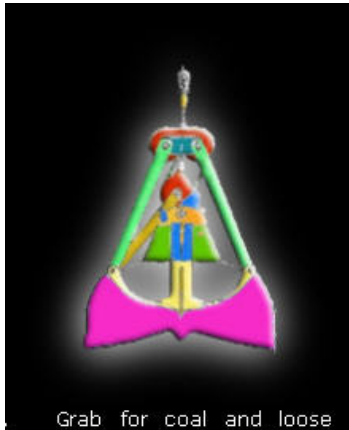


LNG loading arms.

Modern marine arm loading systems are **computer controlled** enabling the operator to have total control and indication of the arm parameters.

DRY BULK CARGO

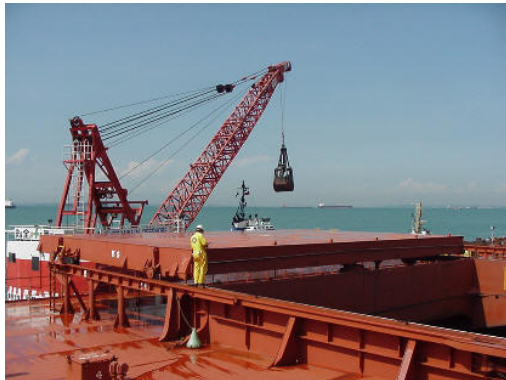
Loading with Grabs



Grab for coal and loose cargo



Loading into hopper/bunker



Bulkcarrier - Sliding hatchcover



Grab ship unloader with integrated hopper and conveyer belt.

Types of Grabs



Grab for iron ore



Belt conveyor

To maximise the unloading process **loose cargoes** are often loaded from a **stockpile** (*skladište rasutih tereta*) or stockyard into a **hopper** (*lijevak, bunker*). This is useful when loading into rail cars and lorries because the ship can continue

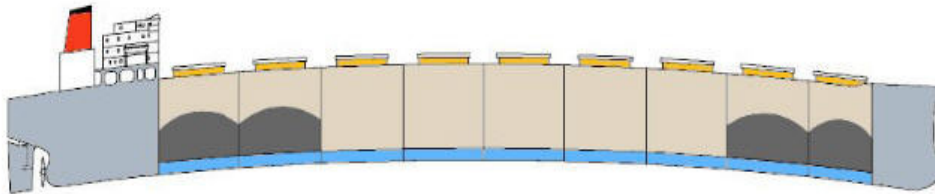
unloading even though there may not always be a lorry immediately available. Some hoppers have an **elevator** (*nagnuti transporter*) for depositing the cargo into heaps on the quay side for later onward transportation. Likewise the same machinery can be used in reverse to load cargo into the ships hold.

Besides loading the cargo, grabs can be used to even out the load. The ship was loaded using a **conveyer** which leaves heaps in the cargo. The tops of the heaps are removed and distributed around the hold to give an even top to the load.

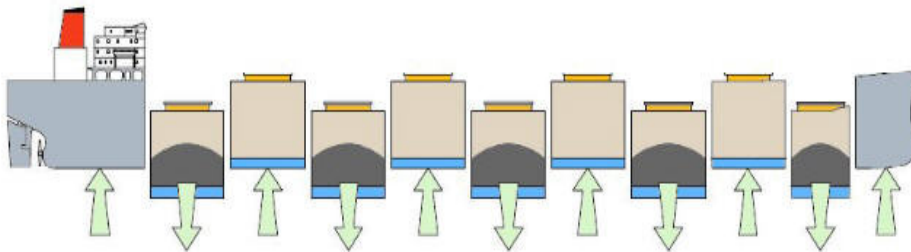


Removing powdered coal from the bottom of the hold.

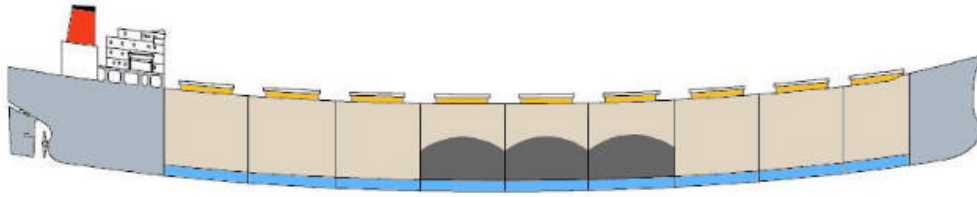
Bulk carriers: Loading Considerations



Sagging (*progib/anje*)

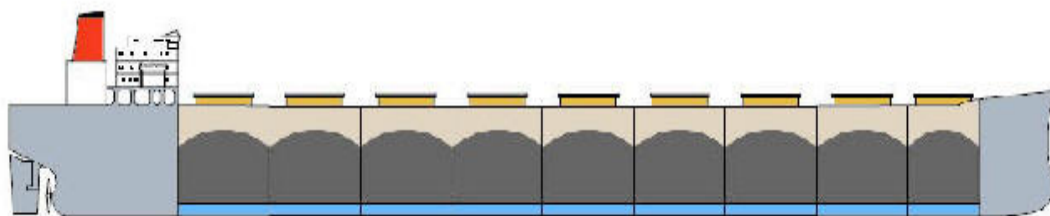


Shearing (*smicanje, smik*)

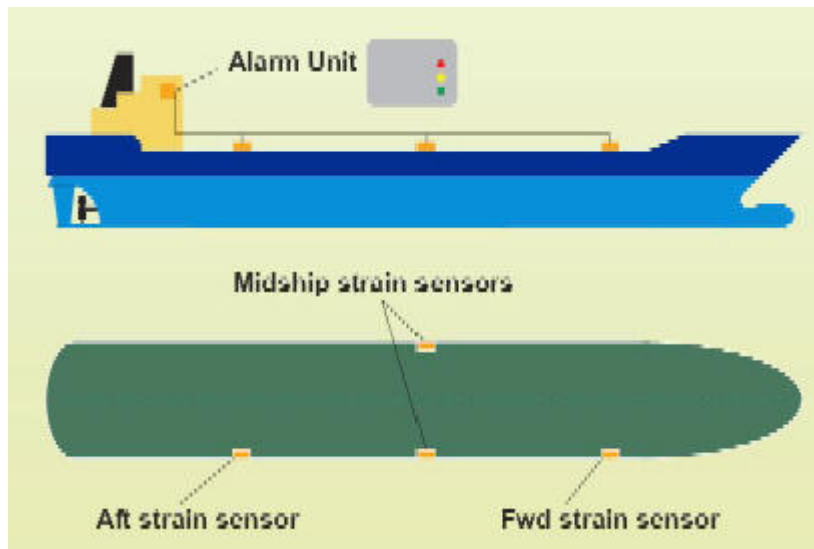


Hogging (pregib/anje)

