

Function - 3.

my self

Name: Dhananjay K. Singh.

Class:

School / College: _____

Email:

Index

Date	Page No.	Subject:	Sign	Remark
		SOLAS		
		MARPOL		
		PSCA		
		EEDI		
		UNCLOS		
		IMO		
		Amendments,		
		ISPS		
		ISM		
		MFA		
		Stability		
		Contents		

Convention - is the framework of an agreement between countries.

Regulations - Technical provisions of convention

Protocol - modification in convention.

It is used to react quickly to serious accident at sea or recent development which needs changes.

Amendments - Changes to improve the context of the regulation of the convention.

Resolutions - Amendments made by council, committee, sub-committee for conventions, which are brought by resolutions by IMO.

Codes - Gives specific technical requirements for the convention.

- 2 groups -
- 1) Binding code (eg: ISM Code)
 - 2) Recommended code (eg: Code of safety for special purpose ship)

Treaty - is a written international agreement b/w two or more states and binded by international law.

Established - 1948 in Geneva
IMO - Came into Force - 1958

Page No.

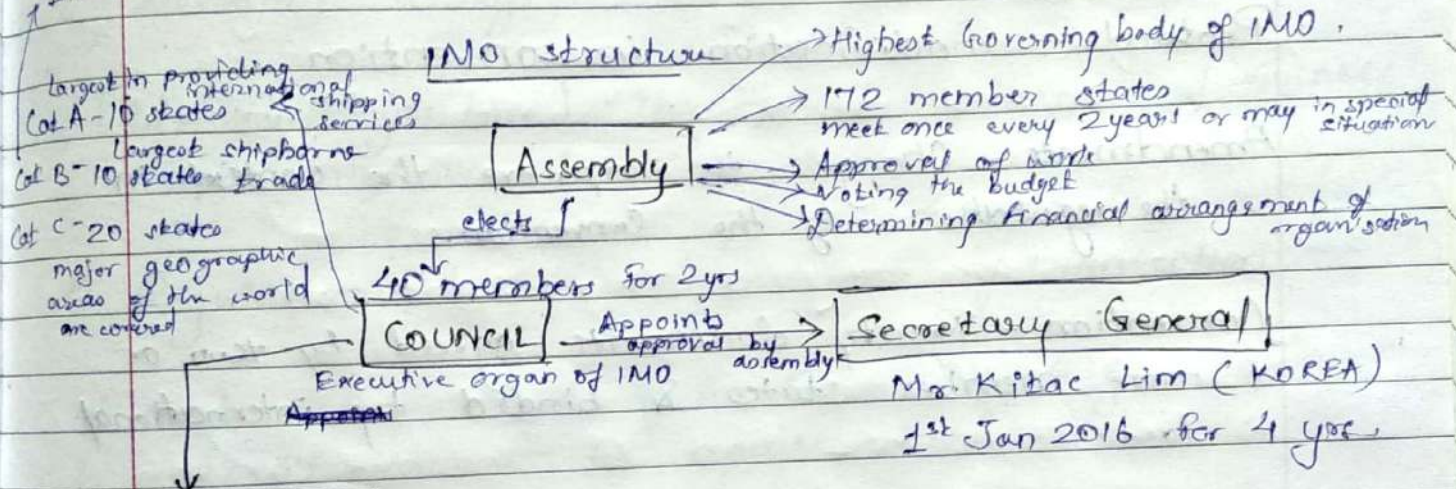
Date

Previous name IMCO - Inter Governmental Maritime
Consultative Organisation.
Changed to IMO - 1982

Headquarters - London

IMO - Specialised agency of UN for safety & security
of ships & to prevent marine pollution from ships.

India



Committees

1. MSC (Maritime Safety Committee)
2. MEPC (Maritime Environment Protection Committee)
3. LC (Legal Committee)
4. TCC (Technical Co-operation Committee)
5. FC (Facilitation Committee)

Assisted by

Sub Committees

HTW
ZEE
NCSR
PPR
CCC
SSE

Council - Supervises the working of
organisation

Human Element Training & Watchkeeping

Implementation of IMO structures.

Navigation, Communication & Search & Rescue

Pollution Prevention & Response

Ship design & Construction

Carriage of Cargoes & Containers

Role of IMO: Create a regulatory framework for shipping which is fair & effective, universally adopted & Universally implemented.

→ It makes sure majority of Conventions are kept up to date.

→ At present 50 conventions & numerous protocols & amendments.

Protocol - modification in convention

Amendments - Changes to improve the context in the regulation of the Convention.

Convention - Treaty documents agreed by two or more member states & binded by international law.

Resolutions - Amendments made by council, committees & subcommittees ^{for} a convention, ~~from~~ which are brought by resolutions by IMO.

Resolution to come into force

- Propose - ~~Committee & Subcommittee~~ Contracting Governments
- Review - IMO
- Adopted - by IMO first
- Finally accept → Member states
- Fix at time for acceptance
A date

MEPC.786 (12)

Who passed this resolution The resolution number The session in which it was adopted

1994

Dhananjay

(UNCLOS) - 160 countries

Camlin Page
Date / /

United Nations Convention on the law of sea

It is an international treaty that provides regulatory framework on seas, & equitable usage of resources.

→ Protection & preservation of marine environment
17 parts, 320 articles & 9 annexes in UNCLOS

Baseline - A legal boundary line from which the coastal states have sovereignty to the seas beginning from that line.

Territorial Sea - 12 nautical miles from baseline.

- Coastal state can impose any law.
- Foreign vessel has the right of 'innocent passage' through any territorial waters.

Innocent passage - means expected and continuous manner of passage.

Archipelagic States - Consists of group or groups of islands which has interconnecting waters who have sovereignty over a sea area enclosed by straight lines drawn to the outermost points of islands.

Contiguous Zone - B/w 12 miles & 24 miles states can enforce law on

- Customs
- Taxation
- Pollution
- Immigration.

Exclusive Economic Zone - 200 nautical miles from baseline.

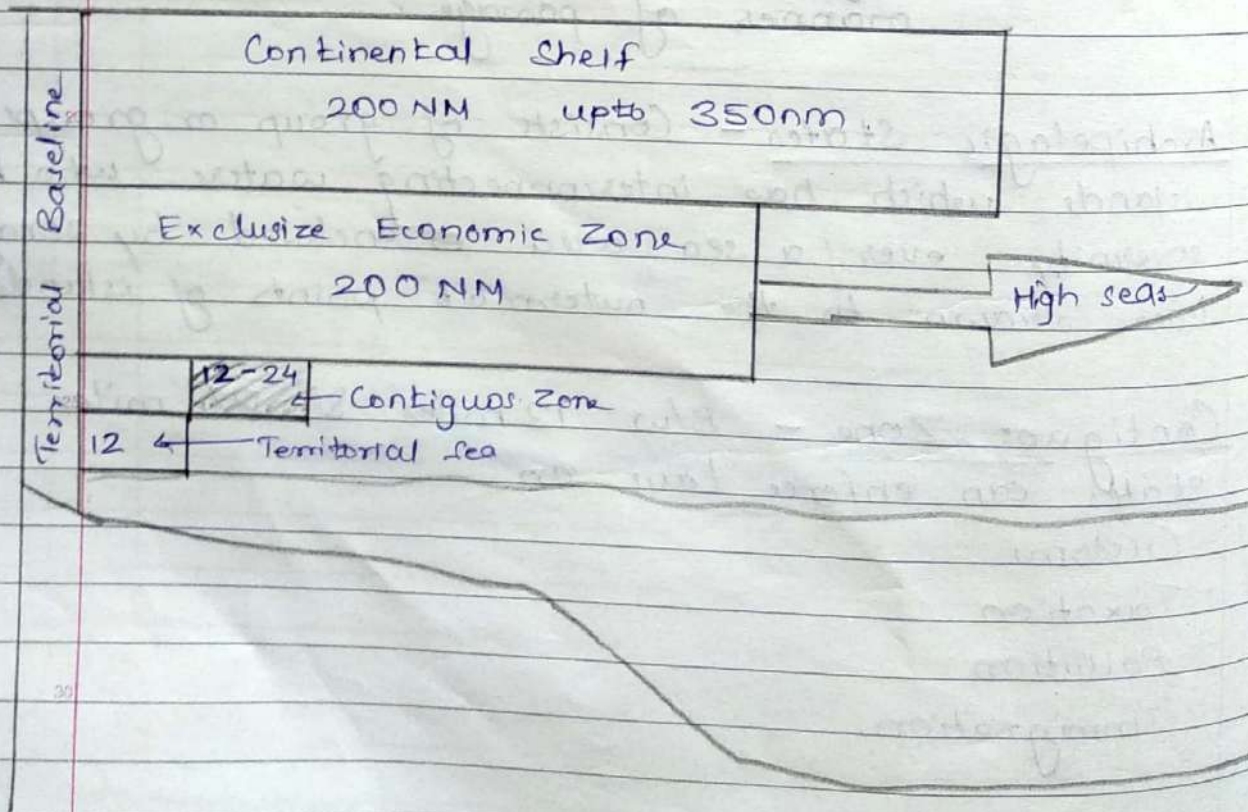
- Coastal states have rights for exploring, exploiting, conserving and managing living & non-living resources of water, seabed & subsoil.
- All other states have rights to navigation, flight, lay submarine cable or pipelines.

Continental Shelf - 200 to 350 NM

- Coastal states have rights for exploring, exploiting non-living ~~resources~~ resources of seabed subsoil plus sedentary species.

High Seas - After 200 NM.

- All states have rights of navigation, flight, research & fishing on high seas.



Controlled Drugs

- 1) Morphine
- 2) Isotretinoin
- 3) Ephedrine tablets
- 4) Ephedrine injection
- 5) Phenobarbital tab

MARPOL Amendments

10 Annex I

- ① 1 Jan 2017 - Oil Residue.
Requirements for discharge connections & piping to ensure discharge of oil is properly disposed off.
- ② 1 Jan 2017 - Polar Code amendments
- ③ 15 To update form B of IOPPC for Segregated Ballast Tank. - 1 March 2018

Annex II

- ① 1 Jan 2017
- ② Polar Code Amendments
- ③ Amendments to guidelines of categorization of NLS.

Annex III

25 Annex IV

- 1 1 Jan 2017
- ① Polar Code Amendments.
- ② Amendments to Sewage Special Area - Sep 2017

Annex V

- ① Polar Code Amendments - 1 Jan 2017
- ② 1 March 2018 - New GRB included.
 Part I - For Garbage other than Cargo residues applicable to all ships.
 Part II - For Cargo residues, only for ships carrying Solid Bulk Cargoes.

* It provides criteria for classification of SBC as HME & it should be declared by shipper.

- | | |
|-------------------------|-------------------------------------|
| A - Plastics - Red | G - Animal Carcasses |
| B - Food - Blue | H - Fishing Gear |
| C - Domestic - Black | I - E-Waste |
| D - Cooking oil - White | J - Cargo Residue (Non-HME) - Green |
| E - Incinerator - G | K - Cargo Residues (HME) - Orange |
| F - Operational - Y | |

Annex VI

- ① 1 Sep 2017 - NO_x Tier III Reporting
- ② 1 March 2018 -
 Collection & Reporting of Ship's fuel oil data consumption.
 New mandatory fuel oil data collector system has been introduced.

SOLAS Amendments

Dhananjay

Camlin	Page
Date	/ /

① 1 Jan 2017 - IGF Code

Int. Code for the Safety of ships using Gases or low flashpoint fuels. amendments to make mandatory.

Amendment regarding secondary venting of cargo tanks to ensure adequate safety.

② 1 Jan 2018 - ~~FAI~~ Revised FAI Convention.

'Single Window Concept' to obtain all info of Crew, Cargo, persons, etc at one portal without duplication.

→ No discrimination on shore leave.

③ 1 July 2018 - ESP Code

Enhanced Survey Program to make mandatory for bulk carriers & oil tankers.

STCW

① 1 Jan 2017 - Manila Amendment transitional provision end

→ Rest hours 70 to 77

→ AB-COC, Ch.ck-COC, ETO-COC.

② 1 July 2018 - STCW polar waters

Emergency training for seafarers, on passenger ships

For Seafarer's Rights

Camlin	Page
Date	/ /

Q MLC (Maritime Labour Convention) 2006
Ans MLC is divided into 4 layers.

- 1) Articles
- 2) Regulations
- 3) Code A (Mandatory)
- 4) Code B (Non-mandatory)

The code is divided into 5 chapters.

Title 1 - Min reg to work on ship.

below 16yr not allowed.

below 18yr not allowed at night work.

Title 2 - Condition of Employment.

Hours of work, rest, leave, compensation on injury.

Title 3 - Accommodation, Recreation, food & catering.

Title 4 - Medical & Social protection.

Title 5 - Compliance & Enforcement.

Q Static test of L/B.

→ Done 5 yearly

→ Loaded to not less than 1.5 times the max break holding capacity of Davit.

→ Tested for Deformation.

Q Dynamic test of L/B

→ Done 5 yearly

→ Loaded to not less than 1.1 times the max break holding capacity of Davit.

→ Released at max lowering speed tested for deformation.

* These tests are only done in drydock

- It is done annually by company representative with no crew onboard L/B.

OPA-90 - It works to avoid oil spills from vsls & facilities. The cost for cleanup, damage and fund for cleanup, damage or removal of spilled oil cost, are taken from the ship ~~irrespective~~ irrespective of determination of fault for oil spill

STCW rest hours

- 10 hrs min rest in 24 hrs
- 77 hrs in 7-day

ILO (MLC)

(a) Max work hours shall not exceed

- 14 hrs in 24 hr
- ~~72~~ 72 hr in 7 day

(b) Min rest hours shall not be less than

- 10 hrs in 24 hr
- 77 hrs in 7 day.

20 STCW Convention

Chap 1 - General Provisions

2. Master & Deck Department

3. Engine Department

4. Radio Communication & Radio personnel

5. Special training requirements for personnel on certain types of ships.

6. Emergency, Occupational safety, medical care & survival functions

7. Alternative Certification.

8. Watchkeeping.

Liferaft carrying Criteria.

- 1) One or more ^{together} with 100% capacity, easily transferable
 - 2) 100% each side, if not easily transferable.
 - 3) If freefall L/B with 100% capacity, then L/R with 100% capacity on each side.
 - 4) For ships less than 85m, no need of L/B. then L/R 100% on each side, if easily transferable or L/R 150% on each side, if not easily transferable
- A rescue boat which may also be used as L/B may be used for fulfilling this 150% criteria.
- 5) Additionally, 1 at the fwd if length of aft L/B from fwd is more than 100m capacity not less than 6 persons

Lifeboats

- 1) 100% on each side in cargo ships
- 2) 50% on each side in passenger ships

Rescue Boats

- 1) At least one

Lifebuoy.

<100m	8	50% with light, of these 50%
100-150	10	2 lifebuoys also (4.5 kg or more)
150-200	12	MOB buoys.
>200	14	2 lifebuoys having buoyant lifeline (8mm 5kn strength)

Life Jacket

- 1) For 100% crew
- 2) 10% for child
- 3) 2.5% for infant

* BA generator air testing period 1 year

Q Chemical tanker safety parameters

Ans Double hull & Double bottom & tank capacity is fixed in chemical tanker

Type 1 - capacity cannot exceed 1500 m^3

Type 2 - capacity cannot exceed 300 m^3

Type 3 - no capacity requirement

Q FIRE ... Find Identify Report & Extinguish

Q Intermediate survey is done b/w 2nd & 3rd annual survey

3 months window period as per harmonised survey

Q Disposal of Non-controlled drugs

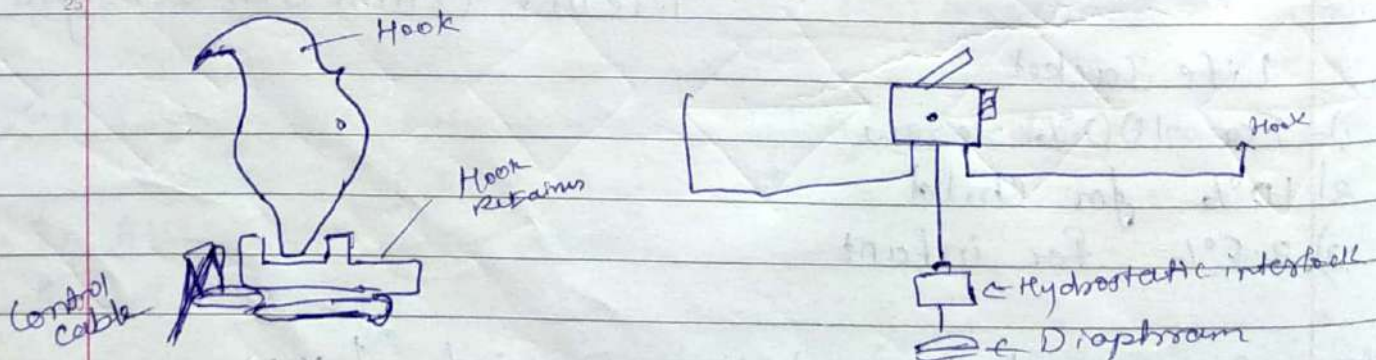
→ At shore & return to the supplier if possible

→ Incineration

Disposal of controlled drugs

→ Give to qualified doctor or pharmacist

→ Incineration



Slop tank Requirement

< 70000 DWT - 1 slop tank

 ≥ 70000 DWT - 2 slop tanks

1 slop tank capacity

min 3% of total cargo space

2% if administration satisfied + SBT



1.5% + SBT + COW

1% → combination carrier

Marpol line

- Small diameter line used to discharge last part of cargo.

Diameter - 10% of main cargo discharge line

- Connection of marpol line for discharge ashore should be after main manifold V/V. & slop tank

Master Responsibilities & authority under SMS.

- 1) Implementing the safety & pollution prevention policy of company.
- 2) Motivating the crew in observation of policy.
- 3) Over-riding authority & responsibility to make decision.
- 4) Report deficiencies to ashore.

B.P - 120/80

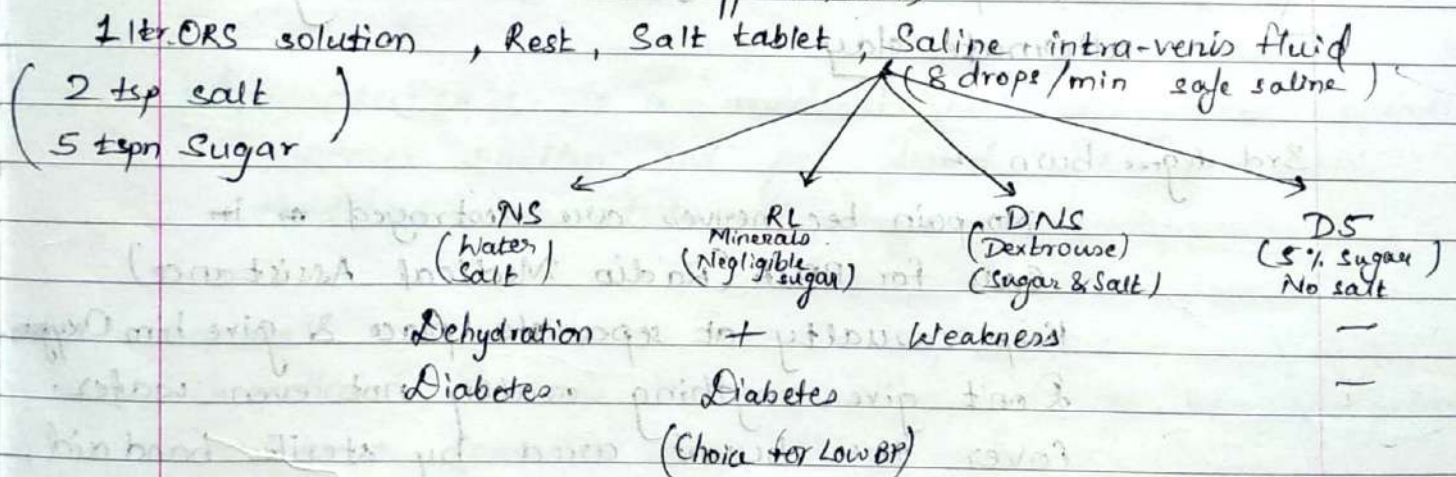
During ejaculation the pressure maintained is called Systolic
When the blood returns back to the heart is Diastolic
Sphygmomanometer - instrument record BP.
Old with mercury → New with digital (onboard)

High BP - more than ¹⁴⁵/~~140~~/90 (Hypertension)
→ stroke, paralysis, Heart attack

140/90 - Primary hypertension

Anti-hypertensive medicine to relieve very high hypertension
(Stamlo) 5mg tablet → [content: amlodipine] - once in a day

Low BP - 110/60 (Hypotension) - (110/80 120/90 - Normal)



epidermis

dermis

Subcutaneous tissue (hypodermis)

Thermal Burn - Dry heat source - eg: hot surface

Scald Burn - Moist heat source - eg: water vapour

Chemical Burn - Acid, Alkali

Electrical Burn - Electricity

1st degree burn - whenever epidermis is involved.

Redness & Pain

Wash by running water, wipe & antiseptic
Silver X, Burnol cream, Soframycin
Brufen

2nd degree burn - Epidermis & Dermis

Blisters & Swelling

Strict sterile precaution & dressing

Wash with NS, ~~santon~~ distilled water then
use Savlon, then betadin then wear new

sterile hand gloves apply antiseptic then use

Bactigrass sheet

Take injection TT (Tetanus Toxoid), antibiotics and
some painkiller tablets & dressing on
alternate day

3rd degree burn :-

No pain bec nerves are destroyed. or in

Call for RMA (Radio Medical Assistance)

Keep casualty at separate place & give him Oxygen

Don't give anything orally not even water.

Cover the burnt area by sterile band aid.

Give IV Fluids, & TT injections,

Rule of 9

It is used to evaluate percentage of burned
body surface

WBC = To make immunity (5000-11000)

2 causes of death in Burnt Casualty

Septicaemia
(Infection in whole blood)



Due to No skin surface

Multiple Wounds

Unhygienic dressing



Septic Shock (caused due to unsterile practices)



Death

Renal Failure



Huge fluid loss from body

in the form of blisters,

swelling, wound discharge



Acute kidney shutdown



Kidney failure



Death

Appendicitis :- is a medical condition where appendix becomes swollen and gets filled with pus, this condition can strike at any age group.

Causes

- 1) Infection - Previous stomach infection may have progressed into a appendix and causing infection.
- 2) Obstruction - Dried piece of waste may have progressed into a appendix and causing infection over there.

Symptoms:-

- 1) Pain - Initially there will be pain in all over abdomen as infection progresses pain becomes more confined to right lower abdominal region.
- 2) Nausea/Vomiting -
- 3) Fever

Fer. If tenderness is present, it's a confirmation of appendicitis.

Call for a RMA

Start antibiotic, pain killers (Combiflam, Brufen) and Antacid (Digene) Rantag D

Start liquid or semi-solid diet

Heart attack

Heart attack is a condition where muscles of heart begin to die due to lack of oxygen and blood supply. This condition is also called as MI (Myocardial infarction).

Causes

Hypertension, Diabetes, High level of Cholesterol in blood, Obesity, mental stress

Symptoms:-

- 1) Sudden severe left sided chest pain. This pain radiates towards left arm and left lower jaw.
- 2) Excessive Sweating
- 3) Breathlessness
- 4) Bluish discolouration of skin
- 5) Chest pain increases while walking & subsides little bit in resting position.
- 6) In elderly person, vomiting is common during this session.

First Aid

M - Injection Morphine (Intra-Muscular (IM))

O - Oxygen Supply

Wait for 10-15 mins.

N - Tablet Nitro-glycerine (NTG)

Keep this tablet below the tongue

A - Tablet Aspirin 300mg

Some other drugs for heart attack

- 1) Tablet Clopitab (4 in number) + Aspirin 150mg
- 2) Tablet Sorbitrate (5mg/10mg) + Aspirin 150mg
- 3) NTG + Aspirin

CPR - Cardio Pulmonary Resuscitation

CPR is the process to restart the heart

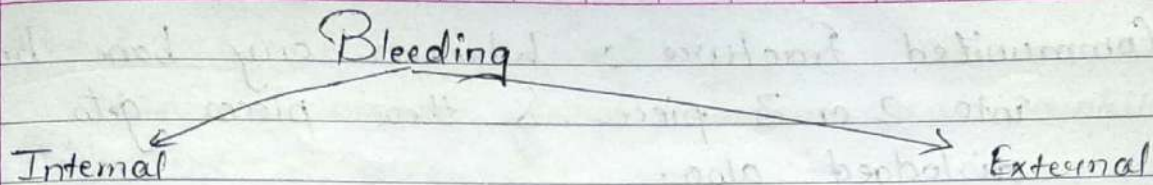
Ratio:- 30:2

Chest compression : Rescue Breath

Within 1 min, 3 cycles of CPR should Complete

Depth of chest compression = 4-5cm

Site of chest compression = Lower half of sternum bone



i). First Aid kit

Xylocaine - injection (Local Anaesthetic injection)

Put 0.1 ml in the skin & make circle on that place. After 15 min, look is there any redness or edema at that place marked, if there is no problem then use anaesthesia. at every 1cm distance.

Stitch the wounded part, → Betadine → dressing
TT injection & antibiotics.

* Healing is slow if Less WBC & Diabetic. Normally, it takes 7 days for a body to heal.

Dusting powder should be used at wet heal places.

Epitaxis Sudden bleeding through nasal cavity

First aid: Pinch cavities nose for 10 mins

Fracture

(Any break into the continuity of bone)

Types:

Simple fracture: Whenever there is single cut into a continuity of bone & even after fracture this two pieces are in same alignment.

Compound fracture: Whenever any bone protrudes through the skin

Communitied Fracture :- Whenever any bone breaks into 2 or 3 pieces. & these pieces gets dislodged also.

Impacted fracture :- Whenever one fragment of bone is driven into another fragment of bone.

Greenstick fracture :- These are incomplete type of a fracture, commonly seen in childrens.

Symptoms:

Severe pain at the sight, swelling, loss of movement, restricted movements, bluish discolouration of the skin, crepitation (crackling sound of bone)

First Aid:-

Pain which increases with the movement is usually a fracture.

Provide immobilisation (Bandages & Splint)

Always check colour & pulsation of affected area.

Fractures in skull, vertebral column, Hip bone

In case of suspected skull fracture don't remove helmet.

Don't give anything to eat or drink to such casualty till you take medical advice for them.

Immobilise the casualty at the same place

* Neil-Robertson's stretcher

Fractures in Upper limb

We can provide food, water, oral painkillers
Movement is allowed

Fractures in Lower limb

In case of femur fracture, internal blood loss upto 1.5 ltr is possible.

Don't advise ~~set~~ ^{weight} bearing condition.

You can follow different transport techniques.

Internal Bleeding

Heavy internal bleeding may occur within chest cavity, abdominal cavity and tissues surrounding the bones. This condition is potentially fatal if left undiagnosed.

Causes :- Accidents, Hypertension, fractured bones, sharp injuries like knife injury, deep penetrating injuries like bullet wound injury

Symptoms:

Head - Nausea/Vomiting, double vision, dizziness, severe repeated headache; darkness in front of eyes, Rarely unconsciousness, redness in eyes.

Chest - Repeated coughing along with reddish or pinkish coloured sputum.

Stomach - Coffee coloured vomiting

Intestine - Black coloured stool

Liver & spleen - Superficial skin discolouration, shock.

First Aid:

For the confirmation of internal bleeding, check casualties pulse rate, if it is on higher side, it's a sign of internal bleeding.

Don't give anything orally to such casualty till you take any medical advice.

Protect such casualties from hypothermia
Start oxygen supply

Be ready for even CPR.

Frostbite / coldburn:- (freezing of tissue fluid)

Heimlich ~~Manoe~~ Manoeuvre first aid for choking

Blood - 4.5 - 5 ltr normally

Breath - 17 - 18 breaths/min

Types of Shock

- 1) Cardiogenic
- 2) Hypo-ovamic (when body fluid becomes less)
- 3) Anaphylactic (Due to allergy)

Cetirizine 10/20 mg for allergy

Q Diff b/w m/c & stew rest hours?

Ans MLC - Both Work & Rest hours

STCW - Rest hours

MFA - Medical First Aid.

- 1) Case Scenario
 - 2) ~~Symptoms~~ Examination → symptoms (we can't see)
→ signs (we see)
 - 3) Priority of First Aid (OR ABC)
 - 4) Recovery position
 - 5) First Aid (First Aid given before medical facilities arrive)
 - 6) Second Aid (Ship's hospital) → MFAA
→ RMG
→ Medicines
 - 7) Transportation
 - 8) Evacuation
- Recovery posn.
→ Resuscitation (for CPR)
→ Feet up posn (BP falling)
→ Half seating (for blood to go to lower body)
→ V posn (Blood circulation for abdomen region)
→ Any other

Case 1 - During maintenance AB fell in water hits the floating log and is recovered by rescue boat.

Examination:- Unconscious but breathing, head injury, open wound on head.

D - Danger (Protect yourself from surrounding)

R - Response (Call out his name loudly, move his face & check)

A - Airway

B - Breathing

C - Circulation

First Aid - Head Bandage, Blankets, recovery posn, rebreathing mask.

Case 2: Same scenario but casualty not breathing?

① → Use Oxygen Resuscitator

② → Close nose and give (2 puffs) of breathing

or

use AMBU Bags

A - Assisted

M - Mechanical

B - Breathing

U - Unit



③ Guediels Air - to keep airway open in mouth

④ Jaw thrust method

⑤ Sylvester Method. - Last option, use the arm of the casualty and press lower chest and open & press something put on the back to allow airway to remain open.

Case 3: Casualty not breathing & heart not pumping

→ Start CPR (Cardio Pulmonary Resuscitation)

30:2

In 1 min, 3 cycles of CPR to complete
check pulse every 2 min & continue CPR for 30 min

Defibrillator - For giving shock

Case 4: Nose Bleeding

(Temp, Fell on surface, Head injury, High BP)

→ Casualty - sit with face near to the basin and pinch the soft part of nose for 10 mins.

→ Doesn't stop then repeat for 10 mins. then also don't then again continue 10 mins.

→ After 3 times trying still doesn't stop then insert a ribbon gauze.

Types of Fracture

- 1) Greenstick Fracture (occurs in kids, bone bends only crack) Hairline Fracture in adults
- 2) Simple fracture
Bone gets a single cut and ~~its~~ both the pieces are in same alignment)
- 3) Compound Fracture -
Whenever bone comes out of skin
- 4) Complicated Fracture - (Comminuted)
Single bone broken in multiple Areas.
- 5) Impact Fracture.
Bone fragment is driven into another bone

Burn.

Rule of 9

Head & Neck	= 9%	= 9	Burn more than 15% Person may go into shock. Give more Fluids
Arms	= 9%	= 18	
(F & Back) Upper Middle Body	= 9%	= 18	
(F & Back) Lower Middle Body	= 9%	= 18	More than 20% burn Get him evacuated
Genitals	1%	= 1	IV Fluids mandatory
Legs each	9% Fwd & 9% Back	= 36	
		100%	

Q When to take Radio medical Advice

Ans 2nd degree burns.

