Safety Notes

for

MEO Class 4

- Clyde

All The Best !!!

SAFETY

① SOLAS

- All Chapters
- Special attention to ISM & ISPS
- Read Saurav Sirs notes

② MARPOL

- Annex ① - 2nd Oct, 1983
- Annex ② - 2nd Oct, 1983
- Annex ③ - 1st July 1992
- Annex ④ - 27th Sept 2003
- Annex ⑤ - 31st Dec 1998
- Annex ⑥ - 19th May 2005

③ Construction

CLYDE

- Definations
- Bulkheads
- Floors
- Girders
- Keels
- Fore end const
- Aft end const
- Loadline
- Degree of motion
- Bulbous bow
- Panting
- Pounding
- Chain locker
- Limber hole
- Margin line

④ LSA

- Personal LSA (lifebuoy) (lifejacket) (Immersion suit) (TPA) (Anti-exposure suit)
- Pyrotechniques {Rocket Parachute, Hand Flares, Smoke Signals}
- EEBD
- SCBA
- Lifeboat
- Lifebuoy
- Life raft

} Launching Procedures

⑤ FFA

- Portable extinguishers
- Semi portable extinguishers
- Heat & Smoke detectors
- CO_2 Sys
- Sprinkler Sys
- Hypermist Sys
- Foam Sys
- IG Sys.

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⑥ Others

- IMO
- BWM
- STCW
- MLC
- ESP
- Polar Code
- Flag State & Port State.

HYDE

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* IMO * Topic 1

* Specialized agency of UN → safety
  → security
  → protection of env

* Adopted on 17 March 1948
  Came into force 1958

* It has 174 member states &
  3 associate members

* Secretary General of IMO - Mr Kitak Lim
  ↓
  Republic of Korea

* IMO Slogan

* 1982 name changed to (IMO)
  Before that it was (IGMCO)

* IMO doesn't implement legislation
  It only provides a regulatory framework
  Flag state is responsible to implement it

* IMSAS conducts audits on behalf of IMO

Structure Of IMO

↳ ASSEMBLY

* Highest governing body of IMO
* It meets once every 2 yrs → regular sessions
* Otherwise it meets at extraordinary sessions
* Assembly responsible for
  ↳ approving wk programme
  ↳ vote budget
  ↳ determining financial arrangements of organization.
* Assembly elects council.

↳ COUNCIL

* Council elected by assembly for 2 year term
* Council is executive organ of IMO
* Council works under assembly for supervising all work of organization.
* Council performs all fun of assembly except of making recommendations to govt on maritime safety & pollution prevention aspect.
* Council appoints secretary general which need approval from assembly

↳ Committees

① Maritime ~~Security~~ Safety Committee
* All safety aspects related to navigation, construction, manning, cargo handling, log books, navigational records
② Marine Env Protection Committee
* Control & prevention of pollution from ships
③ Legal Committee
* Legal matters espcl after accidents
④ Technical Committee
* Technical matters
⑤ Facilitation Committee
* Easy and smooth facilitation of Int trade.

↳ Sub - Committees

* Human element training & watchkeeping
* Pollution prevention & response
* Ship design & const
* Ship sys & equipment
* Carriage of cargoes & containers
* Navigation, communication, search & rescue.

Ballast Water Management** TOPIC 2

Int Convention on control & management of ships ballast water & sediments.

* Entry into force 8th Sept, 2017

WHY Ballast Water Management?

- Due to transfer of invasive aquatic species from 1 place to another making changes in ecological system

Invasive → Zebra muscles
Aquatic → Toxic algae
Species → Cholera

All ships of 400GT & above should have
- BWM Plan
- BWM Record Book
- BWM Certificate

Ballast Water Mgmt has D_1 Standards
D_2 Standards

D_1 Standards : Exchange Stds

In this we carry out 95% volumetric exchange

① Sequential Method.
Fully pump in & fully pump out.

② Flowthrough Method
Pump in & overflow tank from vent.
ex - plp capacity $100 m^3/hr$
vol of tank $1000 m^3/hr$
So no of plp hrs = 10

③ Dilution Method
Pump in from top & discharge from bottom of tank keeping level constant in tank.

This exchange of water should be done 200Nm from land at dept 200m

If not then

This exchange of water should be done 50Nm from land at dept 200m

D_2 Standards : Performance Stds

In this we limit organisms in B.W.

① 10 viable organisms / m^3 ($\geq$ 50 micrometer)
② 10 viable organisms / ml (10 $\leq$ 50 micrometer)
③ Toxicogenic vibrio cholera (1 CFU / 100 ml)
④ E - Coli (250 CFU / 100 ml)
⑤ Intestinal intercocai (1000 CFU / 100 ml)

(Viable means organisms that can survive on its own & cannot reproduce)

By 8th Sept, 2024, All ships to comply with D_2 standards.

MLC Documents
* Passport
* CDC
* Medical Cert
* Wages - contract
* Familiarization forms
* Work - rest hrs
* Risk assessment
* Safety meeting minutes

New ship, New owner, New flag } Interim MLC (6 months)
Full Term MLC (5yrs)

Recent 2016 New Ammendments
- Guidance to eliminate shipboard harassment & bullying.

Grievance Redrassal Mech :- For problems onboard

MLC (2006)** → Adopted by ILO

TOPIC 3

* Entry into force 20th Aug, 2013

MLC is a convention which provides a broad perspective over seafarers rights

It is a tripartied agreement between Flag, Seafarers Union, Company / ship owner working for betterment of seafarers.

MLC has 5 titles

① Min req for seafarers to work onboard.
② Conditions of employment.
③ Accomodation, recreational facility, food & catering.
④ Heath protection, medical care, welfare & social security.
⑤ Compliance & enforcement.

Title 1

↳ Min age
* YOUNG SEAFARER
* No night work → (Midnight to 5am)

↳ Medical certi
* Approved doctor
* Validity → 2yrs (seafarer)
1yr (young seafarer)

↳ Training & qualification * STCW certi

↳ Recruitment & placement

Title 2

↳ Seafarers employment agreement
* Contract to be signed
* Copy to be onboard.
* Decent work conditions.

↳ Wages
* Monthly basis
* Right to allotment
* No unauthorized deductions

↳ Hrs of Work & Rest
* 10hrs rest in 24hrs
77hrs rest in 7days
* 14hrs work in 24hrs
72hrs work in 7days
* Records to be signed by master & self.
* Compensatory rest for callouts
* Drills to minimize disturbance of hrs of rest.

↳ Entitlement to Leave * Shore leave to ensure health & well being.

↳ Repatriation * Ability to return home with no costs.

Title 3

* Sanitary facilities
* Laundry facilities
* Recreational facilities
* Fittings & fixtures in place
* Hot & cold water available
* Galley clean & hygenic
* Food free of cost
* Drinking water good quality.

Title 4

* Right to visit doctor
* Hospital clean & hygenic
* Radio medical advice
* Medical supplies

Title 5

DMLC 1 - Flag state of vessel will draw a ship specific decl of ML compliance part I

DMLC 2 - Shipowner / operator shall develop & implement measures to ensure on going compliance with national req in ship specific decl of ML Compliance part II

STCW (1978) **

Topic 4

Int Convention on stds of training, certification & watchkeeping for seafarers.

- adopted in 1978
→ New ammendments came in 1995
→ New recent ammendments came in 2010

8 Chapters
① General Provision
② Master & deck dept
③ Engine dept
④ Radio com & radio personnel
⑤ Special training req for personnel on certain ship.
⑥ Eme occupational safety, medical care & survival function.
⑦ Alternative certi
⑧ Watchkeeping.

Significance of STCW : To update knowledge & skill on tech advancement of field.

Our exams fall under Chapter ③ A III-1

* REST 10 hrs in 24hrs
77 hrs in 7 days
* Hrs of rest not to be divided into more than 2 periods.
* 1 Period to be atleast 6 hrs
* Interval bet^n periods not to exceed 14 hrs
* Compensatory rest for call outs
* STCW gives power to master to suspend hrs of rest in eme situations

2010 Manilla Ammendments

① Improved measures to prevent fraudulent practices
② Revised hrs of wk & rest.
- before 70 hrs in 7 day period
- new 77 hrs in 7 day period.
③ New requirements for drug & alcohol abuse
- 0.05 % blood alcohol level
- 0.25 mg/l alcohol in breadth
④ New stds for medical fitness
⑤ New certi for AB's
⑥ New training & certifications for ETO's
⑦ New training guidance for person serving onboard in polar waters
⑧ New training guidance for person serving on DP vessels
⑨ New req for security training when under piracy attack.
⑩ New req for marine env awareness training in leadership & team work.
⑪ New req for training in modern technology like ECDIS

A III
① All watchkeepers
② CE & 2E above 3000 kW
③ CE & 2E 750 ~ 3000 kW
④ ER rating
⑤ Able seafarers
⑥ ETO
⑦ Trainee ETO

25 June, 2010 → Declared as Day of Seafarers

Date :

MON TUE WED THU FRI SAT SUN

SOLAS chap 14 = Polar Code. **TOPIC 6**

Safety measures for ship operating in Polar Waters

* entry in force = 1 Jan 2017
* Polar code deals with safety of life at sea & prevention of pollution from ships

- applicable to all new ships constructed on or after 1st Jan 2017 operating in Polar waters
- applicable to existing ships constructed before 1st Jan 2017 & should meet req of polar code by 1st intermediate & renewal survey. which occurs 1st

* Covers All passenger ships
  All cargo ships of 500 GT & above

Part 1
- 1-A Mandatory Safety Measures (13 chapters)
- 1-B Mandatory Provisions, Guidelines & Recommendations

Part 2
- 2-A Mandatory Measures (4 chapters)
- 2-B Guidelines & Recommendations

CLYDE

Date :

MON TUE WED THU FRI SAT SUN

Category A Ship :

* Designed for operations in atleast medium 1st year ice which may include old ice inclusions.
Ships to be ice strengthened & scantlings shall be approved by admin or RO

Category B Ship :

* Ship not included in category A, designed for op in polar waters in atleast thin 1st year ice which may include old ice inclusions.
* Ships to be ice strengthened & scantlings shall be approved by admin or RO

Category C Ship :

* Ship designed to operate in open water or in ice conditions less severe than those in A or B.
* Ships to be ice strengthened & scantlings shall be approved by admin or RO
* Category C ships may not be ice strengthened if in opinion of admin, ships structure is adequate for its operation.

Date :

MON TUE WED THU FRI SAT SUN

Part 1-A

* General
* Polar water operating manual
* Ship structure
* Subdivision & stability
* Watertight & weathertight integrity
* Machinery installations
* Fire safety protection
* LSA & arrangements
* Safety of navigation
* Communication
* Voyage planning
* Training

Part 2-A

* Prevention of pollution by oil
* Control of pollution by noxious liq sub in bulk
* Prevention of pollution by harmful sub carried by sea in packaged form
* Prevention of pollution by sewage from ships
* Prevention of pollution by garbage from ships

CLYDE

Date :
MON TUE WED THU FRI SAT SUN

1st yr ice = thickness 0.3m ~ 2m (1 winter growth).
Medium 1st yr ice = thickness 70cm ~ 170cm
Old ice = ice survived atleast 1 summer melt
thickness upto 3m or more
Thin 1st yr ice = thickness 30cm ~ 70cm

Hazards

① Thick ice
hull st. stability, machinery sys, navigation, malfunction of equipments

CLYDE

② Topside icing
stability & equipment functionality.

③ V. low temp.
working env & human performance
maintenance & eme prepardeness tasks
efficency

④ Extended periods of darkness
navigation

⑤ High latitude
nav sys, com sys

⑥ Lack of crew experience
causing human error

Date :.....

MON TUE WED THU FRI SAT SUN

⑦ Rapid change to severe weather conditions.

* Ships applicable to polar code should have Polar Ship Certi
* Certi given by admin
* Certi to be harmonized with other SOLAS certi wrt validity, survey dates & endorsements

CLYDE

Date :

MON TUE WED THU FRI SAT SUN

Enhanced Survey Program — Topic 7

Aim : To ensure watertight structural integrity of ship.

* This program contains guidelines to prepare the ship for special survey to maintain the safety of ship @ sea & port.

* The survey program to be developed by owner & is to be submitted to classification society 6 months before survey.

* Program is developed in such a way that it can be integrated with other surveys like
  - → Annual survey
  - → Renewal survey
  - → Intermediate survey
  - → Dry dock survey.

CLYDE

* This survey program includes

  - → Close up survey of structures such as shell, frames, bulkheads
  - → Thickness measurement of hull.
  - → Inspection & testing of cargo tanks
  - → Inspection & testing of ballast tanks
  - → Inspection & testing of hatch covers & coamings
  - → Inspection & testing of fuel tanks & DB tanks

Date :

MON TUE WED THU FRI SAT SUN

* After survey 3 reports will be made available
  ① Reports of structural survey
  ② Condition evaluation report
  ③ Thickness measurement report.

Oil Tankers
- Single hull const.
- double hull const.

Bulk Carriers
- Single hull const.
- Double hull const.
- Hopper side tanks.
- Top side tanks.

CLYDE

9 Chapters in ESP for both oil tankers & bulk carriers

① General application... & documentation
② Periodic / renewal survey
③ Annual survey.
④ Intermediate survey
⑤ Condition & equipment for surveys
⑥ Repairs to damages
⑦ Documents for survey
⑧ Report & evaluation of survey
⑨ Condition evaluation report.

Date :.....

MON TUE WED THU FRI SAT SUN

The plan submitted to class. society consists

① Main structural plans including info regarding use of high tensile steel.
② List of holds & tanks
③ Provisions & methods for access to superstructure
④ Equipment for survey.
⑤ Appointing areas of ship for thickness measurement.
⑥ Appointing tanks for tank testing.

Surveyor collects all available date & carries out Corrosion Analysis & Hull Damage Analysis

Survey Report : CLYDE

* Corrosion with description of location, type & extent.
* Areas with substantial corrosion.
* Cracks / fractures with description of position & scale
* Buckling with description of location & extent
* Incients with description of location & extent
* Identification of compartments where no damages / defects are found.

MARPOL

Date :

MON TUE WED THU FRI SAT SUN

Annex ① - 2 Oct, 1983 ✓
Regulation for prevention of pollution by oil

Annex ② - 6 April 1987 ~~x(1989)~~
Regulation for ~~prevention~~ control of pollution by noxious liquid substances in bulk.

Annex ③ - 1 July 1992
Regulation for prevention of pollution by harmful substances carried by sea in packed form

Annex ④ - 27 Sept 2003
Regulation for prevention of pollution by sewage from ships

Annex ⑤ - 31 Dec 1988
Regulation for prevention of pollution by garbage from ships

Annex ⑥ - 19 May 2005
Regulation for prevention of air pollution from ships.

~~New proposed MARPOL annexes are~~

Annex ⑦
Regulation for prevention of pollution from ships by ballast water.

Annex ⑧
Regulation for prevention of pollution by antifouling paints from ships.

Annex ⑨
Regulation for prevention of pollution by noise from ships

Annex ⑩
Regulation for prevention of pollution by vibration of ship.

Annex I — II Chap 47 Regulations

Date : .....

MON TUE WED THU FRI SAT SUN

Nearest land = Baseline from territorial sea

Oil tanker = Ship constructed to carry oil in bulk in its cargo spaces

Crude oil tanker = Oil tanker engaged in trade of carrying crude oil only

Product carrier = Oil tanker engaged in trade of carrying oil other than crude oil

Combination carrier = Ship designed to carry either oil or solid cargo in bulk.

Special Area — Sea where for recognized tech reasons in relation to its oceanographical & ecological condition where prevention of oil pollution req.

Mediterrarean sea
Baltic sea
Black sea
Red sea
Gulf area
Gulf of Aden
Antartic area
N-W European waters
Oman area of Arabian sea
Southern south African waters

Slop tank = Tank specially designated for collection of tank drainings, tank washing or oily mixtures

Permeability = Ratio of vol within that space which is assumed to be occupied by water to total vol.

Instantaneous rate of discharge of oil means rate of discharge of oil in lit / hr at any instant divided by speed of ship in knots at same instant.

MARPOL Annexures

Date :

MON TUE WED THU FRI SAT SUN

IOPP certificate → 5 yrs valid.

PPM parts of oil / million parts of water by volume.

Regulation 6
Oil tanker 150 GRT & above
Other ship 400 GRT & above shall be subject to surveys
* Initial survey
* Renewal survey
* Intermediate survey
* Annual survey
* Additional survey

CLYDE

Now you can get IOPP certificate.
Administration takes full responsibility of certificate.
IOPP not exceed 5 yrs

Regulation 12 - Tank for oil residues (sludge)
* 400 GRT & above should have sludge tk
* Oil residues may be disposed to reception facilities through Standard Discharge Connection
* Oil residues may be disposed in incinerator, aux boiler or disposed by other accepted means.
* Sludge tk should be adequate capacity
* Sludge tk shodd be provided designated p/p
* Sludge tk should have no discharge connection to bilge system, OBT, tank top
* Sludge tk to be arranged with no discharge OVBD except SDC

Date :

MON TUE WED THU FRI SAT SUN

Regulation 9 - Form of certificate
IOPP certificate shall be atleast English, Spanish, French. Official language of issusing country can also be used.

Regulation 11 - PSC on op. requirements.
Ship when inspected, there are clear grounds for believing that master/crew are not familiar with procedures for prevention of pollution by oil. Party can detain the ship.

Regulation 13 - Standard Discharge Connection.
Outer dia = 215 mm
Max Inner dia = 125mm
(PCD) Bolt Circle Dia = 183 mm
Slots in flange = 6 holes, 22mm in dia
Slot width = 22mm
Flange thickness = 20mm
Bolts & nuts = 6, 20mm dia

Regulation 14 - Oil Filtering Equipment
Any ship of 400 GT & above
Ships such as hotel ships, storage ships need not be provided with oil filtering equipment.
Ship less than 400 GT should retain onboard

Date :.....

MON TUE WED THU FRI SAT SUN

Ship can discharge in special area except polar area. No distance regulation

Oil fitering equipment design approved by admin
Oil discharged into sea after passing through ows should not exceed 15ppm.
Ship > 10,000 GT alarm & stop.

Regulation 15 - Control of discharge of oil
Can discharge in spcl area except Artic & Antartic area.

① Ship is proceeding enroute.
② Oily mixture is processed through oil filtering equipment meeting requirement of reg 14
③ Oil content of effluent without dilution does not exceed 15ppm.
④ Oily mixtures does not originate from cargo plp room bilges on oil tankers.
⑤ Oily mixture in case of oil tanker is not mixed with oil residues.

No discharge shall contain chemicals or other substances in quantities or concentrations which are hazardous to env.

Date :
MON TUE WED THU FRI SAT SUN

Code F failure of any equipment
Code I special entries or forgotten entries (General entry)
Code H bunkering operations.

Regulation 17 CLYDE
tankers 150 GT & above
Other ships 400 GT & above

- ballasting or cleaning of oil fuel tank
- discharge of dirty ballast or cleaning water from oil fuel tanks
- collection & disposal of oil residues (sludge)
- discharge ovbd or disposal otherwise of bilge water which has accumulated in machinery spaces
- bunkering of fuel or bunk LO

Date :

MON TUE WED THU FRI SAT SUN

Every oil tanker of 150 GT & above & every ship of 400 GT & above shall be provided with ORB Part I (Machinery space operations)

Items to be recorded in ORB

Code A : BALLASTING OR CLEANING OF OIL FUEL TANKS

* Identification of tanks ballasted
* If tank cleaned after contamination of oil
* Position & time when cleaning started & completed.
* Position & time when ballasting started & ended.
* Quantity of ballast in (m^3) if tanks not cleaned

Code B : DISCHARGE OF DIRTY BALLAST OR CLEANING WATER FROM OIL FUEL TANKS

CLYDE

* Identify tank
* Position of ship @ start & completion of discharge.
* Speed during discharge.
* Discharge through 15ppm equipment or recept facilities
* Quantity discharged.

Code C : COLLECTION, TRANSFER & DISPOSAL OF OIL RESIDUES.

Collection of oil residues

- identify tank
- capacity of tank
- total quantity of retention
- quantity of residue collected by manual ops.

Methods of transfer or disposal of oil residues

- to reception facility
- to another tank
- incinerated
- other method.

Date :

MON TUE WED THU FRI SAT SUN

Code D : DISCHARGE OVBD OR DISPOSAL OF BILGE ACCUMULATED IN MACHINERY SPACES

* quantity discharged, transferred or disposed
* time of discharge, transfer or disposal.
* method of discharge, tranfer or disposal.
  - through 15ppm equipment
  - to reception facility
  - to slop tank or holding tank.

Code E : DISCHARGE OVBD OR DISPOSAL OF BILGE ACCUMULATED IN MACHINERY SPACES

* Time & position of ship through 15ppm equi
* Time when sys into auto mode for trans bilge to holding tank
* Time when sys put into manual operation.

Code F : CONDITION OF OIL FILTERING EQUI

* Time of sys failure
* Time when sys has been made operational
* Reasons for failure.

Code G : ACCIDENTAL OR OTHER EXCEPTIONAL DISCHARGE OF OIL

* Time of occurance
* Place or position of ship.
* Approx quantity & type of oil
* Circumstances of discharge.

Code H : BUNDERING OF FUEL

* Place
* Time
* Type & quantity of fuel & identify tank
* Type & quantity of LO & identify tank.

Date :.....

MON TUE WED THU FRI SAT SUN

Code I : Additional Operational Procedures & General Remarks.

IOPP with form A

form B → For oil tankers

MARPOL COMPLETE

① Annex 1

Came into force

IMP DEFINATIONS & regulations you cannot skip.

→ Oil
→ Crude oil
→ Oil tanker
→ Crude oil tanker
→ Product carrier
→ Combination carrier
→ Nearest land
→ Special area
→ Instantanous rate of discharge
→ Wing tank
→ Center tank
→ Slop tank
→ Clean ballast
→ Segregated ballast
→ Anniversary date

* Reg ⑥ (Oil tanker 150 GT & above) (Other ship 400 GT & above)
* Reg ⑦ Int Oil Pollution Prevention Certi
* Reg ⑨
* Reg ⑩
* Reg ⑪
* Reg ⑫
* Reg ⑬
* Reg ⑭ (Every ship 400 GT & above & less than 10,000 GT)
* Reg ⑮ - Control of dis of oil
* Reg ⑰ - (Oil tanker 150 GT & above) (Other ship 400 GT & above)
* Reg ㉝ - COW
* Reg ㉞
* Reg ㊱ - ORB II

SOPEP

Annex II

Date :

MON TUE WED THU FRI SAT SUN

Regulation for control of pollution by noxious liq sub in bulk

NLS :- Substances that fall under pollution category column as per IBC code or intended under category X Y Z.

IBC Code : It is an international code for const. & equipment of ship carrying dangerous chem. in bulk adopted by MEPC

10 Chapters
22 Regulations

CLYDE

Regulation 17 : SMPEP
Every ship of 150 GT & above are certified to carry NLS shall have SMPEP
Such plan must be based on guidelines developed by organization

* procedure to be followed by master or persons incharge of ship to report nox. liq sub. pollution incident.
* list of authorities or persons to be contacted in event of noxious liq sub. pollution.
* detailed description of action to be taken by persons onboard to reduce or control discharge of NLS.
* procedure & pt of contact on ship for coordinating shipboard action with national & local authorities in combating pollution.

discharge criteria.

Date :

MON TUE WED THU FRI SAT SUN

Regulation 6 : Categorization & listing of NLS.

Category X :
NLS which if discharged into sea from tank cleaning or deballasting ops are deemed to present a major hazard to either marine resources or human health & ∴ justify Prohibition of discharge into marine env.

CLYDE

Category Y :
NLS which if discharged into sea from tank cleaning or deballasting ops are deemed to present a hazard to either marine resources or human heath & ∴ justify Limitation on quality & quantity of discharge into marine env.

Category Z :
NLS which if discharged into sea from tank cleaning or deballasting ops are deemed to present a minor hazard to either marine resources or human heath & ∴ justify less stringent restrictions on quality & quantity of discharge into marine env.

OS :
deemed to present no harm to marine resources, human health, amenities & other legitimate uses of sea

Date :

MON TUE WED THU FRI SAT SUN

Discharge of residues of category X

* Tank from which sub of category X has been unloaded shall be prewashed before ship leaves port of unloading.
* Resulting residues shall be discharged to reception facility until conc of effluent is at or below 0.1% by wt.
* Other tank washings, ballast water can be discharged... when
  - → ship enroute @ 7 Knots self propelled
    @ 4 Knots not self propelled
  - → discharge made below waterline through underwater discharge
  - → discharge not less than 12 Nm from nearest land & depth not less than 25m

CLYDE

Discharge of residues of category Y

* Conc & rate of discharge of effluent does not exceed 1ppm.
* Max quantity of cargo discharged from each tk & pipe sys does not exceed $1m^3$ or 1/3000 of tank capacity

Discharge of residues of category Z

* Conc. & rate of discharge of effluent does not exceed 10 ppm
* Max quantity of cargo discharged from each tk & pipe sys does not exceed $3m^3$ or 1/1000 of tank capacity.

② Annex 2

→ NLS
→ IBC Code
→ Chem tanker
→ NLS tanker

IMP DEFINATIONS & regulations you cannot skip

* Reg ⑥
* Reg ⑧
* Reg ⑨ Int Pollution Prevention Certi For Carriage of NLS in bulk.
* Reg ⑩
* Reg ⑬ Control of discharge of NLS

SMPEP

Annex IV

Date :

MON TUE WED THU FRI SAT SUN

Regulation for prevention of Pollution by sewage from ships.

7 chapters

18 regulations

Sewage : drainage or waste from toilets or urinals.
drainage from medical premises, wash basins, wash tubs
drainage from spaces containing living animals

Holding tank : collection & storage of sewage

BOD : Amt of O_2 needed by aerobic bacteria to breakdown organic matter into waste water.

E-coli : Bacteria that can easily develop colonies & multiply under suitable conditions.

Initial survey

Renewal survey

Additional survey

Int sewage pollution prevention certificate → 5yrs

Reg 10 : Std Dis Con

Outer dia	210mm
Inner dia	~~170mm~~
Bolt Circle Dia	170mm
Slots in flange	4 holes, 18mm dia Slot width = 18mm
Flange thickness	16mm
Bolts & nuts	4, 16mm dia

Max ID = 100mm

Serv P_d = 600 KPa

Date :

MON TUE WED THU FRI SAT SUN

Reg 11 : Discharge of sewage

① Ship discharging comminuted & disinfected sewage approved by admin at dist. of more than 3 Nm from nearest land.

② Sewage which is not comminuted & disinfected at dist. of more than 12 Nm from nearest land.

③ Discharge should be at moderate rate when ship is enroute. & proceeding not less than 4 knots

④ The discharge effluent shall not produce visible floating solids nor cause discoloration of water

③ Annex 3

Came into force

→ Harmful substances
→ IMDG Code
→ Objectives of IMDG Code
→ Principles of IMDG Code

Classification → (9)
Packing → (3)
Marking / Labelling →
Documentation
Segregation.

④ Annex 4

Came into force

→ Sewage
→ Holding tank
→ BOD
→ e coli

* Reg ④
* Reg ⑤ Int Sewage Poll Prevention Certi
* Reg ⑦
* Reg ⑧
* Reg ⑩ - Std dis con
* Reg ⑪ - Sewage discharge criteria.

Annex V

Date :

MON TUE WED THU FRI SAT SUN

Regulation for prevention of Pollution by Garbage from ships.

5 Chapters

25 Regulations

- Mediterranean sea
- Baltic sea
- Black sea
- Red sea
- Gulf area
- North sea
- Antartic area
- Wider Caribbean Region

CLYDE

Garbage :

* All kinds of food wastes, domestic wastes & operational wastes, all plastics, cargo residues, cooking oil, fishing gear & animal carcasses
* Garbage does not include fresh fish & parts generated from fishing activities

Food waste :

* Spoiled or unspoiled food substances including fruits, veg, dairy products, poultry, meat products & food scraps generated onboard.