As with any cargo ship it is important to load the cargo so that **stresses** in the ship remain at a minimum or at least evenly distributed. This is especially so with large bulk carriers. All ships are designed with limitations imposed upon their operability to ensure that the structural integrity is maintained. Therefore, exceeding these limitations may result in over-stressing of the ship's structure which may lead to catastrophic failure. The ship's approved **loading manual** provides a description of the operational loading conditions upon which the design of the hull structure has been based. The loading instrument provides a means to readily calculate the still water **shear forces** and **bending moments** (*savijanje*), in any load or ballast condition, and assess these values against the design limits. A ship's structure is designed to withstand the **static and dynamic loads** likely to be experienced by the ship throughout its service life. The loads acting on the hull structure when a ship is floating in still (calm) water are static loads, one of the major ones being created by the cargo. The main hull stresses set up by the cargo are **hogging** (*pregib*), **sagging** (*progib*) and **shearing** (*smik*). These can be minimised by evenly distributing the cargo - homogenous loading. Dynamic loads are those additional loads exerted on the ship's hull structure through the action of the waves and the effects of the resultant ship motions (i.e. acceleration forces, slamming and sloshing loads). Hogging and sagging forces are at a maximum when the wave length is equal to the length of the ship. **Sloshing loads** (*sila zapljuskivanja*) may be induced on the ship's internal structure through the movement of the fluids in tanks/holds whilst slamming of the bottom shell structure forward may occur due to emergence of the fore end of the ship from the sea in heavy weather. Cargo **over-loading** in individual hold spaces will increase the static stress levels in the ship's structure and reduce the strength capability of the structure to sustain the dynamic loads exerted in adverse sea conditions. In harbour, where the ship is in sheltered water and is subjected to reduced dynamic loads, the hull is permitted to carry a higher level of stress imposed by the static loads, so a certain amount of difference in the loading of each hold is allowable.



Homogenous loading.



Most modern bulkers have **strain** monitoring equipment (*mjerenje naprezanja*) so that hull stresses that cause hull fractures as above are minimised.

LOADING & UNLOADING CONTAINERS



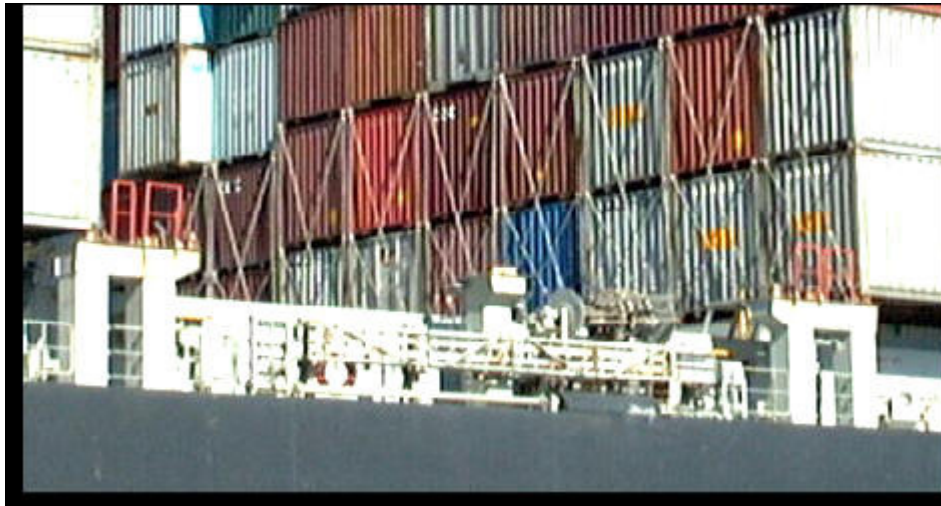
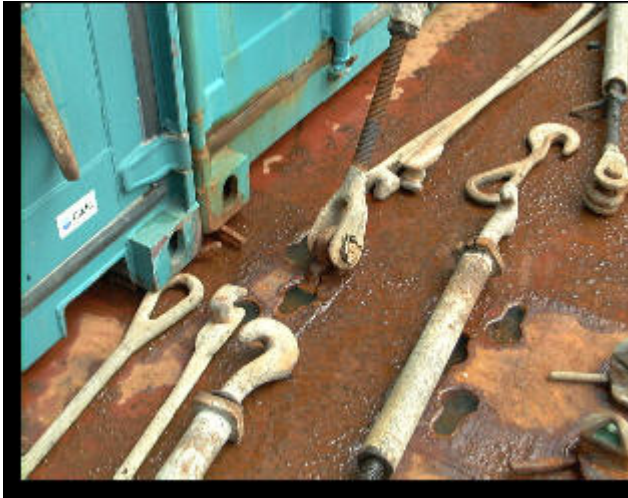
Gantry crane / Portainer / Container gantry

The preferred method of loading container vessels is with a rail mounted **gantry crane** (*mosna dizalica, obalni kontejnerski most*). The main arm or derrick boom can be raised when the vessel departs so as to clear the mast and superstructure.



Cell guides (*vodilice*) on the sides of the hold ensure that the containers *stack* properly.

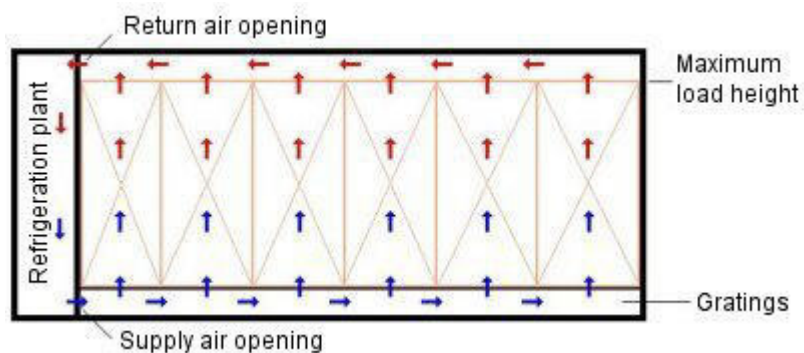
Containers are **secured** by cross bracing, with **turnbuckles** (*stezaljka*, '*škartoc*') and **lashing bars** (*motke*), and anchored to **slots** (*urez*) or **fitting** (*okov za hvatanje*) and **eye-pads** (*ušice*) on the deck:



Improper stowage (containers stowed six-high) or improper use of cargo handling equipment can cause heavy damage or collapse of container stack due deformation of bottom container.



The majority of **reefer** cargo (*ras/hladeni teret*) is now transported by containers. Containers with their own integral **cooling system** can be plugged into the ships electricity supply (connection power points).