Burns in babies.

Burns face, genitals, Large burns

18% burns - adults

10% burns - children & older persons

Hypothermia.

Body loses heat faster than it produces heat

Normal Body temperature = 37°C or 98.6°F

Hypothermia occurs when temp falls below 35°C .

Types

- 1) Mild - 35°C to 32°C (Person conscious, shivering)
- 2) Moderate - 32°C to 28°C (Semiconscious, not shivering, Body turns bluish)
- 3) Severe - Less than 28°C (Unconscious, whole body turns blue)

* Rectal thermometer - Instrument

Types of injections

- 1) Intramuscular - 90° Muscles
- 2) Subcutaneous - 45° Subcutaneous tissue
- 3) Intravenous - 25° Dermis (directly in blood)
- 4) Intradermal - $10-15^{\circ}$ Epidermis

Medical Chest - Locker in which medicines are kept

Medical Scale - List of medicines required to carry onboard as per 'Area of trade' and 'Cargo onboard'.

Medical scale is in MFAG

MFAG is IMDG supplement.

Q How to use Ship Captain's Medical Guide? Where is it present onboard?

Ans It is kept in 'Medical Cabinet'.
It helps to diagnose and injured & sick seafarers.

How to use it?

- Go to the index at the end of the Guide.
- Check for required problem.
- Go the specified page for the 'General' & 'Specific' treatment for it.

Q What is IMGs?

Ans International Medical Guide for Ships published by IMO & WHO.

Q How will you indent medicines onboard?

Ans By consulting.

- 1- IMGs
- 2- Flag state requirements
- 3- Medical Scale.

IMGs has recommended medicines to be carried onboard as per ship type along with Flag state requirements Medical Scale as per area of trade & cargo onboard.



Needles

- 1) Hemo-seal - For vascular surgery
- 2) Multicurve - For confined access procedures.
- 3) Tapercut - For dense tough tissue
- 4) Prime - For skin dissection

Certificate

validity - 1 year

- 1) Medical Chest Certificate OR
Certificate of inspection of medicines, medical stores & appliances.
→ Medicines must be inspected regularly not exceeding 12 months.

- 2) MSDS
- 3) Certificate of Training MFA for officers.
- 4) Seafarer's medical Fitness certificate
- 5) Record book (maintained by master)

* Margin Plate - It is the outboard strake of structure to inner bottom which connects sheer plating to bilges.

* ISPS Functional Requirements

- 1) Info Exchange
 - Maintaining Commn
 - Preventing Unauthorized access
 - Unauthorized weapons or explosives
 - Security Plan
 - Training & Drills
 - Alarms

* Action in leg fracture.

- 1) Stop bleeding if any by applying pressure.
- 2) Immobilise the injured area - don't try to realign the bone.
- 3) Apply ice packs to limit swelling & help in relieve pain.
- 4) Treat for shock - if person feels faint or breathing is short rapid breaths lay the person with head slightly lower than the trunk.

Ch-11 of SOLAS

Entered into force

Page No.

Date

ISPS Code

(JULY 2004) - ~~12 months~~ validity

It came after 9/11 attacks on twin towers the World Trade Centre.

Applies to:- All ships on international voyages which includes passenger ships & cargo ships of 500 GRT and above

ISSC (International Ship Security Certificate)

- Valid for 5 years.

Q Who decides the security level?

Ans At sea: Security level set by flag state & CSO informs the ship.

At port: By agent, before arrival.

Level 1:- 20% search.

- Visitor & Gangway log to be maintained.
- All visitor ID checked
- Stored locked, restricted areas & unattended space locked.
- Security seal to be kept.
- Security round

Level 2:- 50% search, in addition,
→ off shore side check.

Level 3:- 100% search, specific threat to the ship.
→ Heave up the gangway, no one can come in or go out.

Security drill = Every 3 month,
or if 25% crew change.

Q Alarms in Bulk Carrier?

- Ans 1) In every cargo hold, Pre-alarm = 0.5m & Main alarm - at h_L $\pm 15\%$ and not more than 2m.
- 2) In any ballast tank forward of collision bulkhead, giving visual & audible alarm when the liquid reaches 10% of the capacity.

Q IMO Conventions?

1) SOLAS - 1974 MLC

MARPOL - 1973/78

STCW - 1995 & 2010

COLREGS - 1972

FAL - 1965

SUA - 88

ILL - 1966

International Maritime SAR = 1979

International Salvage Convention - 1989

International Nairobi Convention - 15 April 2015

International convention for safe containers - 1972

IMSCO - 1976 Maritime Satellite Organisation

Ref on International voyage

Q Diff b/w Pack A & B

Solas B - short international voyage		Solas A
Medicine box	Smoke signal - 1	2
Whistle	Rock parachute - 2	4
1 -	Hand flares - 3	6
Signalling mirror	No food ration	Yes
LSA signals	No drinking water	Yes
Table	No can opener	Yes
SARS	No Fishing kit	Yes
	No graduated drinking cup	Yes

1st July 1998

Page No.

Date 20/09/18

ISM - International Safety Management for safe Operation of Ships & for Pollution prevention

* Why did it come?

Ans "The Herald of Free Enterprise" was a Ro-Ro passenger ferry which capsized on 6 March 1987 (Ship left harbour with its bow door open). This happened due to the negligence of the "assistant boatswain" who was asleep in his cabin when he should have closed the bow door.

80% of accidents happen due to human error and negligence so to counter this IMO adopted ISM Code on 23rd Nov 1995 which entered into force from 1 July 1998.

Purpose - To provide international standards for the Safe Management and for safe operation of ship and for pollution prevention.

Objective - Safety at sea, prevent human injury, loss of life & to prevent damage to environment & to property.

Applies to ALL ships. > 500 GRT

* What are the functional Requirements of Safety Management System (SMS)?

Ans Every Company should develop, implement & maintain a 'SMS' which involves the following functional requirements.

- 1) Safety & Environmental protection policy.
- 2) Instructions & procedures to ensure safe operation of ships and protection of environment in compliance with international & flag state legislation.
- 3) Defined level of Authority and lines of communication b/w shore and shipboard personnel.

- 4) Procedures for reporting accidents and non-conformities with the provisions of this code.
- 5) Procedures to prepare for and respond to Emergency situations.
- 6) Procedure for internal Audit & management review.

* Certificates under ISM?

- Ans 1) DOC - issued to company
2) SMC - issued to ship.

DOC - (Document of Compliance) - issued to Company - fulfilling the following criteria.

- Following initial verification of Compliance with the requirement of ISM Code.
- Determination of objective evidence proving that it is effectively implemented.
- Objective Evidence Determining that the Company's SMS has been in operation for at least 3 months.
- A SMS has been in operation onboard at least One ship of each type, operated by the company for at least 3 months.
- Record of internal audit performed by company ashore & onboard.

Validity :- Valid for 5 years.

- DOC is valid for the type of ship on which the initial verification was based.

Copy of DOC is kept onboard.

SMC - Safety Management Certificate

- It signifies that the company and shipboard management are operating in accordance with SMS.

Validity - 5 years.

→ 1 intermediate verification to confirm that effective functioning of SMS, and if any modification carried out.

Note :- The nature of non-conformity may provide a basis for increasing the frequency of intermediate verification.

* → Only the issuing Administration may withdraw SMC/DOC if, ^{or flag state}

→ Intermediate verification is not requested or

→ If there is evidence of major non-conformity.

→ Annual verification is not done.

→

→ PSC cannot withdraw DOC/SMC → It informs the Administration or flag state.

→ When DOC is withdrawn, SMC is automatically invalid.

##

Enclosed Space

means limited entry, unfavourable ventilation ~~or~~ not allowed for continuous workers occupancy.

→ Competent person - Qualified for certain job with sufficient theoretical knowledge & experience to make assessment of dangerous atmosphere.

All to P
4 officers

→ Responsible person - Responsible for certain job.

Master Authorized to permit entry & having sufficient knowledge & experience.

Enclosed space drill $\rightarrow$ once in 2 months

Page No.

Date

Procedures for entering enclosed space is found in

- 1) SMS
- 2) Ship's permit to work system
- 3) Maritime safety card
- 4) Ship's quality assurance scheme
- 5) Code of safe working practices

Enclosed Space Entry $\rightarrow$

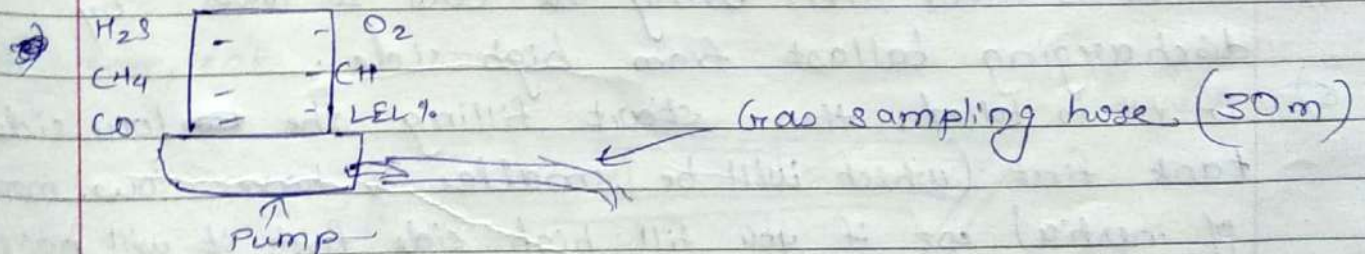
- 1) Isolation
- 2) Gases
- 3) Ventilation
- 4) Illumination
- 5) Communication

1) Isolation

Put tags, labels, in the enclosed space area

2) Gases / Atmosphere

- $\rightarrow$ Oxygen Analyser (O_2 to be 21%)
- $\rightarrow$ Explosive meter (checks for combustible gases)
- $\rightarrow$ Multi gas detector ($O_2, H_2S, CH_4, CO, LEL\%$)
- $\rightarrow$ Toxic gas detector



3) Illumination

4) Standby = outside the space

Ensure - Breathing Apparatus

Stretchers

Lifeline

Tripod stand standby

5) Authorisation & checklist.

Person entering area first permission taken from the company then master allows for entry, risk assessment is done, then enclosed space entry permit is filled and everyone's signature is taken then signed by responsible officer.

6) Communication

7) Validity of Permit.
usually 12 hrs.

Statutory Certificate

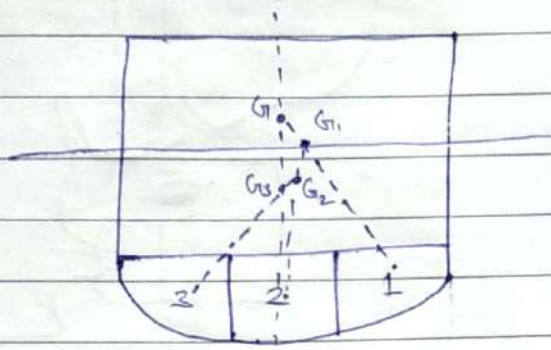
→ are required by law

Mandatory Certificate

→ Mandatory for a particular trade.

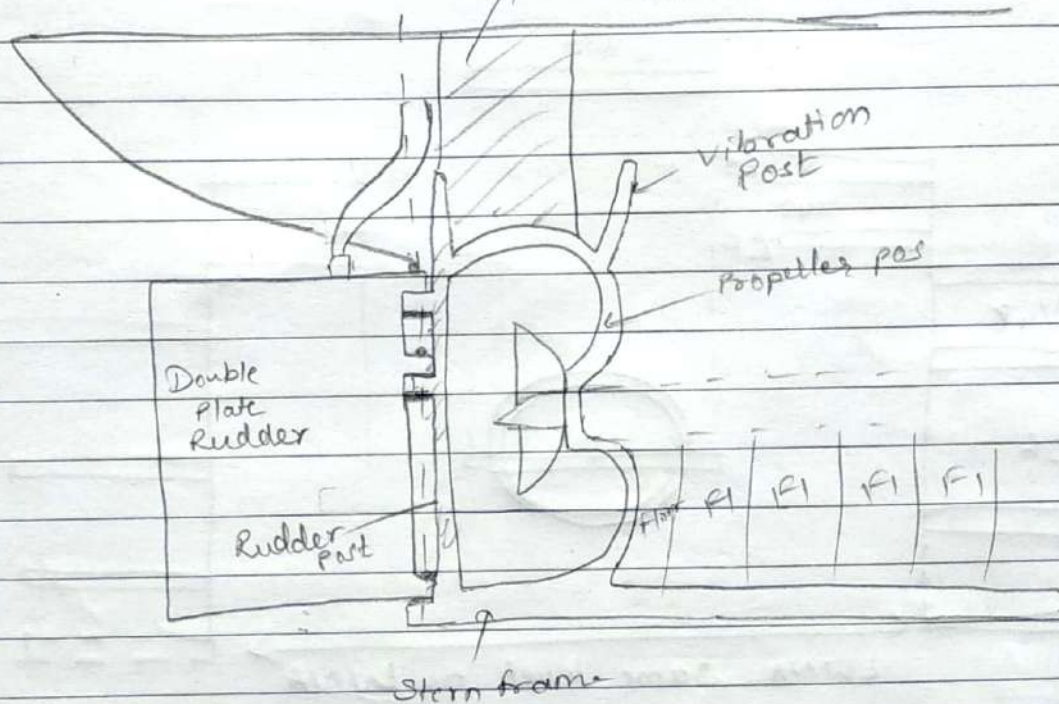
✱ Corrective action for Angle of Loll

- 1) First check vsl is listed or lolled
- 2) Calculate the vol of tanks & check for any slack tanks
- 3) If the port & stbd listing moments are same then confirm it is lolled.
- 4) If vsl is listed then bring the COG to lower by discharging ballast from high side.
- 5) If vsl is lolled, then start filling the ~~low~~ low side tank first (which will be smaller & have low moment of inertia) coz if you fill high side first, it will have enough moment to capsize the ship.
- 6) Then fill mid tank, then port side (high side) tank.
- 7) Now vsl will be upright, if it is not then for ballasting the ^{other} tanks with same procedure.

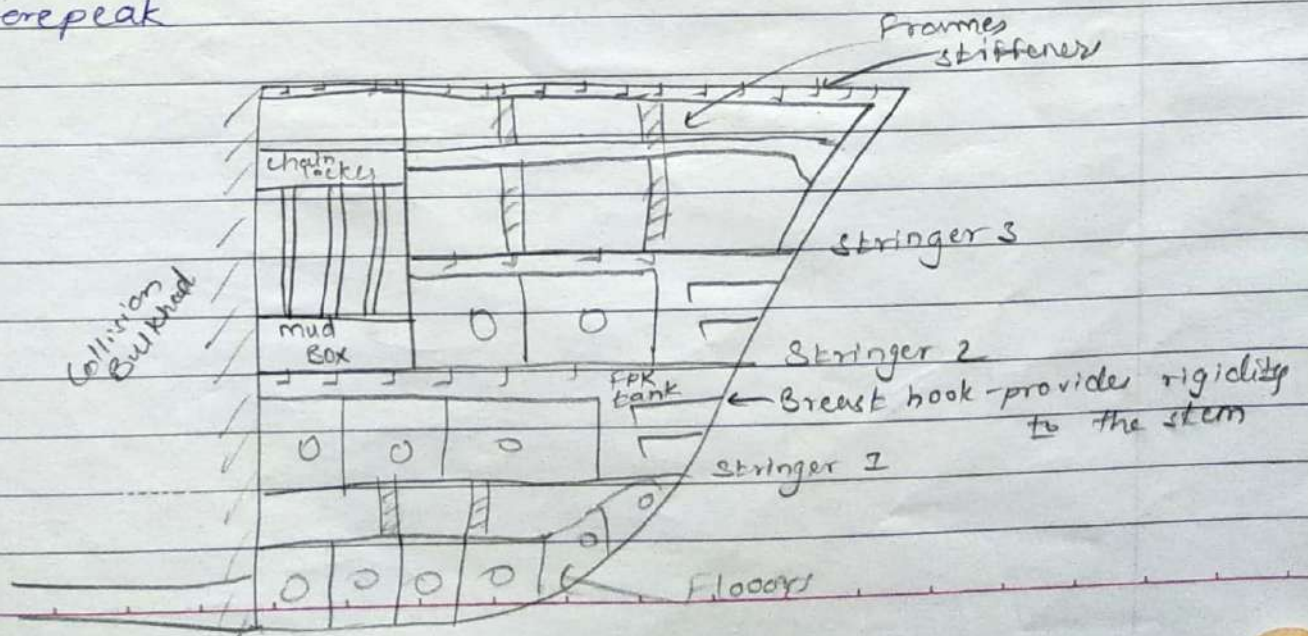


Transom Floor

much heavier & stiffened
Transom Floor - The Floor which connects the rudder part



Forepeak



- HRU - Gets activated upto a depth of 4m.
- Permanently marked with 'type & serial no'
 - Date of manufacture
 - Date of expiry (2 yrs)

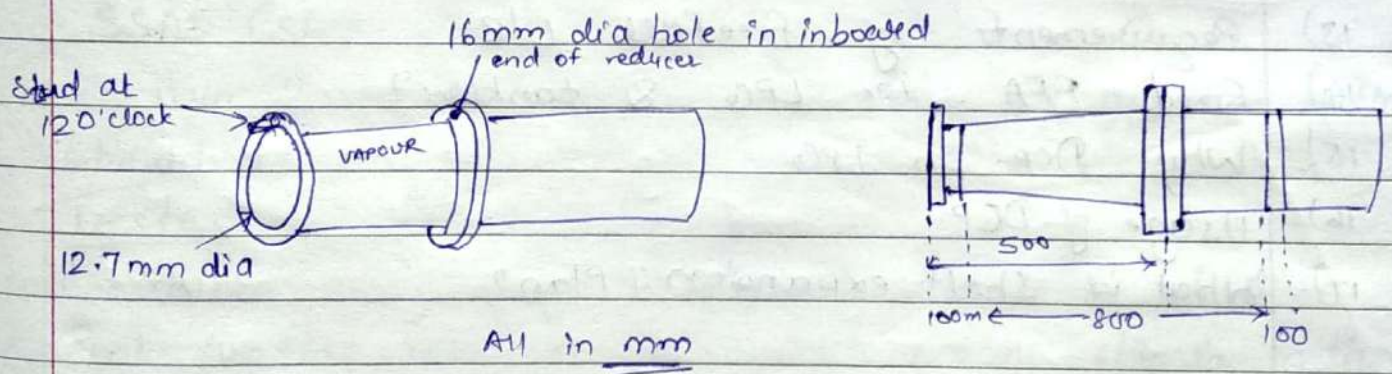
Weak link - B.S = 2.2 ± 0.4 kN

Frames forward of FP is starting with A, B, C, ...
 " Aft of AP " " AA, BB, CC, ...

Frame at FP is numbered 0.

From FP to AP the frame numbers increases

Vapour line dimension.



IRS - Indian Register of Shipping is a classification society founded in 1975.

DG shipping - Governing Body of shipping of India

MMD - Works under dg shipping. The main functions is to implement the provisions of Merchant Shipping Act, conduct surveys, issue certificates and conduct of examinations of seafarers.

- 1) What are painting beams?
- 2) How to give IV injections?
- 3) How to make sure TPA is put on?
- 4) Enclosed space entry precautions?
- 5) Panning & Pounding structures?
- 6) Angle of roll corrective action?
- 7) Tps documents? Security levels? DOS? Certificates
- 8) Limit switch on L/R
- 9) What is continuous synopsis record? Details in it?
Why those details required
- 10) Crew bleeding badly from leg Action? Use tourniquet
- 11) E/R bilges discharge criteria
- 12) Stiff & tender vs stiff
- 13) Requirements of freefall L/R
- 14) Fixed FFA for LPG & tankers?
- 15) Why DCP on LPG?
- 16) Usage of DGP
- 17) What is Shell expansion Plan?

- 9) CSR (Continuous Synopsis Record) is issued by flag state.
All passenger & cargo ships of 500 GRT & above according to SOLAS chap 11-1
- It provides onboard record of the history of ship with respect to the information recorded.

Details in CSR.

- 1) Name of ship
- 2) Port at which it is registered
- 3) Ship's ID number
- 4) Date on which ship was registered to flag state
- 5) Name of flag state
- 6) Name of owner & address

- 7) Name of charterer & address
- 8) Name of classification society.
- 9) Name of company & address
- 10) Name of Administration which has issued DOC specified in ISM Code
- 11) Name of body which has carried audit to issue DOC
- 12) Name of Administration which has issued SMC (Safety Management Certificate) & name of body which carried out audit.
- 13) Name of Administration which has issued ISPS Certificate & name of body which carried out the audit.
- 14) ~~Set~~ Expiry date of ship's registration with state

SSAS (Ship Security Alert System)

min 2 security buttons required, one of these buttons should be on the wheelhouse.

Tested - Annually

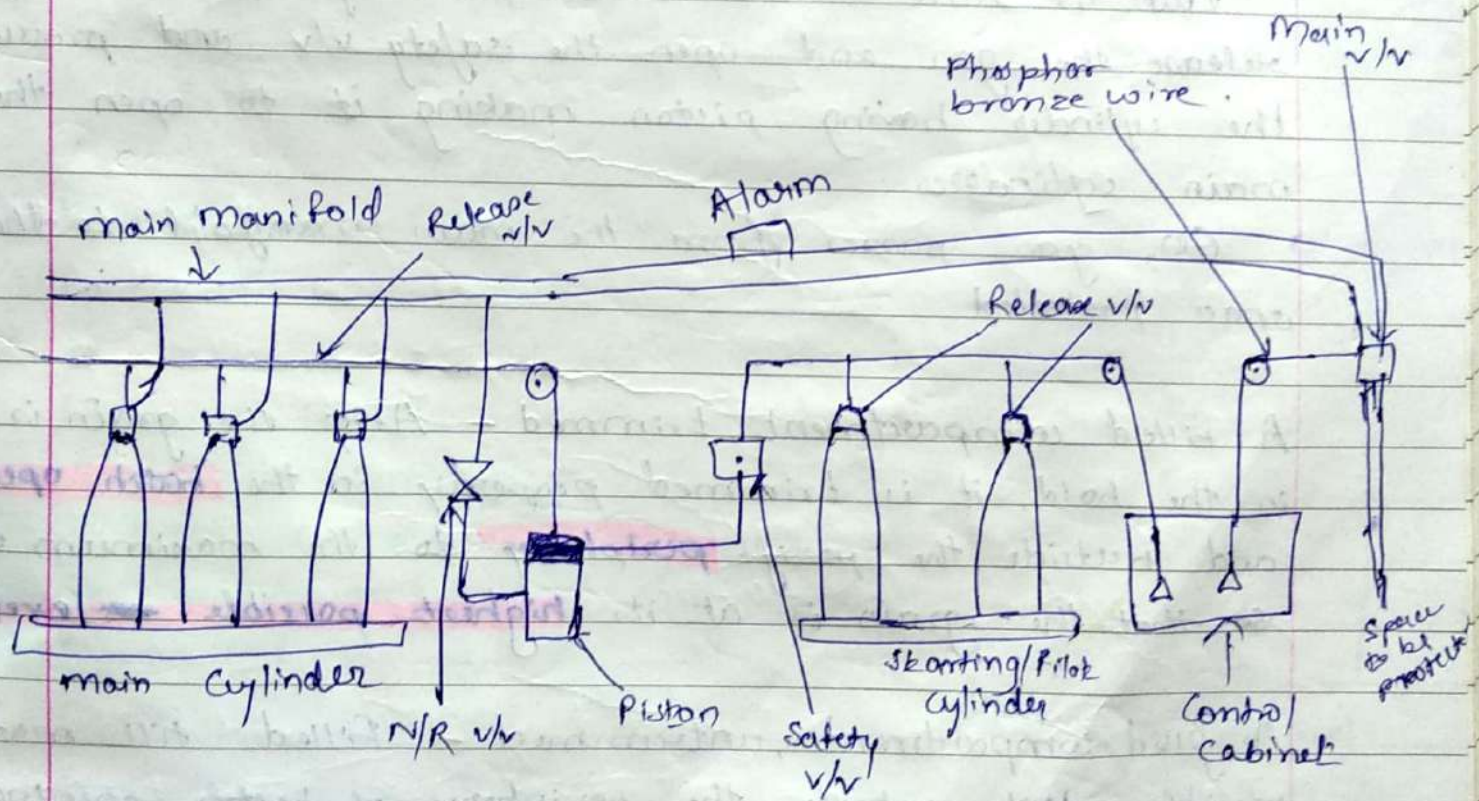
When the button is pressed a covert alert is sent to flag state & CSO which means ship is in threat
 → Not raise alarm on board.

→ It will continue the alert until deactivated and/or reset

→ The company informs RCC & RCC will not try to communicate with the vessel.

DOS need to be filled when

- 1) Ship is operating at higher security level than port.
- 2) Ship is going to a port which do not have PFSP
- 3) Ship is operating at higher security level than other ship
- 4) Ship is ~~oper~~ doing operations with other ship which do not have approved ship security plan.



Release v/v of the pilot cylinders are connected to phosphor bronze wire, the free end is inside the control cabinet.

Release v/v of the main cylinders are connected to phosphor bronze wire which terminates to piston.

Another wire is ~~also~~ operated from main v/v & terminates to the control cabinet.

Before starting the CO₂ system ensure all doors, dampers, ventilators, etc are closed. Jumeil flaps, etc.

Open the control cabinet with the key and ~~pull the~~ wire of main v/v which opens the main v/v. It will activate the audio visual alarm in E/R and stop the ventilator fans.

Pull the wire of main v/v, this will open up the v/v connected to main manifold & machinery spaces.

Pull the wire connected to pilot cylinders, it will release the gas and open the safety v/v and pressurize the cylinder having piston making it to open the main cylinders.

CO₂ gas passes from the main manifold to the space protected.

CO₂ (fixed)

Page No.

Date

Each cylinder capacity = 4.5 kg

Filling ration is $\frac{2}{3}$ of cylinder, $\frac{1}{3}$ is kept empty for

allowing expansion.

refilled in b/w 21°C - 22°C atm temp.

↓
under pressure 52-53 bar.

Cylinder: Heavy duty steel.

Testing → Pressure: 250 bar.

Discharge atleast 85% of required quantity for machinery space in 2 min.

Brings down Oxygen % from 21% to below 5%.

Non-corrosive for metals.

Cannot be used in open spaces.

Toxic & hazardous for human health.

Piping System.

Main manifold tested for

190 kg/cm²

Medium pressure line

80 kg/cm²

Low pressure line

6 kg/cm²

Quantity Required

Cargo Space - 30% vol

ELR & M/c Space - 35% vol

RO/RO Space - 45% vol.

Embarkation Ladder

Dimension of steps - 480 x 115 x 25 mm

Spacing - 300 - 380 mm

Manila rope dia - 60 mm

→ Non skid surface

→ Rope continuous with no joints.

Safety on CO₂ system.

- ① Trip switch - Open the cabinet, it will trip ventilation & sound alarm.
- ② Master v/v - does not allow CO₂ to accidentally release in any space.
- ③ Relief v/v - If manifold pressure is increased, it will open.

- ④ Safety pin - Prevents accidental operation
- ⑤ Non-return v/v -
- ⑥ CO_2 leak alarm - Located on manifold.

It will work @ 4 bar pressure.
 CO_2 is stored @ 52 bar so if any CO_2 bottle leak then it will sound alarm.

Now, you don't know which bottle?

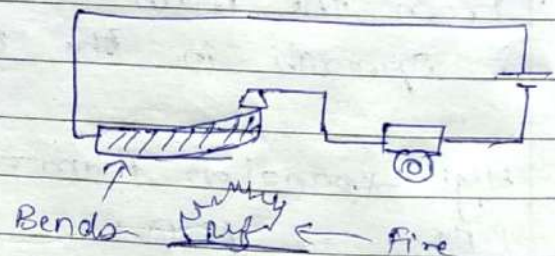
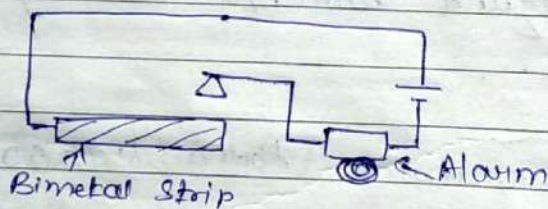
Ventilate the main manifold room.

Carry proper communication equipment.

Then go inside & check by putting hand on each cylinder, the cylinder which is cold is leaking.

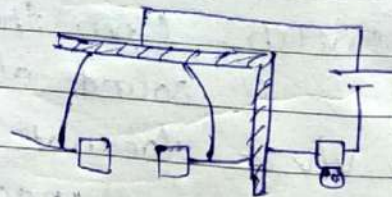
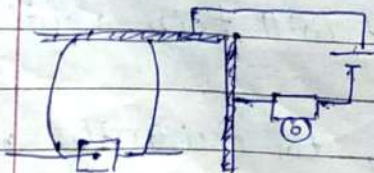
Heat Detectors.

- ① Bimetal type (55°C to 160°C)



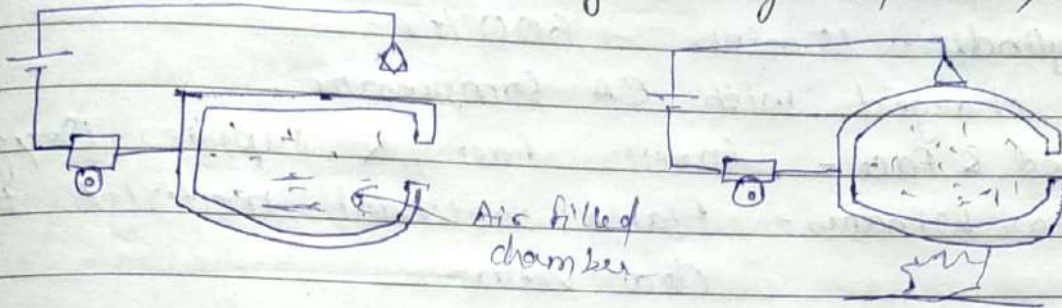
If fire occurs, the bimetal strip bends and touches a point & alarm is raised.

- ② Fusible Link type (55°C to 180°C)



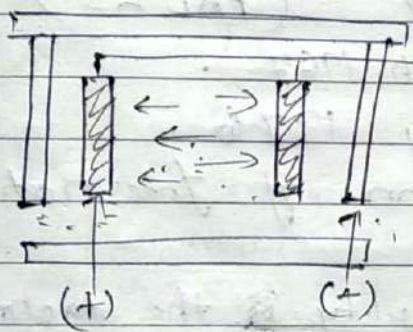
When fire occurs it will disconnect one of the connection & will touch the plate & circuit completes & alarm raised.