Cooking oil :

* Type of edible oil or animal fat used or intended to be used for prep or cooking food.

* Plastics, synthetic ropes, synthetic fishing nets, plastic garbage bags, incinerater ashes – discharge prohibited.

Date :

MON TUE WED THU FRI SAT SUN

Regulation 4 : Discharge of garbage outside spcl area.

* Ship to be enroute
* 3Nm from nearest land : for food waste passed comminuter or grinder
  These waste should be capable to pass through a screen with opening not more than 25mm
* 12Nm from nearest land for food waste not treated
* 12Nm from nearest land for cargo residues, but under any condition, cargo residues should not contain harmful substances.
* Animal carcasses discharge as far as possible from nearest land
* Cleaning agents or additives, but should not be harmful

Discharge of garbage within spcl area

* Discharge is more than 12Nm from nearest land or ice shelf.
* 25mm screen

residues (HME)

Date :

MON TUE WED THU FRI SAT SUN

Garbage Management Plan

* Every ship of 12m or more in length overall shall display placards which notify crew of discharge requirements.
* Placards should be written in working language of ship's crew for ships engaged in voyages to ports or offshore terminals shall be in Eng. French or Spanish.

* Every ship of 100 GT & above & ship certified to carry 15 or more persons shall carry a GMP to be followed by crew.
* The plan should provide written procedures for minimizing, collecting, storing, processing & disposal of garbage
* It shall also designate person or persons in charge of carrying out the plan.
* Such plan must be based on guidelines developed by organization & in working language.

Garbage Rec Book

* Every ship of 400 GT & above & every ship which is certified to carry 15 or more persons engaged in voyages to port or offshore terminals shall be provided with GRB.

Date :

MON TUE WED THU FRI SAT SUN

* Every discharge or incineration shall be recorded & signed by officer incharge on that day
* Each completed page to be signed by master
* Entries must be in Eng, French, Spanish
* Each entry shall have date & time & position, category of garbage & amt discharge or incinerated
* GRB shall be kept for atleast 2 yrs from last entry.
* Discharge or accedental loss shall also be recorded in GRB.

Category

① Plastic A
② Food waste B
③ Domestic waste C
④ Cooking oil D
⑤ Incinerater Ashes E
⑥ Operational waste F
⑦ Cargo residues G
⑧ Animal carcass H
⑨ Fishing Gear I

I → e waste

Part 1

A B C D E F G H I

Part 2

J = Cargo residue
K = Cargo residue (HME)

⑤ Annex 5

Came into force

IMP DEF & Regulations you cannot skip

→ Garbage
→ Food waste
→ Domestic waste
→ Operational waste
→ 8 Special areas
→ Discharge of garbage inside & outside sp areas.

GMP
↳ requirement (100GT & above)
↳ incharge of plan
↳ placards
↳ wking language

GRB
↳ requirement (400GT & above)
↳ time
↳ position
↳ date
↳ catogery
↳ accidental
↳ book to be kept for 2yrs.

Categories of garbage.

Plastic
Food waste
Domestic waste
Cooking oil
Incinerator ashes
Op. waste
Animal carcases
Fishing gear
E-waste
Cargo residues (HME)
Non HME

Annex VI

Date :

MON TUE WED THU FRI SAT SUN

Regulation for prevention of Air Pollution from ships

5 chapters

25 regulations

Emission :- Release of substances from ships into the atmosphere or sea.

Emission control area :- Area where adoption of spcl mandatory measures from ships is required to prevent, reduce & control air pollution from NO_x or SO_x & particulate matter. or all 3 types of emissions & their impacts on health & env.

CLYDE

Date :

MON TUE WED THU FRI SAT SUN

Inital survey
Renewal survey
Intermediate survey
Annual survey
Additional survey.

* Int. Air Pollution Prevention Certi → 5yrs
* Int. Energy Efficiency Certi valid throughout unless
  → Ship changes flag
  → Ship withdrawn from service

Sources of air pollution
Ozone depleting sub.
NO_x
SO_x
VOC
Incineration of waste material.

Chap 3 - Reg for control of emissions from ships
Reg 12 - Ozone Depleting Substances.

* Regulation does not apply to permanently sealed equipment where there is no ref. charging connections.
* Deliberate emissions of ODS are prohibited.
* Installations containing ODS other than HEFC shall be prohibited after 19 May 2005.
* Installations containing HCFC shall be prohibited after 1st Jan 2020
* Each ship shall maintain a list of equip. containing ODS.

Date :

MON TUE WED THU FRI SAT SUN

* Ships having rechargable sys containing ODS shall maintain ODS rec book.
- entries should be in terms of mass(kg) of substance & to be recorded without delay.
- recharge either full or partial
- repair or maintenance.
- discharge of ODS to atmosphere
  * deliberate
  * non-deliberate.
- discharge of ODS to reception facilities
- supply of ODS to ship.

Reg 13 - Nitrogen Oxides

Applies to ships of more than 130KW power output.
Does not apply to eme diesel engine & lifeboat engine.

Tier	Ship Const. on/after	Total Weighted NO_x Emission		
		$n < 130$	$n = 130 \sim 2000$	$n \geq 2000$
①	1 Jan 2000	17	$45 \times n^{(-0.2)}$	9.8
②	1 Jan 2011	14.4	$44 \times n^{(-0.23)}$	7.7
③	1 Jan 2016	3.4	$9 \times n^{(-0.2)}$	2.0

Annex 6

Emission control area - area where adoption of spcl mandatory measures for emissions from ships like NO_x, SO_x, Particulate matter is required to be controlled, reduced or prevented

Attained EEDI - EEDI value achieved by a ship

Required EEDI - Max value of EEDI that is allowed

Regulation 5 - Surveys

* Initial
* Renewal
* Intermediate
* Annual
* Additional

Regulation 6 - Issue or endorsement of certi
↳ Int Air pollution prevention certi
↳ Int energy efficiency certi

Regulaion 8 - Form of certi

Regulation 9 - Duration & validity of certi

Regulation 10 - PSC on op req.

Reg 12 - Ozone Depleting Substances

* Any deliberate emissions of ODS shall be prohibited.
* Emissions can be due to maintaining, servicing, repairing systems or equipments on ships.
* Emissions can also arise due to leaks

Installation of HCFC shall be prohibited
- ships constructed on / after 1 Jan 2020

Each ships having rechargeable systems that contain ODS shall have an ODS Record Book

Entries in ODS record book should be in terms of mass(kg) of substance

→ recharge (full or partial) containing ODS
→ repair or maintenance of equipment containing ODS
→ discharge ODS in atm (deliberate or non-deliberate)
→ discharge of ODS to land based receptional facility.
→ supply of ODS to ship.

Regulation 13 - NO_x

* Applies to ships of more than 130kw Power o/p
* Does not apply to Eme Diesel Engine & Lifeboat Engine

Tier	Ship Constructed On / After	Total Weighted NO_x Emission		
		$n < 130$	$n = 130 \sim 2000$	$n \geq 2000$
①	1 Jan 2000	17	$45 \times n^{(-0.2)}$	9.8
②	1 Jan 2011	14.4	$44 \times n^{(-0.23)}$	7.7
③	1 Jan 2016	3.4	$9 \times n^{(-0.2)}$	2.0

* Emission from engines to be within these limits
* ECA area
  - ↳ North American Area
  - ↳ United States Caribean Area

Baltic Sea
North Sea

How are NO_x formed

→ When nitrogen reacts with O_2 in combustion at v high temp. (>1000°C)

Causes for NO_x formation

→ Heavy load on engine
→ Improper air/fuel mixture
→ Sca air high temp.
→ Jcw temp high
→ Cyl liner temp high.

NO_x Technical File

It is a record containing all detail parameters, components of engine which may influence NO_x emissions.

- liner
- head
- piston
- con rod
- Pump
- Valve
- Nozzle of vlv
- Camshaft
- Tlc rotor
- nozzle ring
- air cooler

So based on this file, EIAPP certi is issued

Regulation 14 – SO_x

Outside ECA

① 4.5% m/m prior 1 Jan 2012
② 3.5% m/m on/after 1 Jan 2012
③ 0.5% m/m on/after 1 Jan 2020

Inside ECA

① 1.5% m/m prior 1 Jan 2010
② 1% m/m on/after 1 July 2010
③ 0.1% m/m on/after 1 Jan 2015

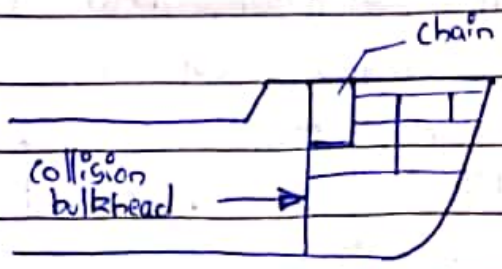
* ECA area
  - ↳ Baltic Sea
  - ↳ North American Sea
  - ↳ US Carribean Sea

Page No.
Date

Collision Bulkhead

CLYDE

① It is the forward most bulkhead in ship.
② It is not situated too foreward as it will immediately damage on impact nor too aft so that compartment fwd gets flooded & causes trim.
③ Acc to SOLAS, collision bulkhead should be located at dist of not less than 1/20 of ships length or 10m from fwd perpendicular whichever is less.
Also not more than 0.08L or 1/20L+3m whichever is greater. {{CLYDE}}
④ No doors, manholes, access openings, ventilation ducts or other opening shall be fitted in collision bulkhead.
⑤ Only 1 pipe for forepeak tank may be allowed provided the pipe is fitted with screwdown v/v capable to be operated from deck.
⑥ It is also watertight extending to uppermost continous deck.
Collision bulkhead is also stiffened by 180mm vertical bulb plates spaced 600mm apart.



Page No.
Date

Q Why collision bulkhead located @ 1/20 of ships length?

- Acc to trochoidal theory, if wave length is equal to length of ship then max shearing force will occur at 1/20 × wave length
- Hence we locate the collision bulkhead @ 1/20 of ship length

Corrugated Bulkhead

CLYDE

① In plain bulkhead lot of extra strengthening is needed to withstand hydrostatic pressure.

② By using corrugated bulkhead, strength is inherently formed & there is a large reduction in wt.

③ Corrugated bulkhead is stronger as it can withstand bending moment or pillar loading along the corrugations

④ Angle of corrugations is 45°

⑤ The edge of corrugated bulkhead which joins shell plating must have stiffened flat plate to increase transverse strength.

⑥ Unlike in watertight bulkhead a vertical stiffner need not be used This saves wt & cost

⑦ Diaphragm plate or ~~vert.~~ horizontal stringers are fitted on bulkhead to keep corrugations in place.

⑧ Fitted in tanks → ease of drainage improved cleaning.

Page No.
Date

CLYDE

* Watertight Bulkhead

① They divide the ship into watertight compartments & thus restrict ingress of water into the compartment.

② Bulkheads separate cargo from each other & also cargo from machinery spaces.

③ Also these bulkheads are fitted transversely which increase the transverse strength of ship. They also help to prevent spread of fire.

④ Bulkheads are tested for watertightness by hosing them with a pressure of $200 KN/m^2$

⑤ If hose test is not possible, the welds of bulkhead are visually examined (DPT or ultrasonic test)

* Non-watertight Bulkhead

① Bulkheads in accomodation.

② Also wash bulkhead in fore end construction. It provides strength to fore end against slamming & pounding.

③ Wash bulkhead placed at centerline hence comes under longitudinal bulkhead.

Page No.
Date

CLYDE - HATC Student

① Length overall :
* It is the total length of ship from fwd extreme end to aft extreme end.
* It is the greatest length of ship.

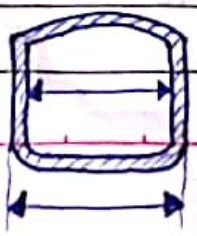
② Fwd perpendicular :
* It is the line drawn from pt of intersection bet^n summer load line & stem of ship.

③ Aft perpendicular :
* It is the line drawn from pt of intersection bet^n summer load line & rudder stock.

④ Length bet^n perpendiculars :
* It is the length of ship from forward ⊥ to aft ⊥

⑤ Breadth extreme :
* It is the greatest breadth of ship from outside of shell plating.

⑥ Breadth moulded :
* It is the breadth of ship from inside of shell plating.

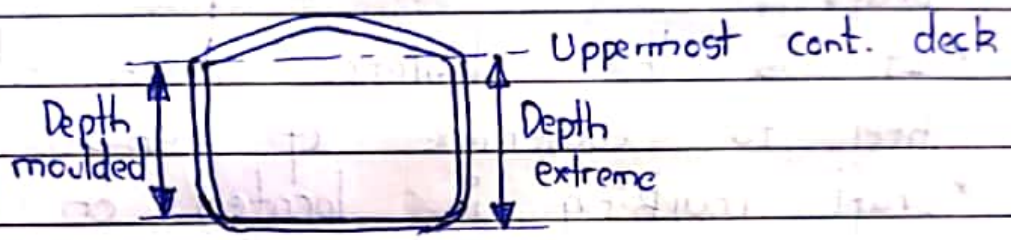


⑦ Depth extreme :

* It is the greatest depth from bottom of keel plate to deck beam of continous deck

⑧ Depth moulded :

* It is the depth from ~~bottom~~ top of keel plate to deck beam of continous deck.

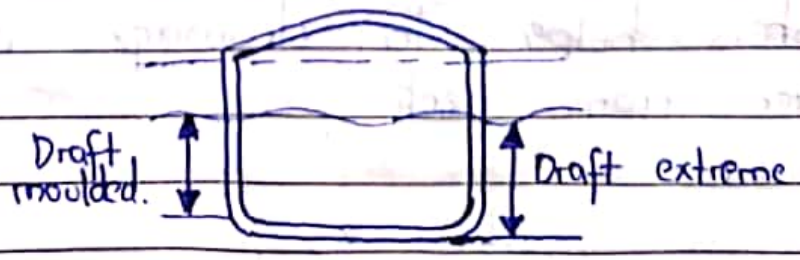


⑨ Draft extreme :

* It is the greatest depth from bottom of keel plate to water line

⑩ Draft moulded :

* It is the depth from top of keel plate to waterline.



CLYDE

Page No.
Date / /

⑪ Freeboard :-

* It is the distance measured from waterline to deck beam of continous deck
  - to get enough reverse buoyancy.
  - to ensure ship is not loaded more than her capacity.
  - protects water from entering on deck.

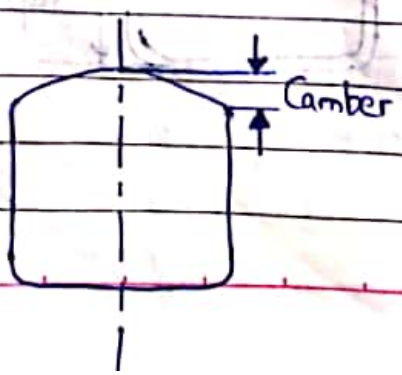
⑫ Draft :-

CLYDE

* It is the distance measured from keel to waterline of ship.
* Draft marking is located on forward of ship, midship & aft of ship.
* The difference in draft will tell the trim of ship

⑬ Camber :-

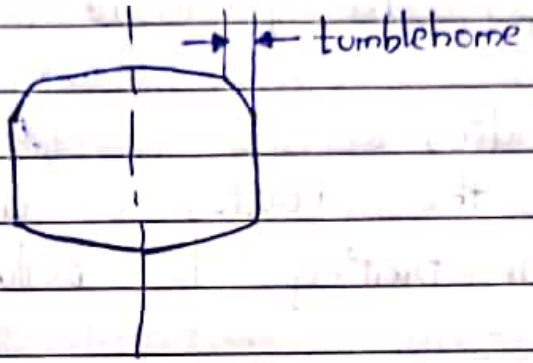
* Also called round of beam
* It is the rise of deck from ship side to centerline.
* It is normally B/50
* Camber helps in drainage of green water from deck.



Page No.
Date

⑭ Tumblehome :-

* The inward curvature of ships side above the summer load line is called tumblehome.

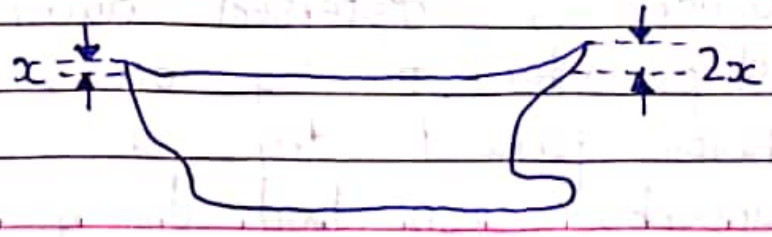


CLYDE

* It gives a better appearance to ship.

⑮ Sheer :

* It is the rise of deck in fore & aft direction.
* The amount of sheer is measured vertically from level line through deck at midship to deck at the 2 perpendiculars
* Fwd sheer is always more compared to aft
  - to increase buoyancy force at ends of vessel
  - to increase reserve buoyancy at ends of vessel.
  - to increase sea worthiness of vessel.

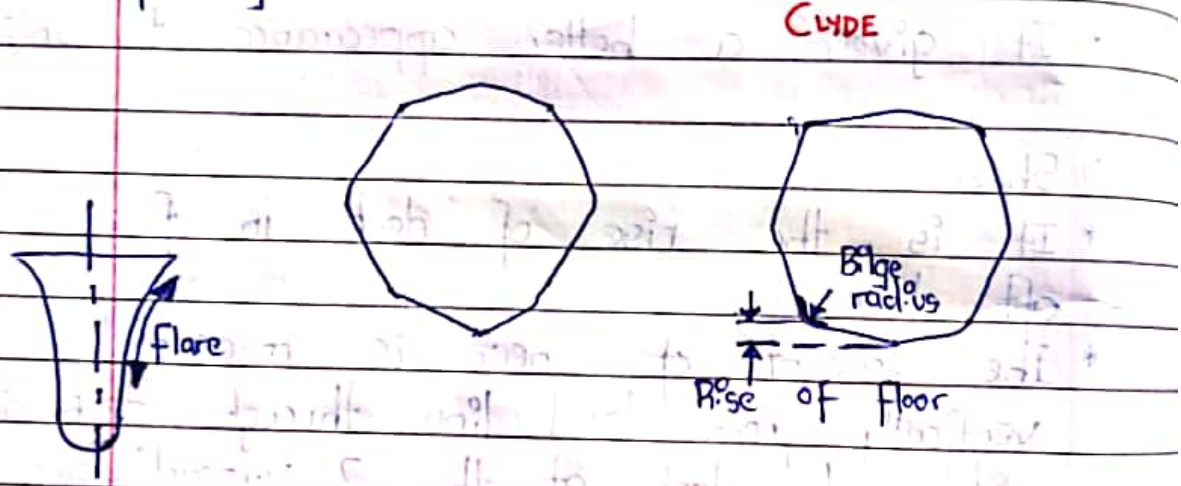


limber hole is hole through frame or any structure to drain water & prevent accumulation of water.

Page No.
Date

(16) Rise of floor :
* Also called dead rise
* It is the vertical ht. from baseline to turn of ship side plating.
* It helps to facilitate drainage.

(17) Bilge radius :
* It is the radius or arc connecting side shell plating to bottom shell plating.



(18) Flare :-
* It is the outward curvature of shell plating at forward end of ship.
- allows space for anchor drop
- creates a wider foxile deck giving more space for fitting machinery like winch & windlass
- water is dispersed away from ship when pitching occurs
- Keeps forward dry.
- absorbs shock load during head on collision.

Line drawn atleast 76mm below surface of deck
It is max permissible ht after which vessel will sink.

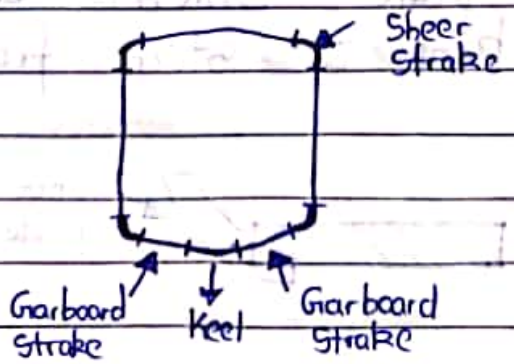
Page No.
Date

⑲ Shell plating :
* It is also known as strakes.
* Shell plating comprises of the external hull of ship which ~~comp~~ consists of
- bottom shell plating.
- ship side plating.
- main deck plating.

CLYDE

Function :-
- to provide longitudinal strength to ship.
- to provide watertightness to ship side.

⑳ Sheer Strake :
* It is the plate that connects main deck plating & ship side plating.
* It is 10~20% thicker than other plating.
* Lots of tensile & compressive stress within that region hence extra thickness required.



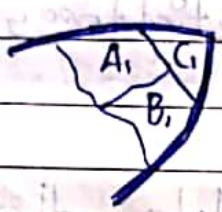
㉑ Garboard Strake :
* It is the plate adjacent to keel on either side.

(22) Bilge Strake :-

* It is the strake which is at turn of bilge radius

(23) Stealer Strake :-

* At ends of ship particularly at b... width of strakes decrease & it is often desirable to merge 2 strakes into 1



C_1 = Stealer Strake

(24) Shoe Plate :-

* It is a plate which connects flat plate keel & stem (fwd)

(25) Coffin Plate :-

* It is a plate which connects flat plate keel & stern frame

(26) Reserve buoyancy :-

* It is potential buoyancy of ship which depends on intact watertight vol above waterline.

Page No.
Date

(27) Buoyancy :-
* It is the upthrust force exerted on ship

CHYDE

If buoyance force increases, BB decreases
If mass is added, BB decreases

(28) Freeing port :-
* It is an opening provided on ship side to allow water on deck to drain ovbd.
* It helps to reduce free surface effect.

(29) Bulwark :-
* It is a solid structure that extends above the weather deck.
* Fitted so that crew doesn't fall ovbd.

(30) Gross Tonnage :-
* It is the vol of all enclosed spaces on ship including ER & non-cargo spaces

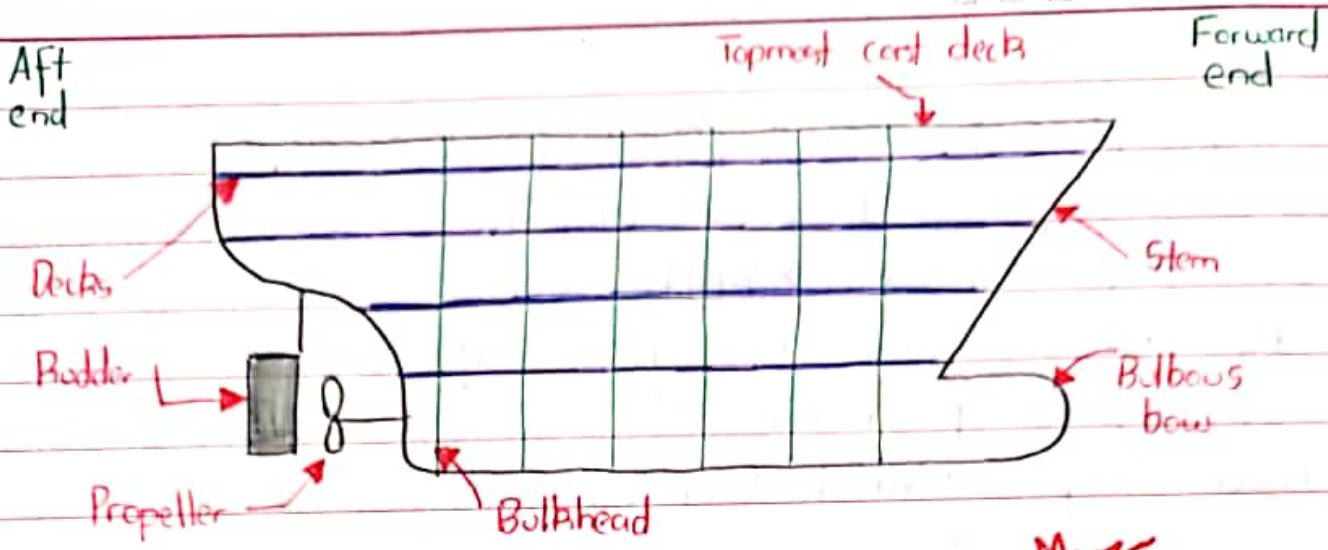
(31) Net Tonnage :-
* It is the vol of only the cargo space on ship.

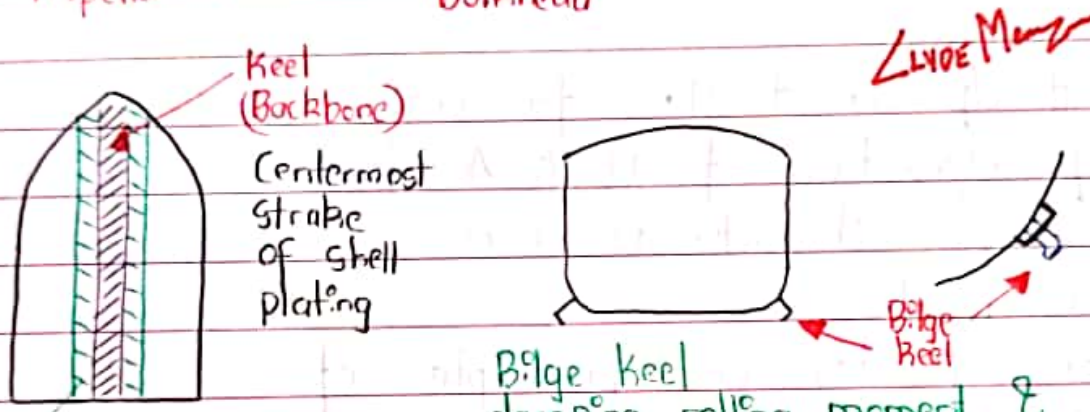
(32) GRT is the entire gross vol of ship. NRT is the entire cargo vol of ship.

Ship Construction

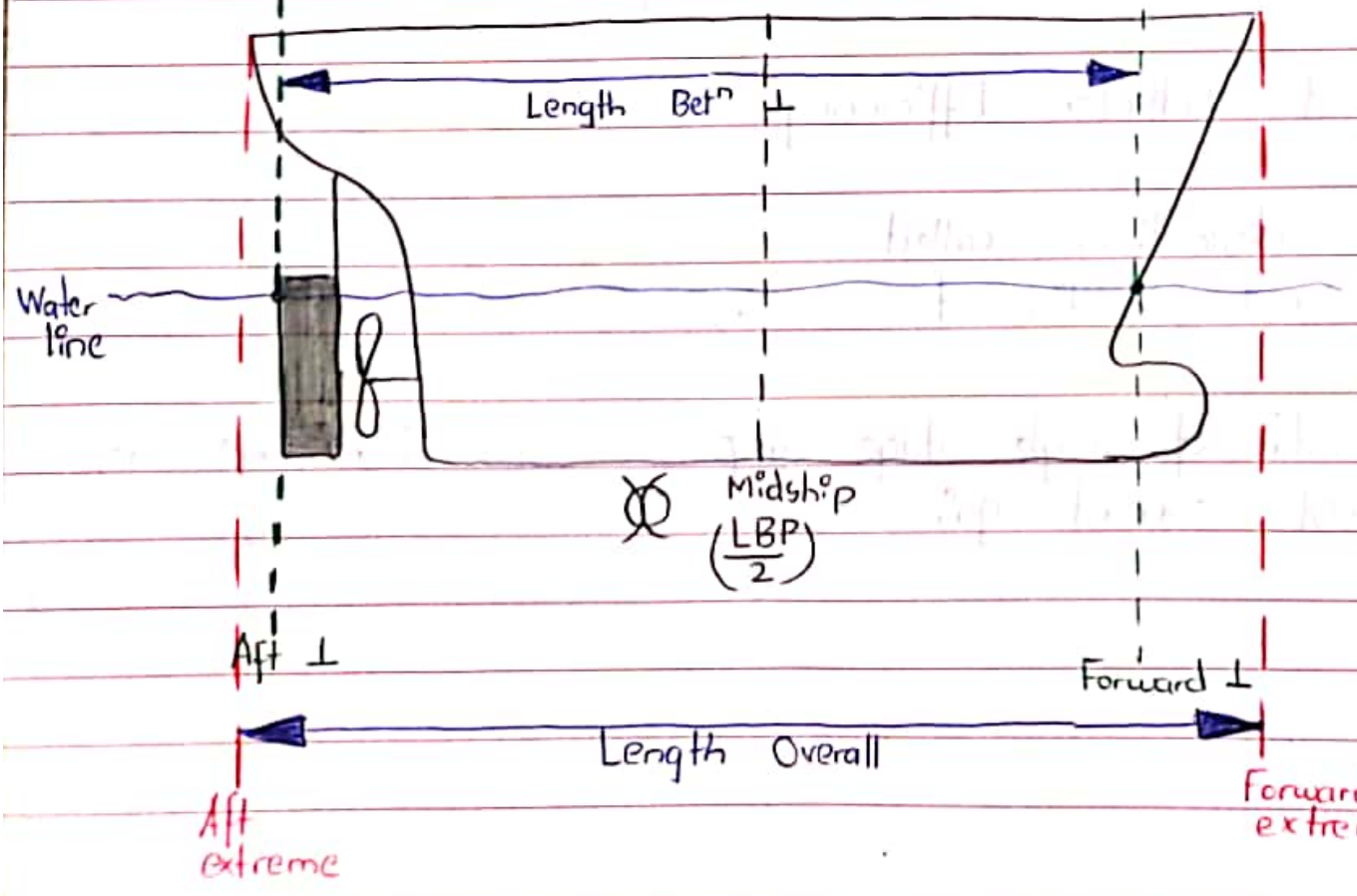
Date : .....

