

Maritime English

Phrases and terminology in describing:

A. DAMAGE TO SHIP'S HULL / STRUCTURAL MEMBERS

B. SHIP DESIGN AND CONSTRUCTION

Sources:

- 17th INTERNATIONAL SHIP AND OFFSHORE STRUCTURES CONGRESS, 16-21 AUGUST 2009, SEOUL, KOREA, VOLUME 2, COMMITTEE V.1, DAMAGE ASSESSMENT, AFTER ACCIDENTAL EVENTS
- MAIB
- Nautical Institute
- www.Bestshippingnews.com
- [www sources for casualty reports, ship design and construction, etc.](#)

A. DAMAGE TO SHIP'S HULL

1. Types of damage to ship's hull - 1

(in collisions and allisions)

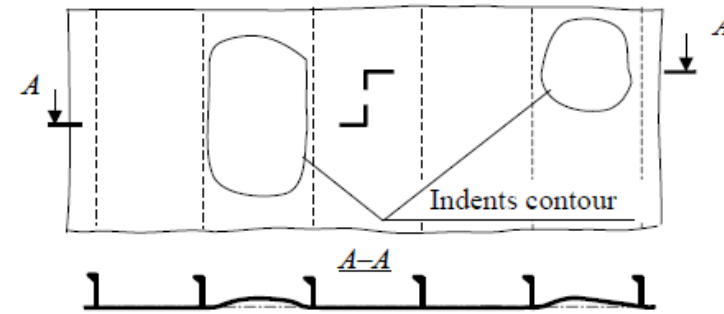
- **holes** (*rupe u trupu*) - a hollow space in the ship's hull with an opening on one side
- **rupture** of elements (*lom, prijelom*) - infringement of integrity of a hull structure element due to exhaustion of its plastic deformation limit,
- **cracks** (*pukotina, napuklina*) infringement of integrity of a hull structure element due to fatigue) or one-time overload in area of

2. Types of damage to ship's hull - 2

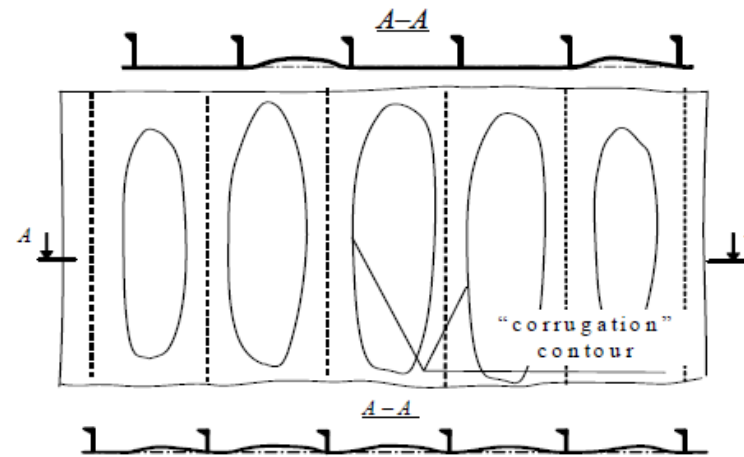
- residual deformations -

- **Corrugation** (permanent deflections of several adjacent areas of plate between stiffeners); (*naboranost limova između ukrepa, rebrasto oštećenje limova*)
- **Indentations, Indentions**, (local plate permanent deflection in some areas between stiffeners); (*nazubljeno oštećenje; nazubljeno udubljenje*)
- **Indents** (*udubljenje, udubina*) - deformations resulting from buckling (*izvijanje*), as well as different kinds of deformations that are observed after accident
- **Dents** (local permanent deflection of a panel, which includes the plate and supporting stiffeners); (*udubljenje limova i ukrepa*) **Bulges** (permanent deflection of the stiffener's web plate or the stiffener's attached plate) (*defleksija, izbočina, ispupčenje, oštećenje limova oko ukrepe*)
- **Gashes** (*urezotina, rezovi na trupu*)
 - As a result of the collision, the RIMAC took on water due to a hole in the area of the port side of cargo hold 5; however, this did not compromise her buoyancy.
 - The vessels collided, ripping %ba large hole%b in the ferry's engine room.
- **Scrapes** – (*ogrebotine*)

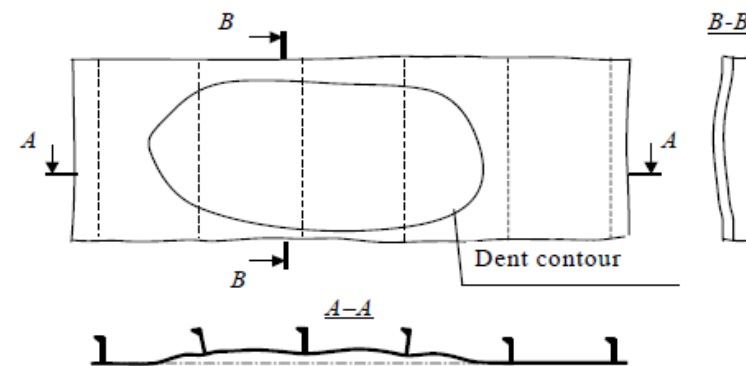
Indentation



Corrugation



Dent



Source: 17th INTERNATIONAL SHIP AND OFFSHORE STRUCTURES CONGRESS, 16-21 AUGUST 2009, SEOUL, KOREA, VOLUME 2, COMMITTEE V.1, DAMAGE ASSESSMENT, AFTER ACCIDENTAL EVENTS
https://books.google.hr/books/about/Proceedings_of_the_17th_International_Sh.html?id=nomwMwEACAAJ&redir_esc=y

Bulge

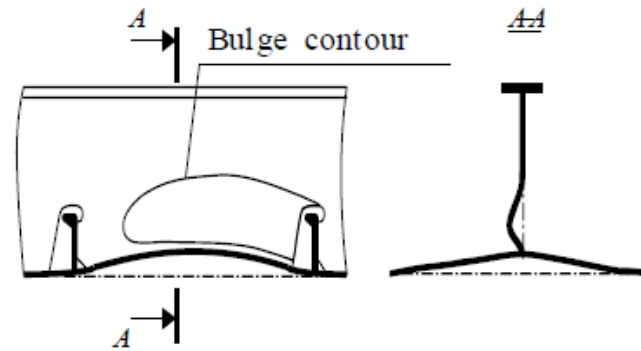


Figure 1: Types of permanent deformations

Source: 17th INTERNATIONAL SHIP AND OFFSHORE STRUCTURES CONGRESS, 16-21 AUGUST 2009, SEOUL, KOREA, VOLUME 2, COMMITTEE V.1, DAMAGE ASSESSMENT, AFTER ACCIDENTAL EVENTS
https://books.google.hr/books/about/Proceedings_of_the_17th_International_Sh.html?id=nomwMwEACAAJ&redir_esc=y

Holes - examples

(= a hollow space in something solid, as a ship's hull, with an opening on one side)

- A **hole** in starboard (StB), Fr. 92-106 (hold No 3), area 35 m² , length 7 m, height 5,5 m.
- A **hole** in a lower deck of hold No 3, width 1-2 m, length 6 m.
- A hole in way of strake No. Between frames No. ... and No. ...
- A cargo ship pierced a **hole** in the **hull** of a Cypriot container ship in Sunday's collision, causing the fuel leak.
- No one was injured in Sunday's collision, but it smashed a hole of several meters (yards) long in the **hull** of one of the ships, causing the spill,
- If there is any change in the sounding, there can be a **crack** or a **hole** in the tank
- The accident caused a **hole** several yards long in the hull of one of the ships, leading to an oil spillage
- Collision Rips **Hole** In USS destroyer
- In case of damaged ships due to collision, ships may have a **hole** on a side shell, ...
- A tanker has been **holed** in a clash with a fishing **vessel** off the port of ..
- Aframax tanker hit by fishing vessel, **holed**,
- A tanker **holed** in collision
- If the **holes** are not stopped the **ship** will take on more water, it will lose buoyancy, and may develop more list.
- A **hole** in transverse bulkhead Fr. 99 StB with area up to 4 m² .

Holes - examples

- a protruding fragment of ice ripped a **hole** in the ship's hull
- The collision tore **a hole** in the warship's waterline, flooding the ship's hold
- The MV „...." **has been cut** in two;
- During collision in 1965 of the dry-cargo ship „..." with a supertanker the former has **developed a hole** depth up to $\frac{2}{3} B$;
- Due to explosion on the tanker „...", the **depth of damage had reached 21 m.** (44% of breadth);
- Due to explosion on „...", **the hull had been damaged through** the whole breadth;
- the tanker „....", after a collision with the floating plant „.....", **had received a hole** depth up to $0,4 B$;
- the dry-cargo ship „.....", as a result of collision, **had developed a hole** depth up to $\frac{1}{2} B$;
- the dry-cargo ship „....", as a result of collision, **had developed a hole** depth up to $\frac{1}{2} B$.



Holed Carla Maersk in Dry Dock

Rupture (lom, prijelom)

Rupture of longitudinals and plates
(= *break, separate, tear, split*)

1. *Carlings of forecastle deck have **ruptures** through the whole height*
2. ***Rupture** of forward transverse coaming-carling from StB forecastle deck.*
3. *Top plate of StB coaming on the main deck in the area of hold No 1 has a **rupture** through the whole width.*
4. *Longitudinal stiffeners of main deck in area Fr. 96-97 (hold No. 3) **breaks** through the whole height.*
5. ***Rupture** of forecastle deck in area of coaming bracket*
6. *The heavy oil that leaked from the ship's **ruptured fuel tank** covered the West Vancouver shoreline*
7. ***Web rupture***



Cracks (puknuće, napukline)

in shell and framing

(= a very narrow gap between two things, eg. two hull plates, frames etc. or between two parts of a thing)

1. *A **crack** of longitudinal coaming in StB on the forecastle deck with length 1200 mm and 45 mm opening at coaming*
2. *A **crack** in StB carling on forecastle deck with length of 150 mm and opening of 3 mm.*
3. *If there is any change in the sounding, there can be a **crack** or a **hole** in the tank*



Out-of-plane **deflection** of longitudinal girders, **deformation** and **buckling** of longitudinals

- (DEFLECTION = the movement of a structure or structural member when subjected to a load)

- 1. StB coaming on forecastle deck **inclined** toward the hatch opening by 40 degrees, the top edge has left the vertical plane by 700 mm.*
- 2. Portside (PtS) coaming on forecastle deck **unwrapped** inside of the hatch by 10 degrees, the top edge **has left the vertical plane** by 110 mm.*
- 3. The top edge of the main deck StB coaming in the area of hold No. 2 **left the vertical plane** by 600 mm while the coaming **has inclined toward** the hatch opening by 40 degrees.*
- 4. The top edge of the main deck StB coaming in area of hold 2 **has left the vertical plane** by 110 mm while the coaming **has inclined toward** the hatch opening by 10 degrees.*

General deformations

(DEFORMATION = the changing of form or shape of a plate or structural member, as by stress)

- *The forecastle deck **received significant permanent deformations** inside the tweendeck; the **maximal deflection** is up to 200 mm.*
- *The main deck of hold No 3 is **deformed** in area of the damage hole, the maximal deflection is up to 300 mm*
- *large **plastic deformations and shape distortion of tubes** subjected to combined loads: lateral **indentation**, bending moment and axial force.*

Bulges (izbočine, defleksije)

- (= a shallow hole or cut in the surface of the shell plating or ship's plates developing after impact)
- (= a form of passive defence against naval torpedoes occasionally employed in warship construction for protection, esp. in war ships)
- *U.S. sailors inside reported a **bulge** on an inside wall, or bulkhead, of the ship, but the vessel did not take on water and no one was injured*
- *in ship collision ... load becomes large enough, buckling occurs and they develop local **bulges***
- *The outcome was a hull form with two **bulges***
- *the plate **bulges** out of the original plane of the girder and folds to both sides in turn*
- *side frames have buckled; **bulges** up to 200 mm*

Dents, indentations, scratches

(udubljenja, manja udubljenja, ogrebotine)

(DENT= a hollow in the surface of something which has been caused by hitting or pressing it) (Collins Dict)

(INDENTATION = a shallow hole or cut in the surface or edge of something)

- *The collision caused a 20-meter **dent** to the ship's port bow*
- *diagonal was **dented** and **distorted***
- *Ship collision and grounding represent significant potential incidents which may result in local **denting** and **sliding deformation***
- ***Minor dented damages** due to ship collision could be the cause of major concern...*
- *the cargo ship **scratched** on the port side and several **dents** on the side shell of the port*
- *Two types of **deformation modes** are identified, namely **local denting** and **sliding deformation***
- ***Denting** of web girders*
- ***Indentation** of a bare plate (a) before fracture, (b) after fracture*
- *The **deformation** mode of **local denting of web girders** is widely experienced during ship collision and grounding*
- *Shell plating is subjected to **lateral indentation***
- ***indentation** in the steel tube*

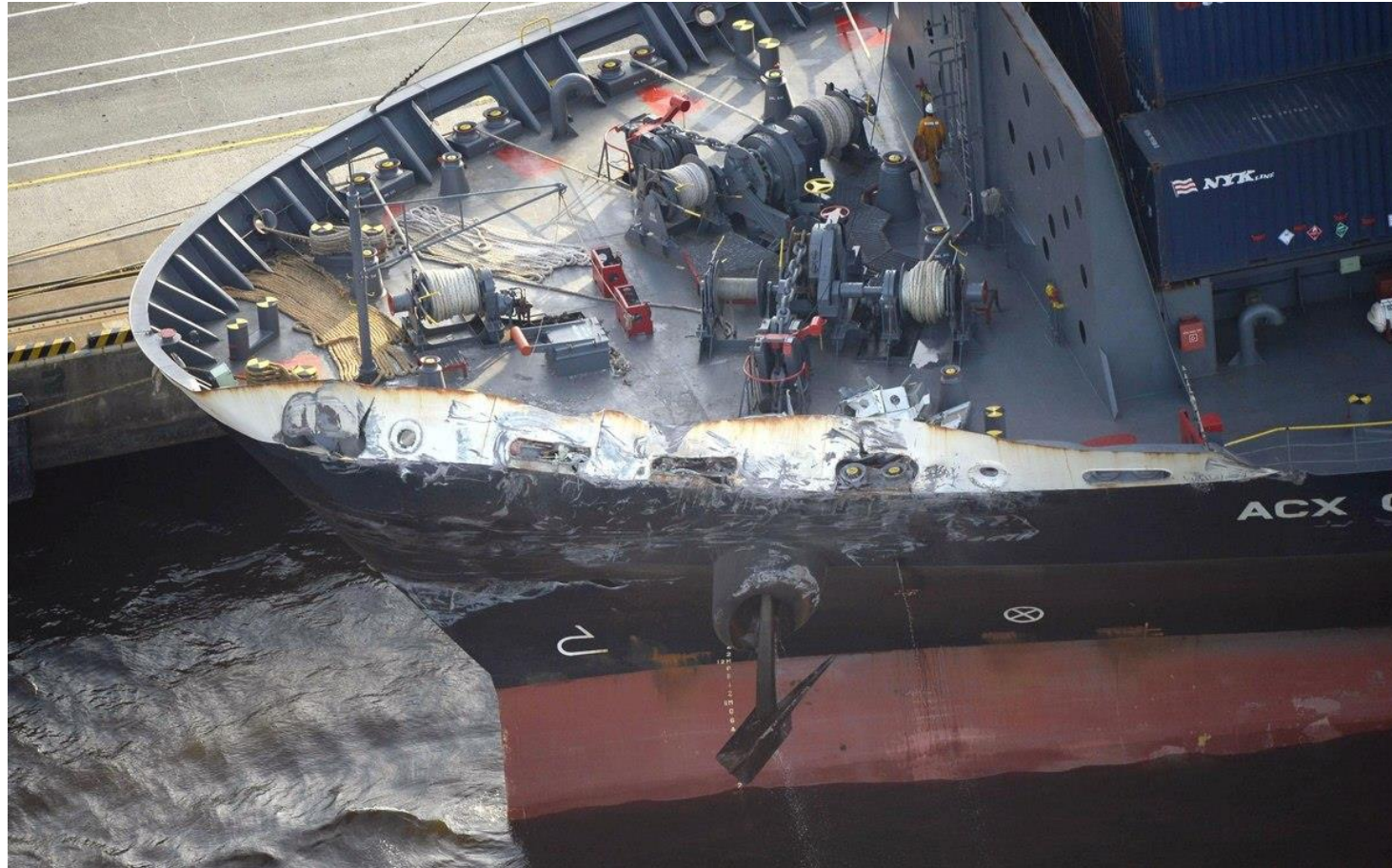


Dents, indentations, scratches, ctd.