③ Air filled chamber (Rate of rise of temperature) $57^{\circ}\text{C} \pm 82^{\circ}$



Smoke detectors

① Ionisation type



② Alarm plates

It has + & - charged

(+) ions moves toward (-)

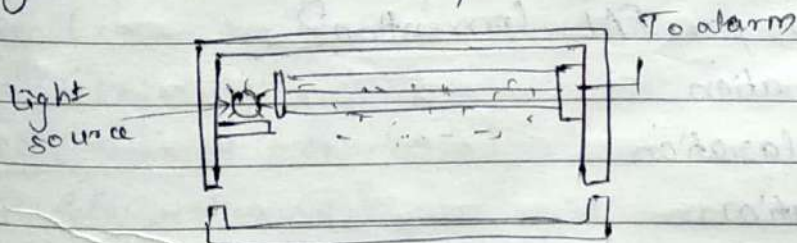
& (-) ions moves towards (+)

when smoke comes then

there is resistance formed

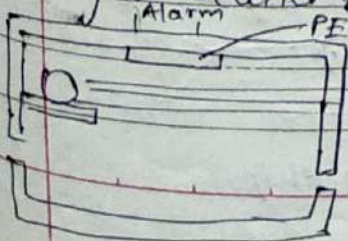
& current falls down which gives alarm.

② Light Obstruction type



In normal condition, light source will focus on Photo Electric cell but when fire occurs, the smoke comes in b/w the light & ~~the~~ seduction of light source on PEC will rise the alarm.

③ Light Scatter type

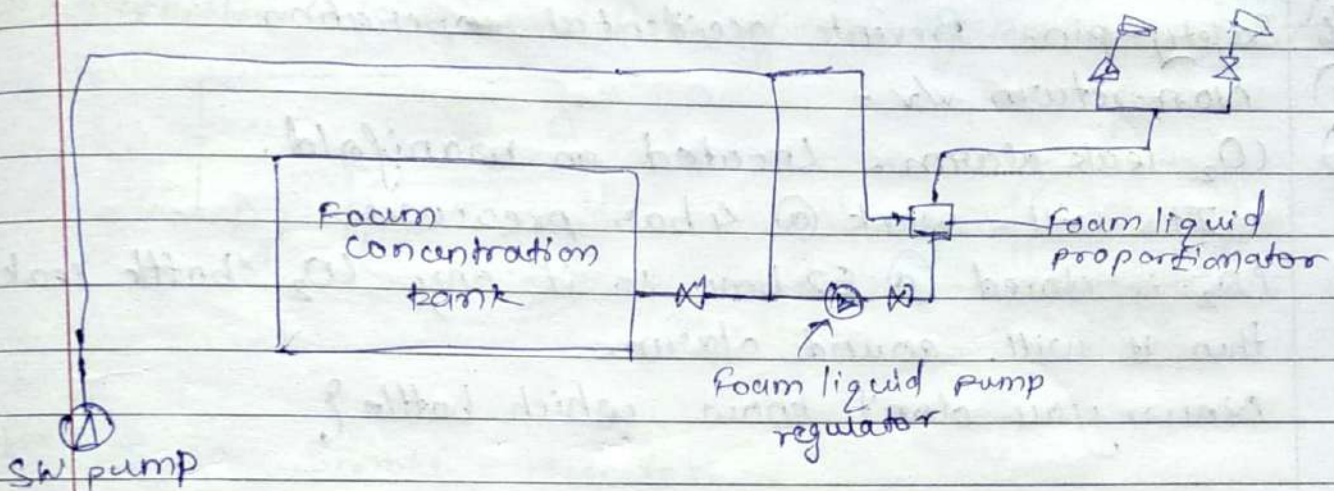


It works opposite to obstruction type when smoke comes it reflect to PEC & when light come on PEC, it gives alarm.

Fixed Foam System

Page No.

Date



- ① Foam is stored in a tank
- ② Bilge, ballast or fire pump delivers SW to the fire main system.
- ③ Foam liquid pump delivers the liquid to the proportionator via foam liquid pressure regulator.
- ④ The proportionator mixes the foam & liquid in correct proportion & transfers the foam solution to the foam main line.
- ⑤ From the main line liquid branches into hydrants & spreads in the E/R.

High Expansion foam - Expansion Ratio 1:1000

LEP = 1:10

AFFF

- EEBD. - All Cargo ships - min 2 in accommodation.
- ① Cylinder - 15 mins - 600 ltr.
charged with BA Compressor.
 - ② Hood & Face - Covers face & supplies Oxygen.
 - ③ Clear window - Flame resistant material to provide clear views.
 - ④ Pressure gauge -

Q What is FAL Convention? (FAL 65)

Ans Entered into for 5th March 1967.
India ratified on 25th May 1976

Convention on Facilitation of International Maritime Traffic

Purpose is to ~~simplify~~ simplify the documentation procedures of loading, unloading & stay of ships on international voyages & minimise the formalities.

Q Documents as per FAL Convention?

Ans General Declaration

Maritime Declaration

Cargo Declaration

Ship-store Declaration

Crew-effect Declaration

Crew list

Passenger list

Document required for mail under ^{Universal} Postal Convention

Flag state → Set & monitor the standards of safety & pollution of its own ships

→ Does survey of its own ship

→ Investigation of accidents of its own ships

Drills & their Frequencies

Page No.

Date

- 1) Abandonship drill } Every Month.
- 2) Fire drill

Note: If 25% crew change, then at least 24 hrs of ship leaving port.

Before sailing

- 1) When ~~25%~~ crew changed (all crew)
- 2) A major modification is done
- 3) ^{when} Ship enters the service for first time (Dry dock)

- 3) Rescue or MOB drill } At least once in
- 4) Enclosed Space Entry } every 2 months.

5) Lifeboat drill

→ Davit launched - Each L/B launched in water with its assigned crew & manoeuvred, at least once in 3 months with abandonship drill

→ Freefall L/B - At least once in 3 months during abandonship drill - Crew board, secure, seat & commence launch procedure but not release (4 times Lower in Year) (2 times free fall launch)

→ Once in 3 months lower your L/B

→ Once in 6 months launch your L/B

- 6) Abandonship drill } Weekly for passenger ship
- Fire drill

Lifeboats.

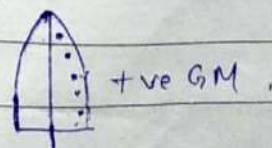
Page No.

Date

- 1) Made of GRP
- 2) Rigid hull structure ROS proof, fire resistant, non-corrosive and sweat proof (Resist Oil & fungal Attacks)
- 3) Capable of being launched or stowed while making a headway of 5 kts.
- 4) A L/B with its full complement of persons shall & equipments should be able to maintain +ve stability
- ~~5) It should be able to withstand lateral damage~~
- 5) Seating - Benches (100 kg/person) • Withstand the benches when dropped from a height of 3 m
- c) Skates & fenders to be in position to withstand lateral damage to L/B against ship side at an impact velocity of atleast 3.5 m/s & also drop in water from a height of 3 m.
- 7) Max persons - not exceed 150 persons.
- 8) L/B should be 12 inches or 30 cm clear of ship side when lowered.
- 9) Withstand air temperature when stowed -20°C to 65°C
- 10) Made of highly visible material, Retroreflective tape
- 11) Minimum vertical dist b/w Floor & Roof.
1.3 m for 9 persons
1.7 m for 24 persons.
- 12) Non-skid walking surface
- 13) In Cargo ship, All the crew members to board in less than 3 mins.

Freeboard & Stability

If 50% crew seated on one side of L/B centerline, shall be stable & have +ve GM



Freeboard 1.5% of L/B length
or 100 mm, whichever is greater.

Propulsion of L/B

- 1) Compression - Ignition Engine
- 2) Flash point $> 43^{\circ}\text{C}$
- 3) Manual Starting System or Power Starting System with 2 independent rechargeable sources.
- 4) Engine starting system & starting aids shall start the L/B in -15°C in 2 mins
(Starting system shall not be impeded with engine casing or seaathing)
- 5) Min running of 5 mins on a cold start outside water.
- 6) Operate with 50% flooding of crankshaft.
- 7) Min speed - 6 kts
& 2 kts when towing a 25 person L/R
- 8) Min fuel to last 24 hrs @ 6 kts.

Offload Release

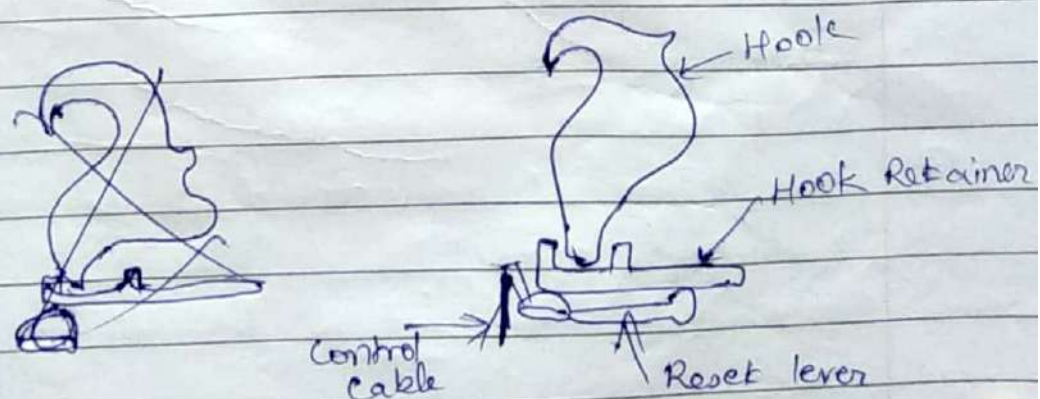
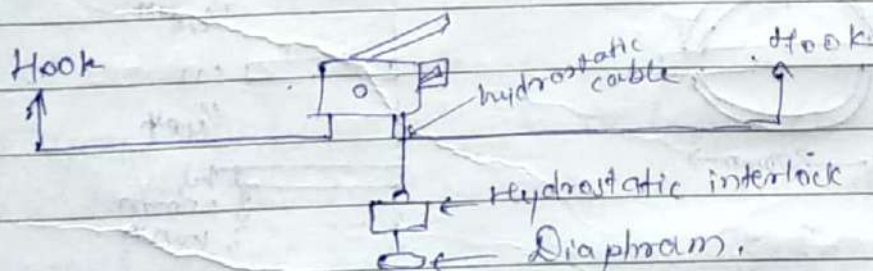
Page No.

Date

- All crew seated & seat belts fastened
- Engines started
- Lower the L/B to the water surface
- Diaphragm of L/B will touch water. It will show green light
- Remove safety pin
- Pull the handle to release hooks
- On-load can be used if hooks not releasing.

On-load Release

- When L/B not fully waterborne
- Engine + Crew seatbelt
- ~~Open the~~ ^{out} L/B as close to water surface as possible
- Pull the safety pin
- Open the hydrostatic interlock cover
- Uncovers the latch of interlock
- Pull the hydrostatic interlock lever with one hand until the light becomes green from red.
- Pull simultaneously the handle to unhook.



Liferaft carrying Criteria.

- 1) One or more ^{together} with 100% capacity, easily transferable
- 2) 100% each side, if not easily transferable.
- 3) If freefall L/B with 100% capacity, then L/R with 100% capacity on each side.
- 4) For ships less than 85m, no need of L/B. then L/R 100% on each side, if easily transferable or L/R 150% on each side, if not easily transferable
- 5) A rescue boat which may also be used as L/B may be used for fulfilling this 150% criteria.
- 5) Additional, 1 at the fwd if length of aft L/B from fwd is more than 100m
Capacity not less than 6 persons

Lifeboats

- 1) 100% on each side in cargo ships
- 2) 50% on each side in passenger ships.

Rescue Boats

- 1) At least one

Lifebuoy

<100m	8	50% with light, of these 50%
100-150	10	2 Lifebuoys also (4.5 kg or more)
150-200	12	MOB buoys.
>200	14	2 lifebuoys having buoyant lifeline (8mm 5kn strength)

Life Jacket

- 1) For 100% crew
- 2) 10% for child
- 3) 2.5% for infant

* BA generator air testing period 1 year

VECS

Vapour Emission Control System. → It is an equipment to control the vapours in tanker operation including ship shore vapour collecting system & vapour processing arrangement.



Stability Booklet Contents

General particulars

Plan showing cargo spaces, tanks & stores

Hydrostatic tables

Hydrostatic curves

KN Curves

Cross-curves of stability particulars

Capacity & COG

Plimsoll Mark Details

Tonnage Mark Details

Deadweight scale

Inclining experiment report

Trim tables.

Lowering L/B

- Muster all
- Remove all lashing, covers
- Plug the drain plug
- Remove the ~~last~~ charges
- ~~Fasten~~ Fasten the painter forward & aft
- All crew board the L/B except one
- Remove safety harbour pin
- Remove the brake pin from derrick
- Lower L/B steadily
- Unhook the falls
- ~~Remove~~ Let go aft painter then fwd
- Start Engine & clear from ship

Stowage

Page No.

Date

① Lifeboat

Cargo ship (80-120m) $\Rightarrow$ ~~forward end of p.~~

Aft end of L/B should be not less than the L/B forward of the propeller.

$\geq 120m$ - Aft end of L/B not less than 1.5 times length of L/B forward of propeller.

Stowed attached to launching appliances

② Life raft

$\rightarrow$ Painter permanently attached to ship.

$\rightarrow$ L/R shall be stowed in such a way that it permits manual release of L/R

$\rightarrow$ Davit launched L/R should be within the range of lifting hooks

$\rightarrow$ L/R to throw overboard should be readily transferred for launching on either side.

③ Rescue Boat

$\rightarrow$ Ready to launch within 5 mins

$\rightarrow$ If inflated type - then it should be in fully inflated condition.

$\rightarrow$ In a posn suitable for launching & Recovery.

$\rightarrow$ So that rescue boat do not interfere with the operation of survival craft

* Rescue Boat.

L = 3.8 to 8.5m

5 seated person & lying on a stretcher

Bow cover min 15%

4 hrs @ 6 kts

Tow a L/R @ 2 kts.

* SCBA → Atleast 2, 4 additional in chemical tanker.

Supply fresh air to the wearer on demand,

100% spare cylinders

- If air compressor present, 4 SCBA set, 4 spare cylinders not less than 1200 ltrs each

200% spare cylinders

- If air compressor not present, 8 SCBA, 8 spare cylinders of 1200 ltrs each.

* Checks on SA sets

Visual Inspection

Face mask seal test

Positive pressure test

Whistle alarm test

High pressure leak test

Gauge should be on green side

Switch off Demand valve

① Close the bypass valve

② Press reset button

Cylinder pressure & leak test

Open the cylinder v/v slowly then check the pressure on gauge. Close the cylinder v/v & observe pressure it should not fall more than 10 bar per min.

→ Open the bypass v/v then the pressure in the system will fall & when it comes to red area, whistle should sound.

Face mask leakage test.

Close cylinder v/v & breathe normally. Check the whistle sounds at correct setting. Then breathe for 10 sec after that, if mask moves away from face then leakage is present. Then check again.

Working duration = $\frac{\text{Fully charged cylinder capacity}}{40}$ minutes

* International Shore Connection

Ships 500 GRT & above - at least 1

Outer dia - 178 mm

Inner dia - 64 mm

Bolt circle dia - 132 mm

Slots in flange - 19 mm

Flange thickness - 14.5 mm

Bolts & ~~Nuts~~ - 16 mm dia, 50 mm length

Washers - 4 Bolts & nuts

Nuts - 16 mm dia

Bracket → made of any material suitable for

1 N/mm²

Life jacket

- For all crew + Additionally for watch officers.
- Child L/J 10% of total crew or No of children whichever greater
- Person with 140 kg & chest girth 1750 mm, special arrangements to secure L/J.
- Made of buoyant material 5% after 24hrs
- Fire-resistant - ~~5 sec~~ 2 sec
- Whistle is attached with lanyard.
- Self igniting light (0.75 cd, 8 hrs)
50 flashes, & not ~~less~~ ^{more} than 70 flashes per minute
- Release buoyant line or means to secure to other L/J.
- ~~Before demonstration~~ Only one way of donning it within 1 minute
- Capable to withstand jump from 4.5 m.
- Lift the mouth of unconscious person not less than 120 mm clear of water inclined backwards at an angle not less than 20° from vertical
- Turn the body of unconscious person's mouth clear of water in not more than 5 sec.

Markings

Name of vessel

Port of registry

Highly visible color

Retro-reflective tape

2) Immersion Suit.

- For every person + Additional for OOW, F/R.
- Water-proof material
- Fire resistant - 2 sec
- Unpacked & don within 2 min with L/J.
- Covers entire body except face
- Withstand jump from 4.5m without ingress of water
- Should be able to swim, carry out abandonment duties
- Climb ladder for atleast 5m
- There should be an arrangement to reduce free air in legs.

Without Insulation } Body temp shall not fall more than 2 deg in 1 hr in calm circulating water of 5 deg. (wear warm clothing inside)

With Insulation } Body temp shall not more than 2 deg in 6 hrs in calm circulating water of 0 to 2 deg

Exemption - For cargo ships trading in warm areas
30°N to 30°S

* Bulk carriers cannot be exempted.

Buoyancy requirements

- fitted with buoyant pillow or L/J inbuilt
- when fitted with inbuilt L/J then it has to fulfill all criteria of L/J also

Markings -

Immersion suit bag - Instruction on how to don
Manufacturing date
Retroreflective tape

Testing of Immersion Suit (Pressure test)
Every 3 years.
Sent ashore

- If on board then pressure kit is provided.
- Put air pressure of 0.7 to 1.4 kPa.
 - Apply soap
 - Look for bubbles
 - wherever bubbles coming mark that area
 - Let it dry
 - Repair as per manufacturer's instruction.

Thermal Protective Aid (TPA)

- Low
- It is a bag or a suit made of waterproof material with low thermal conductivity.
 - Covers full body except face
 - max thermal conductance = $7800 \frac{\text{W}}{\text{m}^2 \text{K}}$

Watt / m² Kelvin
Heat transfer coefficient
 - Unpacked & donned easily without assistance
 - Carriage → Life raft } 10% or 2

Life boat
Rescue Boat

}

whichever is greater.
 - Permit wearers to remove in water within 2min.
 - Shall function properly in Air temperature range -30° to 20°C
 - Reduce Convective & Evaporative heat loss from body
 - Cannot swim
 - Cannot perform Abandonship duties
 - Cannot climb ladder.

Pyrotechnics

(Req) → 12 - Rocket parachute & 4 LTA (on bridge)

2 - Smoke signals

6 - Hand flares

4 - Rocket Parachutes

} Lifeboat & / Liferaft

4) Hand flares (3-5 yrs validity)

- 6 in number

- Contained in watertight casing with brief instruction & diagram

Casing should contain Manufacturer's name, serial number, Date of Manufacturing & Expiry Date of testing

→ Have Integral means of ignition

→ Burn - Bright red colour

Burning period - not less than 1 min

Luminous intensity - not less than 15000 cd.

Continue to burn for 10 sec after 100mm immersion in water.

5) Rocket Parachutes (3-5 yrs validity)

→ Provided in watertight casing with instructions & diagram

→ 12 - on bridge, 4 - L/B & L/R

→ Integral means of ignition

→ Min vertical height - 300m

→ ~~Should~~ Parachute should get activated at top or nearly the top

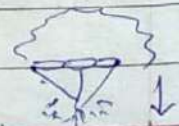
→ Burn - Bright Red Colour

Burning period - not less than 40 sec

Luminous intensity - 30000 cd.

Rate of descent - not less than 5 m/sec

→ Not damage parachute while burning



f) Buoyant smoke signals (3-5 yrs)

- Contained in water resistant casing with instructions
- 2 - in L/B & L/R
- Emit smoke of highly visible color at uniform rate not less than 3 min.
- Not emit any flame during smoke emission
- Not be swamped in seasway. (due to water spray it should not get drowned as not to release smoke)
- Continue to emit smoke for 10 sec when completely immersed in 100mm of water

Liferaft requirements

18x2=36
double
of min
of draft

- Withstand 30 days exposure
- Withstand drop from 18 m
- Withstand repeated jumps on it from 4.5m
- Sufficient air, even when entrance is closed
- Total mass not exceed 185 kg
- Painter line 10m + distance of stowed position to waterline or 15m whichever is greater
- A manually operated lamp at top, 12 hrs, 4.3 cd.
- Flash light if fitted - 12 hrs 50-70 flashes/min
- A manually controlled lamp - 12 hrs
- Provided a space for keeping SART 1 metre above water level.
- When liferaft is fully loaded with persons, withstand drop from 3 m height & lateral impact from ship side at a velocity of not less than 3.5 m/s.
- Min coverage - 6
- Inflation within 1 min in 18-20°C or 3 min at -30°C by non toxic gas
- Can be towed at 3 kts with full complement of persons.

Equipment

- 1) Rescue quaff with min 30 m line
- 2) 13 person or more, (2) bailers. - 1 bailer
- 3) 2 sponges - BESS (4) 2s
- 4) 2 sea anchors
- 5) 2 buoyant paddles S F W T R M P S
- 6) 3 tin openers.
- 7) 2 Smoke signal SARAH
- 8) 6 Hand Flares
- 9) 4 Rocket parachute
- 10) TPA 10% or 2 whichever is greater
- 11) Food ration - 10000 kJ per person
- 12) 1.5 L FW per person
- 13) Anti-seasickness tablets for 48 hrs
- 14) 1 sea sickness bag per person
- 15) 1 Fishing tackle
- 16) 1 Scissor
- 17) 1 First aid kit (8) 1 no.
- 18) 1 Whistle
- 19) 1 Torch
- 20) 1 Radar reflector
- 21) 1 Mirror
- 22) 1 knife

Marking on L/R. (Container)

- 1) SOLAS
- 2) Type of emergency pack enclosed
- 3) Maker's Name / Trade mark
- 4) Serial No
- 5) No of persons carried
- 6) Stowage ht
- 7) Date of last service
- 8) Length of Painter
- 9) Launching instructions

Marking on L/R. inflatable

- Maker's Name / Trade mark
- Serial No.
- Date of Mfg
- Issuing Authority
- Date of last service
- Name & Place
- No of persons permitted

Life Boat Equipment.

[2] buoyant rescue quorb with 30m line

1 bailer & [2] buckets

2 sponges.

2 hatchets. meaning?

2 painter.

3 tin openers.

2 smoke signal

6 Hand flares

4 Rocket parachute

TPA 10% or 2

Food ration - 10000kJ per person How to eat look?

FW - [3L] per person

Anti-sea sickness tablet for 48 hrs

1 sea sickness bag per person

1 fishing tackle

1 scissor

1 First aid kit

1 Whistle

1 Torch

1 Radar reflector

1 mirror

1 knife

1 search light - Horizontal & vertical sector - 6"

Luminous - 2500 cd

Min run time - 3 hrs

[1] sea anchor

[1] search light

Compass

Survival Manual

1 rustproof dipper with lanyard

1 rustproof drinking vessel

1 copy of Life saving signals.

1 bilge pump

1 Portable extinguisher for oil fires.

Propulsion L/R

→ Compression Ignition Engine

Flash point $> 45^{\circ}\text{C}$

-15°C - 2 mins to start

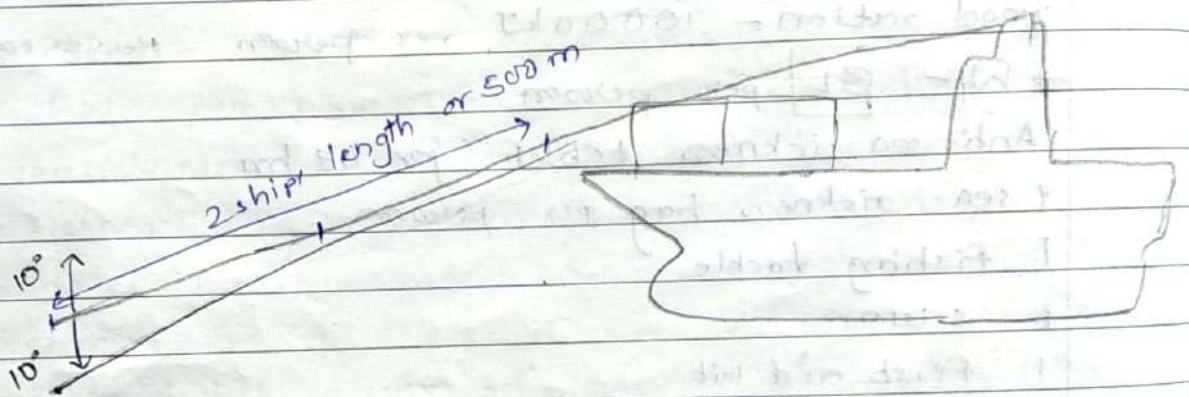
cold start - 5 mins run the engine

2 independent rechargeable sources for starting

Manual starting

Min fuel 6 kts for 24 hrs

2 kts speed when towing 25 person L/R.



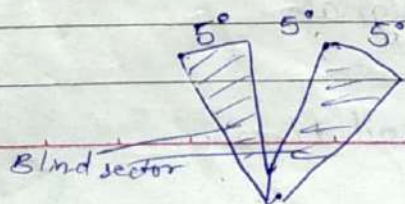
- The view of sea surface from coming position shall not be obscured by 2 ship length or 500m whichever is less & 10° on either side in all conditions of draught, trim & cargo.

- No blind sector, caused by cargo, cargo gear or other obstructions outside the wheelhouse forward of the beam shall exceed 10° .

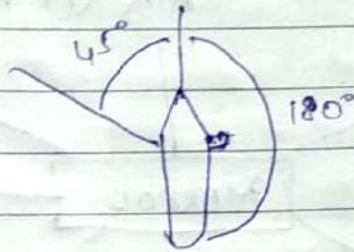
Total arc of blind sectors shall not exceed 20° .

The clear sector b/w blind sector shall be atleast 5° .

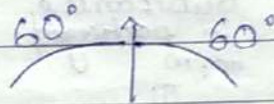
Each individual blind sector shall not exceed 5° .



- 3) The horizontal field of vision 225° with 22.5° ^{abatt} ~~about~~ the beam on either side
- 4) From each bridge wing 225° arc of visibility, 45° on opposite side from forward & 120° from forward to aft on the same side



- 5) From the main steering position, the arc of visibility 60° on each side of ship



- 6) Ship side shall be visible from bridge wing
- 7) The height of lower edge of the window forward shall be as low as possible & provide no obstruction to the forward view.
- 8) The upper edge of the window shall allow forward view of horizon, for a person with a height of 1800mm above the bridge deck at coming position, when ship is pitching in heavy seas. If Administration is unsatisfied with 1800mm HOE, then it can be reduced but not to less than 1600mm

Ch - II (ii)

A class divisions - Divisions formed by bulkhead & deck

→ They are constructed with steel or equivalent material

→ They are stiffened

→ Insulated with approved non-combustible material such that the average temperature of ^{inside hold} unexposed side will not rise more than 140°C & in any joints or welding 180°C from original temp.

A0 - 0mins, A15 - 15mins, A30 - 30mins, A60 - 60mins.

→ Capable of preventing the passage of smoke & flame to the end of 1hr of standard fire test according to FTP Code

B Class divisions - Bulkheads & decks, ceilings & linings

→ Constructed of approved non-combustible material.

→ They have an insulation r/v such that the average temp of unexposed deck will not rise to 140°C & at any point the joints & welding will not rise more than 220°C

→ Capable of preventing flame & smoke for $\frac{1}{2}$ hr

C Class divisions -

→ Constructed of approved non-combustible materials.

→ Need not to comply with requirements of flame & smoke passage.

1) Fire Mains & Hydrants

- Pipes & hydrants so placed that fire hoses can be easily coupled with them.
- Arrangements of pipes and hydrants such that to avoid Freezing.
- Drainage provided for fire main piping.
- Isolation v/v shall be provided for all open deck branches.

Diameter of Fire mains
 2 fire pumps → Sufficient for distribution of maximum required discharge from 2 fire pumps operating simultaneously.
 140 m³/hr → Except for cargo ships, the diameter should be such that discharge of 140 m³/hr.

→ The number & position of hydrants shall be such that

2 jets → At least 2 jets ~~to~~ of water not coming from same hydrant.
 ↳ One of which from single hydrant reaching any part of the ship.

2 jets → In cargo spaces, 2 jets shall reach any part of space from a single length of hose.

* Pressure of hydrants.

Imp For cargo ships min pressure at all hydrants
 For vsl 6000 GRT & above - 0.27 N/mm²
 less than 6000 GRT - 0.25 N/mm²

Diameter of hydrant - 2½ inch

Max pressure shall not exceed that at which fire hose can be demonstrated

2) Fire pump.

* No of fire pumps.

1000 GRT & above - ^{at least} A 2 fire pump.
less than 1000 GRT - 2 power driven pumps
one of which shall be independently driven

* Total Capacity of fire pumps.

^{180 m³/hr} In cargo ships other than emergency pump.
→ Capacity not exceed 180 m³/hr

Every such fire pump shall have capacity not less than 80% divided by minimum number of fire pumps but in any case not less than 25 m³/hr.

$$80\% \text{ of } 180 \text{ m}^3/\text{hr} = \frac{144 (80\%)}{2 (\text{No of fire pumps})} = 72 \text{ m}^3/\text{hr}$$

* Each pump shall provide 2 jets of water in any case

3) Fire Hoses

shall have length of at least 10m.

→ 15 m in N/c spaces

→ 20 m in open decks & other spaces.

→ 25 m in open decks for ships whose max breadth exceeds 30 m.

In Cargo ships 1000 GRT & above

→ One for each 30m length of the ship & 1 spare but in no case less than 5.

→ 3 additional hoses & nozzles for ships carrying dangerous goods.

* less than 1000 GRT - Same as above but in any case not less than

4) Nozzles. (Spray/Etc type in all Nozzles to be present)
Size:

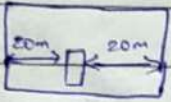
Standard size = 12mm, 16mm, 19mm

Notes: Nozzle size greater than 12mm cannot be used for accommodation spaces & service spaces.

→ M/c spaces nozzle should not exceed 19mm.

5) Portable Fire Extinguishers. (Type & Design) FSS

→ provided for each deck & in each hold or compartment carrying vehicles.



spaced not more than 20m from each side of the space

→ In Ro-Ro ships, For 'Special spaces' with vehicle with fuel. At least (3 ^{water} fog applicator) & (1 Foam Applicator Unit) complying with FSS code.

→ At least 2 units to be available in such spaces.

Arrangements

→ Accommodation, service spaces & control stations with appropriate type and in sufficient numbers to the satisfaction of Administration.

→ 1000 GRT & above at least 5.

→ One of the Fire extinguishers which can be used in any space ~~can~~ should be placed at the entrance of that space.