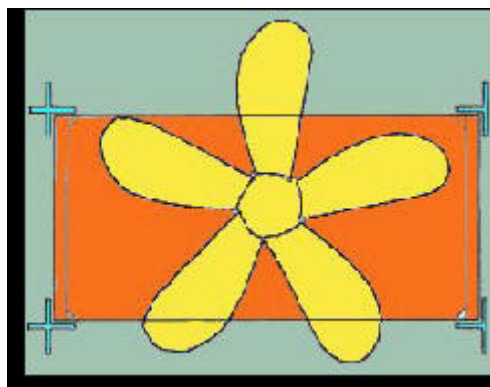
One of the most persistent problems experienced onboard containerships is **bad stowage**. This can take many different forms, but the most potentially damaging example occurs when heavyweight containers find their way into the upper **tiers** (*redovi po visini*) of container stacks on deck.

Loading with **mobile crane** (*autodizalica*) is used at ports that don't have the cargo throughput to justify a rail mounted gantry crane installation. It also has the advantage that it is not restricted to container cargoes.

Careful monitoring of the ships stability during loading operations is required or else the ship might **capsize**:



Out of gauge (*izvangabaritni*) cargo, that is cargo which is slightly higher or wider than will fit standard containers, can still be carried in **open top**, **openside** or **flatrack** containers. The latter type has higher **payload** ratings (*korisna nosivost*) which is often important.



Container Lashing

Containers are locked together using **twistlocks** (*zakretne brave*). They come in many variations but their purpose is to lock the container stack together at the corner posts.

With further development in the industry during the 1970s and 80s, the size of containerships continued to grow, with **9-high** stowage in holds and 4-high stowage on deck becoming commonplace and the industry began to wake up to the fact that standards in lashing were required. Ships were, at this stage, still supplied with loading computers that continued to calculate a ship's **stability**, **shear forces**, **bending** and, occasionally, **torsion moments** (*zakretni moment, torzija*). Very few had the capability to calculate dynamic loads on container frames and lashing systems caused by ship motions and wind forces. And so the lashings were still applied throughout the stow in accordance with the manufacturer's manual.

Cargo used to be **lost overboard** even though a properly designed securing system was in place and the cargo was **correctly stowed**. It became apparent that

there was a great deal of ignorance concerning the combined static and dynamic loads acting on a securing system when adverse weather was causing severe ship motions, particularly rolling. Today, large container ships are being built - known as the 'post-panamax' class (too large to transit the Panama Canal) - capable of carrying up to 8,500 TEUs (the most recent ones even up to 12,000), and small container ships down to coaster/feeder vessels of a few hundred TEUs. But in general terms, by a process of evolution, the lashing systems in use on both types of vessels are very similar. Both have adopted the **twistlock** and **lashing bar/turnbuckle** system..



*Turnbuckles and lashing rods.
Lashing Bridge*

Container position numbering

To enable the position of a container on a ship to be specified, a standard numbering system is used. Container **slot** positions aboard ship are expressed by three co-ordinates indicating :

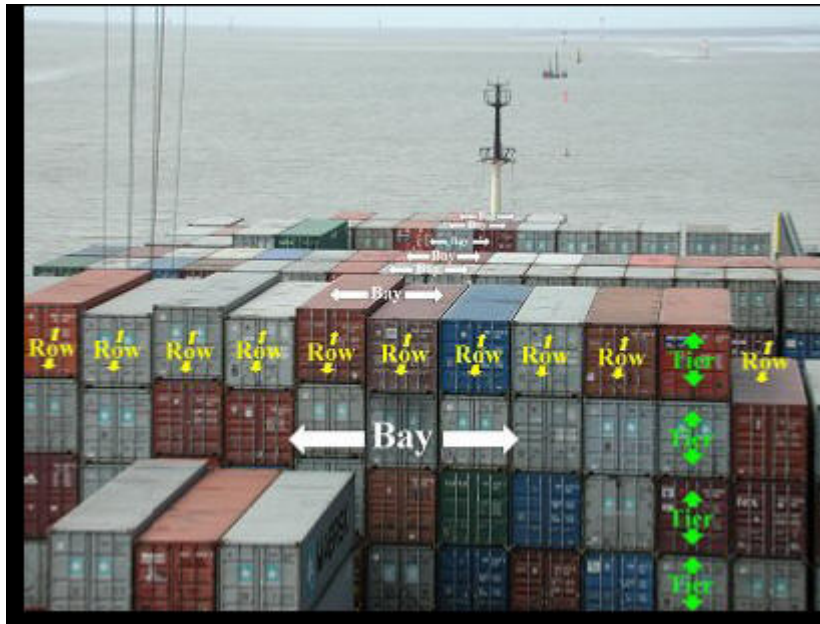
Bay ----- **Row** ----- **Tier**

Bays are numbered lengthwise from bow to stern with **odd** numbers for 20' containers and even numbers for 40' containers. The **even** number between two 20' containers is used to define 40' bays.

Rows (*poprečni vodoravni redovi*) are numbered from centreline to portside with even numbers and from centreline to starboard with odd numbers. The container row stowed on the centreline is marked 00.

Tiers. (*redovi po visini, uzdužni*). In underdeck stows, containers are numbered vertically downwards with even numbers from top to bottom. The bottom row will be 02, except where as a result of the hull contour, the bottom of an adjacent row is at a higher level. In case of two half heights the bottom ones are to be

numbered by an odd number. On deck stowage is indicated by code key 8 followed by an even number sequence.



Container loading and stowage

The **securing** and **lashing** of containers on ship's decks is a difficult operation in terms of the work environment. There are great problems during loading and discharge of containers. The **stevedores** who carry out this work, known as **riggers**, have to work on **container stacks** (*redovi složenih kontejnera*) which often are 13 metres high or more above the ship's deck. Safety arrangements are in some ports poor and the work frequently has to be performed in the dark, under windy and rainy or sometimes icy conditions. The difficulties are to a large extent due to the lashing equipment. The immense diversity of the devices used gives rise to great problems. Securing of containers is the responsibility of the ship's master, which can mean that there are large differences in the manner in which the operation is effected between individual vessels and shipping companies.

In the early years of **containerisation**, existing general cargo vessels were converted with the removal of tween decks and the addition of cell guides into the cargo holds. On deck, the hatch covers were strengthened and fittings added for lashings. However, the containers on deck were seldom stowed above one high and so were secured to the vessel by 'traditional' cargo ship methods. Often seen still trading today, are a few of the 'first generation' vessels built during the late sixties and early seventies. These ships were the first to be designed and built as pure container carriers. The holds and hatch covers were as wide as possible, and container posts were fitted on deck to facilitate loading of deck-stowed containers out to the ship's side.

For this generation of vessel, two systems of securing the cargo were common. One relied on the use of **twistlocks** in conjunction with lashing bars or chains, and the second relied on the use of **stacking cones** (*kutni okovi*) and **bridge pieces** (*mostići*) in conjunction with lashing bars or chains.