(udubljenja, manja udubljenja ogrebotine)

(DENT: a depression in the ship's hull made by a blow or by pressure in a collision or allision, ice etc)

- *An tug **boat dented** an oil tanker in ..., leading to an investigation*
- *Both vessels suffered only minor damage of **dents** and **scratches**.*
- *The **collision** created a 3-by-5-foot **dent** on Lake Champlain,*
- *The ship's stern **was dented** above the waterline, but it does not appear to have ruptured the hull.*
- *The icture shows with a **heavily dented hull**,*
- *the container **ship** ... with its left bow **dented** and scraped after colliding with the tanker*
- *The crude carrier ... **suffered dented bulwark** at the portside fore, while the container ship ... **suffered dents and bruises** at the starboard side aft*
- *the carrier **has lots of dents** and **scratches** to the plating above the water line,*
- *large **plastic deformations and shape distortion of tubes** subjected to combined loads: lateral **indentation**, bending moment and axial force.*
- *the **indentation** of a restrained mild steel plate by a rigid striking mass*

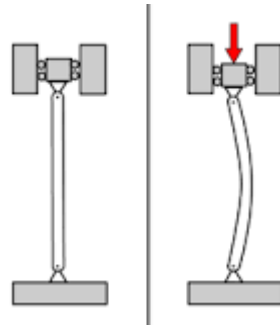


In this June 17, 2017, file photo, the container ship ACX Crystal with its left bow **dented** and **scraped** after colliding with the USS Fitzgerald off Japan earlier in the day, is berthed at the Oi Container Terminal in Tokyo. (Hitoshi Takano/Kyodo News via AP, File)

Deformation and buckling

(of brackets and stiffeners of longitudinals)
(deformacije i izvijanje)

Buckling is characterized by a sudden sideways deflection of a structural member



Deformation and buckling of transverses

- *Aft transverse coaming on forecastle deck from StB **was deformed** inside of the hatch up to 225 mm.*
- *In the upper tweendeck of hold No1, the web plates of all reinforced beams **are deformed**, the beams' brackets **have buckled**; the **bulges** are up to 180 mm in depth. In the same place, the brackets of all ordinary frames **have buckled**.*
- *In the lower tweendeck of hold No1, the brackets of reinforced beams on StB **have buckled**.*
- *Forward transverse coaming on the main deck on StB **was deformed toward** the hatch opening (hold No 2).*
- *In the tweendeck of hold No 2 the brackets of the StB reinforced side frames **have buckled**; **bulges** up to 200 mm.*
- *The reinforced side frame 99 StB in the tweendeck is completely destroyed.*

Damages of transverse bulkheads

- *Webs' flange of the forepeak bulkhead is **deformed** in places where the longitudinal deck girders are connected to webs.*
- *A **hole** in transverse bulkhead Fr. 99 StB with area up to 4 m² .*

Gashes

(urezotine, rezovi)

GASH = a long deep cut in the surface of the ship's hull (shell plating, plates, etc.)

- *Tanker gets 30-foot **gash** from collision with scalloper*
- *The collision **tore a gash** below the ship's waterline*
- *The ship is outside of the harbor while the Coast Guard inspects a 30-foot **gash** along its hull*
- *Tanker's Hull Gashed in **Collision** with Fishing **Vessel** Off New York*
- *The collision left the tanker with a 30-foot **gash** in its hull.*
- *the **collision** tore a huge **gash** in the side of the war ship*
- *The **collision** tore a **gash** below the ship's waterline,*
- *the **collision** caused a **gash** under the warship's waterline*
- *a steamship in dock at Newcastle displaying the results of a collision - a huge gash in its side.*
- *The June 2 accident tore a gash in the 800-foot Minerva Maya and caused all five barges to break away from the tugboat*
- *The barges scraped across much of Minerva Maya's hull, opening a gash above the waterline on its port bow.*
- *The **gash** is above the waterline, and the **ship** is docked alongside in Shanghai*
- *the **ship** also had a big gash on the bottom. ... including a sharp horizontal cut across it, scratches and **dents** on the port side ...*



Scrapes, bruises (ogrebotine)

(SCRAPE = drag or pull a hard or sharp implement along or across the ship's side, bow or stern, shell plating etc.)

- *The container vessel Tolten **scraped against** the stationary Hamburg Bay as it was berthing*
- *US Navy ship suffers minor damage **in scrape with** Japanese tug boat*



Ship Scrapes Wall Leaving Harbour

Other types and causes of damage

- **Ramming damage** – *šteta/oštećenje od udarca* (**ramming**, eg. a war a ship against another ship resulting in the destruction of the ships involved)
- **Slamming** - *udaranje dna pramca/krme o valove* (the impact of the bottom structure of a **ship** onto the sea surface. It is mainly observed while sailing in waves, when the bow raises from the water and subsequently impacts on it. **Slamming** induces extremely high loads to **ship** structures and is taken into consideration when designing **ships**. <https://en.wikipedia.org/wiki/Slamming>)
- **Racking** – *poprečna distorzija* (When a ship is rolling, the accelerations on the ship's structure are liable to cause distortion in the transverse direction. The deck tends to move laterally relative to the bottom structure, and the shell on one side to move vertically relative to the other side. <https://cultofsea.com/ship-construction/ship-stresses/>)
- **Bending** – *savijanje* (The **bending** moment is the amount of **bending** caused to the **ship's** hull by external forces. For example, The **bending** moment is the highest in the midship section when the **ship's** ends are supported by crests of a wave ,known as `sagging' or `positive **bending** ' bulkcarrierguide.com/shearing-forces-&-bending-moments-limitations.html)
- **Pounding** - *lupanje / udaranje valova o pramac* (prednji dio) broda -pulsiranje / ugibanje plastične površine brodice (na bokovima i dnu pramca) (When a ship is pitching, the bows often lift clear of the water and then slam down heavily onto the sea, subjecting the forepart to severe pounding <https://cultofsea.com/ship-construction/ship-stresses>)
- **Panting** – *(pulsiranje limova pramca ili krme (zbog udaranja valova)* (Panting is an in and out motion of the plating which occurs at the end of the vessel due to the variation in water pressure as the vessel pitches in a seaway. The effect is accentuated at the bow when making headway)
- **Buckling** – *izvijanje, ispupčenje, deformacija* (limova i konstrukcije pri sudaru); izvijanje kad je brod u progibu ([happens](#) when a force [presses](#) on a [slender](#) structure and makes it [collapse](#), Collins Dict.) (**buckling** is a mathematical instability that leads to a failure mode. When a structure is subjected to compressive stress, **buckling** may occur. **Buckling** is characterized by a sudden sideways deflection of a structural member; <https://en.wikipedia.org/wiki/Buckling>)

Further examples

- Passenger ship „...." **has been rammed** up to the CL;
- Ferry „....." **has received** as a result of collision **a hole** depth up to 0,4B
- the bow, port and starboard, in way of No. 1 hold **received heavy shell plating fracture**
- **The ship** sustained **damage** in the form of **dents** on the port stern shell plate
- The **damage** was below the waterline and **in way of** the engine room (Figure 2).
- A subsequent inspection identified **indentation of the bottom plates** in way of the engine room
- **significant damage was sustained** in way of several tanks, including water ingress into No.

Further examples

- *The ship ran aground on rocks off the port of ..., in way of No. 4 cargo hold, **broke in two***
- *Although there were no reported injuries or pollution, her port side shell plating in way of cargo **hold no. 3 was punctured** and a number of side shell plating, frames and brackets **were either deformed or dented***
- *At 0336, the vessel **ran aground** in way of ballast tank No. ..*
- *In the drydock, it was observed that apart from **the large hole punched** in the shell plating in way of the fore peak tank, there was no other damage.*
- *The collision left the tanker with a 30-foot **gash** in its hull.*
- *There were slight personal injuries and **the hull was dented**.*
- *The barge whipped around and struck the shell plating on the port bow of the anchored ship, **causing a large dent**.*
- *A little while later the Master inquired from the C/O if he heard the loud bang, and explained that there was **a heavy indent** on the starboard side of the bridge wing deck.*
- *Brackets of the main deck StB coaming of hold No 2 **torn off** the deck*

Further examples

- *Her hull **sustained tears, punctures, and dents.***
- *the ship **has sustained some major indentation** or other damage for which there is no report or record.*
- *A subsequent inspection identified **indentation of the bottom plates** in way of the engine room (see figure).*
- *The bunker barge **suffered a large indentation** below the waterline where it was struck by the cargo ship's bulbous bow (see figure).*

Type of hull damage	Example on MV "Mozdok"
Holes in elements of the midship	<ol style="list-style-type: none"> 1. A hole in starboard (StB), Fr. 92-106 (hold No 3), area 35 m², length 7 m, height 5,5 m. 2. A hole in a lower deck of hold No 3, width 1-2 m, length 6 m.
Rupture of longitudinals and plates	<ol style="list-style-type: none"> 1. Carlings of forecastle deck have ruptures through the whole height 2. Rupture of forward transverse coaming-carling from StB forecastle deck. 3. Top plate of StB coaming on the main deck in the area of hold No 1 has a rupture through the whole width. 4. Top plate of StB coaming on the main deck in area Fr. 136 (hold No 2) has a rupture through the whole width. 5. Longitudinal stiffeners of main deck in area Fr. 96-97 (hold No. 3) breaks through the whole height. 6. Rupture of forecastle deck in area of coaming bracket debonding.
Cracks in shell and framing	<ol style="list-style-type: none"> 1. A crack of longitudinal coaming in StB on the forecastle deck with length 1200 mm and 45 mm opening at coaming. 2. A crack in StB carling on forecastle deck with length of 150 mm and opening of 3 mm.
Out-of-plane deflection of longitudinal Girders, deformation and buckling of longitudinals	<ol style="list-style-type: none"> 1. StB coaming on forecastle deck inclined toward the hatch opening by 40 degrees, the top edge has left the vertical plane by 700 mm. 2. Portside (PtS) coaming on forecastle deck unwrapped inside of the hatch by 10 degrees, the top edge has left the vertical plane by 110 mm. 3. The top edge of the main deck StB coaming in the area of hold No. 2 left the vertical plane by 600 mm while the coaming has inclined toward the hatch opening by 40 degrees. 4. The top edge of the main deck StB coaming in area of hold 2 has left the vertical plane by 110 mm while the coaming has inclined toward the hatch opening by 10 degrees.
General deformations of grillages	<ol style="list-style-type: none"> 1. The forecastle deck received significant permanent deformations inside the tweendeck; the maximal deflection is up to 200 mm. 2. The main deck has received significant permanent deformations inside the tweendeck; the maximal deflection is up to 200 mm (hold No 2). 3. The main deck of hold No 3 is deformed in area of the damage hole, the maximal deflection is up to 300 mm.

Deformation and buckling of brackets and stiffeners of longitudinals	<ol style="list-style-type: none"> 1. Brackets of forecastle deck StB coaming torn off the deck. 2. Brackets of the main deck StB coaming of hold No 2 torn off the deck.
Deformation and buckling of transverses	<ol style="list-style-type: none"> 1. Aft transverse coaming on forecastle deck from StB was deformed inside of the hatch up to 225 mm. 2. In the upper tweendeck of hold No1, the web plates of all reinforced beams are deformed, the beams' brackets have buckled; the bulges are up to 180 mm in depth. In the same place, the brackets of all ordinary frames have buckled. 3. In the lower tweendeck of hold No1, the brackets of reinforced beams on StB have buckled. 4. Forward transverse coaming on the main deck on StB was deformed toward the hatch opening (hold No 2). 5. In the tweendeck of hold No 2 the brackets of the StB reinforced side frames have buckled; bulges up to 200 mm. 6. The reinforced side frame 99 StB in the tweendeck is completely destroyed.
Damages of transverse bulkheads	<ol style="list-style-type: none"> 1. Webs' flange of the forepeak bulkhead is deformed in places where the longitudinal deck girders are connected to webs. 2. A hole in transverse bulkhead Fr. 99 StB with area up to 4 m².

1.3.4 Post-collision events

https://assets.publishing.service.gov.uk/media/547c6f36e5274a4290000017/CMACGMFlorida_Report.pdf

Following the collision, Chou Shan's crew were mustered and an inspection of the vessel's forward part carried out. Significant damage was reported, however it was found to be limited to the area forward of the collision bulkhead. Chou Shan's master reported the accident to the vessel's manager and regular soundings of appropriate spaces continued overnight.

Chou Shan proceeded to dry dock during the afternoon of 19 March. Due to the resulting oil pollution caused **by ruptured fuel oil tanks**, CMA CGM Florida was required to await inspection before any repair arrangements could be made.

A salvage vessel was contracted and officials from China Maritime Safety Administration boarded CMA CGM Florida to carry out an inspection. On 21 March, the vessel was anchored 80 miles off Shanghai so that the damaged tanks could be cleaned prior to allowing the vessel to proceed into port.

CMA CGM Florida received clearance to proceed towards Yang Shan on 26 March, and berthed alongside on 27 March. After a naval architect was consulted, most of the containers were discharged from the vessel, and the vessel then proceeded to dry dock for repairs.

Damage and pollution

https://assets.publishing.service.gov.uk/media/547c6f36e5274a4290000017/CMACGMFlorida_Report.pdf

- The ship **suffered extensive damage** to the port side (Figures 7 and 8).
- Damage was focused in the vicinity of No.5 cargo hold and the outboard No.5 upper HSFO tank, which **were holed** above and below the waterline.
- No.4 cargo hold and the engine room LSFO tank adjacent to No.5 cargo hold **were also breached**.
- Above the main deck, the accommodation block **was damaged** over five decks, and the port lifeboat was seriously damaged, rendering it unusable.
- Five pontoon-type hatch covers **were damaged** and 263 containers were damaged or lost overboard.
- No.s 4 and 5 **cargo holds flooded** as a result of the collision.
- **Breach of the engine room LSFO tank and No.5 upper HSFO tank** resulted in the loss of around 610t of fuel oil.
- There were no injuries and **the resulting oil pollution was contained and cleaned up** with minimal environmental impact

Damage and pollution

https://assets.publishing.service.gov.uk/media/547c6f36e5274a4290000017/CMACGMFlorida_Report.pdf

- *The ship **sustained serious damage** to its bow, limited to the area forward of the collision bulkhead .*
- *The full **force of the impact** was concentrated on its port side due to the angle of approach with the other ship.*
- *The fore peak tank **was opened to the sea.***
- *two other compartments **were breached** as a result of the collision*
- *Considerable **shell plate and frame damage occurred to the bow area.***
- *The port anchor and hawse pipe **were destroyed.***

Report on the investigation of the collision between the container ship *Ever Smart* and the oil tanker *Alexandra 1*

<https://www.gov.uk/maib-reports/collision-between-container-vessel-ever-smart-and-oil-tanker-alexandra-1>

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Collison Case3s (synopsis)

Case 1.