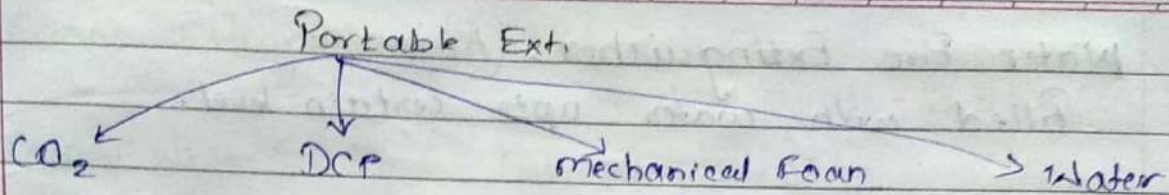
* → CO₂ should not be used for accommodation

→ fitted with devices which indicates that they have been used. (pressure gauge)

FIRE

Page No.

Date



Classes of fire

- A (Solid) - Water
- B (Liquid) - DCP, Foam, CO₂
- C (Gas/Chemical) - DCP
- D (Metal) - DCP, ~~CO₂~~
- E (Electrical) - DCP & CO₂

Starvation	Removal of fuel
Smothering	" Oxygen
Cooling	" Heat means cooling
Inhibition	" Chain reaction

SOLAS Reg.

- 1) Accommodation, Control Station & Service Stn shall be provided with PFE to the satisfaction of Administration
 - 2) ~~100~~ > 1000 GRT Atleast - 5 PFE
 - 3) Weight $\geq 23\text{kg}$ & Capacity of fluid $\geq 4.9\text{L}$ & $\geq 13.5\text{L}$
 - 4) 1 PFE must be kept at the entrance of the space to be used at any space
 - 5) CO₂ must not be used in Accommodation.
 - 6) PFE should be provided with device to indicate whether they have been used
 - 7) Spare charge $\Rightarrow$ 100% - First 10
50% - Remaining
But not more than 60 spare charge
- $\rightarrow$ IF cant recharge on board, additional PFE of same size, capacity, type shall be provided in lieu of spare charge.

① Water Fire Extinguisher. (A)

Filled with water upto certain level.

Empty wt = 5.6 kg

Full weight - 15.15 kg.

09 L water type

60 gram - CO_2 cartridge

17-18 bar - Inner pressure

Ht - 545 mm

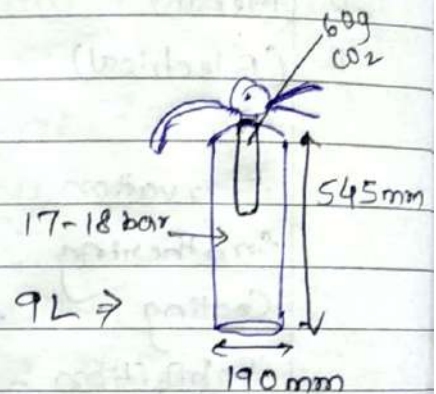
dia - 190 mm

Test pressure - 22.5 bar

Duration - 90 sec

Range - 6 mtr for first 30 sec.

Hydraulic pressure test - 05 yrs.



3 types of Water Ex.

① FW + CO_2 Cartridge

② Soda Acid type

③ Stored pressure type

② Soda-Acid Type. 454g

9L FW + Sodium Bicarbonate + Sulphuric acid
(Cylinder) (Outer chamber) (Inner chamber)

Sodium sulphate + CO_2 + Water
(It builds pressure)

③ Stored pressure type.

Extinguisher is filled up with water & compressed air is introduced in the container with 10 bar pressure.

② FOAM Extinguisher (A8B)

Max charging capacity - 13.5 L + AFFF 270 gram

* Empty wt = 5.6 kg Full wt = 15.35 kg
without cartridge

9L foam type.

600 gram - CO₂ cartridge.

17-18 bar - Inner pressure

* Ht = 600 mm dia - 190 mm Test pressure -

* Duration - 30 - 40 sec at 0° to 60°

Range - 6 mtr for the first 30 sec

Hydraulic pressure test - 0.5 yrs.

2 types → Mechanical Foam type
→ Chemical Foam type

① Chemical foam type

9L water + Sodium Bicarbonate + Aluminium Sulphate.
(Outer) (Inner)

② Mechanical foam

[AFFF (3%) + Water (97%)] + CO₂ cartridge.
Outer shell

③ DCP Extinguisher, (A, B, C Fire)

- 5 to 10 kg size
- Filled with DCP & mono ammonium phosphate at greatest proportion.
- Pressurized with Nitrogen or CO_2

3 types

- Mono potassium phosphate
- Sodium Bicarbonate NaHCO_3
- Potassium Bicarbonate KHCO_3

5 kg DCP

- 120 gm CO_2 cart
- 17-18 bar pressure
- 3-4 m range
- Duration - 10-15 sec

10 kg DCP

- 200 gm
- 17-18 bar
- 3-4 m
- 15-23 sec

④ CO_2 Extinguisher.

- ① - CO_2 filled with 53 bar pressure inside
- wt of charge inside 5-6.8 kg

② 5 kg CO_2

③ Min charge capacity - 5 kg 6 kg (max)

④ Range - 1.5 m

⑤ Duration - 10-15 sec

⑥ Tested at 207 - 236 bar

Maintenance for Water & Foam type Extinguishers

Weekly

- ① Check exterior & clean
- ② Check nozzle outlet & clean
- ③ Check relief hole & clean

Monthly

- ① Check internal
- ② Check gas cartridge
- ③ Check plunger
- ④ Check spring
- ⑤ Weight of container

Yearly

- ① Pressure test

Annual Inspection - 01 year

Hydraulic Pressure test - 05 yrs

Markings on fire extinguisher

Manufacturer's name & no

Type of Extinguisher

Class

Capacity

Instructions on how to use it & recharge

Temp range for operation

Approval details

Hypermist Fire Extinguisher - E/R

Used for high risk areas like M/E, Boilers, Purifier, IG Generator, Incinerator, Diesel Generator.

Working -

- The area required to be protected has 2 detectors Flame & Smoke.
- When fire is detected by 1 detector, it activates an audible alarm which sounds throughout the ship.
- Location is seen on the control panel.
- If temp keeps on increasing, the 2nd detector also gets activated.
- When the fire is detected by 2nd detector also then hypermist gets automatically activated.

10-50 HPA

It has special nozzles operating at high pressure to generate superfine particles of mist which

- a) Absorbs radiant heat from fire & reduces the temp.
- b) Reduces the supply of oxygen to fire.

Two ways of operation: Automatic or Manual.

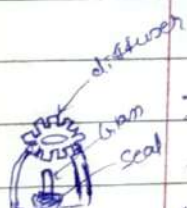
As long as it detects O_2 it won't stop manually. In all other cases it can be stopped manually or auto stop after 20 mins.

It uses FW tank dedicated for it. and that tank shall always maintain the minimum amount of FW.

Sprinkler System.

Used in accommodation, mostly in passenger ship.

In pumprooms also.



Working -

- A charged system of pipes kept pressurized with FW.
- Outlet is sealed with glass bulb having liquid of high coefficient of expansion.

→ At designated temp, the liquid will expand and burst the glass and the seal is removed and FW hits the diffuser and sprinkles on fire.

Temp rating	Rating	Colour
	57°C	Orange
	68°C	Red
	79°C	Yellow

Fixed foam system on Deck
Operating instruction.

Fire Training Manual. SOLAS Chp II - 2

- 1) General fire safety practice & precaution related to danger from smoking, electrical hazards, flammable liquids.
- 2) Instruments on firefighting & procedures.
- 3) Alarm
- 4) Operation & use of PFA
- 5) " " " " Fire doors
- 6) " " " " Fire dampers -
- 7) Escape systems & appliances.

Fire wallet

Watertight container on both side of accommodation.

- 1) Fire Control Plan
- 2) Stowage Plan
- 3) Crew list
- 4) Emergency Contact list
- 5) MSDS of Cargo.

Fire Damper - Flaps installed in ventilation system to cut off air flow manually or pneumatically.

Emergency fire pump.

- 1) Independently driven power operated pump.
- 2) Capacity $\geq 40\%$ of total capacity of fire pump
OR $25 \text{ m}^3/\text{hr}$ whichever is greater.
- 3) Any diesel driven power source for pump shall be capable of starting with hand cranking at 0°C .
- 4) Any service fuel tank shall contain sufficient fuel to enable
 - the pump to run on load for 3 hrs.
 - & sufficient reserves of fuel outside the machinery spaces for 15 hrs.

SEC Survey. (Carried out annually)

Things that will be checked are.

- 1) LSA equipments
- 2) EFA equipments
- 3) Navigational equipments
- 4) Records & Certificate
- 5) Record of navigational activities.

L/B Falls Usually 6×37

It has more flexibility compared to others

Regularly inspect L/B Falls and renew if necessary due to deterioration or at interval of 5 years whichever is earlier.

Maintenance of L/B.

- must be carried out in accordance with the SMS manual or manufacturer's instruction.
Record shall be kept.

Weekly.

- 1) ~~Go~~ Move from stowed posn
- 2) Check conditⁿ of painter
- 3) Check battery charger is ON
- 4) Check markings on L/B.
- 5) Check lashings in place
- 6) Check boat hook, oars & loose gear.

Monthly. in addition to weekly

- 1) Lower the L/B. upto water level.
- 2) Try out engine, nav light & steering
- 3) Check sheaves for proper operation.
- 4) Inventory must be updated.
- 5) Muster list checked.
- 6) Ensure retro-reflective tape in place
- 7) Lubricate lowering ~~on~~ handle
- 8) Clean sight glass.

Quarterly.

- 1) In addition to monthly, launch L/B and manoeuvre on water.
- 2) Try out sprinkler system
- 3) Lubrication of sheaves
- 4) Limit switch operation

Half Yearly. In addn to quarterly.

- 1) Falls coated with WRP (Wire Rope lubricants & Protective)
- 2) Davit chipped & painted
- 3) Lubricating oil in winch.
- 4) Launching arrangements visible or not

Annual Inspection. In addition to half yearly to be carried out by maker's authorised personnel and supervised by Class surveyor. - Thorough examination under SED survey. it will include onload release test, davit test & dynamic winch brake test.

Tricing Pendant - made of Wire connected to davit eye on one side and to eye on hook of L/B on other side.

- Used to bring the L/B closer to embarkation deck while lowering as all other lashings are removed.

Bowsing Tackle - A 3 fold purchase with manila rope used to bring the L/B more closer to embarkation deck and to release tension of tricing pendant.

Anti-exposure Suit - A protective suit designed for use by rescue boat crews.

- 1) Waterproof material having inherent buoyancy $\geq 70N$
- 2) Unpacked & donned without assistance in 2mins.
- 3) Don with L/J without assistance
- 4) Sustain burning for a period of 2 sec when totally enveloped in fire without melting.
- 5) Equipped with a pocket for portable VHF
- 6) Fitted with light & Whistle.
- 7) Wearer's body temp shall not fall below the rate of $1.5^{\circ}C/hr$ after first $\frac{1}{2} hr$ in a calm circulating water of $5^{\circ}C$.

- 1) What are panting beams?
- 2) How to give IV injections?
- 3) How to make sure TPA is put on?
- 4) Enclosed space entry precautions?
- 5) Panting & Pounding structures?
- 6) Angle of loll corrective action?
- 7) Isps documents? Security levels? DOS? Certificates
- 8) Limit switch on L/B
- 9) What is continuous synopsis record? Details in it?
Why those details required
- 10) Crew bleeding badly from leg Action? Use tourniquet
- 11) E/R bilges discharge criteria
- 12) Stiff & tender vs stiff
- 13) Requirements of freefall L/B
- 14) Fixed FFA for LPG & tankers?
- 15) Why DCP on LPG
- 16) Usage of DGP
- 17) What is Shell expansion Plan?

- 9) CSR (Continuous Synopsis Record) is issued by flag state
All passenger & cargo ships of 500 GRT & above
according to SOLAS chap 11-1
- It provides onboard record of the history
of ship with respect to the information recorded.

Details in CSR.

- 1) Name of ship
- 2) Port at which it is registered
- 3) Ship's ID number
- 4) Date on which ship was registered to flag state
- 5) Name of Flag state
- 6) Name of owner & address

- 7) Name of charterer & address.
- 8) Name of classification society.
- 9) Name of company & address.
- 10) Name of Administration which has issued DOC specified in ISM Code.
- 11) Name of body which has carried audit to issue DOC.
- 12) Name of Administration which has issued SMC (Safety Management Certificate) & name of body which carried out audit.
- 13) Name of Administration which has issued ISPS Certificate & name of body which carried out the audit.
- 14) ~~Exp~~ Expiry date of ship's registration with state.

SSAS (Ship Security Alert System)

min 2 security buttons required; one of these buttons should be on the wheelhouse.

Tested - Annually

When the button is pressed a covert alert is sent to flag state & CEO which means ship is in threat
 → NOT raise alarm on board.

→ It will continue the alert until deactivated and/or reset

→ The company informs RCC & RCC will not try to communicate with the vessel.

DOS need to be filled when

- 1) Ship is operating at higher security level than port.
- 2) Ship is going to a port which do not have PFSP
- 3) Ship is operating at higher security level than other ship
- 4) Ship is ~~oper~~ doing operations with other ship which do not have approved ship security plan.

* Implementation Phases.

Phase 1 - Runs from 2015 to 2019

Phase 2 - from 2020 to 2024

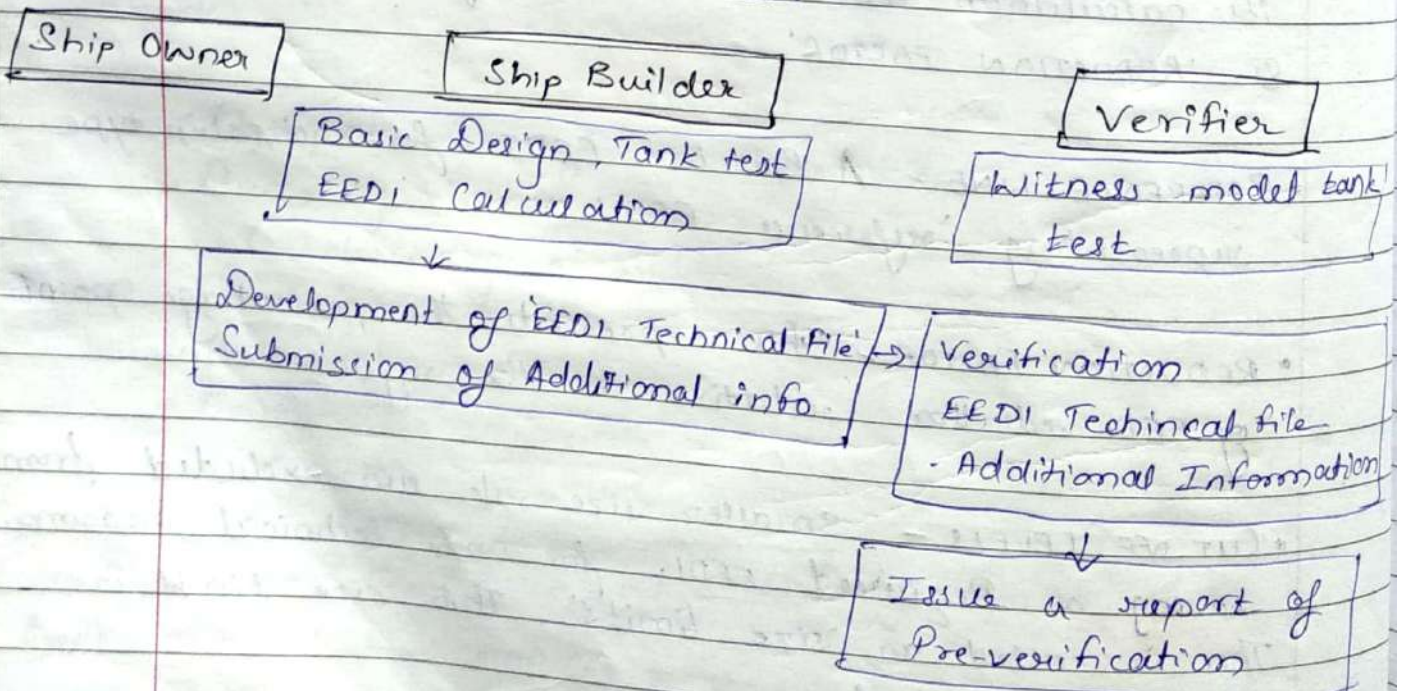
Phase 3 - 2025 onwards

Note - Upon successful verification of 'EEDI & SEEMP' an **IEE** Certificate is issued by verifier.
 ↳ A Record of construction for Energy Efficiency will be attached to the certificate.

Validity of IEE Certificate

- ⇒ Valid throughout the life of ship except.
 - If the ship is withdrawn from service
 - Undergone major conversion & issued new certificate
 - Upon transfer of ship flag to another state

Verification Process.



Modification

Start of Ship Construction

Sea Trial



Modification & resubmission
of EEDI Technical File

Verification

- Sea trial
- Ship speed
- Revised EEDI Technical File

Issuance of certificate

Delivery of ship

SEEMP (Ship Energy Efficiency Management Plan)
Annex VI Reg. 22 & 22A

PART - I

PART - II

* Ship Management Plan to
improve Energy Efficiency

- Framework & structure
of Part-I of SEEMP.
- Guidance on best practices
for fuel efficient
operation of ships.

- Provides a possible approach
for monitoring ship &
fleet efficiency performance
overtime & some options
to be considered when
seeking to optimize
the performance of the
ship.

* Ship fuel oil consumption
Data Collection Plan.

- Guidance on methods for
collecting data on fuel oil
consumption, Dist travelled
& hours underway.
- Direct CO₂ emission
measurements.

- Provides the methodologies,
Ships of 500GRT and above
should use the data required
to Reg 22A of Annex 6. &
the process that ship use to
report the data to Administration
or organisation authorized
by it.

Applies to all ships of 400 GRT & above constructed
on or after 1st July 2013.

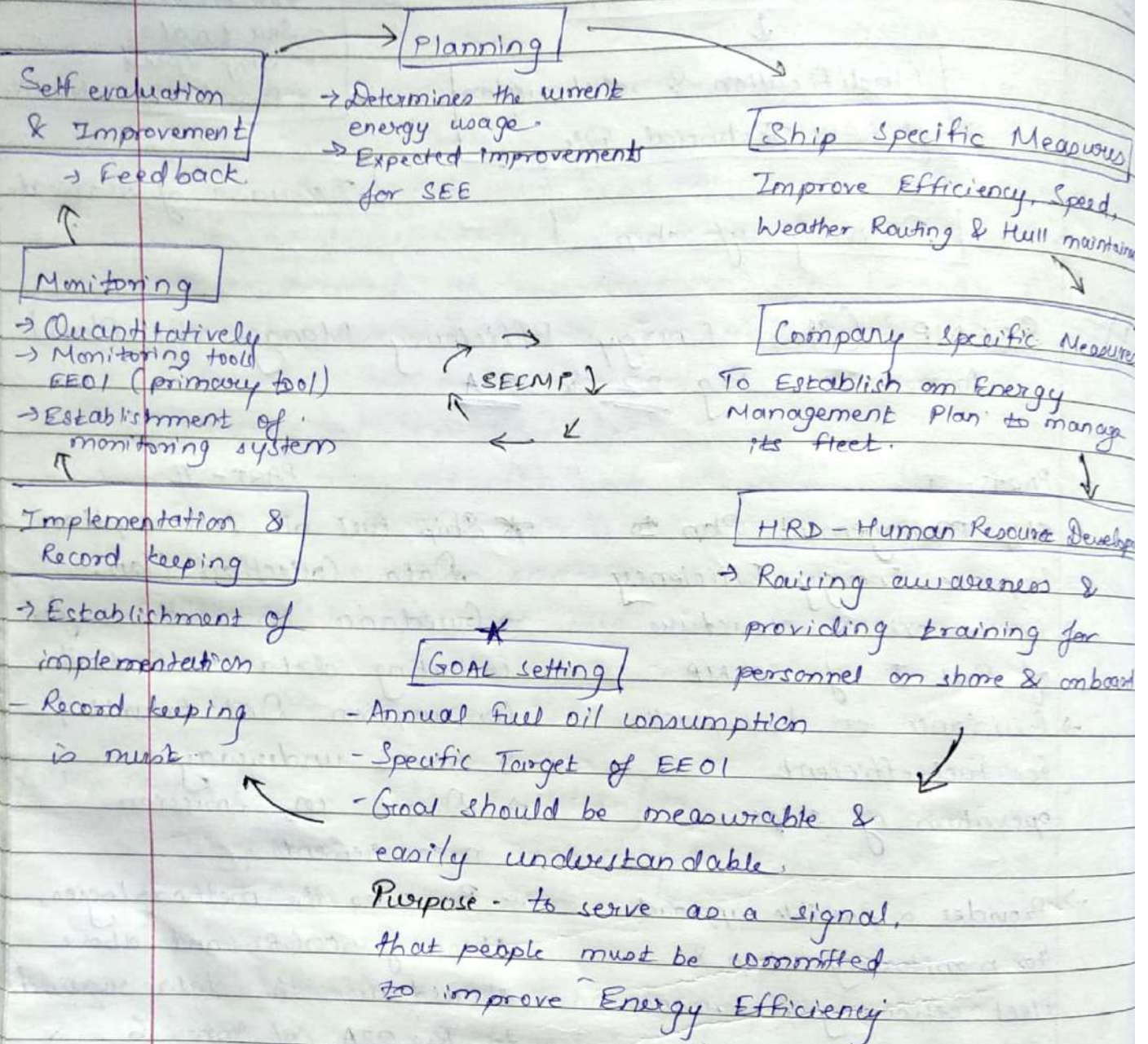
- Using Bunker fuel oil tank monitoring on board, Determines the annual fuel oil consumption, the amount of daily fuel oil consumption by automated readings, soundings, dip tapes.

Note = The ship's 'SEEMP' may form part of the "Ships safety management system".

* EEDI

- It is an index that shows the amount of CO_2 that a ship emits in relation to the goods transported.
- Indication of energy efficiency by CO_2 emission (g) per cargo carry (ton mile). The actual EEDI of ship is called 'attained EEDI' and is calculated based on IMO guidelines. The result must be below the limit 'required EEDI' prescribed in MARPOL.
 - For existing ships, the EEDI in most cases is irrelevant. It will become relevant only when the ship has undergone a major conversion that is so extensive that the ship is regarded by as a newly constructed ship by the Administration.
 - For newly constructed ships, a technical file must be created showing attained EEDI and its calculation process.
 - The EEDI and technical file will be subject to verification by the flag administration.
- New ship means,
- Ship constructed on or after 1st July 2013.
 - The delivery of ship on or after 1st July 2015.

Framework & structure of Part - I of SEEMP



Part - II of SEEMP - Ship fuel Oil Consumption Data Collection Plan

* Fuel Oil Consumption.

→ Using "Bunker Delivery Notes (BDN)"

(Determines the total amount of fuel oil used using BDN)

→ Using 'Flow meters'

(Determines the annual total amount of fuel oil used by measuring fuel flows from Flow meters)

* PSSA (Particular Sea Sensitive Area)

PSSA is an area that needs 'special protection' from IMO because of its significance for recognized 'Ecological or Socio-economic or scientific reasons' and which may be vulnerable to damage by 'International Maritime Activities'.

Criteria for identification of PSSA & the criteria for designation of special area are 'not mutually exclusive'. In many cases, a PSSA may be identified within special area or vice versa.

List of adopted PSSA

- 1) The Great Barrier Reef, Australia (Designated PSSA in 1970)
- 2) The Sabana Camaguey Archipelago, Cuba (1997)
- 3) Malpelo Island, Columbia (2002)
- 4) The sea around Florida Keys, USA (2002)
- 5) The Wadden Sea, Denmark, Germany, Netherlands (2002)
- 6) The Paracas National Reserve, Peru (2003)
- 7) The Western European Waters (2004)
- 8) Extension of the existing Great Barrier Reef PSSA to include the 'Torres Strait' (Proposed by Australia & Papua New Guinea - 2005)
- 9) Canary Islands, Spain - (2005)
- 10) The Galapagos Archipelago, Ecuador - (2005)
- 11) The Baltic Sea area, Denmark, Germany, Finland, Poland, Latvia, Lithuania, Sweden & Estonia - (2005)
- 12) The Papa Hānau-mokuakia Marine National Monument, USA (2007)
- 13) The Strait of Bonifacio, France & Italy (2011)
- 14) The Saba Bank, in North Eastern Caribbean Sea. (2012) of the ~~Nether~~ Kingdom of Netherlands.
- 15) Extension of the Barrier Reef and Torres Strait to encompass the SW part of the Coral Sea. (2015)
- 16) The Jomard entrance, Papua New Guinea (2016)
- 17) Tubbataha Reefs Natural Park, The Sulu Sea Philippines (2017)

Q How is it done?

Ans PSSA is proposed by states to IMO



There are few criteria for an area to be met to be designated as PSSA

Ecological,
Socio-economic
Scientific.



On approval from MEPC & MSC the area is designated as PSSA by IMO.



IMO forwards it to IHO to update it on charts (which are further updated on ships through WNM)

* Information about the designated PSSA?

- Charts
 - WNM
 - Ship's Routing
 - IMO site
 - etc
- IMO also published a book on PSSA on 30 June 2017.

Stringent rules for discharge of

- Dumping waste
- Oil discharge
- Garbage
- Incineration
- Sewage, etc

##

EEDI - Energy Efficiency Design Index.

Applies to - All ships 400 GRT & above, engaged in international waters
It gives limited powers to Administration to waive the requirements of EEDI. For a new ship upto delivery
For new ships, upto a delivery date of 1 July 2019.

subject to informing the IMO and other parties to the MARPOL Annex VI.

Attained EEDI - Actual EEDI of ship

- ↳ Must be calculated for each new ship or Existing ships which has undergone major conversion
- ↳ Only applicable to large number of ship types, but not all ships. for eg:- Fishing vessels, not required
- ↳ Must be calculated taking into account relevant IMO Guidelines.
- ↳ Must be accompanied by "EEDI Technical File"
- ↳ Must be verified, based on EEDI technical file, either by Administration or by organization authorized by IMO.

* REQUIRED EEDI - is the regulatory limit for EEDI & its calculation ~~use~~ involves use of 'REFERENCE LINE' & 'REDUCTION FACTOR'.

- REFERENCE LINE - A Baseline EEDI for each ship type representing 'reference EEDI'.
- REDUCTION FACTOR - This represents the percentage points of EEDI reduction relative to the reference line.
- CUT OFF LEVELS - Smaller size vessels are excluded from having a Required EEDI for some technical reasons. This is called as 'size limits'. This size limit is called cut off levels.

ISM Code

GAS Can Destroy Master's Red Dick so Emergency Report, Maintenance, Documentation & Company verification required.

1) General

→ Definitions

→ Objectives

→ Application

→ Functional Requirements of SMS

2) Safety & Environmental Protection Policy

3) Company Responsibilities & Authorities

4) DPA (Designated Person)

5) Master's Responsibilities & Authorities

6) Resources & Personnel

7) Development of plans for shipboard operations

8) Emergency preparedness

9) Report of non-conformities, accidents & hazardous occurrences

10) Maintenance of the ship & Equipment

11) Documentation

12) Company verification, review & evaluation

Part B: Certification & Verification

13) Certification & Periodical verification

14) Interim certification

15) verification

16) Forms of Certificate

LSA Code

Page No.

Date

- Chap 1 - General
- Chap 2 - Personal LSA
- Chap 3 - Visual Signals
- Chap 4 - Survival Craft
- Chap 5 - Rescue Boats
- Chap 6 - Launching & Embarkation Appliances
- Chap 7 - Other LSA

* Testing & evaluation of LSA

Annex 1 - Adult reference test design & Construction

Annex 2 - Child reference test design & Construction

Annex 3 - Infant reference test design & Construction

EFA Code

- Chap 1 - General Definitions
- 2 - International Shore Connection
- 3 - Personal Protection
- 4 - Fire Extinguishers
- 5 - Fixed Fire Extinguishing System
- 6 - Fixed Foam fire extinguishing system
- 7 - Fixed water pressure & water spraying system
- 8 - Auto sprinkler, fire detection & Fire alarm
- 9 - Fixed fire detection & alarm system
- 10 - Sample Extraction smoke detection system
- 11 - Low ~~in~~ Location Lighting System
- 12 - Emergency fire pump
- 13 - Means of escape
- 14 - Fixed deck foam system
- 15 - Inert Gas System

GIR FFFF ^{Auto} Fixed sample Low Emergency means Fixed deck IG system

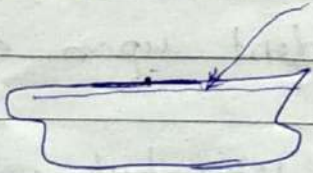
SOLAS - 14 chap

- Ch-I General Provisions.
- Ch-II(i) Construction (Structure, Subdivision, Stability, Electrical equipments & installations)
- Ch-II(ii) Construction (Fire protection, Fire detection & Fire extinction).
- Ch-III Life Saving Appliances.
- Ch-IV Radio Communications
- Ch-V Safety of Navigation
- Ch-VI Carriage of Cargoes
- Ch-VII Carriage of dangerous goods.
- Ch-VIII Nuclear Ships
- Ch-IX Management for the safe operation of ships.
- Ch-X Safety measures for high speed craft
- Ch-XI(i) Special measures to enhance maritime safety
- Ch-XI(ii) Special measures to enhance maritime security
- Ch-XII Additional safety measures for bulk carriers
- Ch-XIII Verification of compliance
- Ch-XIV Safety measures for ships operating in Polar regions.

Ch-II (1)

Definitions

- 1) Bulkhead deck - Uppermost deck upto which transverse watertight bulkhead is carried.
- 2) Margin line - 76mm below bulkhead deck from side



1)

Fire Mains & Hydrants.

- Pipes & hydrants so placed that fire hoses can be easily coupled with them.
- Arrangements of pipes and hydrants such that to avoid Freezing.
- Drainage provided for fire main piping.
- Isolation v/v shall be provided for all open deck branches.

Diameter of Fire mains

2 fire pumps
140 m³/hr

- Sufficient for distribution of maximum required discharge from 2 fire pumps operating simultaneously.
- Except for cargo ships, the diameter should be such that discharge of 140 m³/hr

- The number & position of hydrants shall be such that

2 jets

- At least 2 jets ~~to~~ of water not coming from same hydrant.

↳ One of which from single hydrant reaching any part of the ship.

2 jets

In cargo spaces, 2 jets shall reach any part of space from a single length of hose.

* Pressure of hydrants.

Imp

For cargo ships min pressure at all hydrants

For vsl 6000 GRT & above - 0.27 N/mm²

less than 6000 GRT - 0.25 N/mm²

Diameter of hydrant - 2½ inch

Max pressure shall not exceed that at which fire hose can be demonstrated.