MON TUE WED THU FRI SAT SUN



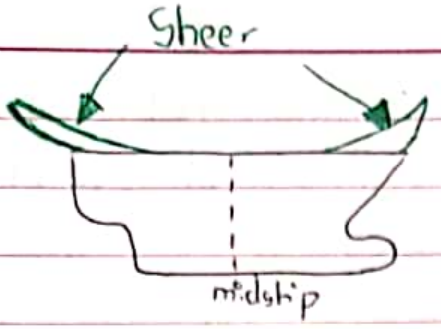


Bilge keel damping rolling moment & provides longitudinal strength to ship



Date :

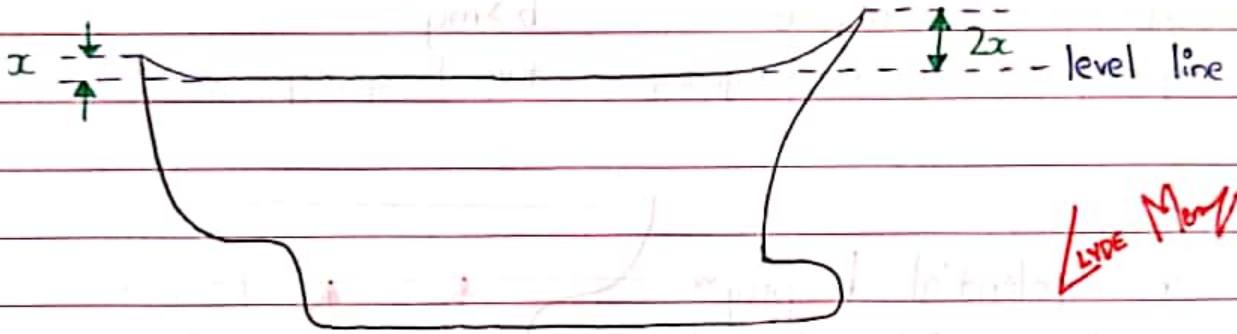
MON TUE WED THU FRI SAT SUN



Curvature of deck in longitudinal direction = Sheer

Aft perpendicular :- Point of intersection bet^n the Summer load line & line drawn from rudder stock or rudder post.

Forward perpendicular :- Point of intersection bet^n the Summer load line & line drawn from stem



Sheer :- It is the rise of deck in fore & aft direction The amount of sheer is measured vertically from level line through the deck at the midship to the deck at the 2 perpendiculars (forward & aft perpendicular)

Fore Sheer is always more compared to aft

* to increase buoyancy force at ends of vessel.
* to increase reserve buoyancy at ends of vessel
* to increase sea worthiness of vessel.

Freeboard & Reserve buoyancy

Date :

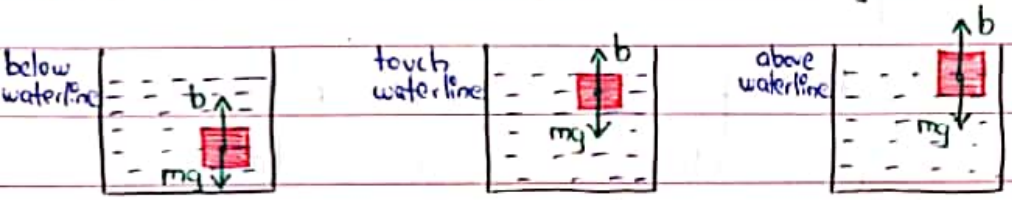
MON TUE WED THU FRI SAT SUN

COB :- It is the pt about which net resultant thrust force passing through this pt vertically upwards

COB depends on the underwater volume

COB depends on the angle of heel or list.

Water pr acting on ships hull vertically upwards perpendicular to surface ∴ Buoyancy Force

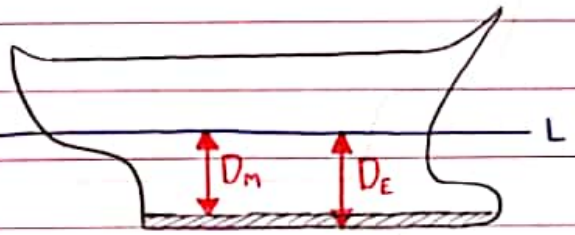


LYDE Menz

mg > b	mg = b	b > mg
-ve buoyancy	neutral buoyancy	+ve buoyancy

Reserve Buoyancy :-

It is the potential buoyancy of any ship which depend upon the intact watertight volume above the waterline of ship.



If buoyancy force increases, reserve buoyancy increases

If buoyancy force decreases, reserve buoyancy decreases

If mass is added, reserve buoyancy decreases.

If mass is removed, reserve buoyancy increases.

Date :

MON TUE WED THU FRI SAT SUN

Shell Plating (Strakes)

It is the external hull of ship which consists of bottom shell plating, ship side plating & main deck plating which are formed by longitudinal strips. is called STRAKES

Function Of Shell Plating

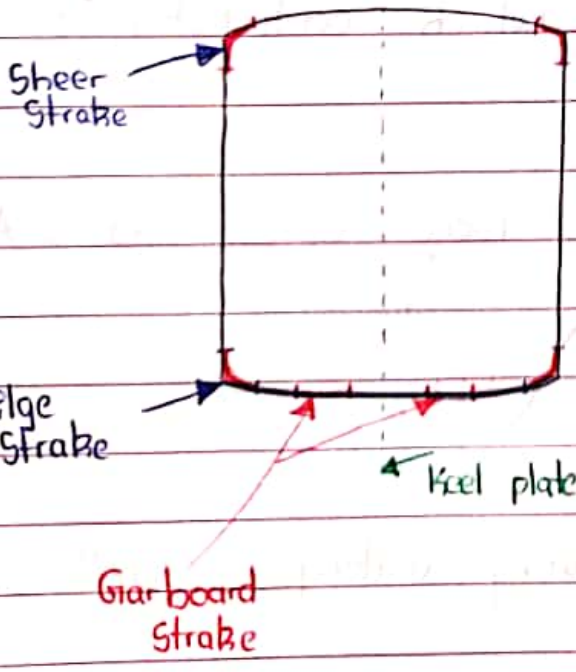
- contribute to longitudinal strength
- to provide water tightness to ship side.

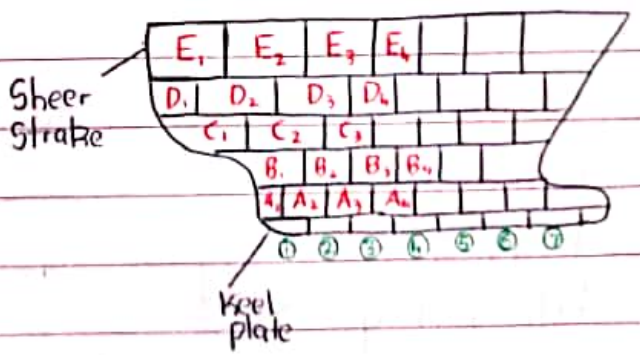
Ship Side Plating

* Sheer strake

Bottom Shell Plating

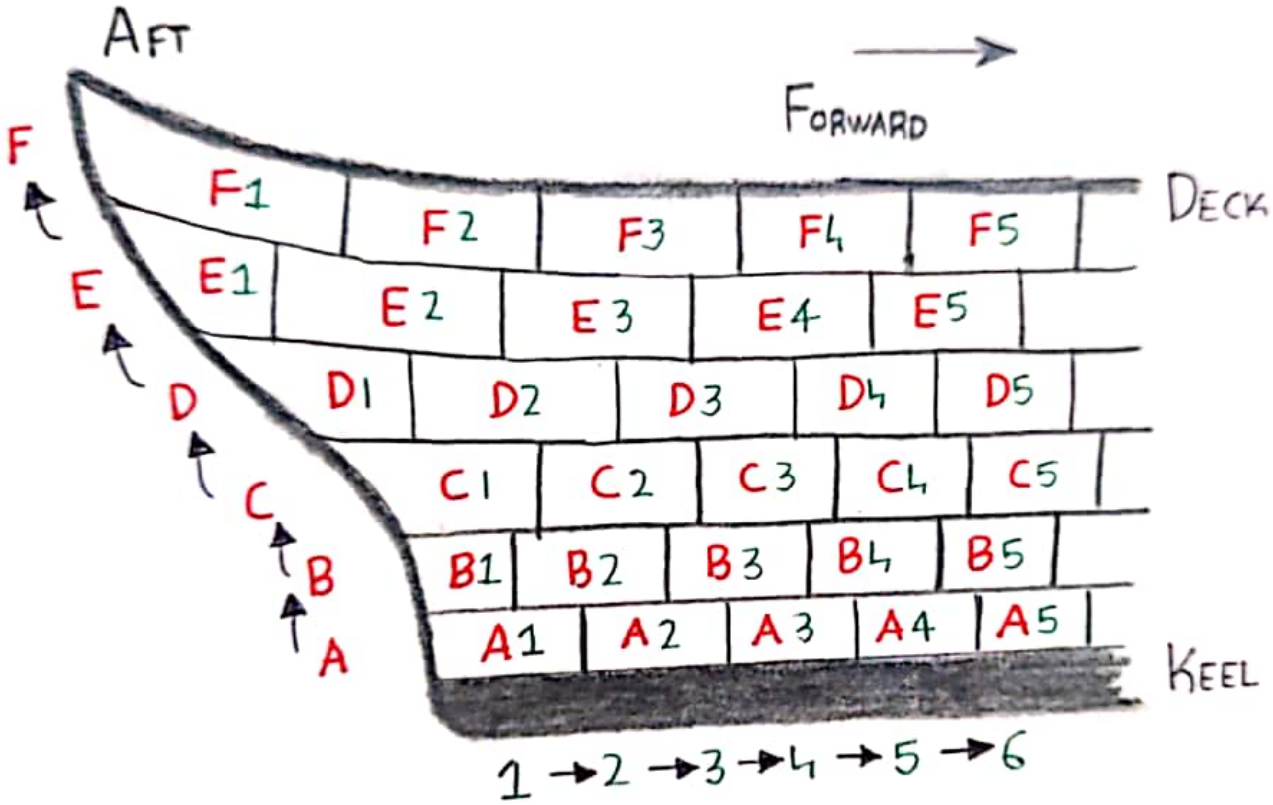
* Garboard strake





Butt welding

Fillet welding



Date :

MON TUE WED THU FRI SAT SUN

Sheer Strake :- It is the plate which connects the main deck plating & ship side plating

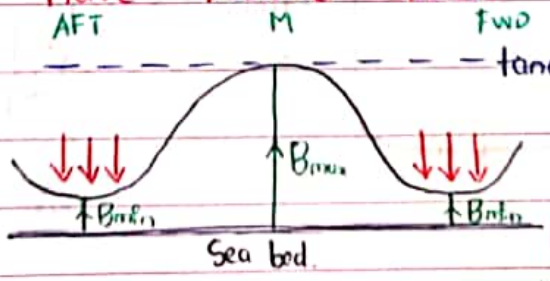
* The thickness of sheer strake is usually atleast 3mm more than that of main deck plating & ship side plating (whichever is greater)
* This portion may be subjected to tensile or compressive stress

It is 10 to 20% thicker than other side plating

Lots of stress concentration occurs in this region, hence higher plate thickness is required to keep stress levels within designed limits

When ship is bending from forces from tension to compression & shear stress is subjected to max tensile & compressive which contributes to strength of hull

Hogging When we have loaded more cargo Fwd & Aft w r t midship



Due to hogging, bottom shell plating undergoes compressive ~~strength~~ stress & ~~sid~~ top shell plating undergoes tensile stress

Conditions for Hogging & Sagging

→ Ship must be in static condition. Anchor or Port

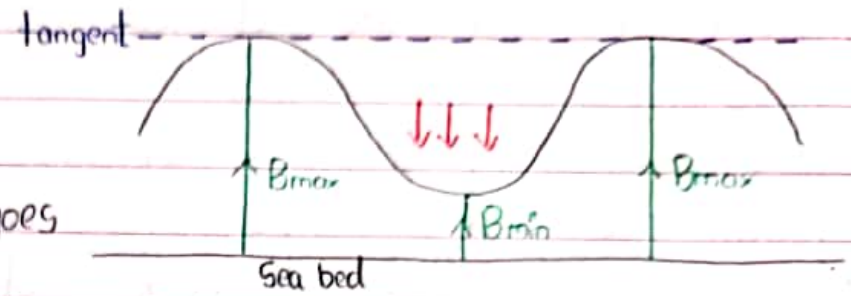
→ Uneven distribution of mass loading, discharging ballasting, deballasting, bunkering.

Date :

MON TUE WED THU FRI SAT SUN

Sagging When we have loaded more cargo center w r t Fwd & Aft

Due to sagging bottom shell plating undergoes tension & top shell plating undergoes Compressive stress



Garboard Strake :- It is the stake which in adjacent to keel plate on either side of ship.

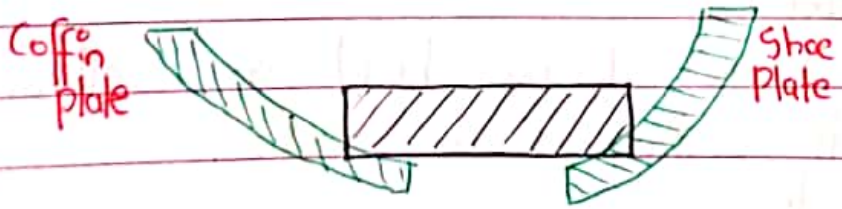
Bilge Strake :- It is the strake at turn of bilges

Bilge radius :- It is the radius which connects bottom shell plating & ship side plating at center of ship.

Shoe Plate :- It is a plate which connects flat plate keel & stem (FWD)

Coffin Plate :- It is a plate which connects flat plate keel & stern frame

Stringer Strake : It is the extreme strake of deck plating present at side



Date :

MON TUE WED THU FRI SAT SUN

(Dead rise)

Rise of floor :- This is the vertical ht from baseline to the turn of ship side plating.

* Used to facilitate drainage of cargo hold bilges

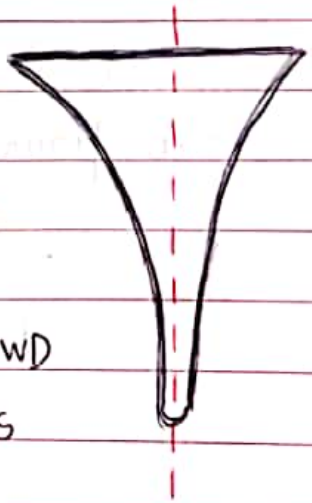
Camber (Round of beam) :- It is the rise of deck from the ship side to centerline.

* Used to facilitate drainage of deck water
* Parabolic in nature (B/50)

Stealer plate :- At ends of ship particularly at bow, the width of strakes decreases & it is often desirable to merge 2 strakes into 1.

Flare :- It is the outward curvature of shell plating at forward end of ship.

Here C_1 is called Stealer Plate



* It allows space for anchor drop.
* It creates a wider foxile deck giving more space for fitting of machinery like windlass.
* Water is dispersed away from ship when lightly pitching occurs.
* It increases reserve buoyancy at FWD end to provide better sea worthiness during rough weather.
* To absorb shock loads during head on collision.
* To protect side shell plating from anchor
* To keep forward dry.

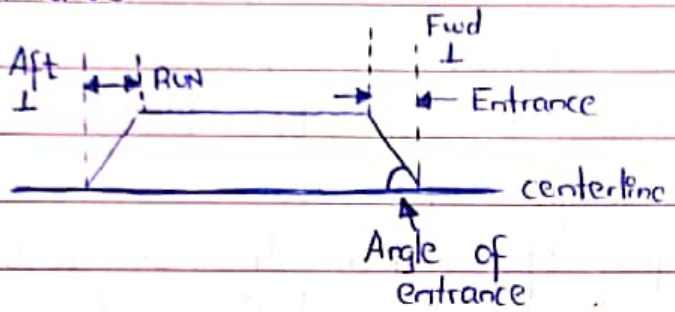
Date :

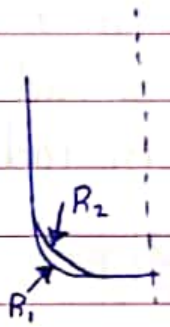
MON TUE WED THU FRI SAT SUN

Freeing Port :- The opening provided on ship side to allow water on deck to pass through sea.

* It is provided to reduce free surface effect.

Bilge Radius





LYDE Mean

Date :

MON TUE WED THU FRI SAT SUN

Purpose of loadline

* It allows max. legal permissible valve upto which a ship can be loaded without any damage.

Loadline requirements

① Area under GZ curve should be following.
- area under GZ curve should be less than 0.055 m-rad upto angle of 30°
- 0.09 m-rad upto angle of either 40° or less.
- 0.03 m-rad when angle of heel bet^n 30° & 40°

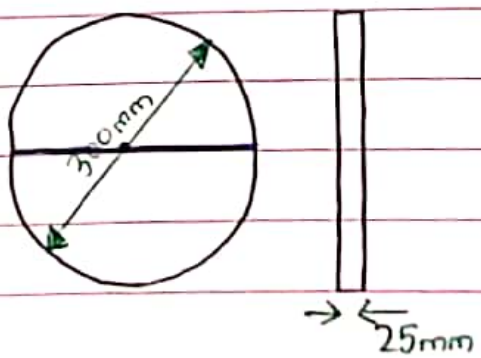
② Righting lever shall be atleast 0.20m when angle of heel $\geq 30°$

③ Max GZ shall occur at angle not less than 30°

④ Metacentric ht should not be less than 0.15m

How to draw loadline.

* There are 2 types of loadline marking
  - Std loadline marking (valid for all ships)
  - Timber loadline marking
* There are 3 vital parts of loadline
  - deck line reference line to decide freeboard whose dimensions are $l = 300mm \times b = 75mm$
  - load line disc
    It is 300mm dia & 25mm thick round shaped dis

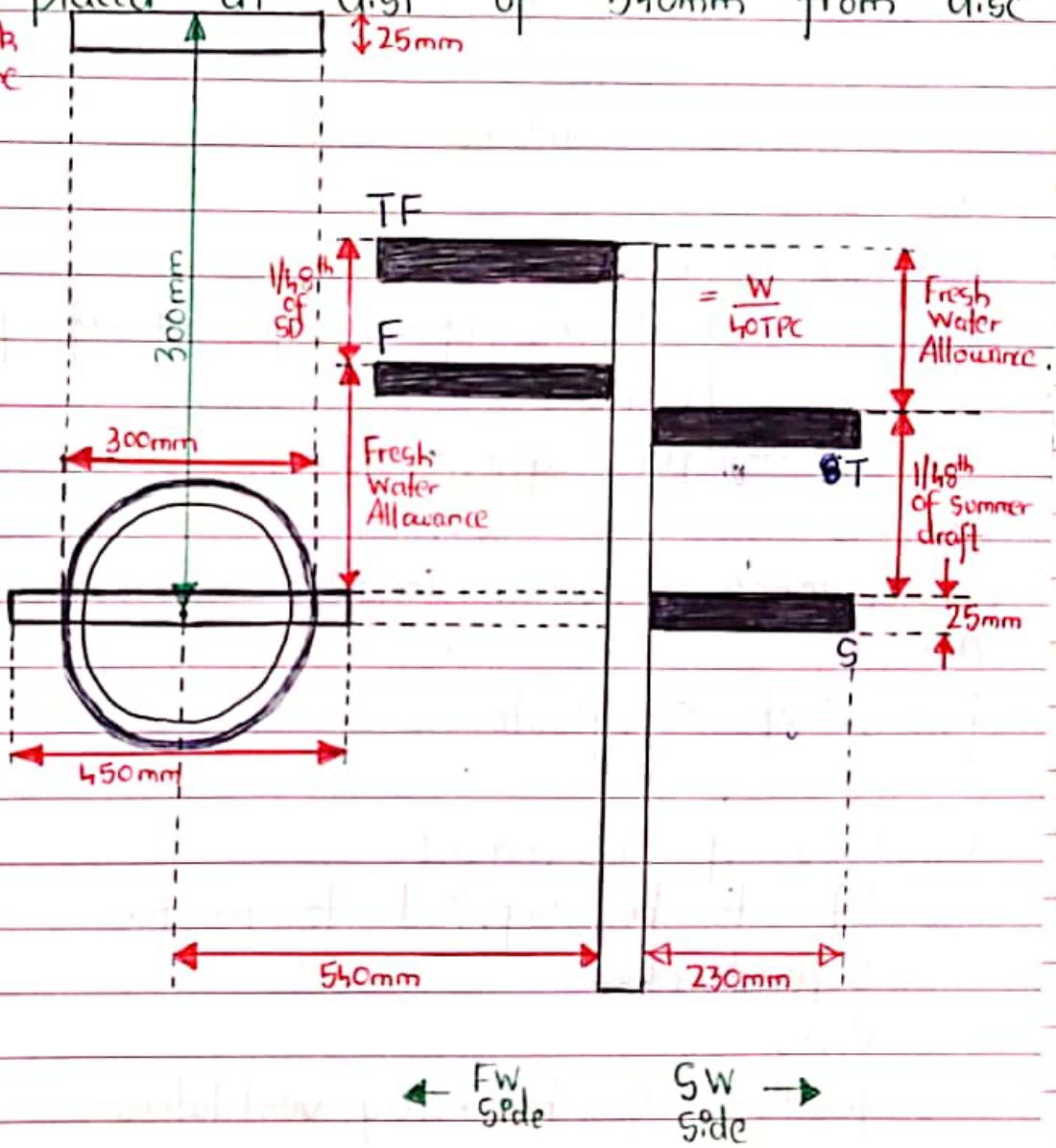


Date :

MON TUE WED THU FRI SAT SUN

The upper edge of horizontal line marks the Summer water line also called Plimsoll line.
- load line

The horizontal line extending fwd & aft from vertical line placed at dist of 540mm from disc center.



Date :

MON TUE WED THU FRI SAT SUN

6 Degree of freedom of ship

Heaving
Swaying
Surging
} Linear motions of ship

Rolling
Pitching
Yawing
} Rotational motions of ship.

Heaving → linear motion up & down
Swaying → P to S
Surging → Fwd to Aft

Rotational motion given to surging → Rolling
Rotational motion given to swaying → Pitching
Rotational motion given to heaving → Yawing

COEF OF FORMS

Date :

MON TUE WED THU FRI SAT SUN

* Coefficient of forms are unitless quantity or dimensionless which describes hull fineness & overall shape of ship.

* It is a ratio of area of volume for actual hull form as compared to Prism or Rectangle which is defined by Length, Breadth & Height (draft) all moulded.

CLYDE

Since length & width on waterplane as well as draft vary with displacement. Hence coef of form also vary with displacement.

Range of coefficients from 0 to 1

There are mainly 4 types of coefficients

① BLOCK COEFFICIENTS (coef of fineness) (C_b)

It is ratio of immersed hull volume to the product of Length, Width, Draft of ship

$$C_b = \frac{\nabla \text{ (underwater volume)}}{L \times B \times D}$$

Its value lies between 0 to 1

The purpose is to determine, the amt of freeboard, ship should have economic hull design, to determine the hull flare.

Date :
MON TUE WED THU FRI SAT SUN

NOTE : Ship having higher block coef → indicates flat bottom along with more interior volume
Ship having smaller block coef → indicates fine bow & fine astern sections.

for tanker 0.85 C_b
container 0.70 C_b
warship 0.50 C_b

② PRISMATIC COEFFICIENTS (C_p)
It is the ratio of vol of displacement to product of length & area of immersed section midship.

$$C_p = \frac{\nabla}{L \times A_m}$$

* Prismatic coef provides an indication of distribution of displacement
* It is an indication of fineness of ends with respect to midship section

Ship having low prismatic coef → indicates large fine ends & large mid body.
Ship having higher prismatic coef → indicates more displacement distributed towards ends wrt midship

③ MIDSHIP SECTION AREA COEFFICIENTS (C_m)
It is ratio of area of immersed section of midship to product of breadth and draft
It gives an idea of shape of ship at midship

$$C_m = \frac{A_m}{B \times d}$$

Date :

MON TUE WED THU FRI SAT SUN

⑤ WATERPLANE AREA COEFFICIENT (C_w)

It is ratio of the area of waterplane to the product of length and breadth.

$$C_w = \frac{A_w}{L \times B}$$

Higher C_w → indicates good stability, good manoeuvring & high frictional resistance.

Lower C_w → indicates low frictional resistance & fine ends.

A_w (waterplane area) can be found by simsons rule.

CLYDE

Ship length = 120m

ordinates	Simsons Multiplier	SOP
2·0	1	2x1
1·8	4	1·8x4
3·0	2	3·0x2
7·0	4	7·0x4
8·9	2	8·9x2
9·0	4	9·0x4
0	1	0

now no of ordinates = 7 (odd) so apply 1/2 ordinate rule.

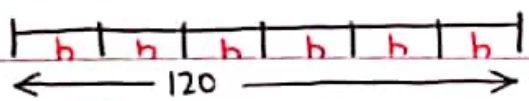
1 4 1

1 4 1

1 4 2 4 1 → for 5 ordinates

1 4 1

1 4 2 4 2 4 1 → for 7 ordinates



$6h = 120$

$h = \frac{120}{6}$

B = max ordinate value = 9 x 2 = 18

$$A_w = \frac{h}{3} \times \Sigma(SOP) \times 2$$

$$C_w = \frac{A_w}{L \times B}$$

panting → ship side plating
pounding → bottom hull of ship.

Date :

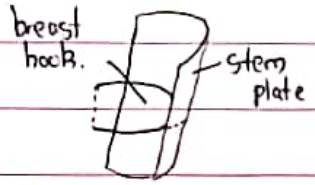
MON TUE WED THU FRI SAT SUN

FOREPEAK TANK CONSTRUCTION

The following structed are found :

Stem Plate or Stem Bar

* it forms the profile of bow
* it is normally made up of steel plate & stiffened by centerline girder or stiffner
* the stems run from highest pt to keel of foxile.



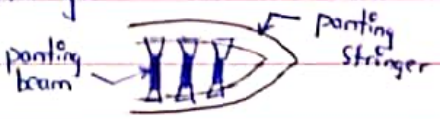
Breast Hook::

* it connects stem plate to side stringer or (panting stringer)

1

Panting Stringer (side stringer)

* it is fitted at regular intervals on ship side to reduce panting effect
[inward & outward deformation of ship side plating is called PANTING]
* This happens due to change in water pr



Panting Beam

* it is supported by pillars & normally it is spaced at every other frame
* it absorbs the transverse fluctuating forces (induced during slamming & pounding of ship)

Date :

MON TUE WED THU FRI SAT SUN

Perforated Bulkhead (Swash bulkheads) (Wash bulkhead)

* it is not watertight
* its main function is to reduce free surface effect or heeling moment of water in tanks.
* this is for ships having tanks partially filled.