Gradually, due to the increased utilisation of differing height containers, the second method became redundant and it became common practice to use twistlocks throughout the stow. This method normally allowed containers to be **stacked three high** and, in some cases, four high if the fourth tier was light in weight or empty. For first generation vessels, computer technology was not available onboard to speedily calculate dynamic loads acting on container lashings and frames. The **shipboard computer** (if any) was only used to calculate stresses and stability for the ship itself. Therefore, the shipboard staff would ensure the vessel was lashed according to a **lashing plan** taken from the lashing equipment manufacturer's manual, which appeared to assume an ideal stow with respect to the distribution of weight in each stack (the homogenous stack).

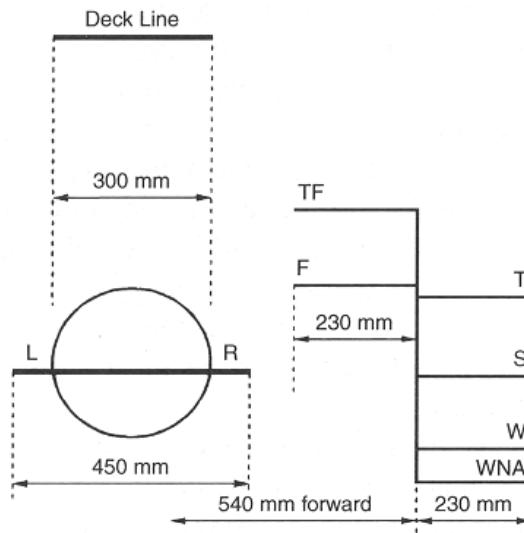
On post-panamax vessels - where among other features the vessel's large beam results in an unavoidable, relatively large GM (metacentric height), and 6-high stowage on deck is common - the modern practice is for the vessel to be fitted with a **lashing bridge**; a substantial steel structure running athwartships between each forty foot container bay. This allows the second and third tiers of containers to be secured to the bridge using lashing rods and turnbuckles, whilst the whole stow is secured throughout with twistlocks. The lashing bridge allows the anchoring points for each stack to be moved higher up the stack, which allows the lashings to be more effective in reducing the **tipping moments** acting on a stack when a vessel is rolling heavily. However, the practice of fitting the bridges between forty foot bays means that the twenty foot containers can only take advantage of the lashing bridges at one end. So, in effect, the twenty foot stacks have to revert to the limits of a conventional lashing system.. This is the case, because the practice of estimating the forces acting on a stack divides the container weight equally between each end of the container. So the weight in each twenty foot container is limited by the capacity of the lashing system at the container end, which does not have the advantage of being secured by a lashing bridge. On smaller vessels, the whole stow is also secured throughout with twistlocks, and the lowest three tiers are secured to the hatch cover or support post using the **lashing bar/turnbuckle** combination. However, since the mid 1980s, **naval architects** have produced computer programs to **calculate the dynamic loads** acting on container stacks. Such programs have been designed for use by ships' officers and container planners. On modern vessels, 5-high and 6-high stowage on deck is common; the use of onboard computers to check the dynamics of **the stow** in all weather conditions is vitally important for the safe carriage of the cargo.

Some useful terms concerning conventional cargo stowage

Dunnage (materijal za podlaganje tereta, zaštitni separacijski materijal, 'dunedž')

- is the material to protect cargo, and ensure good stowage. *Ceiling* is a surface of three-inch boards put on top of the tanks, below the lower hold, which is called *permanent dunnage*. Dunnage is used according to

Load Line and Draught



circumstances and consists of *baulks*, *planks*, and *quarterings* of timber, it also includes *matting* clothes and rope. One use of wood dunnage is to make sure that water from sweating/condensation will trickle into the bilges and to ensure that ventilation is efficient, and that fresh air reaches the cargo. *Cargo battens* are wood battens used in the hold to keep the cargo away from the ship's side and to allow the necessary through ventilation.

DBB – (*tavaloni, daske, letve*), deals, boards and battens.

Lockups – (*‘lokeri’*) are parts of the holds for cargoes of special value. They can be locked against pilfering.

Broken stowage (izgubljeni prostor) - means stowage space which cannot be used on account of it being too small.

Battening down (*vodonepropusno zatvaranje*) - is closing the hatch watertight.

Hatch coaming (*pražnica grotla*) - an upright steel wall, in the shape of a shallow box without top or bottom, is put around the entry to the hold, which helps to keep out water.

Hatchway beams (*sponje grotla*) - are made of steel and are laid thwartships.

Tarpaulins (*cerade*) - are large sheets of canvas, spread over the whole hatch. Their edges are turned inwards and forced hard against coaming with a long bar of steel called a batten (hence: battening down).

Shore gang (*lučka grupa*, “ruka”) - consists of a gang foreman, a hatchwayman, winchman, stevedores. **Tally clerk** - checks each part of the cargo.

Shifting boards (*razdjelne daske*) -are used to stop grain from shifting.

Homogeneous cargo - any roll cargo of equal stowage factor.

Cargo plan – (*plan krcanja / tereta*) shows longitudinal sections of the ship and the spaces reserved for the various items.

Leakage – (*curenje*) entrance or escaping of a fluid through a hole.

Drainage – (*drenaža, pražnjenje*) process of draining, to make gradually dry or empty.

Moisture – (*vlaga*) slight wetness, penetrating dampness.

Contamination – state of being stained or corrupted by contact.

Taint – (*kaljanje, prožimanje*) to impregnate with a tinge, assume the characteristics of another cargo stowed in the same hold.

Chafe – (*šteta tarenjem tereta o drugi teret*) wear away, rub, cause friction.

Vermin – (*štetočine*) noxious animals of small size as flies, lice, fleas, bedbugs, cockroaches, mice, rats, etc.

Wastage – loss by use, decay, evaporation or leakage.

Pilferage – (*krađa*) petty theft.

Package – (*kolet/o, jedinica gen. tereta*) cargo packaged as a single unit.

Parcel – departed part of cargo, especially oil, which is all of one nature or is for one consignee or port.

Consignment – (*pošiljka*) goods sent for shipment.

Shipment – (*pošiljka morem*) goods sent for shipment by sea.

Shipload – (*brodska pošiljka*) a full load for a ship.

IMO STANDARD MARINE COMMUNICATION PHRASES

IV-C - CARGO AND CARGO HANDLING

1.1.2 - Port/shipboard cargo handling gear and equipment

Are dockside/floating cranes available?

What is maximum reach of crane?

- Maximum reach of the crane: ... metres.

What is handling capacity of container crane/bridge?

- Handling capacity of container crane/bridge: ... containers per hour.

What is handling capacity of grain elevator/ore loader/... ?

What is pumping capacity of cargo pumps?