The *Ever Smart* and the *Alexandra 1*

- On 11 February 2015, the United Kingdom registered container ship *Ever Smart* collided with the Marshall Islands registered oil tanker *Alexandra 1* near the entrance to the buoyed approach channel in Jebel Ali, United Arab Emirates.
- The container ship was outbound at a speed of 12 knots and had disembarked its pilot. The tanker was inbound and was moving very slowly ahead while waiting for the pilot from the container ship to board.
- **Both vessels suffered major structural damage** to their bows but there were no injuries or pollution.
- The collision resulted from several factors. In particular, a passing arrangement was not agreed or promulgated and the actions of both masters were based on assumptions.

- Alexandra 1 was unnecessarily close to the channel entrance and the tanker's master acted on scanty VHF radio information.
- In addition, Ever Smart's bridge team did not keep a proper lookout or monitor the tanker's movement. They only realised that Alexandra 1 was close ahead seconds before the collision when alerted by the port control.
- The accident occurred within Jebel Ali's port limits. The precautions of pilotage and the port's vessel traffic service, which would normally co-ordinate and de-conflict the movements of vessels in the port area, were ineffective on this occasion.
 - <https://www.gov.uk/maib-reports/collision-between-container-vessel-ever-smart-and-oil-tanker-alexandra-1>

- Evergreen Marine (UK) Limited, the managers of Ever Smart and Iships Management Private Limited, the managers of Alexandra 1 have taken action to improve the standard of bridge watchkeeping on board their vessels.
- A recommendation to DP World UAE Region, the operators of Jebel Ali port, is intended to improve the effectiveness of the vessel traffic and pilotage services it provides

1.2.3 Post-collision actions

<https://www.gov.uk/maib-reports/collision-between-container-vessel-ever-smart-and-oil-tanker-alexandra-1>

Alexandra 1

- Alexandra 1's master immediately reported the collision to Jebel Ali port control by VHF radio and stated: *'He's not following your rules, you told him to go by my stern.'*
- Alexandra 1 remained at 'full astern'.
- The general alarm was not sounded but the tanker's officers immediately went to the bridge and quickly accounted for all of the crew and determined that none were injured.
- The voyage data recorder (VDR) data was saved.
- At 2348, Alexandra 1 and Ever Smart separated and the tanker's master set the engine telegraph to 'stop'.
- The chief officer and **the chief engineer assessed the damage** and established that there was water ingress into the forepeak tank.

1.2.3 Post-collision actions

<https://www.gov.uk/maib-reports/collision-between-container-vessel-ever-smart-and-oil-tanker-alexandra-1>

1.3 DAMAGE

- 1.3.1 Alexandra 1
- Alexandra 1's **bow was split vertically** from the main deck to below the waterline (Figure 12). The tanker was not permitted to enter the port and was unable to anchor due to the extensive damage to its forecastle and deck equipment.
- The collision bulkhead was not penetrated and there was no pollution.
- The tanker remained underway off Jebel Ali and Dubai until its condensate cargo was transhipped at sea to other vessels.
- The tanker arrived in Dubai for permanent repair in April 2015.

1.2.3 Post-collision actions

<https://www.gov.uk/maib-reports/collision-between-container-vessel-ever-smart-and-oil-tanker-alexandra-1>

1.3.2 Ever Smart

- Ever Smart **sustained considerable structural damage** forward of its collision bulkhead.
- **The bow was distorted** and **the hull plating was severely indented** and holed (Figure 13).
- Following temporary repairs in Dubai, Ever Smart proceeded to Ningbo, China for permanent repairs

Case 2.

The Huayang Endeavour & the Seafrontier

- https://assets.publishing.service.gov.uk/media/5ad86d01e5274a76c13dfdc1/MAIBInvReport07_2018.pdf

The Huayang Endeavour & the Seafrontier

https://assets.publishing.service.gov.uk/media/5ad86d01e5274a76c13dfdc1/MAIBInvReport07_2018.pdf

- Damage *Huayang Endeavour* **sustained damage to the hull plating** on the starboard side of the bow, with **penetrations** into the forecastle store and forward void space. The starboard hull plating **was indented** along its entire length.
- *Seafrontier* **suffered significant damage** to the port side accommodation, which was damaged over five decks. The port rescue boat and davit **were extensively damaged**, rendering them unusable, and one set of external stairs was totally removed. The internal structure **was significantly damaged** and it was fortunate that there were no injuries or pollution.

Case 3.

Grounding damage

Grounding damage

MAIB: *Vessel Grounded After Master Left Bridge Unattended*

<https://www.maritime-executive.com/article/maib-vessel-grounded-after-master-left-bridge-unattended>

- *After discharging her cargo at Warrenpoint, Ruyter proceeded to a dry dock in Belfast, where a full **inspection revealed extensive structural damage** throughout the forward third of the hull, with **26 penetrations** in three compartments. There was also damage to the shaft generator due to the fire.*

- *Re-floating and inspection Later during the morning of 8 October, a technical superintendent from Faversham Ships Ltd, Islay Trader's owner and manager, and a classification society surveyor, attended and assessed the vessel's condition.*
- *The vessel was subsequently authorised to discharge its cargo in Antwerp, and then proceed to Dordrecht, Netherlands, for a hull inspection. At 1420, Islay Trader was re-floated with tug assistance.*
- *Faversham Ships Ltd ordered Islay Trader's master to anchor the vessel in Margate Road to enable its crew to rest.*

- *When the vessel appeared to start passage towards Antwerp, the ship owner/manager intervened and again instructed the master to anchor. Islay Trader then anchored until 2355. The vessel arrived in Antwerp at 1800 the following day.*
- *On 12 October, an out of water inspection in Dordrecht identified that Islay Trader's hull **was indented below the waterline** either side of the bow (Figure 7). **Five vertical stiffeners were also bent** in way of a fresh water tank towards the stern.*

<https://www.maritime-executive.com/article/maib-vessel-grounded-after-master-left-bridge-unattended>

- *A Flag State inspection was also conducted while Islay Trader was in Dordrecht. Its findings included:*
 - *Poor implementation of navigational procedures:*
- *Passage planning was very limited. Only waypoints and headings were marked on the paper charts. Position fixing methods or intervals were not defined*

B. SHIP DESIGN AND CONSTRUCTION

- Drawings from the web sources
- **Structural members** (Principal Structural Members of a Ship: The Hull • The Keel • The Framing • The Decks • The Bulkheads)

HULL STRUCTURAL DESIGN - SHIPS WITH LENGTH 100 METRES AND ABOVE

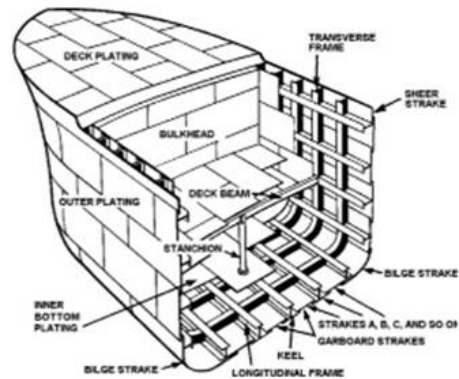
<http://home.hib.no/ansatte/jjo/ftp/S%C3%A6rkursMarin/Literatur/DNV-Hull%20structure-08.pdf>

Table B2 Application of the material classes		
<i>Structural member</i>	<i>Within 0.4 L amidships</i>	<i>Outside 0.4 L amidships</i>
Secondary A1 Longitudinal bulkhead strakes, other than that belonging to the Primary category. A2 Deck plating exposed to weather, other than that belonging to the Primary or Special category. A3 Side plating.	II	I
Primary B1 Bottom plating including keel plate. B2 Strength deck plating, excluding that belonging to the Special category. B3 Continuous longitudinal members above strength deck excluding hatch coamings. B4 Uppermost strake in longitudinal bulkhead. B5 Vertical strake (hatch side girder) and uppermost strake in top wing tank.	III	I
Special C1 Sheer strake at strength deck. ^{1), 8)} C2 Stringer plate in strength deck. ^{1), 8)} C3 Deck strake at longitudinal bulkhead. ^{2), 8)} C4 Strength deck plating at outboard corners of cargo hatch openings in container carriers and other ships with similar hatch opening configuration. ³⁾ C5 Strength deck plating at corners of cargo hatch openings in bulk carriers, ore carriers, combination carriers and other ships with similar hatch opening configuration. ⁴⁾ C6 Bilge strake. ^{5), 6), 8)} C7 Longitudinal hatch coamings of length greater than 0.15 L. ⁷⁾ C8 End brackets and deck house transition of longitudinal cargo hatch coamings. ⁷⁾	IV	III (II outside 0.6 L amidships)
1) Not to be less than grade E/EH within 0.4 L amidships in ships with length exceeding 250 m. 2) Excluding deck plating in way of inner skin bulkhead of double hull ships. 3) Not to be less than class IV within the length of the cargo region. 4) Not to be less than class IV within 0.6 L amidships and class III within the remaining length of the cargo region. 5) May be class III in ships with a double bottom over the full breadth and with length less than 150 m. 6) Not to be less than grade D/DH within 0.4 L amidships in ships with length exceeding 250 m. 7) Not to be less than grade D/DH. 8) Single strakes required to be of class IV or of grade E/EH and within 0.4 L amidships shall have breadths not less than $800 + 5 L$ mm, need not be greater than 1 800 mm, unless limited by the geometry of the ship's design.		



SHIPS STRUCTURAL COMPONENTS

- A SHIP STRUCTURE CONSISTS OF A NETWORK OF WELDED TOGETHER CROSS-STIFFENED PLATES (SOMETIMES REFERRED TO AS A "GRILLAGE").



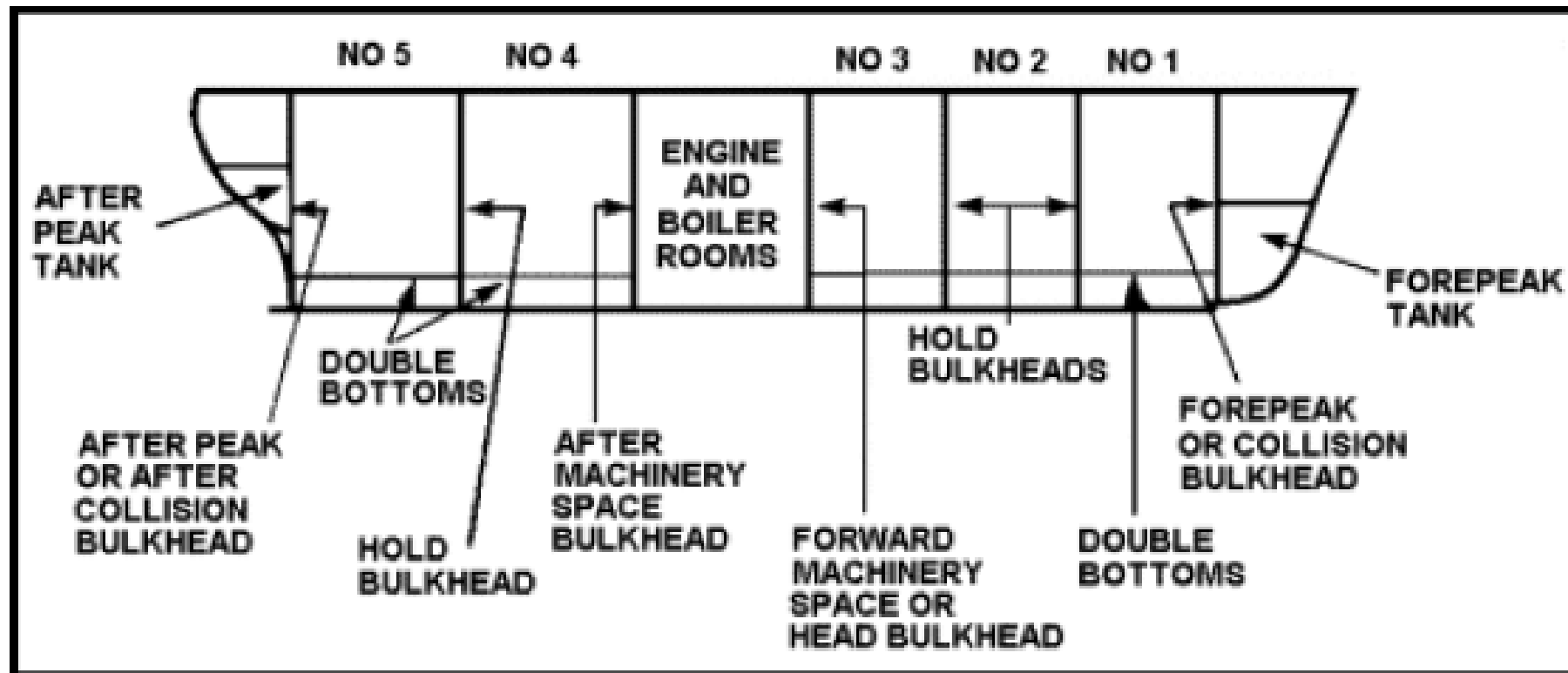
- PLATES ARE STIFFENED BY WELDED GIRDERS (I-BEAMS, T-BEAMS, ETC.).