Solid Floors

* it is fitted at every frame
* it provides strength of ships bottom structure
* a centerline girder is fitted to provide rigidity of structure. & fitted transversely

Collision Bulkhead.

Deck Head

* it is the uppermost deck of forepeak tank which must be watertight.
* entry to forepeak tank is through manhole doors. which are kept watertight with covers

Date :

MON TUE WED THU FRI SAT SUN

Panting

* It is the in & out movement of shell plating caused due to variation in water pr is called panting
* This effect is found to be the greatest at fore & aft end of ship where shell is relatively flat.
* Due to pitching motion of ship, additional variation in water pr causing panting

Arrangements to stop panting

① Horizontal plates welded to sides of vessel called Panting stringer

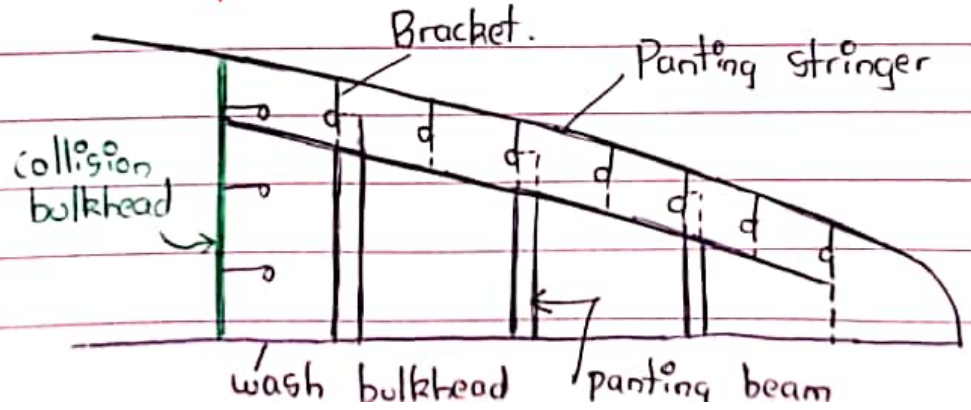
② Transverse beams extending from side to side called Panting beams

+Sometimes instead of Panting beams, there are perforated flat plates

* Panting beam is connected to bracket
* Panting beam are fitted on alternate frames
* Panting stringer is located FWD of collision bulkhead

③ Pillars are also fitted to wash bulkhead to tie Panting beams together

④ Collision bulkhead is stiffened by vertical bulb angle 600mm apart



Date :

MON TUE WED THU FRI SAT SUN

Pounding

When ship enters rough weather & starts heaving & pitching, the bow rises over crest of wave & emerges completely out of water. When bow goes back in water, it is subjected to tremendus slamming called Pounding.

Arrangements to stop pounding

① SF is strengthened to resist the effects of pounding from collision bulkhead to 25% of ships length forward.

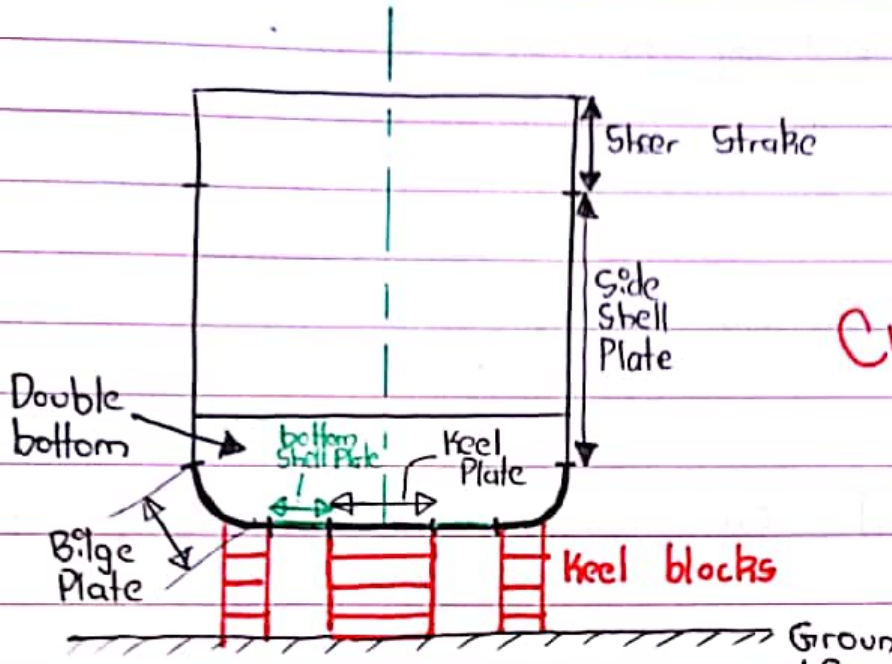
② Flat bottom shell plating adj to keel on each side is thicker 15% to 30% depending on ships length.

③ Plate floors are fitted at every frame space & are connected to outer bottom parting by continous welds.

④ Extra intercoastal side girders such that dist bet^n them does not exceed 2.2m.

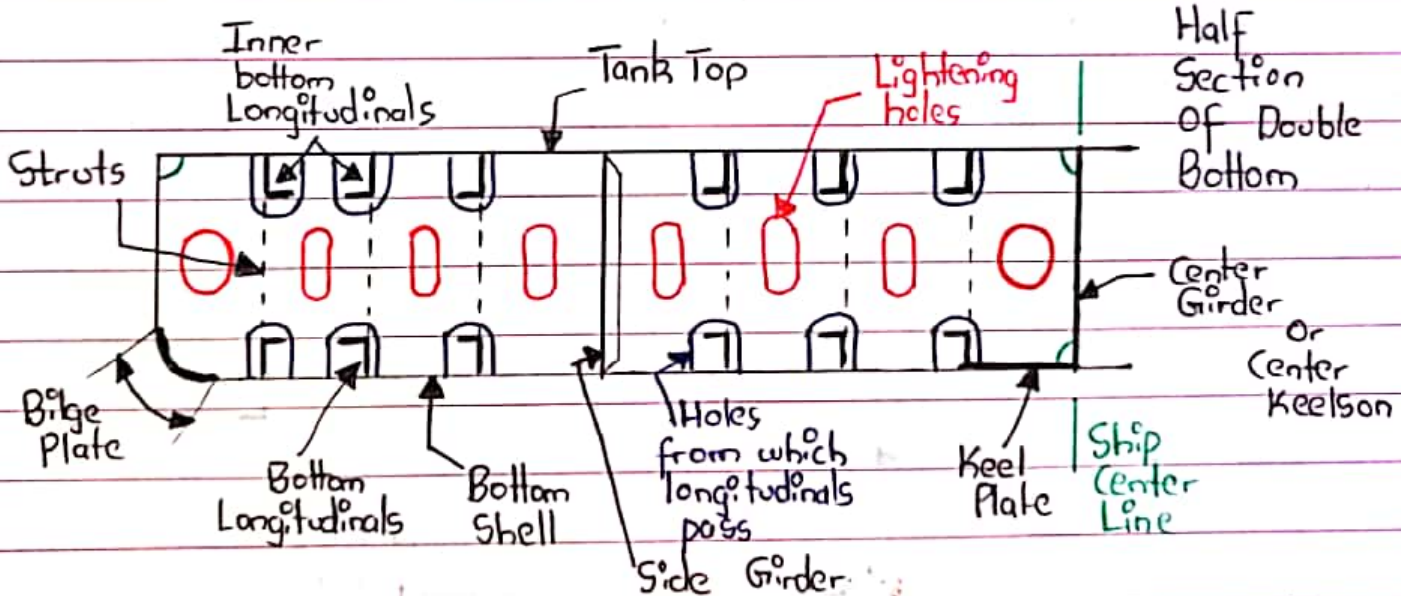
Date :

MON TUE WED THU FRI SAT SUN



CLYDE - MUMBAI

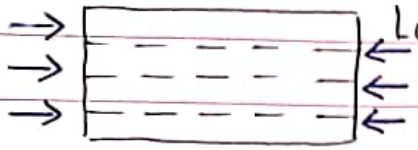
Longitudinal Framing



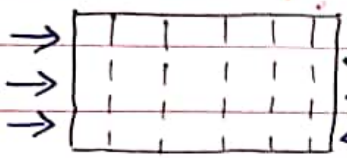
* Struts help to stiffen floor plate
* Bigger breadth of ship means more than 1 side girder
* Keel plate is slightly higher thickness.
* DB can be used for ballast water
* Center girder is a water tight girder
* Side girder may or maynot be watertight

Date :

MON TUE WED THU FRI SAT SUN



Longitudinally Framed

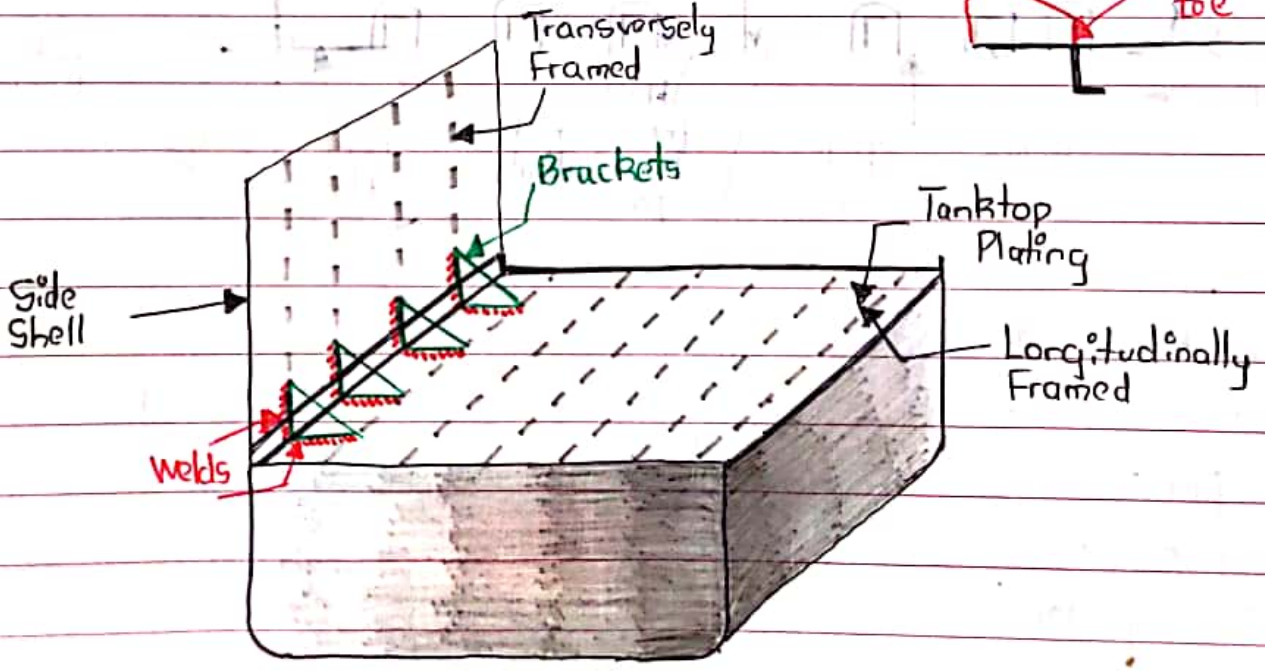


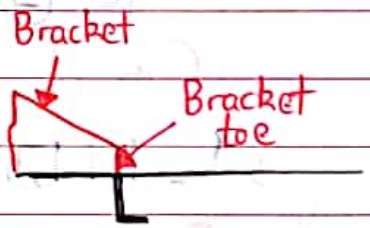
Transversely Framed

* Longitudinally framed can sustain higher amt of load.

$$\left(\frac{\text{Strength}}{\text{wt}}\right)_{\text{long}} > \left(\frac{\text{Strength}}{\text{wt}}\right)_{\text{trans}}$$

* For same wt, strength long. would be better

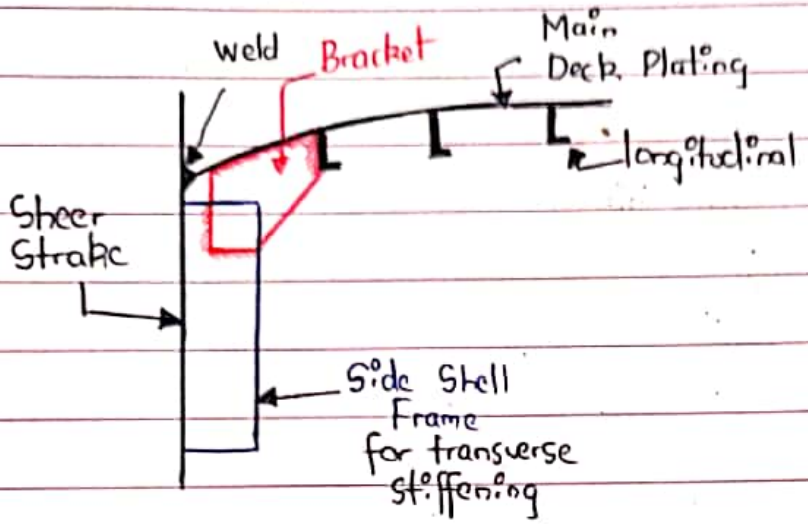


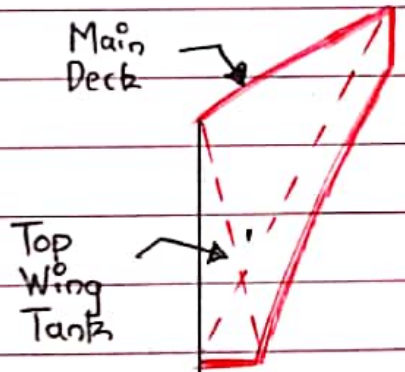


Date :

MON TUE WED THU FRI SAT SUN

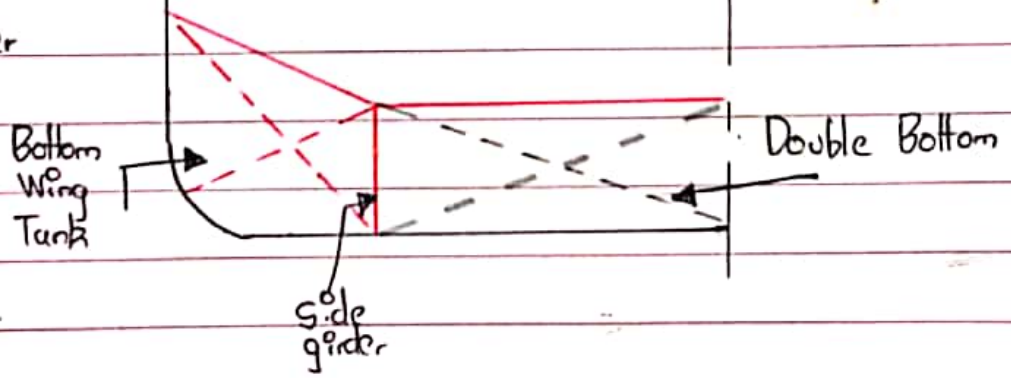
· CLYDE - MUMBAI





* Top & Bottom wing tanks are only in Bulk Carrier

Half Cargo Hold of Bulk Carrier



Transverse Stability :-

* It is the transverse inclination of ship along the width either port or stbd

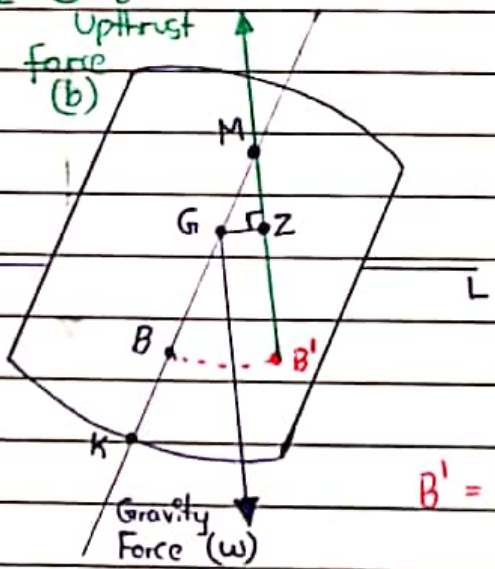
CLYDE

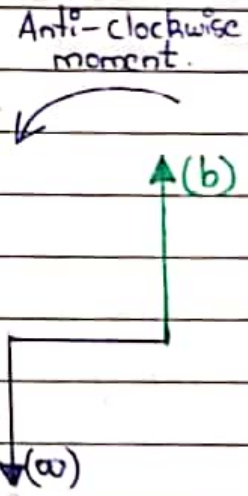
* For ship to be in stable equilibrium, we want center of buoyancy (B) & center of gravity (G) to be on same centerline

* But when ship heels or lists, the above condition can change. Here we'll have 3 cases as when ship heels or lists, center of buoyancy changes

* So center of buoyancy (B) can pass wrt G in 3 cases

CASE ① :-



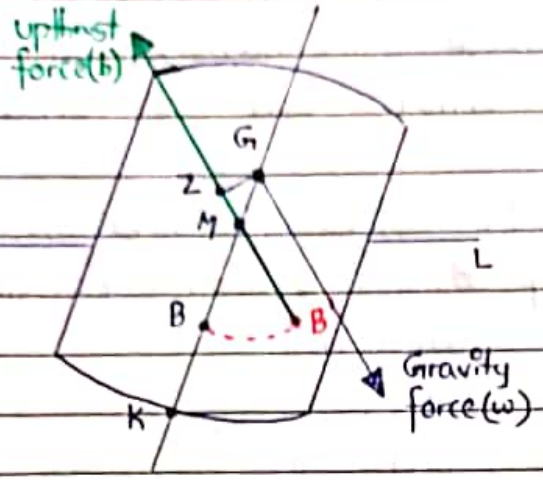


B' = shifted center of buoyancy

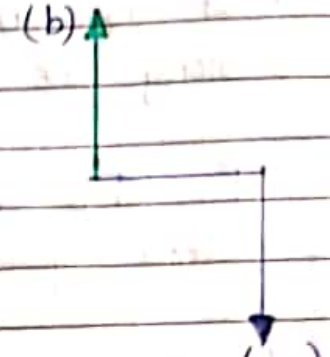
* In this case KM > KG
* Due to upthrust force (b) & gravity force (w), a anti-clockwise moment will be created.
* This will bring the ship back from its heeling position
* This is case of **Stable Equilibrium**

clockwise moment

Case ② :-

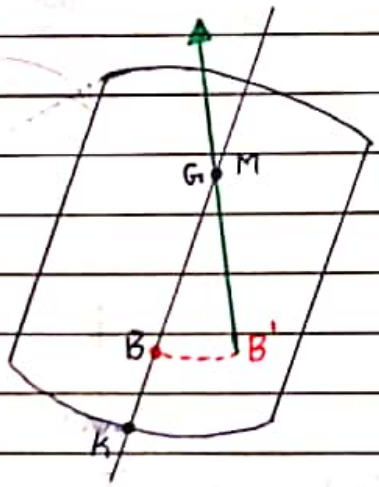


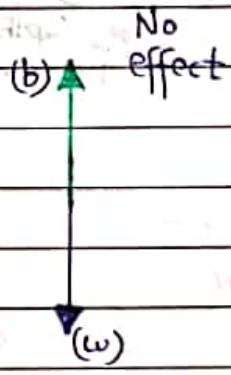
* Here GZ is called capsizing lever



* In this case KM < KG
* Due to upthrust force (b) & gravity force (w) a clockwise moment will be created
* This will cause the ship to heel further
* This is case of **Unstable Equilibrium**

Case ③ :-





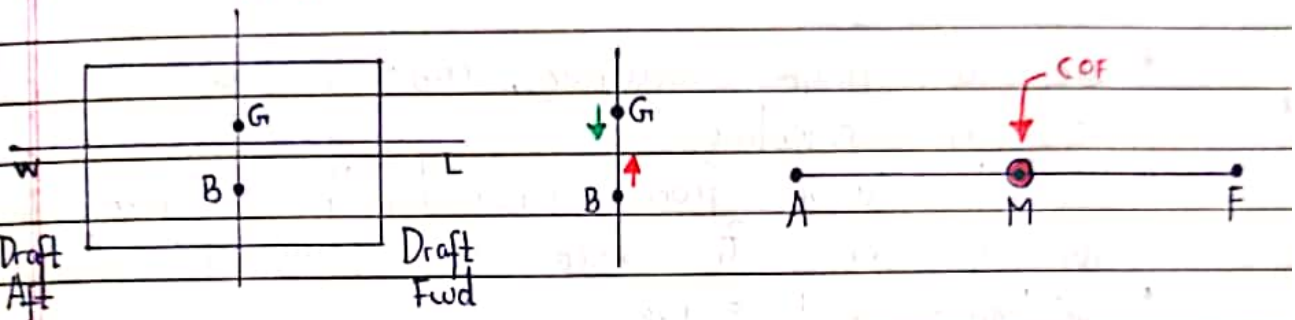
* In this case KM = KG
* Here upthrust force (b) & gravity force (w) will act on same centerline
* This won't allow to further list nor bring back the ship
* This is case of **Neutral Equilibrium**

Longitudinal Stability :-

* It is the longitudinal inclination of ship forward & aft.

* Due to forward & aft movement of ship, the center of flotation also shifts fore & aft

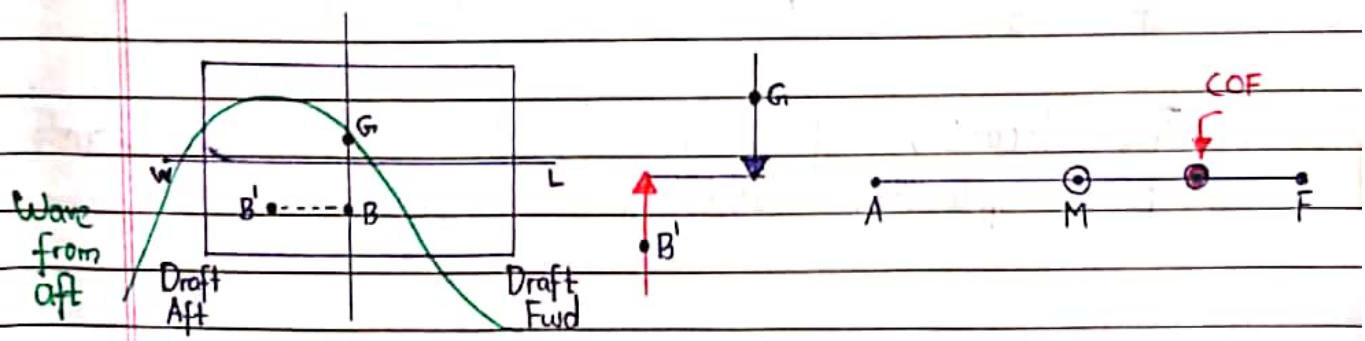
Case ① - Upright Condition → Weather is calm



* Due to calm weather, COB & COG both lie on centerline.
* ∴ $D_{Aft} - D_{Fwd} = 0$
* So center of floatation lies at midship.

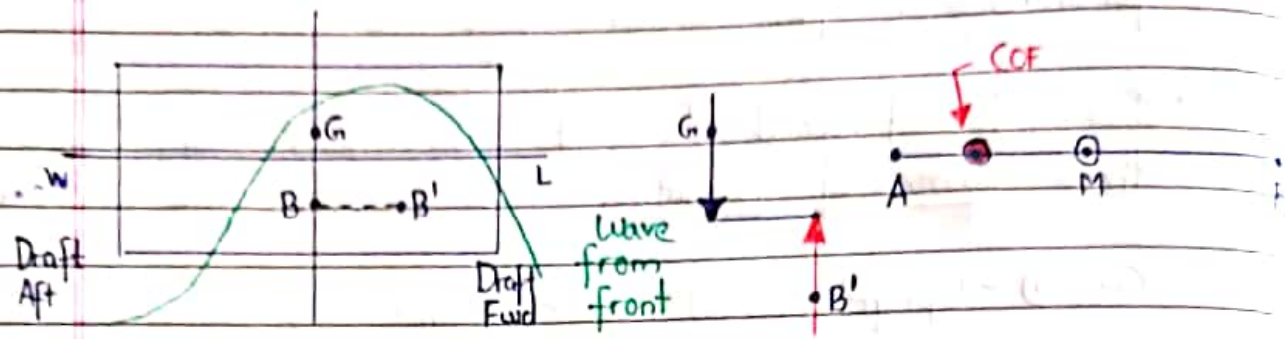
CLYDE

Case ② - Wave from aft → Weather is rough



* Due to rough weather, COB & COG do not lie on centerline
* Due to wave from aft, the underwater vol is more & hence B shifts to B'
* ∴ $D_{Aft} - D_{Fwd} = -ve$
* So center of floatation lies towards forward.

Case ③ - Wave from forward → weather is rough



* Due to rough weather, COB & COG do not lie on centerline
* Due to wave from forward, the underwater vol is more & hence B shifts to B'
* ∴ $D_{Aft} - D_{Fwd}$ = +ve
* So Center of floatation lies towards aft.

→ We always want COF to be at aft inorder to ensure propeller is always in water.

These 3 cases describe the Pitching motion of ship

The location of COF is determined on basis of Longitudinal Stability

Ton per centimeter :-
It is the no. of tons req to cause the ship to sink or rise by 1cm wrt mean draft.

Sink → loading
Rise → discharging

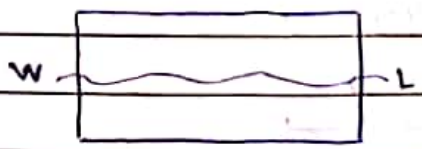
Factors affecting TPC
① Waterplane area
② Draft
③ Underwater volume
④ Buoyancy / upthrust force
⑤ Temp $\propto \frac{1}{\text{Density}}$

CLYDE

Case ①
W = 1000 t (cargo)
$\rho_{SW} = 1.025\ t/m^3$

$\rho = \frac{m}{V}$

$\therefore V = \frac{m}{\rho} = \frac{1000}{1.025} = 976 m^3$



* Less underwater volume
* More buoyancy force

Case ②
W = 1000 t (cargo)
$\rho_{FW} = 1.000\ t/m^3$

$\rho = \frac{m}{V}$

$\therefore V = \frac{m}{\rho} = \frac{1000}{1.000} = 1000 m^3$

More underwater volume
less buoyancy force

Case ② - Ship 1

SW = 22°C
ρ_{SW} is less

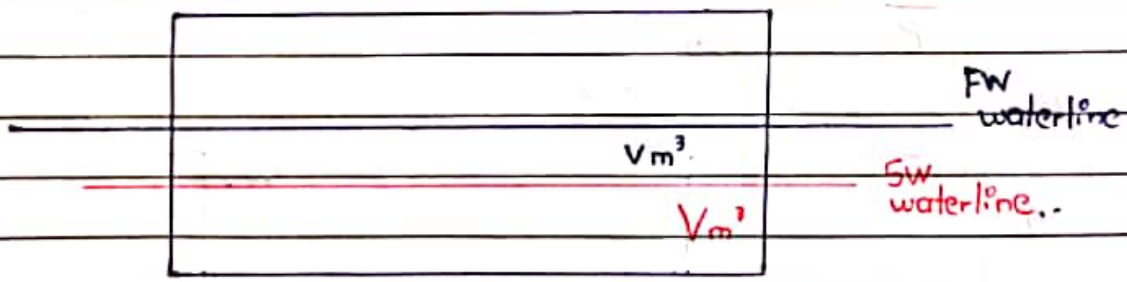
Case ② - Ship 2

FW
SW = 18°C
ρ_{FW} is more

Fresh Water Allowance :-
It is the difference in draft when ship goes from FW → SW or SW → FW

When ship goes from SW → FW
Ship will sink down

When ship goes from FW → SW
Ship will rise up.