- Pumping capacity of cargo pumps: ... tonnes per hour.

Can you work with union purchase/in tandem?

- Yes, we can work with union purchase/in tandem.

Who will provide slings?

- Vessel/stevedores will provide slings.

Are can hooks/net slings/car slings/board slings/ ... available?

- Yes, can hooks/net slings/car slings/board slings/ ... available.

Are bob cats available for trimming?

- Yes, bob cats available for trimming.

Are stiffeners available?

- No, stiffeners not available.

1.1.3 - Preparing to load/unload

Prepare vessel for loading/unloading.

Unlock hatch covers.

Rig hatch rails in no. ... hold(s).

Give notice of readiness to load/unload by... UTC/local time.

Is cargo list available and complete?

- Yes, cargo list available and complete.

- No, cargo list not available and complete (yet).

- Cargo list available and complete in ... minutes.

Complete stowage plan.

Agree stowage plan with stevedores.

Make stability calculation.

Are goods ready to load?

- Yes, goods ready to load.

- No, goods not ready to load (yet).

- Goods ready to load in ... minutes/hours.

Are holds clean/dry/free of smell?

- Yes, holds clean/dry/free of smell.
- No, holds not clean/dry/free of smell (yet).
- Holds clean/dry/free of smell in ... minutes/hours.

Are safety arrangements in hold(s) operational?

- No, safety arrangements in hold(s) not operational (yet).
- Safety arrangements in hold(s) operational in ... minutes.

Cover bilge(s) with tarpaulins/wrapper/ ... before loading.

Are sufficient dunnage and mats available?

- Yes, sufficient dunnage and mats available.

Fill double bottom tank(s)/ballast tank(s) before loading heavy lifts.

Pump out ballast water.

What is maximum loading rate/unloading rate?

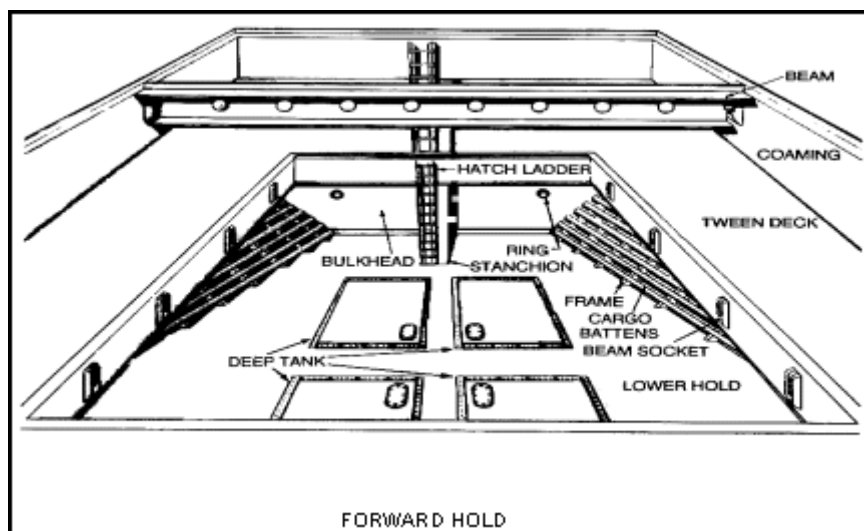
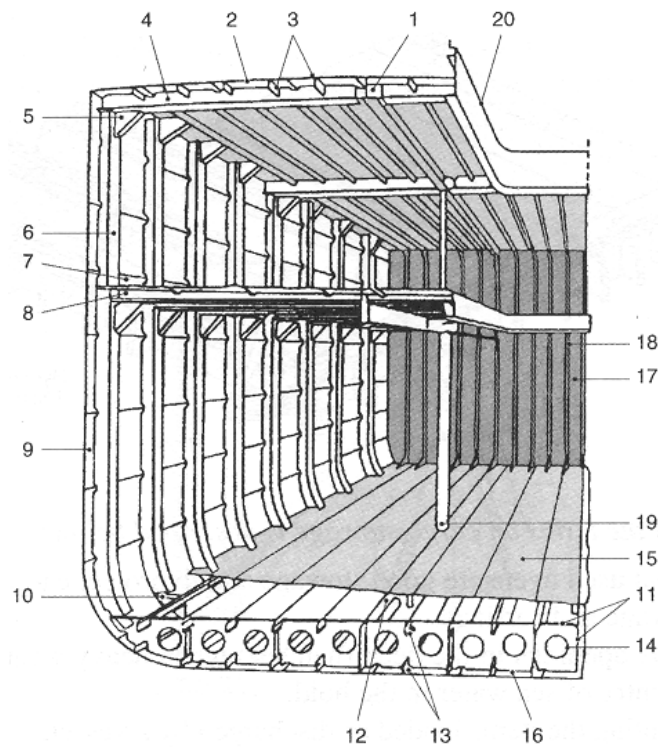
- Maximum loading rate/unloading rate ... tonnes per hour.

Do not exceed loading rate/unloading rate of ... tonnes per hour.

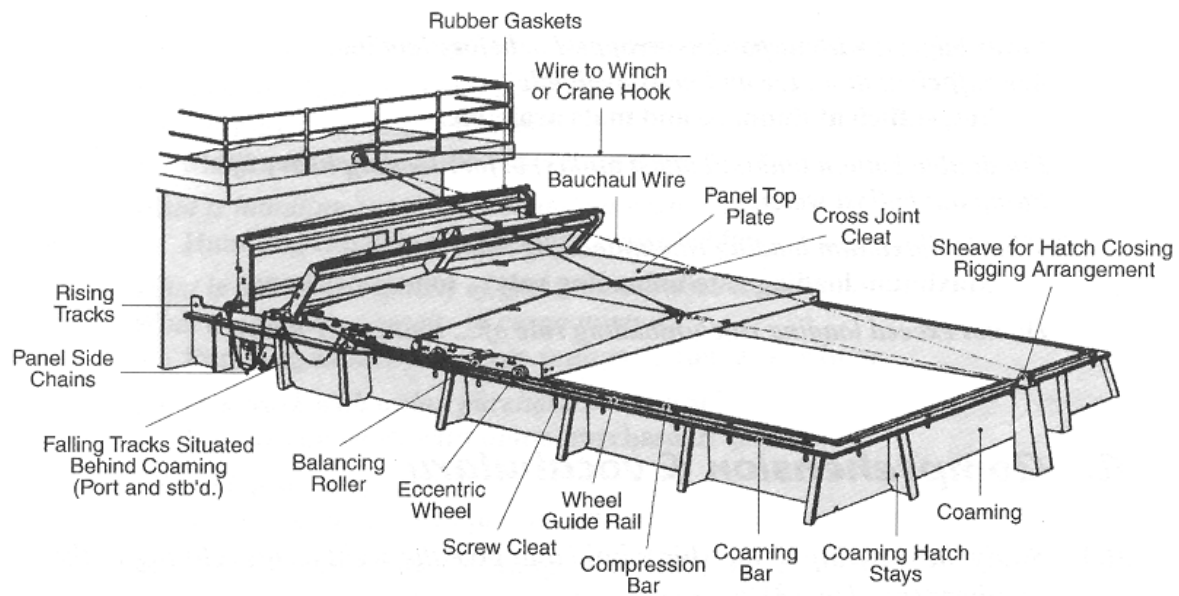
A. Comprehension & vocabulary

A.1 Study the drawing of the ship's hold and give the right terms relating to the numbers (see Unit 3).