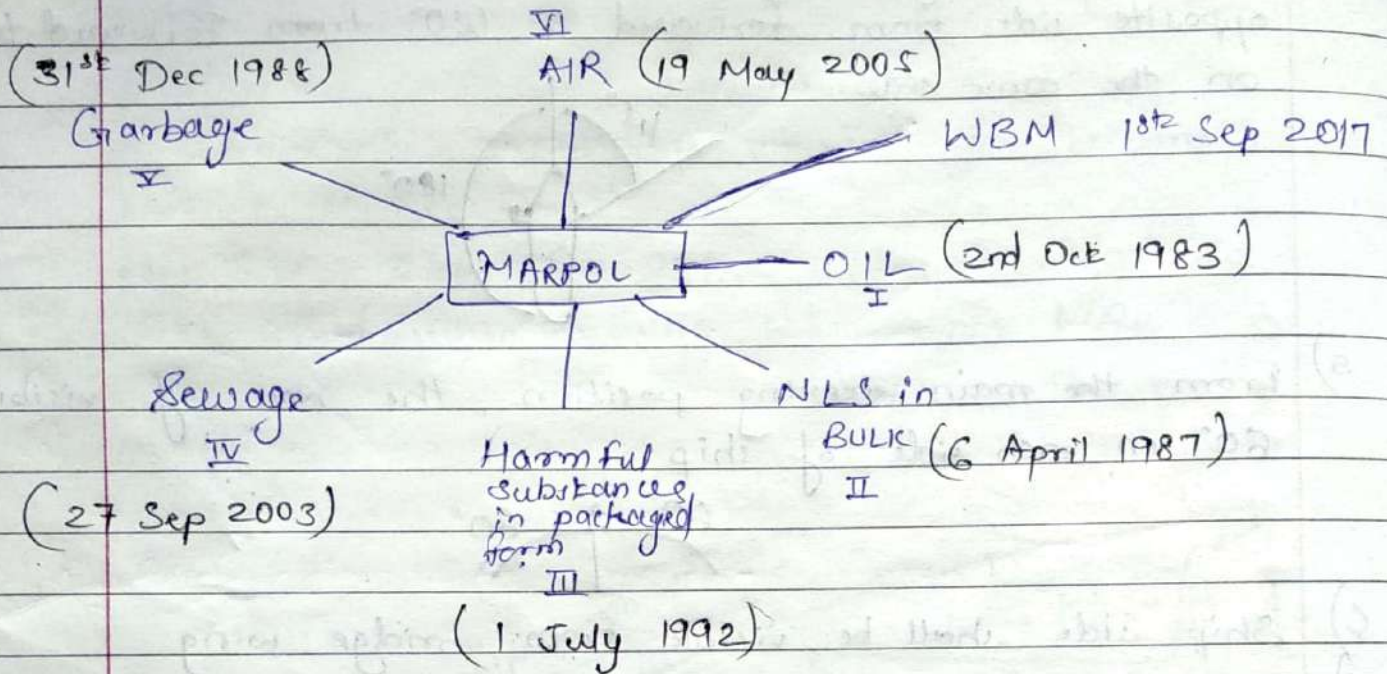
Torrey Canyon?
disaster

Amendment Protocol

Page No.

Date 30/07/18

MARPOL 73/78 (into force 2nd Oct 1983)



- 10
Annex 1 - Regulations for the prevention of pollution by Oil.
- Antarctic
Annex 2 - Regulations for the control of pollution by Noxious Liquid Substances carried in Bulk
- Annex 3 - Regulations for the prevention of pollution by harmful substances carried in packaged form
- Annex 4 - Regulations for the prevention of pollution by sewage from ships.
- 8
Annex 5 - Regulations for the prevention of pollution by garbage from ships.
- 5
Annex 6 - Regulations for the prevention of air pollution from ships.

Annex I

Page No.

Date

Oil discharge

M/C Spaces

Outside Special Areas

- Ship enroute
- Oily mixture is processed through Oil filtering Equipment
- Oil Contents of the effluents without dilution shall not exceed 15 ppm
- Oily mixture should not originate from Cargo pump rooms
- Oily mixture is not mixed with cargo residues.
- (Reg 17) Oil Record Book (ORB) Part-I has to be maintained

Inside Special Areas

- ✓
- ✓
- ✓ + Automatic stopping device + Audio visual alarm
- ✓
- ✓
- ✓
- Oil/oily mixtures from any ship is prohibited in Antarctic area.

Cargo Spaces

Outside Special Areas

- Oil tanker to be more than 50 NM away from nearest land
- Proceeding Enroute
- Instantaneous rate of discharge shall not exceed 30 Lt/NM
- Total quantity of oil discharge does not exceed 1/30000 of total cargo on board including oil to be discharged.
- Tanker will to have an operational (ODMCS) Oil discharge Monitoring & Control system + Recorder and a slop tank.
- ODMCS ^{record} must be retained onboard for 3 years

Inside Special Areas

- Any discharge of oil or oily mixture from the cargo spaces of oil tanker into the sea is prohibited in special areas

Reg 17 - applies to all oil tanker of 150 GRT & above and all other oil of 400 GRT & above

Instantaneous rate of discharge = $\frac{\text{rate of discharge in hour}}{\text{Speed of the ship}}$

Special Areas.

- 1) The Gulfs Areas
- 2) The Oman Area of Arabian Sea
- 3) The Gulf of Aden
- 4) Red Sea
- 5) Mediterranean Sea
- 6) Baltic Sea
- 7) Black Sea
- 8) The NW European Waters.
- 9) The Southern South African waters
- 10) Antarctic Area

IMP Certificate & Document for Annex 1

(1)

Validity

5 yrs

Reg 6 - IOPPC (International Oil pollution prevention + certificate)

Form A & Form B

- Issued after initial or renewal survey by Administration
- Applies to Oil tankers 150 GRT, others 400 GRT

Record of Construction & Equipments

Form A

For ships other than Oil tankers

Form B

For Oil tankers.

(2)

ORB

Part I (Reg 17)

- 150 GRT Oil Tk
- 400 GRT other ships
- M/c spaces

Part II (Reg 36)

- 150 GRT oil Tk
- (Cargo / Ballast Ops)

③ SOPEP (Reg 17)

150 GRT & above - Oil tk

400 GRT & above - other ships

shall carry an ~~approved~~ SOPEP approved by Administration

④ ODMCS Manual

⑤ COW Manual

⑥ Record of ODMCS for the last ballast voyage

- 3 yrs

→ Every Oil tk 150 GRT & above (fitted with ODMCS)

→ approved by Administration

→ Recording Device

→ Continuous record of discharge in 'Metres' per 'NM'

→ Oil Content & instantaneous rate of discharge
(ppm) (Lt/NM)

→ Time & Date of Record

⑦ CAS - Condition Assessment Scheme

ships after 1st April 2005
or 15 yrs age

- statement of Compliance

- CAS report & renewal reports

⑧ Subdivision & stability information

⑨ STS operation plan & record

Regulation for the control of pollution ~~from~~ ^{by} NLS covered in Bulk

Discharge criteria based on (4 category) categories & listing

- ① Category X - MAJOR HAZARDS → Marine Resources
→ Human Health
→ Prohibited.
- ② Category Y - HAZARDS — Either → Marine Resources
→ Human Health
→ Limitations on the → Quality of discharge
→ Quantity of discharge
- ③ Category Z - Minor Hazard - Either → Marine Resources
→ Human Health
→ Less stringent restrictions → Quality of discharge
→ Quantity of discharge
- ④ Other substances - ~~Does~~ Indicated as 'OS' in ch.18 of IBC Code
→ Does not include in X, Y, Z category.
→ No Harm → Marine Resources
→ Human health.
→ There is no requirement for discharge of these substances.

* Special Area for Annex II

→ ANTARCTIC AREA

- Any discharge into sea of NLS or mixture is prohibited.

Annex II discharge Standards.

(For residues of X, Y, Z or Ballast water, Tank Washing or other mixture containing such substances.)

PRE-WASH - mandatory for X & Y & not for Z & OS
carried out before vessel arrives the port.
discharge residues to port facility.

STRIP the tank & piping, tank cleaning, cargo handling
as per ~~P & A~~ P & A Manual (Procedures & Arrangement Manual)

- ① As per Reg 13 (Applies for - Discharge of residues of Y & Z)
- 7 kts (if self propelled)
 - 4 kts (not self propelled)
 - Ship enroute at a speed of atleast
 - Distance from nearest land, not less than 12 NM
 - Depth of water not less than 25 metres.
 - Discharge is made below waterline through u/w discharge outlet, not exceeding the maximum rate for which the discharge outlet is designed

② Discharge of residues of Category X.

- Tank which has unloaded cat X shall be pre-washed ~~off~~ before ship leaves the port. of unloading.
- The remaining residues shall be discharged to port facility ~~with~~ until the concentration of the substance in the effluent ~~is~~ is at or below 0.1% by weight.
& remaining tank washing shall continue to discharge to port facility until the tank is empty.
- As per P & A manual
- Entry in Cargo Record Book
- Endorsed by Surveyor.

Certificates & Documents of Annex II

- ① IPPC - International Pollution Prevention Certificate.
 - For coverage of NLS in Bulk.
 - issued after initial or renewal survey by Administration
 - issued for a period specified by Administration, not exceeding 5 yrs.
- ② COF - Certificate of Fitness.
- ③ P & A Manual.
 - Main Purpose.
 - to identify for ship's officer → Physical arrangements → all operational procedures with respect to
 - Cargo Handling
 - Tank cleaning
 - Slop Handling
 - Cargo tank Ballasting & Deballasting
- ④ SMPEP - Shipboard Marine Pollution Emergency Plan.
 - 150 GRT & above - certified to carry NLS in bulk. it shall contain.
 - Procedures to report NLS incident
 - list of authorities to contact if incident happens
 - Owner
 - Company
 - Port Authority
 - Pollution Control organist
 - ~~list of~~ ^{A detailed} action to be taken by persons on board.
- ⑤ Cargo Record Book
- ⑥ IBC Code
- ⑦ officer's Specialise Chemical tanker Certificate

Annex 3.

Page No.

Date

Regulation for the prevention of pollution by harmful substances in packaged form.

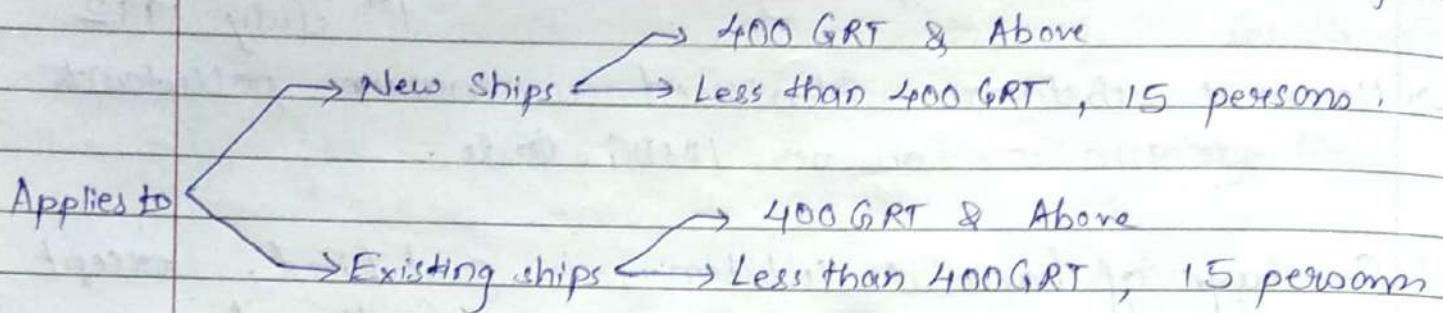
1st July 1992

- Harmful substances - identified as marine pollutants as per IMDG Code.
- Carriage of harmful substances is prohibited. except in accordance with the provisions of this Annex.
- The provisions of this annex is that each party shall issue detailed requirements on:
 - Packing - Labelling - Marking - Stowage.
 - Documentation - Quantity Limitations & Exceptions for preventing or minimising pollution.
- Empty Packaging (which previously carried harmful substances)
- Does not apply Ship Stores & Equipment

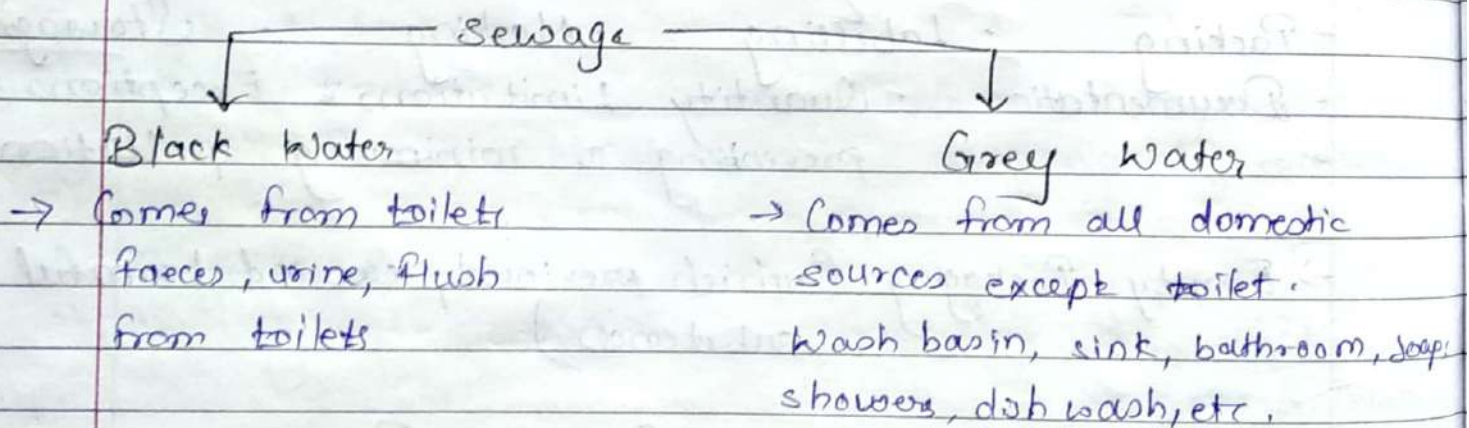
~~Bath & Sea~~

Regulations for the prevention of sewage from ships

27th Sep 2003



→ **HOLDING TANK** - used for collecting & storage of Sewage.



Certificate.

ISPPC - International Sewage Pollution Prevention Certificate.

- issued at initial or renewal survey by Administration
- 5 yrs validity

Sewage Systems

- ① Sewage Treatment Plant approved by Administration
- ② Sewage Comminuting & disinfecting system approved by Administration.
- ③ A Holding tank

Baltic Sea

Page No.

Date

Discharge of sewage.

- discharge of sewage into sea is prohibited except ship is discharging comminuted sewage more than 3 NM from nearest land.
- Non-comminuted sewage more than 12 NM from nearest land.
- In any case, discharge at moderate rate when ship enroute at 4 kts
- Ship has approved sewage treatment plant.
- The effluent shall not produce any visible traces in the water.

Annex 5.

Page No.

Date

Regulations for the prevention of pollution by Garbage from Ships 31st Dec 1988

- Applies to all ships of any type.
- Prohibits the discharge of plastics anywhere in the sea.

Special areas of Annex V

- 1) The Gulf area
- 2) The Red sea
- 3) The Mediterranean sea
- 4) The Baltic sea
- 5) The Black sea
- 6) The North sea Area
- 7) The wider caribbean region including gulf of mexico & caribbean sea.
- 8) The Antarctic sea Area

* Discharge provisions of the revised MARPOL Annex V Entered into force 1st Jan 2013

Residues → These substances must not be harmful to marine environment
Additives →

Specific circumstances when discharge is allowed.

- 1) Both port of departure & arrival are in special areas and the ship will not transit outside the special areas b/w the ports.
- 2) If no adequate reception facilities available at those ports.

Type of Garbage	Outside Special Areas	Inside Special Areas
Food waste not comminuted or ground	≥ 12 NM from nearest land when ship enroute, and as far as practicable	Discharge Prohibited
Food waste comminuted or ground	≥ 3 NM from nearest land when ship enroute as far as practicable	≥ 12 NM from nearest land when ship enroute as far as practicable
Cargo residues not contained in wash water	≥ 12 NM from nearest land when ship enroute and as far as practicable	Discharge prohibited,
Cargo residues contained in wash water		≥ 12 NM from nearest land when enroute & as far as practicable & subject to 2 additional conditions
Cleaning agents & additives contained in ^{cargo hold} wash water.	Discharge Permitted	≥ 12 NM from nearest land when enroute & as far as practicable & subject to 2 conditions
Cleaning agents & additives contained in deck & external surface wash water		Discharge permitted,
Carcasses of animals carried on board as cargo and died during voyage	Discharge permitted as far as practicable from nearest land	Discharge prohibited
All other garbage plastic, metal, glass, linings, nets, etc	Discharge Prohibited	Discharge Prohibited

Regulations for the prevention of Air pollution from ships. 19 May 2005

The Regulation seek to control/ air emissions from ships of.

→ SO_x , NO_x , ODS (Ozone Depleting Substances)

VOC (Volatile Organic Compound),

Shipboard incinerations,

& their contribution to local & Global Air Pollution

* → A revised Annex VI was adopted with significantly stringent requirements in Oct 2008, which entered into force on 1st July 2010

① * Reg 14 - SO_x (Sulphur Oxide)

SECA (Sulphur Emission Control Area)

- 1) Baltic Sea
- 2) North Sea
- 3) North America
- 4) Most of the US & Canadian Coast
- 5) Caribbean area including Puerto Rico & Virgin Islands

* Sulphur limits for fuel in SECA'

Before 1st July 2010

1.5% m/m

B/w 1st July 2010 - 1st Jan 2015

1.0% m/m

After 2015

0.10% m/m

mass/mass

* Sulphur limits for 'Other Sea Areas'

Before 1st Jan 2012

4.5% m/m

B/w 1st Jan 2012 - 1st Jan 2020

3.5% m/m

After 1st Jan 2020

0.50% m/m*

* subject to review completed no later than ~~2020~~ 2018

Ships within SECA must fulfill one of the following conditions.

- i) Sulphur content should be within limits.
- ii) Exhaust cleaning system to reduce SO_x to 6 g/kwh or less.
- iii) Any other method to reduce the sulphur content as above.

* Applies to all ships of 400 GRT & above, platforms or drilling units.

* IAPPC - International Air Pollution Prevention Certificate
not exceeding 5 yrs or period specified by Administration.

② NO_x (Nitrogen Oxide)

Applies to

→ Each diesel engine with a power output more than 130 kW installed on ship. OR

Ship engine has major conversion.

→ Ship constructed on or after 1st Jan 2000

* NECA (Nitrogen Emission Control Area)

- 1) North America
- 2) United States
- 3) Caribbean Sea.

Tier	Ship constructed on or after	Total Weight Cycle (g/kwh)		Emission Limit (n = rpm)	
		$n < 130$	$n \leq 130-1999$	$n \geq 2000$	
I	1 st Jan 2000	17.0 g/kwh	$45 n^{(-0.2)}$ g/kwh	9.8 g/kwh.	
II	1 st Jan 2011	14.4 g/kwh	$44 n^{(-0.23)}$ g/kwh	7.7 g/kwh.	
III	1 st Jan 2016	3.4 g/kwh	$9 n^{(-0.2)}$ g/kwh	2.0 g/kwh.	

* Certificates & Documents of Annex VI

- 1) IAPP (International Air Pollution Prevention Certificate)
- 2) EEDI (Energy Efficiency Design Index)
- 3) SEEMP (Shipboard Emergency Efficiency management Plan)

IMO, SEEMP, Amendments.

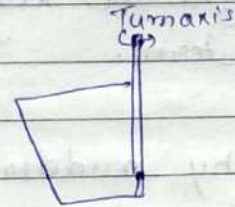
RUDDER.

- 1) Cast type - Made in cast & brought to shipyard & attached to the ship.
- 2) Prefabricated - These are made in shipyard itself.

① Unbalanced Rudder -

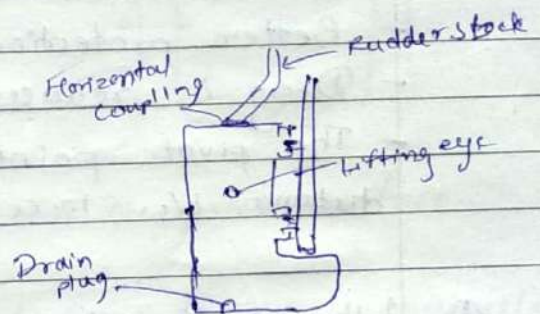
Entire turning area abt the turning axis.

Used in small ships, tugs, L/B



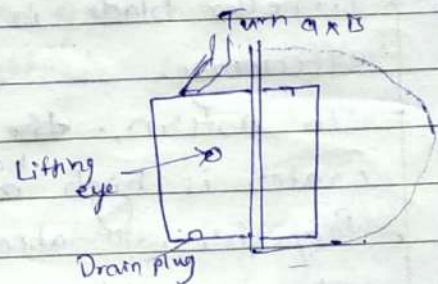
② Semi-balanced Rudder.

Less than 20% of lateral area forward of turning axis.



③ Balanced Rudder.

These rudders have turning circle so placed that equal areas of rudder is at fwd & Aft. Typically 20-30% fwd.



Q Why rudder angle is limited to 35 degrees?

Ans Beyond 35° efficiency is reduced due to formation of eddies at the back of the rudder.

Q Why steering test Rudder angle 35° to 30°?

Ans So that the point at which it reaches can be judged exactly judged as it crosses 30°.

Q Why astern turning moment is less than ahead?

Ans Bec the thrust of propeller is lost when moving astern & the pivot point shifts 1/3rd length of aft.

Q What is pivot point?

Ans - The ship turns at a point called pivot point which is $\frac{1}{3}$ rd the length of ship from forward if ship is moving ahead. & $\frac{1}{3}$ rd the length of ship from aft if ship is moving astern.

Q Why rudder is situated at the aft?

Ans - To make use of propeller wash for thrust.

- Better protection from damage at astern.

- Drag is reduced if rudder is at aft.

- The pivot point is $\frac{1}{3}L$ of ship. the greater perpendicular distance b/w force & pivoting point the better movement.

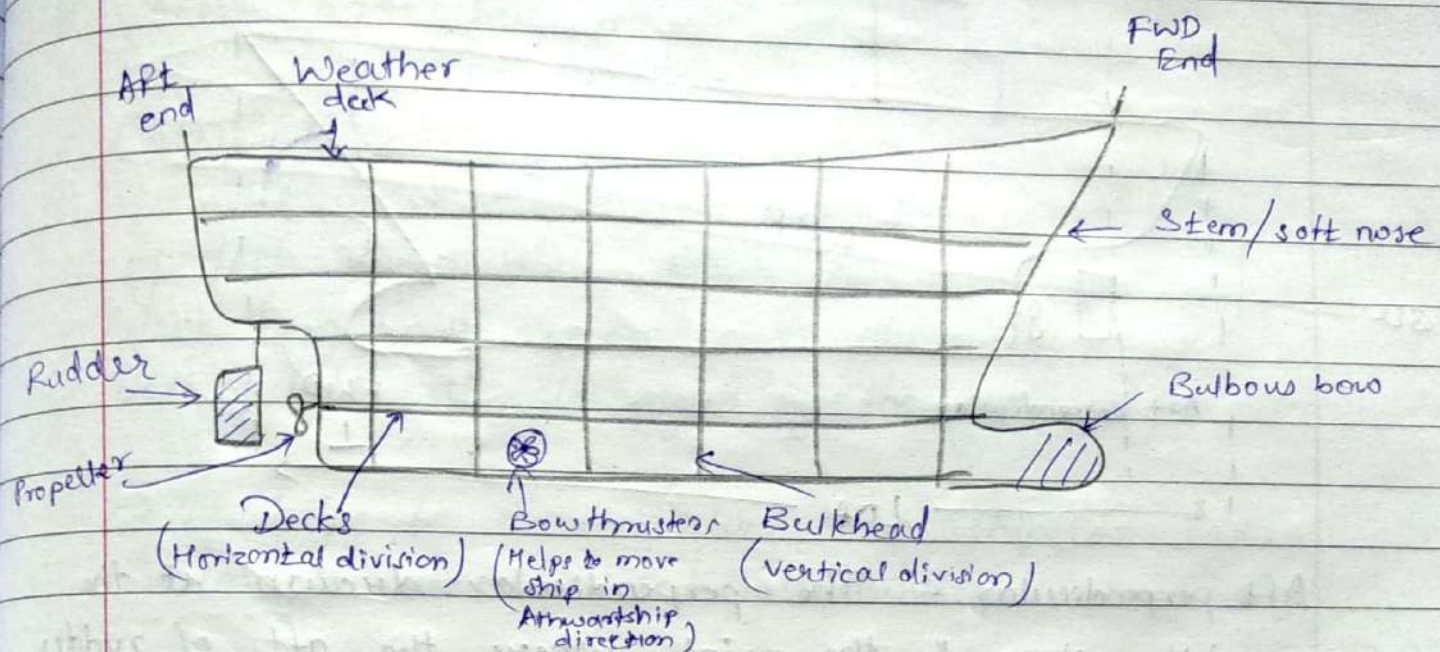
Q Why full astern power is usually less than full ahead?

Ans - Propeller blade is designed to move ahead at maximum efficiency.

- In astern, ~~the~~ direction, the angle of attack of water is high on ^{back of} blade.

- Propeller will absorb very little power & ~~to~~ severe eddies are formed.

Ship Construction.



Topmost continuous deck that runs throughout the length of ship is called weather deck / Bulkhead deck / Freeboard deck
 (Exposed to weather) (Passenger ship) (Cargo ship)

Shell plating - Outermost skin of the ship.



Keel - Centermost ~~stroke~~ ^{stroke} of shell plating.

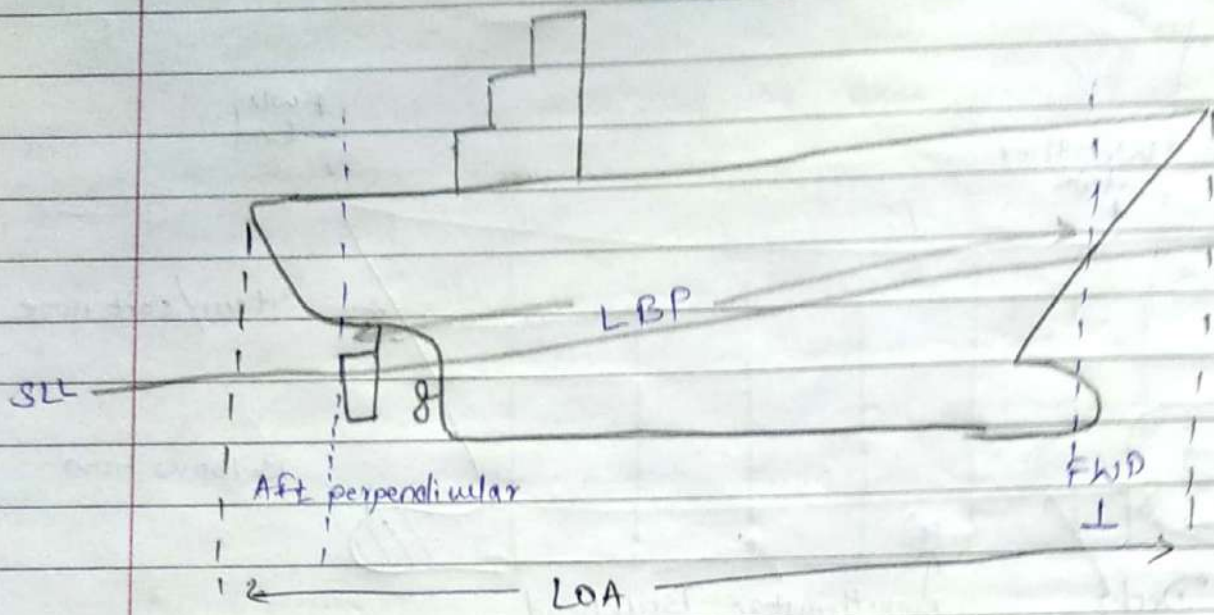
↳ strongest part of ship.

The numbering of stakes are done from keel.

The water line (WL) in fully loaded condition in summer is called Summer load line (SLL)

The WL in fully loaded condition in winter is called WL₂

The WL in fully loaded condition in tropical is called TLL



Aft perpendicular. - The perpendicular drawn at the WL where to the point where the aft of rudder meets ~~at~~ SLL is called Aft $\perp$

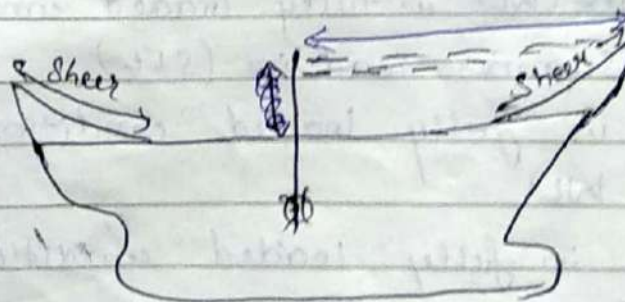
Fwd $\perp$ = The perpendicular drawn at the WL to the point where the stem meets the SLL is called Fwd $\perp$.

LBP - Length b/w FP & AP measured at SLL.

LOA - Length at extremities.

 Centreline - Imaginary line from forward to aft passing from midship

SHEER



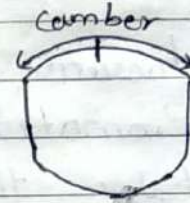
Curvature of ship's deck in longitudinal direction is called Sheer.

measured b/w deck height amidship and the particular point on the deck.

* Sheer adds buoyancy

CAMBER

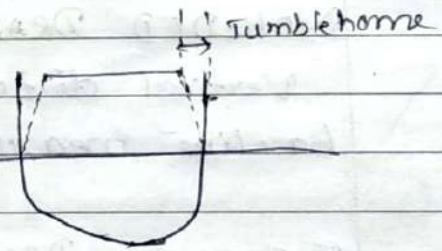
It is the transverse curvature of deck measured ~~from~~ b/w deck height at centreline to the deck height at the sides of the ship.



→ It helps to drain water from ship helps to strengthen longitudinally.

TUMBLEHORN

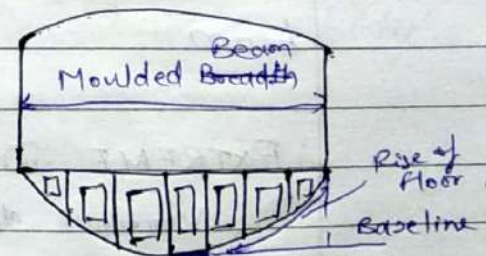
Inward curvature of ship side above waterline.



It gives additional stability in uprighting the ship when ship is rolling.

MOULDED BEAM.

Maximum moulded breadth of ship measured at midship.

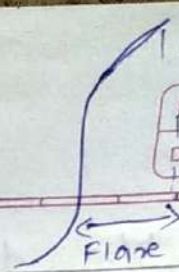


BASE LINE - Horizontal line drawn from the top of the keel plate.