Case ① → In FW

$V = (v+V)\ m^3$
$\rho_{FW} = 1\ t/m^3$

$$\rho = \frac{m}{V}$$

$\therefore m = \rho \times V$

$= 1 \times (v+V)$ ①

Case ② → In Sw

$v = V_m^3$

$\rho_{sw} = 1.025\ t/m^3$

$$\rho = \frac{m}{V}$$

CLYDE

$\therefore m = \rho \times V$

$= 1.025 \times (V)$ ②

Now eq ① & ② should be equal when we travel from Fw → Sw

$(v+V) = 1.025V$

$v = 1.025V - V$

$v = V(1.025 - 1)$

$v = V \times 0.025$

Now $v = \frac{0.025\ V \times 1000}{1000}$ {To remove decimal}

$v = \frac{25^{1}\ V}{\cancel{1000}\ 40}$

$v = \frac{1\ V}{40}$

If we talk w r t w

$w = \frac{1\ W}{40}$ but $w = TPC \times FWA$

$TPC \times FWA = \frac{1\ W}{40}$

$\therefore FWA = \frac{W}{40 \times TPC}$

Inclining Experiment

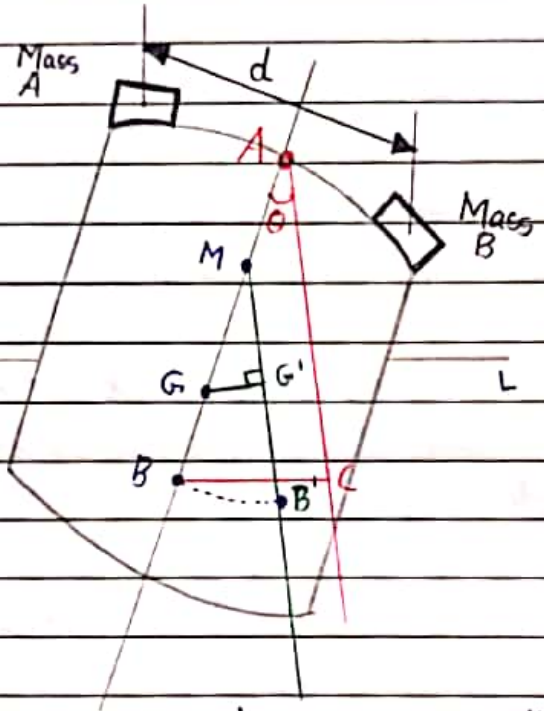
Purpose :
① To measure lightweight of ship.
② To find vertical, longitudinal & transverse positions of center of gravity.
③ To calculate metacentric ht from keel

When to be carried out :
① Newly built ship
② Ship undergone collision / grounding

Conditions :
- Draft fwd, aft & midship and density of water to be noted before & after exp
- Any loose weights must be secured
- Gangway lifted up
- Weather must be calm
- Port must be sheltered
- All persons not directly connected to exp should not be on ship
- Shore crane to be used to add mass on ship.

For carrying out inclining exp, 2 stabilograph are used attached to a pendulum
1 in fwd
1 in aft
Pendulum must be immersed in oil/water to damp the swing

* Weights are added by shore crane on ship in transverse direction so that ship can list.
* During this deflections on all pendulums are noted & mean deflection is calculated
* Same process is repeated by adding weights on side of ship.



CLYDE

Mass A is moved across the ship
The distance it moved is (d)

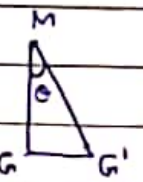
This will cause change in COG to move from G to G'

weights × distance = Total wt. of ship

$$w \times d = W \times GG'$$

$$GG' = \frac{w \times d}{W} \quad (1)$$

Now see Δ GG'M



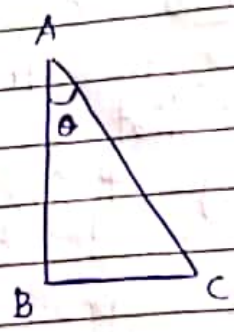
So $\tan\theta = \frac{GG'}{GM}$

$\therefore GG' = GM \tan\theta$ (2)

$$GM \tan\theta = \frac{w \times d}{W}$$

$$GM = \frac{w \times d}{W \times \tan\theta}$$

$$GM = \frac{w \times d}{W \times \frac{BC}{AB}}$$



PAGE No.
DATE

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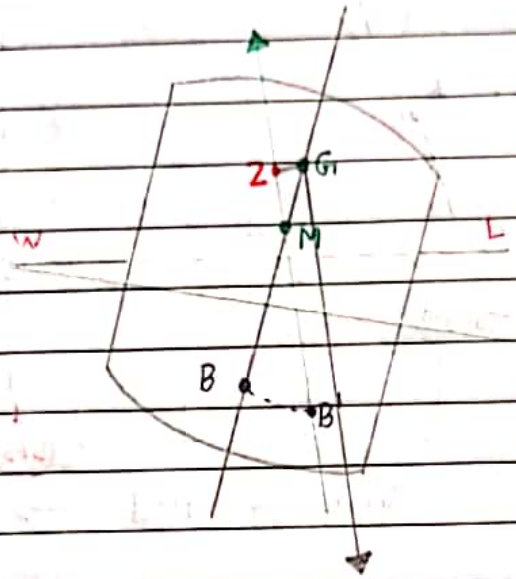
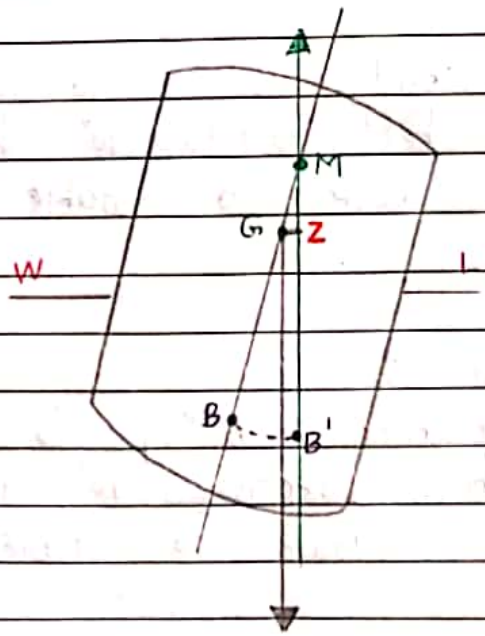
Angle of LOLL

* It is the angle with which will archieve negative metacentric bit under effect of external forces



Here Angle of loll is grater

→ Negative Stability



Here Angle of loll is lesser

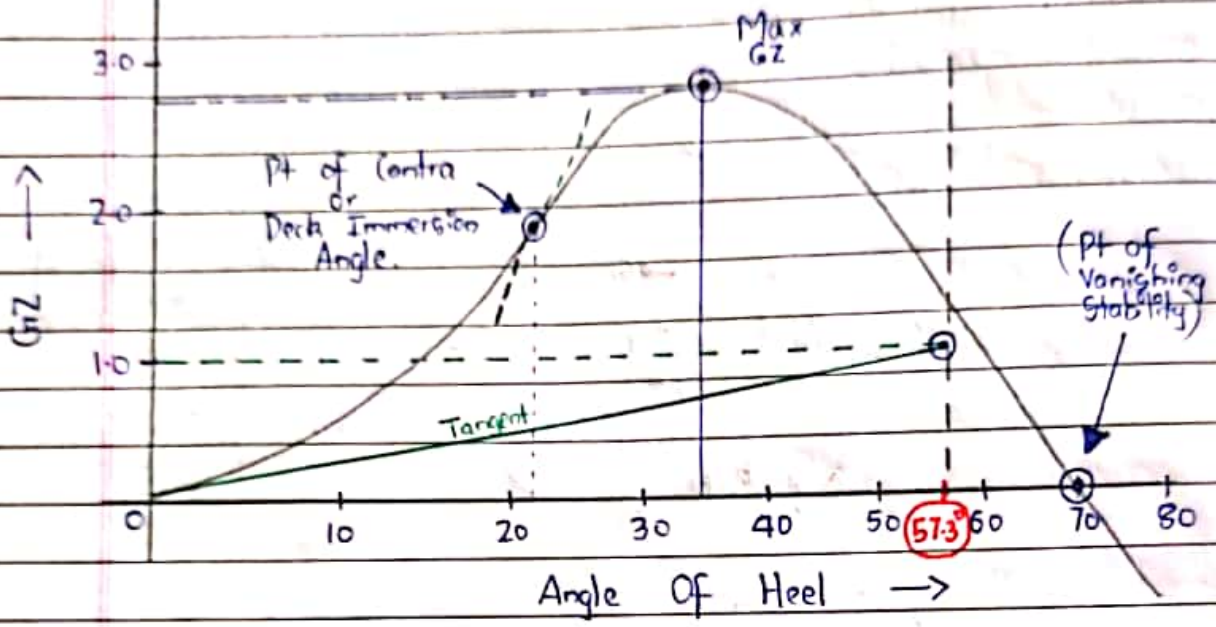
→ Positive stability

As a result of -ve righting lever ship heels further such that righting moment becomes 0 (G & M both on center)

$SS = W \times GZ$

GZ Curve → Static Stability

* This graph can be obtained from a loadicator



Range Of Stability :

* Here range of stability is 0° to 70°
* If vessel heels bet^n 0 to 70° the vessel will come back to stable equilibrium state

Point of vanishing stability.

* Here pt of vanishing stability is 70°
* If angle of heel reaches 70°, the ship won't come back to stable equilibrium state

Max GZ pt

* Here vessel will achieve max GZ @ 35°
* At that time GM value is 2.9m

Heel → Always due to external forces

Deck immersion angle or pt of contraflexture

* It is the pt where curve changes its direction
* Acc to curve happens at 21°
* At this pt. entire deck edge will be immersed into water.

CLYDE

GM of Vessel (Intial GM)

* Mark a pt of 1 rad = 57.3°
* Now draw a targent to curve
* The pt where it meets will give you the GM of vessel
* Here GM = 1m

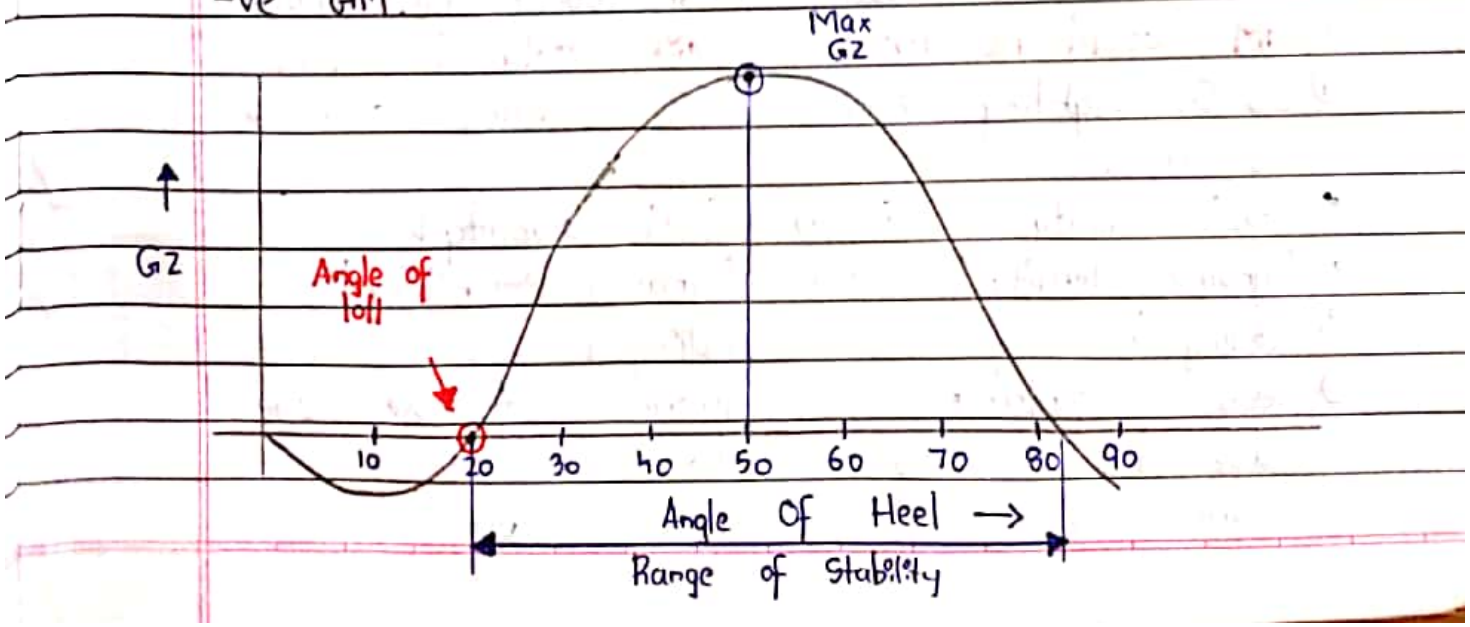
Area under curve can be found by SIMPSONS

So **A x W (displacement) = Dynamic Stability**

at whatever angle of heel

Now GM of ship not necessarily stats at GM = 0

Some conditions can cause ship to have -ve GM.



In KN curve, assumed KG=0

	Heel	List
①	P↔S movement due to external forces (wind, swell, current, CF during turning)	P↔S movement due to distribution of mass (Ballasting, deballasting, loading, unloading, bunkering)
②	COG remains on centerline	COG shifts away from centerline
③	Due to external forces, ship will heel on both sides	Due to uneven distribution of mass, ship will list on 1 side

	Stiff Vessel	Tender Vessel
①	G of vessel will be quite lower due to high density cargo	G of vessel will be higher
②	KG would be lesser	KG would be more
③	GM would be more	GM would be less
④	∴ GZ righting lever is more	GZ righting lever is less
⑤	Static Stability ↑ (GZxw)	Static Stability ↓
⑥	Dynamic Stability ↑ (Axw)	Dynamic Stability ↓
⑦	Rolling ↓	Rolling ↑
⑧	less comfortable due to vibrations	More comfortable due to vibrations
⑨	More stable	Less stable

We want our ship to not be too stiff nor too tender

CLYDE

Free Surface Effect

* When a tank onboard is not completely filled with liquid, as vessel heels the liquid moves in tank in same direction of heel.

Due to this
- ↳ shift in COG
- ↳ Reduction in GM
- ↳ Less righting lever.

Finally unstable ship.

* In case of tank is fully filled, the liquid in tank will act as a solid cargo & no FSE will take place.

Methods to reduce FSE

1. Tank divisions (longitudinal division)
2. Pocketing
3. Surface permeability
4. Swash bulkhead
5. Sluice valve

Page No.
Date

Pitch :-
* It is the distance covered by the propeller blade in 1 revolution

CLYDE

Skew :-
* Offset of propeller blade from the vertical plane of rotation in direction opposite to direction of rotation.

Theoretical Speed :-
* The distance the propeller would advance in unit time (V_t)

Slip :-
* It is the difference betⁿ the theoretical distance and the actual distance travelled by ship.

* If ship travelled more distance than theoretical distance then slip is -ve

$$\frac{V_T - V}{V_T} \times 100 = -ve$$

* If ship travelled less distance than theoretical distance the slip is +ve

$$\frac{V_T - V}{V_T} \times 100 = +ve$$

Real or True Slip :-
* Difference betⁿ theoretical speed & velo of advan

Page No.
Date

Gunwhale :-

* It is the upper edge of ships side where sheer strake meets deck plating.

6 Degrees Of Freedom Of Ship

Heaving	Rolling
Swaying	Pitching
Surging	Yawing
↑	↑
Linear Motions	Rotational Motions

Heaving → Up & down
Swaying → Port & Stbd
Surging → Fwd & aft

Rotational motion to Surging → Rolling
to Swaying → Pitching
to heaving → Yawing

Page No.
Date / /

Floors

* It is fitted in double bottom to support & stiffen the double bottom
* It is the transverse member of DB.
* Floor structure is continous from the center girder to the ship side shell plating & support the inner bottom shell.
  - ↳ Plate floor
  - ↳ Watertight floor
  - ↳ Bracket floor.

CLYDE

Plate Floors

- Usually laid out with spacing of 3-4 frame spaces.
- Bet^n these bracket floors are placed
- But in places like ER along with engine & other machineries., plate floors are at all frames.
- Plate floors also called solid floors as struts stiffen them.
- Due to the compressive load & buoyancy forces, strengthening need to be done with help of struts.
- Bottom & inner bottom longitudinals pierce through floor through scallops
- Lightening holes saves weight & provide means of access inside DB

Page No.
Date

Bracket Floor

- They are 2 pieces of plate brackets connecting center girder and bilge end of side shell plating.

Watertight Floor

- They are placed below transverse subdiv bulkheades
- These floors do not have lightening holes and scallops are blanked using collar plates

GIRDER

* It is a longitudinal member used in construction of bottom of ship
* If it is placed right above the keel then it is → Center Girder
* If it is placed at equal distance away from center girder then it is → Side Girder

Center Girder (watertight)

- Also called center keelson.
- It is a vertical plate running along centerline of ship
- It can extend from aft to fwd collision bulkhead.

- It is welded to keel plate at bottom & to inner bottom plating at top
- This divides DB into P & S tanks

Side Girder (non-watertight)

- Also called intercoastal side girder
- It is a vertical plate within DB running from aft to fwd collision bulkhead.
- But unlike center girder, side girder runs from 1 plate floor to next plate floor.
- There are lightening holes to allow liquid to flow within DB.
- Depending on breadth, there can be 1 or more side girders on either side of center girder.

CLYDE

Structural members providing longitudinal strength to ship

- Bottom shell
- Bottom shell longitudinal
- Tank top
- Tank top longitudinal
- Center girder
- Side girder
- Longitudinal bulkheads
- Main deck plating
- Inner & outer shell plating.

Page No.
Date

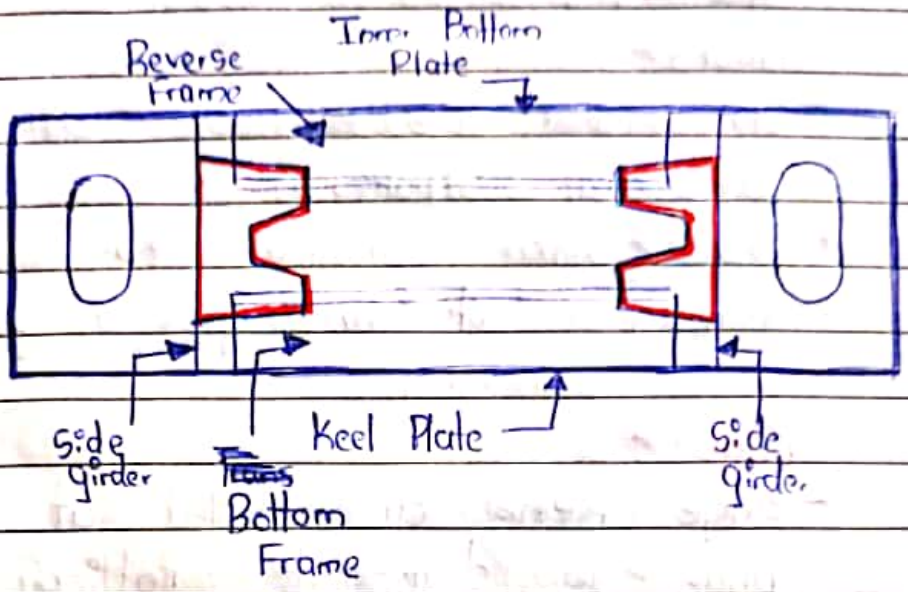
Structural members providing transverse strength to ship.
- Plate floors
- Bracket floors
- Watertight bulkheads
- Watertight floors
- Side shell plating
- Deck beams
- Main deck plating

Duct Keel
- It is a structural arrangement within DB where center girder is replaced by 2 side girders forming a tunnel along the length of ship.
- This arrangement of 2 adjacent side girders is called duct keel.

* This duct is used to lay pipes & electric cables otherwise they would run through DB space.
* The maintenance of these pipes & cables become easy
* Any leakage in pipeline will not contaminate the ballast water
* Provides a stronger support for ship structure when it sits on keel blocks
* It provides good longitudinal strength.

* The spacing bet^n 2 side girders to not be more than 2m inorder to not exceed width of keel blocks

CLYDE



* The keel plate & inner bottom plate bet^n 2 side girders are stiffened by bottom & reverse frames.
* These frames are well bracketed to side girder

Flat Keel

* It is a single bottom construction
* The center girder is attached to keel & inner bottom plating by welds & no scallops
* The flat keel plate forms an I section with vertical longitudinal center plate
* Used in large vessels to provide strength.

Page No.
Date

Bar Keel

* It is a steel bar placed over the keel replacing center girder
* The bar is supported by solid floors
* On either side of bar keel are garboard strakes
* Used in small vessels to prevent damages during grounding

Bilge Keel

- Bilge keels are fitted at turn of bilge to damp to rolling motion of ship
- Bilge keels are about one half of length of ship
- They are attached to continous flat bar rather than directly to shell & their ends are gradually tapered to prevent stress concentration
- They are employed in pairs one on each side
- When bilge keel gets damaged on impact it will shear off thus protecting bilge strake
- The bilge keel attached to flat bar are double continous fillet welds

Page No.
Date

CLYDE

Bulbous Bow

- It is the extension of hull just below waterline
- The BB itself creates a wave which remains out of phase with the wave created by hull of ship.
- This will help to reduce drag of vessel & reduce fuel consumption.
- BB also works as a robust bumper in the event of collision.
- It also allows the installation of bow thrusters in foreward part
- They also help to provide a extra capacity for ballast water & improve stability.
- The bulb can be additional bulb or implicit bulb.
- Implicit bulbs are continuation of hull & no knuckle
- Additional bulbs are addition to hull with a knuckle at bulb-hull intersection
- In BB, horizontal diaphragm plates 1m apart along with a support by a centerline web
- The thickness of plates in BB are thicker to protect from damage by anchor & cables

Page No.
Date

Fore end construction.

- Fore end of ship needs to be strong to withstand various forces
  - ↳ Slamming load on side shells due to pitching & heaving motions of ship in rough weather.
  - ↳ Wear & tear of hawse pipe by anchor chain by hoisting & lowering
  - ↳ Impact load due to head on collision
  - ↳ local load due to winch & windlass
- A higher flare which prevents water to enter on deck & provides area for winch & windlass.

① Stem Plate / Stem Bar :

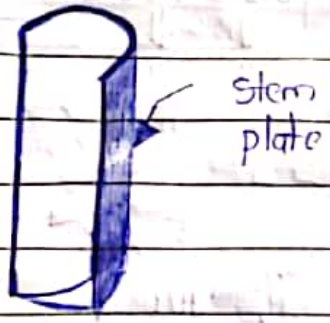
- It forms the profile of bow.
- It is a steel plate stiffened by centerline girder or stiffner.
- The stemplate runs from keel to deck.

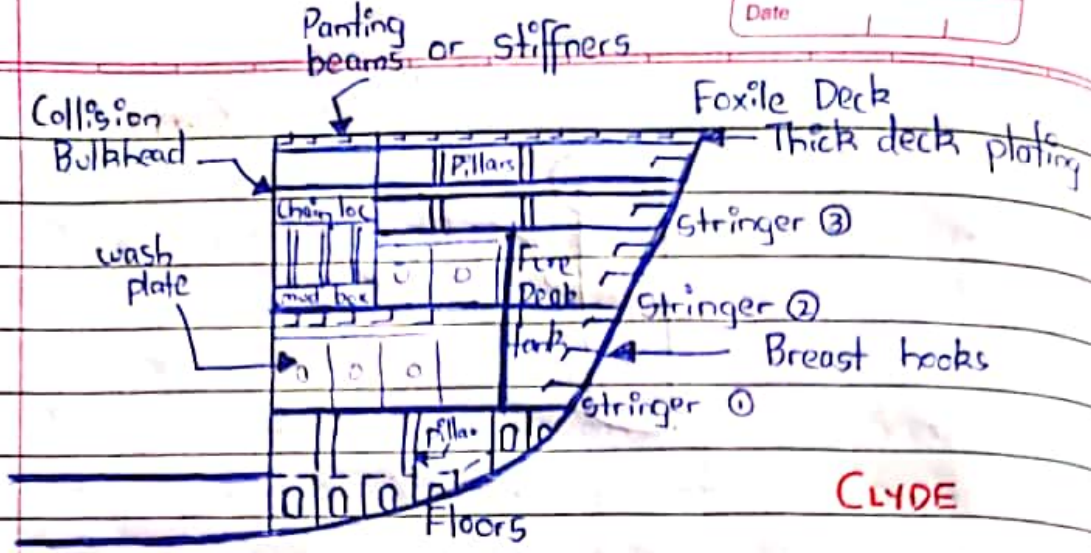
② Breast Hooks :

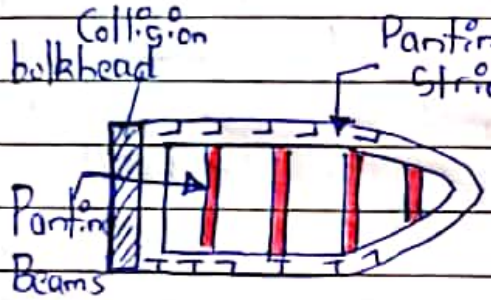
- It is connected to stem plate and panting stringer.
- It provides rigidity to stem structure.

Page No.
Date

CLYDE







* Fore end of ship needs to be stronger due to various forces :
  - ↳ Slamming load on side shells due to pitching & heaving motion
  - ↳ Local load due to winch & windlass
  - ↳ Impact load due to head on collision

① Stem plate
- It is a thick steel plate forming profile of bow
- It is stiffened by stiffners
- The stem plate runs from keel to uppermost continous deck

Page No.
Date

② Breast Hooks
- It is a strengthening member which connects stem plate to panting stringer.

CLYDE

③ Panting Stinger
- Fitted at regular intervals to reduce panting effect

④ Panting Beams
- Fitted at every frame space
- It helps to reduce panting effect

⑤ Solid Floors
- It provides strength to bottom structure of ship.
- It also has a center girder.

⑥ Deck
- The foxile deck is thick enough to withstand local loading of winch & windlass.

⑦ Collision Bulkhead
⑧ Perforated Bulkhead / swash bulkhead.

Page No.
Date

CHAIN LOCKER

* Place used to store anchor chain
* It is located fwd of collision bulkhead
* A centerline partition is provided to segregate stowage of P & S anchor chains.
* The bottom of chain locker is used for drainage of mud or dirt from anchor chain
* The chain cables are guided by pipes from deck to chain locker. These are called Hawse pipes
* Lower half are much thicker as they undergo heavy wear & tear due to chain friction
* The end of chain cable is secured to chain locker by a quick release mechanism called Bitter end.

From chainlocker upto windlass
↳ Spurling pipe

Page No.
Date

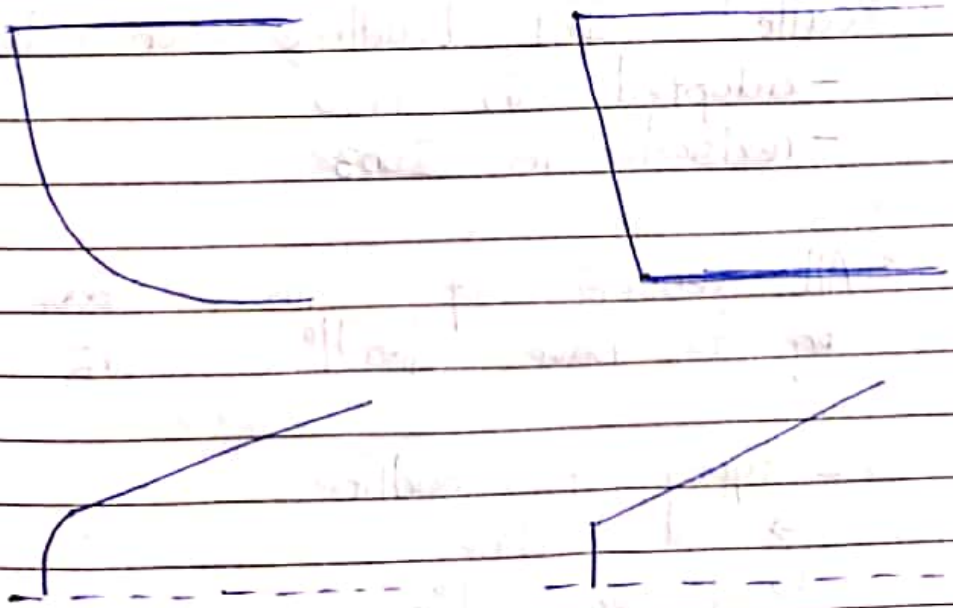
CRUISER STERN

- It has a upward curved profile from aft ⊥ to main deck.
- It has a large overhang making it more vulnerable to slamming.
- Hence plate floors are fitted at every frame.
- Deck stiffened by deck beam & cant beam along with center & side girders

CLYDE

Transom Stern

- It is flat having more deck space
- Cant frames not required
- Deck stiffened by deck beams & supported by center & side girders



Cruiser stern

Transom stern

Page No.
Date

Loadline

* It is special marking made amidship which shows draft of vessel & max permissible limit to which the ship can be loaded.