© WMA BRUAA, DEPARTMENT OF SHIP TECHNOLOGY, USNA

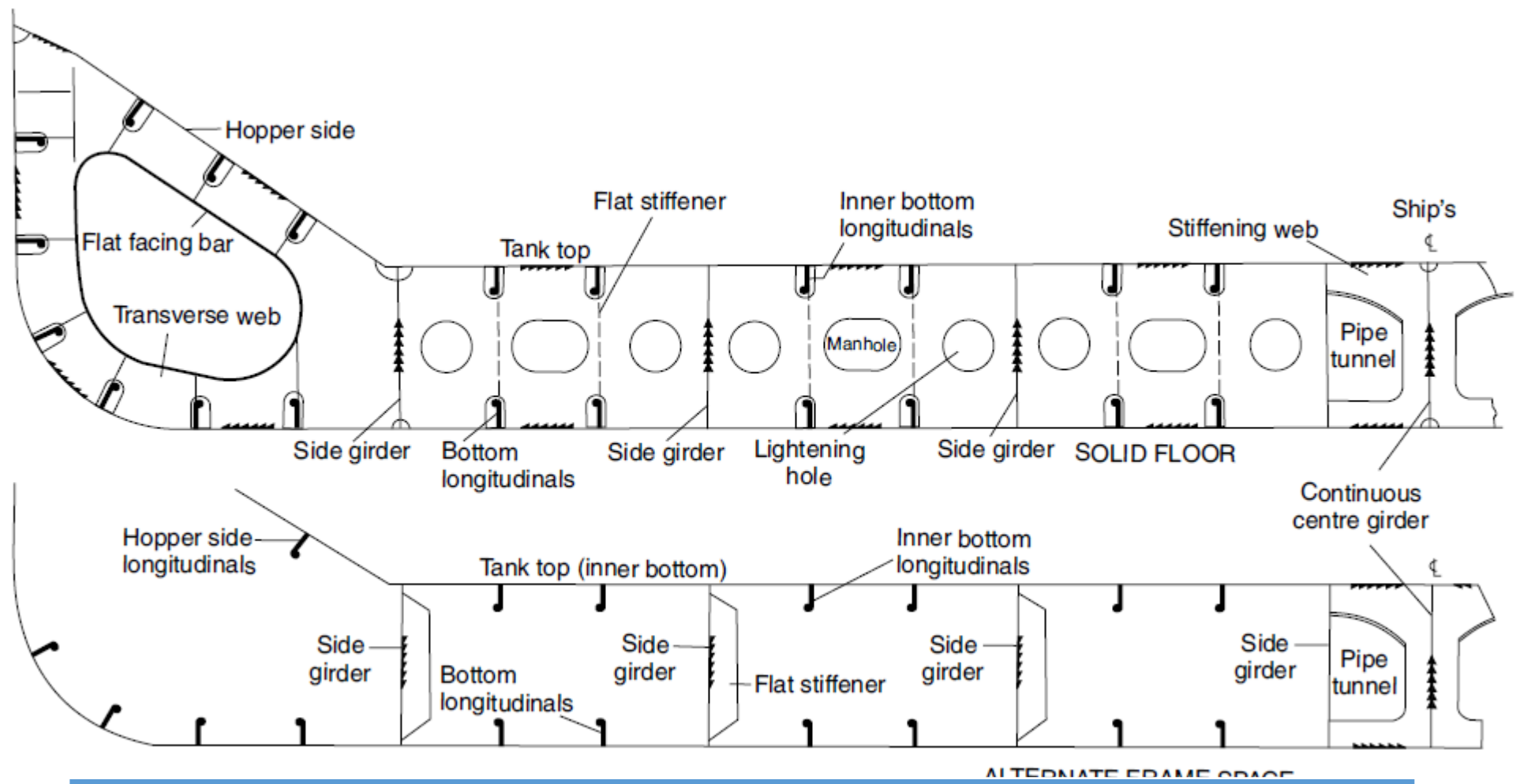


TYPES OF BOTTOM CONSTRUCTIONS





Ship's spaces

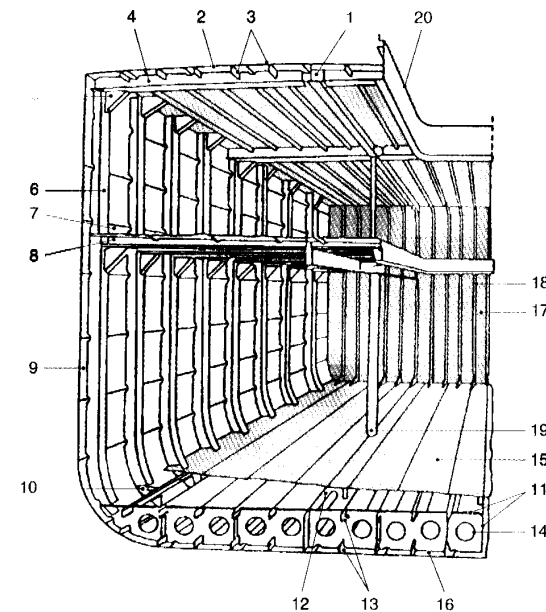


Bulkcarrier double bottom

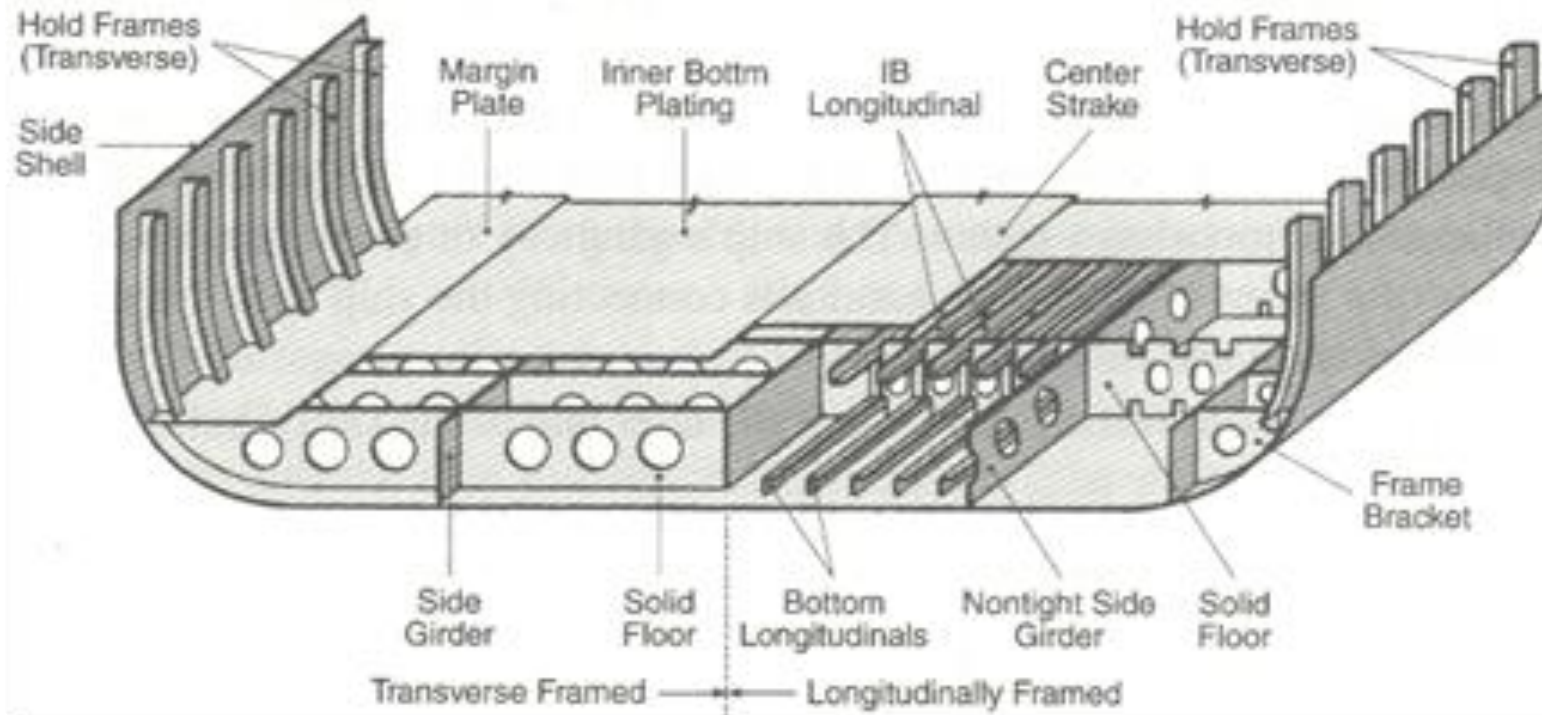
A.6 Give your language equivalents for the following ship's terms (Ship's Hold, Unit 2):

1. central stringer _____
2. deck plating _____
3. deck stringers _____
4. deck beam _____
5. knee, angle bar _____
6. frame _____
7. 'tween-deck plating _____
8. 'tween-deck beam _____
9. side plating (strakes) _____
10. margin plate _____
11. central girder _____
12. side stringer _____
13. bottom and double bottom stringers _____
14. floor _____
15. tank top, inner bottom _____
16. bottom plating (strakes) _____
17. cross bulkhead _____
18. bulkhead stiffener _____
19. hold pillar _____
20. hatch coaming _____

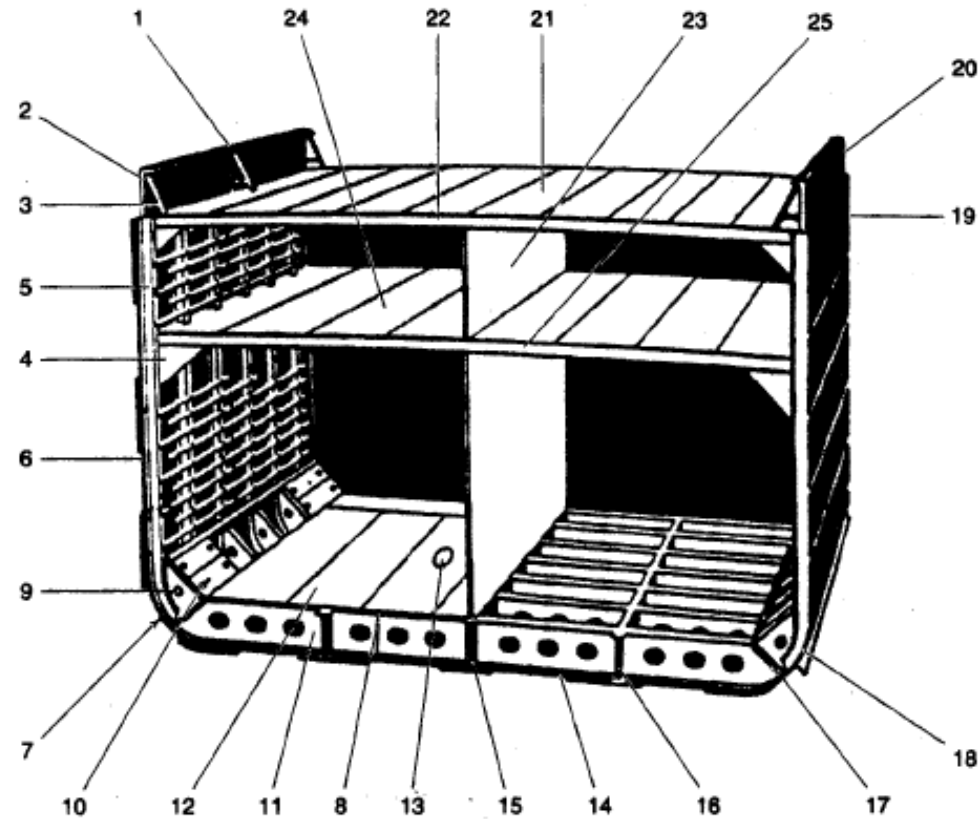
Design of a Ship's Hold (Cross Section)



Double bottom, floors, longitudinals, frames, girders, plates,

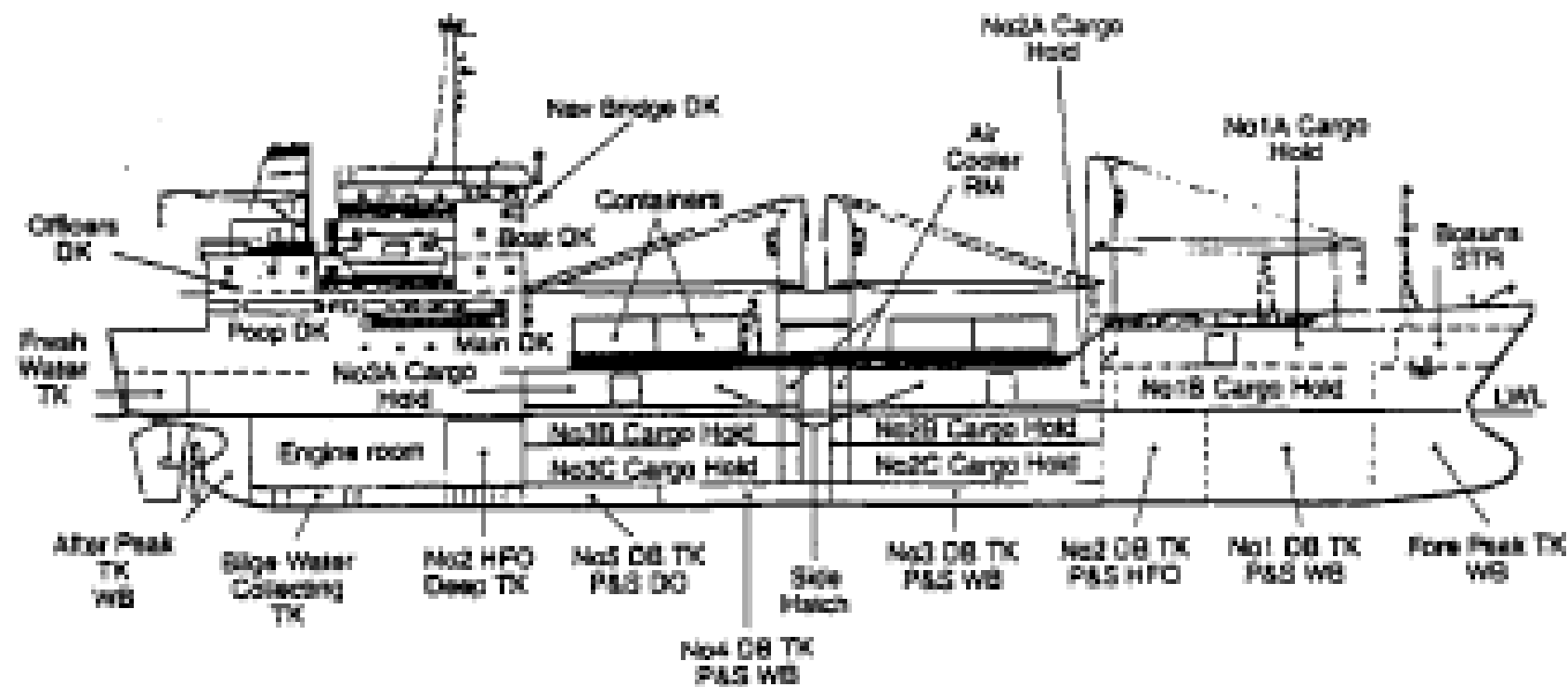


Mid section of a cargo ship

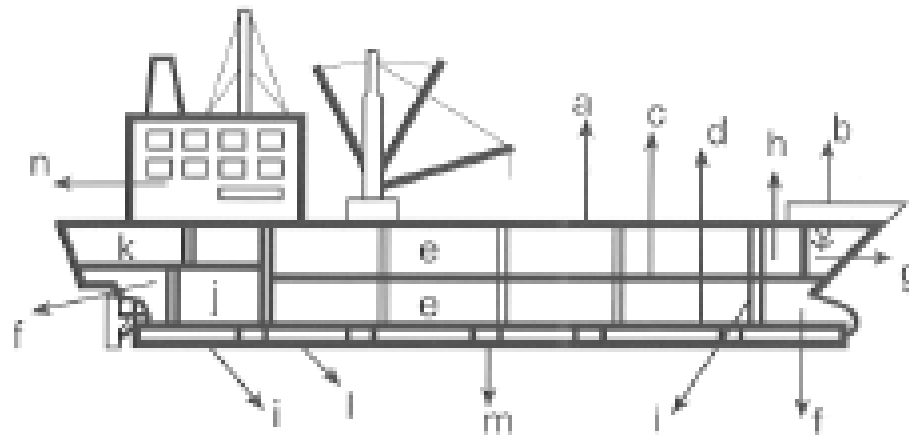


- | | |
|--|--------------------------|
| (1) Bulwark rail | (13) Manhole cover |
| (2) Bulwark stay | (14) Garboard strake |
| (3) Spur | (15) Keel plate |
| (4) Beam knees | (16) Intercostal |
| (5) Spar ceiling | (17) Margin plate |
| (6) Frame | (18) Bilge strake |
| (7) Bilge keel | (19) Sheer strake |
| (8) Reverse frame | (20) Bulwark |
| (9) Lightening hole in tank side bracket | (21) Upper deck plating |
| (10) Limber boards | (22) Upper deck beam |
| (11) Floor | (23) Centreline bulkhead |
| (12) Tank top plating | (24) Main deck plating |
| | (25) Main deck beam |

Ship's decks and spaces



1 Ship's spaces - reefer ship



Longitudinal section with spaces and separations

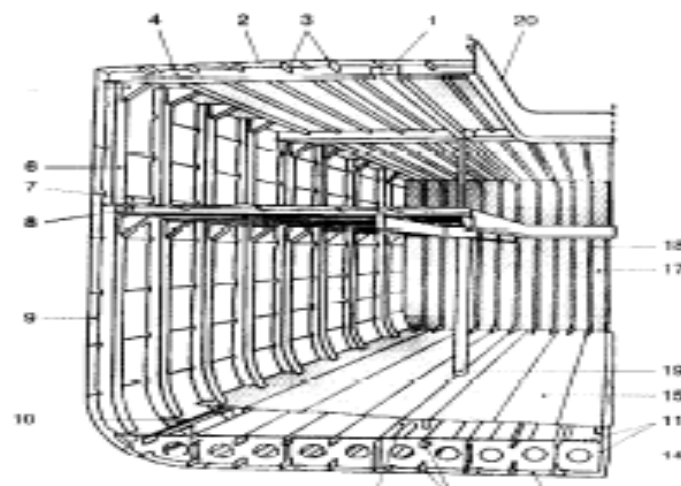
Source: P. van Kluijven (2005) IMLP

- a. upper deck or main deck
- b. forecastle
- c. tweendeck
- d. tanktop
- e. upper hold and lower hold
- f. peak tank
- g. chain locker
- h. bosun's locker
- i. collision bulkheads
- j. engine room
- k. steering machinery
- l. double bottom
- m. cofferdams
- n. superstructure

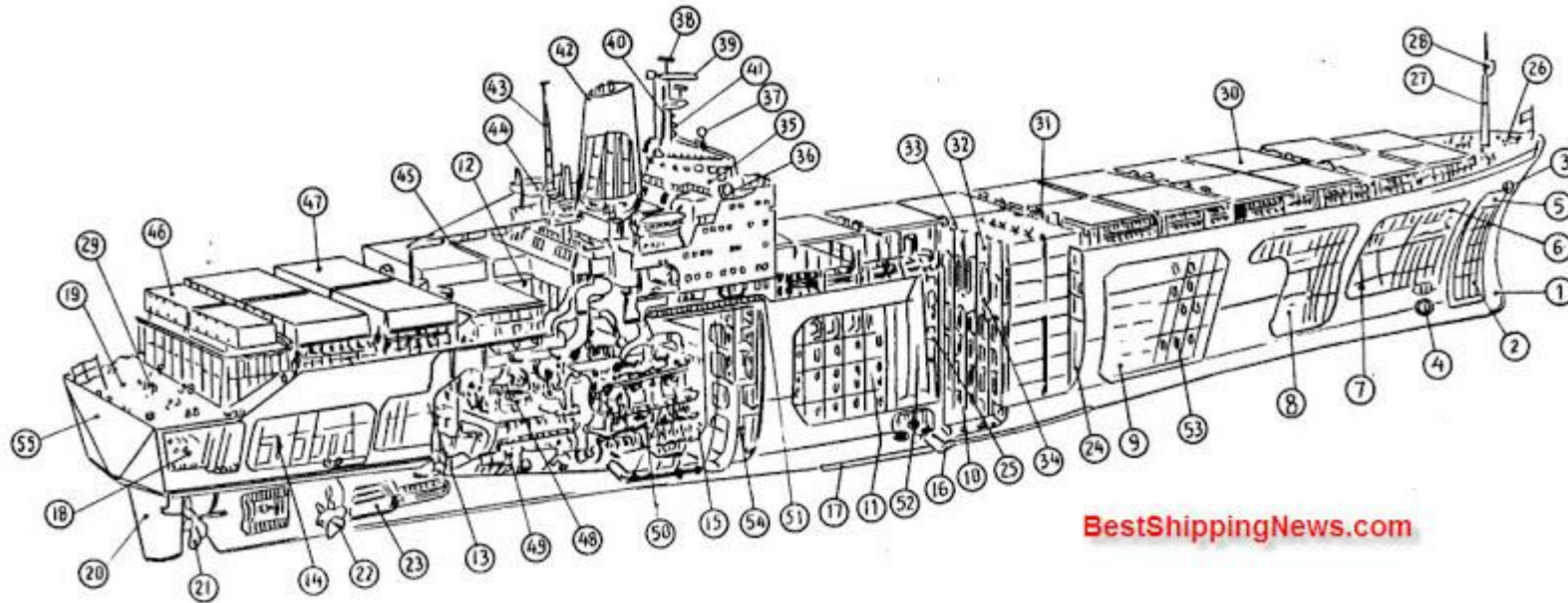
A.6 Give your language equivalents for the following ship's terms (Ship's Hold, Unit 2):

- | | |
|--|-------|
| 1. central stringer | _____ |
| 2. deck plating | _____ |
| 3. deck stringers | _____ |
| 4. deck beam | _____ |
| 5. knee, angle bar | _____ |
| 6. frame | _____ |
| 7. 'tween-deck plating | _____ |
| 8. 'tween-deck beam | _____ |
| 9. side plating (strakes) | _____ |
| 10. margin plate | _____ |
| 11. central girder | _____ |
| 12. side stringer | _____ |
| 13. bottom and double bottom stringers | _____ |
| 14. floor | _____ |
| 15. tank top, inner bottom | _____ |
| 16. bottom plating (strakes) | _____ |
| 17. cross bulkhead | _____ |
| 18. bulkhead stiffener | _____ |
| 19. hold pillar | _____ |
| 20. hatch coaming | _____ |

Design of a Ship's Hold (Cross Section)

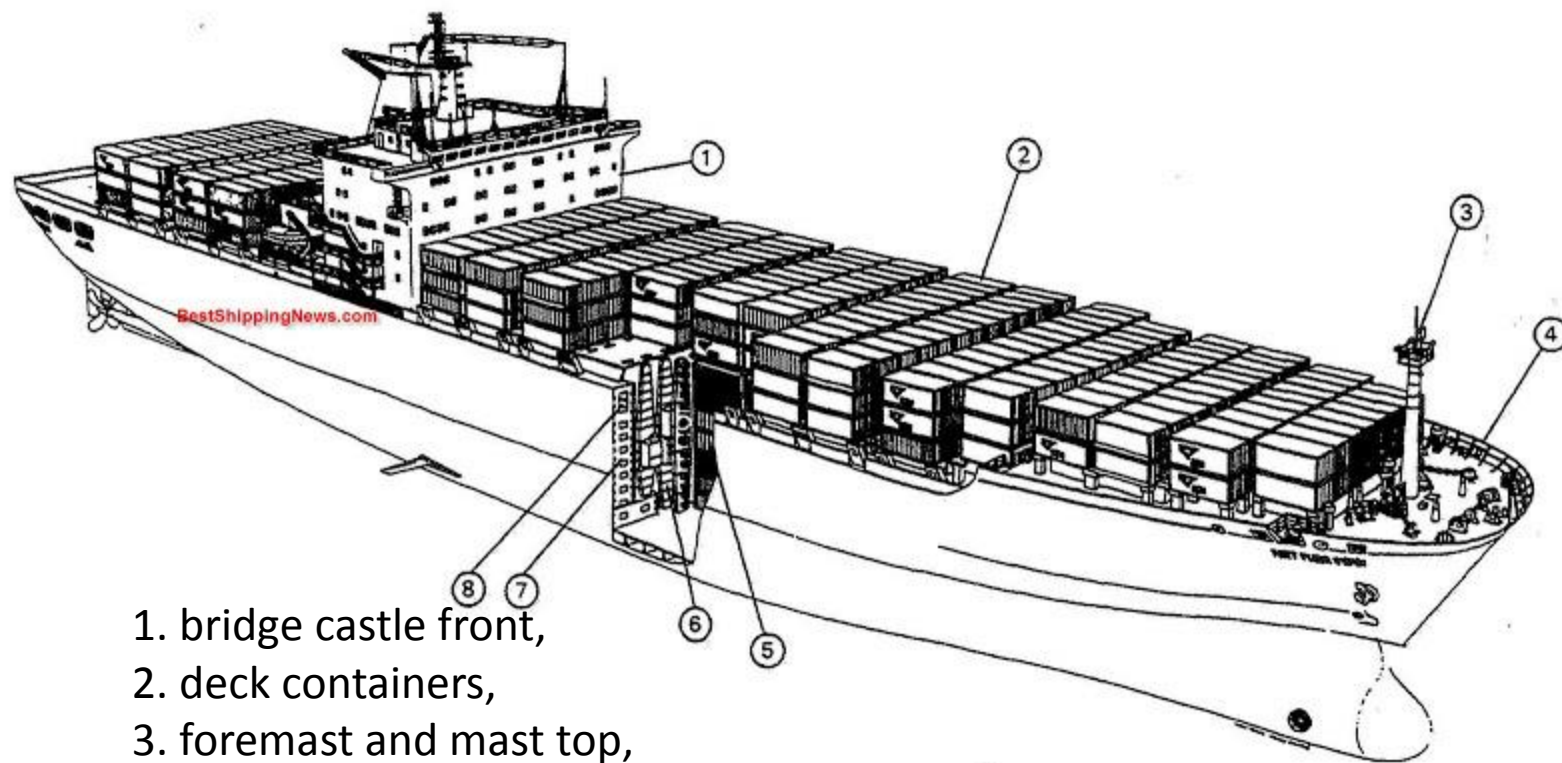


- 1 . Bulbous bow
- 2 . Fore peak tank
- 3 . Bow anchor
- 4 . Bow thruster
- 5 . Bo'sun store
- 6 . Under deck passage
- 7 . Not Container hold
- 8 . No2 Container hold
- 9 . No3 Container hold
- 10 . No4 Container hold
- 11 . No5 Container hold
- 12 . No6 Container hold
- 13 . No7 Container hold
- 14 . No8 Container hold
- 15 . Engine room
- 16 . Fin stabilizer
- 17 . Bilge keel
- 18 . Steering gear room
- 19 . Sunken deck
- 20 . Rudder
- 21 . Center propeller
- 22 . Side propeller
- 23 . Bossing
- 24 . Side ballast tank
- 25 . Deep ballast tank
- 26 . Windlass
- 27 . Foremast
- 28 . Crow's-nest
- 29 . Mooring winch
- 30 . Hatch cover



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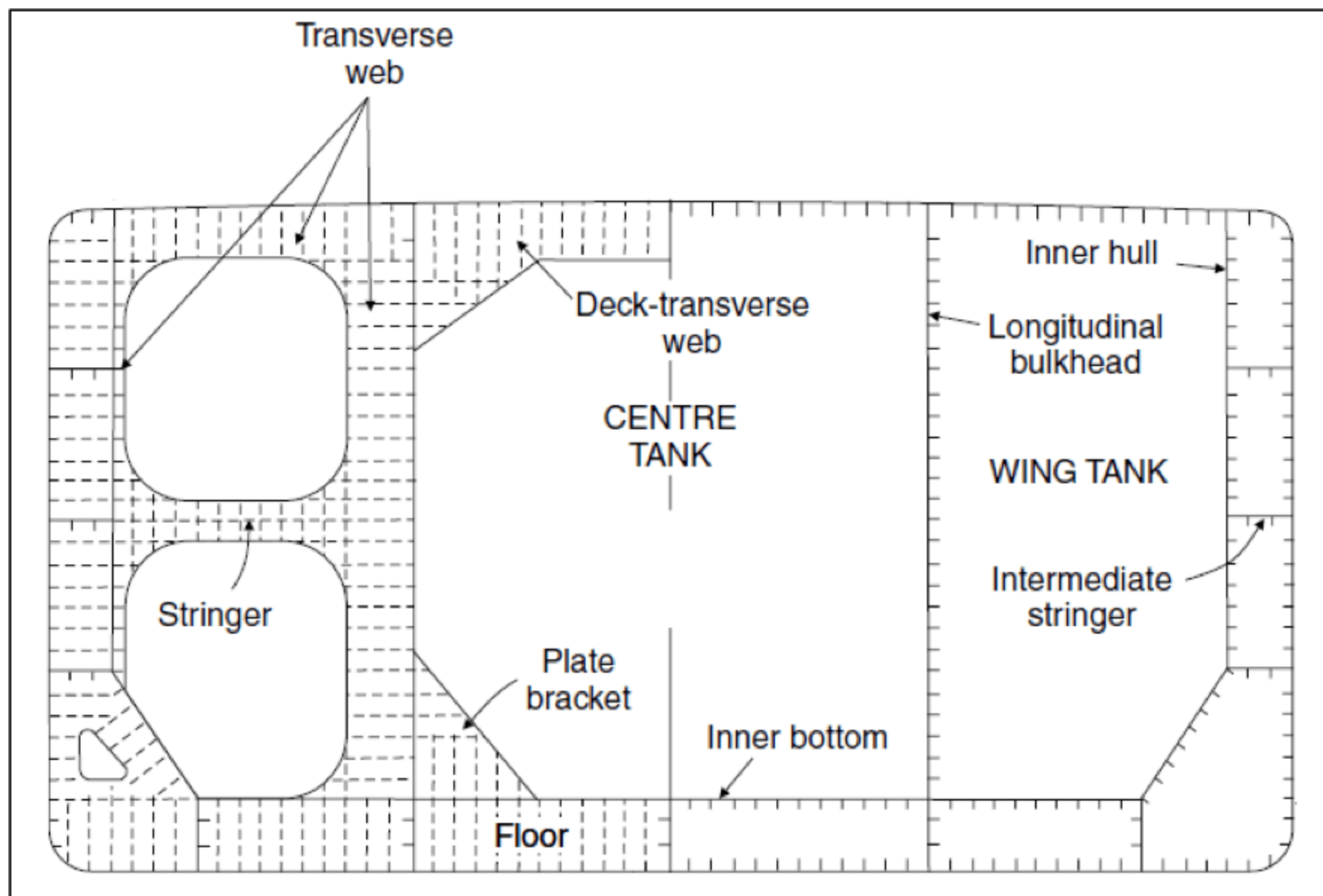
- 31 . Vent. for hold
- 32 . Cell guide
- 33 . Flip- flop
- 34 . Container support
- 35 . Wheel house
- 36 . Liferaft
- 37 . Direction finder antenna
- 38 . Radar scanner
- 39 . Signal yard
- 40 . Radar mast
- 41 . Suez signal light
- 42 . Funnel
- 43 . Antenna pole
- 44 . Lifeboat
- 45 . Crane
- 46 . 20' container
- 47 . 40' container
- 48 . Diesel generator
- 49 . Center main diesel engine
- 50 . Side main diesel engine
- 51 . Accommo. ladder
- 52 . Trans. BHD
- 53 . Long. BHD
- 54 . Fore BHD in Eng. room
- 55 . Transom stern

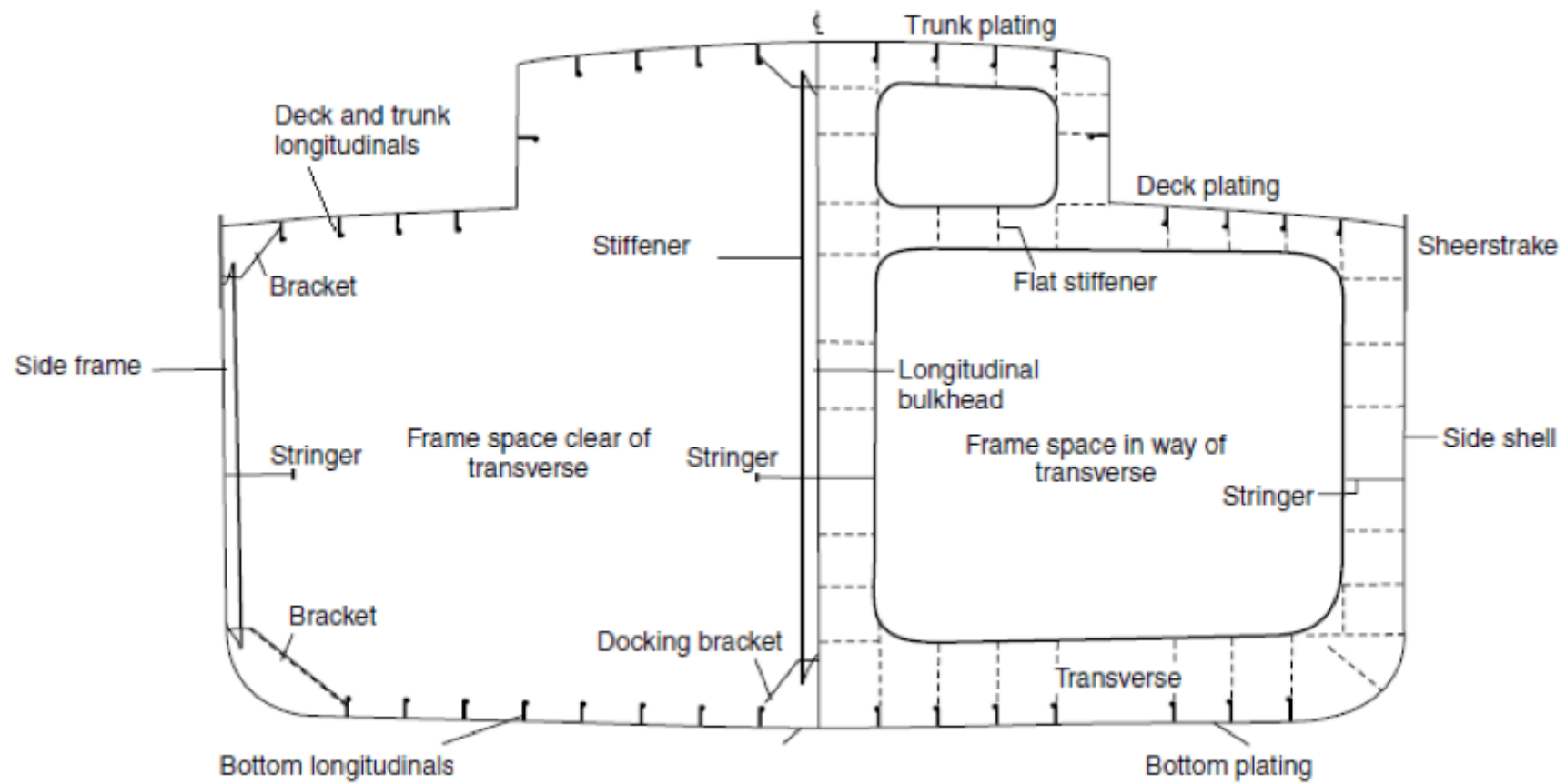


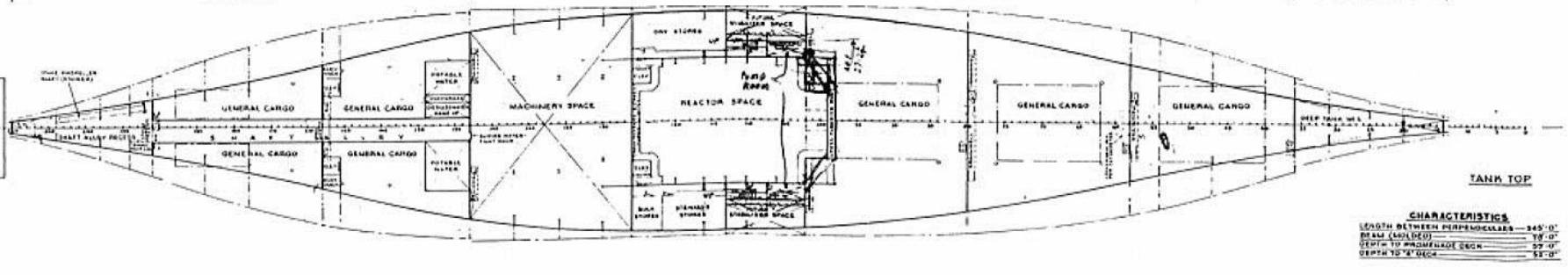
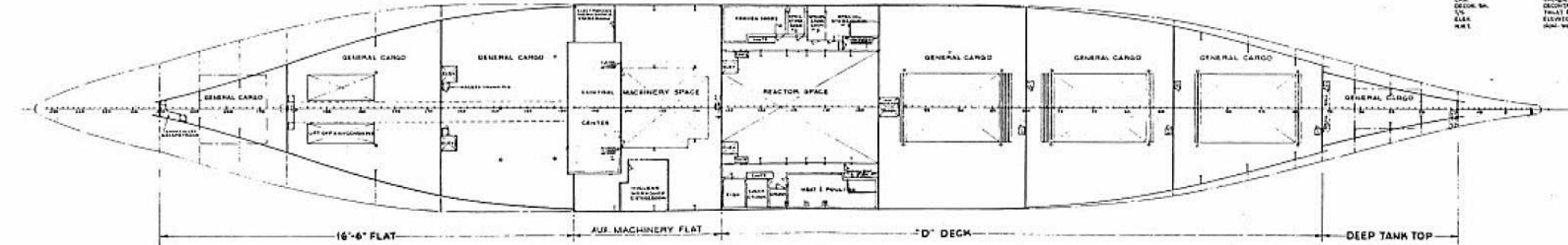
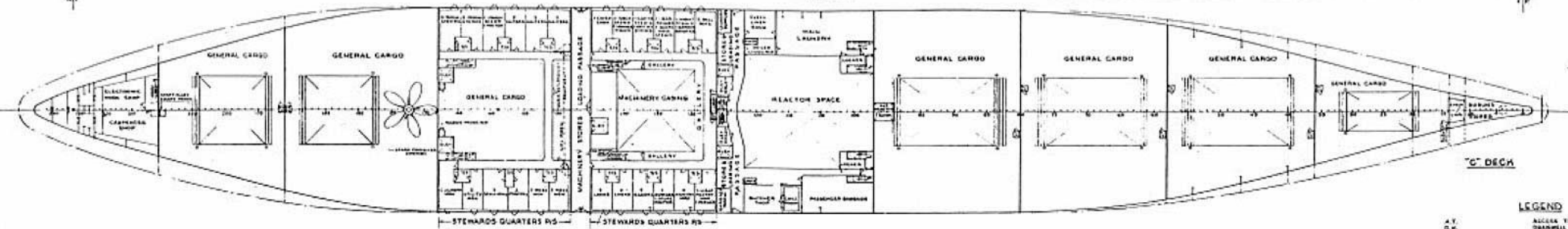
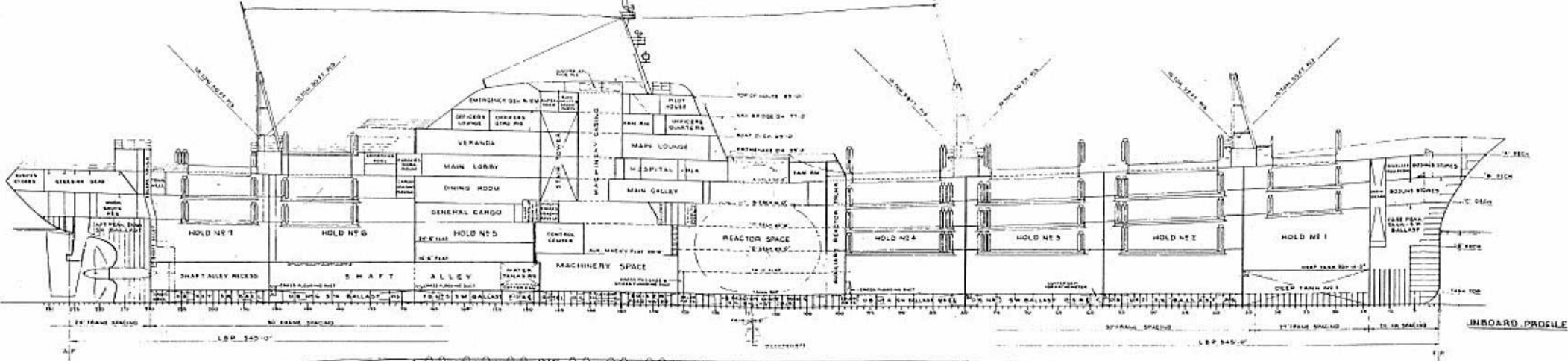
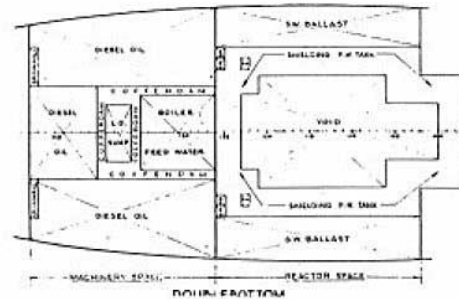
1. bridge castle front,
2. deck containers,
3. foremast and mast top,
4. forecastle,
5. insulated containers in holds,
6. container refrigeration ducts,
7. double hull,
8. passageway,

1. Rudder
2. Propeller
3. Stem
4. Container with a length of 40 feet (FEU) on a 40' stack
5. Container with a length of 20 feet (TEU) on a 20' stack
6. Accommodation ladder
7. Pilot or bunker door
8. Container guide rail
9. Row no 11
10. Row no 04
11. Tier no 08
12. Wing tank (water ballast)
13. Service gallery
14. Fixed stack
15. Movable stack
16. Bay no 15
17. Bay no 06
18. Tier no 86
19. Cells, hold 1 and 2, for containers with dangerous goods (explosives)
20. Container support
21. Breakwater
22. Bulbous bow









LEGEND

A.Y.	ALICEA YOUNG
C.W.	CHARNELL
D.B.	DOUGLAS BATHAM
E.W.	ELF WATTS
L.R.	LEONARD
DECON. SM.	DECONTAMINATION SMOKE
T.S.	TRAIL & SMOKE
ELER	ELIOT
H.M.T.	HOM. WIKELITING

TANK TOP

CHARACTERISTICS	
LENGTH BETWEEN PERIMOLARIES	345' 0"
DIAM. (W) (DEG)	18' 0"
DEPTH TO WADSWORTH DECK	57' 0"
DEPTH TO "A" DECK	52' 0"

1.cargo gear, masts and derricks

2. hatch covers

3. cargo winches

4. mast house

5. main deck

6. second deck

7. 'tweendeck centreline bulkhead

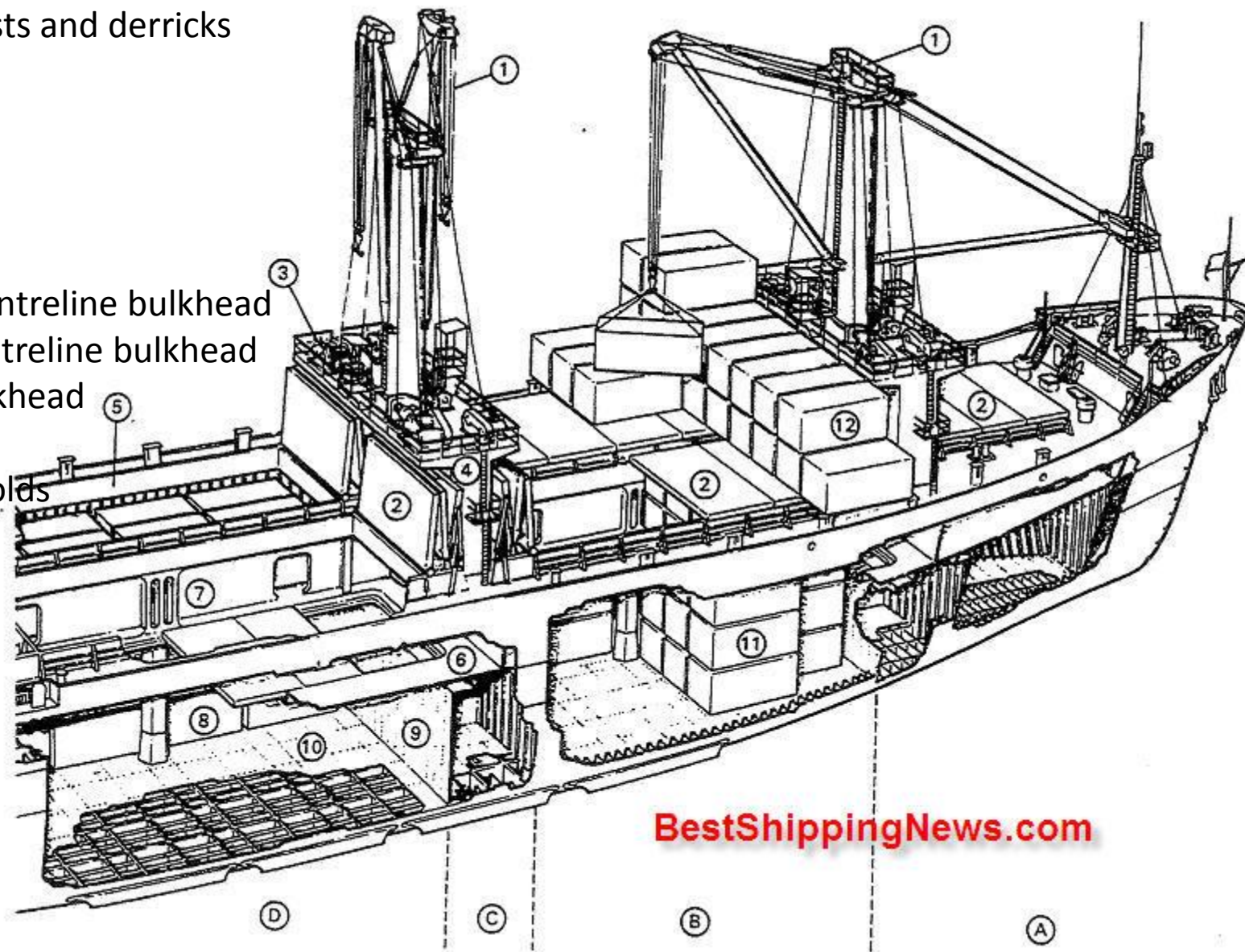
8. lower hold centreline bulkhead

9. transverse bulkhead

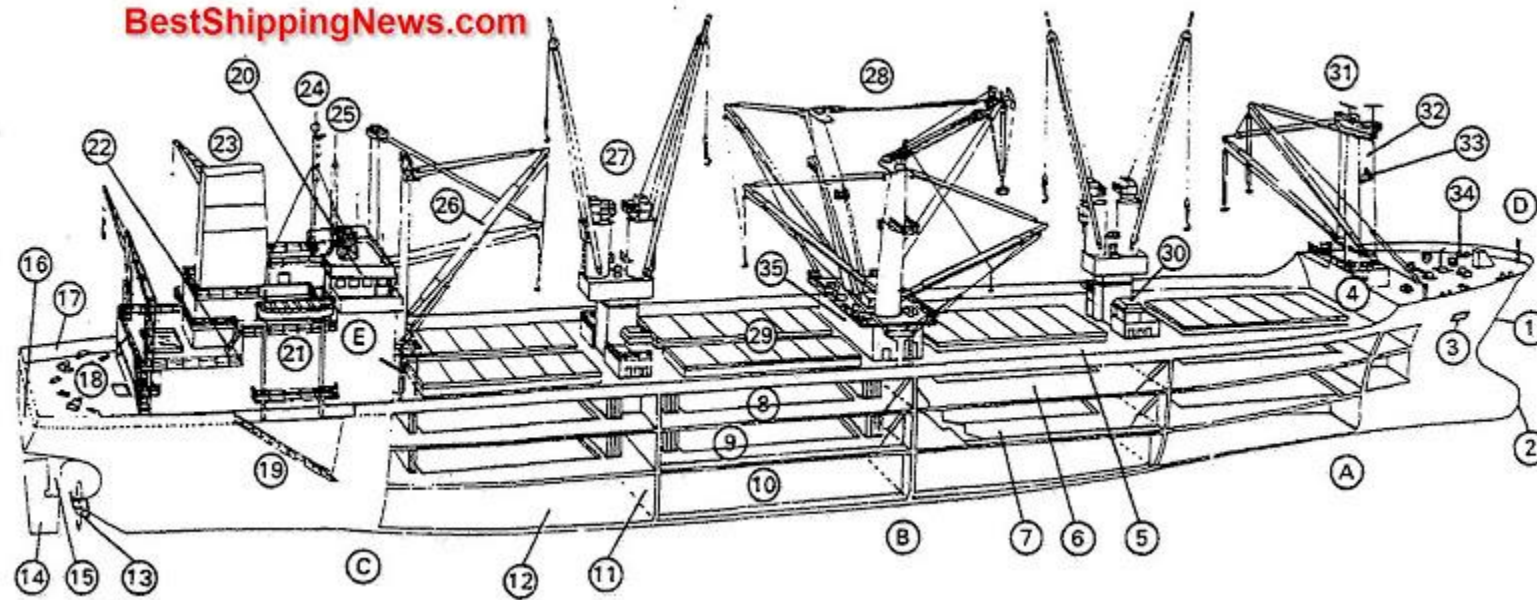
10. tank top

11. stowage in holds

12. deck cargo

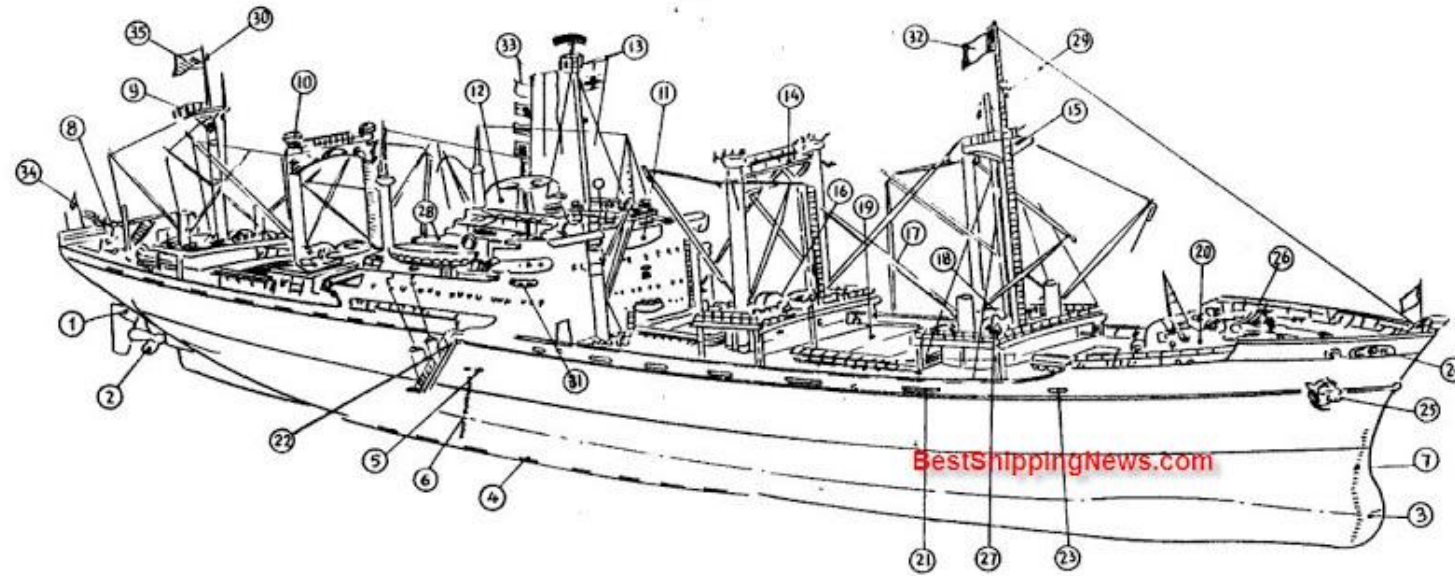


A bow
 B midship body
 C quarter
 D forecastle
 E bridge castle
 1 stem, bow
 2 bulb
 3 hawse pipe
 4 forecastle break, forecastle bulkhead
 5 main deck
 6 second deck
 7 third deck or orlop deck
 8 upper 'tween deck
 9 lower 'tween deck
 10 lower hold
 11 transverse bulkhead
 12 tank top plating
 13 propeller
 14 rudder
 15 stern frame
 16 counter stern



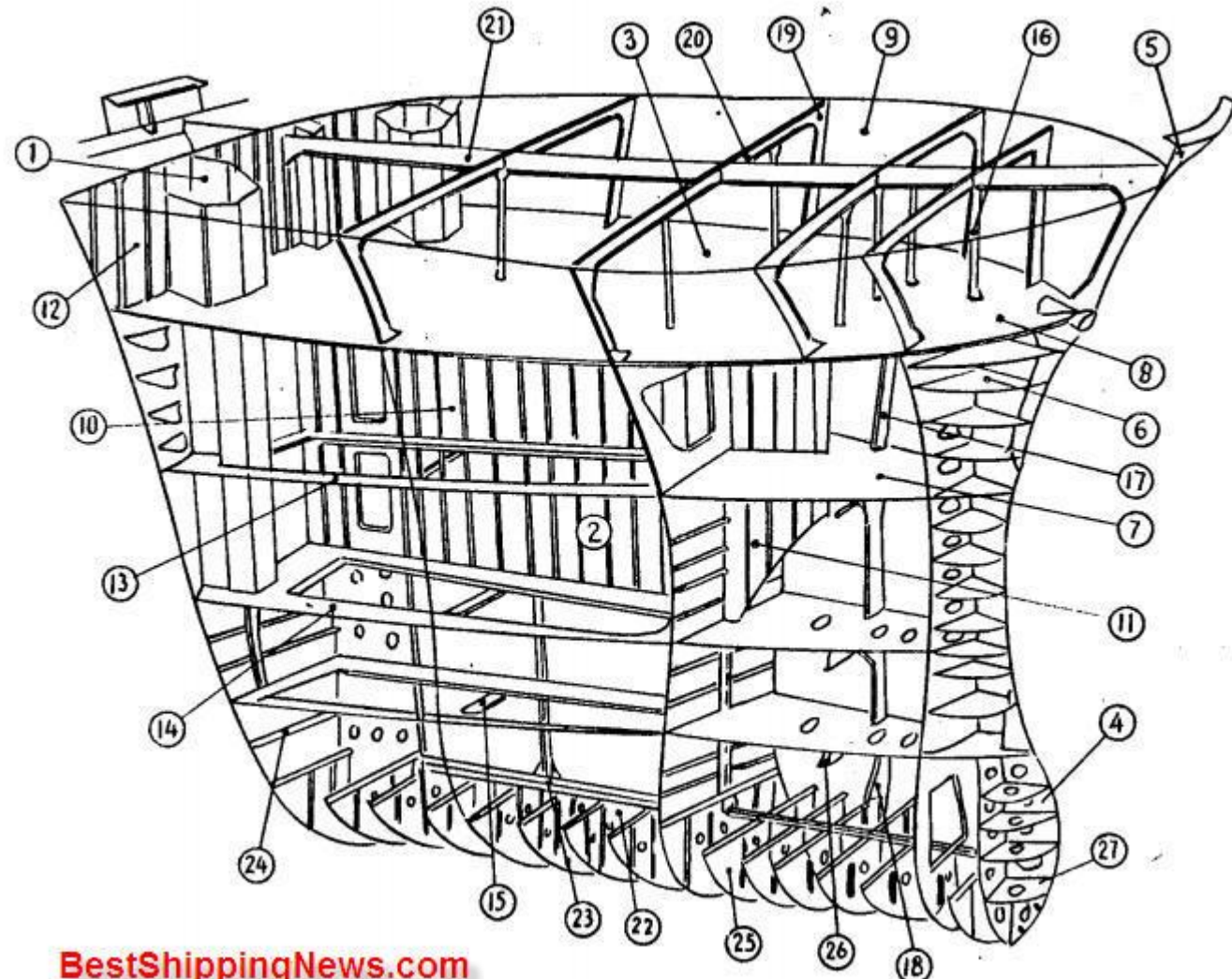
17 bulwark
 18 mooring gear
 19 accommodation ladder
 20 bridge, flying bridge, "monkey island"
 21 lifeboat
 22 ladder
 23 funnel
 24 signal mast, "Christmas tree"
 25 aerials
 26 cargo derricks
 27 cargo cranes
 28 heavy lift rig
 29 hatch covers
 30 ventilator
 31 mast top, mast platform
 32 samson post, king post
 33 navigation light
 34 hawse gear
 35 deck house

- 1 . Rudder
2. Propeller
3. Bulbous bow
4. Bilge keel
5. Load line disc
6. Midship draft marks
7. Forward draft marks
8. Docking bridge
9. Mainmast
- 10 . After derrick post
- King post
- Samson post
- 11 . Bridge
- 12 . Funnel
- 13 . Radar mast
- 14 . Fore derrick post
- 15 . Foremast

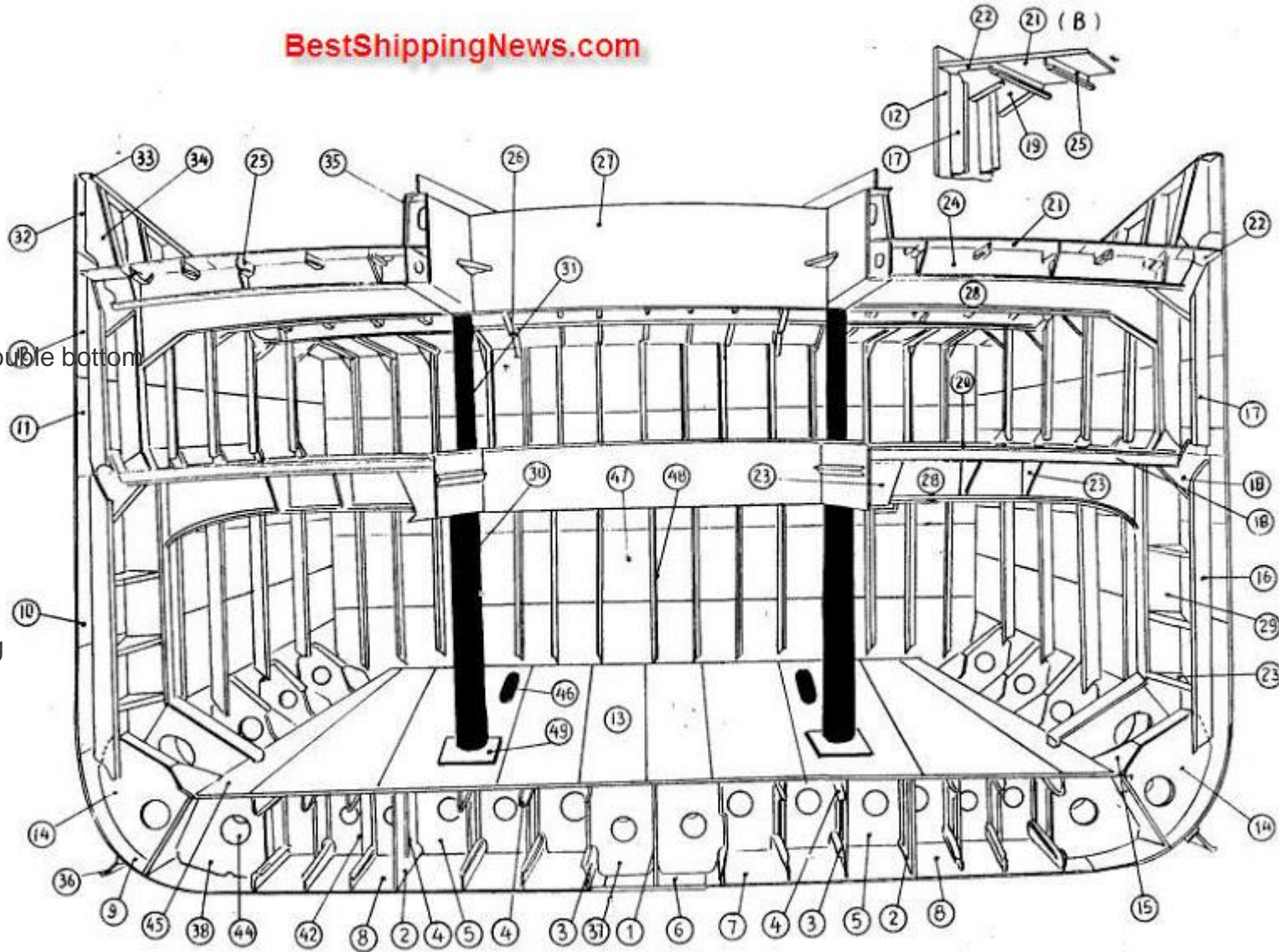


- 16 . Winch platform
- 17 . Derrick boom
- 18 . Ventilator
- 19 . Hatch, hatchway, cargo hold
20. Forecastle
- 21 . Freeing port, wash port
22. Accommodation ladder
23. Mooring pipe
24. Fair-leader, fair-lead
- 25 . Anchor
26. Windlass
27. Winch
- 28 . Life boat
29. Mast head light
30. Range light
- 31 . Side light
32. Blue peter
33. Signal flag
34. Ensign flag
35. House flag

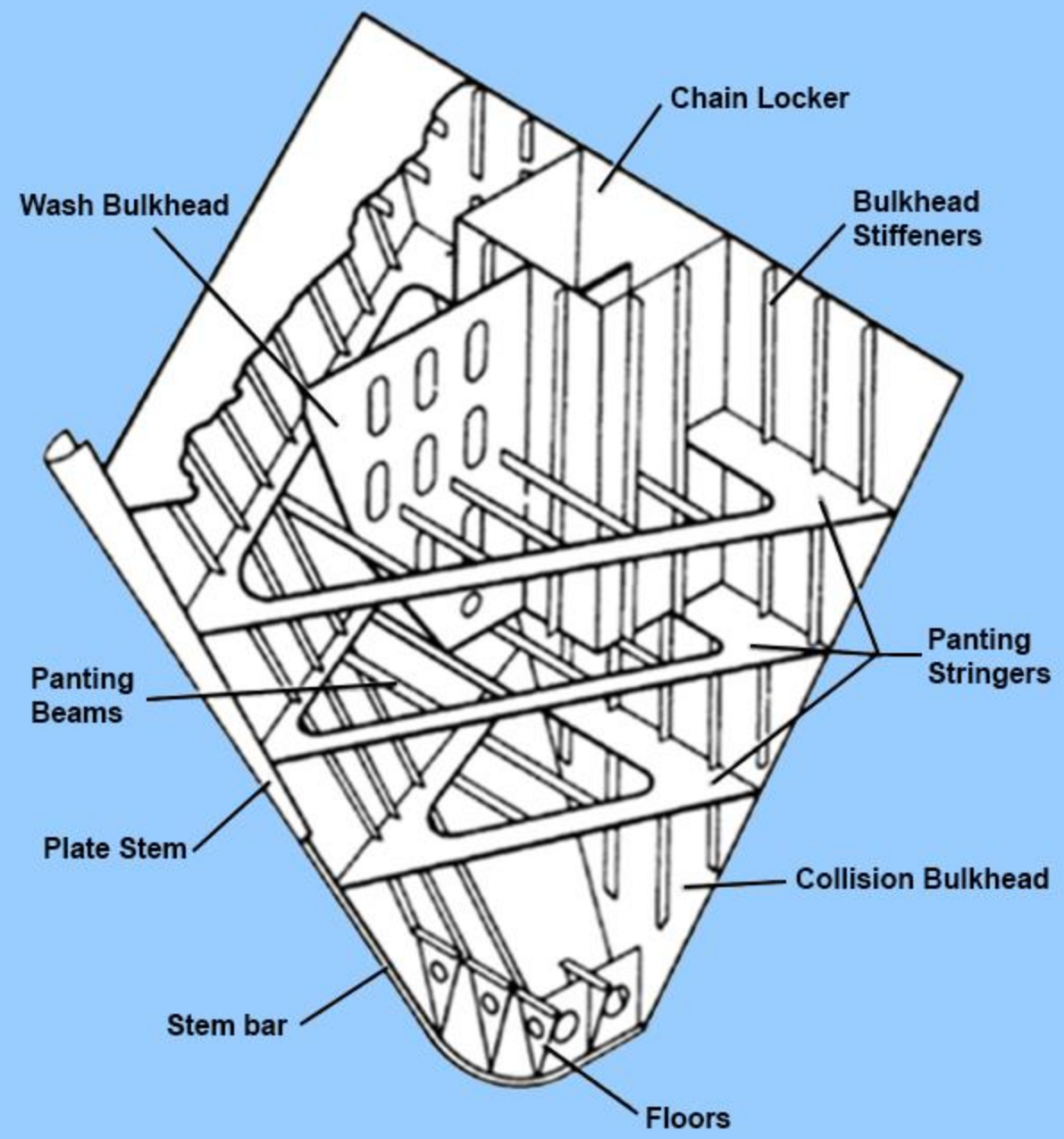
- 1 . Chain locker
2. Fore peak tank
3. Boatwain's store
4. Bulbous bow'
5. Fashion plate
6. Breast hook
7. Second deck
8. Upper deck
9. Forecastle deck
- 10 . Center division
- 11 . Wash plate
- 12 . Collision bulkhead
- 13 . Side stringer
- 14 . Panting stringer plate
- 15 . Panting beam
- 16 . Pillar
- 17 . Frame
- 18 . Tank side bracket
- 19 . Beam bracket
- 20 . Beam
- 21 . Deck girder
- 22 . Center girder
- 23 . Rider plate
- 24 . Horizontal stiffener
- 25 . Deep floor
- 26 . Panting stringer under beam
- 27 . Rib
- 28 . Shell long.
- 29 . Keel

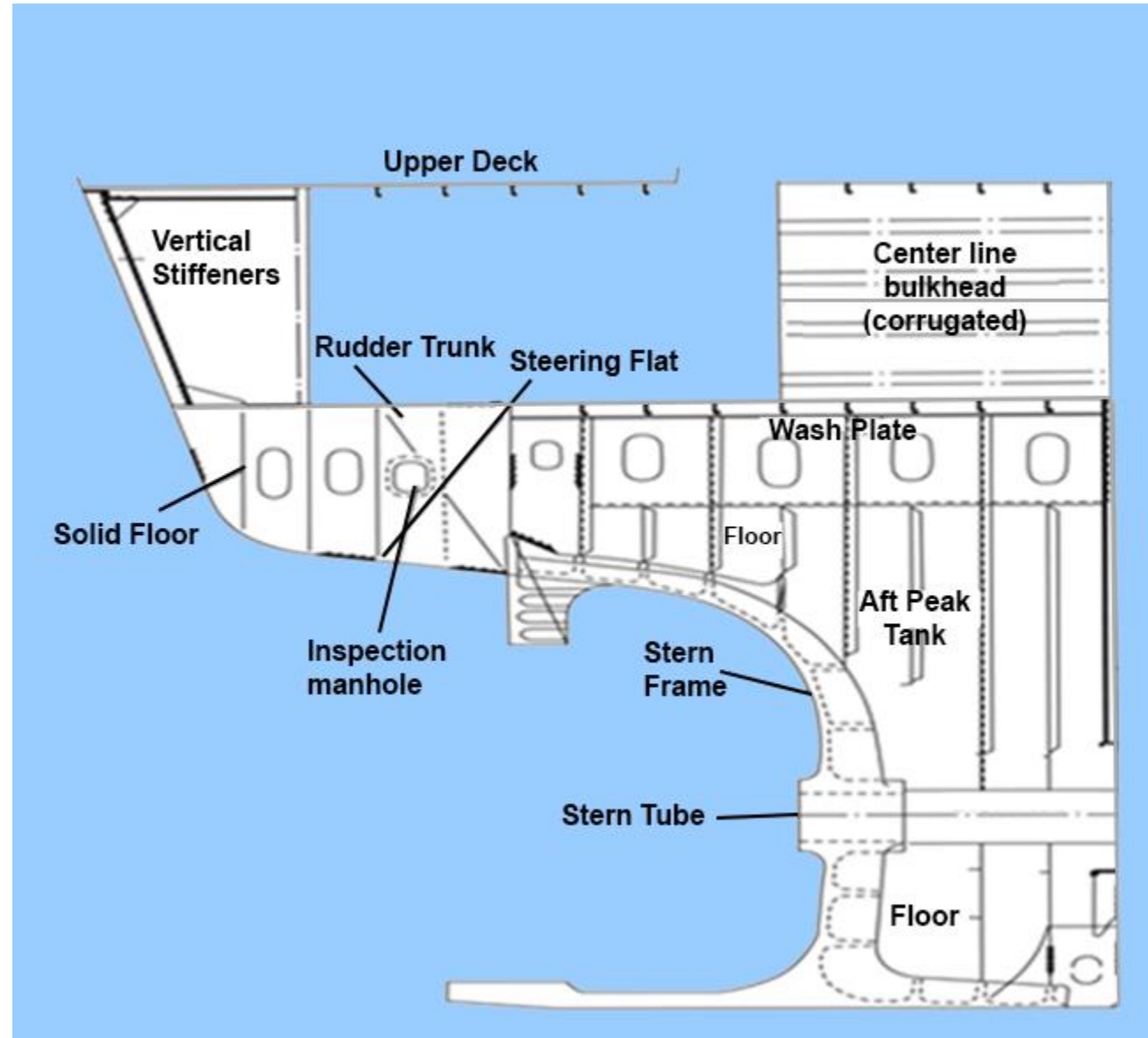


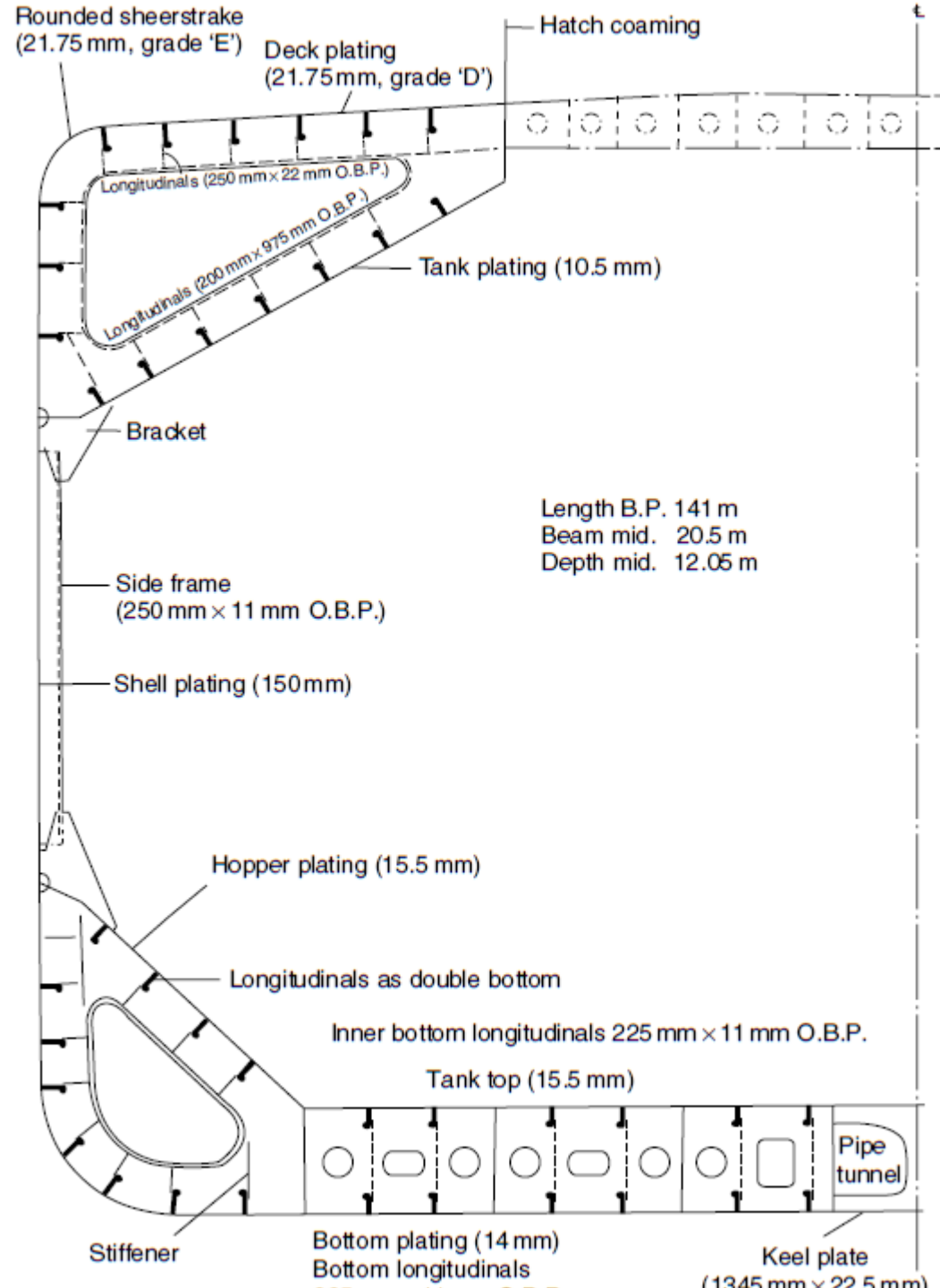
- 1 . Center girder
- 2 . Side girder
- 3 . Bottom longitudinal
- 4 . Top longitudinal of double bottom
- 5 . Solid floor
- 6 . Keel
- 7 . A strake
- 8 . Bottom plating
- 9 . Bilge strake
- 10 . Side plating
- 11 . Top side strake
- 12 . Sheer strake
- 13 . Inner bottom plating
- 14 . Tank side bracket
- 15 . Gusset plate
- 16 . Hold frame
- 17 . Tween deck frame
- 18 . 2nd deck beam
- 19 . Beam bracket
- 20 . ;ucund duck



- 21 . Upper deck
- 22 . Stringer plate
- 23 . Tripping bracket
- 24 . Deck transverse beam
- 25 . Deck longitudinal
- 26 . Deck girder
- 27 . Hatch coaming
- 28 . Strong beam
- 29 . Web frame
- 30 . Hold pillar
- 31 . Tween deck pillar
- 32 . Bulwark plate
- 33 . Hand rail
- 34 . Bulwark stay
- 35 . Horizontal stiffener
- 36 . Bilge keel
- 37 . Docking bracket
- 38 . Bracket to margin plate
- 39 . Water tight floor
- 40 . ; Bracket to water tight floor
- 41 . Vertical stiffener
- 42 . Strut
- 43 . Scallop or Serration
- 44 . Lightning hole
- 45 . Margin plate
- 46 . Manhole
- 47 . Water tight bulkhead
- 48 . Bulkhead stiffener
- 49 . Doubling







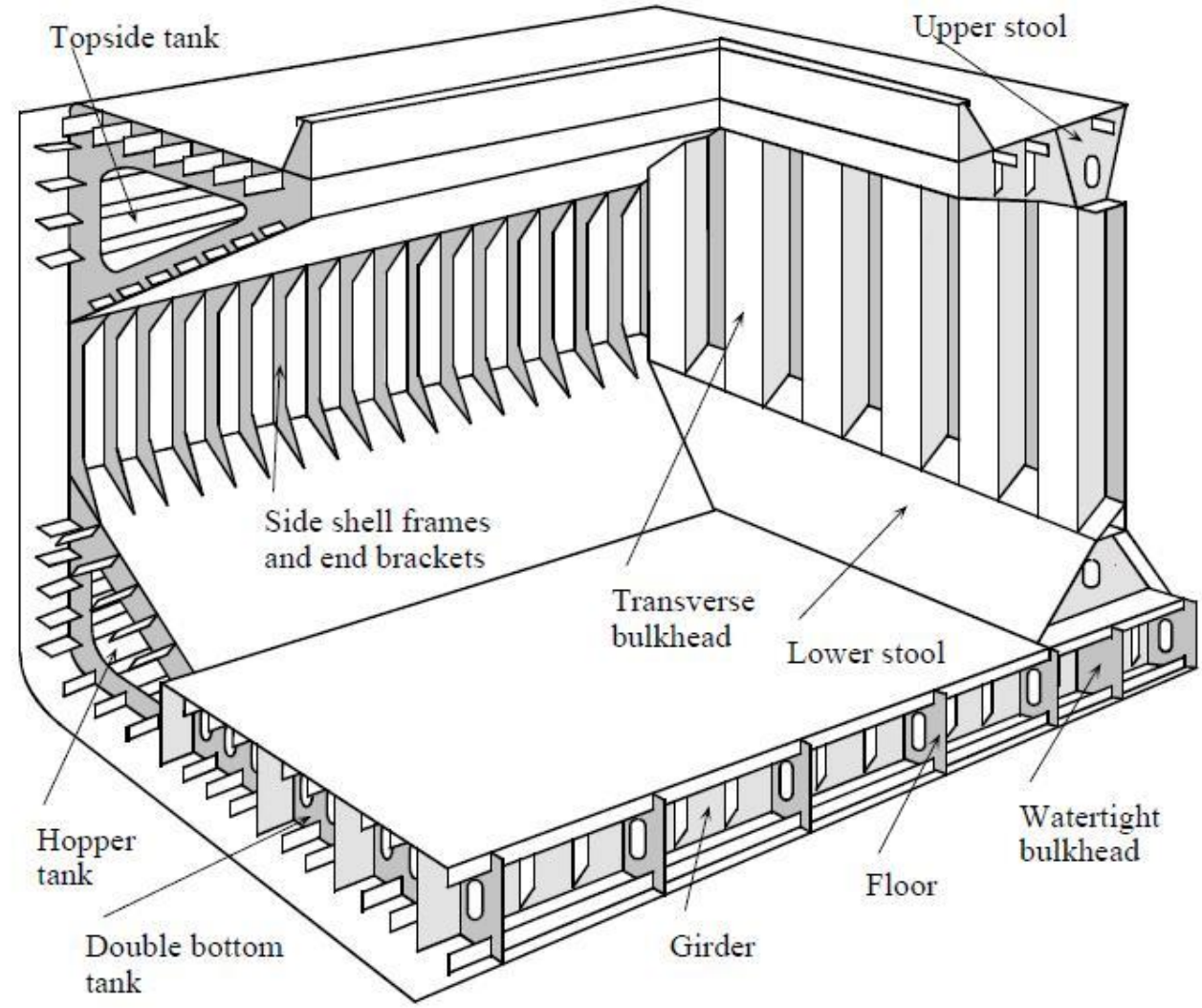
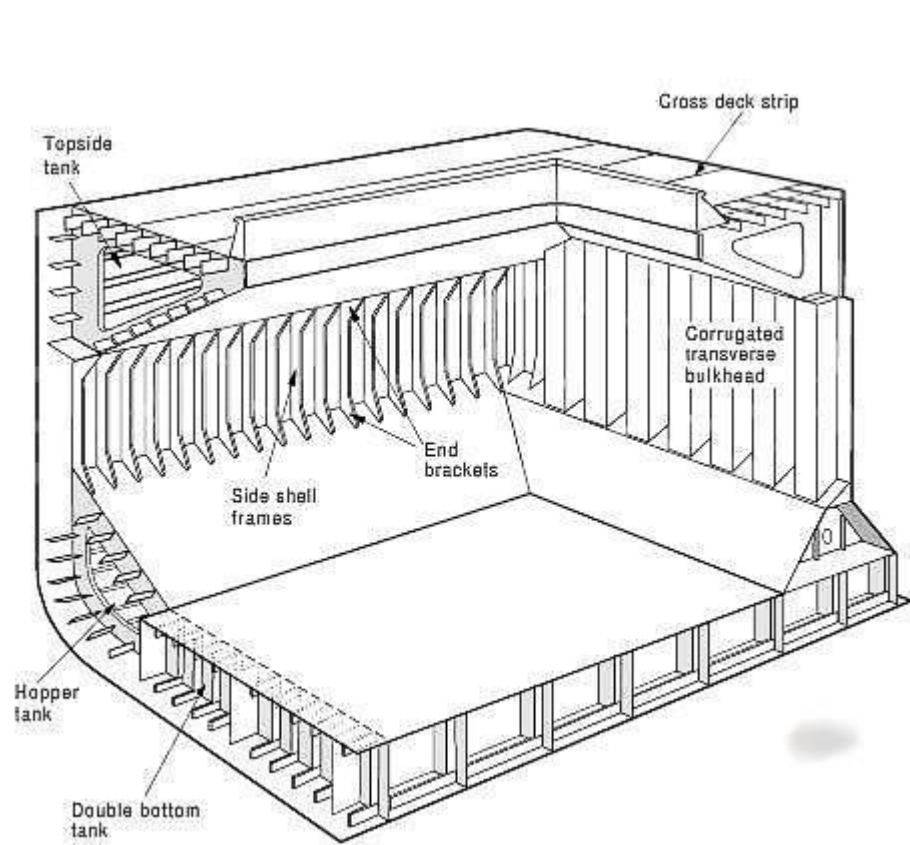


Figure 2 Typical cargo hold configuration for a single skin bulk carrier

LNG tanker (side view)