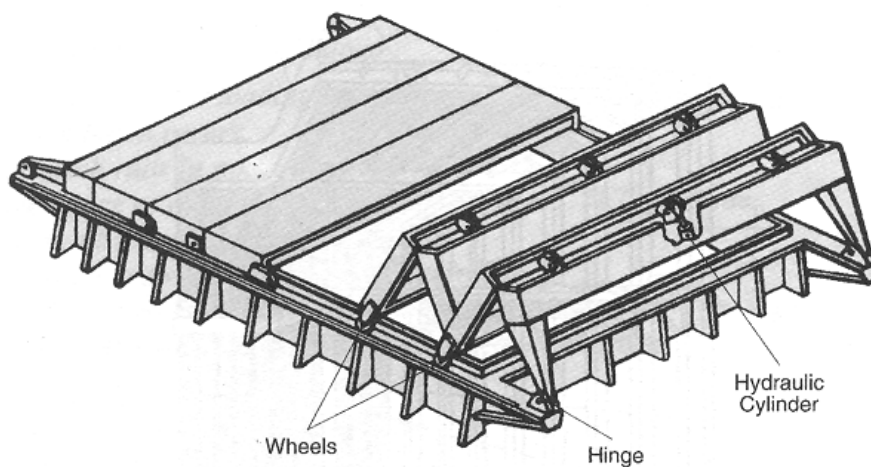
Design of a Ship's Hold (Cross Section)



A Single Pull Cover Showing the Principal Fittings



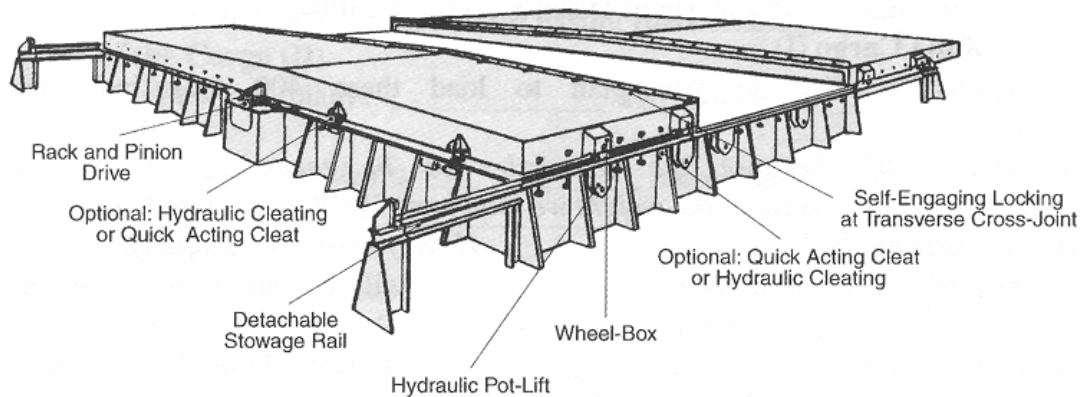
A Multi-Panel End-Folding Hydraulic Cover for Weather Deck Use



A.2 Which of the terms on cargo stowage is described below:

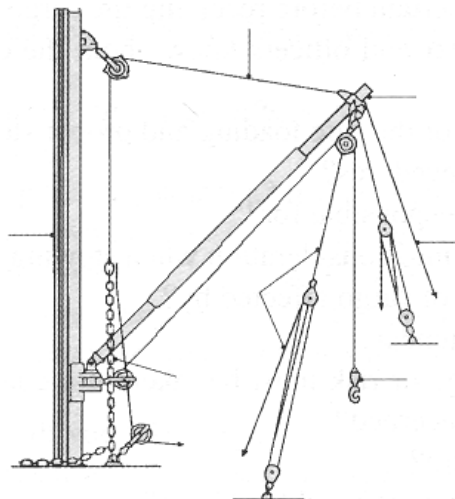
1. Any material used to ensure good stowage and to protect cargo from damage during stowage and carriage.
2. Securing the openings in the deck (hatches) when heavy weather is forecast to prevent entry of sea water in the hold.
3. Person counting the items loaded or discharged by a vessel.

*A Pair of Typical **Side-Rolling Covers** with Rack and Pinion Drive
And Hydraulic Lifting and Clearing*



4. Planks or boards erected in a hold to prevent the cargo (usually grain) from shifting.
5. Space in the hold or amongst the cargo that is impossible to fill with cargo and therefore wasted.
6. Loss of liquid quantity from a drum; may damage other cargo.
7. Process and result of one cargo being affected by certain characteristics of the other cargo.
8. A cargo occupying the entire ship's carrying capacity.
9. A single type of cargo intended for one port or one receiver.
10. A unit of cargo forming one individual box, case, bale, etc.

A.3 Give the English equivalents for the parts of a derrick.



A.4 Supply the missing terms:

• hatch • stern • sea • obstruction • way • basin • berth
• crane • hold • stability • port • mooring • pier • hold

The Master and the Agent Discussing the Loading/Discharge of the Cargo (I)

- AGENT - Why do you plan to load these 400 tons into two 1. _____ ?
MASTER – It's because the remainder to be taken in the second 2. _____ is twice the weight we load here. We' ll take it in to hold No. 3, thus measuring the best 3. _____. Have you anything against it?
- AGENT - I'm afraid that 4. _____ will be out of reach of our 5. _____ at the 6. _____.
MASTER – It's because of wrong 7. _____. I told the pilot about it. If they had originally moored us starboard side to the 8. _____, there would have been no difficulty at all.
- AGENT - I guess that was the only possible way to take you into this 9. _____. I seem to have found a 10. _____ out. We'll shift your vessel a bit further than usual with her 11. _____ a little projecting into the 12. _____.
MASTER - She may become an 13. _____ to other shipping in the basin.
- AGENT - There is no ship expected in the basin till late at night, and by this time you'll be through and at 14. _____.

A.6 Supply the missing term:

Before containerisation, apart from bulk, most cargoes were (1)_____ as general cargoes. Even vehicles were handled as general cargo before the advent of vehicle (2)_____ and ro-ro vessels. Most ships had their own handling (3)_____ in the form of derricks. Now the majority of cargo is shipped in (4)_____. Thus there is no need for ships to have their own cargo handling gear and they rely entirely on (5)_____ facilities. Much of the general (6)_____ carried now is of a type that cannot be readily packed into containers. General cargo is loaded from the dock by traditional dockside (7)_____ except where the weight precludes this. To speed up (8)_____, much of the cargo is unitised. The process of unitising consists of strapping together individual items of cargo to form a single (9)_____. Ships designed to carry heavy cargoes usually have their own cargo handling gear in the form of heavy duty (10)_____ or cranes. Most cargo vessels used to have '(11)_____ decks (in between decks) in the holds but not many cargo ships are fitted with these now.

A.7. Re-order (re-write) the chunks in the sentences shown in bold and italic to obtain sensible sentences. The first chunk is the beginning of the sentence:

Cargo Stowage Plan

CONVENTIONAL CARGO VESSELS. Conventional cargo vessels are constructed with several hatch openings on the weather deck into the

holds below. **In the deck arrangement • into one of the deck levels in the hold • cargo is lowered • of a conventional cargo ship • through the main deck hatch opening .** It is landed in the hatch square and moved forward, aft, or into the wings by machine or by hand, where it is stowed. **The hatches are numbered • lower tween deck, and hold • in order • from bow to stern • are normally designated as upper tween deck • and the various deck levels .**

BREAK-BULK VESSEL STOWAGE PLANS. The break-bulk vessel cargo stowage plan is a complete diagram of a vessel's cargo space showing the location (both on and below deck) of all cargo aboard ship.

a. General. The stowage plan looks like a vessel when viewed from the side. It contains information about cargo stowed in the vessel's hold, tween decks, and forecastle deck. Only the lower hold is shown from the side or profile view. **The cargo stowage plan • at all ports along the voyage • is prepared by the loading terminal • after the ship has been loaded • and is used to facilitate • the subsequent loading and discharge of cargo .**

The cargo stowage plan contains—

- A summary of cargo to be discharged at each port.
- A summary and location of heavy lifts.
- **Information on • and location of • the capacity • heavy lifts.**
- Information on the capacity and location of the ship's boom.
- General information such as the location of special items of cargo (protected, controlled, sensitive, mail, high-value, and so forth).

A.8 Supply the correct term from the brackets (hold, guides, bay, design, tier, stacking, stacked, cell, castings, terminal)

Containers are vertically constructed with vertical _____ (similar to an elevator shaft) within which the containers are _____ one above the other. The number of containers in a single _____ depends on the ship's depth. The bottom container takes the weight and force from those containers resting above it. The entire weight of the load is transmitted through corner _____ or posts on the containers to reinforced doubling plate on the tank top at the bottom of the _____. When _____ the containers more than the limit of six high in a cell, the loading terminal must provide movable supports off the vertical structure for the upper containers. Also, the _____ must always arrange container cells so that the long dimensions of the containers are fore and aft. The length of the cells varies from 20 feet to 40 feet, depending on the ship's _____ .

(2) A _____ is a single transverse (crosswise) row of cells. For smaller holds, there may be only one bay. In larger holds, there may be two bays—the forward bay and the aft bay.

(3) Each horizontal layer of containers is a _____. The loading terminal numbers the tiers from the bottom of the hold upward including the containers on deck.

A.9 Multiple-choice test. Underline the correct word:

Discharge

DISCHARGE PLANNING. During discharge, cargo handlers must _____ (*load, stow, unload, carry*) cargo from the vessel, segregate it, and place it aboard the mode of transportation that will move it to its destination. Cargo handlers should make maximum use of berthing (*load, space, place, discharge*). They should plan for the discharge and movement of cargo on _____ (*supply, receipt, transport, carriage*) of the ship's papers (stowage plan and ocean manifest) and cargo disposition (*orders, instructions, notes, requests*). Planning includes determining the following:

- Point of discharge—wharf or anchorage.
- Operating unit or units to be used—terminal service company, boat company, and so forth.
- Special equipment required for special or heavy _____ (*boxes, lifts, bundles, cartnos*).
- Priority of discharge, if any.
- Arrangements for terminal _____ (cleaning, passage, clearance, arrival) including transportation required, depot capability to receive, and need for further segregation.
- Cargo documentation and personnel required to accomplish it.

A.10 Match the parts of the sentences on the right with those on the left. The first one has been done for you in the center column.

DISCHARGE OVER WHARVES:

1 When wharf discharge is being planned,	1A	A cargo handlers should consider unloading the cargo onto the wharf or into lighters or a combination of both.
2 Plans include using ship's crew and ship's gear, but		B 100 feet of wharf length is available for each ship's hatch.
3 Cargo handlers should consider possible delays caused		C to ensure a minimum of 2 metres of water between the ship's keel and the bottom at low tide.
4 For planning purposes, cargo handlers should ensure that		D by weather, port strikes, and so forth.
5 The water depth alongside the wharf should be sufficient		E on the size and draft of the vessel to be berthed.
6 The water depth requirement will vary depending		F. may also include using other equipment and port labor.
7 Ship-to-lighter discharge may be required		G may be used for lighter discharge.
8 Practically any wharf		H to lighten heavily laden vessels in deep water anchorages so that they may be accommodated at shallow depths alongside berths for further discharge.

Key: 1A8G6E7H5C3D2F4B

A.11 Find the relevant parts of the text and answer the following questions:

1. What is the aim of the ship's personnel as regards the receiving, stowage, carriage and delivery of cargo?
2. What should you ascertain before receiving the cargo on board?
3. What must the Master and officers know about the cargo they are likely to carry?
4. Who is responsible for the safe loading and proper stowage of cargo? 5. What is the job of stevedores?
6. What is the Master responsible for?
7. What must be taken into consideration when stowing cargo?
8. What is the stowage of cargo affected by?
9. When is a ship stiff/tender?

10. What kind of damage or risk must be taken into consideration as far as the safety of cargo is concerned?
11. What is the ship's trim?
12. What are the draught marks and load lines?

A.12 Stowage of cargo on board: Discuss the picture below with your classmate



B. Grammar

B.1 Insert the missing verb using the right verb form (active or passive):

The Master and the Agent Discussing the Loading/Discharge of the Cargo (II)

MA.STER – When you (plan) 1. _____ we (manage) 2. _____ to finish loading?

- AGENT - It (not take) 3. _____ more than a few hours. Now everything (depend) 4. _____ on that vessel's completing and leaving berth.

MASTER - And if she (not leave) 5. _____ before midday?

- AGENT - I (not think) 6. _____ so, but if it (come) 7. _____ to the worst, we (have) 8. _____ to order overtime because all work in the port (stop) 9. _____ at 17.00 on Friday and (not resume) 10. _____ till 08.00 hours next Monday.

MASTER - If we (stay) 11. _____ here that long, the vessel (be) 12. _____ on demurrage, and the Charter Party (hold) 13. _____ the Shippers liable in such case. As to overtime the Carrier (not be obliged) 14. _____ to order it unless he (desire) 15. _____ to do so.

- AGENT - (be) 16. _____ aware of all those terms in the C/P, but I also (know) 17. _____ that the cost of demurrage (be) 18. _____ much higher than that of overtime.

B.2 Insert the missing prepositions and conjunctions:

MASTER: - Excuse me, Mr. Jones, but 1. _____ some ports they accept overtime orders only 2. _____ midday and refuse 3. _____ do any work 4. _____ such order is submitted later than that.

- AGENT - That's the custom here too. Don't worry, I'll remember it perfectly well.

MASTER - I have instructed my cargo officer 5. _____ have everything ready 6. _____ commence loading.

- AGENT - Will you require any dunnage? It'll cost you next 7. _____ nothing. We have a lot of logs down there 8. _____ the pier.

MASTER - Thank you, Mr. Jones, 9. _____ we have brought 10. _____ our own dunnage. The stevedores have only 11. _____ distribute it 12. _____ the lower holds so as not 13. _____ damage some shelves welded 14. _____ the sides and stanchions.

- AGENT., What hold will you take cargo 15. _____ ?

MASTER - I'll have to check it 16. _____ our cargo plan. We have made hatches 1 and 2 ready 17. _____ work any moment.

B.3 Pro-forms: The pronouns in the reading text appear in the following order:

Sentence No. 1 - it, it

Sentence No. 2 – you

Sentence No. 3 – they

Sentence No. 4 - who

Sentence No. 5 - this, he

Sentence No. 6 - it, it

Find the words these pro-forms refer to.

B.4 Supply the verb forming the brackets in the right place of the sentence

CONTAINER VESSEL STOWAGE PLAN.

a. The stowage plan for a container vessel is different from one used for break-bulk cargo since only the container, not the cargo, (*is identified*). On containerhips, all loose cargo is packaged into containers and the container itself is loaded aboard a vessel (*is loaded*). The stowage plan where to find a particular container (*indicates*). To find cargo within a container, personnel must to the shipping documents (*refer*). The cargo stowage plan tells where in the vessel the container (*is stowed*).

b. The ship's configuration basically the same for most containerhips (*is*). They are constructed to containers of standard size (*handle*). Although containers vary in size (20-, 35-, and 40-foot), today's container vessels these containers with little alteration in the container-handling gear (*can handle*). Compartments designed to stow containers differ considerably from the compartment to stow general cargo (*designed*). Container compartments do not have tween decks. Usually they do have two or three transverse (crosswise) hatches which serve one hold (*serve*). The transverse row of container cells is referred to as a bay (*referred*). A hatch on a container vessel just the same as the hatch on a general cargo ship (*is*). It is the opening through which cargo loaded or unloaded (*may be*). In most cases, there are two bays of containers per hold: the forward bay and the aft bay.

c. Three terms are important when containers aboard ship (*discussing*). Containers are stacked vertically in cells; the transverse row of cells are referred to as bays (*are referred*); and each layer of containers is referred to as a tier (see Figure). A thorough knowledge of these terms will enable personnel to locate specific containers aboard a containerhip.

B.5 Supply the missing article where necessary:

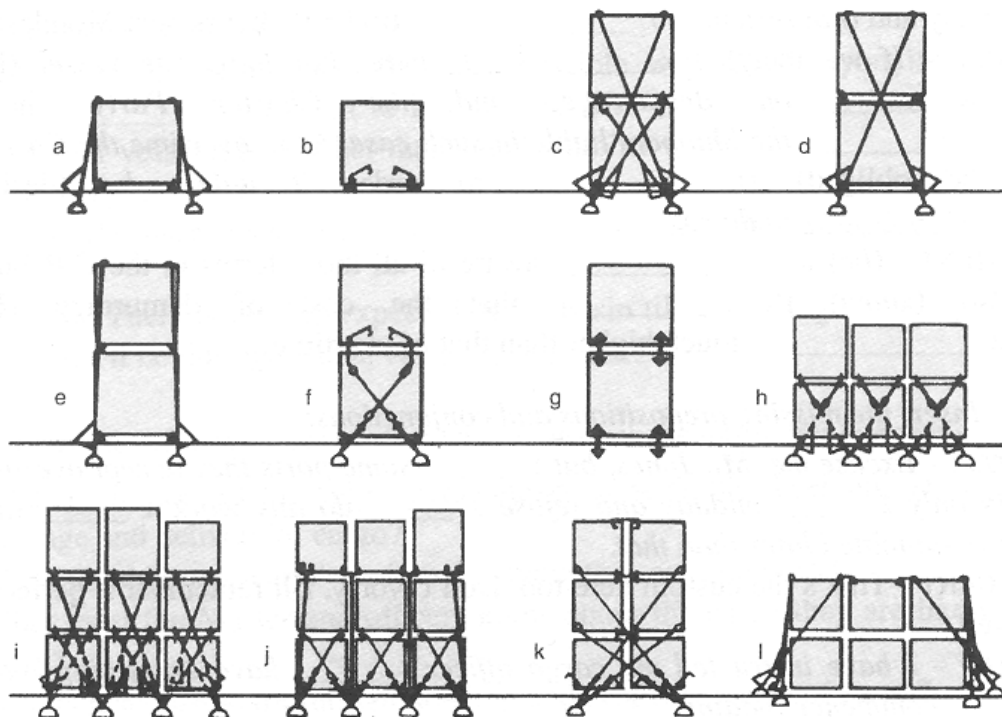
_____ designation of stowage locations used on container vessels is different from that for general cargo ships. The terms hold and tween deck, used for the general cargo ships, do not apply to _____ containerhips. The loading terminal can place _____ two or more container lengths in _____ single hold of a containerhip permitting

stowage of two 20-foot containers or one 40-foot container in ____ given opening. In containerships it is necessary to provide ____ precise stowage location for ____ each container. ____ designation system for a container ship is numerical.

Each container is stowed in ____ given bay, in ____ given cell, in ____ certain tier. In containerships that carry only one size containers, bay numbers can run consecutively from bow to stern in numerical order. Ships that carry both 20-foot and 40-foot containers distinguish between the two sizes by the way ____ bays are numbered. ____ numbering system used by the various steamship lines varies considerably; therefore, ____ cargo planner must be familiar with the system used on each vessel.

One numbering system adopted by some of the larger steamship lines provides not only a number for each stowage location, but also ____ size container being stowed.

Typical Container Lashing Arrangements



⇕ Twist Lock

┌┐ Bridge

✕ Bottlescrew

└┘ Chain + Lever

⤿ Hook