* Loadline limit ensures the ship has sufficient freeboard at all times to ensure vessel is stable & safe

* But buoyancy of vessel depends on type of water & density.
Hence we cannot define a fixed freeboard limit at all times

∴ loadline convention came up called Int Loadline Convention
- adopted in 1930
- revised in 2003

* All vessels of 24m & above are req to have loadline mark

2 types of loadline
↳ Std loadline
↳ Timber loadline

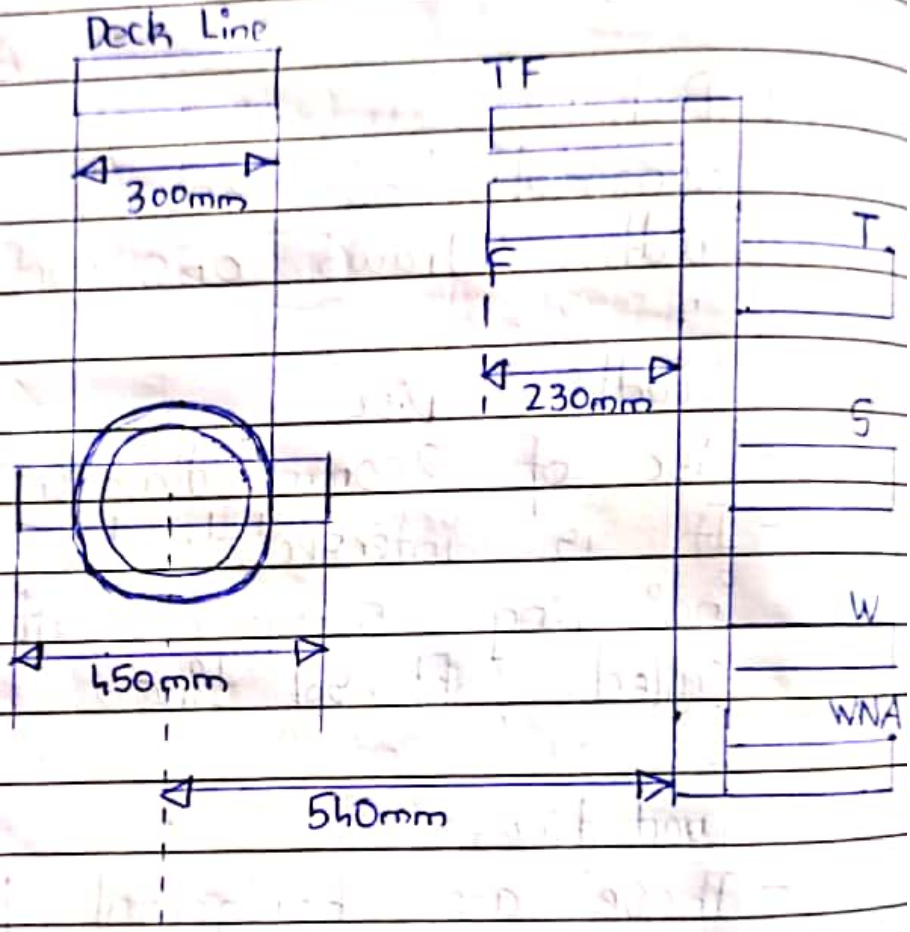
* The markings have to be done in a bright colour on dark background
* Loadline consists of 3 main markings

CLYDE

① Deck Line
- Horizontal line 300mm length & 25mm width. drawn on surface of freeboard

② LoadLine Disc
- Disc of 300mm dia & 25mm thick
- It is intersected by a horizontal line indicating summer salt water line called Plimsol Line

③ Load Lines
- These are horizontal lines extending fwd & aft from vertical line
- This vertical line is placed at dist of 540 mm from center of disc.
- The loadlines are 230mm x 23mm
- The uppermost line indicates max depth to which ship may be submerged.



4 Dec 2008 ← Adopted Date .....

Intact Stability. – 1 July 2010 ← Entry into force MON TUE WED THU FRI SAT SUN

DEFINATION :- To present mandatory & recommendatory stability criteria & other measuring safe operation of ship to minimize risk to such kind of ships (cargo, tanker, passenger, timber)

Stability which is decided by SOLAS at certain conditions for different ships.

Intact stability code 2008
This code is divided into 2 parts.
Part A : Introduction & mandatory criteria.

Applicable to all ship 24m and above

Intact stability includes fundamental principles such as → General precautions against capsizing. (righting lever) & (Metacentric height) & (Area under GZ curve)
→ Weather criteria
→ Water tight integrity.
→ Free surface
→ Icing.

not
① Metacentric ht should be less than 0.15m
② Righting lever should not be less than 0.20m
③ Max GZ should occur at >30° but not <25°
④ Area under GZ curve

Muster list

* It is a list of functions, each member of ship are expected to perform in case of emergency

* Details of general eme alarm & public address system
* Specifies how order of abandon ship will be given.
* Shows assigned duties of members.
  - closing watertight doors, fire doors, skylights, portholes & other openings
  - preparing & launching survival craft.
  - manning of fire parties to deal with fire.
  - use of com. equipment
  - preparation of other life saving appliances.
* Details of primary & secondary muster station
* If crewchange happens, revision of list or new list must be prepared.
* Also specifies substitutes to key persons in that case of disability to tackle emergency.

(Located in ER/bridge/accomodation alleyways)

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Fire control & safety plan

Location : Main deck (P)
Main deck (S)
Bridge
CCR

CLYDE

located in red colour container

It gives details of all fire fighting appliances located in ship.

- location of extinguishers portable & semiportable
- location of EEBD & quantity
- CO_2 system details
- Fire detection & alarm system
- ventilation system.
- No & loc of fire hydrants
- Life raft location
- Life boat location
- Sprinkler system details
- Foam system details
- No of fire hoses & nozzles.
- location & details of fire pump.
- location & details of fire pump (emergency)
- Details of fire main line.
- Fire integrity of ships sections along with bulkhead class.
- Fire control station.
- Fire detection in accomodation, m/c, cargo
- Calculation of CO_2 bottles

FIRE MAIN

* System consisting of fire pumps, SW inlet, & distributed piping system supplying water to fire hydrants, hozes & nozzles.
* It is backbone of fire fighting system used to cambat fire.
* Water can be used as a — CLYDE
  jet stream → deep seated fires
  spray → combustible liquid fires
  water curtain → to protect from heat wave.

Water → provides cooling.
Water has good thermal conductivity
Water has high latent heat of vaporization
With adequate cooling, heat is insufficient to support combustion & fire goes out.
Water when turned into steam expands 1600 times in vol. at atm pr.
$1m^3$ water can generate $1600 m^3$ steam
This steam creates cloud displacing air supplying O_2 for combustion.
Hence Water → provides smothering

Eme Fire Pump

* apart from main fire plp, an eme fire plp provided that can be used in case of eme or main fire plp dysfunctional.
* Should be capable of supplying 2 jets (12 m each)
* capacity 40% of total cap of Main Fire pump but not less than $25 m^3/hr$ for 1000 GT pass ship
  for 2000 GT cargo ship.
  not less than $15 m^3/hr$ for < 2000 GT cargo ship.
* Should be located outside ER
* Should be driven by diesel engine battery operated hard cranking or other alternate method

CLYDE

* Be able to take suction even in highest seagoing condition
* It should be attached to priming unit.
* Suction piping must be additionally reinforced with fire retardant material to ensure no damages & supply of water ensured at all times.
* Eme fire plp sea suction, source of power supply, switchboards, electric cables must be seperated from main fire plp
* Venting of eme fire plp room should be far as possible from machinery space.

* Total suc head not to exceed 4.5m under all conditions of list & trim

Fire Hose

* Made of non-perishable material.
* Synthetic woven textile lined with rubber & PVC coated.
* 64mm in dia.
* Kept near hydrants, either rolled or flaked in a fire hose box

  Min length 10m

  Max length (machinery space) 15m

  Max length (deck) 20m

  If ship breadth > 30m then 25m
* To be tested anually @ 50% above working pr
* Working pr 17 bar
* Testing pr 24 bar.

Fire Nozzles

* They should be kept with hoses in fire hose box.
* They should be approved dual purpose type.
* Precaution to be taken, to ensure nozzle holes are not clogged by impurities.
* It should be able to provide avg distribution of water atleast 5 lit/m^2/min

Sizes available 12mm ← for accomodation
16mm
19mm

Pr available at hydrants

- for pass ships
  - 4000 GT & above 0.40 N/mm^2
  - less than 4000GT 0.30 N/mm^2
- for cargo ships
  - 6000 GT & above 0.27 N/mm^2
  - less than 6000GT 0.25 N/mm^2

Int shore ~~Connection flange~~ Bridge, CCR or Fire locker
Gasket kept ready

Int Shore Connection SOLAS chap 2-2

* All ships of 500GT & above should have atleast 1 ISC

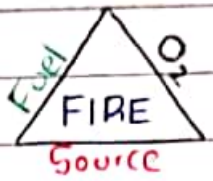
OD = 178
ID = 64
BCD = 132
4 holes, 19mm dia

Flange thickness 14.5
Bolts 4, 16mm dia

Mg, T, Na, Li, K

FIRE

Presence of combustible material (fuel)
Presence of oxygen
Source of ignition



Starvation - fuel
Smothering - O_2
Cooling - lower temp
Inhibition - Chain rxn

Fire is an exothermic rxn when a combustible material burns in presence of O_2

To stop fire, any 1 side of fire triangle can be removed or chain rxn can be stopped

CLYDE

Water → cooling
Foam → cooling & smothering
CO_2 → Smothering
DCP → Inhibition & smothering
Sand → Smothering

Foam

Mechanical Foam

* Foam concentrate + water + air
* Produced by portable & mobile fire extinguishers.
* Also produced by high exp. foam generator.
* Foam applicators are also used

Protein Foam

* Contains natural proteins unlike synthetic foams.
* These foams are bio-degrable
* They provide a foam blanket.
* More heat resistant & durable

Fluoroprotein foams

Synthetic foams

AFFF (contains sodium alkyl sulfate which spreads over area of hydrocarbon liquids)

A-L AFFF

Foam Exp	Ratio
Low exp foam	1:1 to 1:12
Med exp foam	1:13 to 1:120
High exp foam	1:121 to 1:1000

Dry Chem Powders
- Sodium bicarbonate
- potassium bicarbonate
- mono ammonium phosphate

TEC ternary eutectic chloride
Sodium chloride 20%
Potassium chloride 29%
Barium chloride 51%

This absorbs heat from metal surface & forms hard crust on surface providing blanket effect.

Dry Sand
Soda ash
Lime stone
} can be used on metal fires

Conduction :- transfer of heat bet^{n} surfaces
Convection :- transfer of heat through a medium
Radiation :- energy particles travelling through a medium

water = red band
foam = cream band
CO_2 = black band
DCP = blue band.

Markings
- operating instructions
- class of fire it can be used
- capacity
- date when last serviced
- name of manufacturer
- date of manufacture

* 23 bgs max

CLYDE

Water type fire extinguisher. (Pr Gauge)
- used for type A fires
- provides cooling effect
- filled with water upto mark. (9 litre) ~ 13.5 lit
- consists of CO_2 cartridge (36 bar) 60grm cartridge
- provides 6 m jet for 60 sec

Safety = Relief Holes, Safety pin, Pr gauge.
Yearly pr test @ 35 bar before recharging.

Foam type fire extinguisher (Pr Gauge)
- used for type A & B fires
- provides smothering effect.
- filled with AFFF upto mark 97% AFFF 3% Water
- consists of CO_2 cartridge (36 bar)
- provides 6 m jet for 60 sec

Safety = Relief Holes, Safety pin
Yearly pr test @ 35 bar before recharging.

* Put foam on vertical surface & not directly fire

Above 1000 GT, atleast 5 portable fire extingui

DCP fire extinguisher
- used for type A, B, C, D & electrical fires
- provides inhibition effect
- filled with DCP upto mark 4.5kg Sod. Bicarbonate
- consists of CO_2 cartridge (36 bar)
- provides 3~4 m jet for 20 sec.

Safety = Relief Holes, Safety pin
Sod. Bicarbonate mixed with Mg Sterate to prevent caking.

Yearly pr test @ 35 bar before recharging

CO_2 fire extinguisher. (No pr gauge) CLYDE
- used for type B & electrical fires
- provides smothering effect.
- filled with liquid CO_2 at 53 bar pr
- provides 3~4 m for 20 sec

Safety = Pr relief vlv, Safety pin, Non conductive discharge horn & handle

Recharged to be only at shore when wt reduced more than 10%

Yearly pr test @ 210 bar before recharging

* CO_2 cannot be used be in accomodation.

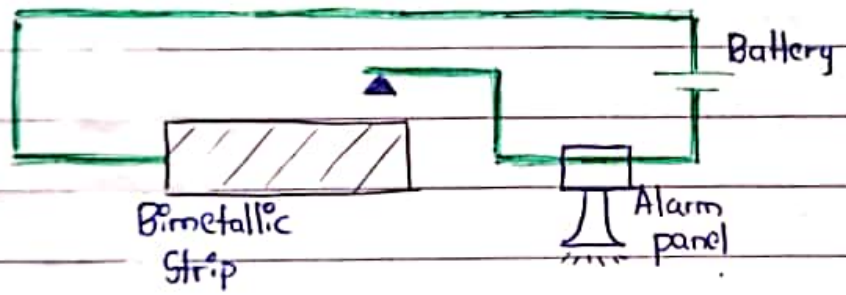
Heat Detector

* Mainly located near purifier room, incinerator, boiler platform, ME, AE
* Should be 0.5m from bulkhead
* Operating temp bet^n 54°C to 78°C
* Max floor area of detector = 37m^3
* Max dist apart from each other = 9m
* Max dist away from bulkhead = 4.5m
* Power supply from MSB, ESB, Battery.

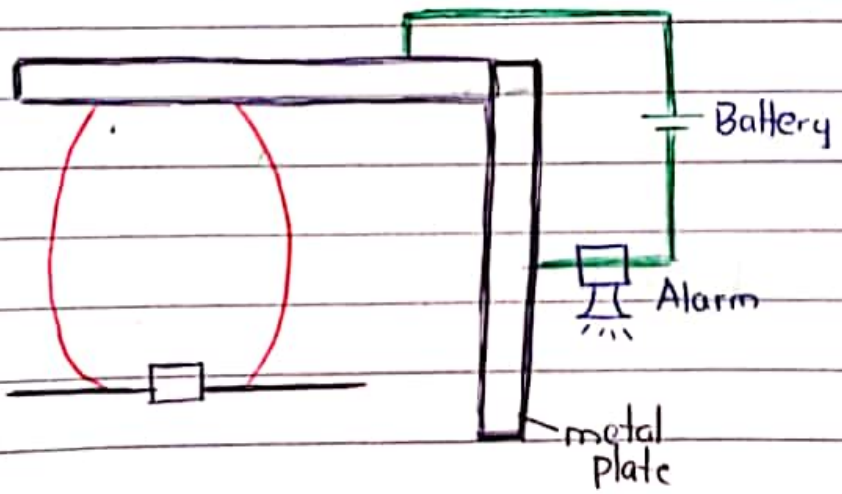
CLYDE

Bimetallic type

* working range 55°C to 160°C

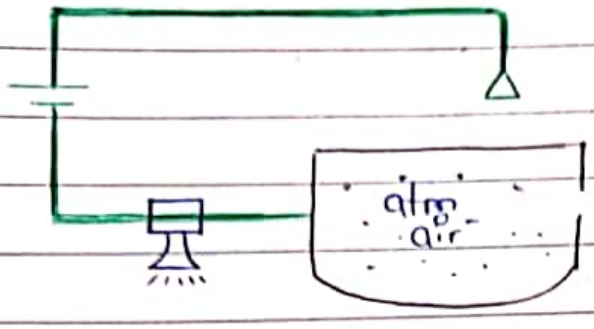


Fusible link type



* working range 55°C to 180°C

* Rate of rise of temp pneumatic type

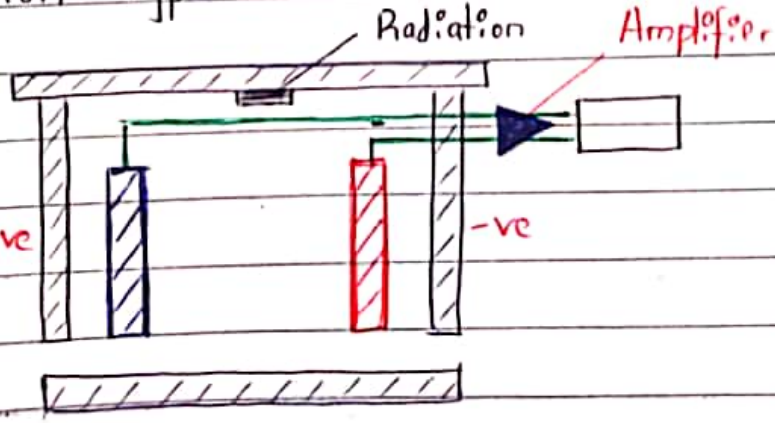


* working range 57°C to 82°C

Smoke Detector.

* Located near accomodation stairway, ECR, bridge, cargo space, machinery space.
* Shold be 0.5m from bulkhead
* Should operate before smoke density exceeds 12.5% obscuration / min but not until 2%
* Max floor area of detector = 74m²
* Max dist apart from each other = 11m
* Max dist away from bulkhead = 5.5m
* Power supply from MSB, ESB, Battery.

Ionization type



CO_2 Sys & Regulations

Why CO_2 used as extinguishing media

- It is non-conductive, non-toxic, non-flammable
- CO_2 does not deteroriate with time & temp. (unlike air which deteroriates with time)
- It gives v slight cooling effect to surrounding area.
- CO_2 is 1.5 times heavy than air

Regulations

* Acc to SOLAS, a ship having machinery space of $500m^3$ vol & above requires fixed fighting sys.
* 85% of CO_2 to be released within 2min & 50% of quantity should be discharged within 1min
* CO_2 bottles solid drawn steel, hyd tested at 228 bar

Manufacturer
Class
Statvatory
} will ensure of this

* CO_2 room should be outside ER generally above the uppermost continous deck. → for easy access.
* Bulkhead bet^n ER & CO_2 should be A class bulkhead
* CO_2 room door should be watertight & should open outwards
* CO_2 room should have ventilation arrangements, capable of developing 6 fresh charges / hour
* CO_2 room should have a thermometer, ~~& shold be provided with alarm when temp goes above 55C~~

CO_2 bottle has bursting disc which will rupture at temp 63°C & 177bar

CO_2 should give a leakoff alarm when pr in pipeline reaches 4bar → This alarm in ECR, bridge

CO_2 bottles to be kept on wooden platforms or brackets connected to hull as CO_2 produces electricity when it flows in pipeline (static electricity)

CO_2 pipeline to have relief v/v, which is set @ 10% more working pressure

If CO_2 is installed in cargo spaces, quantity of CO_2 should be sufficient enough to provide a min of 30% of total vol to be protected by CO_2

$$= \frac{\text{largest vol of cargo hold} \times 0.30}{\text{vol. of } CO_2 \rightarrow 0.56 m^3/kg \text{ of } CO_2}$$

CO_2 capacity / cylinder → 45.4kg

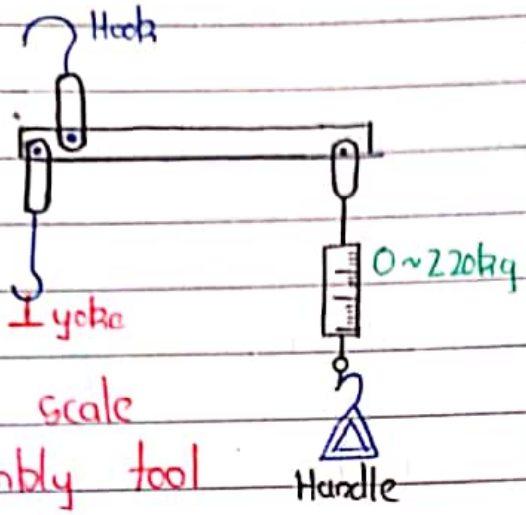
$$\text{ER (excluding casing)} = \frac{\text{ER gross vol} \times 0.40}{\text{vol of } CO_2}$$

CO_2 cap. / cylinder

$$\text{ER (including casing)} = \frac{\text{ER gross vol} \times 0.35}{\text{vol of } CO_2}$$

CO_2 cap / cylinder.

Weighting Of CO_2



Beam scale assembly tool

* first loosen securing strap from cyl in place
* fit yoke on cyl head assembly
* fit adjustable hook on crossbar
* now pull scale with help of handle upto cyl free from bottom

If 10% reduction in wt, Recharge the bottle.

CO_2 room safety.

① Trip switch on cabinet
② Master vlv (on main CO_2 manifold line)
③ Relief vlv
④ Bursting disc (@63°C, 177bar)
⑤ CO_2 leak alarm (4bar)
⑥ NR vlv

* CO_2 pressurized in liquid form @ 52 bar
* CO_2 bottle solid drawn steel, hyd pr tested at 228 bar
* CO_2 not to be kept where temp will exceed 55°C.
* Vol of CO_2 = 0.56 kg/m^3
* Capacity of CO_2 / cylinder = 45.4 kg.

@ 63°C it will become 177 bar

Freezing pt of CO_2 = -78°C

A-0 pure steel bulkhead which can withstand std firetest for 1 hr

Class A divisions

- those divisions formed by bulkheads & decks
  - they should be constructed of steel or other equivalent material
  - they are suitably stiffened.
  - they are insulated with NON-COMBUSTIBLE material such that
    * avg temp of unexposed side should not rise more than 140°c above original temp
    * temp at any 1 pt including joints of bulkhead should not rise more than 180°c above original temp.

    A-60

    A-30

    A-15

    A-0
  - These bulkheads are so constructed to prevent passage of smoke & flame for SFT of 1hr.

Class B divisions

- those divisions formed by bulkheads, decks, ceilings or linings
  - they should be constructed of approved non-combustible material

- they should be insulated such that
  * avg temp of unexposed side should not rise more than 140°C above original temp.
  * temp at any 1 pt including joints of bulkhead should not rise more than 225°C above original temp.

  B-15

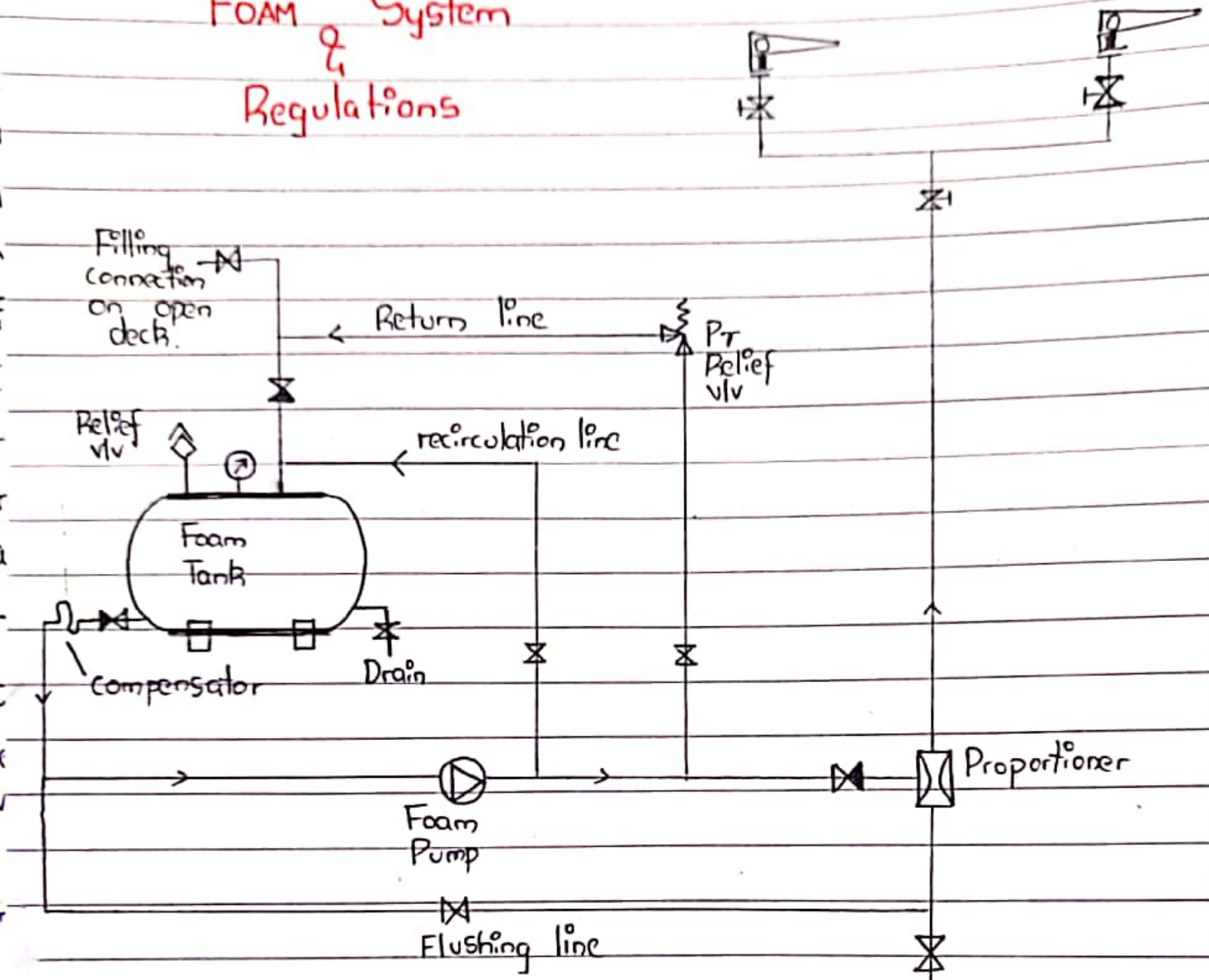
  B-0
- These bulkheads are so constructed to prevent passage of flame for 1st half hr of SFT.

Class C divisions

* those divisions constructed of approved non-combustible materials.
* they do not need to meet requirements for passage of smoke & flame nor any limitations to temp. rise.