RISE OF FLOOR - Rise of bottom shell plating from baseline to imaginary measured at ship side.

- Help in drainage b/c bilge present at centre

All moulded dimension from baseline



FLARE

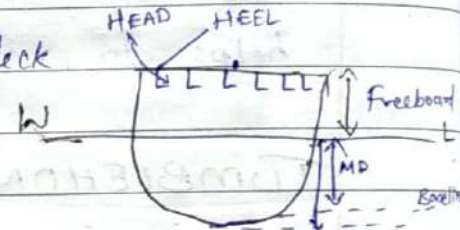
Outward curvature of side shell above water line at the forward.



- Increase in buoyancy, less sinkage of bow
- Promotes dryness in the forward.
- Helps the anchors to drop clear of side shells.
- Larger fore-castle deck

FREEBOARD.

Vertical line from SLL to freeboard deck



MOULDED DRAFT

Vertical distance from SLL to baseline measured amidship.

EXTREME DRAFT

Vertical distance from SLL to underside of keel.

~~MOULDED~~ MOULDED DEPTH

Vertical dist from base line to heel of upper deck beam

EXTREME DEPTH

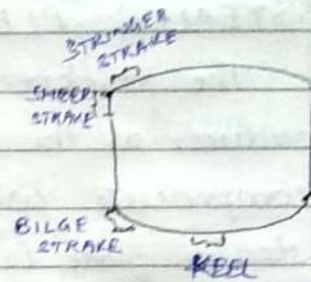
Vertical dist from extreme edge of upper deck to ~~ext~~ underside of keel.

AIR DRAFT

Vert dist from WL or SLL to extreme edge of superstructure

SHEER STRAKE -

Topmost strake of side shell which connects the deck plating to side shell.



BILGE STRAKE/TURN OF BILGE -

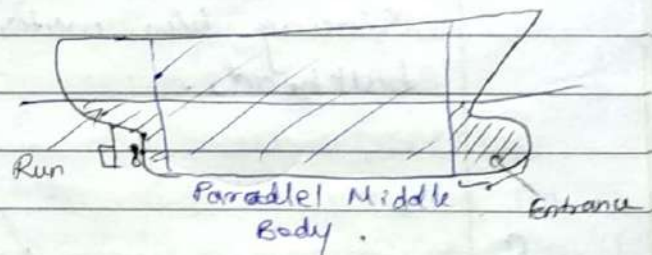
The lowermost strake of side shell which connects the side shell plating to bottom shell.

STRINGER STRAKE -

The sidemost strake of deck plating present at side connects to sheer strake.

Parallel Middle Body -

The midship section which remains constant in shape, size & Area.



ENTRANCE - Immersed portion of ship forward of parallel middle body.

RUN - Immersed portion of ship aft of parallel middle body.



GARBOARD STRAKE - The strake next to the keel.

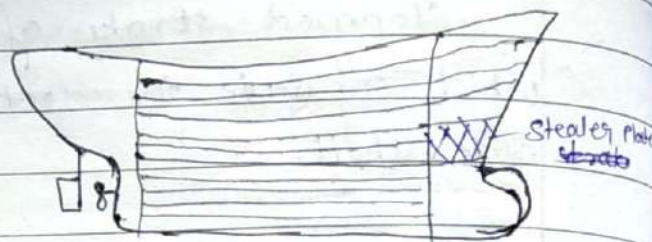
First plate where two strakes of plate join into a single strake

Page No.

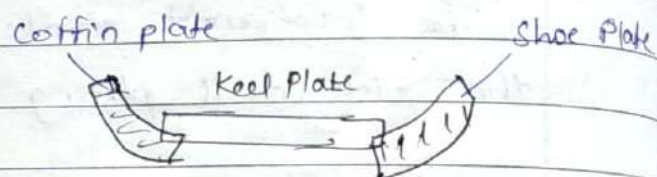
Date

STEALER PLATE -

The thickness of the strakes increases at the bow, to compensate with this stealer plate is used.



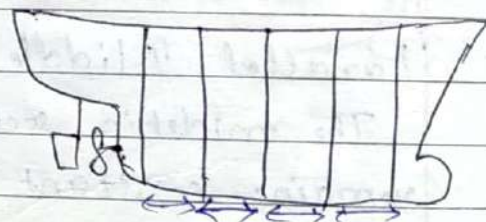
COFFIN PLATE - The plate which connects flat plate keel to stern frame



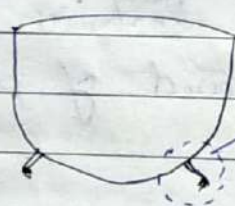
SHOE PLATE - The plate which connects the keel plate to the stern.

WATERTIGHT SUBDIVISION -

Spacing b/w watertight bulkheads.



SHIP



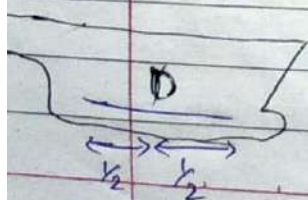
Flat plate bar
off set bulb plate

BILGE KEEL -

- ① Dampens the rolling moment
- ② Provides Longitudinal strength.

A flat bar is connected to the turn of bilge. an offset bulb plate is attached to flat plate bar.

Function of flat plate bar - If the off set bulb breaks then it will break from flat plate bar & it won't damage the outer shell plating.



Bilge keel extends $\frac{1}{2}$ length of ship either side from midship. & bilge keel tapers towards the end.

STRESSES .

Page No.

Date

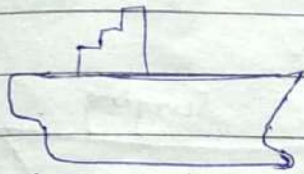
Stresses due to Forces.

Within

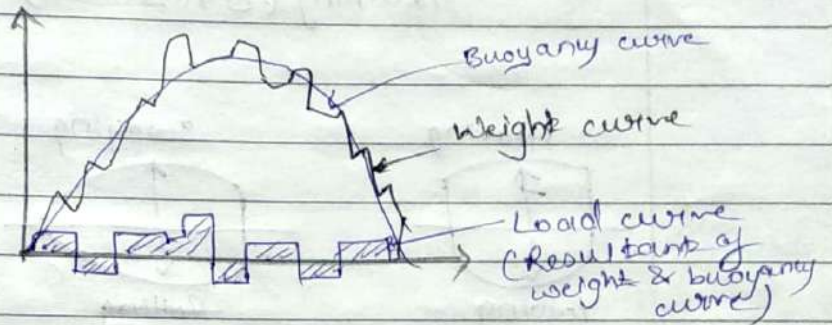
- M/c Running
- Cargo weight
- Weight of ship
- distribution, etc.

External

- Water (Hydrostatic Pressure) &
- Air (Wind Pressure)



total upthrust



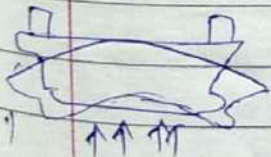
Area of Load curve helps to find out shearing force acting at a particular point.

STATIC FORCES

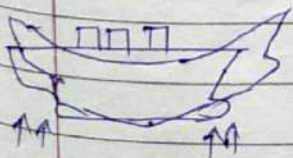
- Difference in weight & Buoyancy along the length of ship

DYNAMIC FORCES.

- When ship is moving the resultant & due to wind & waves acting on ship.



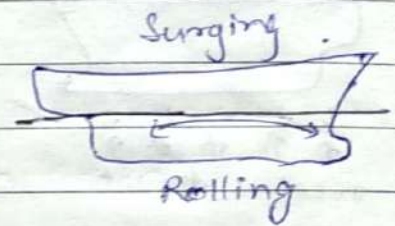
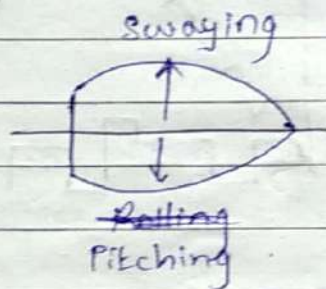
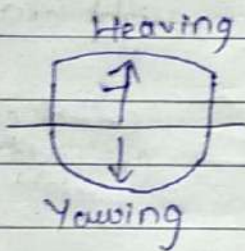
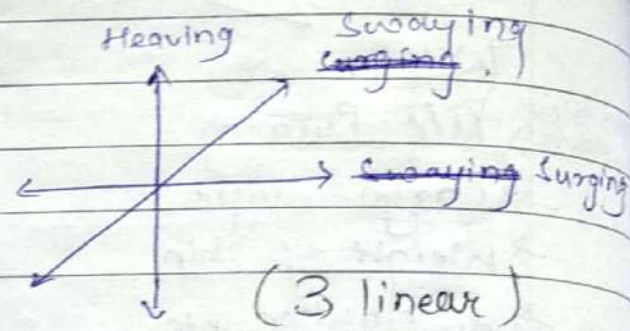
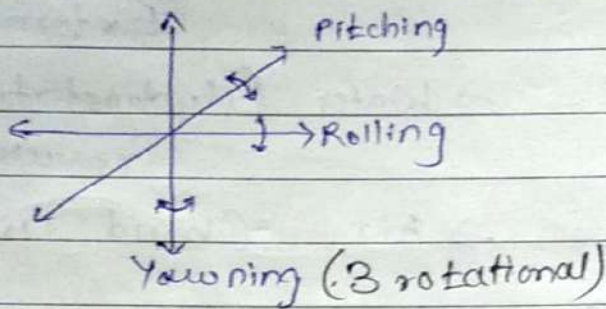
HOGGING → When the force of buoyancy is more in middle than at the sides in still water.



SAGGING.

Q What are 6 degree of freedom a ship is free to move?

Pisua
Hea Ya
Rover.



GLOBAL STRESSES

- * Longitudinal (SF & BM)
- * Transverse (Racking, Torsional)

LOCAL STRESSES

- Panting
- Pounding
- Local stresses / Local loading
- Openings present on deck
- Ends of superstructure

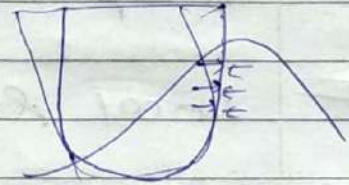
In still water

In seaway

SHEARING FORCE - Algebraic sum of all the vertical forces acting on the structure to one side of that point.

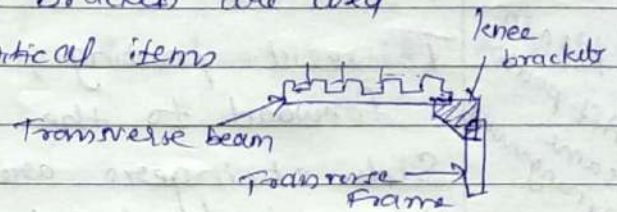
RACKING -

When a ship is rolling, it is accelerating & decelerating, the forces tends to distort the structure known as Racking.



Max - Light ship condition.

Imp To resist Racking, knee brackets are used which connects horizontal & vertical items



Twisting **TORSIONAL**

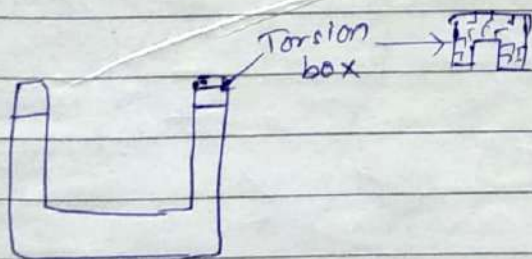
- When a twisting or a torque moment occurs on the ship's hull, the ship is said to be in torsion.

- Usually happens when you are taking waves at 45°



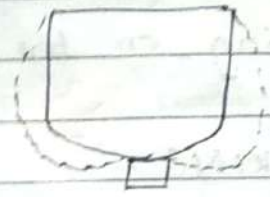
It happens more where width of ship is larger as well as it has large openings eg: Container ship in empty condition torsion max.

To overcome this, container ships are provided with torsion boxes.



DRY DOCKING - STRESS

distort side shell plating & it develops along the length of the ship.



Local Stresses

- ① PANTING - Inhalation & exhalation of side shell plating which occurs at forward region.

Also, in
Aft peak
same
arrangement

To resist panting, 15% of the ship's length from forward to the stern is strengthened.

Side stringers are fitted at 2m intervals.

Beams are fitted with alternate frames & frames are connected by bracket.

- ② POUNDING - Slamming of bottom shell plating into water.

- To resist pounding,

For ships greater than 65m

& those ships whose fwd draft is 0.045 Length of the ship

30% of forward region is provided with extra strengthening.



65m

30% 0.045L

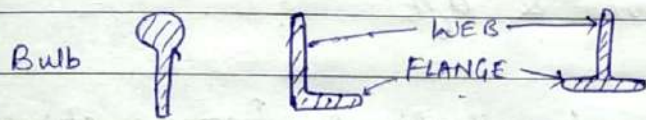
STIFFENING OF ~~ER~~ SHELL PLATING.

Types of framings used.

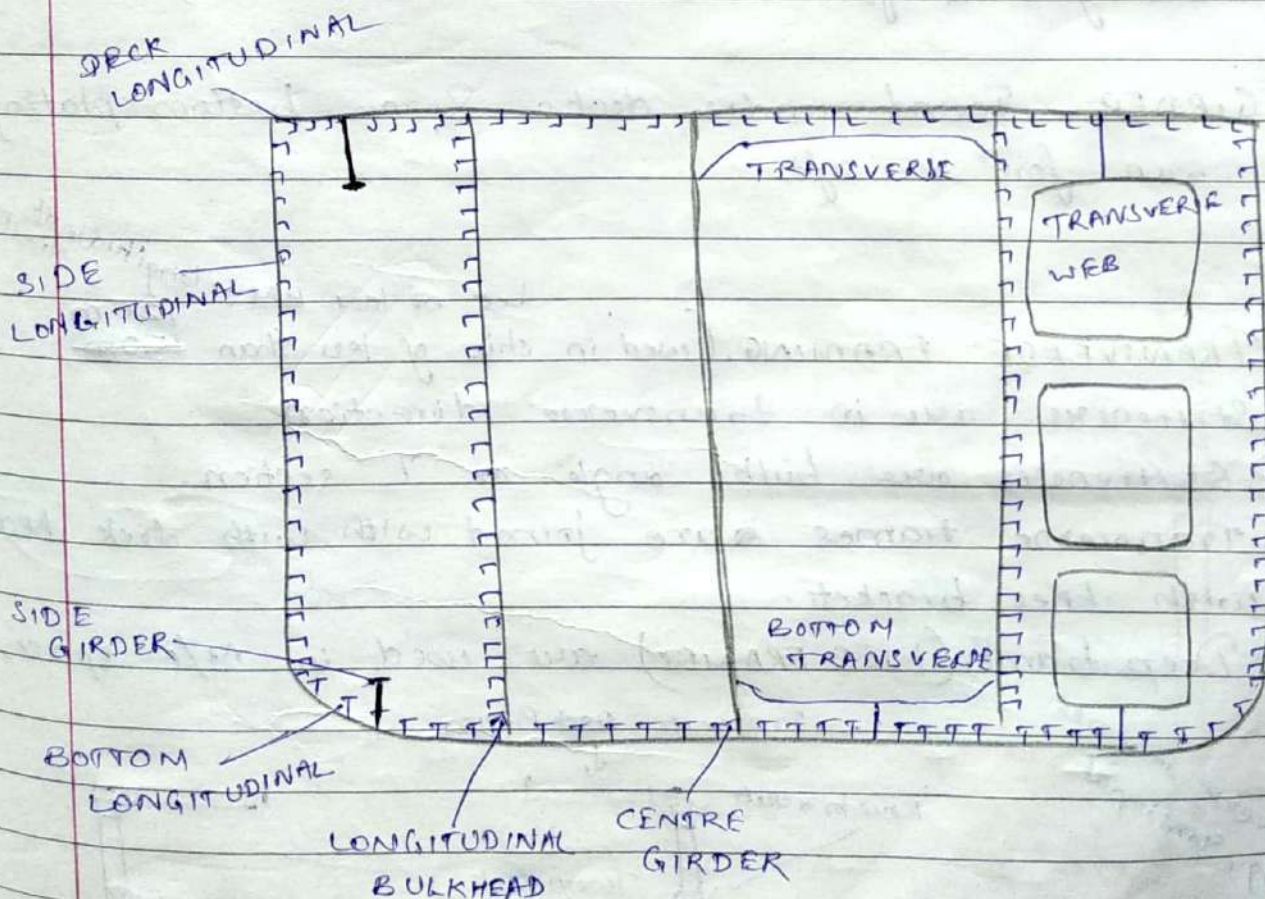
- 1) Longitudinal
- 2) Transverse
- 3) Mixed

① Longitudinal Framing. For ships 100m or more in length

Stiffeners are used in Longitudinal direction.
Stiffeners are either, Bulb, angle or 'T' section



Placed vertically to bulkhead
& 760mm apart



FRAME - On side plating, running vertically up & down

BEAM - Under decks, runs transversely

TRANSVERSE - Under deck - deck transverse
Over bottom plating - bottom transverse

FLOORS - Found only in double bottom runs transversely

 STRINGER - On side plating & longitudinal bulkheads runs horizontally fore & aft.

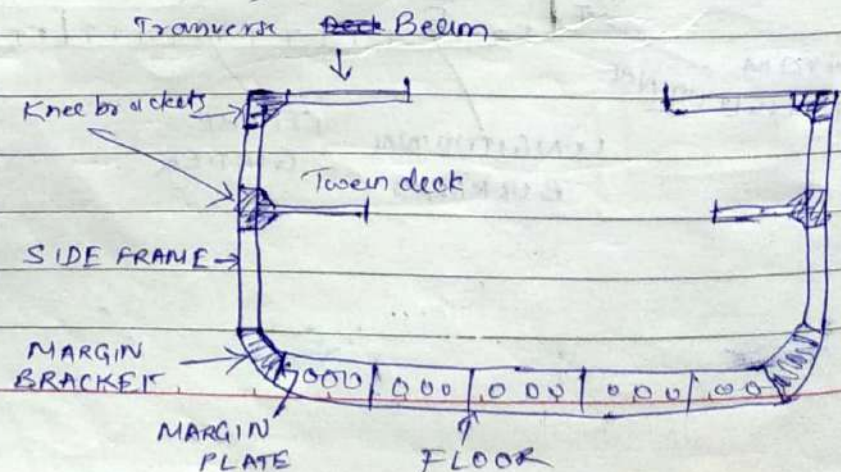
LONGITUDINAL - Found on longitudinal frame ships runs fore & aft.

GIRDER - Found under decks & on bottom plating runs fore & aft.

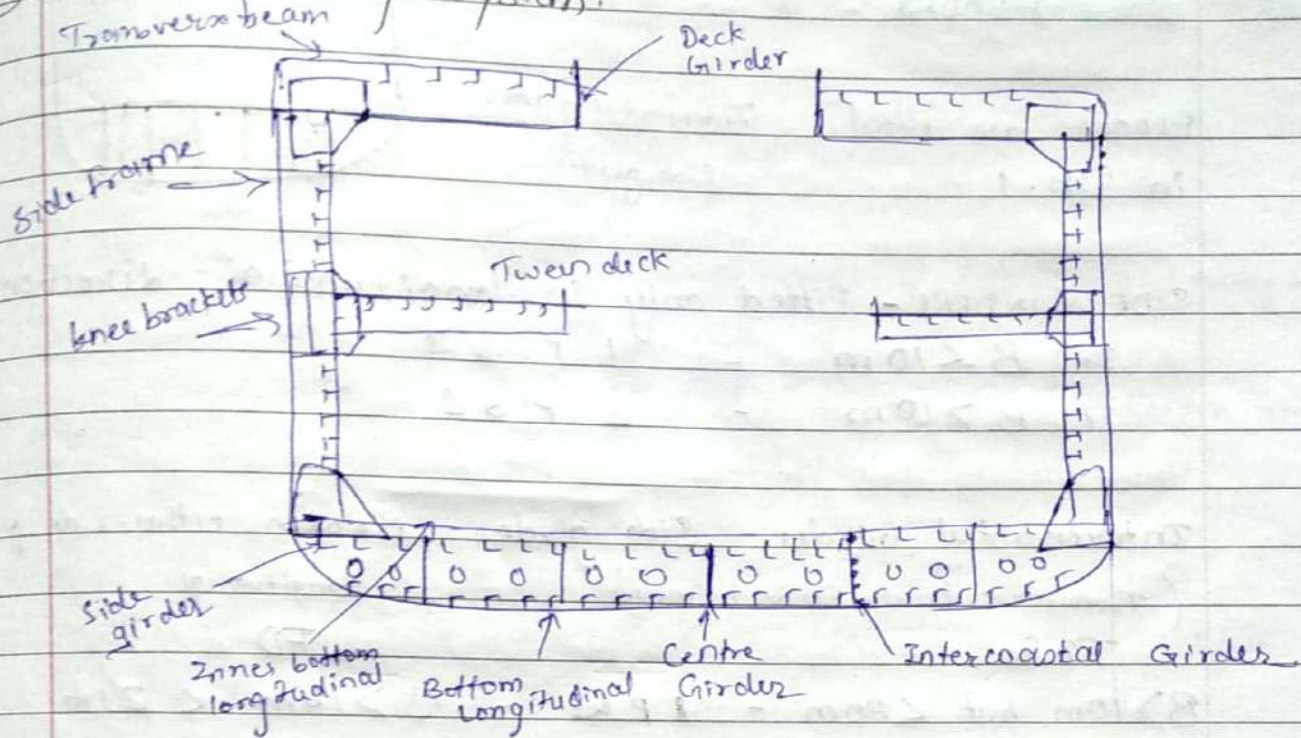
② TRANSVERSE FRAMING. (used in ships of less than 120 m, less or less BM in longitudinal direction)

- Stiffeners are in transverse direction
- Stiffeners are bulb, angle or T section.
- Transverse frames are joined with deck beams with knee brackets.
- Deep frames (WEB FRAMES) are used in M/C spaces

for transverse stresses like racking, torsional.



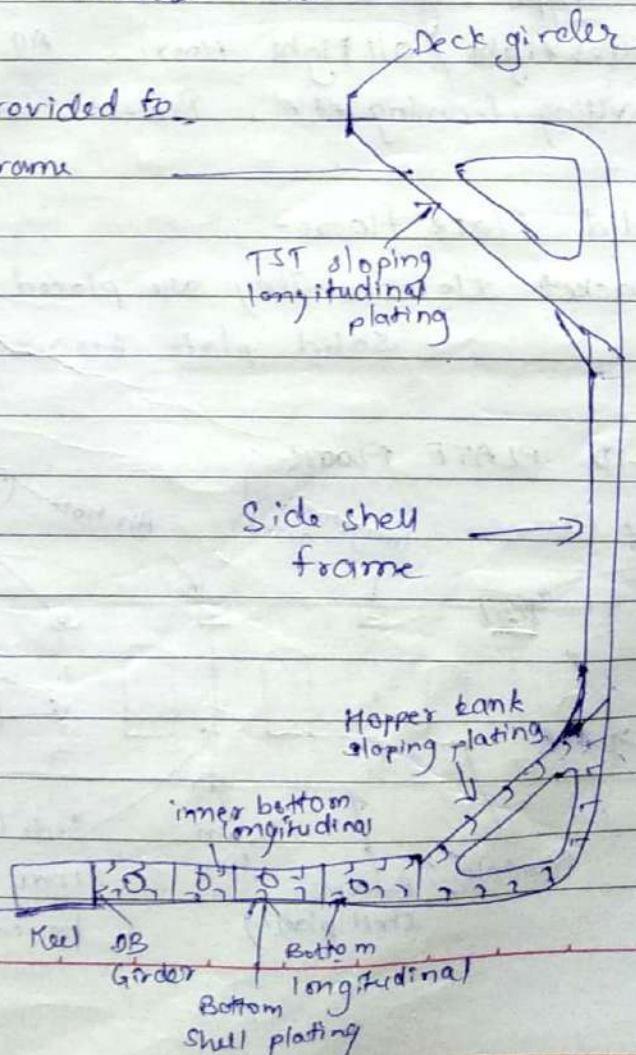
③ Mixed Framing system. (Used in ships of intermediate length)



Imp

Frame Spacing - Space b/w two transverse frame

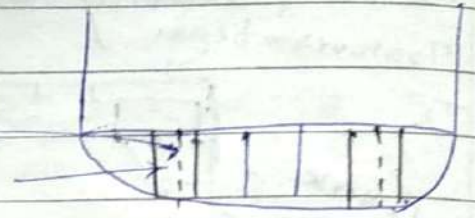
Frame space - The place provided to put frame is called frame space



FLOORS

Floors are fitted in DB.

Intercoastal girder
Side girder.



SIDE GIRDERS - Fitted only in longitudinal direction
If $B < 10\text{m}$ - 1 P & S
If $B > 10\text{m}$ - 2 P & S

Intercoastal Girder - Side girder Broken either side of floor
(Transverse Frame Double bottom) Longitudinal
TFD LFD

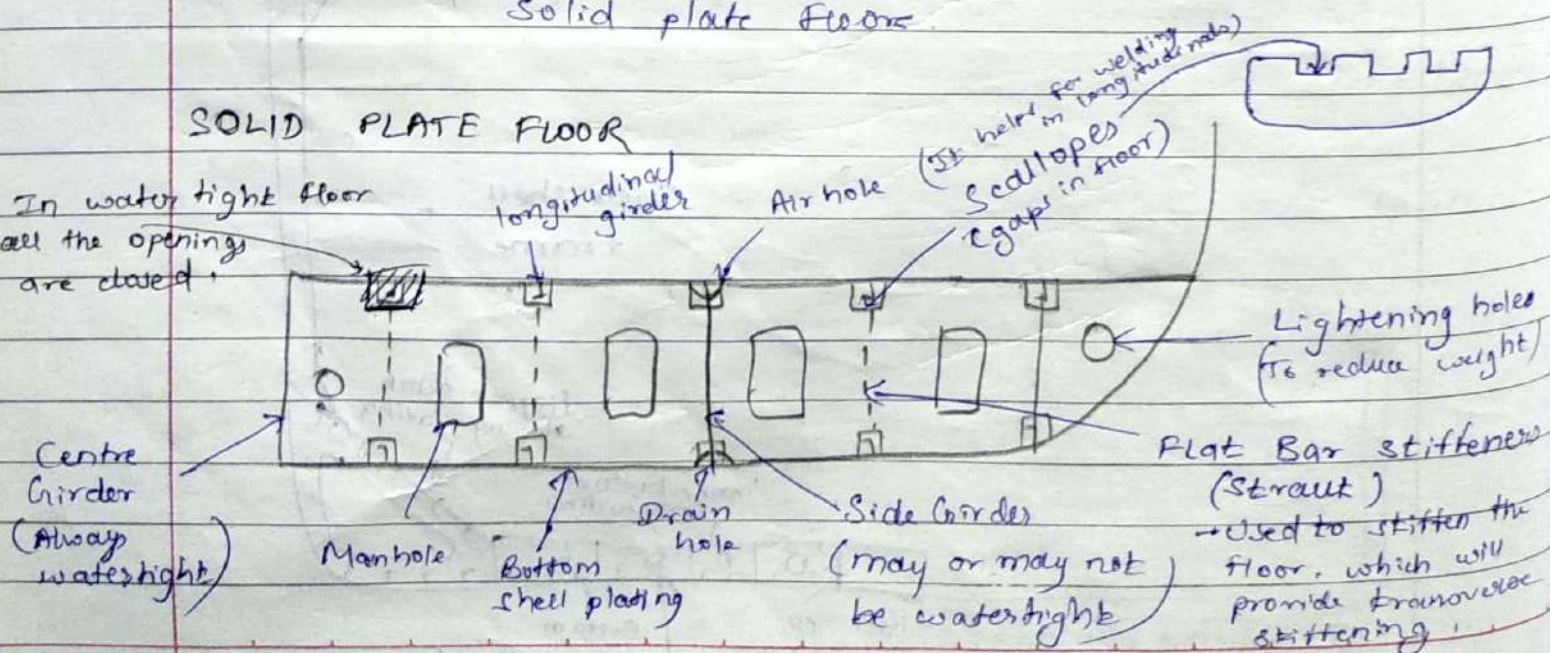
$B > 10\text{m}$ but $< 20\text{m}$ - 1 P & S - $B > 14\text{m}$ $< 21\text{m}$
 $B > 20\text{m}$ - 2 P & S - $B > 21\text{m}$

Type of floors.

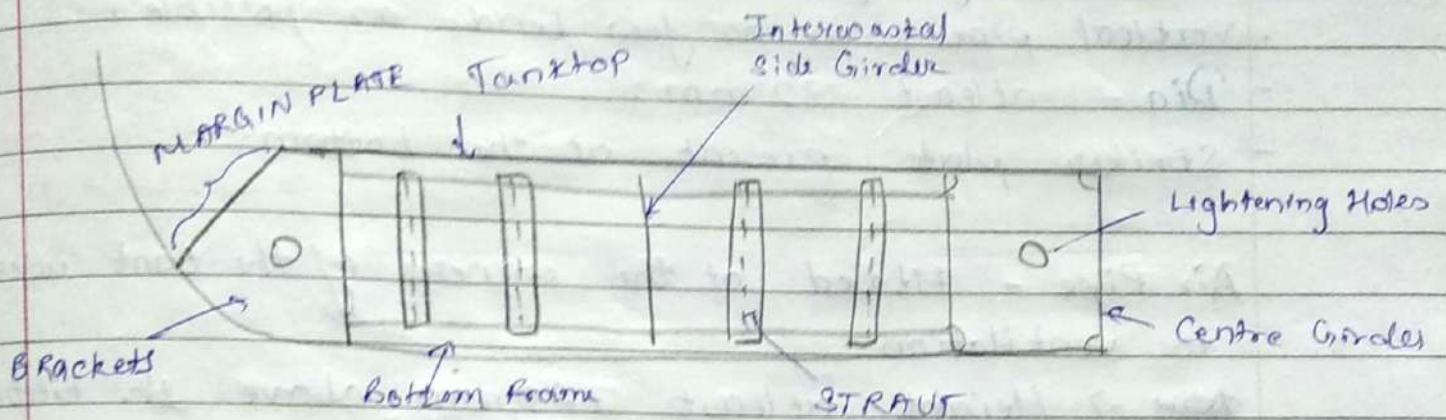
- ① Watertight / Oil tight floors - All the openings are closed by welding, framing, etc. Present below watertight bulkheads
- ② Solid Plate floors -
- ③ Bracket floors - They are placed ~~at~~ intermediately b/w Solid plate floors

SOLID PLATE FLOOR

In watertight floor all the openings are closed.



BRACKET FLOOR -



Q Where bracket floor is present?

A It is present at 'intermediate frame space' b/w solid plate floor.

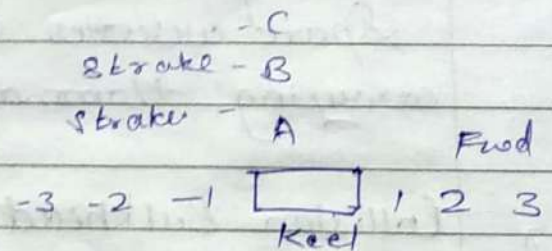
Shell expansion Plan
numbered from aft

eg: C12 port means,

12th plate from Aft

in the 3rd strake up.

from the keel on the port side.



Sounding pipe - Fitted in every tank, bilge, to measure depth of liquid inside

- Vertical pipe with as few bends as possible.
- Dia - atleast 32 mm.
- Striker plate present at the bottom.

Air Pipe - Fitted at the corners of the tank usually for ventilation.

~~At least~~ → Height atleast 760 mm above the freeboard deck

- Mushroom vent is used for Ballast tanks, mast houses & stores. ^{weather tight screw down arrangement.}
- Goose neck (Swamp) is used for tanks or cargo holds which has a cover to close also having gasket. & butterfly nut to close it.

Spark arresters should be there whenever tank is carrying flammable liquids.

Collision Bulkhead. must have 12% thicker plating than other bulkheads. positioned b/w 0.05L & 0.08L from the forward end of the load waterline.

Aft peak Bulkhead. which encloses the stern tube & rudder trunk in a watertight compartment.

Functions of Stern frame -

- To ~~provide~~ support the rudder bearing
- To support the propeller & shaft
- To reduce vibration stresses
- To enable the keel to be connected to the structure satisfactorily
- To enable shell plating to be closed at stern satisfactorily
- To support upthrust at the stern in dry dock

Stability

Page No.

Date

1) Density = $\frac{\text{mass}}{\text{volume}} = \frac{t}{m^3}$

Uses -

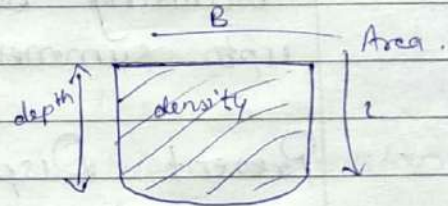
i) Sounding booklet

RD = $\frac{\text{density of substance}}{\text{density of FW}}$
(no units)

Load per unit area.

2) Pressure = $\frac{\text{depth}}{m} \times \frac{\text{density}}{t/m^3}$
 t/m^2

3) Thrust = pressure $\times$ Area
 $t = t/m^2 \times m^2$



Thrust is total pressure exerted on a given surface.

Archimede's Principle - When a body is fully or partially submerged in a Fluid (liquid or gas), ~~the~~ it suffers an apparent loss of weight which is equal to the weight of fluid displaced.

Principle of Floatation - When a body is floating in liquid, the weight of the body is equal to the weight of liquid displaced.

→ The volume of fully immersed body will be equal to the volume displaced.

→ The u/w volume of partially submerged body will be equal to the volume of water displaced.

MCTC = $\frac{W \cdot GM_L}{100L}$ (moment to change the trim by 1cm)

$\frac{W \cdot BM_L}{100L}$ (Since GM_L is very large, BM_L use will not make any difference)

tm

(Mass of ship)

Page No.

Date

4) (W) Displacement = $\frac{W}{V}$ volume $\times$ density (Tonnes)

Light Displacement - mass of the ~~an~~ empty ship without any cargo, ballast, fuel oil, freshwater consumable stores, ~~etc~~ passengers, crew, etc

Load Displacement - Mass of fully loaded ship including ballast, cargo, oil, stores, crew, upto summer load line in salt water.

Present Displacement - Mass of the ship with everything on board at present.

Deadweight (DWT) = Load disp - Light disp
Amount of cargo, fuel oil, freshwater, etc that can be loaded on ship ~~at~~ when she is floating in SW at her Summer Load Line.

Deadweight Aboard - Present disp - Light disp
Total mass of cargo, fuel, FW, etc on board at present

Deadweight available - Load disp - Present disp
Total mass of cargo, fuel, FW, etc that can be loaded at present to bring her to the Summer load line in SW.

COEFFICIENT OF FORM.

① Waterplane Coefficient (C_w) / Coefficient of fineness of Waterplane

$$C_w = \frac{\text{Area of water plane}}{L \times B}$$

- It is the ratio of area of water plane to the area of rectangle with ~~maximum~~ same length & maximum breadth.

High C_w

Low C_w

- Good Stability
- ^{Good} High manoeuvrability in Rough conditions
- High frictional resistance

- Low frictional resistance
- Fine ends

② Block Coefficient (C_b) / Coefficient of fineness of displacement
 $C_b = \frac{\text{u/w volume}}{L \times B \times D}$ $\rightarrow$ Ratio of u/w volume of ship to the rectangular box have same extreme dimensions at that draft

Uses -

- i) Helps in calculation of u/w volume
- ii) It affects the squat (A box shaped vessel will push more water forward and hence more squat)
 More C_b = more Squat.

Passenger ship
 $\downarrow$

Low C_b

Tanker
 $\downarrow$

Higher C_b .

TPC - Tonnes per Centimetre.

Amount of weight required to sink or rise the ship by 1 cm.

$$TPC = \frac{\text{Area of waterplane} \times \text{density of water displaced}}{100}$$

Available for displacement

Reserve Buoyancy - volume of enclosed spaces above water line, expressed in volume or %.

$$RB = \text{Total vol} - \text{U/w vol}$$

$$RB\% = \frac{\text{Above water vol}}{\text{Total vol}} \times 100$$

Partial loss of intact buoyancy - Whenever there is any hole created on your intact structure.

FWA - Increase in draft when ship goes from SW to FW or vice versa.

$$FWA = \frac{W}{40 TPC} = \text{cm}$$

W = displacement of ship in SW.

TPC = TPC in SW.

Q What all things will change when ship goes from SW to FW?

Ans FWA & TPC

All vessels of 24metre or more are required to have loadline

Page No.

Date

DWA = Increase in draft when ship goes from SW to DW & vice versa.

$$DWA = \frac{\text{Change of RD}}{0.025} \times FWA$$

Load lines . 5th April 1966
(Adopted)

Entered into force on 21st July 1968.

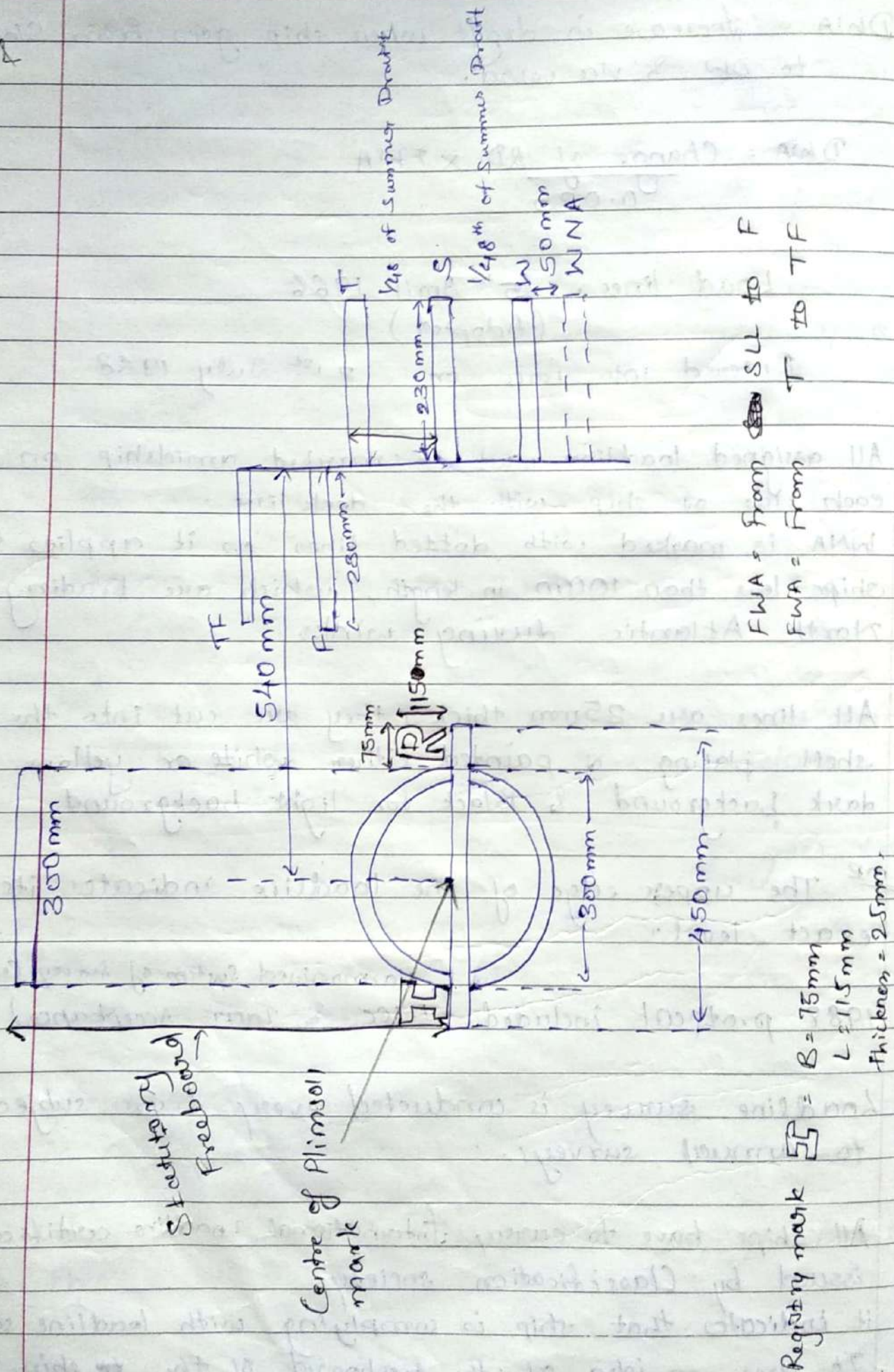
- 1) All assigned loadlines must be marked amidship on each side of ship with the deck line.
- 2) WNA is marked with dotted lines as it applies to ships less than 100m in length, which are trading in North Atlantic during winter.
- 3) All lines are 25mm thick, they are cut into the shell plating & painted either white or yellow for dark background & Black for light background.

V.Imp The upper edge of the loadline indicates its exact level.

Harmonised System of Survey Certified
1988 protocol included (HSCC & TACR Acceptance)

Loadline survey is conducted every 5 yrs subject to annual surveys.

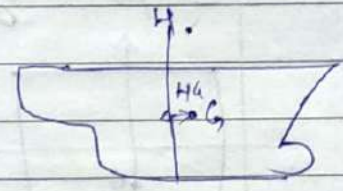
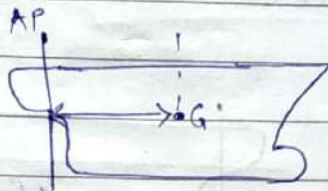
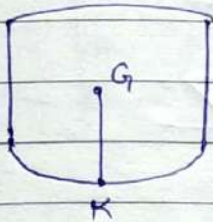
All ships have to carry International Loadline certificate issued by Classification society
it indicates that ship is complying with loadline survey
It gives an idea of the freeboard of the ship.



COG

- The point from which all the forces of gravity acts vertically downwards.

3 points of reference on ship for COG.



KG - distance b/w keel & COG.

AG - Dist b/w Aft $\perp$ & COG

HG - Dist from centreline to COG

→ KG determines the list or ~~heel~~ ^{heel} of vessel

→ AG determines the trim of vessel

* When weight is added, the COG moves towards the direction of weight

* When weight is removed, the COG moves away from the weight

* When weight is shifted, the COG moves parallelly in the direction of shifted load

$$GG_1 = \frac{wd}{W}$$

where, GG_1 - Vertical shift of COG in metres

w = Weight loaded, discharged, shifted

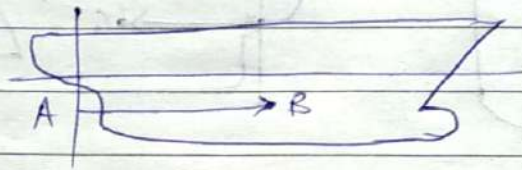
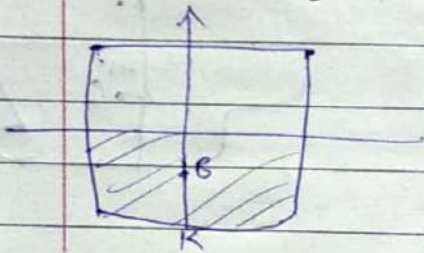
W = Final displacement of ship

d = Vertical dist b/w COG of ship & COG of weight

COB.

The point from which the forces of buoyancy tends to act vertically upwards, with a force equal to weight of water displaced by the ship.

2 point of reference.

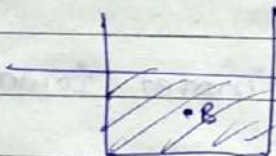


KB - Keel to COB

AB - Aft L to COB

* We get KB & AB from ship's particulars at different draft

For a boxed shape vsl, the COB is exactly $\frac{1}{2}$ the draft



LIST

→ Transverse inclination caused by unequal distribution of weights on either side of the centreline

* → It is caused when COG moves away from the centreline

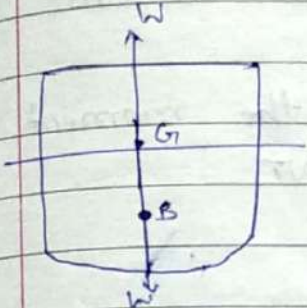
HEEL

→ Transverse inclination caused by external forces like wind, waves, overtight mooring in port, etc

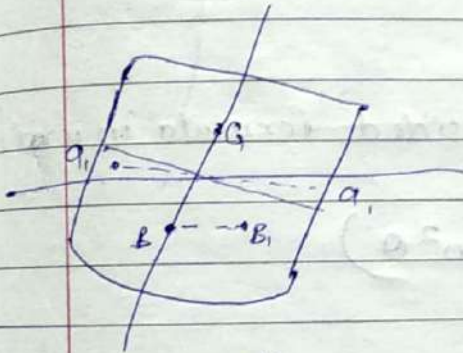
→ COG is on the centreline of the ship.

EQUILIBRIUM OF THE SHIP

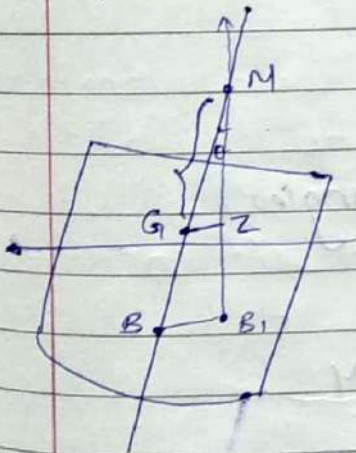
① Static Equilibrium - It occurs in still water.



This equilibrium is when COG & CB are in a line and these forces act on each other.



Transverse shift of CB is along the line of immersed & emerged. When the ship is heeled.



TRANSVERSE METACENTRE (M)

When a ship is heeled, the force of buoyancy acts vertically upwards from a new CB, which cuts the centreline at a point known as transverse metacentre.

(GM) METACENTRIC HEIGHT - Vertical distance b/w COG and metacentre.

GM may be positive or negative.

∴ GM is positive, when $KM > KG$ = Stable Equilibrium

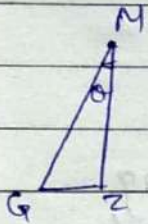
GM is negative, when $KM < KG$ = Unstable Equilibrium

GM = 0 when $KM = KG$ = Neutral Equilibrium

RIGHTING LEVER (GZ)

When a vessel is heeled, the forces of buoyancy act vertically upwards from a new COB and COG is separated by a horizontal distance known as GZ.

& it forms a couple and the moment which occurs is called, RIGHTING MOMENT



For small angle of heel upto 15° .

$$GZ = GM \sin \theta$$

For Large angle of heel, (Wall sided formula is used)

~~$$GZ = GM$$~~

$$GZ = \sin \theta \left(GM + \frac{1}{2} BM \tan^2 \theta \right)$$

For RIGHTING MOMENT

$$RM = W \cdot GZ$$

$$RM = W \cdot GM \sin \theta \quad (\text{for small angles})$$

Stiff vessel - It has very large GM

Tender vessel - It has very small GM

* Angle of Loll = when $KM = KG$.

When a vessel is heeled progressively, at one stage the COB will come vertically below the COG. The vessel is then said to be in neutral equilibrium & the angle at which this happens is called the angle of loll.

Action to correct Angle of roll.

First check that GM is -ve. and ship is not listed bec of cargo imbalance.

- 1) Remove the cargo from the top.
- 2) ~~Put~~ the Lower the topped derrick or crane.
- 3) Move cargo from above G to below G or discharge ashore.
- 4) Fill DB tank in the low side first to prevent rol from flopping to other side, ~~then fill~~ COG will fall and move off causing a list but creating a righting lever. Then fill the opposite tanks and bring the ship to upright & lower G further.
- 5) If necessary jettison cargo on ~~first high side~~ starting on the high side first.

FREE SURFACE EFFECT

When a tank is partially full then ~~for the~~ the liquid moves to lower side as the ship rolls causing angle of roll & it caused virtual loss of GM.

This effect is called FSE.

It is highest when tank is 50% full.

In all stability calculations Fluid GM is used.

$$FSC = \frac{id_i}{W}$$

where, i = moment of inertia of slack tank
 d_i = density of liquid in tank.
 W = displacement of ship

$$FSM = id_i$$

$$\therefore FSC = \frac{FSM}{W}$$

KM

- KG

GM solid

- FSC

GM Fluid.

* List $\Rightarrow$ $\boxed{\tan \theta = \frac{\Delta w}{W \cdot GM_f}}$

* List $\Rightarrow$ $\boxed{\tan \theta = \frac{\Delta w}{W \cdot GM_f}}$

where,

θ = angle of list

Δw = Final listing moment

W = displacement of ship

GM = Fluid GM .

Displacement in DW $\therefore W_{sw} \times \text{density in DW}$
1.025

COF = is the geometric centre of water plane area about which the ship will pivot (trim)

Hydrostatic Draft = Draft measured at COF

$$\text{Hydraft} = \frac{AF \times \text{Trim}}{LBP}$$

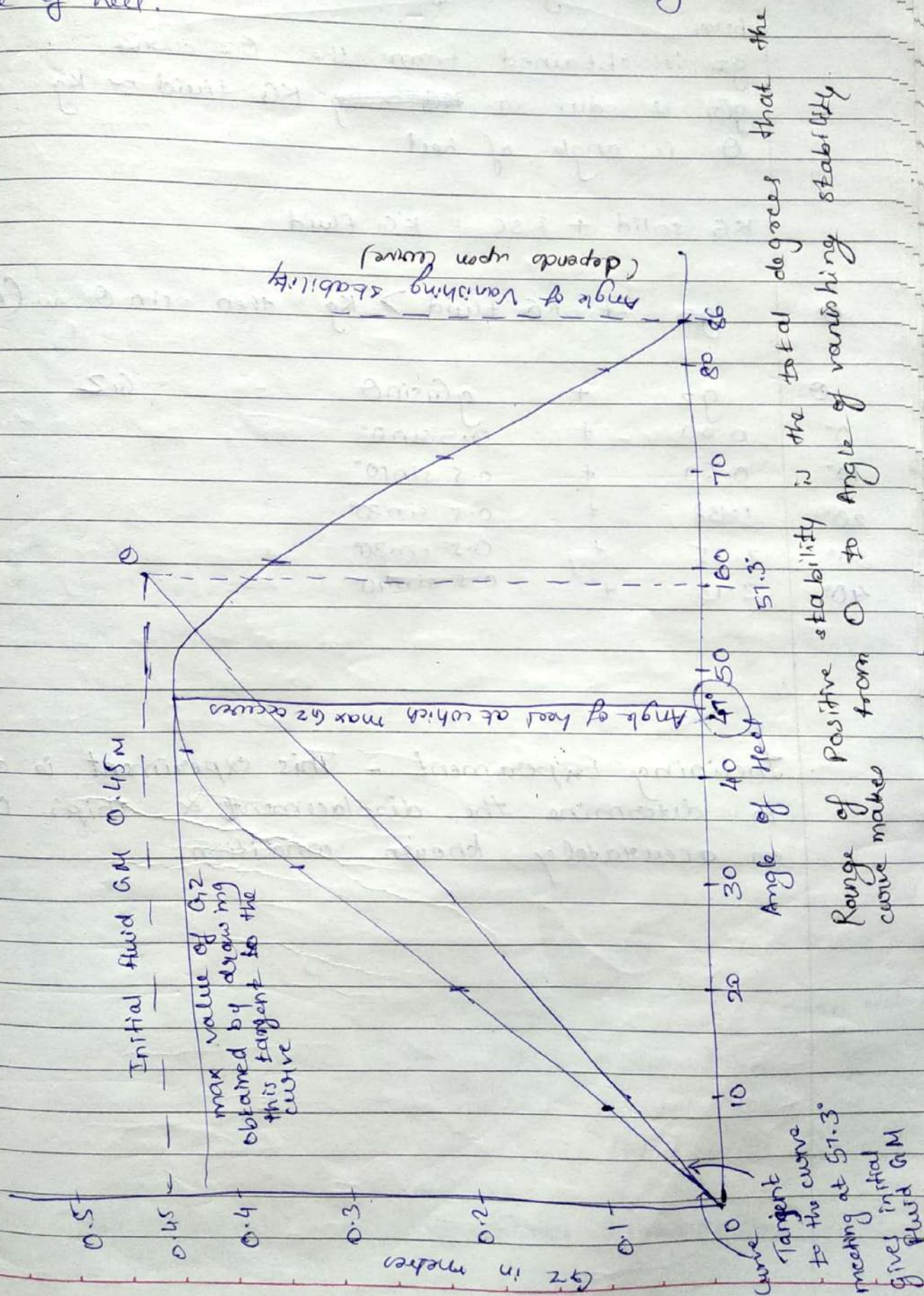
Trim = Diff in fwd & aft draft.

Statical Stability Curve

Page No.

Date

Curve where righting lever GZ is plotted against Angle of heel.



$$GZ = gZ \pm gG \sin \theta$$

where,

gZ is obtained from the GZ curve

gG is diff in ~~KG~~ KG fluid $\sim K_g$

θ is angle of heel

$$KG \text{ solid} + FSC = KG \text{ fluid}$$

If $KG \text{ fluid} > K_g$ then $\sin \theta$ is (Minus)

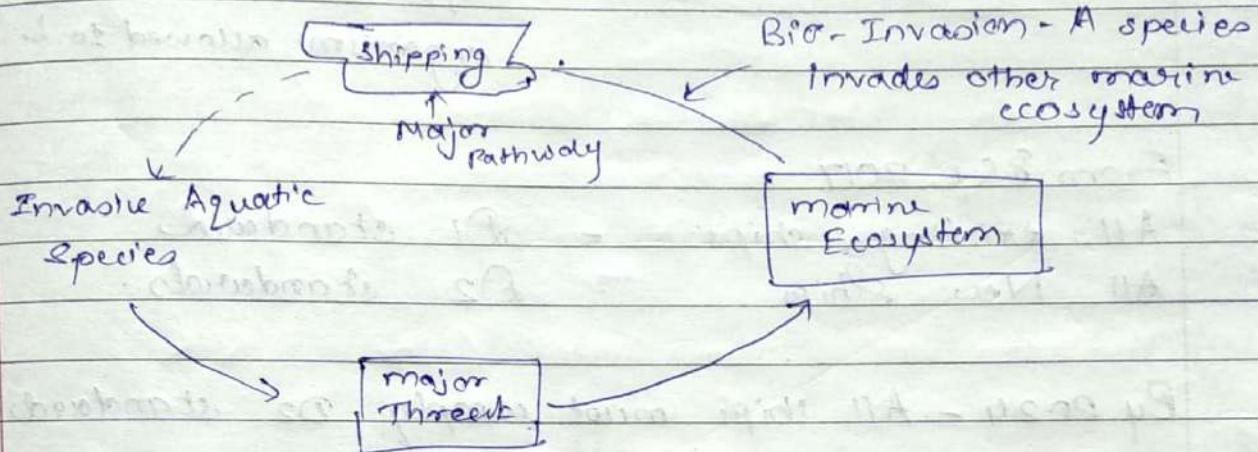
θ	gZ	+	$gG \sin \theta$	=	GZ
0°	0.00	+	$0.5 \sin 0^\circ$	=	
10°	0.60	+	$0.5 \sin 10^\circ$	=	
20°	1.38	+	$0.5 \sin 20^\circ$	=	
30°	2.25	+	$0.5 \sin 30^\circ$	=	
40°	3.13	+	$0.5 \sin 40^\circ$	=	

Inclining Experiment - This experiment is done to determine the displacement & ship's COG in an accurately known condition.

International Convention for the Control & Management of Ship's Ballast Water and its sediments.

Adopted - 13 Feb 2014

Force - 8 Sep 2017



Aim - To prevent the spread of harmful aquatic organisms from one place to another, by establishing standards & procedures for the Management & Control of ballast water & sediments.

Applies to all ships,

Does not apply to - War ships, Naval Auxillary Ships

→ Ships not designed to carry ballast water

→ Ships having permanent ballast water with tank sealed

→ Ship only on non-commercial voyage.

All ships 400 GRT & above required to carry (4 certificates)

- 1) An approved Ballast Water Management Plan.
- 2) A Ballast Water Record Book.
- 3) Type approval Certificate for ships fitted with Ballast Water Treatment plant system.
- 4) An International Ballast Water Management Certificate (Issued by flag state)

Two Standards

D1

(BW Exchange Standard)

D2

(Performance standard)

- specifies max amount of organisms allowed to be discharged

From 8 Sep 2017

All existing ships - D1 standards

All New Ships - D2 standards.

By 2024 - All ships must comply D2 standards.

① D1 -

→ An efficiency of 95% volumetric exchange of BW.

→ By using flow through method - the pumping should be done 3 times the total volume of BW in order to meet the 95% volumetric exchange standard.

Methods of Exchange

Sequential

→ Empty - refill

Flow through

→ 3 times pumping

Dilution

same as flow through but the (inflow = outflow)

② D2 standard

1) < 10 viable micro-organisms ≥ 50 micrometer in diameter2) < 10 viable micro-organisms < 50 micrometers in minimum dimension & ≥ 10 micrometer in minimum dimension per mL.

Discharge of indicator microbes shall not exceed specified concentration.

- ① Toxiogenic *Vibrio Cholera* (01 & 0139) with less than 1 CFU per gram (Wet Weight) Zooplankton Samples.
- ② *Escherichia Coli* - less than 250 CFU per 100 ml
- ③ Intestinal Enterococci less than 100 CFU per 100 ml

Ballast Water treatment may include but not limited to the following.

- Mechanical Filtration & Separation
- Sterilisation
- Chemical treatment & Biocides, etc.

FORMS

Form A - Record of Construction & equipment for ships other than Oil tankers.

Form B - Record of Construction & Equipment for Oil tankers

Form C - Record of Equipment for 'Cargo ship Safety Certificate'.

Form E - Record of Cargo ship Safety Equipment Certificate.

Form P - Record of Equipment for Passenger Ship Safety Certificate.

Form R - Record of Cargo ship Safety Radio Certificate.

Diff b/w Form E, R & C

Form E	Form R	Form C
→ Particulars of Ship	- Particulars of Ship	- Particulars of Ship
→ Details of LSA	- Details of Radio Facilities.	- Details of LSA
→ Details of Navigation System & Equipments	→ Details of Methods to ensure availability of Radio facilities	- Details of Radio facilities
		Everything of Form E & R

You can either have Form C or E & R



List of Plans onboard.

- LSA
- FFA
- SOPEP
- SMPEP
- Garbage Management Plan
- BWM plan
- CSP - Ship security Plan
- Capacity Plan
- Antenna Rigging Plan
- Shell Expansion Plan - (Numbering & Naming of shell plating)
- General Arrangements
- Shore based Maintenance.

CAS GAS

* IAMSAR Contents

Sec 1 - Overview

2. Rendering assistance

3. On-scene Co-ordination

4. On-board emergencies

Appendix A - Reg for the safety of life at sea

B - Search Action Message

C - Factors affecting observer's effectiveness

D - Standard format of SAR Report

E - SAR briefing

* Exception to SOLAS

War ship

Cargo ship < 500 GRT

Cargo ship not propelled by Machinery

Fishing vessel

Pleasure Yacht

Wooden Ships

* INTERCO (International Code of Signals)

① Single Code - For the signals which are very urgent, important or common use

② Double Code - For general signals code

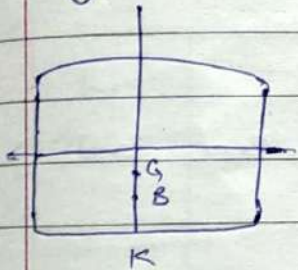
③ Triple Code - Starting with M for Medical Code

Q What is Stability? (Righting Moment)

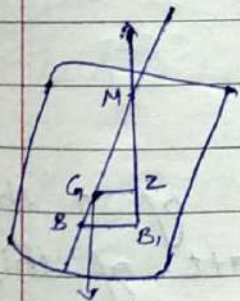
Ans Ship stability is an area of naval architecture & ship design that deals with how a ship behaves at sea, both in still water & in waves, whether intact or damaged.

Stiff vessel

- Not likely to heel easily
- COG lower due to high density cargo



- < - KG
- > - RM
- > - GZ
- > - GM
- < - Roll



> - vibration
(General Cargo)
ML - Shifting - LL

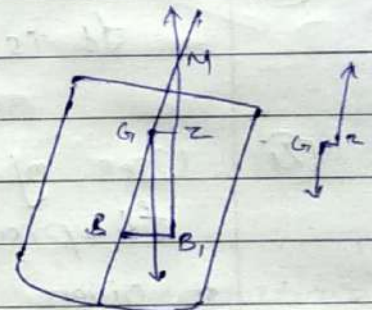
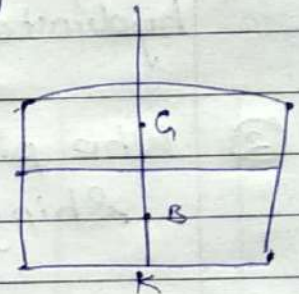
Persons - More comfortable

Loss of GM
still will be stable

Unstable - Loss of GM
may result in unstable vessel

Tender vessel

- Likely to heel easily
- COG higher



Q Do you want your vessel to be stiff or tender?

Ans We don't want vessel to be too stiff or too tender. I want my vessel to be in between stiff and tender.

Hydrostatic Table & Hydrostatic Curves.

① What it is?

Hydrostatic tables are the tables which represent the hydrostatic particulars of the ship against the hydrostatic draft.

Hydrostatic curves are the representation of hydrostatic table in form of a graph.

② Who prepares?

Shipyard prepares.

③ It is universal or ship specific?

It is ship specific.

④ Uses of it

It provides hydrostatic particulars of a ship for a given hydrostatic draft (True draft of ship)

⑤ Where is your ship's hydrostatic draft?

It is present at the COF of your ship.

⑥ What is COF?

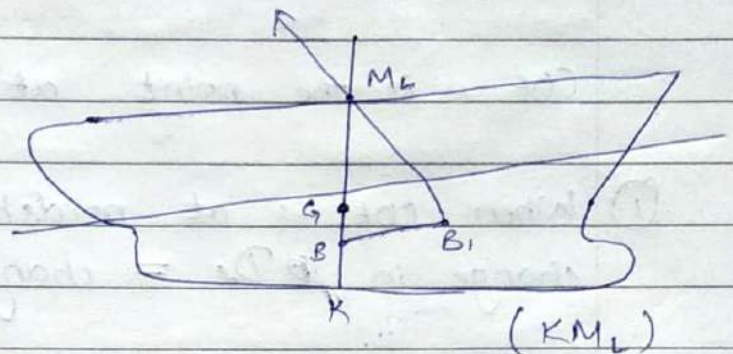
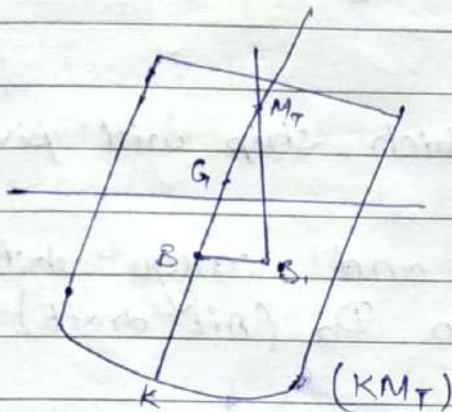
COF is the geometric centre of the water-plane area.

⑦ When is a vessel considered to be floating at her "Even keel draft"?

Ans When her Aft, Forward & Midship draft is same.

Hydrostatic Particulars.

W , TPC , $MCTC$, AB , AF , KB , KM_T , KM_L



Draft	W	TPC	$MCTC$	KB	KM_T	KM_L	AB	AF
2	7000	30.02	150.01	1.2	10.30			
2.2								
2.4								

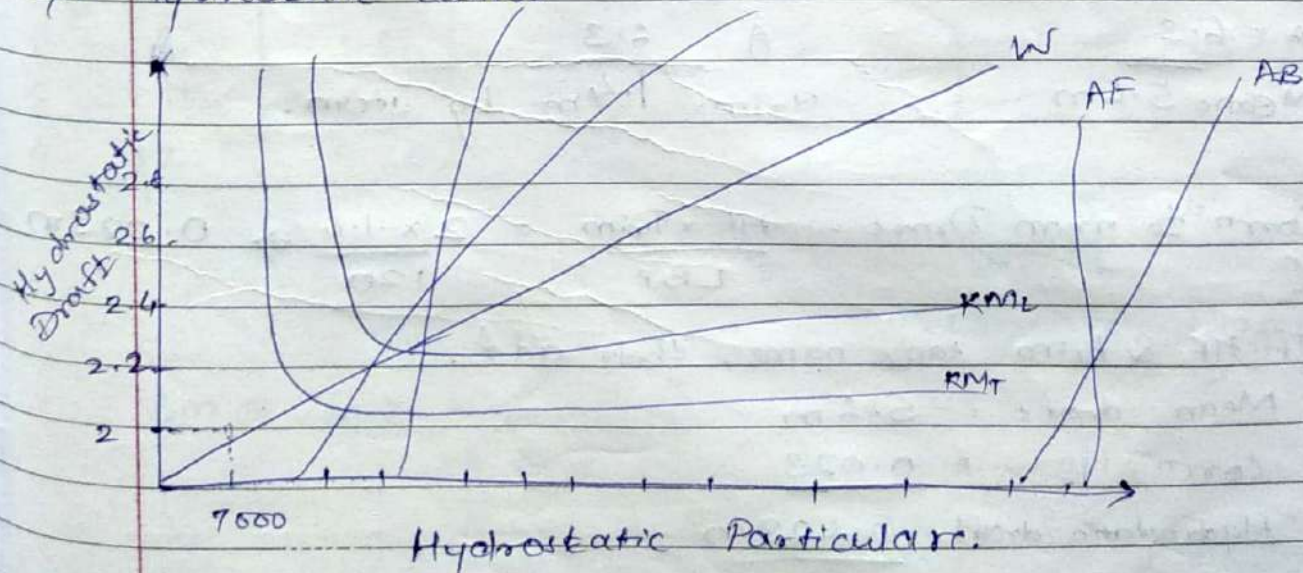
These will remain constant

LOA , LBP , GRT , NRT , Load W , DWT
Light W .

GRT = Total vol of enclosed space of ship

NRT = Total vol of spaces used for revenue generation.

* Hydrostatic Curves



Hydrostatic Draft & Trim.

Page No.

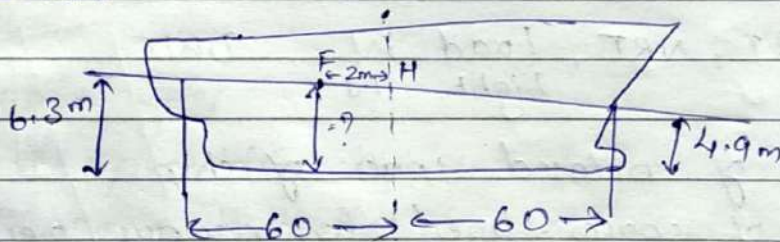
Date

Hydrostatic Draft - Draft of ship measured at COF. (True Draft)

COF = is the point at which ship will pivot.

- ① When COF is at midship and cargo shifted, the change in $D_f = \text{change in } D_a$ (Aft draft)
- ② When COF is aft & cargo shifted forward, the change in $D_f > D_a$.
- ③ When COF is forward & cargo shifted aft, the change in $D_a > D_f$.

Ex ① Pg 146



HF = 2m
or AF = 58m.

$$F = 4.9$$

$$A = 6.3$$

$$\text{Mean} = 5.6 \text{ m}$$

$$F = 4.9$$

$$A = 6.3$$

$$\text{Trim} = 1.4 \text{ m by stern.}$$

$$\text{Corrn to mean Draft} = \frac{\text{HF} \times \text{Trim}}{\text{LBP}} = \frac{2 \times 1.4}{120} \Rightarrow 0.023 \text{ m}$$

★ If HF & trim same name, then add.

$$\text{Mean draft} = 5.6 \text{ m}$$

$$\text{Corrn} = 0.023$$

$$\text{Hydrostatic draft} = 5.623 \text{ m}$$

OR

$$\text{Corrn to Aft draft} = \frac{AF \times \text{Trim}}{LBP} \Rightarrow \frac{58 \times 1.4}{120} \Rightarrow 0.677$$

∴ trim by stern, correctⁿ is negative.

$$\text{Aft draft} \Rightarrow 6.3$$

$$\text{Corrn} = -0.677$$

$$\text{Hydrostatic Aft d} \Rightarrow 5.623 \text{ m}$$

KM Curve

KM Curve is graphical representation of the KM of ship to the draft of ship

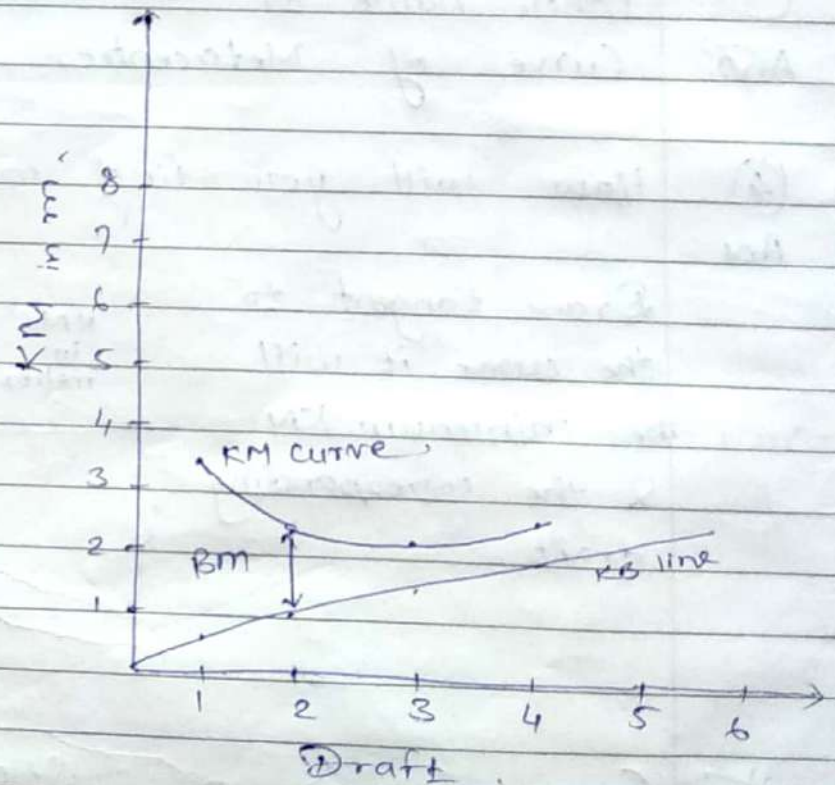
$$KM = KB + BM$$

$$KB = \frac{1}{2} \text{ draft}$$

$$BM = \frac{B^2}{12 \times \text{Draft}} \quad \left(\begin{array}{l} \text{Breadth} \\ \text{for Box} \\ \text{shaped} \\ \text{vsl} \end{array} \right)$$

Ex 4 pg 155

Draft	KB	BM	KM
1	0.5	3	3.5
2	1	1.5	2.5
3	1.5	1	2.5
4	2	0.75	2.75



(Metacentric Diagram)

$$BM @ 2m \Rightarrow KB = 1m \quad \& \sim \quad KM = 2.5$$

$$\text{So } BM \Rightarrow 1.5 \text{ m} \quad (KM - KB)$$

① What is KM Curve?

Ans. Graphical representation of KM against the draft of the ship.

Representation of KM curve is always from light displacement to load displ.

KM varies according to the change of draft.

② Uses.

Ans → It gives KM for a particular draft

→ We don't want to make ship too stiff or too tender so we find KM & we know KG so we find GM.

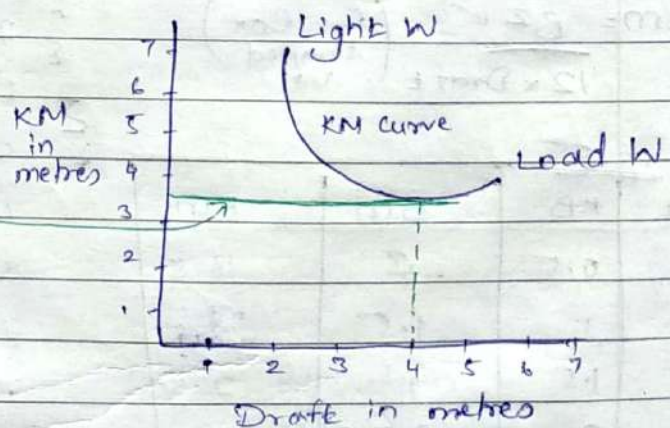
③ Other name for KM Curve?

Ans Curve of Metacentres.

④ How will you find min KM?

Ans

Draw tangent to the curve, it will be minimum KM & the corresponding draft.



Cross-Curves of Stability.

GZ Curve & KN Curve.

1) What is it?

Ans GZ curve is the representation of Righting arm for a particular displacement for various angle of heel.

2) Various GZ curves for various assumed value of K_G in stability booklet & these are may or may not be same of the actual K_G of the ship. If actual K_G is less or greater than assumed K_G then a correction is applied

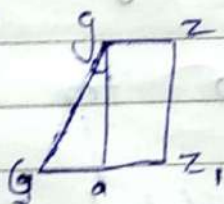
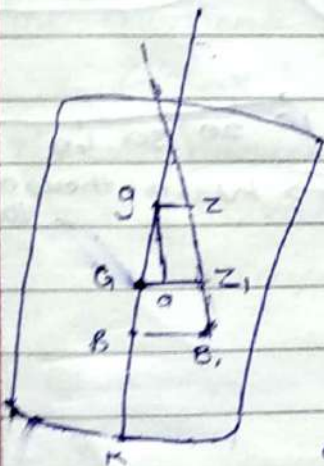
3) Used to find GZ

4) It is called cross curves b/c curves cross each other.

Correction of GZ

i) $K_G < K_g$

g - assumed
 G - Actual

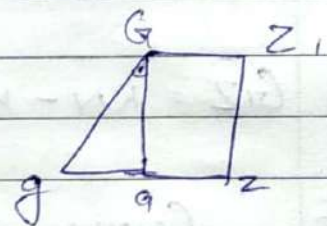


$ga \parallel z z_1$

$$GZ_1 = az_1 + aG$$

$$= az_1 + gG \sin \theta$$

ii) $K_G > K_g$



$Ga \parallel z_1 z$

$$GZ_1 = GZ - gG \sin \theta$$

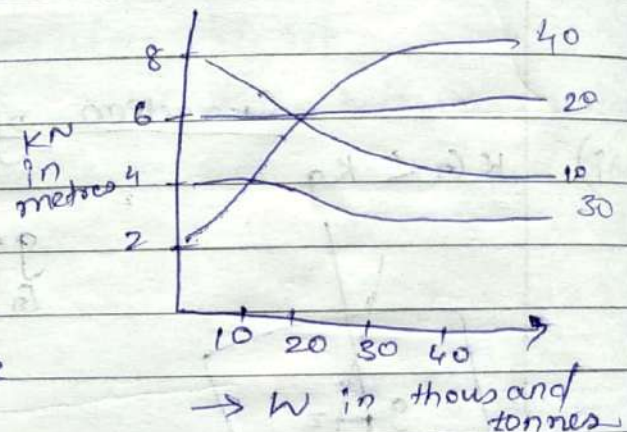
* There was lot of confusion b/w + or - so KN curves was used where assumed $K_G = 0$.

Q. What is KN curves?

Ans. KN curves are representation of KN in metres on Y axis against the displacement of ship for a particular displacement under various angle of heel.

KN is righting arm when assumed $KG = 0$.
It is found in stability booklet.

We'll apply corr to actual KG which will always be greater.



* Corr will always be negative

$$GZ = KN - KG \sin \theta$$

Curve of Statical Stability

This curve is prepared by C/O for GZ for various angle of heel.

Once the loading is completed this is made. F & A draft, find Mean draft. by applying corr we find hydrostatic draft, then we go to hydrostatic tables & curves, we get displacement & KG.

With this displacement we go to cross curves of stability, we get GZ against W.

Uses - For W & KG of that voyage

Information we get.

- 1) Max. GZ & the angle of heel where it occurs.
- 2) Angle of vanishing stability - is the angle at which GZ will again become 0.

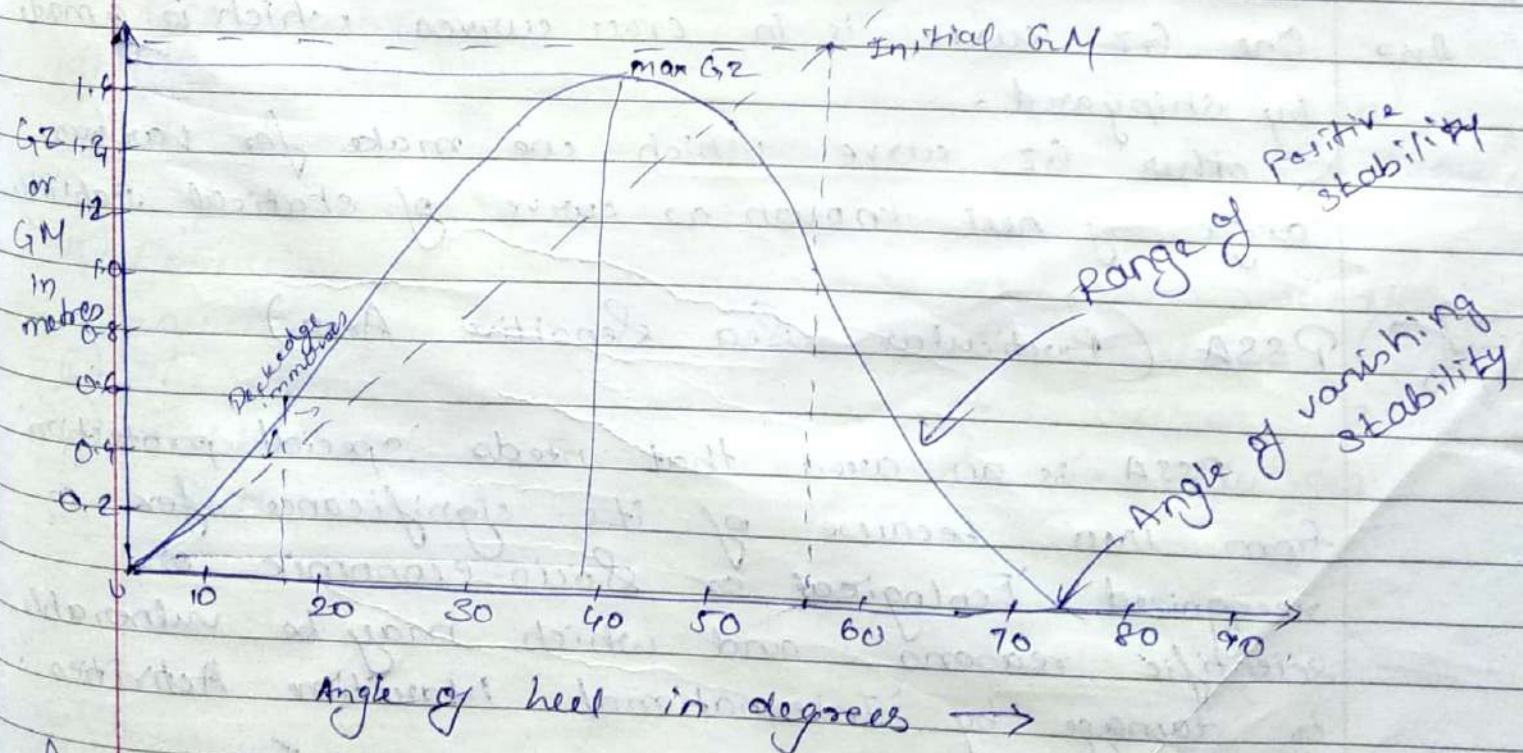
Range of positive stability - is the range when $GZ > 0$ to the angle of vanishing stability.

- 3) Initial GM = (Draw a line from 57.3° heel & draw a tangent from initial curve wherever it cuts 57.3° line draw a line from there where it cuts will give you initial GM)

- 4) Angle at which deck edge immerses

- 5) The moment of statical stability at any angle of heel
 $= GZ \times W$

- 6) The Dynamic stability of vessel at any angle of heel
 $= A \times W$
 By Simpson's rule



★ Also known as 'GZ Curve'

Cross Curves

GZ Curve

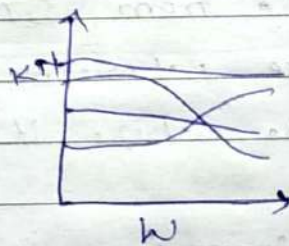
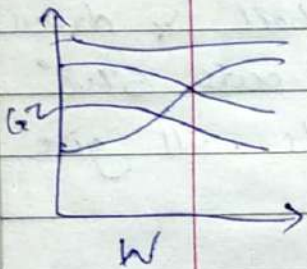
KN Curve

Assumed KG

Assumed

(1, 2, 3, ...)

KG = 0



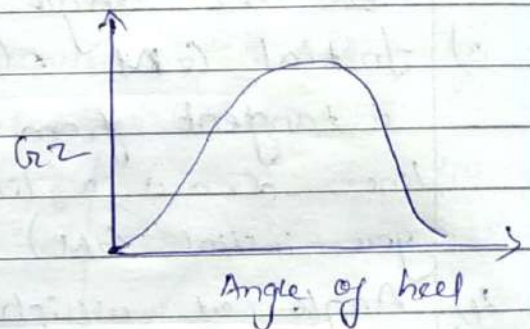
Corr either
positive or
negative

Corr always
negative

Curves of statical stability

GZ Curve

Actual KG.



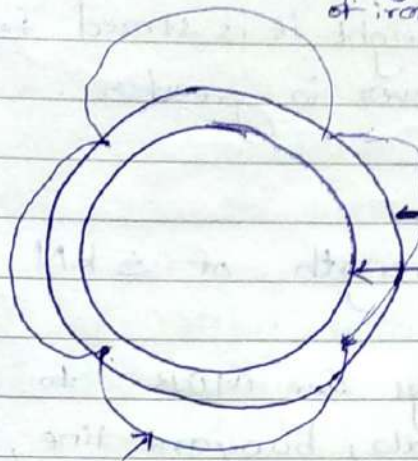
Q What is GZ curve?

Ans One GZ curve is in cross curves which is made by shipyard.

& other GZ curve which we make for various angle of heel known as curve of statical stability

Lifebuoy → be capable of supporting not less than 14.5 kg of iron in fresh water for 24 hrs.

withstand drop
→ from stowed posn
→ or 30m
→ whichever is greater



OD not more than 800mm
ID not more than 400mm
mass not less than 2.5kg
Burning sustain - 2 sec.

Be fitted with grabline not less than 9.5mm in diameter
Grabline shall be secured at 4 equidistant points

* If it is intended to operate the quick release arrangement provided for the self-activated smoke signal and self igniting lights, have mass not less than 4 kg.

Length	No. of Lifebuoy required
less than 100m	8
100m to 150m	10
150m to 200m	12
200m and above	14

50% of these lifebuoys should be fitted with self igniting lights
White in colour

Luminous intensity - 2 candellas

Burn continuously for 2 hrs., with flashes not less than 50 and not more than 70

* Lifebuoys should be equally distributed on both sides of vessel
At least 1 Lifebuoy to be present in the vicinity of the stern
At least 2 Lifebuoy present with buoyant lines.

Buoyant life line

→ length $\Rightarrow$ twice the height it is stored from waterline or 30m whichever is greater.

→ Non-kinking

→ min 8mm Dia

→ min Breaking strength of 5 kN

* Atleast 2 lifebuoys for MOB to be present with buoyant smoke signals, buoyant line, self igniting lights & quick release mechanism.

Mass - not less than 4 kg

MOB lifebuoy smoke signals should burn for atleast 15 min

Burn for atleast 10 sec underwater of 100mm

Self igniting lights luminous intensity - 35 cd.

Burn continuously for 45 min

Markings on a lifebuoy

1) Highly visible colour

2) fitted with retro reflective tapes

3) Ship's name & port of registry

Applicability

Cargo ships - 500 GRT & above, int cargo

Passenger - All ships on int voyage.

All offshore installations.

All ports handling international trade

Threats

- 1) Terrorism
- 2) Piracy (Armed robbery, hijacking)
- 3) Smuggling
- 4) Stowaways
- 5) Cyber attacks

Security Responsibilities

- 1) Contracting govt
Set up security level.

→ The degree to which the threat information is credible
→ " " " corroborated
→ " " " specific or imminent
→ Potential consequence of such a security incident.

- 2) Recognised Security Organisation (RSO)
By contracting govt
→ Approval of SSP
→ Certification & verification.

- By company
→ Ship Security Assessment (SSA)
→ Preparation of SSA

- PFSA
→ PFSA (Port Facility Security Assessment)
→ PFSP

- 3) Company
 → Master's Authority
 → CSO
 → Company Support

4) CSO - A company CSO is designated by company for the security of the ship and for developing, implementing and maintaining SSP.

5) SSO - A person on board designated by company, accountable for ~~the~~ master.

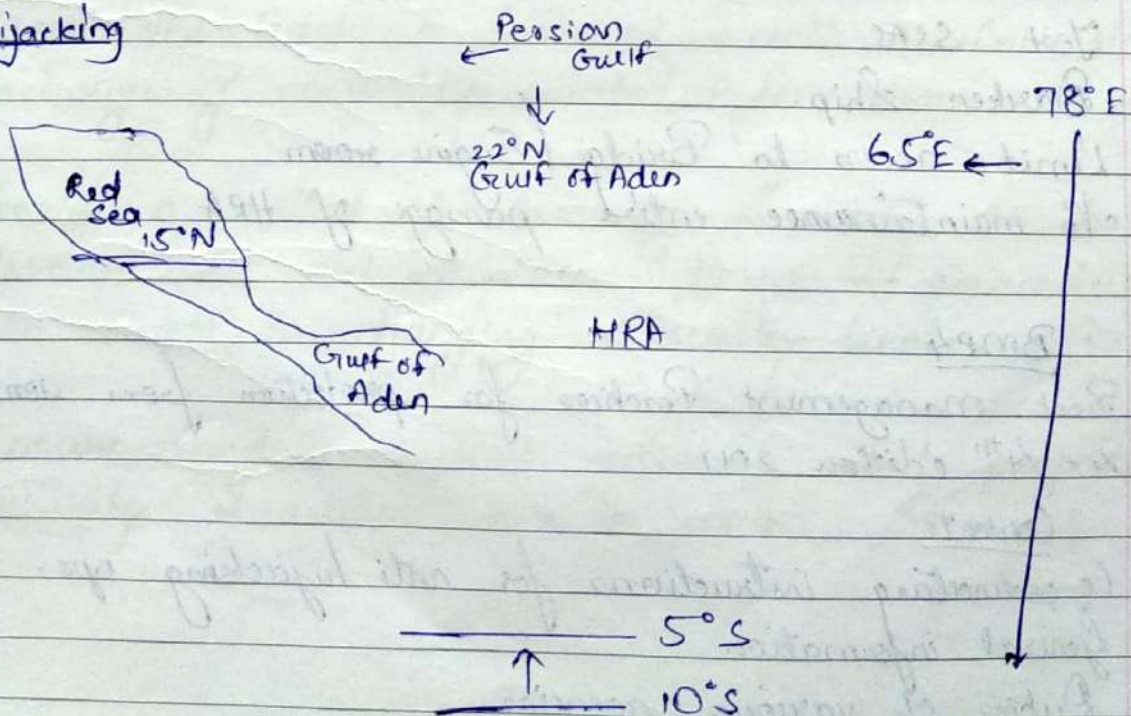
6) PFSO

7) Security Watch

8) OOW

9) Other personnels.

Hijacking



Ships protection Measures (SPM)

- 1) Register with MSCHOA (Maritime Security Centre Horn of Africa)
Overall controller of HRA
- 2) Report to UKMT0 (UK - Maritime Trade Operations)

IRTC - Internationally Recommended Transit Corridor
Dim - 495' x 12'

3) Prepare Citadel

- Lighting
- Ventilation / AC
- Toilets
- Communication

4) Addl W/K on bridge

- 5) Bridge w/k to wear bullet proof Jackets / Helmets.
- 6) Rig barbed / razor wire
- 7) Rig addl fire hoses.
- 8) Place dummies.
- 9) Test SSAs
- 10) Darken Ship.
- 11) Limit access to Bridge / Engine room.
- 12) No maintenance enter passage of HRA

BMP4

Best Management Practices for protection from somali pirates
4 - 4th edition 2011

Contents

- Co-ordinating instructions for anti hijacking ops.
- General information
- Dubies of various agencies.

- Planning ~~by~~ action by company, Master, ship
- Communication instructions.

ISPS - chap 11 (2) of SOLAS.

Special measures to enhance maritime security

Objective of ISPS Code.

- 1) Establish co-operation between various governments, government agencies, Local administrative shipping and port industry to Detect Security threats & Take preventive measures against security incidents which could affect trade.
- 2) Establish Role & Responsibility of the above bodies at National & international level for ensuring maritime security.
- 3) Ensure the Early & Efficient Detection, Collection & Exchange of security related information.
- 4) Provide a method of Assessing Security so as to develop and put in place Plans & procedures which can react to changing security levels.
- 5) Ensure Confidence that adequate and proportionate security measures are in place.

Functional Requirements (ISPS Code)

- 1) Gathering & assessing information with respect to security threats & Exchanging such information with appropriate Contracting Governments.
 - 2) Requiring maintenance of communication protocols for ships & port facilities.
 - 3) Preventing unauthorized access to ship, port facilities and their Restricted areas.
 - 4) Preventing unauthorized weapons, devices or explosives to ships or port facilities.
 - 5) Providing means of raising the alarm in case of security threats or incidents.
 - 6) Requiring ship & port facility security plan.
 - 7) Requiring training, drills & exercises to ensure familiarity with Security plan & procedures.
-
- 1) Gathering, Accessing & Exchanging info
 - 2) Communication protocols b/w ship & port
 - 3) Unauthorized entry
 - 4) Unauthorized weapons.
 - 5) means for raising alarm
 - 6) ~~SSP~~ SSP & ~~PPSP~~ PPSP
 - 7) Training

SSP :- is a plan developed to ensure the application of measures on board the ship, designed to protect persons on board, cargo, cargo transport unit, ship stores, or the ship from risk of any security incident.

PFSP :- is a plan developed to ensure the application of measures, designed to protect the port facility & persons, cargo, cargo transport unit & ship stores within the port facilities from the risk of any security incidents.

CSO (Company Security officer)

- A person designated by the Company for ensuring SSA is carried out.
- SSP is developed, submitted for approval and thereafter implemented and maintained and for Liaison with the SSO and PFSO communication & co-operation.

SSO

- A person on board ship accountable to the Master, designated by the company as responsible for the security of the ship.
- including implementation & maintenance of SSP & for Liaison with the CSO & PFSO.

PFSO

- A person designated as responsible for the development, implementation & revision of the PFSP & for Liaison with the CSO & SSO.

SSA (Ship Security Assessment)

- 1) SSA is an evaluation of security of the ship done by a person with appropriate skills or RSO
- 2) CSO responsible for SSA
- 3) SSA is an important & integral part of the process of developing or updating the SSP.

* Certificates

- 1) ISSC (International Ship Security Certificate) issued after initial or renewal verification specified by the Administration validity not exceeding 5 years.
- 2) DOS (Declaration of Security)
 - ~~Agreement~~ Agreement b/w ship & shore or b/w two ships regarding security measures shared b/w them.
 - It lists the security requirements and shared b/w them and states the responsibility of each.

← DOS
b/w ship to ship

→ Ship & shore

shall be completed
by Master or SSO
on behalf of ship

By PPSO or other approved
body for shore side
security on behalf of port

ISPS Equipments-

SSAS

Dog leg mirror

Metal detector

Security log book

Whistle

ID

Flash light

CCTV Cameras.

Security vest

Barrier Tapes

Pull tight seals.

Night vision binocular

★ Types of injections

- ① subcutaneous - ~~45~~ 45°
- ② Intramuscular - ~~90~~ 90°
- ③ Intravenous - 25°
- ④ Intradermal - 10-15°

^{list of} Medicines on board

* Medical scale - present in MFAG. ~~depend~~ medicines depends on area of trade & cargo.

* Ship Captain's medical Guide is present on medical Cabinet.

IMGs - International Medical Guide for Ships,
published by IMO & WHO.

How you indent medicines on board

By consulting - ① IMGs ② Flag State requirements
③ Medical ~~State~~ scale