Air gets in from foam monitor via the

FOAM System & Regulations



Properties Of Foam

* Knockdown speed & flow
* Cohesive properties (foam to stick & create blanket)
* Heat Resistance
* Vapour Suppression (to supress vapours)
* Light enough (to flow over fuel surface)

Expansion Ratio :-

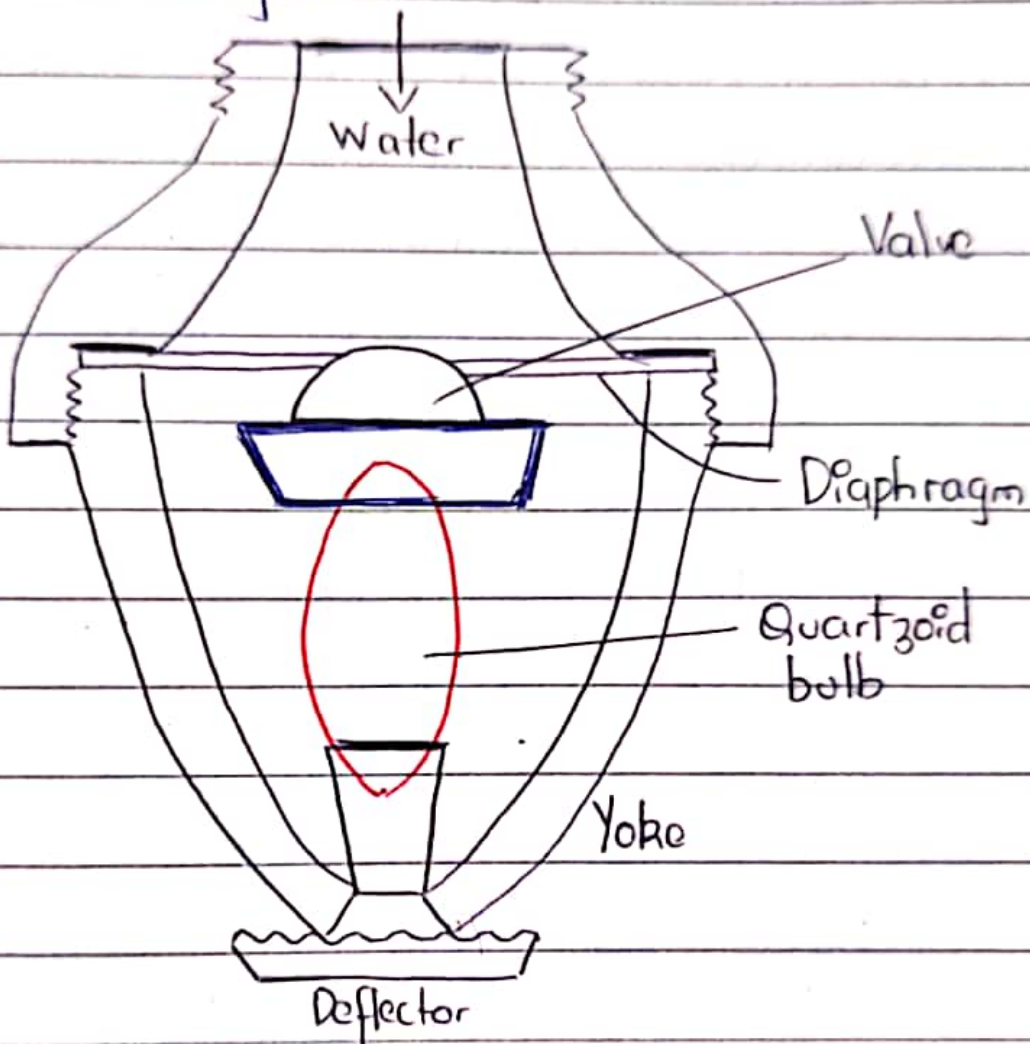
low exp	2:1	to	20:1
med exp	20:1	to	200:1
high exp	above		200:1

Amt of foam generated by using 1 litre of foam concentrate. → Expansion Ratio.

SOLAS req for Low exp foam → Deck

* Foam monitors should have capacity to discharge 3 lt/m²/min.
* Expansion ratio not to exceed 1000:1
* Main control station to be located away from cargo area
* Sys to be able to discharge foam in not more than 5min
* Sys to be capable to supply foam in not less than 20min on tanker with IG & not less than 30min on tanker not fitted with IG.
* Capacity of applicator shall not be less than 400 lt/min & should capable to deliver foam in not less than 15m in still air.

Sprinkler System



Sprinkler Sys

Page No.
Date

CLYDE

* Machinery spaces of $500m^3$ volume & above to have fixed fire fighting sys.

Sprinkler regulations

① No. of sprinkler heads per section not to be more than 200.

② The pr available at highest sprinkler head to not be less than 4.8bar.

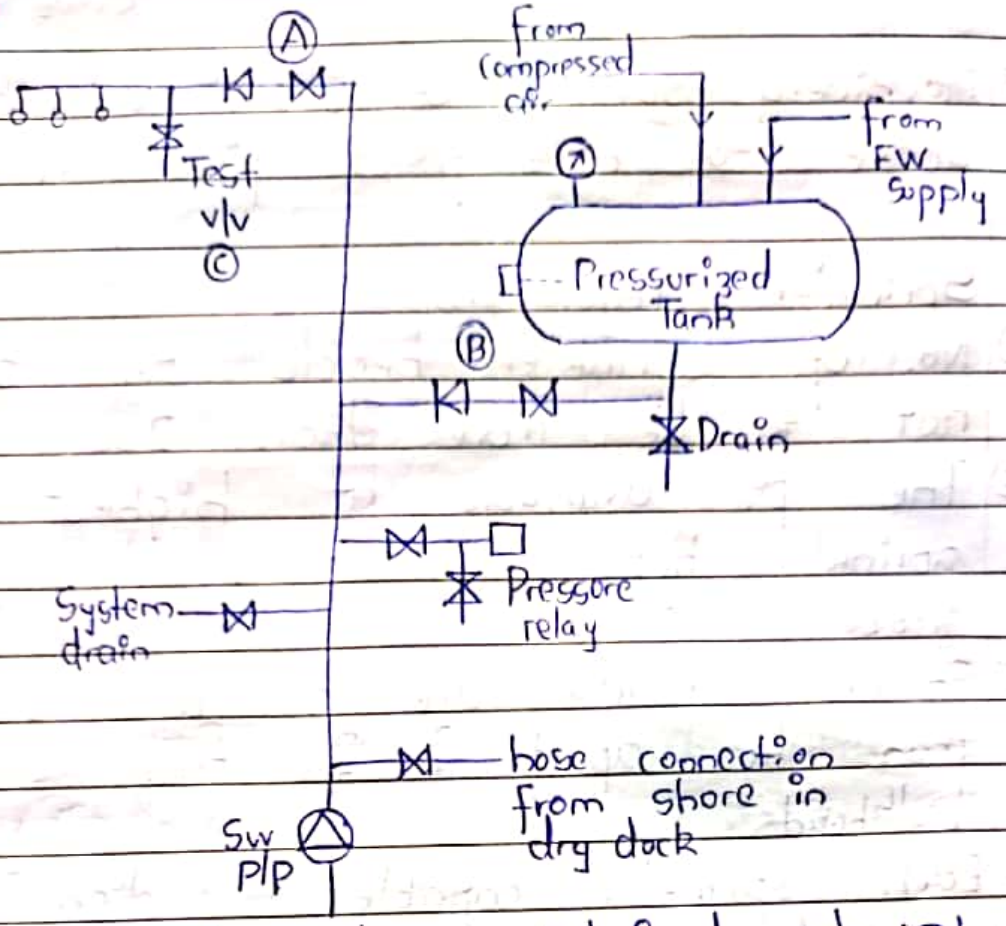
③ Sprinkler heads are spaced not more than 4m apart & 2m from vertical bulkhead.

④ Each sprinkler capable to discharge 100lit/min.

⑤ Each sprinkler section capable of being isolated by 1 stop v/v. & location of stop v/v to be located outside section.

⑥ Each sprinkler should cover sufficient area of $16m^2$

⑦ SW plp to have 2 sources of power.



* Pressurized tank maintained at 8 bar
* As soon as pr in sys drops to 5 bar, sw p/p starts

Testing:

① Close section isolation v/v, an alarm will sound indicating section isolation

② By opening test v/v C (drain) pr drops & alarm is raised.

③ Now close test v/v C open isolation v/v & test if water comes from sprinkler head or no.

Hypermist Sys – High Pr Sys

Page No.
Date

CLYDE

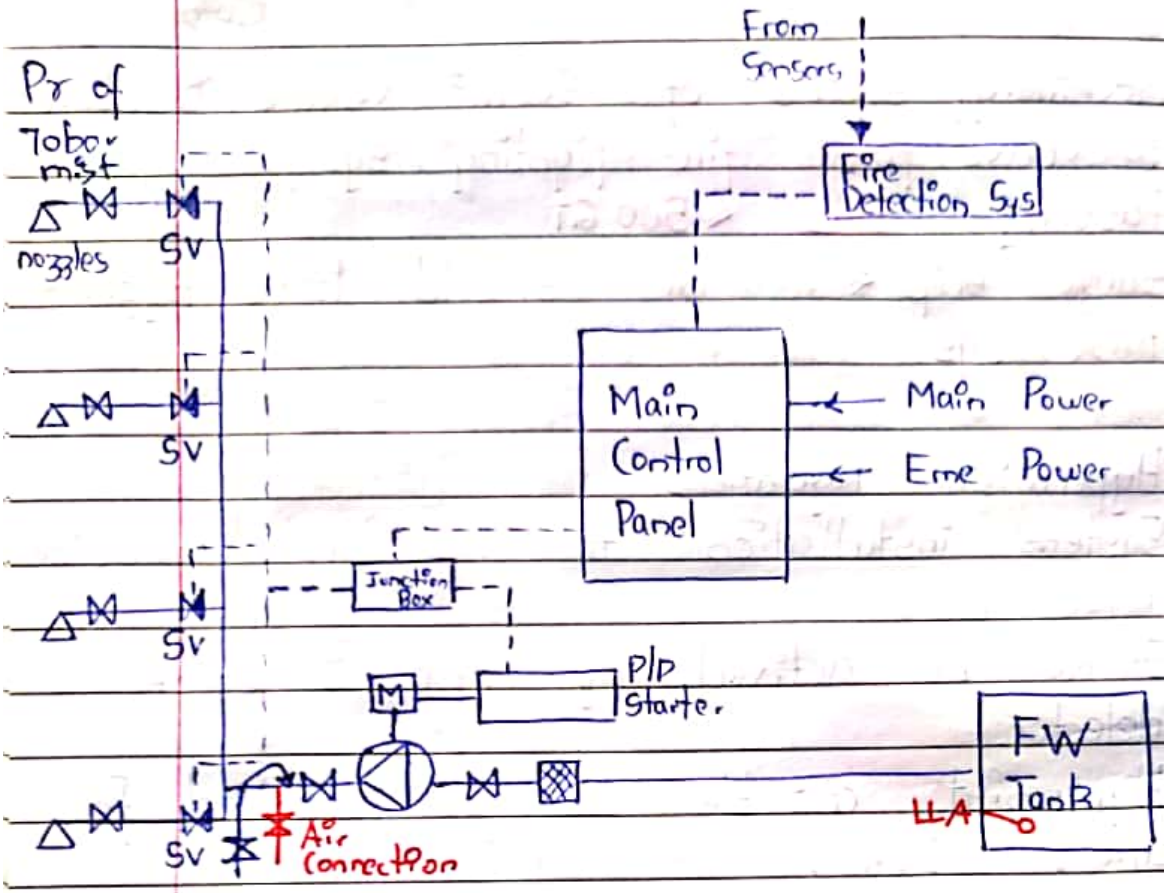
* Machinery spaces of $500m^3$ volume & above to have fixed fire fighting sys
* Passenger ship $\leq$ 500 GT
Cargo ship $\leq$ 2000 GT should have hyper-mist sys.

Hypermist regulations

① System installation to be located outside m/c spaces
② Should be actived by heat & smoke detector.
③ Hypermist capable to be supplied for atleast 20min
④ Op instruction to be displayed on panel
⑤ Should receive power from main & eme source of power.
⑥ Nozzle should distribute atleast 5 lit/m^2/min

Areas Protected

① ME space
② AE space
③ Boiler Space
④ Incinerator Space
⑤ Purifier room



* Nozzle Siz 50~200 µm

* Mist → Cooling effect
  → Mist evaporated by taking latent heat. Water vapour is heavy & settles over fire

* We cannot use sprinkler over bypermist due to boilover effat

Testing :-

① Activate both sensors & use bucket blow nozzles to check if sys is functioning OK.

Page No.
Date

EEBD - eme escape breathing device

Purpose :- To escape hazardous areas due to smoke, fire or poisonous gases

→ Not used for fire fighting
→ Not used to enter O_2 deficient zones

SOLAS req :
① No & location of EEBD specified in Fire Control Plan
② All cargo ships must have atleast 2 EEBD in accomodation spaces
1 EEBD on each deck
1 EEBD in wkshop
1 EEBD in ECR

Min spare
1

It consists of :
- Cylinder : Compressed air cylinder having capacity of 400 litres for 10 min (Min Duration)

This cylinder can be charged by a breathing air compressor if suitable connector is available

- Hood & face piece : The air from cyl comes to face piece via demand valve

- Clear window : Made of flame resistant material for clear sight.
- Pressure indicator : To check pr in cylinder

Maintenance :

① Check indicator needle in green zone indicating 200 bar pr & 400 lit of compressed air.
② Check expiry date → 15yrs
③ Use training EEBD not actual one

SCBA - self contained breathing apparatus

Purpose :- For fire fighting
For entering O_2 deficient zones

* It is an apparatus where fresh air is supplied from cylinder & exhaled air is discharged to atmosphere

It consists of :
- Compressed air cylinder having capacity of 1200 litres for 30min

- Harness to mount cylinder on back.
- Pressure gauge with whistle when (10min) are remaining.
- Pressure reducing valve
- Demand valve
- Exhalation valve
- Facemask which is attached to demand v/v to maintain +ve pr inside at all times

* Pressure reducing v/v reduces pr upto 4 bar then pr further reduced by demand v/v upto 1 bar

* Facemask made of moulded rubber with securing rubber straps to head

Checks:

① Visual inspection
② Wear mask, open cylinder, breathe normally now close cylineder & vent air in line. Pr will drop & should give whistle → low pr whistle test
③ Now before pr gauge becomes 0 hold breath. Facepeace should stick to face → Positive seal test
④ Open cyl v/v, pressurize line. Inhale & hold breath. No leak noise to be observed → Leak test
⑤ Expired air to go out easily. Press

demand v/v to check supplementary air.

Maintenance :-

* Mask to be cleaned well after use
* Check backplate & shoulder / waist straps
* Speech diaphragm & O rings to be cleaned
* Check exhalation valve.

Page No.
Date

LIFE BOAT

* Must have sufficient strength to be capable to be launched & towed when ship is making headway at a speed of 5 knots
* No lifeboat approved to carry more than 150 persons
* Lifeboat seating to be provided such that
  - it can support a load of 100kg in a single seat location when launched by falls from ht of atleast 3m
  - it can support a load of 100kg in a single seat location when free-fall lifeboat is launched at ht of 1·3 times free-fall ht.
* Lifeboat to be boarded in not more than 3 min.
* Lifeboat to be powered by CI engine.
* Fuel not to have flashpt of 43°C or less
* Engine shall be provided with either manual starting sys or sys with 2 rechargeable energy sources
* Engine should be able to start at -15°C within 2min
* Speed of lifeboat when fully loaded with full complement & equipment to be atleast 6knots. & 2 knots when towing a 25 person liferaft with full complement.
* Fuel to be sufficient enough for 24hrs

* Wires which lift & lower lifeboat called falls & speed of lifeboat not be more than 36m/min controlled by centrifugal brakes.
* Hoisting time should not be less than 0.3m/s
* Davits capable to slide down lifeboat when ship heeled at 15°

Safety on davit.

1. Dead hook handle
2. Harbor pin
3. Winch upper limit switch
4. Drum brake
5. Release gear hook ring
6. Winch break counter wt

Marking on lifeboat.

1. Name of ship
2. Makers name
3. Sr no.
4. Port of registery
5. IMO no
6. Call sign
7. Carrying capacity

Page No.
Date

Engine not starting reasons :

- Fuel tank empty
- Defective fuel p/p
- Damaged fuel supply hose
- Contaminated fuel
- Battery not charged.
- Defective starting motor
- Loose electrical connection.

Free - Fall Launch

* Make sure water surface is free of obstackles
* Release lashing line & ensure lashing plate is also released
* Check battery charge cable is deattached
* Open release hook safety pin
* Open the hatch.
* Board the boat & close hatch
* Ensure drain v/v is closed
* All crew to wear seatbelt & grab the handrail of seat in front.
* Start engine
* Remove release lever securing pin & close bypass v/v
* Pumping lever several times releases the main lashing below boat
* Never use a painter for free-fall launch

CLYDE

* Incase hyd release not functioning, then eme release is req
* Open bypass v/v
* Break the acrylic cover & take out eme release handle
* Turn eme release mech clockwise until it comes to stop.

Davit Launch

CLYDE

* Switch on hyd power pack
* Operate control lever to lower traverse
* Remove hook from lashing wires.
* Attach the wire rope of boat to hook of the suspension on both side
* Operate control lever, position davit arms just above boat lifting position
* Embark lifeboat, fasten seatbelts & grab handle in front
* Close hatch door.
* Remove safety pin securing release lever & close bypass v/v
* Pumping several times releases main lashing
* Visually confirm
* Now operator will swing lifeboat out via davit arm & lower boat via falls
* Once waterborne, remove handing wire suspending the boat
* Start engine.

Page No.
Date / /

RESCUE BOAT

* Rigid or inflatable type
* Rescue boat not to be less than 3.8m & not more than 8.5m in length
* Rescue boats shall be capable of manoeuvring at speed of atleast 6 knots & maintaing that speed for atleast 4 hrs.
* Rescue boats should be capable enough
  - to retrieve persons from water.
  - tow liferaft with its full complement of persons & equipment at speed of atleast 2 knots
* Rescue boat to be fitted with either inboard engine or outboard motor
* Rescue boat should be capable to carry atleast 5 seated persons & 1 person lying on stretcher.
* For pass ship of 500 GT & above, atleast 1 rescue boat on each side
* For pass ship of less than 500GT shall carry atleast 1 rescue boat
* For cargo ships, atleast 1 rescue boat.
* Lifeboat may be accepted as rescue boat provided it complies with the requirements of rescue boat.
* Recovery time of rescue boat shall not be more than 5min with full complement
* Rescue boat should be capable to be launched at trim of 10° & list of 20°

* Fuel to be sufficient for atleast 4 hrs.

Items :

① TPA sufficient for 10% of no. of persons in rescue boat or 2 whichever greater.

- Oars
- Boatbook
- Buoyant bailer
- Bucket
- Compass
- Sea anchor
- Painter (min 15m)
- Buoyant tow line
- Waterproof torch
- Whistle
- First aid
- Knife
- Buoyant buoy
- Radar reflector
- Rope ladder

Page No.
Date

LIFE RAFT

* Every liferaft capable to withstand exposure for 30 days afloat in all sea conditions
* Capable to be dropped from ht of 18m without any damage
* Liferaft to be capable to withstand no. of jumps equal to its complement at ht of 4.5m
* Liferaft & fittings to be constructed to be capable to be towed at speed of 3 knots in calm water with full complement & 1 sea anchor streamed.
* No liferaft approved to carry less than 6 persons.
* Liferaft to have a canopy to protect against heat & cold.
* Total wt of liferaft along with its container & equipment not to be more than 185 kg.
* Liferaft to have a painter of not less than 10m + dist from stowed position to waterline or 15m whichever greater
* Liferaft with full complement of persons & equipment capable to withstand a lateral impact against ship side @ impact velo not less than 3.5m/s & drop in water from ht of not less than 3m without damage.

* If weak link is used:
  - break under strain of 2.2 ± 0.4 KN
* If 2 liferafts, then atleast 1 to be of HRU type

* To be inflated within 1min bet° 15~20°C & 3min @ -30°C
* Canopy light
  : 4.3 Cd
  : 12 hrs (50~70 flashes/min)

Items:

① TPA sufficient for 10% of no. of persons in life raft or 2 whichever is greater.
- 4 rocket parachute
- 6 hand flares
- 2 smoke signals
- EPIRB
- SART
- Food ration 500gm/per/upto 3 days
- Water 500ml/per/upto 3 days
- Knife
- Tin opener
- Anti-sick tabs = 50
- First aid kit
- Survival booklet
- Radar reflector
- Whistle
- Heliograph
- Torch

Compass
Sea anchor
Buoyant bailers
Sponges

Page No.
Date / /

Marking On liferaft container MSDD PMS LS

- makers name
- Sr No
- Date of manu
- Date when last serviced
- length of painter
- Max ht of stowage
- Launching inst
- SOLAS

Safety of liferaft

- pr relief v/v
- insulated canopy
- stabilizing pocket.

Launching :

Manual Release -

① Take 80% of painter & secure it to ships side
② Remove lashings
③ Ensure water is clear of any obstruction
④ 2 people lift container & throw it OVBD
⑤ Now pull the painter with hard jerk to inflate the raft
⑥ Board the raft by embarkation ladder

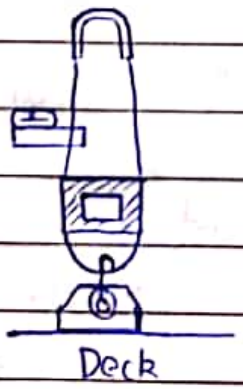
Page No.
Date

Davit Release -

① Open the senhouse slip & disconnect liferaft from HRU
② Take 80% of painter & secure it to ships side
③ Remove the locking to pull out the lifting shackle on the container
④ Connect the shackle to crane hook
⑤ Pull painter sharply to inflate raft
⑥ Now drop the liferaft into water

Auto Release -

① This happens when ship sinks upto a depth of 4m.
② Hydrostatic release unit is connected to senhouse slip. The other end of HRU is connected to deck with shackle The painter is attached to weak link.



③ Due to water pr, the diaphragm is pushed up & blade is released which cuts the rope & liferaft is free
④ As liferaft goes up painter is pulled & weaklink breaks.

EXPERIMENT : No.

PAGE No.
DATE

Q Why tankers have lesser freeboard?

① Due to lesser permeability
② Density of liquid cargo is lesser than other ship
③ Incase of tanker, ship side plating is more stronger than other forces (as tanker has more draft & more water pr acts on side shell)
④ less hatch opening area
⑤ Efficient pumping arrangement
⑥ Higher GM

GM for fully loaded ship
- General carg 0.3 ~ 0.5m
- VLCC 0.3 ~ 0.8m
- Container 1.5 ~ 2.5m
- Ore carrier 2 ~ 3m

waterplane

SOLAS → SOLAS

SOLAS came after Titanic

MARPOL came after Torrey Canon

ISPS came after WTC 9/11

ISM came after Harald of free enterprise

Chap① — General Prov : Surveys & certi of all safety items

* Safety
* Survey
* PSC item
* Applicable to ship enageged in international voyage
* Not applicable to
  - war ships
  - cargo ships smaller than 500 GT
  - ships powered by wind or non-mech means
  - wooden ships
  - pleasure yachts not engaged in trade
  - fishing vessel.

«CLYDE»

Imp certificates covered for cargo ship

- cargo ship safety equi cert CSSEC
- cargo ship safety radio cert CSSRC
- cargo ship safety const. cert CSSCC

No more favourable treatment

EXPERIMENT : No.

PAGE No.
DATE

	Statutory	Mandatory
* Purpose - To find GZ * Cross curve based on assume KG * Prepared by ship yard.	* Those certi req by law of that country ex - law of flag state of that country	Those state/ countries who hasnt ratify but it goes in other countries who have ratified.

Chap ② *1 - Const - Subdiv & Stability, machinery & ele installations which deals with watertight integrity of ship

Intact stability

Chap ② *2 - FSS + FTP Code

Fire safety Sys — Fire test procedures

* Recognized by particular flag state to carry out help & delegation of duties → R.O
* RO is non gov organization
* Ro can also work as Class Society.

2.1

Anchoring Equi
:- All vessels shall carry a complete set of anchors & chains as per rules of R.O

Intact Stability
Subdivision
Permiability
Construction
Watertight Integrity
Loadline assignment
Damage stability

((CLYDE))

Teacher's Sign.:

Subdiv length :- Greatest projected moulded length of that part of ship at or below deck or decks limiting vertical extent of flooding with ship at deepest subdiv draught.

* more subdivisions so better
but we have a limit subdivisions
as cost & wt of div will increase.

loadline conv

Type A :- Ships designed to carry only liq cargo in bulk
Type B :- ships other than type A

Lightwt

* Only wt of ship & machinery without cargo, fuel, water etc & crew

Deadwt

* Difference betn displacement & lightwt of ship.

Deadwt = Disp − Light wt

Displacemt

* loading ship upto the summer load line when ship in sw.
* That displacemt − light wt, we'll get deadwt

Deadship Condition

* Main propulsion plant, boiler & aux are not in ops due to absence of power

Machinery spaces of cat A

* Those space which contain
  - machinery for main propulsion
  - machinery other than main propulsion where aggregat of total power output not les than 375kw
  - oil fired boiler

ETA = eme towing arrangements

EXPERIMENT : No.

PAGE No.
DATE

* Eme towing arrangements on tanker
- If tanker not less than 20,000 ton dwt at both ends of ship

condition
If ship after 1 July 2002
- atleast 1 has to be pre-rigged ready for rapid deployment.
- eme towing arrangement

* Eme towing arrangement on other ships
- all pass ships, after 1 Jan 2010
- cargo ships constructed after 1 Jan 2010
- cargo ships before 1 Jan 2010, but not later than 1 Jan 2012

ETA to be * ship specific
* drawing of fore & aft of towing arrangement
* inventory of equipment for towings
* means & method of communication
* sample procedures to conduct eme towing ops

{{ CLYDE }}

Fwd ETA to deploy need atleast 1 hr
Aft ETA, 15min by 1 man to deploy

* From 1 Jan 2011, new installation of materials which contains asbestos shall be prohibited

Teacher's Sign.:

Construction/drawings

- A set of const drawings showing structural alterations to be kept onboard constructed on or ~~bef~~ after 1 Jan, 2007

Goal based construction std for Bulk Carrier & Oil Tankers

- Came in 2016
- So all ships of 150m & above (tankers & bulk carriers)
- This excludes ore carries & combination carriers
- Ship shall be designed using ergonomic (human to machine interface) principles to ensure safety during operations, inspection & maintenance
- ex - Stairs, ramps, walkways, ladders etc
  Design life, fatigue life, transparency, structural strength, design redundancy, water tight & weather tight integrety.

Objectives : Safety & env friendly

- Ship St, fittings & arrangements
- Pollution prevention

{{ CLYDE }}

Noise Code - Reg 3

* applies to ships more than 1,600 GT
* came on or afer 1 July 2014 or keel laid on or after 1 Jan 2015
* Code to limit the noise level exposure to seafarers

Intact Stability

- All cargo ship of 24m length & above
- Every pass ship
  Inclining exp is necessary to be passed to ~~pass~~ ensure intact stability.
* Inclining exp is done once ship is constructed.

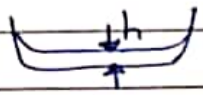
EXPERIMENT : No.

PAGE No.
DATE

Part B-2

Subdiv, watertight & weathertight integrity

* DB extending from collision bulkhead to aftpeak bulkhead. It should be compatible with design & work of ship.



$h = B/20$ Breadth of ship

* In no case h should not be less than 760mm & not more than 2000mm

Reg-11 Watertight bulkheads

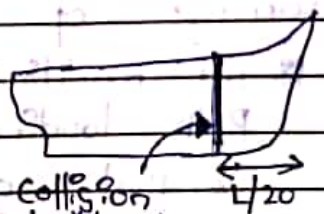
Testing 2 req ① Fill completely with water (hydrostatic test)

② Pressurize hose & check on opp. side

If not, a dype penetration test or ultrasonic leak test can be performed

Reg-12

* Collision bulkhead shall be watertight upto deck
* Bulkhead to be located at dist from FWD ⊥ of not less that 0.05L or 10m whichever is ~~greater~~ less & not more than 0.08L or 0.05L + 3m whichever is greated



* Collision bulkhead only in Fwd of ship
* Situated before forepeak tank & after cargo tank

Teacher's Sign.: _____

General Overview on SOLAS

Chapter ① - General Provisions

- Survey, certificates, port state & flag state inspections for ships, documents

Chapter ②

part ① - stability, construction, subdivision, m/c & electrical installation, GBS, IS code. (intact stability)

part ② - fire fighting → FSS + FTP (Fire test procedures)

Chapter ③ - LSA

Chapter ④ - Radio communication : GMDSS, VHF, Radio

Chapter ⑤ - Safety of navigation, voyage planning, distress signal, SIG, Save manning document

Chapter ⑥ - Carriage of cargo except liq/gas cargo in bulk

- Int maritime solid bulk cargo (IMSBC)
- Bulk loading & unloading (BLU)
- Verified gross mass (VGM)

Chapter ⑦ - Carriage of dangerous good → IBC/IGC/IMDG

Chapter ⑧ - Nuclear ships

EXPERIMENT : No.

PAGE No.
DATE

(1993 Adopt) (1998 ~~in force~~)

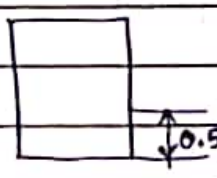
Chap ⑨ - ISM Code + safe management

Chap ⑩ - Safety measures for high speed craft + helicopter pick up areas + PA system
High speed craft code (HSC)

Chap ⑪ - Part ① - enhanced safety measures : ESP (2002)
Bulk Carriers, Oil Tankers
- RO Code
- Casualty investigation
- Ship identification (IMO no)
- Company & Owner identification no.
- Cont. synopsis record (2004)
- PSC requirements
- Enclosed space atmosphere testing equipment

Part ② - enhanced security measures : ISPS (2002) adopted. (2004) enforced

Chap ⑫ - Additional safety measures for bulk carriers >150m (1999 enforced)
new ships → 1000 kg/m³
existing ships → 1780 kg/m³
construction, damage stability, water ingress alarm



2nd alarm → 15% of depth of hold or 2m
0.3m before

2016
Chap ⑬ - Verification of complaince → IMSAS, IMO instrument implementation code
III code.

IMO → SOLAS, MARPOW, STCW, MLC, BWM } Instrument

All member states of ~~IMO has to comply with~~ III Code.

Teacher's Sign.: _____

ITCP

Chapter ③ LSA

* All LSA to be type approved by Administration.

Lifebuoy :- → Personal LSA

CLYDE

Atleast 3 VHF → Passenger Ship
→ Cargo Ship > 500 GT

Atleast 2 VHF → Cargo Ship bet^n 300 ~ 500 GT

Atleast 1 SART on each side → Passenger
→ Cargo Ship > 500 GT

Atleast 1 SART → Cargo ship bet^n 300 ~ 500 GT

Passenger Ship

under 60m	8
60 ~ 120 m	12
120 ~ 180m	18
180 ~ 240m	24
above 240m	30

Cargo Ship

under 100m	8
100 ~ 150m	10
150 ~ 200 m	12
above 200m	14

Carrying Capacity For Life-buoy

Lifejacket :- → Personal LSA

* 1 lifejacket for every person onboard ship
* Children lifejacket atleast 10% of no. of passengers

* 5% extra lifejacket to be provided
* Addition lifejacket @ watchstation & other manned station

Immersion Suit :- → Personal LSA

* 1 immersion suit for each person who is part of rescue team → Passenger Ship
* 1 immersion suit for each person onboard → Cargo Ship

EXPERIMENT : No.

PAGE No.
DATE

Passenger Ships

Lifeboat (Partial or totally enclosed)

* 1 lifeboat on each side which can accomodate not less than 50% of total no. of persons onbaard

Passenger Ships

Rescue Boat

* 1 rescue boat on each side if ship more than 500 GT
* 1 rescue boat onboard if ship less than 500 GT

Immersion Suit

*
* Alteast 3 immersion suit in lifeboat → Passenger ships
* Immersion suit need not be there if ship engaged in voyages in warm climate as per Adminstration

Lifeboat

* 1 or more totally enclosed lifeboat on each side of aggregate capacity on each side to accomodate total no. of persons

Rescue Boat

* Cargo ships to carry atleast 1 rescue boat on any side
* Lifeboat may be accepted as rescue boat provided its launching & recovery arrangements comply with rescue boat

Teacher's Sign.: _____

* Cargo ship may carry 1 or more free-fall lifeboat to be launched over stern of ship to accomodate total no. of persons onboard

Life Raft → Only Cargo Ship

* 1 or more inflatable or rigid liferafts of total wt less than 185 kg stowed for easy side to side transfer of aggregate capacity to accomodate total no. of persons onboard.

* If liferaft not less than 185 kg, then 2 liferafts each of 100% capacity on each side.

* If ship less than 85m, the 1 liferaft on each side.

CLYDE

* Cargo ship where horizontal distance from extreme end of stern or stern of ship nearest to survival craft is more than 100m then 1 additional liferaft far away from the fwd of ship.

* Bulk carries after 1 July 2006, shall have freefall lifeboat

Rescue Boat Req

* Not less than 3.8m
* Not more than 8.5m
* Capable to carry atleast 5 sealed person + 1 on stretcher
* Capable to manoeuvring at speed atleast 6 knots & maintain that speed for 4 hrs
* Capable to be safely launched by trim upto 10° & list upto 20°
* Capable to be launched when ship making a headway at speed of 5 knots.
* Capable to tow a 25 person liferaft atleast at 2 knots

EXPERIMENT : No.

PAGE No.
DATE

* Cargo ships of 20,000 GT & up, lifeboat with davits shall be launched when ship making headway at speed of 5 knots

* Capable to be launched even at trim 10° & list 20°

* Recovery time for ~~sesr~~ rescue boat is max 5 min & launching not more than 5 min

* The speed at which survival craft or rescue boat is lowered into the water should not be less than

$$S = 0.4 \pm (0.02)H$$

S → Speed of lowering (m/s)
H → Ht from davit to waterline (m)

Lifeboat Load Testing

Static Test → By applying brakes
Dynamic Test

* DYNAMIC TESTING IMP

- The davit is brought to its max extent of lowering
- The falls are loosened such that the boat is lower.
- At this pt where boat gains max speed we apply brakes. (3m above waterline)
- Then we check the condition of brakes on brakedrum (centrifugal brake)
- It can allow boat to go down max of 1m after applying brake.

Teacher's Sign.: _____

Onload Release Mechanism :

- Mechanism releases boat when the boat is above the waterline

Offlad Release Mechanism :

Mechanism releases boat after the load of boat is transferred to water.

Working of Offload Release (No load on falls)

- There is a hydrostatic piston unit provided at bottom. and the piston is connected to operating lever via link.
- Once boat becomes waterbourne, the water pr will move the piston up.
- The piston will move up, pushing the lever & it will operate hook arrangement & release fall wire.
- There is a safety pin arrangement which disenables offload release in case of piston malfunction allowing for onload release.

Working Of Onload Release (Full load on hooks)

- Onload mechanism can release boat from wire with the boat above waterline will all crew.
- The load is fully on falls as boat not touched water.
- Boat is released when the boat is slighty above water level so that fall can be smooth & no damage the persons or boat.
- A lever is provided inside boat to operate this mechanism. & release boat in water.

EXPERIMENT : No.

PAGE No.
DATE

* Lifeboat hull test 1.25 times the total mass of lifeboat when fully loaded with full complement of persons & equipment

* If lifeboat doesn't have metal hull then 2 times the total mass of lifeboat when fully loaded with full complement of person & equipment :

* Lifeboat can accomodate max 150 persons
* Lifeboat powered by CI engine
* Fuel flashpt not be less than : 43°C

* Lifeboat engine starting → Manual start
  Power start

* Capable to start @ -15°C within 2 min

* Engine speed 6 knots & for towing 2 knots

* Engine shall be capable of operating for not less than 5min after starting from cold with lifeboat out of water

* Fuel to be sufficient for 24hrs

Teacher's Sign.:

* On both sides of boat there are hooks and locking pin which is a fall prevention devices
* There is a handle inside boat connecting to both hooks of the boat
* Now there is a hydrostatic unit connected to handle. So in offload release the cable becomes loose & handle can be released
* This handle is called coxswain release handle assembly.
* Only when hydrostatic release unit is activated, the interlock cable is pushed up & allows fore movement of coxwain handle.
* In case of onload release, we have to push the button which is eme override or interlock handle to open position.
* Here 2 safeties are there, 1 safety pin on coxwain assembly & the handle has to be lifted up & then only can be activated.

Hand Brake :- It either allows the boat to go down or stop in that position.

Centrifugal Brake :- It controls the rate at which lifeboat is lowered.

* Hand brake is used to perform static test on brakes & Centrifugl brake is used to perform dynamic test on brakes

Davit :- Brings boat from stowed position to embarkation deck

Falls :- Brings boat from embarkation deck to waterline depending on On-Load or Off-Load

EXPERIMENT : No.

PAGE No.
DATE

Another Static & Dynamic test is done over the davits called Proof Load Test

* Waterbags of 375kg capacity is arranged inside boat to simulate crew inside. This is to check if the davit can take load or not → Static Test
* When the davit lowers boat, we apply brake. If the davit brake can hold boat in position, the test is passed. If boat even lowered a little after applying brakes, test is failed
* Done at 10% load higher than wt of boat with all compliments & equipments
* Every 5 years → Dynamic Test

Lifeboat Equipments

Teacher's Sign.:

EXPERIMENT : No.

PAGE No.
DATE

Chapter 4 - Radiocommunications

* This chapter regulations apply to cargo ship of 300 GT & above

① NAVTEX - Navigation telex
* It only receives messages, it doesn't send any messages
* Messages include navigational & meteorological warnings & forecasts and Maritime Safety Info to ships
* Wks in range of 200 Nm

② RADAR
* It is an object detection sys
* It uses radio waves to determine range, angle or velocity of objects
* It can detect aircrafts, ships, missiles, terrain etc
* Radar can transmit & receive.
2 radars available on ship
  - ↳ X-band (3cm) (9GHz) longer range
  - ↳ S-band (10cm) (2.9~3.1 GHz) Shorter range
* S-band used in heavy rain & fog.

Documents to be carried onboard with GMDSS
→ Ships radio license
→ Radio operators certi
→ Safety radio certi
→ GMDSS radio log book
→ Antenna rigging plan
→ Shore mainterance certi

Teacher's Sign.: _____

* SOLAS complied ships should have atleast 1 VHF connected to channel 16 (156.8 MHz)
* On all passenger ships
* Cargo ships of 300 GT & above. } VHF requirement

---

* SOLAS complied ships should have atleast 1 EPIRB
* If cargo ships more than ~~300~~ 500 GT, then 1 EPIRB on each side.
* All passenger ships, 2 EPIRB

---

* SOLAS complied ships should have
  2 SART → over 500 GT
  1 SART → 300 ~ 500 GT

SART can be either → Radar SART
→ AIS SART

Chapter 5 - Safety Of Navigation

* Navigation warnings are received on Navtex

Chapter 14 :- Ships Manning

* Contracting govt ensures all ships shall be sufficiently & efficiently manned.
* They will establish minimum safe manning & issue a Min Safe Manning Document

EXPERIMENT : No.

PAGE No.
DATE

AIS - Auto Identification Sys

- uses transponders to continously transmit our ship info. via satellite
- AIS data is known to all — CLYDE
- IMO no
- Name of ship
- Call sign
- Length & beam
- Type of ship
- Location & position
- Type of cargo
- Ships draft

Safety related reasons OR Drydock → (LRIT & AIS cannot be switched off unless Flag State or Country has said so)

(Every cargo ship of 300 GT & above)

LRIT - Long Range Identification & Tracking (Every Pass ship)

- It also transmits ships info but not to surrounding ships
- It sends data to service station, flag state, rescue services

* LRIT works on satellite communication	AIS works on VHF communicated
* Worldwide coverage available	Coverage limited to 35~40 Nm
* LRIT is not aid to navigation	AIS is an aid to navigation
* LRIT info not available to vessels in vicinity	AIS info is available to vessels in vicinity

Teacher's Sign.:

LRIT transmits
- ↳ identity of ship
- ↳ position of ship
- ↳ date & time of position

basically for tracking of ships by flag state.

CLYDE

~~VR~~ : VDR (Voyage Data Recorder)

* fitted on bridge for recording of data
* It stores info in secure & retrievable form concerning position, movement, control of vessel over a period leading to an accident.
* This info is to be used during the investigation to identify cause of accident.
* Used found on monkey island

* Passenger ship & other ships of 3000 GT & up constructed on / after 1 July 2002 must carry VDR
* Ships before 2002, must be fitted with VDR or S-VDR

Data
- Date & Time
- Ships position
- Speed
- Heading
- Bridge audio
- Communication audio
- Radar data
- AIS
- Echo sounder
- Main alarms
- Wind speed & direction

* IMO requires data to be retained for min 12 hrs after which it overwrites itself

EXPERIMENT : No.

PAGE No.
DATE

Regulation 28 :- Every ship of 500GT & above engaged in international voyages exceeding 48hrs shall submit a daily report to Company

Report of → Ships position
→ Ships course & speed
→ Details of conditions affecting ships voyage

Chapter 6 - Carriage Of Cargoes & Fuels

except liq cargo in bulk
gas cargo in bulk
CLYDE

IMSBC Code :- Int Maritime Solid Bulk Code

Solid bulk means other than liq or gas, consisting of combination of particles or large pieces of material loaded directly into cargo spaces.

IMSBC Code consists of cargoes of 3 categeries

* Group A - cargo which may be liquefy if shipped at a moisture content exceeding transportable moisture limit.
* Group B - cargo which possess chem hazard.
* Group C - cargo which are neither under A or B but still can be hazard

Iron Ore, Silica, Cement

Teacher's Sign.: _____

Chapter 7 - Carriage Of Dangerous Goods

Part A - Dangerous goods in packaged form

* IMDG Code : Int Maritime Dangerous Goods Code.
* Documents → Medical First Aid Guide (MFAG)
  → Emergency response procedure Guide (EmS)
* DOC issued to ships carrying cargo in packaged form or bulk form — CLYDE
* IMDG Code applies to
  → Cargo ships less than 500 GT } carrying dangerous goods
  → All ship
* IMDG Code does not apply to ship stores & equipment
* IGC code also comes under chap 7
* IBC Code also comes under chap 7

IMDG → Packaged form (containers)
→ Bulk form (Bulk carrier)

* IBC Code certificates
  ↳ certi of fitness
* IGC Code certificates
  ↳ certi of fitness

* IMDG Code certificates
  ↳ DOC certi
  ↳ NLS certi

EXPERIMENT : No.

PAGE No.
DATE

Chapter 8 - Nuclear ships
Chapter 9 - Management of safe ops of ships

Herald of Free Enterprise

↑ Disaster

193 lives lost

ISM Code

* Adopted 1994
* Entry into force 1998

ISM Code applicable to all passenger ships
to other ship above 500 GT

→ Pass ships not later than 1 July 1998
→ Oil / Chem tankers, gas/bulk carriers of 500 GT & above not later than 1 July 1998
→ Other cargo ships & MODU of 500GT & above not later than 1 July 2002

Objectives of ISM
→ ensure safety @ sea
→ prevention of human injury or loss of life
→ avoid damage to env
→ avoid damage to property.

ISM divided into
* Part A → 12 elements
* Part B → 4 elements

Part A - Implementation
Part B - Verification & certification

Teacher's Sign.:

Part A

① General - Definations, Objectives

* Safety Management Obj:
  - ↳ Safe practices in ships ops & safe work env
  - ↳ Identify all risks & establish safeguards
  - ↳ Continously improve safety mgmt skills including eme preparedness

* Functional features of SMS
  → SMS always ship specific which includes

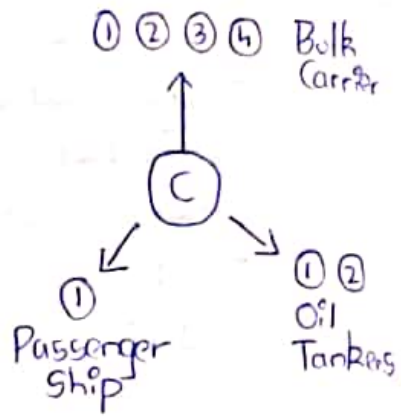
① SEPP

② Safety & Env Protection Policy

③ Company Resp. & Authority

④ DPA

1 Ships can have 1 DPA
That DPA can also see other ships
Company appoints DPA
DPA has highest level of mgmt.



* So ⑦ SMS for 7 Ships

⑤ Master Resp. & Authority
  - ↳ Review SMS & implement
  - ↳ Motivate crew to follow SMS
  - ↳ Report to DPA if necessary

Masters Overriding Authority.

EXPERIMENT : No.

PAGE No.
DATE

⑥ Resource & Personnel
⑦
⑧ Study from KS
⑨
⑩
⑪
⑫

SMS - structured & documented sys to implement the company's SEPP

Observation - observations during ISM audit making a statement of fact based on objective evidence

Objective Evidence - information which can be verified

* Non-Conformity - observed situation where obj evidence indicates non-fulfillment of requirement

* Major NC - identifiable deviation which poses serious threat to person, or, ship & immediate action to be taken to correct it

→ The observation can be NC or Major NC

Teacher's Sign.: _____

DOC issused to (company) which fullfills req of ISM code

- All Statuatory & mandatory certi
- Copy of DOC
- SMC
- All ISM manuals, procedures
- Copy of company SEPP

} Certificates under ISM

SMC issued to (ship)

Condition ①

If a new container ship taken over by a company.

You need to take Interim DOC then take interim SMC & finally convert them full term DOC & SMC

Condition ②

If a new passenger ship add to companys fleet.

You need to take interim SMC & finally convert it to Full Term SMC

* Company must have DOC or interim DOC for that ship to sail

If Company has

10	bulk carriers
5	Oil tankers
6	passenger ships

So 3 DOC
21 SMC

10 bulk carriers, so 10 SMC which will be attached to that 1 DOC

If this 1 DOC becomes invalid, the 10 SMC will also become invalid.

* If you have interim DOC, they you can get interim SMC

* If you have full term DOC, then you can get full term SMC

If you have interim DOC, you cannot get full term SMC

1 RO can be connected to various countries

EXPERIMENT : No.

PAGE No.
DATE

→ DOC certificate valid for 5 years subject to annual verification

1 2 3 4 5
Audit Audit Audit Audit Audit

→ SMC certificate valid for 5 years subject to intermediate verification

1 2 3 4 5
In 5 years 1 audit bet^{n} the 2nd & 3rd year

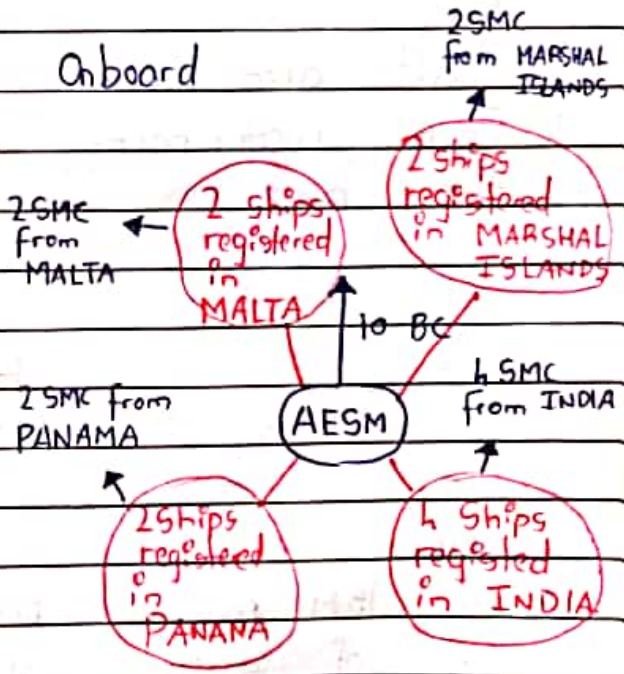
→ DOC can be withdrawn if
- ↳ Annual verification not done
- ↳ Major NC found

* Once DOC withdrawn, all SMC related to that DOC become INVALID

① There should be a Copy of DOC Onboard
Original DOC - with company

① There should be original SMC Onboard
Copy of SMC - with company

Adminstration can issue
RO can issue



* For India, RO is IRS
1 RO can work for different flags for different companies

* If AESM registered by Hong Kong → Then only Hong Kong can give DOC or any other ~~Hong~~ RO on behalf of Hong Kong.

* No matter where ships are registered For 1 type of ship 1 DOC

Teacher's Sign.: _____

EXPERIMENT : No.

PAGE No.
DATE

Interim Certification

* If 4 new BC has been purchased

Now till ship is verified completely & full term certificate is issued - this will take lots of time

Hence interim certificate is given to run the ship for time being

Conditions - 2 conditions

① Company should have a SMS meeting req of ISM Code for 4 new BC. & also has a plan to implement the SMS

Now company will get 1 Interim DOC & be given time for 12 months	(during which SMS has to be implemented & shown)

* Now he has 4 bulk carriers
So he will need 4 interim SMC's for that 1 interim DOC

* To get interim SMC
  - ↳ new ship added to company
  - ↳ when ship changes its flag
  - ↳ new company

Conditions - 4 conditions

① Company should have a DOC → Interim / Full term

Sundaram

Teacher's Sign.:

② Company should have SMS for ships
③ Company has booked internal audit within 3 months
④ Master & officers are familiar with the SMS

Once these conditions are full filled

Interim SMC will be issued for 6 months

Now to get Full Term Certificates

* 1 audit to be carried in which proper implementation of functioning of SMS for atleast 3 months within that 12 month period.
* There should be objective evidence

Full Term DOC will be issued for 5yrs

Now to get full term SMC
→ Full term DOC will be checked
→ Verification that SMC has been in operation for atleast 3 months

New Req to ISM

* cyber security threat must be added with SMS before 1 Jan 2021

EXPERIMENT : No.

PAGE No.
DATE

SMS consists of

Tier ① :- Safety mgmt manual
Tier ② :- Procedures
Tier ③ :- Checklists

If any changes in Tier ① → can be done during annual audit or additional audit

If any changes in Tier ② or ③ → No audit needed but DPA approval which will be checked in next audit

If you get NC
→ root cause analysis
→ preventive action
→ corrective action
→ measures to prevent reoccurance (within 3 months)
→ review SMS

How to convert Major NC → NC

- Convert Major NC to NC
- Carry out external audit

Teacher's Sign.: _____

Short Term SMC

* If auditor not able to give full term SMC he will provide Short Term SMC for 5 months
* This is when auditor does not have certificate ready

Main ISM Deficiency found in element 10

① Inspection & preventive maintenance of all equipments, m/c → PMS
② All LSA & Fire fighting equipment.
③ Records of inspection, maintenance, testing & calibration
④ Defects & deficiencies to be reported
⑤ Status of requisitions controlled.
⑥ Ships housekeeping & hygine
⑦ Critical equipments

CLYDE

EXPERIMENT : No.

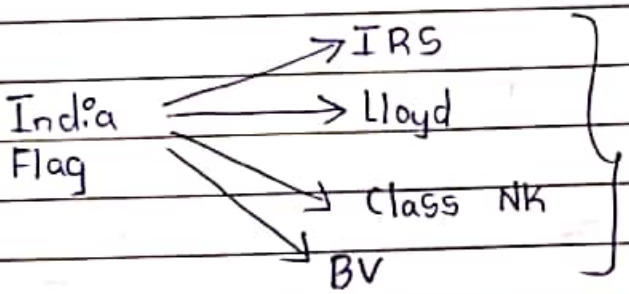
PAGE No.
DATE

Chapter II · 1

Regulation ① - Authorization of RO

- Only a classification society can become an RO
- RO is required to help flag to carry out their duties
- Suppose an Indian Flag vessel has gone to Norway. So our Indian Flag can appoint an RO (which is a classification society) to carry out the audit.

CLYDE



example

certificates are issued on behalf of Flag

Enhanced Survey → ESP
- special surveys for oil tankers & bulk carriers.

Ship Identification No

Sundaram

Teacher's Sign.: _____

IMO Unique identification no. → 1 Jan 2009

Reg 4 – PSC on ops req.

No port state related to flag state

* Port State is of the govt of country we are going to berth
* Port State can detain ship in case of compromise to safety.

CSR 1 July 2004

* All pass ships
* All cargo ship above 500GT

CSR is rec of ships histrory

→ name of flag
→ ship identification no
→ name of ship
→ name of registered owner & address
→ name of company
→ company identfication no
→ name of vessels class - Socity
→ name of organisation issued SMC, DOC, ISPS
→ date on which ship ceased to be registed with state

- After Titanic (SOLAS)
- After Torrey Canyon (MARPOL)
- After 9/11 Herald of free enter (ISPS)

EXPERIMENT : No.

PAGE No.
DATE

Regulation 6 - Additional req for Investigation of marine casualty & incidents

Regulation 7 - Atm test instrument for enclosed space

- All ships
- Capable to measure conc of O_2, H_2S, Carbon monoxide & flammable gases
- Atleast 1 to be onboard

Chapter 11.2

Min O_2 19.5
Max O_2 20.9
Min Ammonia 500ppm
Min Sulphur 100ppm
Min CO 600ppm

ISPS

- 2002 adopted
- Came into force 2004

Part A - mandatory guidelines
Part B - recommendatory guidelines

* ISPS prescribes responsibilities to govt authory, port authority, Ship company
* Applicable to Pass ships & Cargo ships >500GT

Teacher's Sign.: _____

Sundaram

SSO
PFSO
CSO

- Piracy
- Terrorist
- Stowage

* To gather security related info / from contracting govt
* To access the info
* Proper com betn ship & port facility.
* To prevent unauthorized entry in port facilities or on ship
* Define restricted area
* Prevent entry of unauthorized weapons
* Carrying out drills, trainings etc.

CLYDE

For Ship → SSO ← Implements SSP
SSP ← CSO makes

- SSP to be kept in locker
- Master & SSO has ~~exce~~ access
- If SSP kept open place → PSC takes this as major NC

Ship Sec Assessment
- done by SSO
- tell the CSO

Imp duty of SSO is to review SSP

EXPERIMENT : No.

PAGE No.
DATE

Level ① Level at which ships & port facility normally operate

Level ② Level due to heightened risk of sec incident

Level ③ Level where imminent risk of sec incident

CLYDE

Level ①

- Check the identity of all persons
- Search people, baggage, personal effects
- Access pts to be secured
- Locking down unattended spaces
- Providing security briefings
- Procedures to report suspicious persons, objects
- Random searches who seek to board
- Supervision of cargo handling

Level ②

- Addition patrol in deck area
- Limit no. of access pts
- Detecting waterside access to ship.
- Increase freq of searches & more detailing of search
- Escoding visitors on ship.
- Providing additional specific security briefings.
- Carry out full or partial search on ship.
- Limiting access pts on ship.

Teacher's Sign.: _____

- Granting access only people related security
- Suspend embarkating & disembarkation
- Suspend cargo ops, deliveries
- Evacuation of ship.
- Full complete searches on ship.

CLYDE

Who decides sec level? @ sea

- Sec level set by flag state
- But not directly, it will be told CSO
- CSO will tell SSO
- SSO will again inform about the compliance

@ port

- We have to follow same security level as port
- but ship can further increase sec level of ship if required
- In this case SSO should tell CSO & then CSO may decrease level of ship to port level

DOS bet^n ship & port
ship or & ship
to make a fixed sec level.

- Ship operating at higher security level than port
- Ship operating at higher security level than other ship

EXPERIMENT : No.

PAGE No.
DATE

~~Simpsons Rule~~

→ ~~Used to calculate the area, volume, COB~~

International Ship Sec Certificate → Statutory Certificate

- Interim ISSC (6months)
- SSP implemented for atleast 30 days
- Full term ISSC (5yrs) after successful audit by flag or behalf of flag

① SSP
② SSA
③ SSO
④ CSO
⑤ Sec levels
⑥ DOS
⑦ Sec drills
⑧ ISSC
⑨ SSAS

9 elements

* SSAS will be at 2 locations
* 1 should be in bridge other can be anywhere

* It transmits a ship to shore sec alert.
* Does not raise alarm onboard

- Installation certi for LRIT, AIS
- Other sec equipment cert
- Type approval certi for SSAS
- ISSC / Interim ISSC

* Alert goes to flag state & CSO

* SSAS must be tested atleast anually

* SSO must know test procedure of SSAS

Sundaram

Teacher's Sign.: