TRAINING MANUAL

NAUTICAL SCIENCE

Prepared by Capt Hemadri K Ray & Capt Utpal Sengupta

NAME

YEAR

ROLL NUMBER

TRAINING MANUAL
FOR
NAUTICAL SCIENCE SKILL SET REQUIREMENTS

Completion of the tasks set out in this manual will not constitute an official assessment of trainee's competence, but will provide an objective record of the skill sets in which the cadet has been trained.

INSTRUCTIONS

This training manual has been prepared taking into requirements of DGS vide Circular 04/2005, BNS syllabus and industry requirements.

A set of assignments based different competencies, skill sets and topics are set out which have to be completed by the trainee, after which the skill will have to be demonstrated and assessed. A minimum grade of B is to be attained in each of the assignments for the trainee to be considered to have completed his training.

Safe working practises and adherence to personal safety guidelines are the responsibility of the trainee under the overall guidance of the trainer. 2 points are allotted to safe working practises.

Each trainee is required to be responsible of the manual and ensure that all the assignments are completed before graduation.

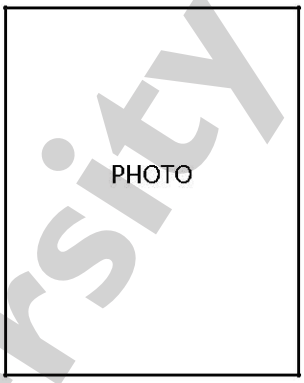
ASSESSMENT GUIDELINES

On a scale of 1 – 10

10	O	Outstanding
8 – 9	A	Very good
6 – 7	B	Good
5 & below		Redo assignment.
D		Completing the assignment is Desirable not Essential

Learning outcomes are statements that describe significant and essential **learning** that **cadets** have achieved, and can reliably demonstrate at the end of the semester/ programme. In other words, **learning outcomes** identify what the cadet should know and be able to do by the end of the semester/ programme.

PERSONAL DETAILS



Name in Full :

Father/ Mother's Name :

Permanent address :

Date of Birth :

Blood group :

The particulars as given above are true to the best of my knowledge

Place :_____

Date :_____ Signature of Trainee

INDEX

BOATWORK

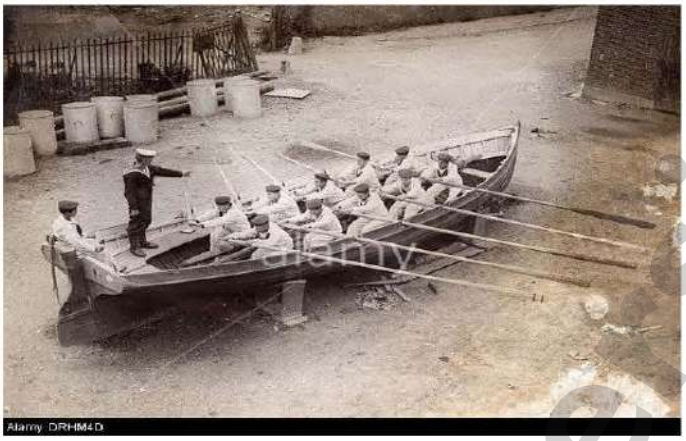
1. Assignment : Swimming

Learning outcomes:

- Knowledge of safe practises to be followed and consequences of not following same.
- Capability to swim 100 mtrs without stop, in any style single or multiple.
- Remain afloat for 5 minutes
- Resuscitation techniques : Mouth to mouth,

Assessment :

- Swim 100 metres non stop
- Remain afloat for 5 minutes

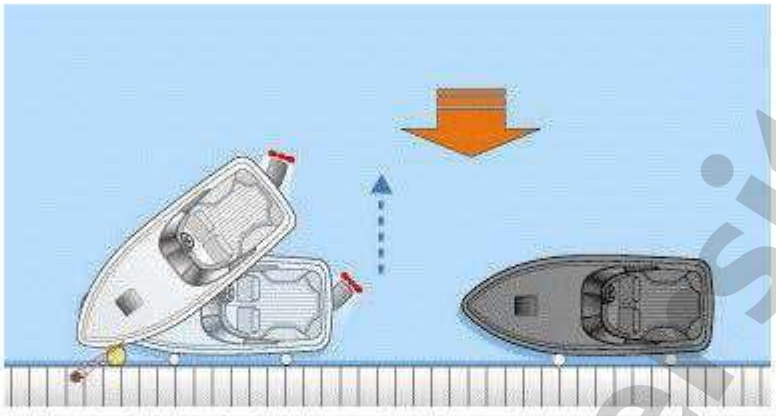


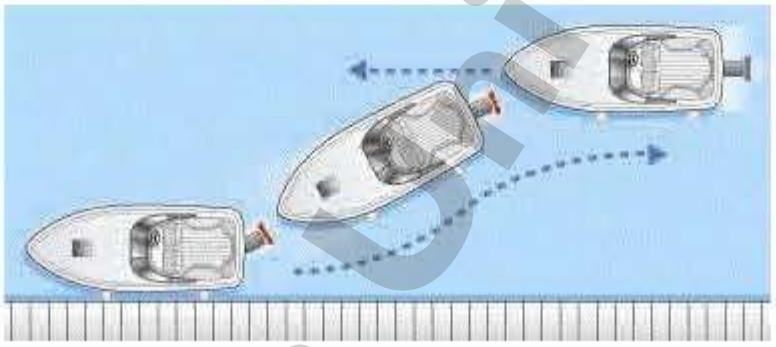
2. Assignment : Oarsmanship

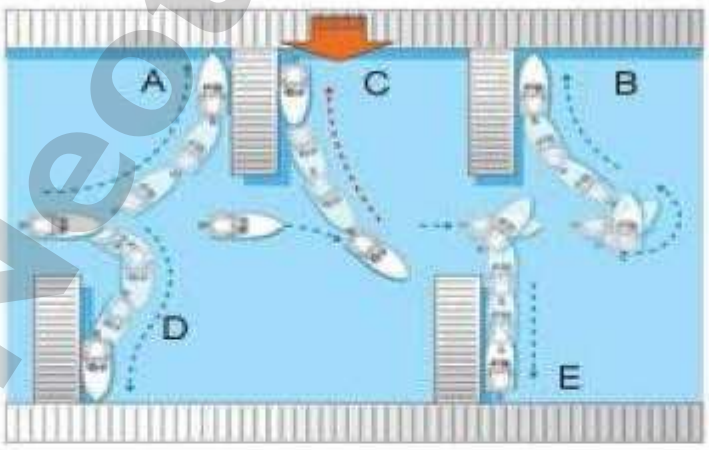
Learning outcomes:

- Knowledge of safe practises to be followed and consequences of not following same.
- Recommended PPE to be worn/ used
- Ability to follow and carry out the following orders
  a) Stand By Oars
  b) Toss Oars
  c) Let Fall Oars
  d) Out Oars
  e) Give Way Together
  f) Oars
  g) Hold Water
  h) Back Water
  i) Boat Oars
- Knowledge and use of steering oar

Assessment: Should be able to take independent charge of the boat as coxswain and show boat handling skills to the satisfaction of the Assessor.







3. Assignment : Power Boat handling

Learning outcomes:

- Knowledge of safe practises to be followed and consequences of not following same.
- Stopping distance and turning ability
- Boxing the compass
- Issue/ operate Engine orders
- How to make fast the boat alongside with ropes and cast off the same.
- Leaving a berth/ Coming alongside
- Man overboard/ Heaving to
- Know the procedure to launch, Lower & hoist the life boat. Safety during Boat handling.
- Ensure that each member of the boat crew wears PPE
- Knowledge of righting of a capsized life boat.
- Knowledge of parts of boat & oars.
- Use of Bowsing Tackle, Tricing pendant & Toggle Painter etc.
- Identification of storage of Life Boat equipment in the boat
- Knowledge and use of FPD and rescue strops.

Assessment: Should be able to take independent charge of the boat as coxswain and show boat handling skills to the satisfaction of the Assessor.

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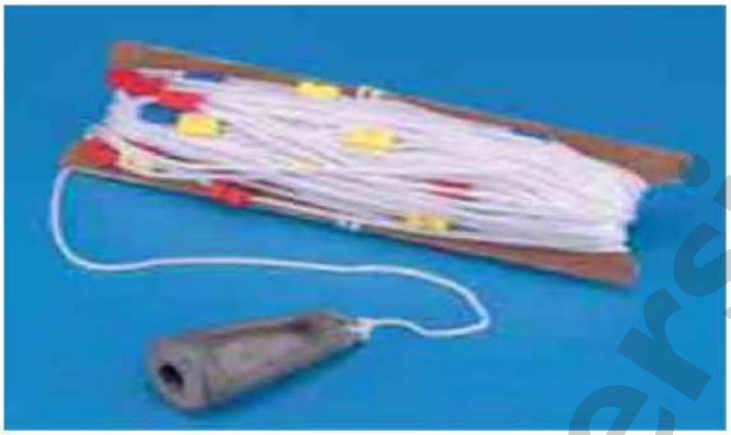
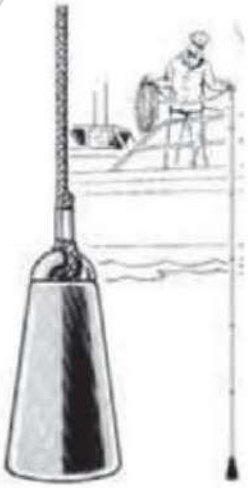


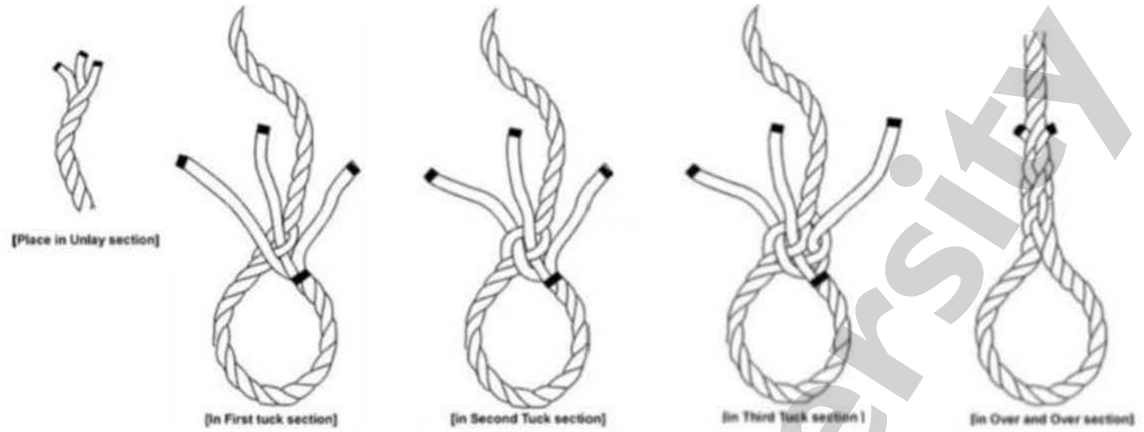


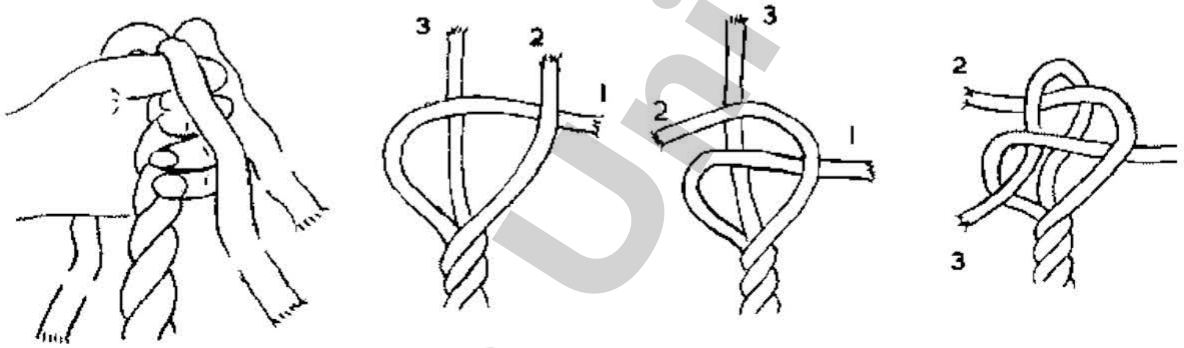
4. Assignment : Hand lead

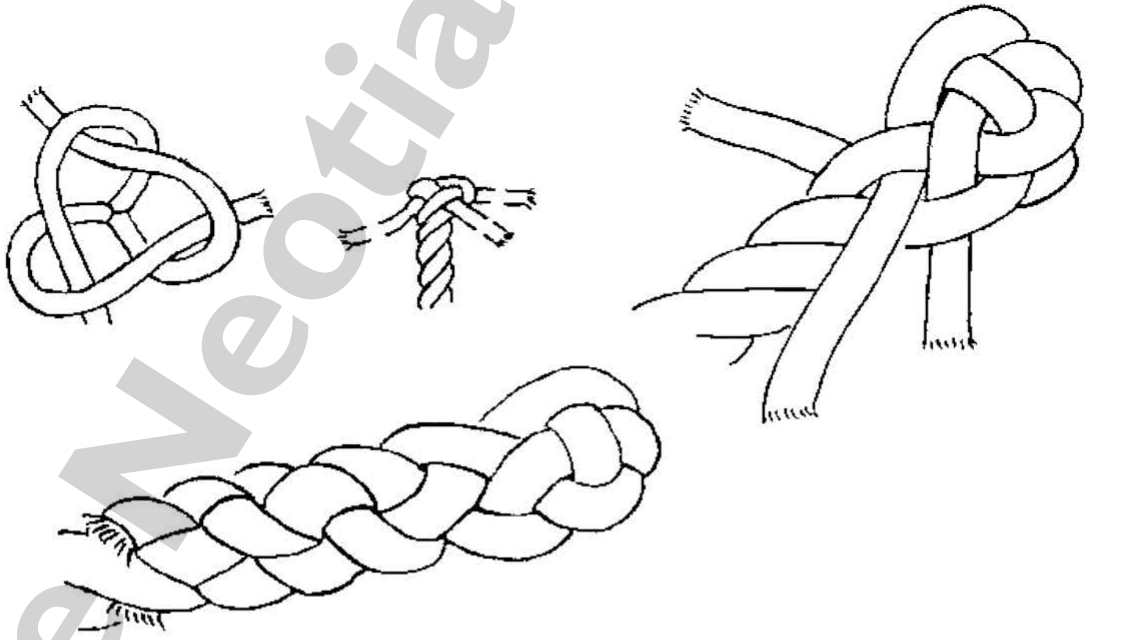
Learning outcomes:

- Carrying a lead line
- Calling out soundings
- Arming the lead
- Drying out the line
- Taking a sounding
- Marking of Handlead line.
- Meaning of benefit of the lead

Assessment: Take an actual sounding and read the nature of the bottom.







5. Assignment : Splicing Rope, Wire, Mooring line

Learning outcomes:

a) Safety, PPE & Tools required.
b) Use. Types of Rope splicing & wire splicing.
c) Make splices- Eye splice, Back Splice, Short splice, Long splice, Cut splice & Chain splice , Liver pool splice in wire rope.
d) Whipping

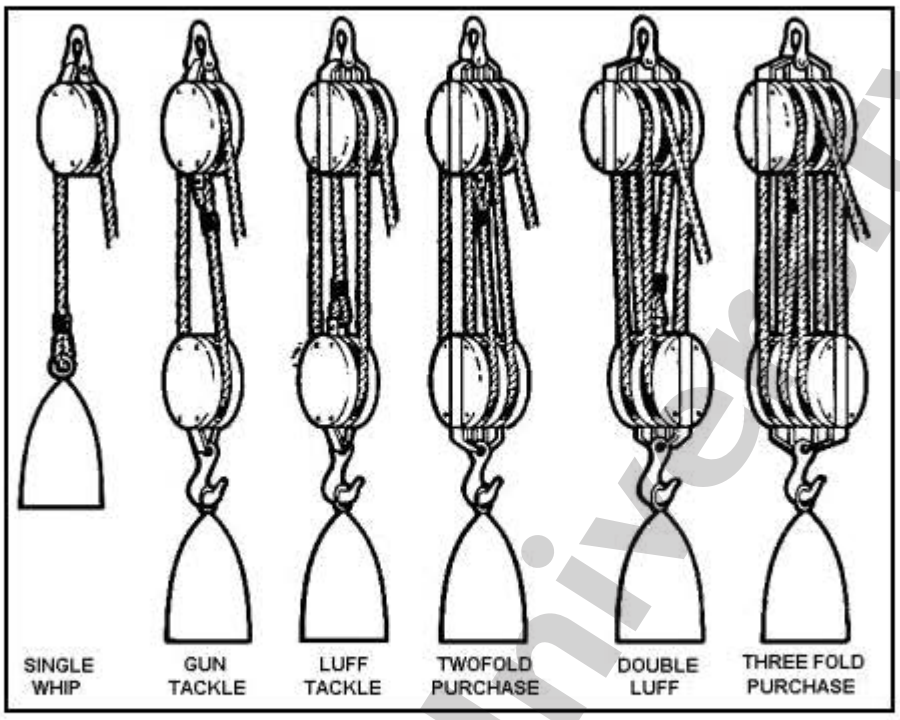
Assessment: Make any one rope splice and answer questions on the same.

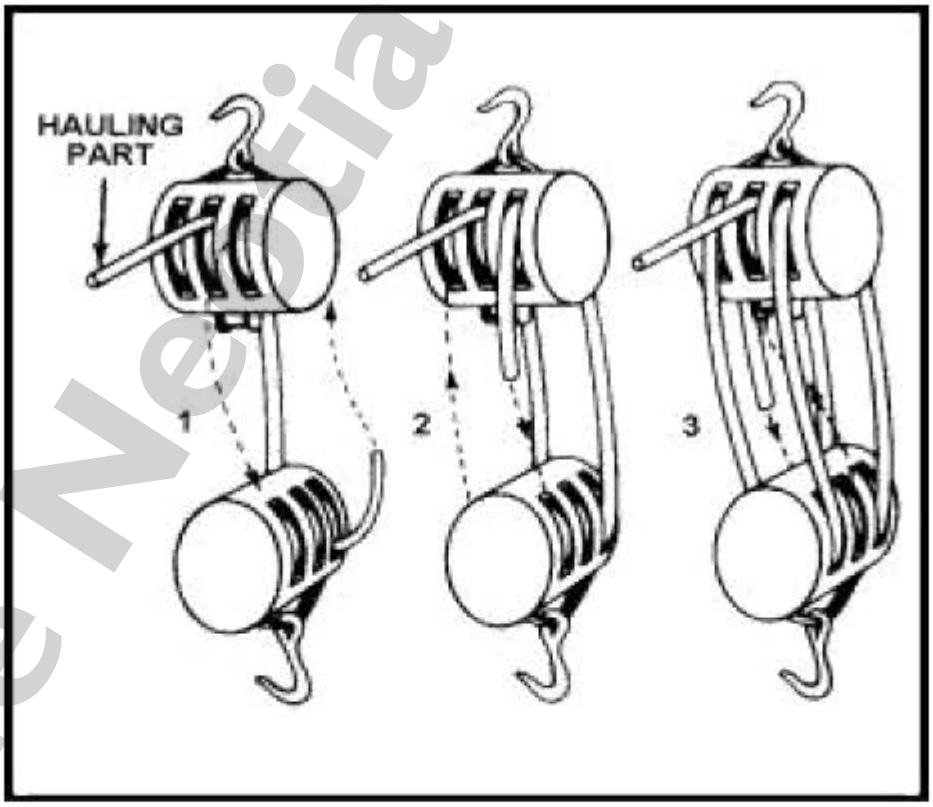
6. Assignment : Canvas work

Learning outcomes:

a) Safety, PPE & Tools required.
b) Types of seams (Flat, Round & Herring Boning)
c) Demonstrate the covering of lifebuoy.

Assessment: Demonstrate proficiency in stitching 2 types 5 cms each.





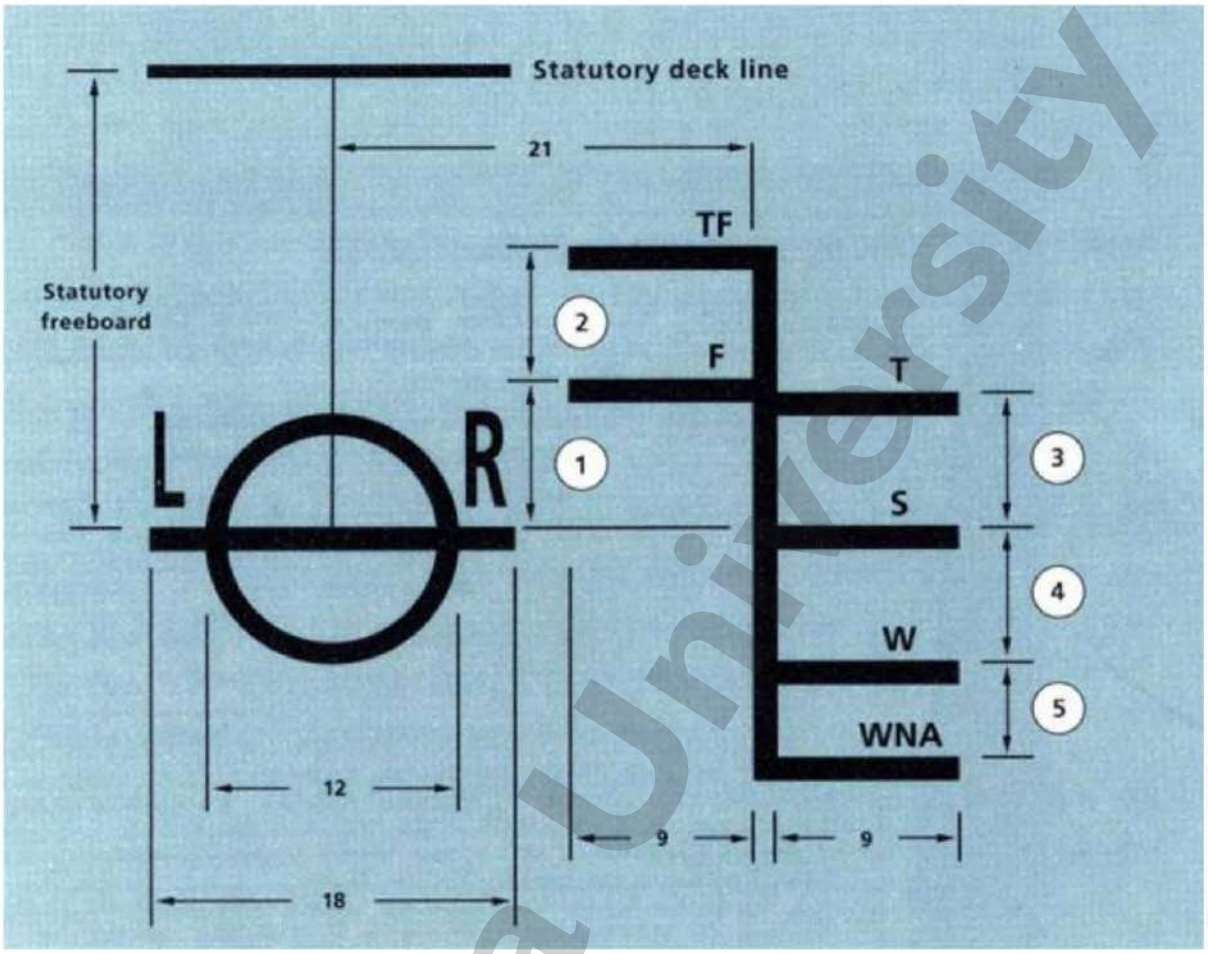
7. Assignment : Blocks & Tackles

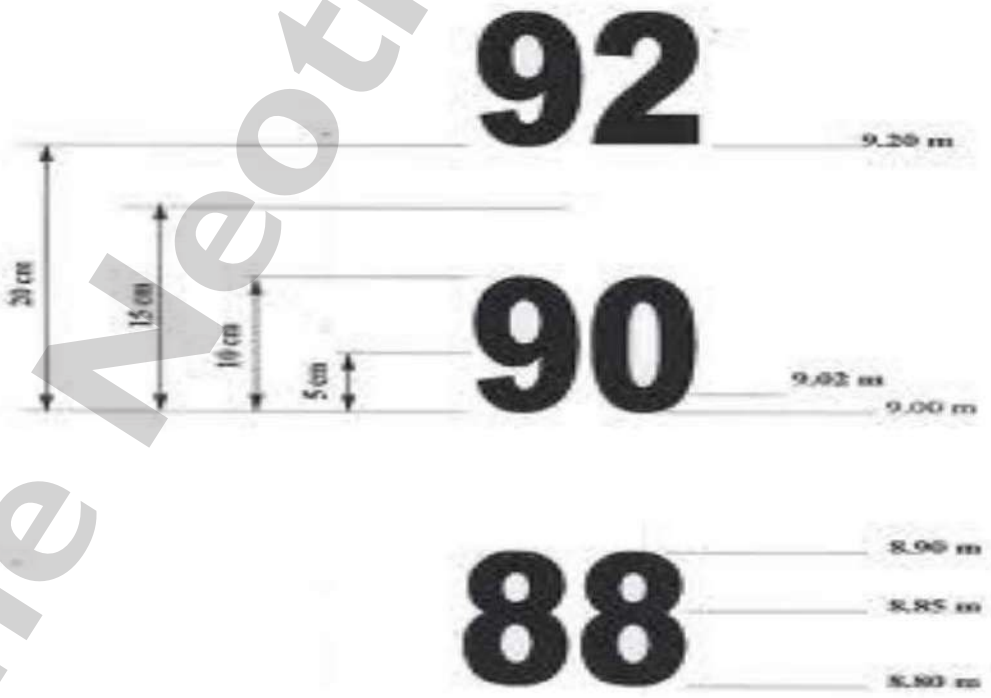
Learning outcomes:

a) Safety during handling Block & Tackles.
b) Use of various block & tackles, Types of various block & tackles.
c) Overhauling & maintenance of block. Difference between blocks & tackles.
d) Demonstrate the reeving of three fold purchase
e) Explain the purpose of using the blocks and tackles on the ships.
f) State that Blocks, may be Single sheave Block, Double-sheave blocks or triple-sheave Blocks.
g) Differentiate the Standing part, Hauling part, Running parts, Standing block, Moving – blocks of a tackle.
h) Differentiate between various blocks and tackles.
i) Explain the SWL of each block and where is it marked.
j) Demonstrate overhauling of the blocks.
k) State that sheaves of the block are measured by its diameter

Assessment:

- Reeve 3 fold purchase and answer at least 3 out of 4 questions.





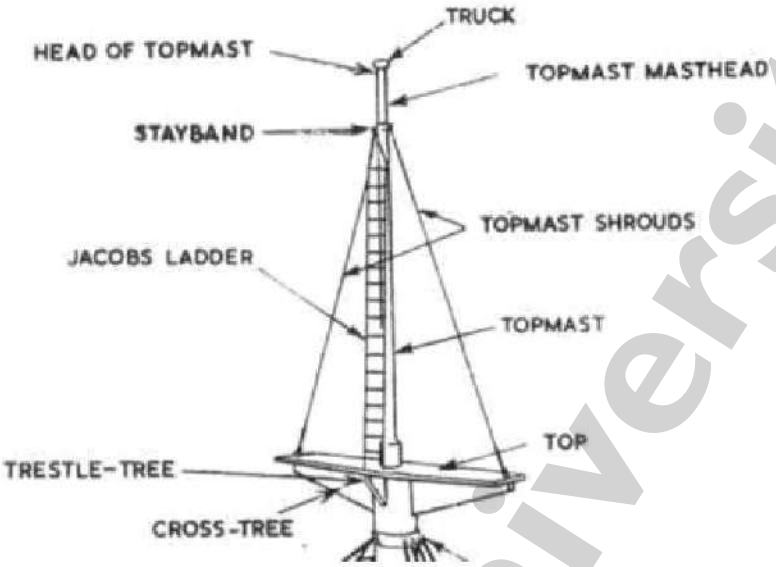
8. Assignment : Reading Drafts & Load Lines

Learning outcomes:

a) Read draft in metres
b) Draw a load line and Plimsoll mark (Port & Stbd)
c) Positions of Freeboard mark, draft marks and loadlines on ships
d) Various markings on the hull of the ship other than draft marks eg Ships Name, POR, IMO Number

Assessment :

- Read draft in metres
- Draw the load lines of one side Port or Stbd



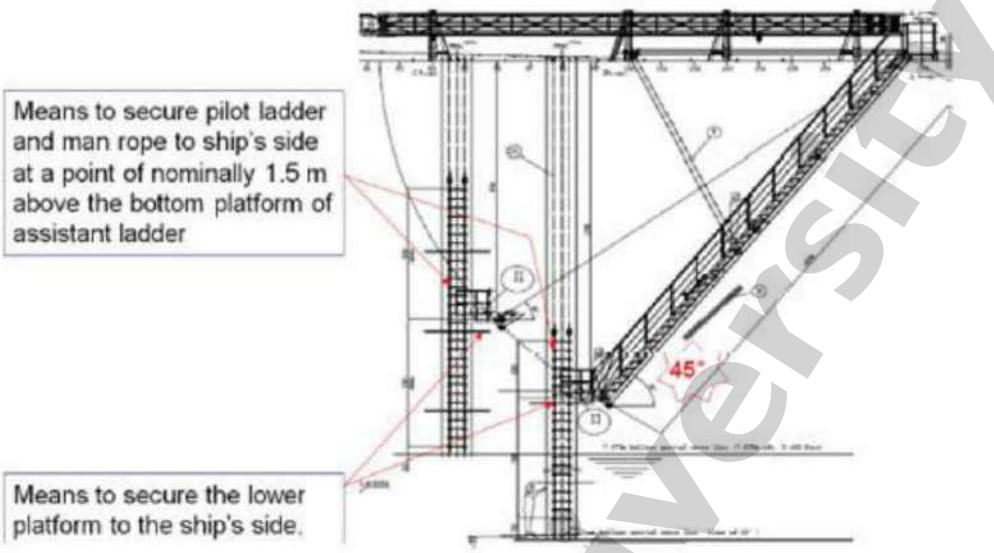
9. Assignment : Mast climbing

Learning outcomes:

a) Identify parts of a mast
b) PPE to be worn while working aloft or on a mast. Permit to work for working aloft.
c) Code of Safe Working Practises
d) 3 points climbing
e) Climb a mast

Assessment:

a) 100% compliance with safety procedures and PPE
b) Climb a mast



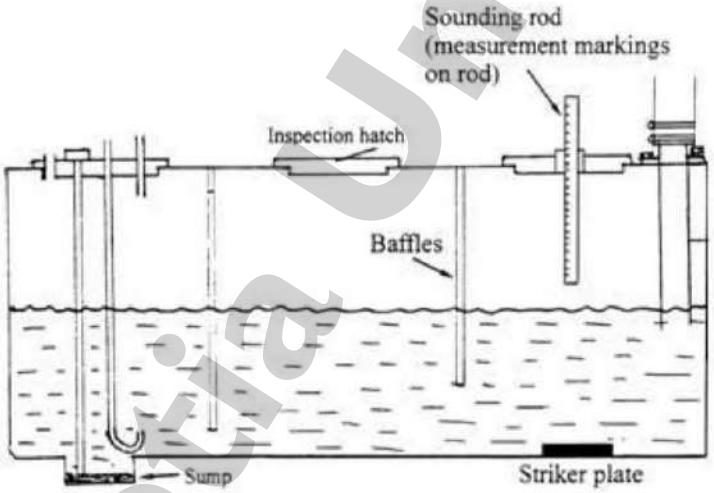
10. Assignment : Rigging a pilot ladder, Identifying the parts, Climbing a pilot ladder

Learning outcomes:

a) Familiarity with International Maritime Pilots Association safety procedures
b) COSWP, PPE and safety procedures
c) Inspecting, Rigging, Lowering ,lifting and stowing away a pilot ladder
d) How to judge the height of the ladder above the sea level.
e) Maintenance of a pilot ladder
f) Climbing up and down a ladder
g) Methods of keeping the pilot ladder flushed alongside shipside

Assessment:

Climbing down and up a pilot ladder following all safety procedures



TANK CALIBRATION TABLE

REV. ORI

COMP NAME: NO.6A S.F.O.TK(P)

SOUNDING TABLE

SOUND DEPTH CM	TRIM BY HEAD 1.0M	EVEN KEEL 0.0M	CAPACITIES IN CUBIC METERS TRIM BY ASTERN -0.5M	-1.0M	-1.5M	-2.0M	-2.5M	ULLAGE DEPTH CM
250.0	136.61	136.1	135.9	135.60	135.4	135.1	134.86	1105.1
255.0	140.40	139.6	139.3	139.09	138.9	138.6	138.34	1098.1
260.0	143.61	143.1	142.8	142.60	142.3	142.1	141.85	1093.1
265.0	147.14	146.6	146.4	146.13	145.9	145.6	145.38	1088.1
270.0	150.70	150.2	149.9	149.68	149.4	149.2	148.95	1083.1
275.0	154.27	153.8	153.5	153.26	153.0	152.8	152.50	1078.1
280.0	157.85	157.4	157.1	156.85	156.6	156.3	156.07	1073.1
285.0	161.03	161.0	160.7	160.31	160.0	159.8	159.57	1068.1
290.0	163.21	163.0	162.9	162.80	162.6	162.4	162.08	1063.1
295.0	165.17	165.0	164.9	164.80	164.7	164.6	164.48	1058.1
300.0	167.15	167.0	166.9	166.78	166.7	166.6	166.51	1053.1
305.0	169.16	169.0	168.9	168.78	168.7	168.6	168.50	1048.1
310.0	171.16	171.0	170.9	170.78	170.7	170.6	170.50	1043.1
315.0	173.19	173.0	172.9	172.82	172.7	172.6	172.55	1038.1
320.0	175.24	175.0	175.0	174.86	174.8	174.7	174.59	1033.1
325.0	177.30	177.1	177.0	176.92	176.8	176.7	176.65	1028.1
330.0	179.37	179.2	179.1	178.99	178.9	178.9	178.72	1023.1
335.0	181.45	181.3	181.2	181.08	181.0	180.9	180.81	1018.1
340.0	183.55	183.4	183.3	183.18	183.1	183.0	182.91	1013.1
345.0	185.66	185.5	185.4	185.29	185.2	185.1	185.02	1008.1
350.0	187.79	187.6	187.5	187.42	187.3	187.2	187.14	1003.1
355.0	189.92	189.7	189.6	189.55	189.5	189.4	189.28	998.1
360.0	192.07	191.9	191.8	191.70	191.6	191.5	191.43	993.1
365.0	194.22	194.0	193.9	193.86	193.8	193.7	193.59	988.1
370.0	196.38	196.2	196.1	196.02	195.9	195.8	195.75	983.1
375.0	198.56	198.4	198.3	198.20	198.1	198.0	197.93	978.1
380.0	200.75	200.6	200.5	200.38	200.3	200.2	200.12	973.1
385.0	202.94	202.8	202.7	202.58	202.5	202.4	202.31	968.1
390.0	205.13	205.0	204.9	204.78	204.7	204.6	204.51	963.1
395.0	207.34	207.2	207.1	206.98	206.9	206.8	206.72	958.1
400.0	209.55	209.4	209.3	209.19	209.1	209.0	208.93	953.1
405.0	211.78	211.6	211.5	211.43	211.3	211.2	211.15	948.1
410.0	214.01	213.9	213.8	213.68	213.6	213.5	213.38	943.1
415.0	216.24	216.0	215.9	215.92	215.8	215.7	215.60	938.1
420.0	218.48	218.3	218.2	218.16	218.0	217.9	217.82	933.1
425.0	220.73	220.5	220.4	220.41	220.3	220.2	220.06	928.1
430.0	222.99	222.8	222.7	222.67	222.5	222.4	222.31	923.1
435.0	225.25	225.0	224.9	224.93	224.8	224.6	224.56	918.1
440.0	227.52	227.3	227.2	227.19	227.0	226.9	226.81	913.1
445.0	229.79	229.6	229.5	229.46	229.3	229.2	229.06	908.1
450.0	232.07	231.8	231.7	231.73	231.6	231.4	231.32	903.1
455.0	234.36	234.1	234.0	234.01	233.8	233.7	233.57	898.1
460.0	236.65	236.4	236.3	236.29	236.1	235.9	235.83	893.1
465.0	238.95	238.6	238.5	238.57	238.4	238.2	238.09	888.1
470.0	241.25	240.9	240.8	240.85	240.6	240.5	240.36	883.1
475.0	243.56	243.2	243.1	243.13	242.9	242.7	242.62	878.1
480.0	245.87	245.5	245.4	245.41	245.2	245.0	244.89	873.1
485.0	248.19	247.8	247.7	247.70	247.5	247.3	247.16	868.1
490.0	250.52	250.1	250.0	249.99	249.8	249.6	249.43	863.1
495.0	252.85	252.4	252.3	252.28	252.1	251.9	251.70	858.1

11. Assignment : Use sounding rod, water finding paste, Take a sounding/ ullage, Sounding tables, Trim corrections

Learning outcomes:

a) Meaning & purpose of sounding.
b) Difference between a sounding tape and a sounding rod.
c) Procedure for taking sounding of tanks and ullages. Use of water finding paste
d) Using sounding tables

Assessment:

- Take a sounding and ullage

12. Assignment : Use of a sledge hammer, Precautions in its use.

Learning Outcomes:

a) How to hold a sledge hammer
b) Practice to be given on use of a sledgehammer.
c) PPE

Assessment:

Drive a marline spike into the ground with a sledge hammer

WATCH KEEPING

13. Assignment : Bridge layout

Learning Outcomes:

a) Know the general layout on a vessels bridge by familiarising oneself with the GMDSS simulator.
b) Bridge lay out at the OOW simulator.

Assessment:

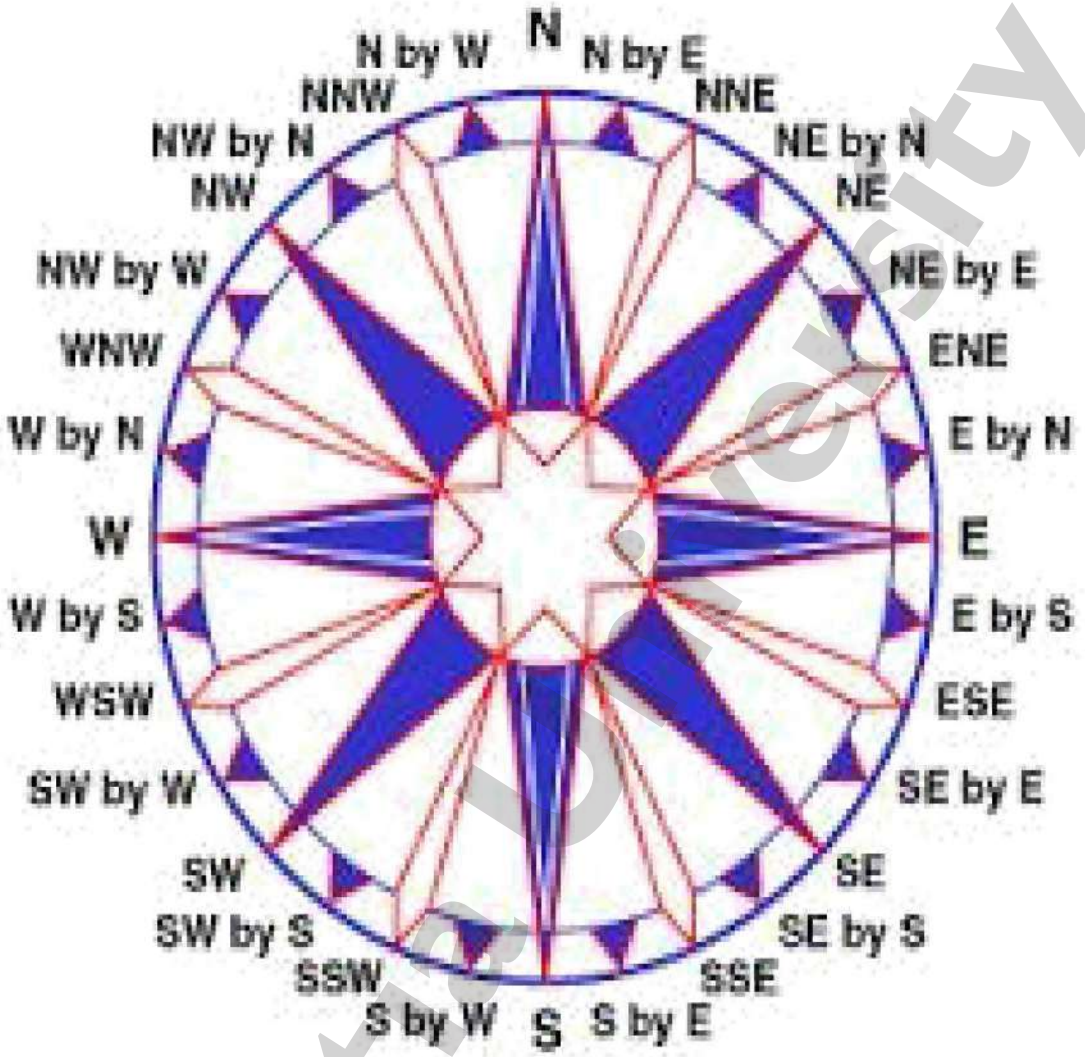
Draw a diagram of a bridge showing the equipment contained therein

14. Assignment : Steering – Open, Coastal, Pilotage, Night on VSS

Learning outcomes:

a) Procedure of taking over helms man duty.
b) Various helms order and the action / reporting.
c) How to put wheel in Auto & vis versa. NFU steering.
d) If Gyro fails, how to steer with help of magnetic compass.
e) Being fit for duty.
f) All Ships carry Gyro Compasses & Magnetic Compasses
g) The Gyro Compass runs on Electricity
h) Magnetic Compasses do not need electricity, but are directed by the Earth's magnetism.
i) Gyro repeaters are fixed at steering platform, bridge wings, etc

Assessment: Completed steering handbook and demonstrate competence on VSS



15. Assignment : Compass, Boxing & Maintenance

Learning outcomes:

a) Know the cardinal and sub cardinal points.
b) Box the compass clockwise and anticlockwise

Assessment:
Box the compass for 2 sectors in either direction

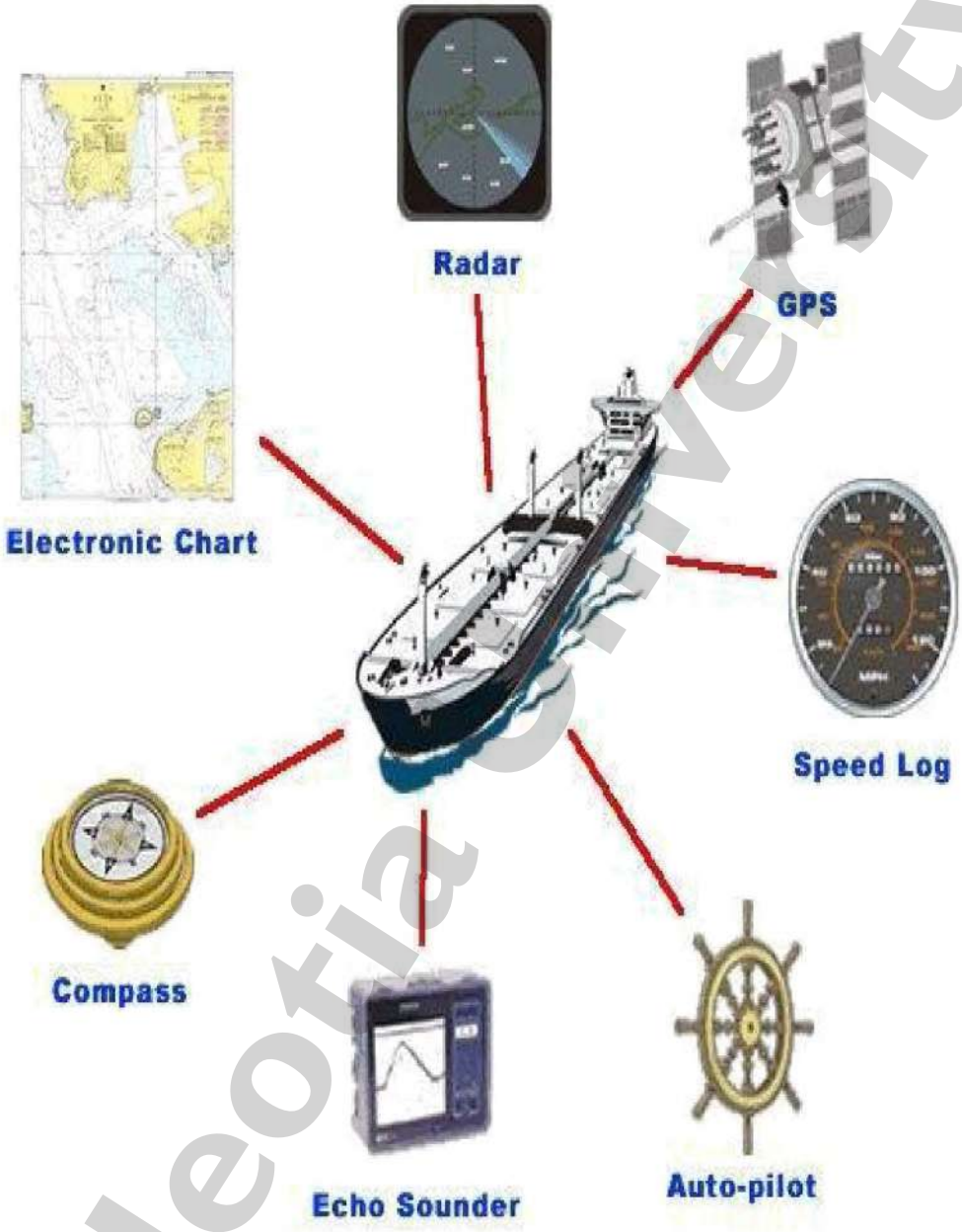
16. Assignment : Sextant, Azimuth mirror & Pelorus

Learning Outcomes:

a) Sextant- Hold, hand over and use sextant to take horizontal and vertical sextant angles of terrestrial and celestial bodies. Knowledge of various errors. To adjust the error of the instrument & maintenance procedure.

b) Azimuth Mirror & Pelorus- Use of Azimuth Mirror to take the bearing of terrestrial & celestial body with arrow down & arrow up position. Function & use of Pelorus.

Assessment: Demonstrate use and proficiency. 100%



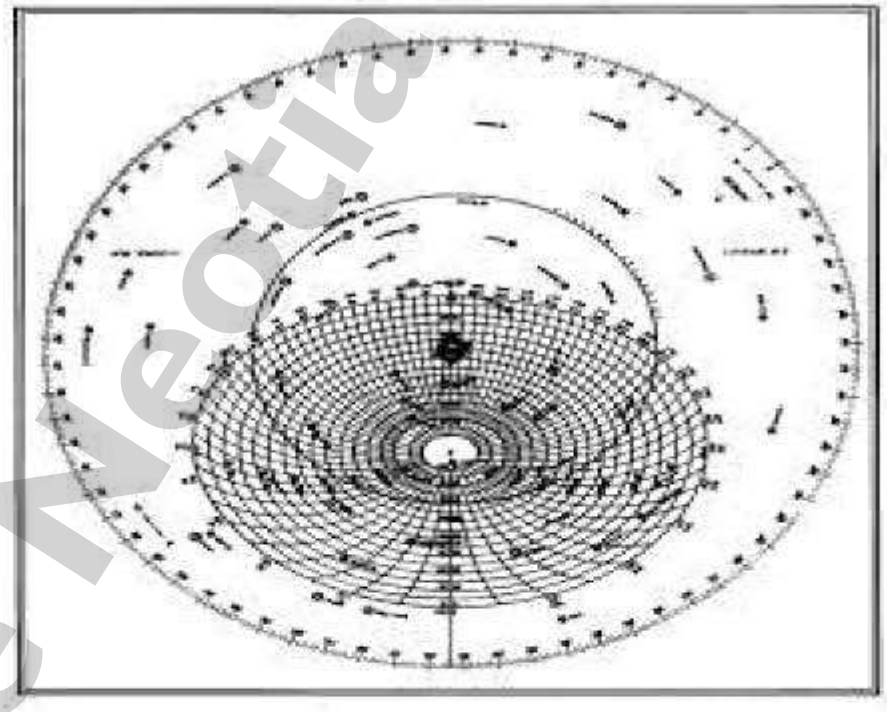
17. Assignment : Bridge equipment familiarisation

Learning outcomes:

a) Familiarity with ECDIS simulator.
b) Operation and errors of following equipment.

GPS
AIS
ECHO SOUNDER
NAVTEX
GYRO
RADAR
ECDIS
SART
EPIRB
VDR & SVDR

Assessment: The cadet should be familiar with the operation and use of all the equipment and simulation of the same.



18. Assignment : Star identification

Learning outcomes:

a) Using star identifiers
b) Identify the main constellations
c) Magnitude of stars
d) Inferior and superior planets

Assessment:

a) Student shall be able to identify the common constellation by observation in the evening sky & familiar the stars of those constellation.
b) Use of Browns star finder
c) Identify 5 stars and one planet

Checklist - Before Arrival - Bridge

Vessel:

The following shall be carefully examined:

a tick indicates the check has been performed and appropriate action taken

N/A indicates the check is not appropriate to the vessel or prevailing conditions

Navigation			
Charts, Tide Tables, Sailing Directions		Reporting to VTS	
Instruments			
Gyro Repeaters		Course Recorder and Rudder Recorder running	
Bearing Diopters		AIS Updated	
Echo Sounder Forward and Aft		All Rudder Angle Indicators From All Locations (Including Bridge Wings)	
Communications			
VHF Radio Telephones		Aldis Lamp	
Walkie Talkies		Whistle No.1	
Telephones - Emergency Telephones		Whistle No.2	
Public Address System		Appropriate Flags/Day Signals Hoisted	
Mooring and Anchoring Arrangements			
Power on Deck		Mooring lines ready	
Anchors ready		Checked time for calling crew Time:	
Pilot Related Matters			
ETA Pilot Time:		Pilot contacted	
Pilot Ladder or Hoist ready with safety equipment		Pilot Ladder or Hoist sufficiently illuminated	
Pilot Card Prepared			
Engineer Related Matters			
Engine Telegraph and Emergency Telegraph		Stabilizers in "IN"	
Manoeuvring Printer Including Time Calibration		Azimuth thruster in "IN"	
Steering Gear and FU-NFU tested		Duty Engineer informed	

Port:

Checked by: Rank:

Date: Time:

Signature (Checker)

19. Assignment : Prepare a checklist for taking/ handing over a bridge/ Cargo watch

Learning Outcomes:

a) Study the ICS Bridge Procedures Guide / Nautical Institute checklists for taking over a navigational watch.
b) Study a format for taking over a cargo watch
c) Importance of standing orders – Company, Master, Chief Officer

Assessment:

Make checklists for:

a) Taking over a Navigational watch.
b) Taking over a cargo watch

SPECIAL PUBLICATION

February 2010

Lookout Training Handbook

NAVEDTRA 12968-A

NOTICE

Pages 31, 45, 46, and 47 must be printed on a COLOR printer.

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

20. Assignment : Visual lookout, Use of binoculars, sector wise lookout

Learning outcome:

a) Stand in the Bridge Wings in an assigned place.
b) Be appropriately dressed for the weather, by warm clothes, gloves, rain coat etc.
c) Keep an all round look out
d) Report any sighting and hearing of any sound signals to the Officer on duty.
e) By Day: All Ships, Boats, Floating Objects, Land and the relative direction in which sighted.
f) By Night: All Lights with their colour, and the relative direction in which sighted.
g) By Day or Night: All Sounds and the external relative direction form which emanating. Eg:
h) 2 Points on Port Bow
i) 4 Points on Stbd Bow
j) Be appropriately dressed to suit the weather (Rain Coat, Caps, Woolens, Gloves etc)
k) Arrive on the bridge 15 minutes before time
l) Get acclimatized to the weather and the darkness
m) Check the courses being steered and report to Duty Officer
n) Compare the Gyro Compass & Magnetic Compass
o) See what Ships / Lights / Buoys are in sight.
p) Receive any special instruction if any, from previous lookout man
q) Inform Duty officer that you have taken charge.
r) Standard procedure to report

Assessment:

Practical in simulator room, showing various objects on screens. Use of binoculars.

TANKER

21. Assignment : Ultrasonic tank gauging & Samplers

Learning outcomes:

UTI:

a) Use, safe handling & Maintenance of UTI
b) Working principals
c) Measurement of ullage/ Temperature and interface.
d) Calibration procedure

Assessment:

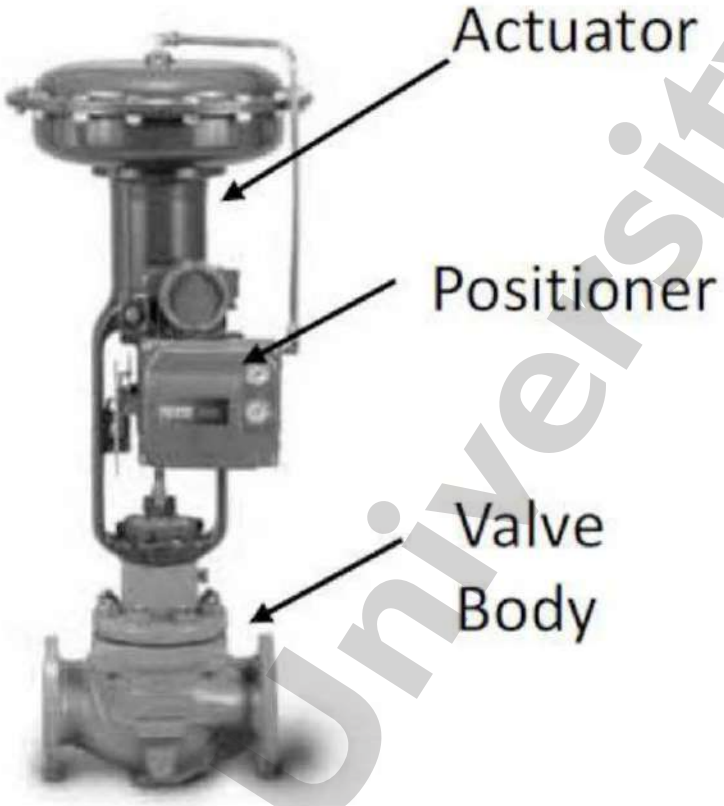
- Actual measurement of temperature ullage and interface.

SAMPLERS:

a) Use, safe handling & Maintenance of sampler
b) Safety precautions

Assessment:

- Actual taking of samples.



Components of a Sliding Stem Valve

22. Assignment : Valves & Actuators

Learning outcomes:

VALVE TYPES:

a) Butterfly
b) Gate
c) Globe
d) Stop/ angle
e) Non return
f) Overhauling of gate valves, butterfly valves and hydrants..

Assessment:

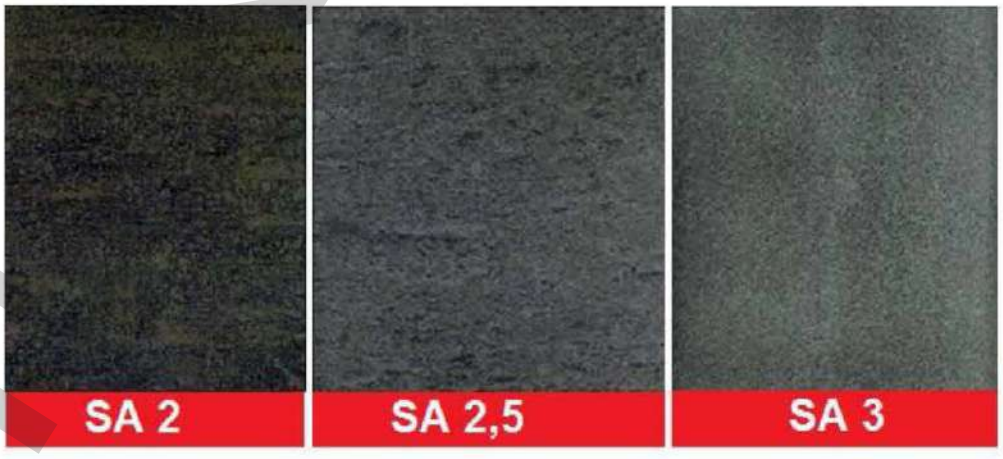
- Identification and operational maintenance

ACTUATORS:

a) Electrical and pneumatic actuators
b) Identification of actuator types
c) Maintenance

Assessment:

- Identification and operational maintenance



DECK MAINTENANCE

23. Assignment : Surface preparation

Learning outcomes:

a) Prior to painting, the surface of the plates must be thoroughly chipped of rust, or old paint, then washed, cleaned and dried.
b) Tools used for chipping are, chipping hammers, scrapers, wire brushes, chipping Machines, etc.
c) Safety procedures, PPE Swedish SA standards regarding grading of metal surface.

Assessment:

- To be carried out with “Painting” assessment.

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24. Assignment : Use of mechanical/ pneumatic/ hydraulic equipment

Learning outcomes:

a) Safety procedures and PPE for usage of power tools.
b) Use and maintenance of power tools
c) Importance of using dry air when running pneumatic machines.
d) Requisitioning of spares for descaling machines

Assessment:

- To be carried out with “Painting” assessment.


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25. Assignment : Painting

Learning Outcomes:

d) prSteelventplatescorrosionmust. be protected against exposure to air, to
e) This is done by painting the steel plates or structures.
f) After cleaning, first coat of paint should be anti-corrosive paint or Primer paint.
g) Second coat should also be the same, but after the first coat has dried.
h) Final coat of the paint should be the' Finishing paint'
i) Where finishing paint is White, one additional coat of undercoat is applied
j) Boottopping paint is applied to shipside plates near the ship's waterline.
k) Anti-fouling paint is applied to the underwater shipside plates in the dry-dock.
l) Anti-fouling paint does not allow the marine growth to take place on the shipside.
m) Tools used for painting on the ship, are paint brushes, roller Brushes, and spray machines.
n) Paint brushes must be cleaned after every use, dried and then stored for future use.
o) Paints give off combustible gases, therefore the paint locker must be well ventilated before entry.
p) Knowledge and precautions required about using spray painting machine.

Assessment:

- Descale and paint a rusted are of not less than 1 sq mtr

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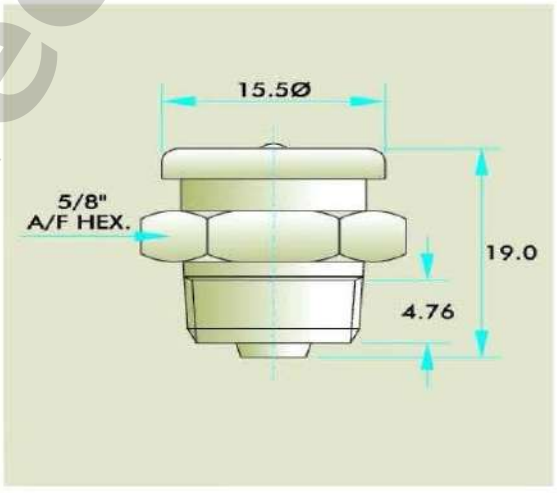

26. Assignment : Lubrication

Learning outcomes:

a) State type of oils and greases used on board in ER and on Deck. (cylinder oil, grease, crankcase oil, gear oil, hydraulic oil
b) Lubrication plan/ cycle
c) Identify grease nipples, greasing and oiling equipment
d) PPE
e) Demonstrates use of grease guns
f) Use oil can for filling in oil in crankcase of a machine
g) State precautions to taken while working on or near an operating machinery.
h) State risks involved if oil or grease falls on hot surfaces

Assessment:

a) Fill a grease gun.
b) Identify the greasing points of the free fall davit.

Personal Protective Equipment

WHAT IS PPE?

PPE is defined in the Work Regulations 1992 as "all equipment (including clothing affording protection against weather) which is intended to be worn or held by a person at work and which protects him against one or more risks to his health or safety, and any addition or accessory designed to meet that objective."

WHAT DO THE REGULATIONS REQUIRE?

- PPE must be supplied and used at work wherever there are risks to health and safety that cannot be adequately controlled in other way.
- PPE is maintained and stored properly.
- PPE is provided with instructions/training on how to use it safely.
- PPE is used correctly by employees.
- Employers must ensure that suitable PPE is provided FREE of charge to the employees including self-employed workers.
- Employers must make sure workers know why PPE must be worn and what risks PPE protects them from.

PPE SIGNAGE

- PPE Signage MUST be provided and maintained by employers.
- PPE Signage MUST be respected by employees, visitors and the general public.
- Offers recognizable visual guidance and instruction to employees, visitors and the general public.
- Warns about the specific need to use or wear items of personal protection equipment.
- Should be located close to the area of risk.

ALL PPE SIGNAGE SHOULD BE BLUE AND WHITE FOR EASY IDENTIFICATION

THE RISKS AND TYPES OF PPE

Eye protection

Risks: chemical or metal splash, dust, gas and vapour, radiation.

Options: safety spectacles, safety goggles, face shields, eye shields.

Head protection

Risks: impact from falling or flying objects, risk of head bumping, hair entanglement.

Options: a range of helmets, bump caps, caps/hair nets.

Breathing protection

Risks: dust, vapour, gas, oxygen-deficient atmospheres.

Options: disposable filtering face-pieces or respirator, half-or full-face respirators, air-fed helmets, breathing apparatus.

Hearing protection

Risks: noise levels are higher than 80db.

Options: earmuffs/defenders, earplugs, semi-inserts.

Hands and arms

Risks: abrasion, temperature extremes, cuts and punctures, impact, chemicals, electric shock, skin infection, disease or contamination.

Options: gloves, gauntlets, mitts, wrist cuffs, armlets.

Body protection

Risks: temperature extremes, adverse weather, chemical or metal splash, spray from pressure leaks or spray guns, impact or penetration, contaminated dust.

Options: conventional or disposable overalls, boiler suits, specialist protective clothing, high-visibility clothing.

Feet and legs

Risks: wet, electrostatic build-up, slipping, cuts and punctures, falling objects, metal and chemical splash.

Options: safety boots and shoes with protective toe caps and penetration-resistant mid-sole, gaiters, leggings, spat.

ORGANISATIONS MUST ASSESS THE DIFFERENT RISKS IN THEIR WORKPLACE AND CHOOSE THE APPROPRIATE PPE

ASSESSING SUITABLE PPE

- Is it suitable for the risks involved and the conditions at the workplace?
- Does it prevent or adequately control the risks involved without increasing the overall level of risk?
- Can it be adjusted to fit the wearer correctly and be comfortable?
- Has the state of health of those who will be wearing it been taken into consideration?
- If more than one item of personal protection equipment is being worn, are they compatible?

EMPLOYERS, EMPLOYEES & EQUIPMENT

Employers MUST

- Provide suitable protective equipment free of charge.
- Maintain PPE in working order and good condition.
- Provide training in the use of PPE.
- Consult employees on suitability of PPE.

Employees MUST

- Use the PPE provided.
- Report any defects or damage of PPE.
- Store PPE correctly when not in use.

Equipment MUST

- Be relevant for the work undertaken.
- Protect effectively against the risks involved in the workplace.
- Comply with relevant standards.
- Protective equipment must carry a 'CE' mark to show that it complies with European Safety Standards.
- Fit properly and comfortably.
- Not hinder the performance of any task.
- Not add to the risks involved.

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27. Assignment : PPE

Learning outcomes:

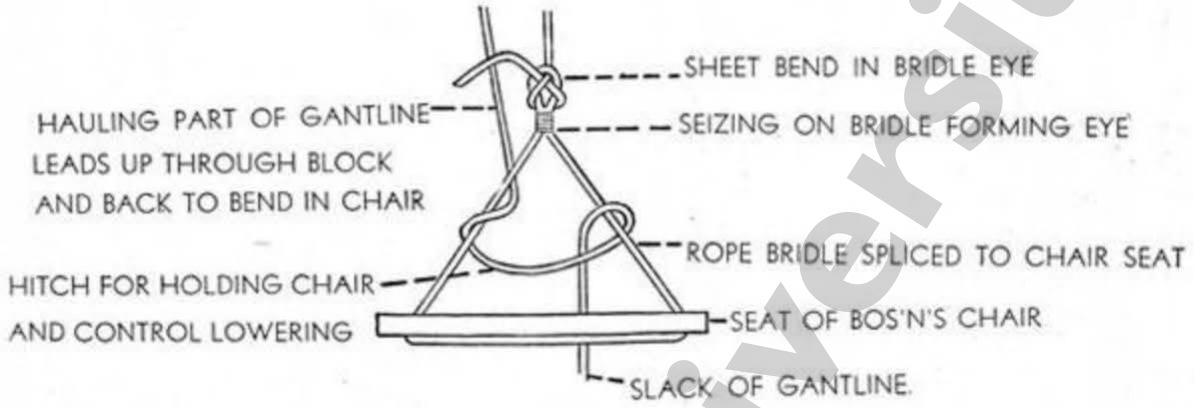
a) PPE - Purpose & use.
b) Ear Protector, Safety helmet , Gloves , Safety shoos , Safety belt & harness, Life jacket
c) Breathing apparatus.
d) Eye and face Protector.
e) Use of PPE in the following situations-

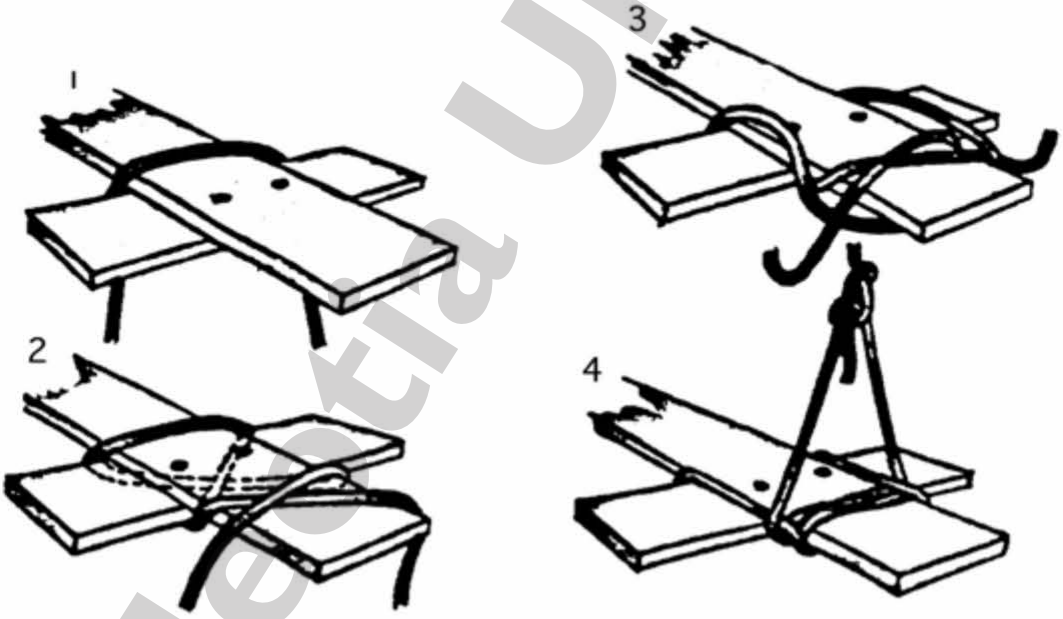
- Over side
- Deck cargo watch
- Aloft
- Tank entry
- Regular deck maintenance
- Operating machinery like grinders, chipping machines etc
- Operation of lathe, welding and gas cutting

Assessment:

- Cadet should be able to identify and don correct PPE.

BOATSWAIN'S (BOS'N'S) CHAIR





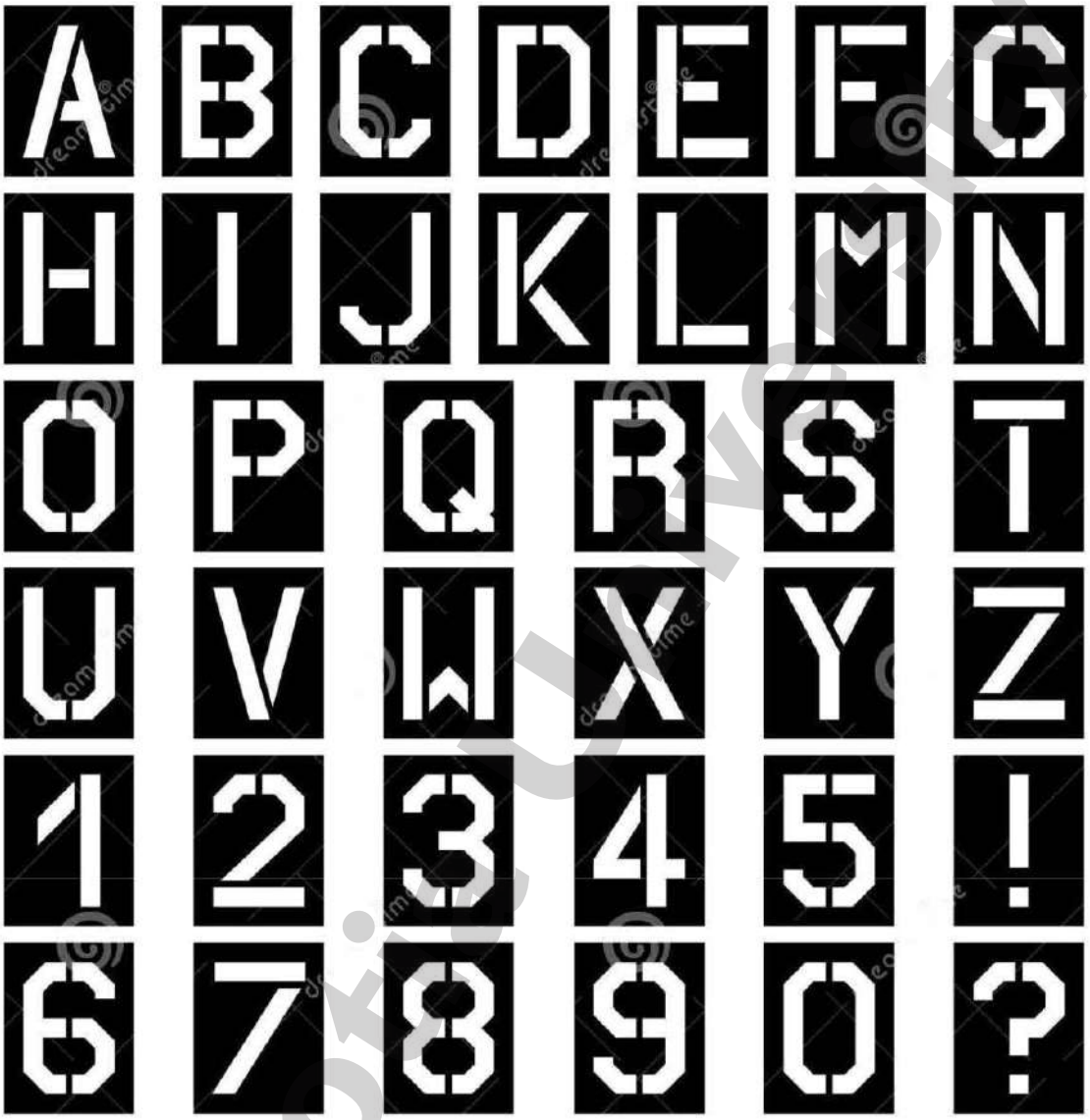
28. Assignment : Rig a stage, Bosuns chair including lowering using self lowering hitch

Learning outcomes:

a) Permit, for working over the side.
b) Be properly clad in Boiler suit, safety Helmet, Life-Jacket, Safety shoes, Hand gloves etc.
c) Have a 'stage' rigged up on the shipside, where work has to be carried out.
d) Have a rope ladder fixed up securely close to the stage.
e) Have necessary equipment for working over the side (e.g. Chipping hammers, scrapers, Paints, brushes etc) in a bucket with a heaving line.
f) Have a Person standing bye on deck for any assistance or emergency
g) A 'Stage' on Shipside for painting
h) Self Lowering / Hoisting 'Bosun's chair'
i) Jacob's ladder or Rope ladder.

Assessment:

- Make a stage knot
- Prepare a checklist for working overside



29. Assignment : Make stencils

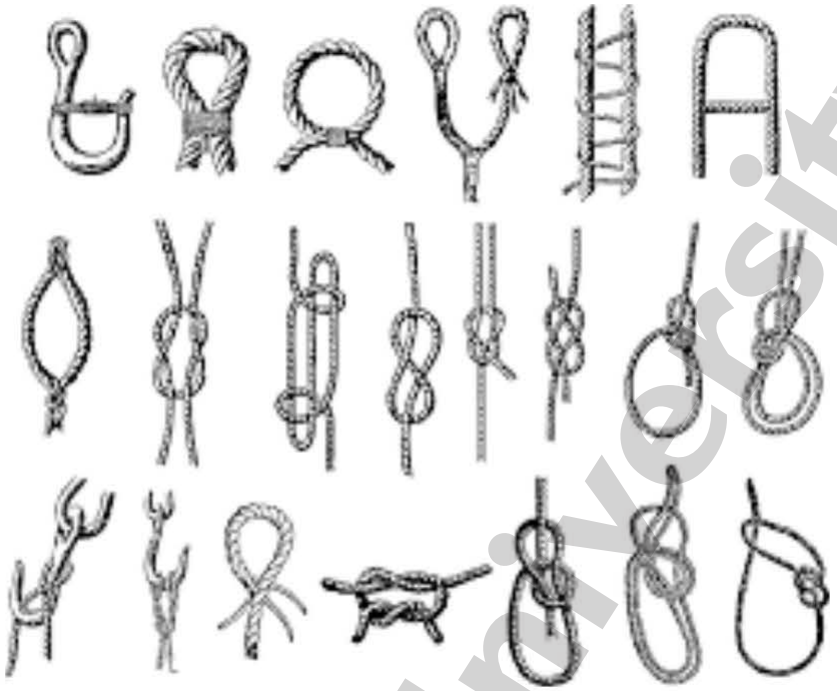
Learning Outcomes:

a) Make a full set of alphanumeric stencils on chart paper

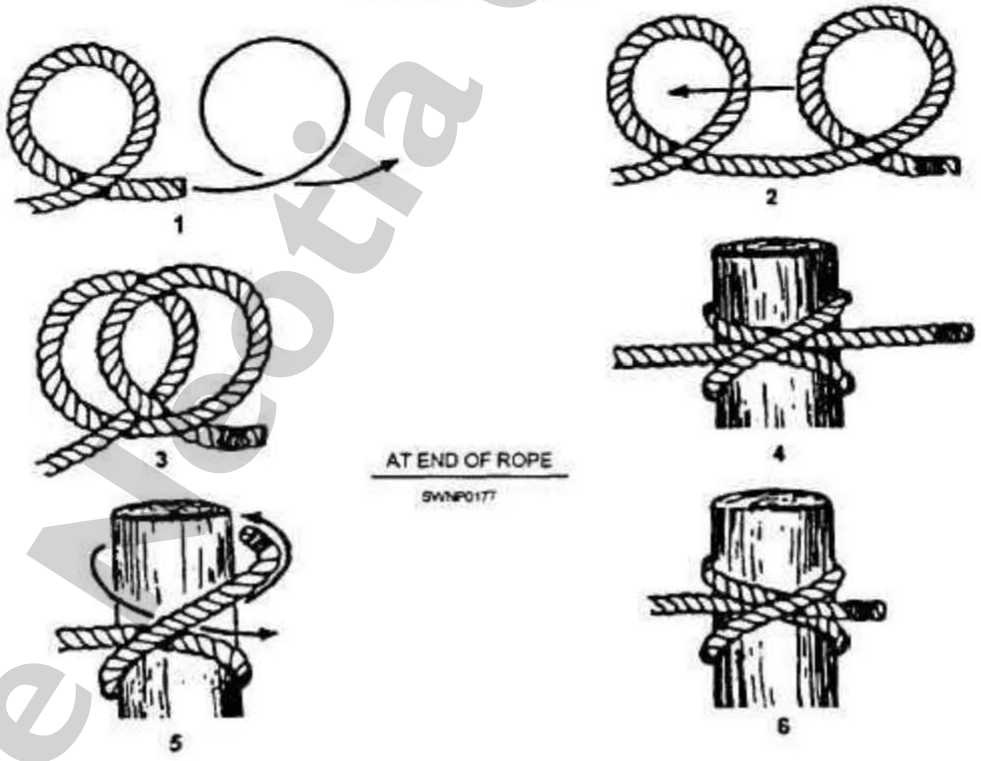
Assessment:

Make any one of the following signs:

- Safety First
- No Smoking
- Prohibited Area



AT CENTER OF ROPE



ROPE WORK

30. Assignment : Knots, Bends & Hitches. Temporarily join two ropes, join a rope to a structure

Learning Outcomes:

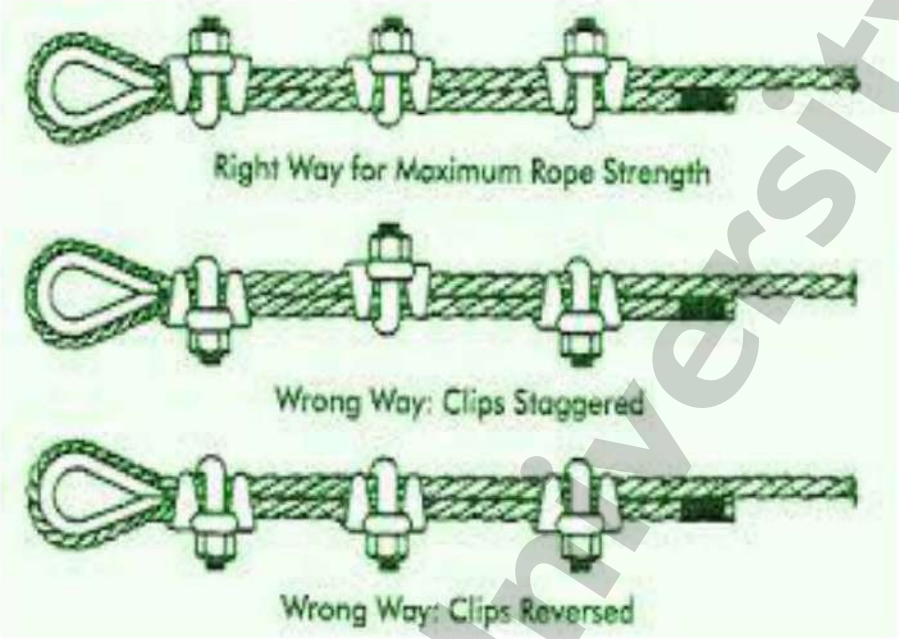
1. Ability to tie the following Knots, bends & hitches. Advantages and disadvantages :-

a) Bowline – Plain and with bight
b) Reef
c) Clove
d) Sheepshank
e) Carrick
f) Monkeys fist
g) Stage
h) Timber

2. Tie two disparate rope ends together and to a fixed structure

Assessment:

- 5 different Knots/ Bends/ Hitches



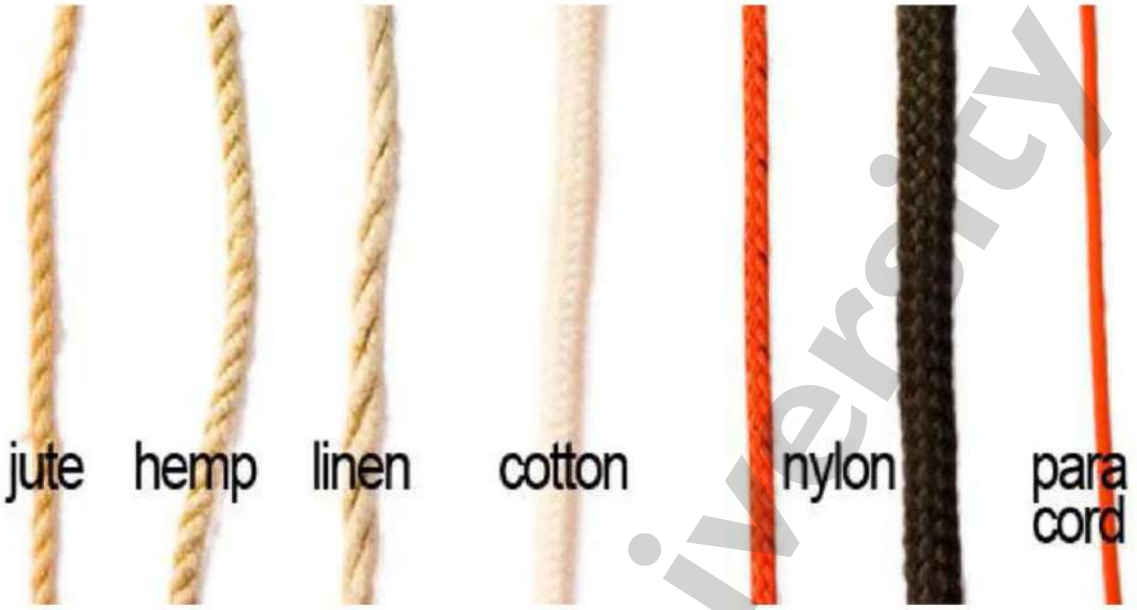
31. Assignment : How to use bulldog grips, Make a temporary eye using bull dog grips

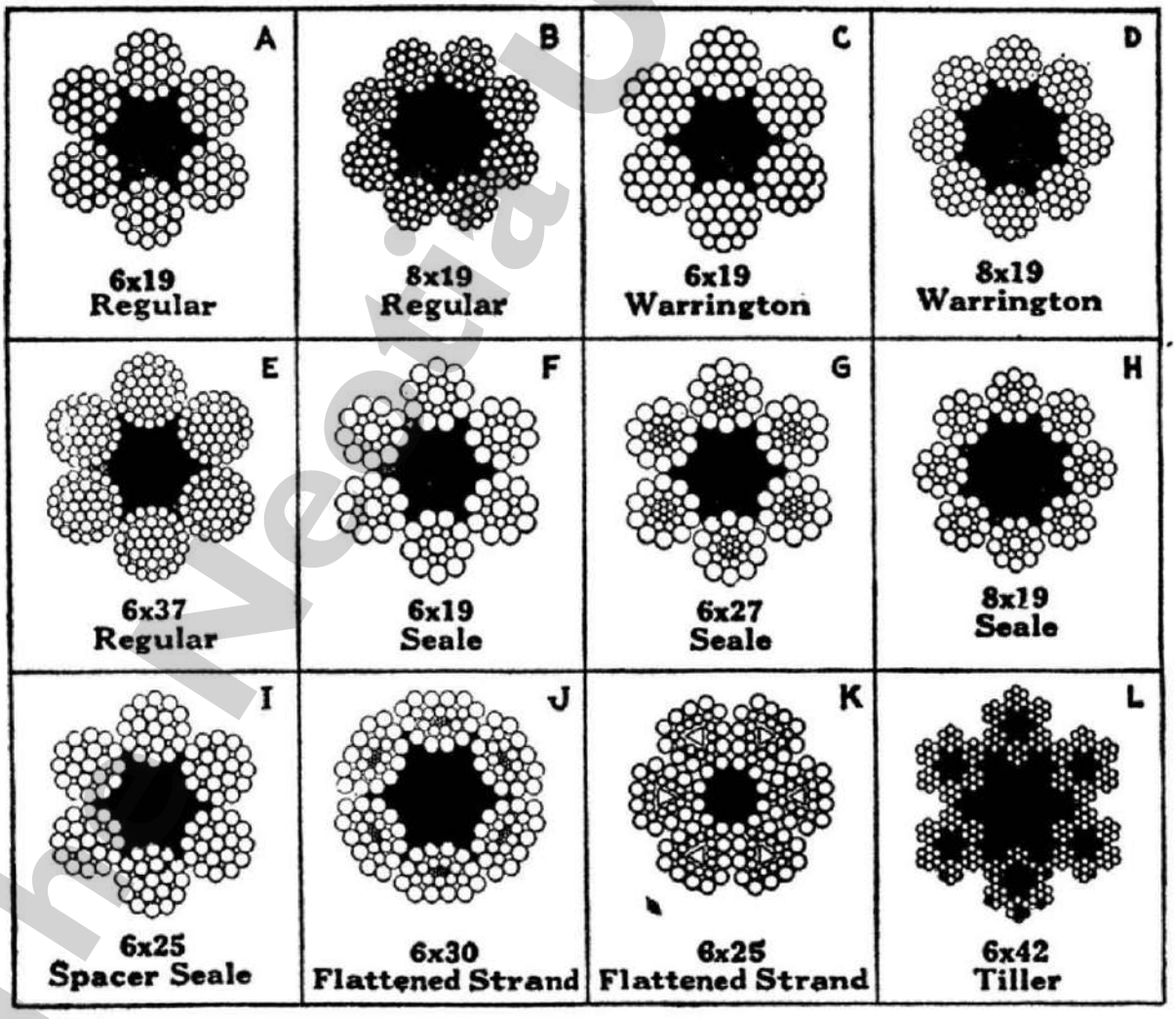
Learning outcomes:

a) The right and wrong way of using bulldog grips
b) Make an eye with bulldog grips
c) Join two wires with bulldog grips

Assessment:

- Make an eye using bull dog grips.





32. Assignment : Identify various types of rope, Lay out rope from a new coil.

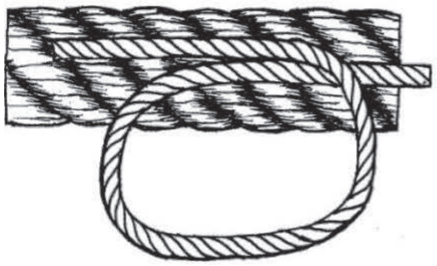
Learning outcomes:

a) List the kind of ropes used onboard the ship
b) Explain the construction and lay of the ropes
c) Explain the care and maintenance of the vegetable ropes and synthetic ropes.
d) Identify ropes by their diameter, lay, strands, etc.
e) List the precautions necessary, when opening a new coil of rope or wire rope.

Assessment:

- Oral questions

1



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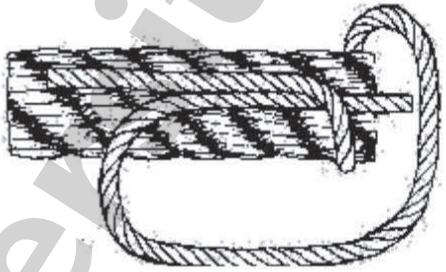

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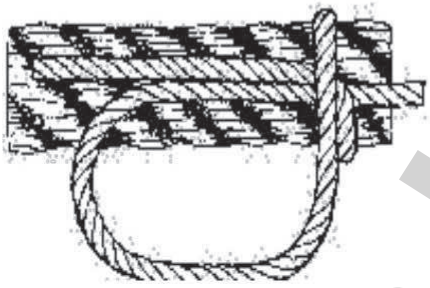

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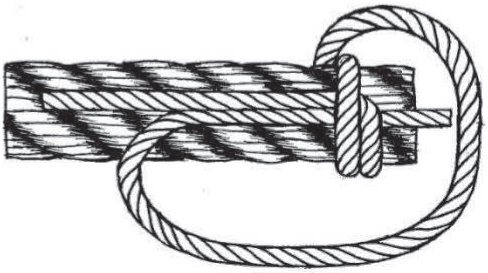

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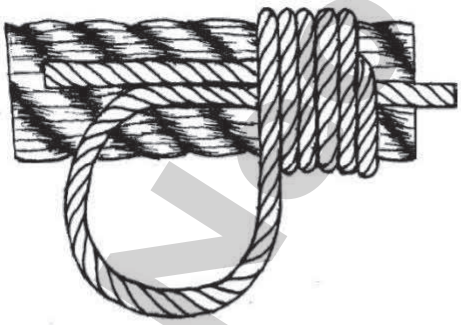
Dia of Rope



6

pull

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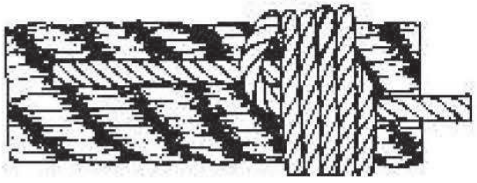
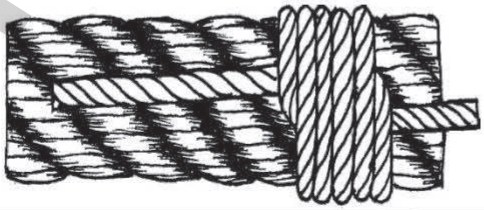


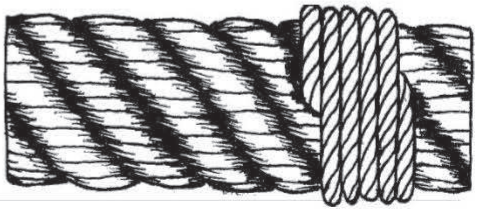
7

Pull tight



8

Cut ends



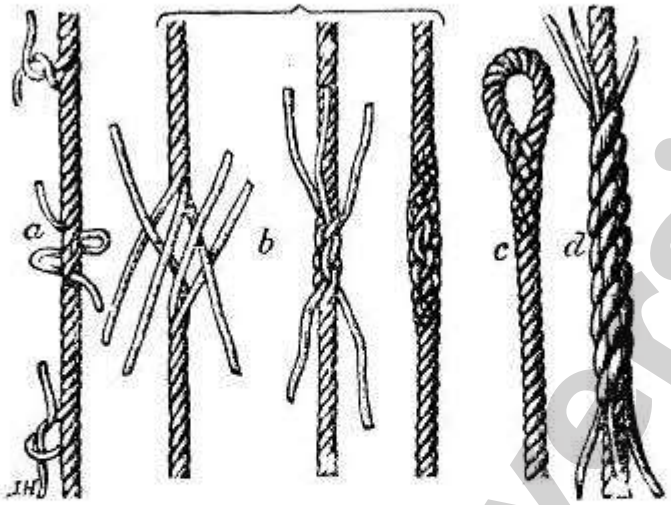
33. Assignment : Whipping

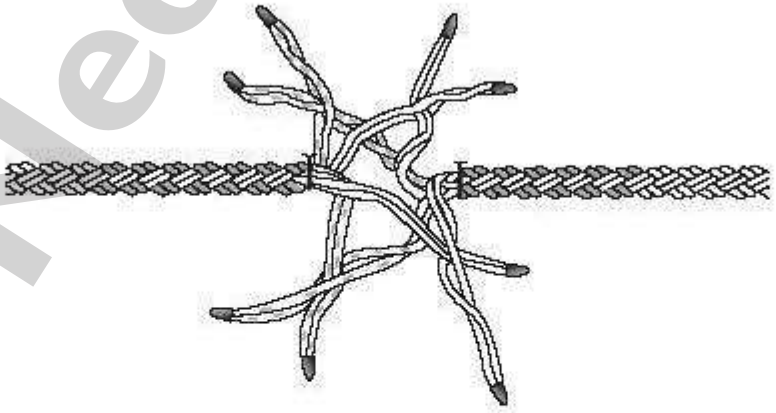
Learning outcomes:

a) Demonstrate his ability to make various kinds of 'Whipping' on the ends of ropes and explain its uses

Assessment:

- Make any one type of whipping





34. Assignment : Short, Long, Back splice

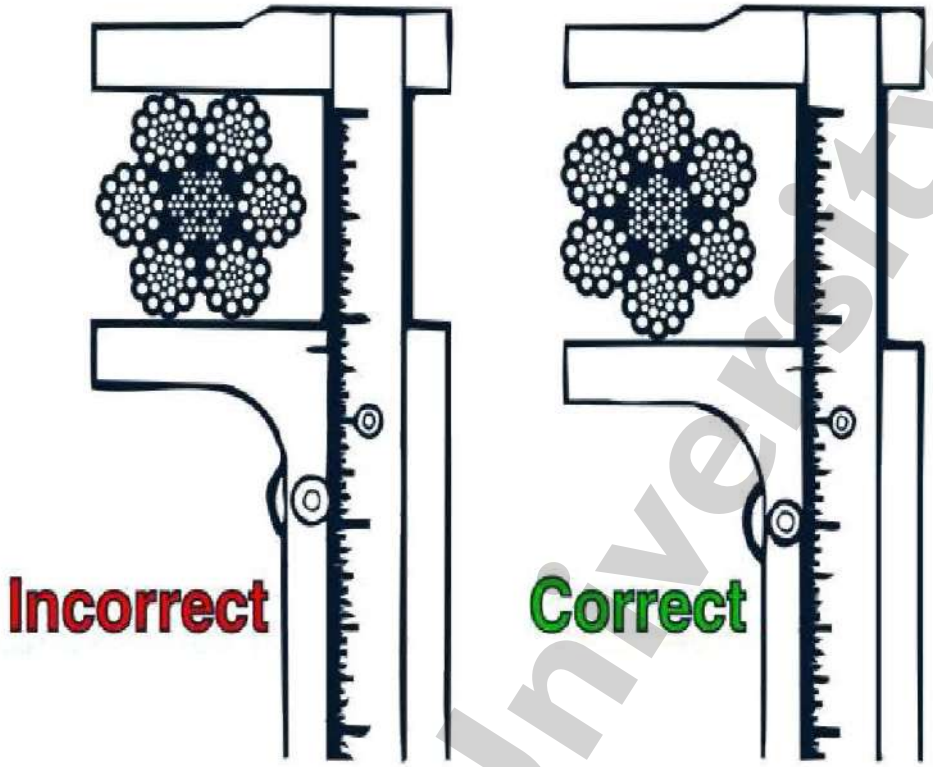
Learning Outcomes:

Make a long/ short/ back splice on fibre rope.

Safety precautions while handling marlin spikes and fid's

Assessment:

- Make any one splice



35. Assignment: Measuring the diameter of wires, Identifying when a wire has to be changed

Learning outcomes:

a) Measuring the diameter of a wire rope with a vernier
b) Measuring the circumference of a rope without any instruments
c) Factory Act (Dock Safety) regulations regarding identification of broken strands in a wire rope. Limits after which a wire rope is to be condemned.
d) Inspecting a fibre rope for damage

Assessment:

a) Measure a wire rope ‘s diameter
b) Inspect a fibre rope for damage

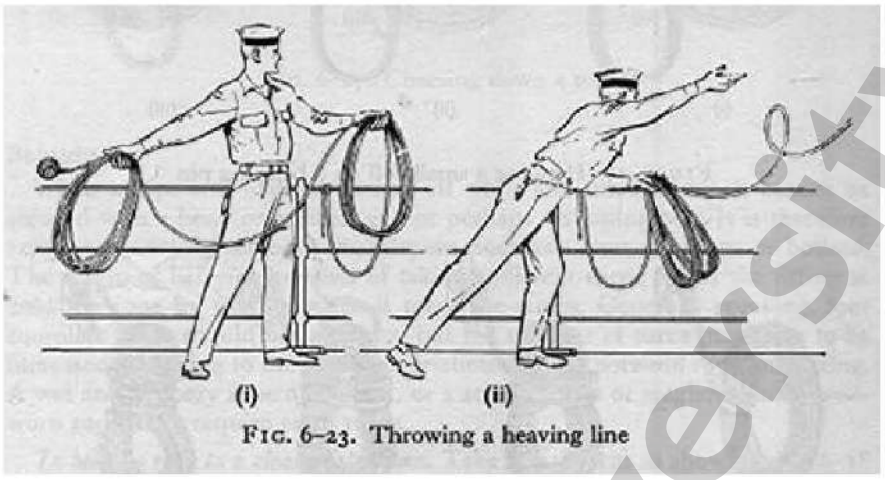
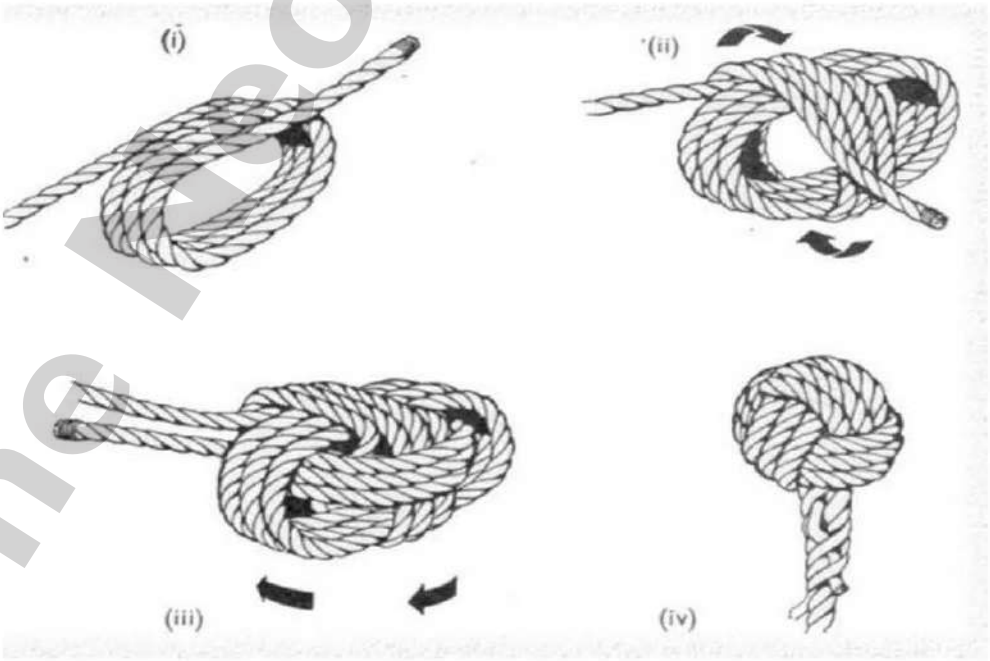


FIG. 6–23. Throwing a heaving line



MOORING

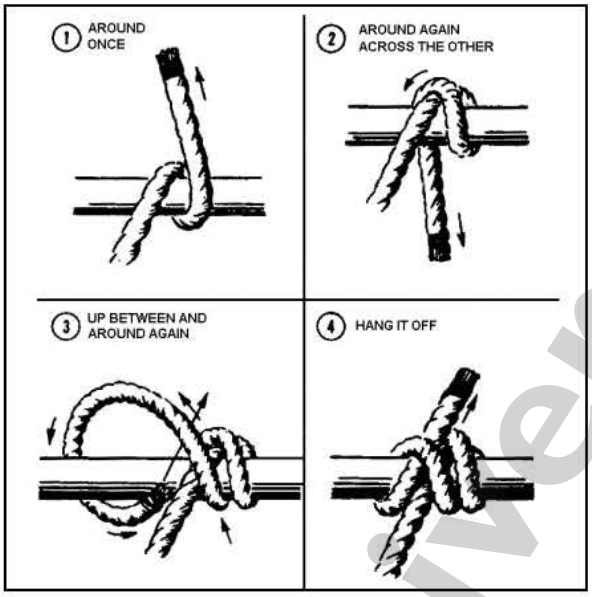
36. Assignment : Make a heaving line. Throw a heaving line to a distance of 20 mtrs

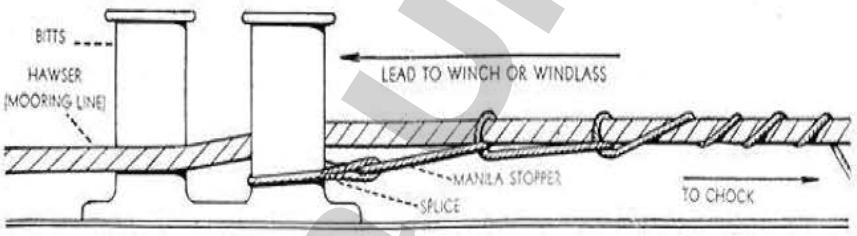
Learning outcomes:

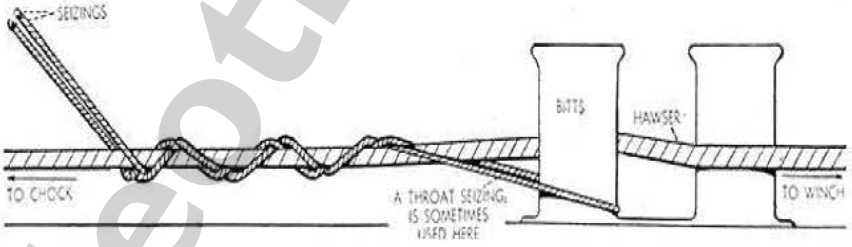
a) Use of heaving line.
b) Making eye splice & Monkey fist.
c) Throwing practice of heaving line.
d) Tying knot with mooring hawsers.
e) Dangers of weighting the Monkey fist. Safety procedures

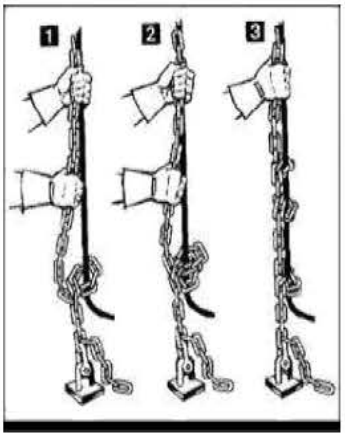
Assessment:

- Throw the line to a distance of 20 mtrs.
- Make fast the line to the eye of a mooring hawser.









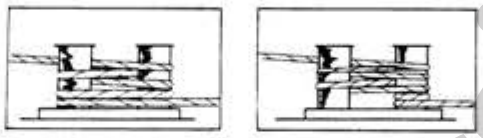
37. Assignment: Stoppers

Learning Outcomse

a) Safety, Use & procedure. COSWP
b) Preparation for mooring. Types of mooring ropes.
c) Use of various types of fairleads
d) Safety. Whiplash zones, marking same.
e) Various orders & Action during mooring.
f) Handling of Ropes with the help of windlass. Split drums.
g) Types & use of various stoppers.
h) Transferring of ropes from mooring drums to bitts

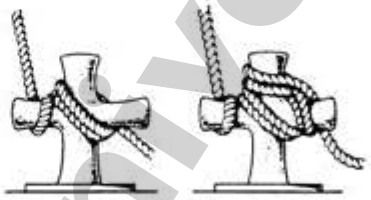
Assessment:

a) COSWP.
b) Demonstrate the use of stoppers.

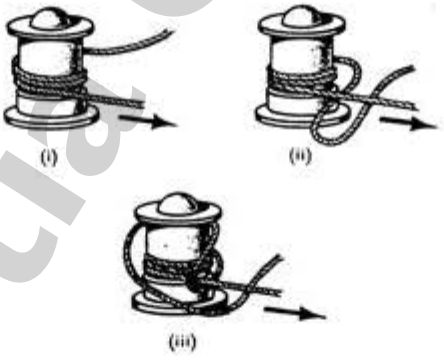


Making fast to bitts

Belaying a rope to a cleat



Belaying a boat's fall to a staghorn



Belaying fibre rope to a single bollard

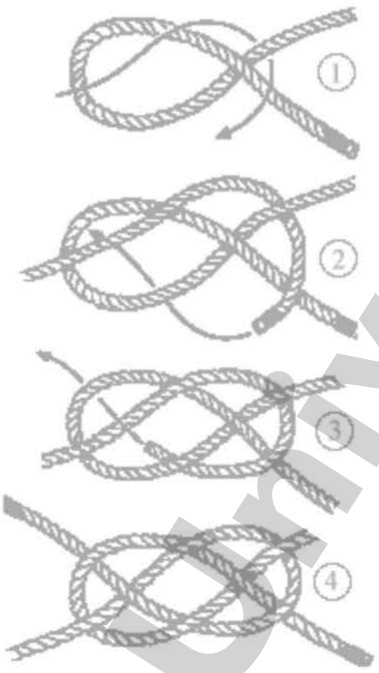
38. Assignment : Securing ropes to bollards and bits

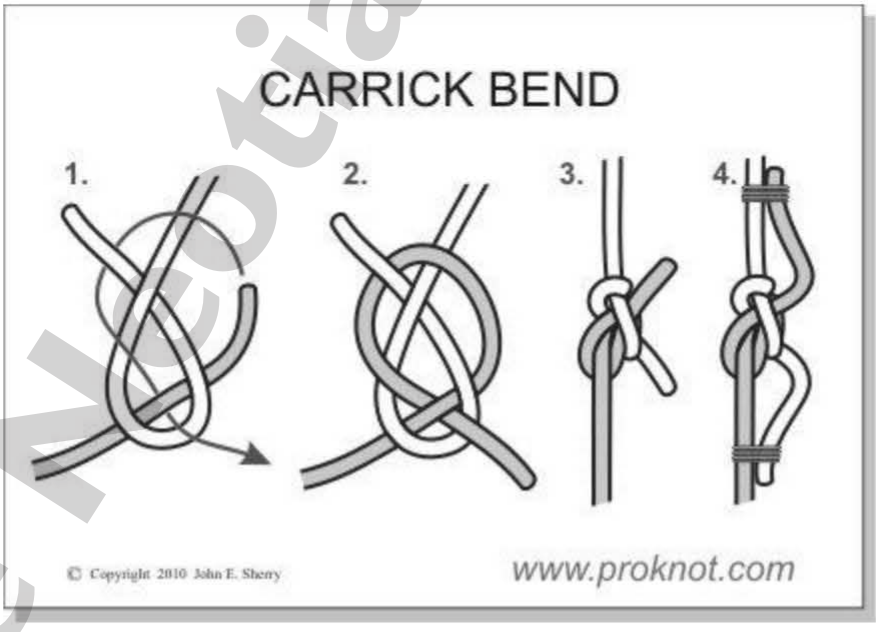
Learning Outcomes:

a) Meaning of Belaying
b) Making fast a rope onto Bitts, Bollard, Staghorns, Cleats
c) Dangers of making fast ropes onto warping drums
d) Tension and Storage drum

Assessment:

- Make fast a hawser onto a bitt with a figure of eight





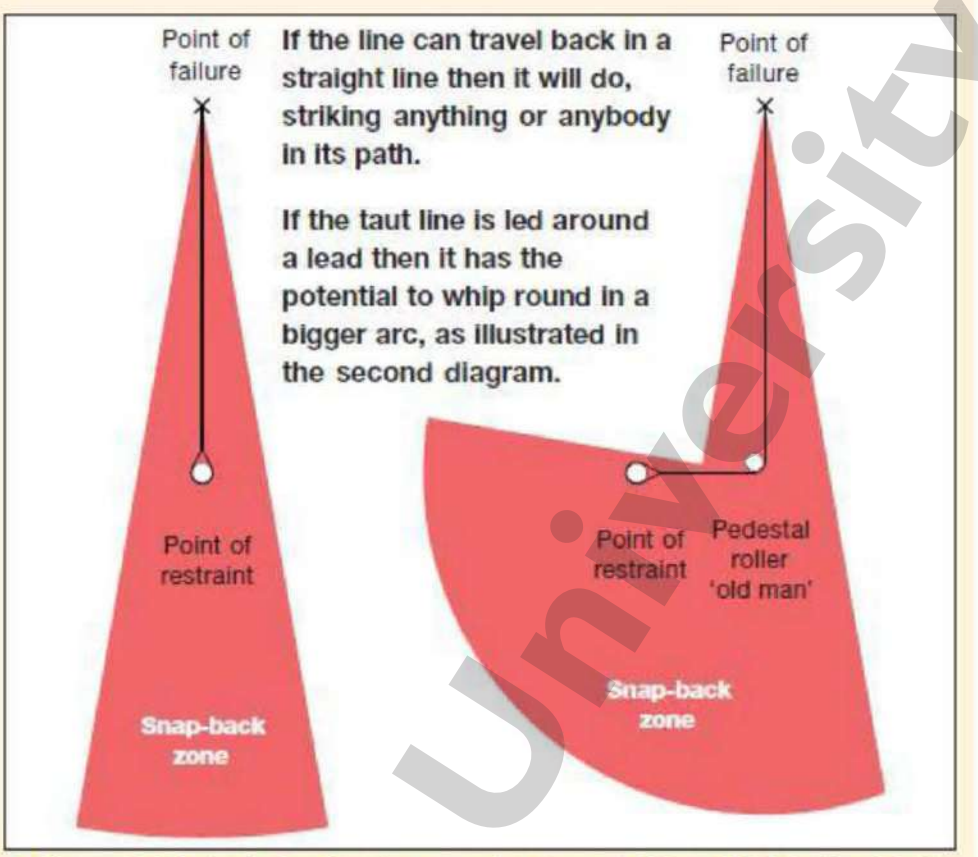
39. Assignment : Join two mooring ropes with a Carrick bend

Learning Outcomes:

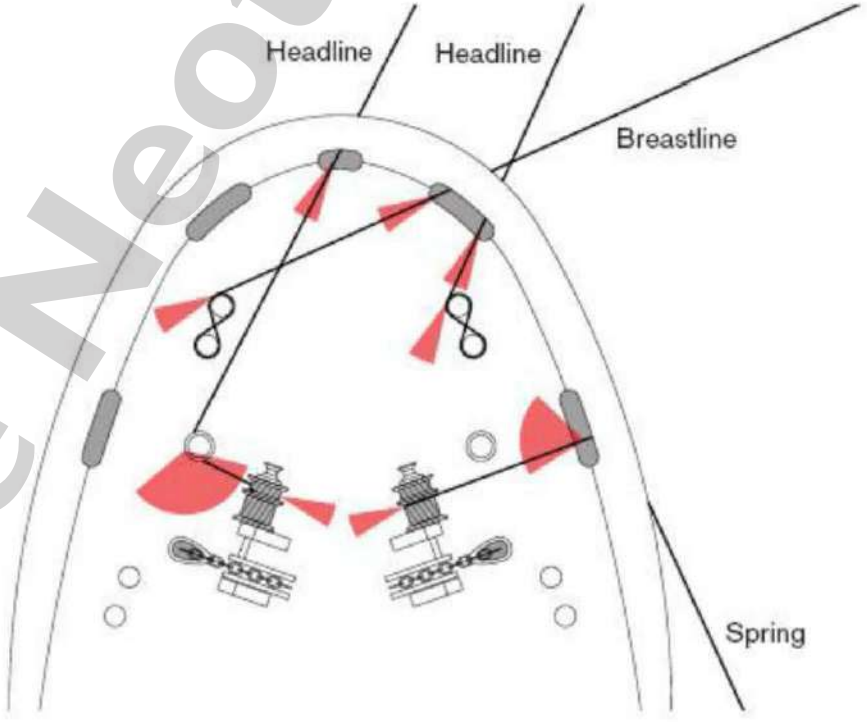
a) Join two ends of a mooring rope with a Carrick bend

Assessment:

- Make a Carrick bend with mooring hawser



▲ Figure 2: Method of estimating snap-back zones (from MCA Code of Safe Working Practices for Seamen)



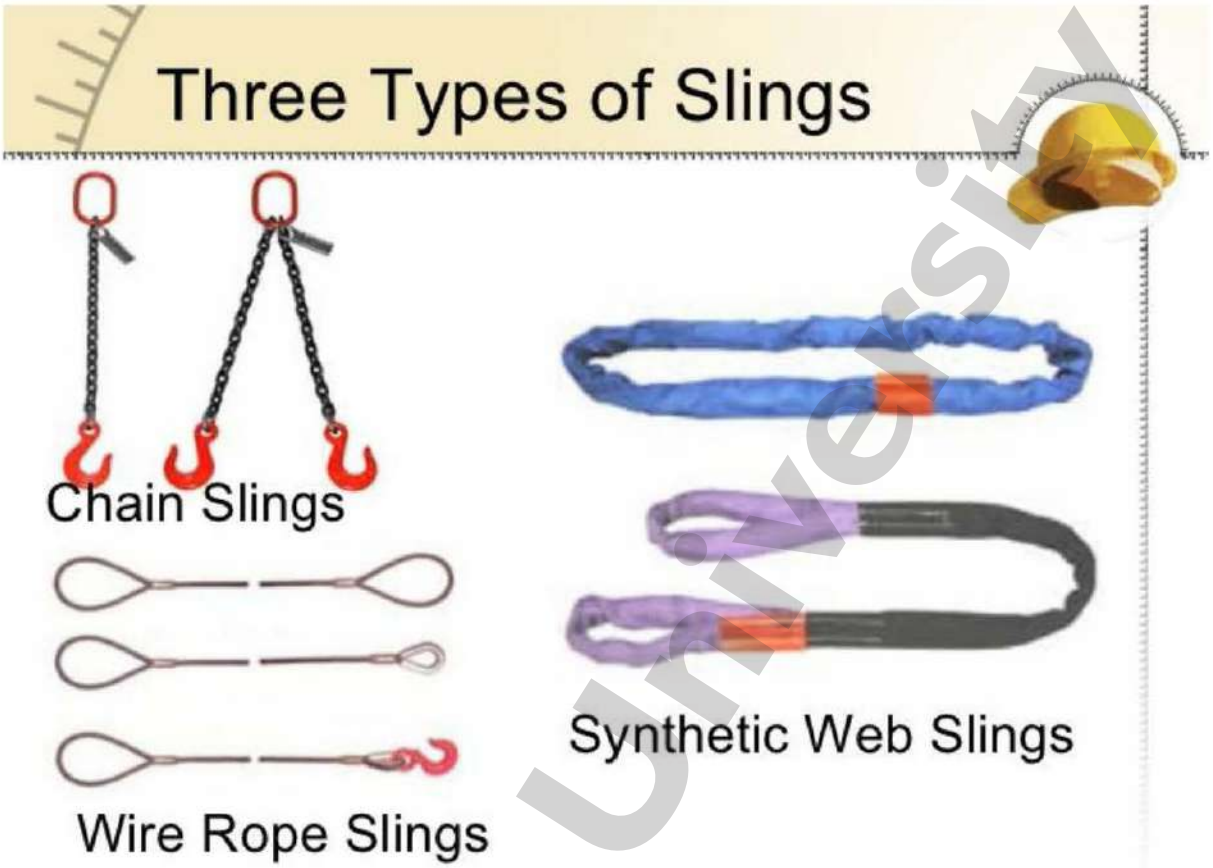
40. Assignment : Snap back zones

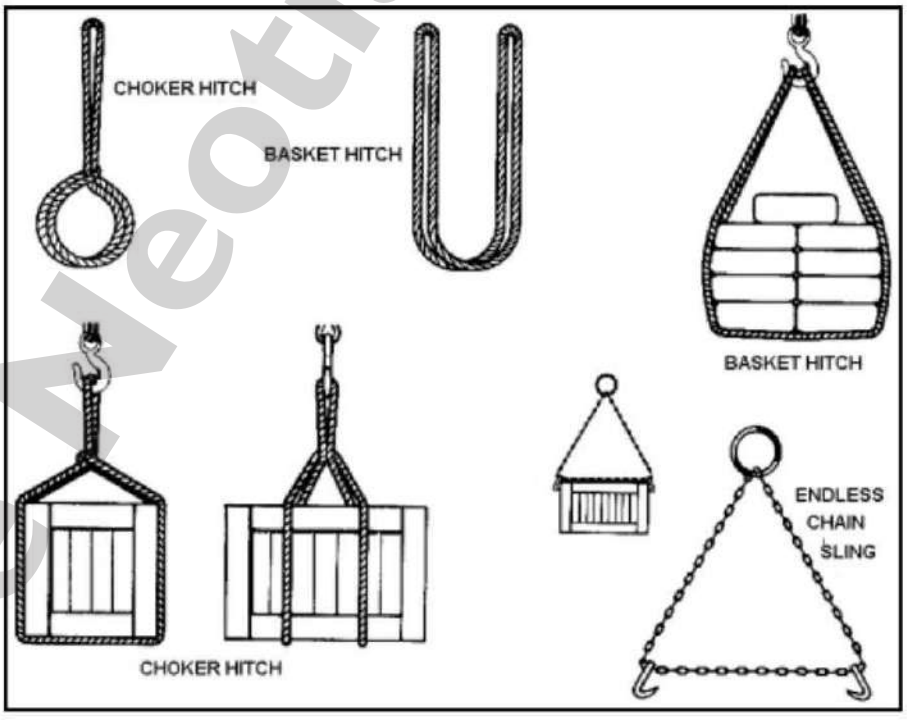
Learning Outcomes:

a) Snap back zones as per COSWP for Merchant Seamen

Assessment:

- Given the direction in which a rope is made fast, draw the snap back zone.





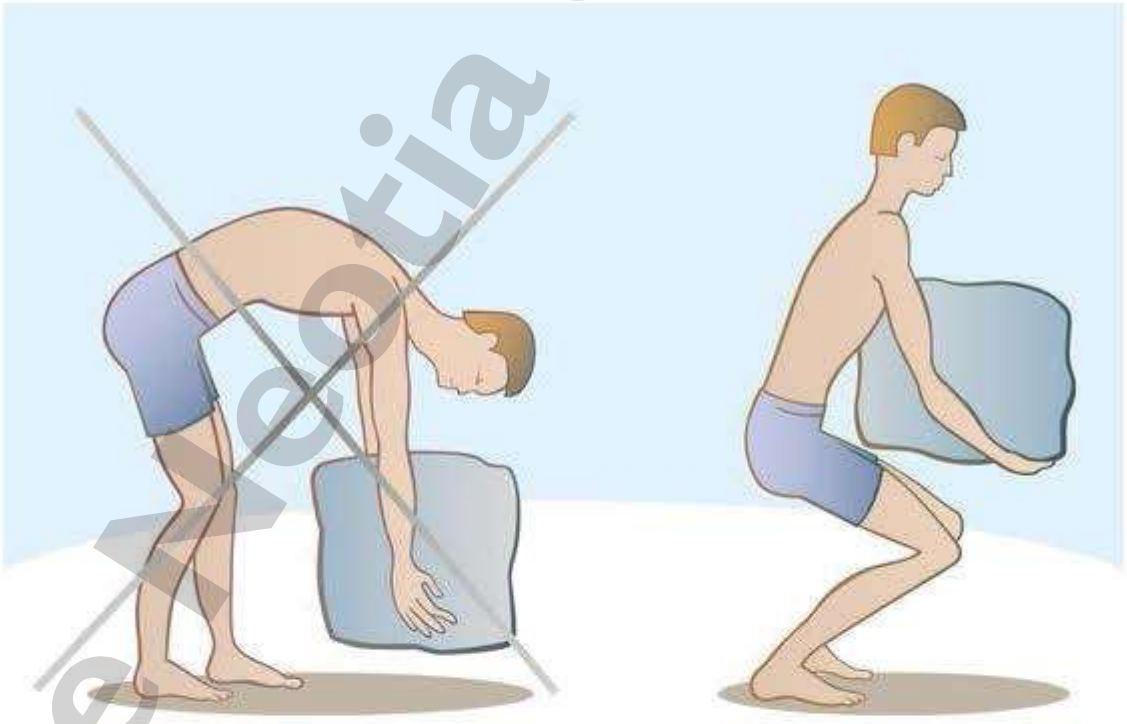
41. Assignment : Identify various types of slings, uses

Learning Outcomes:

a) Various hitches used when using slings. Advantage and disadvantages
b) Dangers of walking under a load
c) Types of slings and identifying their SWL
d) Inspecting slings

Assessment:

- Identify different types of slings
- Any 2 signs that indicate that a sling should not be used



42. Assignment : Safe method of lifting heavy weights

Learning Outcomes:

a) COSWP on lifting heavy loads
b) Practically lift a heavy load correctly
c) Consequences of improper lifting of heavy loads

Assessment

a) Demonstrate the correct way to lift loads.

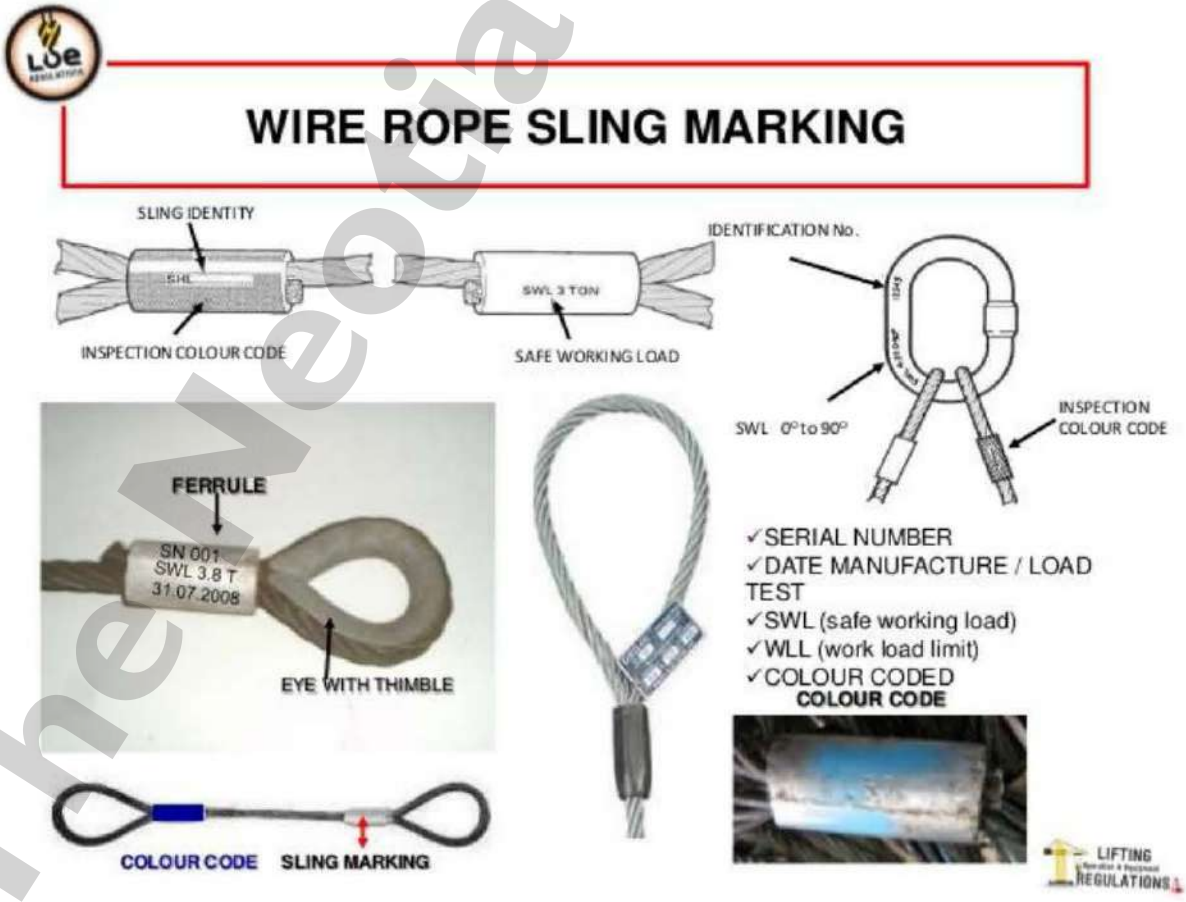
43. Assignment : Identify various types of container lashing equipment, their uses and safety precautions

Learning outcomes:

a) Identifying different types of lashing gear
b) Maintenance of lashing equipment and use of lashing gear log.
c) Safety precautions when using lashing equipment

Assessment:

- Entries in Lashing gear log
- Identify 3 types of lashing gear



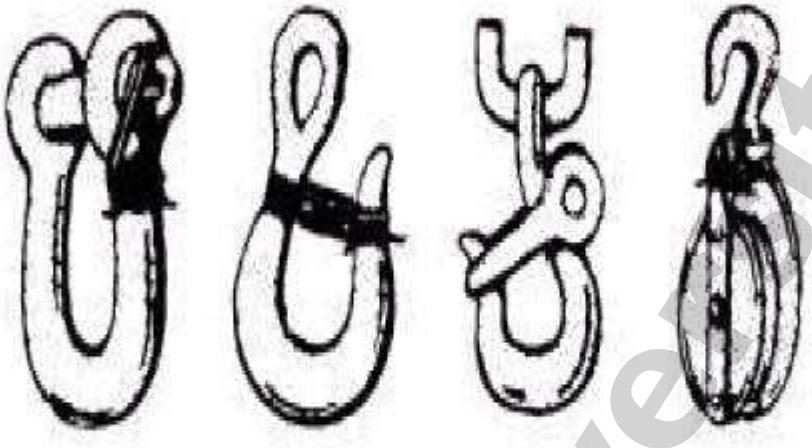
44. Assignment : Identifying SWL and marking SWL

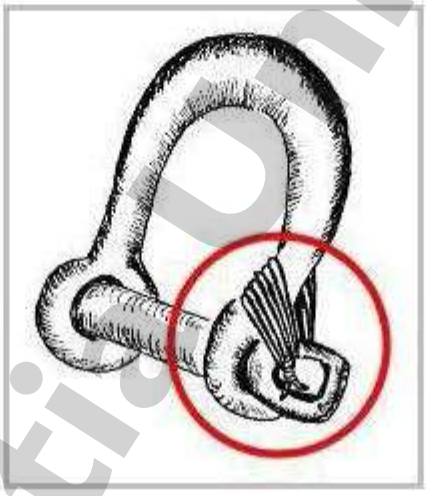
Learning outcomes:

a) What is SWL/ Factor of safety
b) Where do you find it marked. Mandatory requirements
c) Proof load/ Breaking load

Assessment:

- Explain SWL





45. Assignment : Mousing a hook, seizing a shackle

Learning outcomes:

a) Why a hook is moused or a shackle is seized
b) Practically Mouse a hook
c) Practically seize a shackle

Assessment:
Seize a shackle

46. Assignment : Oil and grease wires

Learning outcomes:

a) Why wires are lubricated
b) “Heart” of a wire. It’s utility.
c) Types of lubricants used and PPE required for wire lubrication work.

Assessment:

- Oral questions on the above.

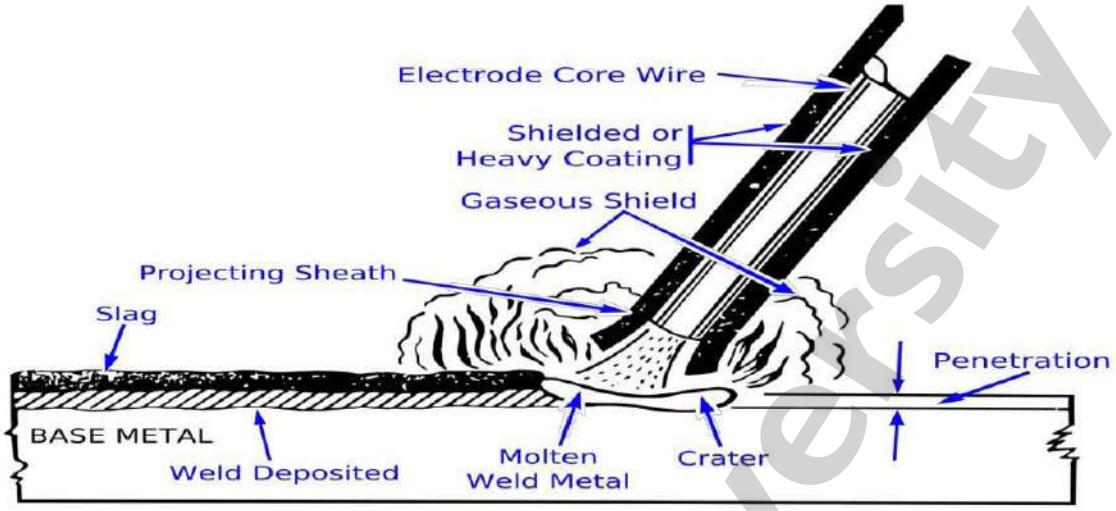
47. Assignment: Engine room layout, UMS, Emergency exit

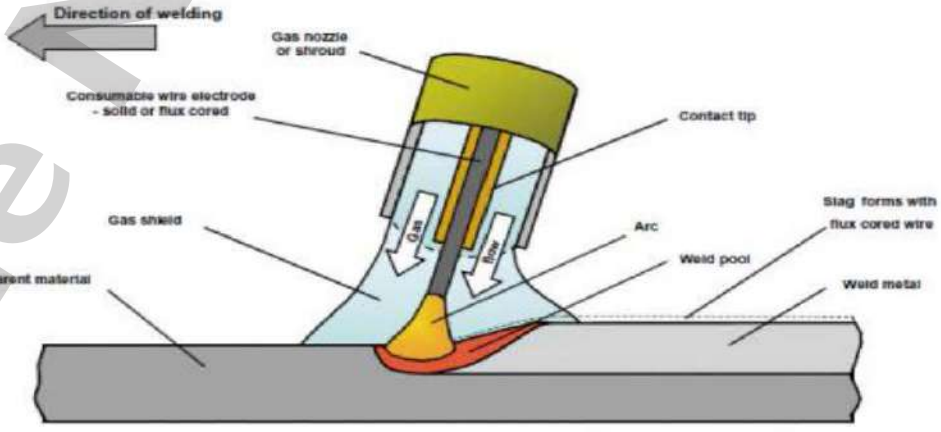
Learning outcomes:

- Basic layout of main engine and auxiliaries
- Why are emergency exits necessary.
- Make a plan of the different platforms as per the GA plan

Assessment

Draw and label a plan view of the engine room bottom platform.





48. Assignment : Welding

Learning outcomes:

a) Principal and process of electric arc welding
b) What equipment a welder needs to carry out the job safely:
   - Well insulated electrode holders.
   - Wire cables and cable connectors.
   - Welding helmet and hand screen or shield.
   - Safety goggles.
   - Welding chipping hammer.
   - Earthing clamps.
   - Hand gloves.
   - Apron & sleeves.
   - Wire brush.
c) Weld defects and how they can be minimised
d) Make a good down hand butt weld.

Assessment:

a) Safety procedures
b) Make a 15 cm down hand butt weld.

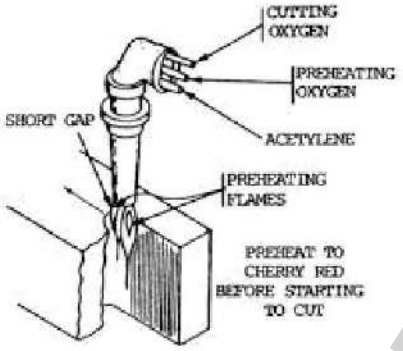
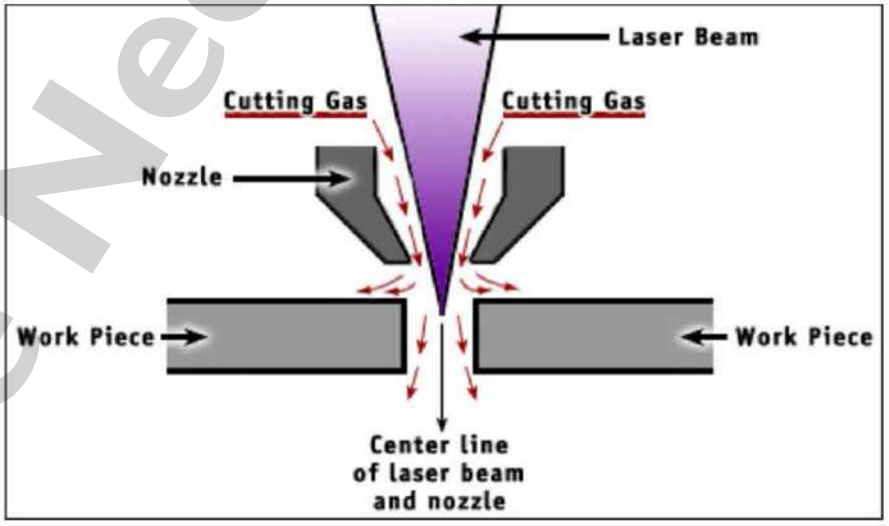


Figure 12-6. Process diagram of oxygen cutting.



49. Assignment : Gas Cutting & Welding

Learning outcomes:

a) Principle of gas welding

Gas welding (also called as Oxy-fuel welding) obtains the heat for welding by the combustion of a fuel gases. The process is fusion welding process where the joint is completely melted and no pressure. Filler metal may or may not be used. The fuel gas most widely used to acetylene (C_2H_2). When mixed with oxygen acetylene burns to produce temp of the range of 3100°C.

b) Types of flame – Neutral, Reducing, Oxidising

c) Safety guidelines for storage of cylinders

d) Safe working procedures when handling a gas flame

- fire caused by heat, sparks, molten metal or direct contact with the flame, explosion when cutting up or repairing tanks or drums which contain or may have contained flammable materials
- fire/explosion caused by gas leaks, backfires and flashbacks
- fumes created during flame cutting, fire/burns resulting from misuse of oxygen
- burns from contact with the flame or hot metal
- crushing or impact injuries when handling and transporting cylinders.
- Use the correct lighting-up procedure.
- Purge the hoses before lighting the torch to remove any potentially explosive gas mixtures. Use a spark igniters and light the gas quickly after turning it on
- Make sure the blowpipe is fitted with spring-loaded non-return valves, Use the correct gas pressures and nozzle size for the job, Maintain the equipment in good condition. Use flash back arrestors

Assessment:

- Cut a 15 cm piece of mild steel at least 8 mm thick
- Join two non ferrous metal by gas welding

50. Assignment : Lathe, Drill, Grinder

a) The various types of machine tools commonly used are:
- Lathes
- Shapers
- Planers
- Drilling machines
- Grinding machines
- Sawing machines

b) Safe working practises and PPE

c) Proper use of the grinding machine, drilling machine (portable and mounted); use of coolants such as water, oil, etc., during drilling

d) Turning a basic piece on the lathe. Drilling through a piece of metal

e) Using a motorised grinder

Assessment:
- Identify parts of a lathe
- Safety precautions
- Turn a basic piece on the lathe. Parallel/ step cut from 50 – 30 mm.

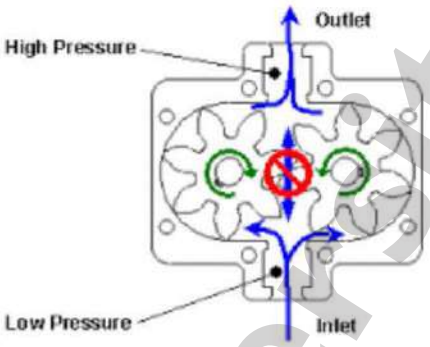
51. Assignment : Lifeboat engine/ Emergency fire pump/ Emergency generator

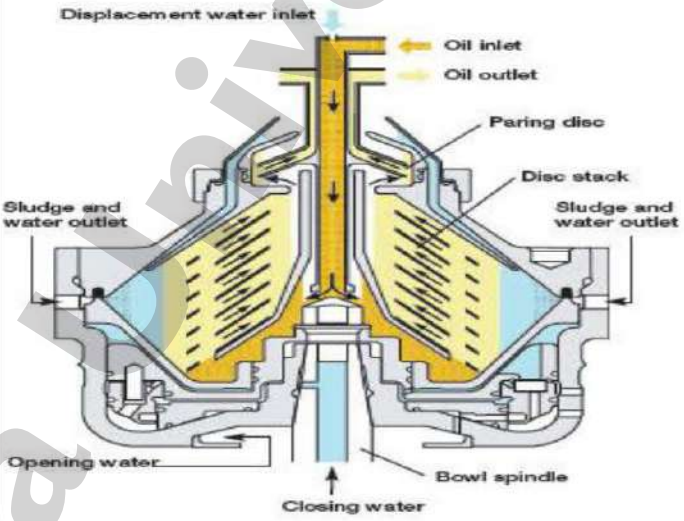
Learning Outcome

- Safety precautions for starting and stopping.
- Fuels used and their various properties.
- Practically Starting/ stopping a) Lifeboat engine b) Emergency fire pump c) Emergency generator

Assessment:

- Start any one type of auxiliary internal combustion engine used on board ship.
- Safety precautions.





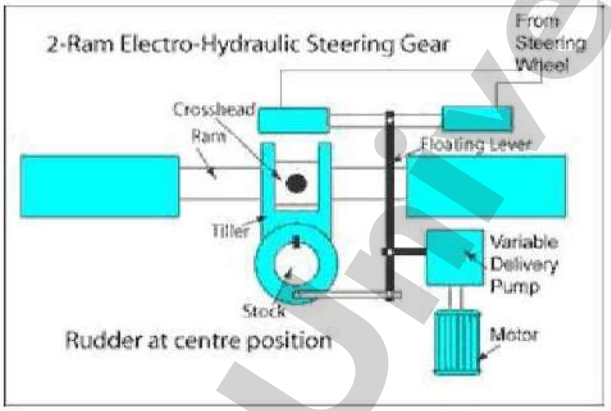
52. Assignment : Pumps

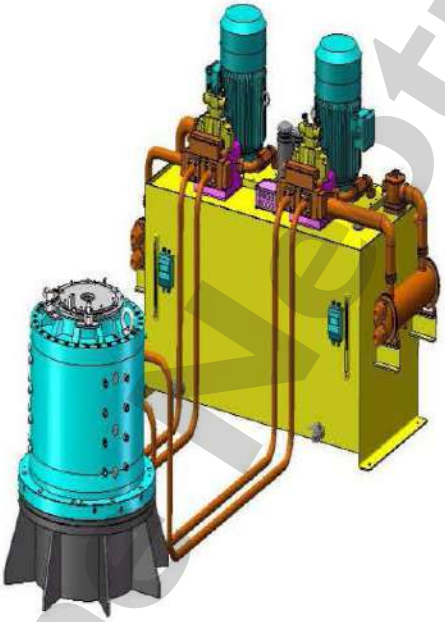
Learning Outcomes:

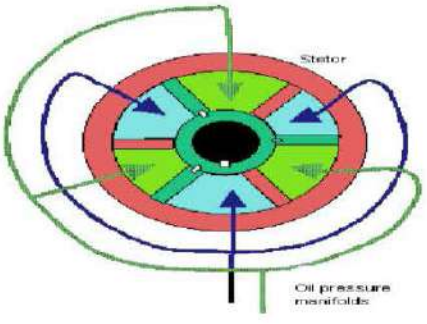
- Various types of pumps and their specific use.
  a) Centrifugal
  b) Reciprocating
  c) Gear
  d) Screw
  e) Eductor
- Starting and stopping procedures
- Safety measures while operating pumps

Assessment:

- Identify various different types of pumps.







53. Assignment : Steering gear

Learning outcomes:

- Types of steering gear
- Mandatory testing of steering gear

Assessment

- Mandatory tests of steering gear

54. Assignment : Reading Thermometer, Gauges, level gauges

Learning outcomes:

- Parallax error when reading liquid level gauges
- What is a pyrometer
- Remote temperature sensing for coal cargo
- Calibrating dial guages

Assessment

- Types of guages

55. Assignment : Handling Chemicals. MSDS

Learning outcomes:

a) Commonly handled chemicals on board
b) PPE to be used and importance of MSDS
c) Precautions to be observed when handling chemicals

Assessment

- What does MSDS stand for
- Why is it important to be familiar with MSDS before handling chemicals

Centre burst or perforation in one housing member

56. Assignment : Use of jubilee clips, temporary repairs to low pressure pipes

Learning outcomes:

a) Identifying different types of hose clamps
b) Danger on using these clamps on medium/ high pressure pipes.
c) Importance of realising that repairs using these clamps a temporary in nature

Assessment

- Fix a flexible hose to a pipe with 2 clamps

CARPENTRY

57. Assignment : Identify various tools and equipment

Learning outcomes:

Identify the following tools

a) Nails
b) Wood screws
c) Screwdrivers
d) Hammers (including claw, ball-pane, sledge, mallet)
e) Crowbars
f) Saws
g) Chisels
h) Wood files
i) Drills, vice
j) Clamps
k) Jack-planes
l) Tape measures

Assessment

- Identify 3 tools

3M Marine Grade Silicone Sealant

58. Assignment : Use of various adhesives

Learning outcomes:

a) Classes of adhesives, Uses of various adhesives in joining of materials.
b) Use of PPE when handling adhesives
c) Repairs to fibreglass surfaces such as boats

Assessment

- Make a fibre glass/ rubber patch

PLUMBING

59. Assignment : Types and proper use of tools

Learning outcomes:

- Various types of tools
- Importance of using the correct size of spanner
- Shutting off liquid flow/ reducing pressure before opening a connection

Assessment

- Identify 3 types of tools used in plumbing

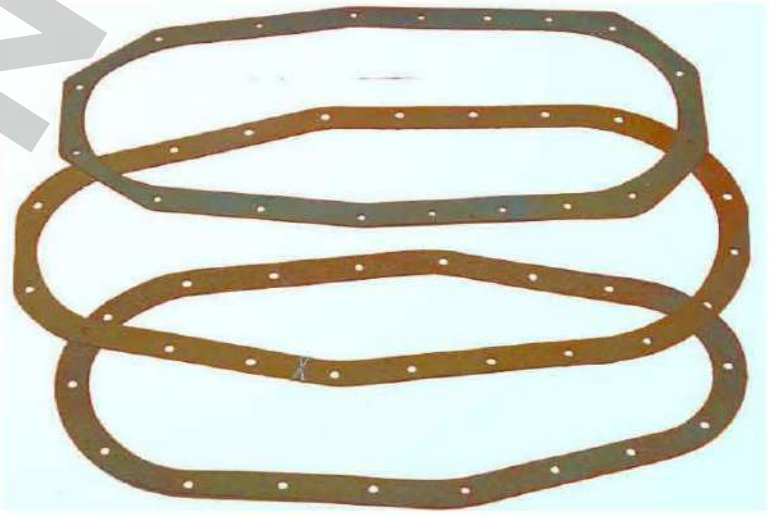
60. Assignment : Types of Pipes, Dismantling and joining pipes.

Learning outcomes:

- How to measure the size of pipes
- Pipe thickness standards
- Precautions to be taken before dismantling a pipe
- Thread sealing before pipe connection

Assessment:

- Measure the diameter of a pipe



61. Assignment : Cutting simple gaskets/ packing

Learning outcomes:

- Mark a manhole gasket on a rubber sheet/ chart paper
- Punch holes where the studs are to be inserted
- Cut the gasket

Assessment:

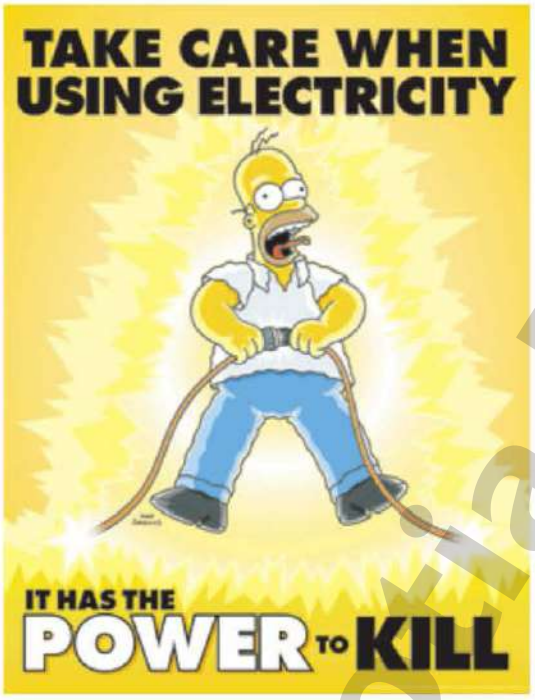
Make a gasket on chart paper

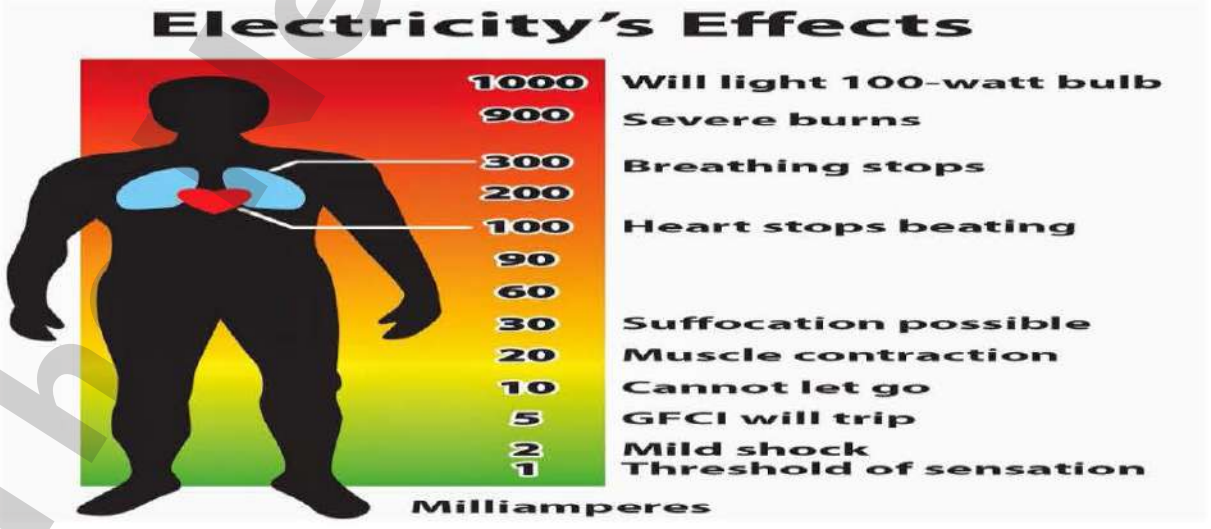
62. Assignment : Clearing choked pipes

a) Using a “Sani snake”
b) Using a suction plunger
c) Use of chemicals

Assessment:

- Identify a plunger





ELECTRICAL

63. Assignment : Hazards/ Use of insulated tools and mats

Learning outcomes:

- Safe working practises when working with electricity
- PPE to be used
- Principle on which use of insulation as protection from electrical shock is based on.
- What is the safe load of an electrical outlet. Dangers of using multi plugs
- Importance of having electrical insulation mats around the working areas of switchboards etc

Assessment:

- Hazards involved in working with electricity
- PPE when working with electrical gadgets

MACHINE WORKSHOP

64. Assignment : Identify and use of various tools

Learning outcome:

- Identify various workshop tools and their uses
- PPE
- Safe working practises

Assessment:

Identify 4 different tools found in a workshop and what ther are used for

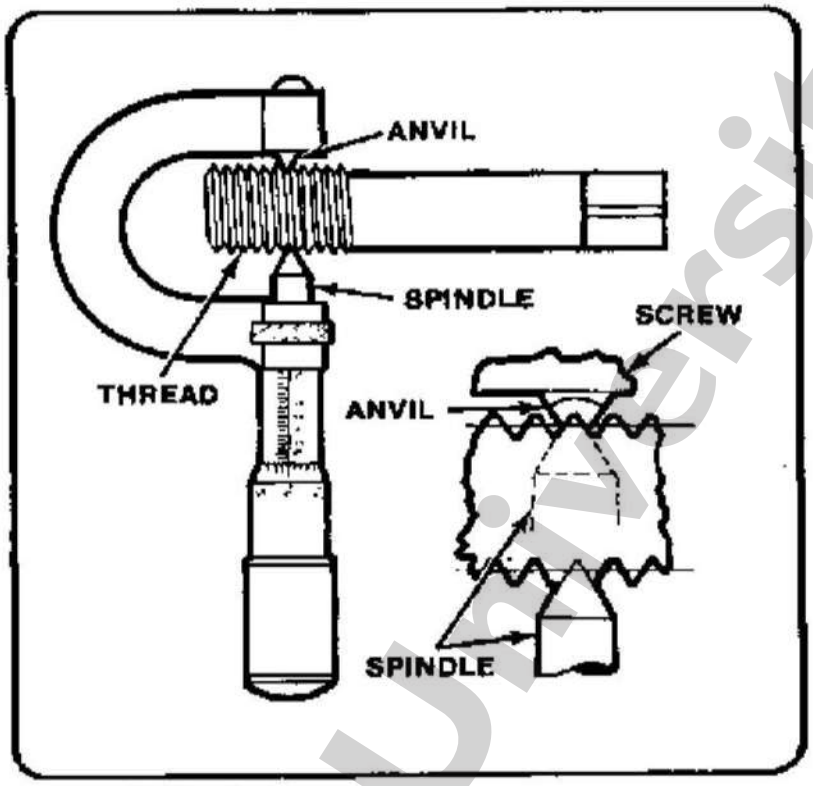
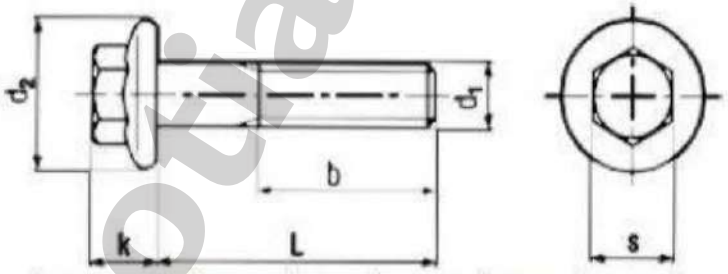
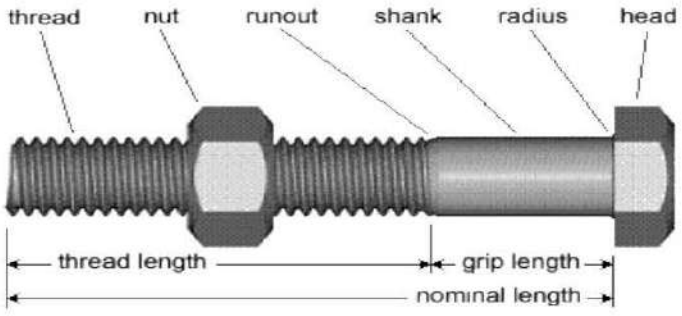


Figure 7-85. Thread micrometer.



Diameter	M6	M8	M10	M12	M16
b	18	22	26	30	38
d_2 max.	14	18	22.3	26.6	35
k max.	6.6	8.1	9.2	11.5	14
s max.	10	13	15	16	21



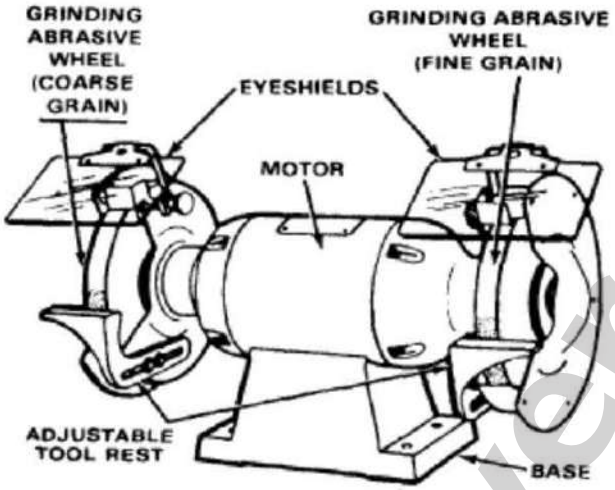
65. Assignment : Nuts and Bolts. Freeing rusted nuts and bolts, Sizes

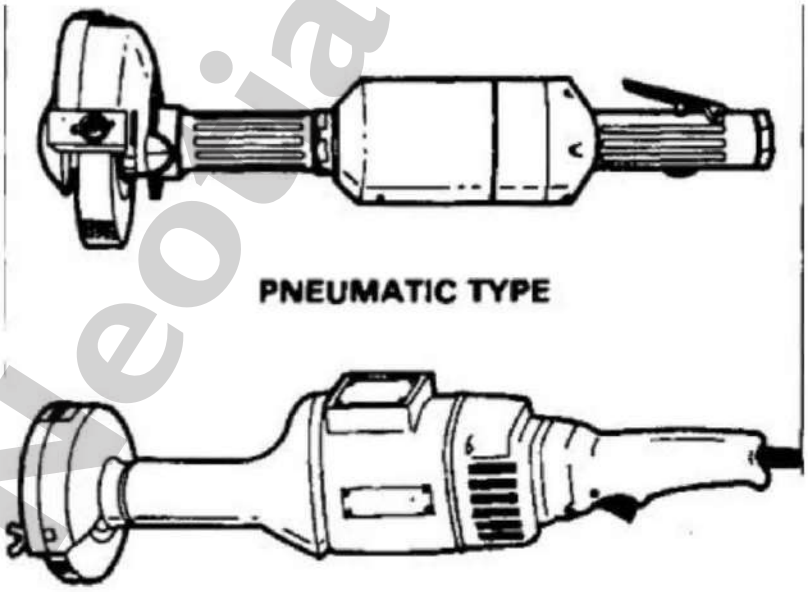
Learning outcome

a) Types of nuts and bolts, studs
b) Identifying nuts and bolts by size
c) Methods of freeing rusted nuts and bolts

Assessment

- Identify the size of a nut and bolt.





66. Assignment : Use of grinding machine both portable and mounted

Learning outcomes:

- Safe working practises
- PPE
- Hazards

Assessment:
Safe working practises and PPE

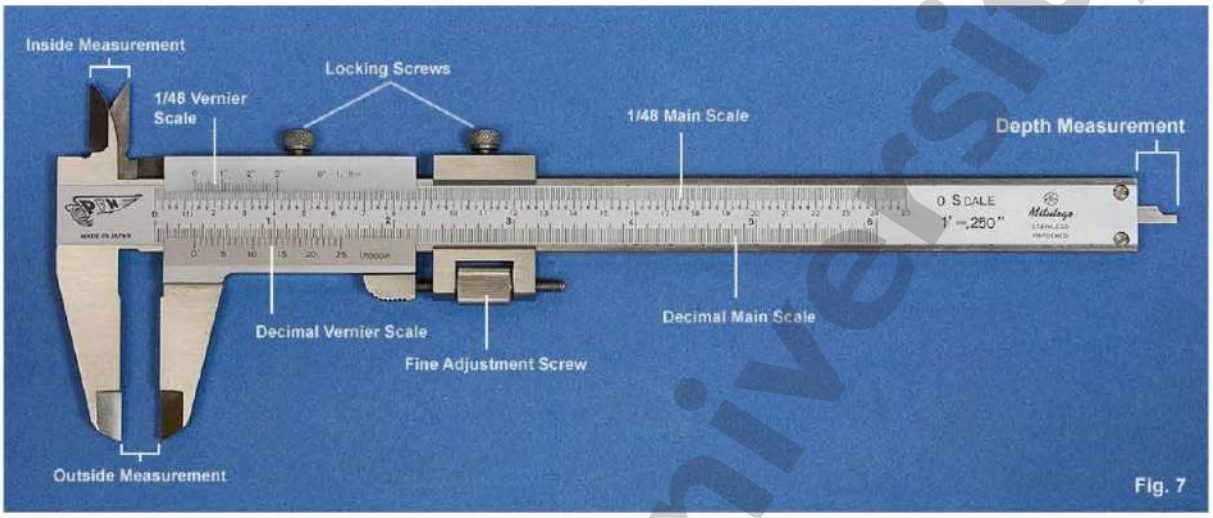


Fig. 7

67. Assignment : Use of vernier, callipers, screw gauges, feeler gauges

Learning outcomes:

- Use of vernier callipers, screw gauge and feeler gauges

Assessment:

- Use any one of the above to make a measurement.

SHIP VISIT

68. Assignment : Write a report listing – Ships particulars, Equipment, Parts and components seen. Port environment.

STCW

69. Assignment : PSSR, EFA, PST, FPFF, SECURITY

Assessment

Completion of STCW 2010 Training in above courses

SOFT SKILLS

70. Assignment : Typing

a) Touch typing at 30 words per minute

Assessment

- Demonstrate a typing speed of 25 words per minute

71. Assignment : MS Office

a) MS Word
b) MS Excel
c) MS Access
d) MS Power Point

Assessment:

- Proficiency in the above four programmes should include opening/ creating files/worksheets/databases/presentations, recording, editing, transferring, printing out, closing files,

Your Employees'

Public Speaking

Fearful?

Confident!

72. Assignment : Public speaking

Assessment: A 10 minute speech on any subject. The speaker will be judged on

1) Content – Relevance, Logicality and Interesting
2) Body language – Gestures (eye contact), vocal variety
3) Use of visual aids – Presentation
4) Maintaining time limit

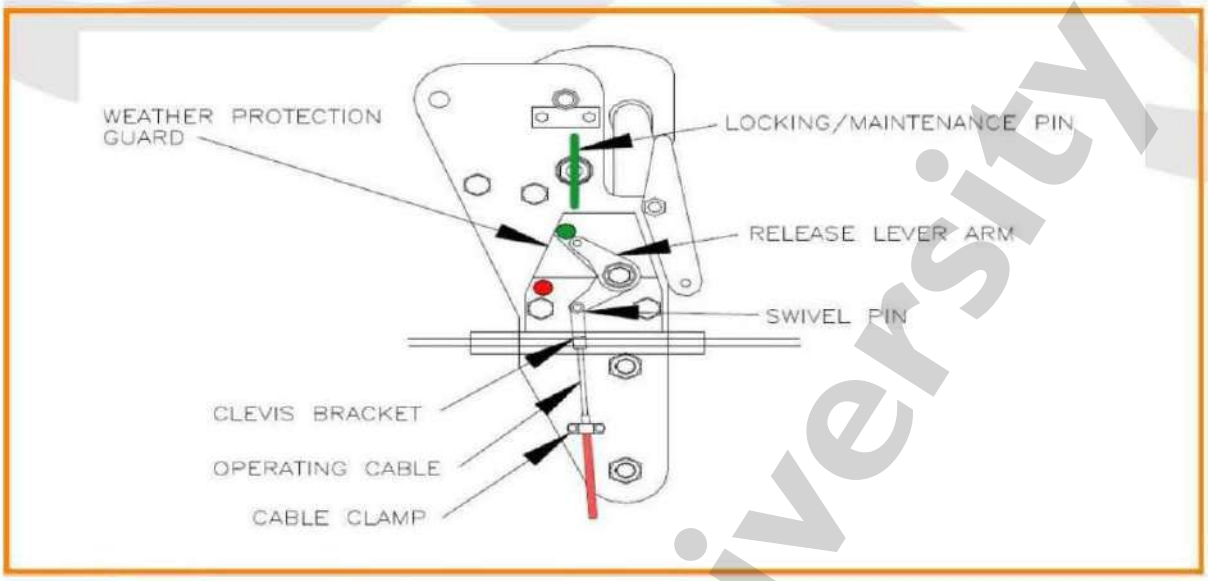
SAFETY

73. Assignment : Use of SCBA. Filling bottles

a) Use of SCBA (Self compressed Breathing Apparatus)
b) Parts of SCBA (Face mark, Backplate & harness , Contents gauge, High pressure manifold, Cylinder connector, Demand valve, Cylinder & Valve.
c) Method of operation, Correct wearing, Carry out pre entry Tests.
d) Use of compressor. Refill cylinder.

Assessment:

a) Carry out all safety checks and wear SCBA and fire suit

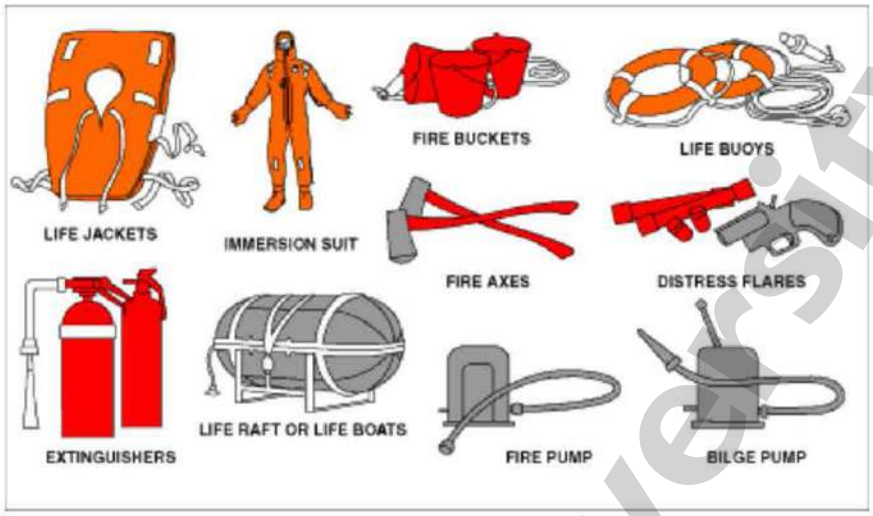


74. Assignment : On load release

a) Understanding how an OLR works, using Multi media training aids
b) Accidents involving OLR gear
c) How to reset OLR after release, before hoisting the boat clear of the water
d) Maintenance of the OLR

Assessment

- Draw an outline sketch of the OLR
- Maintenance and safety procedures when using OLR

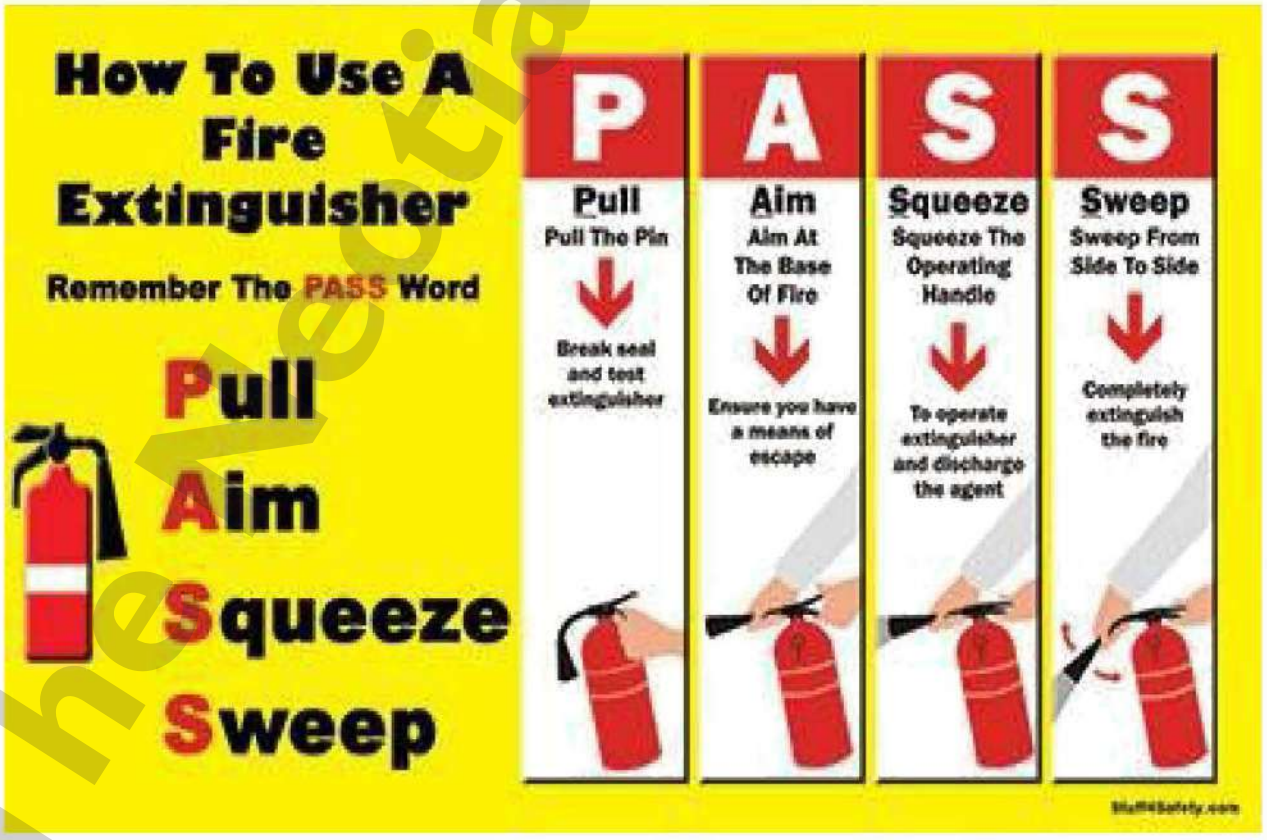


75. Assignment : Use of personal LSA

a) Wearing TPA
b) Wearing Lifejacket
c) Wearing Immersion suit
d) Use of EEBD. Maintenance and safety checks

Assessment

- Wear a,b,c above
- EEBD inspection procedure



76. Assignment : Use of common FFA

a) Familiarity with Fire plan and Fire safety manual
b) Types of fire extinguishers
c) Fire extinguisher maintenance and mandatory checks
d) Fire alarm systems and types of sensors

Assessment

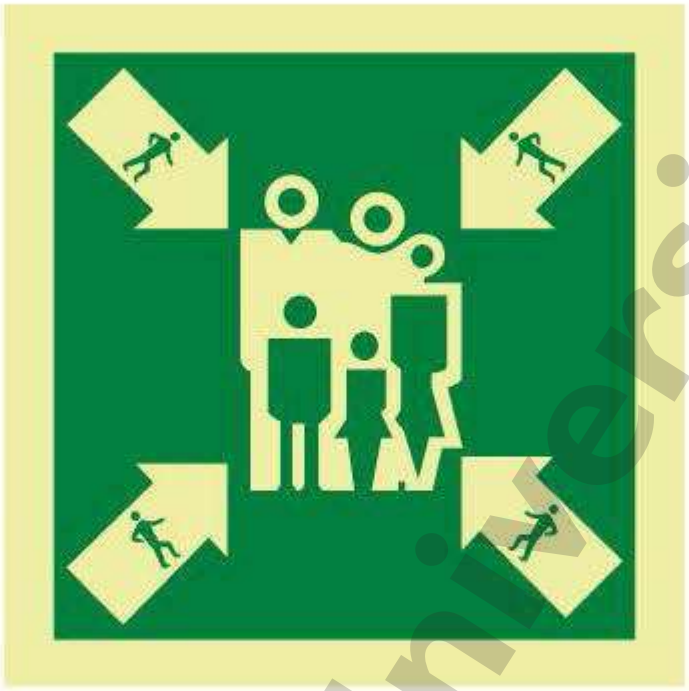
- Recharge a Dry powder fire extinguisher.

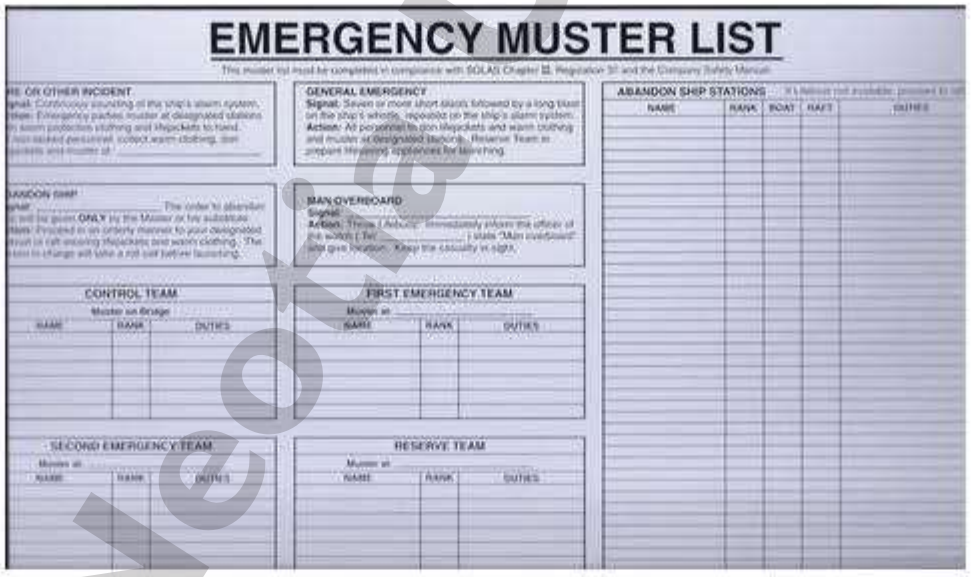
77. Assignment : Gas measuring and analysing equipment

a) Use of O2 analyser, Multi gas detector, Explosimeter
b) Tests and calibration. Limits of useage
c) Cal gas

Assessment

- Use one type of instrument





EMERGENCY MUSTER LIST

This muster list must be completed in compliance with SOLAS Chapter III, Regulation 37 and the Company Safety Manual.

GENERAL EMERGENCY
Signal: Seven or more short blasts followed by a long blast on the ship's whistle, repeated on the ship's alarm system.
Action: All personnel to don lifejackets and warm clothing and muster at designated stations. Reserve Team to prepare lifesaving appliances for launching.

MAN OVERBOARD
Signal:
Action: Throw Lifebuoy immediately inform the officer of the watch ("Mr. _____") state "Man overboard" and give location. Keep the casualty in sight.

ABANDON SHIP STATIONS

NAME	RANK	BOAT	RAFT	DUTIES

CONTROL TEAM
Muster on Bridge

NAME	RANK	DUTIES

FIRST EMERGENCY TEAM
Muster at _____

NAME	RANK	DUTIES

SECOND EMERGENCY TEAM
Muster at _____

NAME	RANK	DUTIES

RESERVE TEAM
Muster at _____

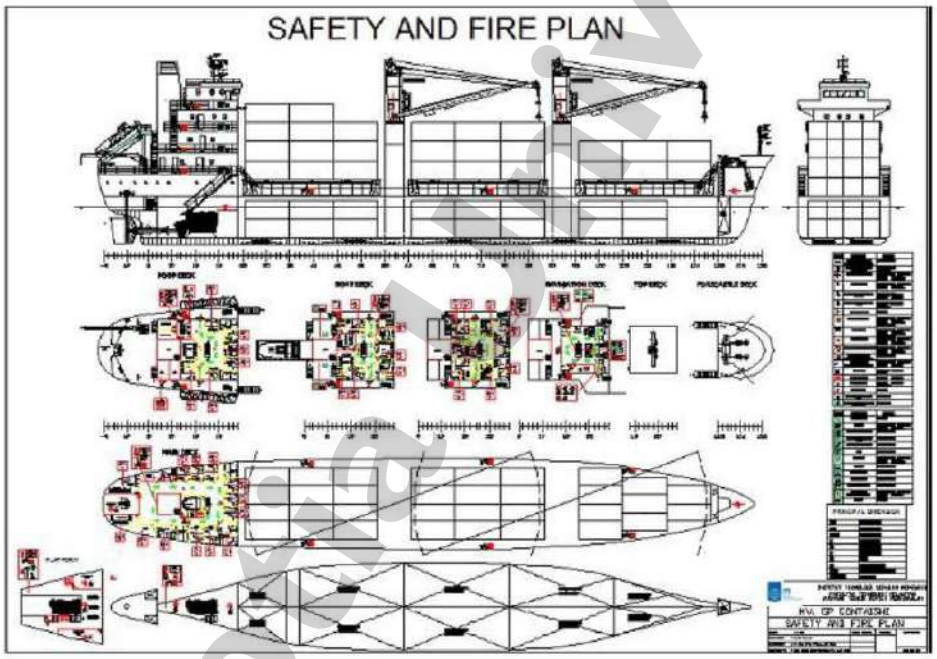
NAME	RANK	DUTIES

78. Assignment : Make a muster list.

a) Study and familiarisation with a Muster list
b) Use of same and information contained in it

Assessment

- Make one section of a muster list eg A boat, Fire squad

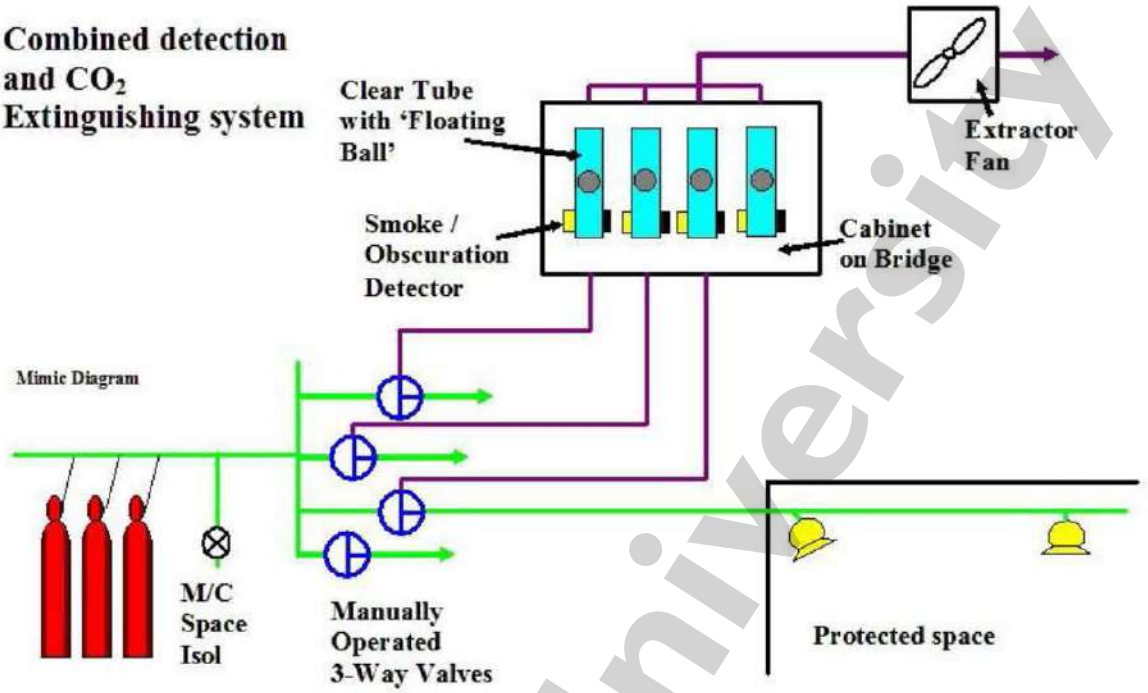


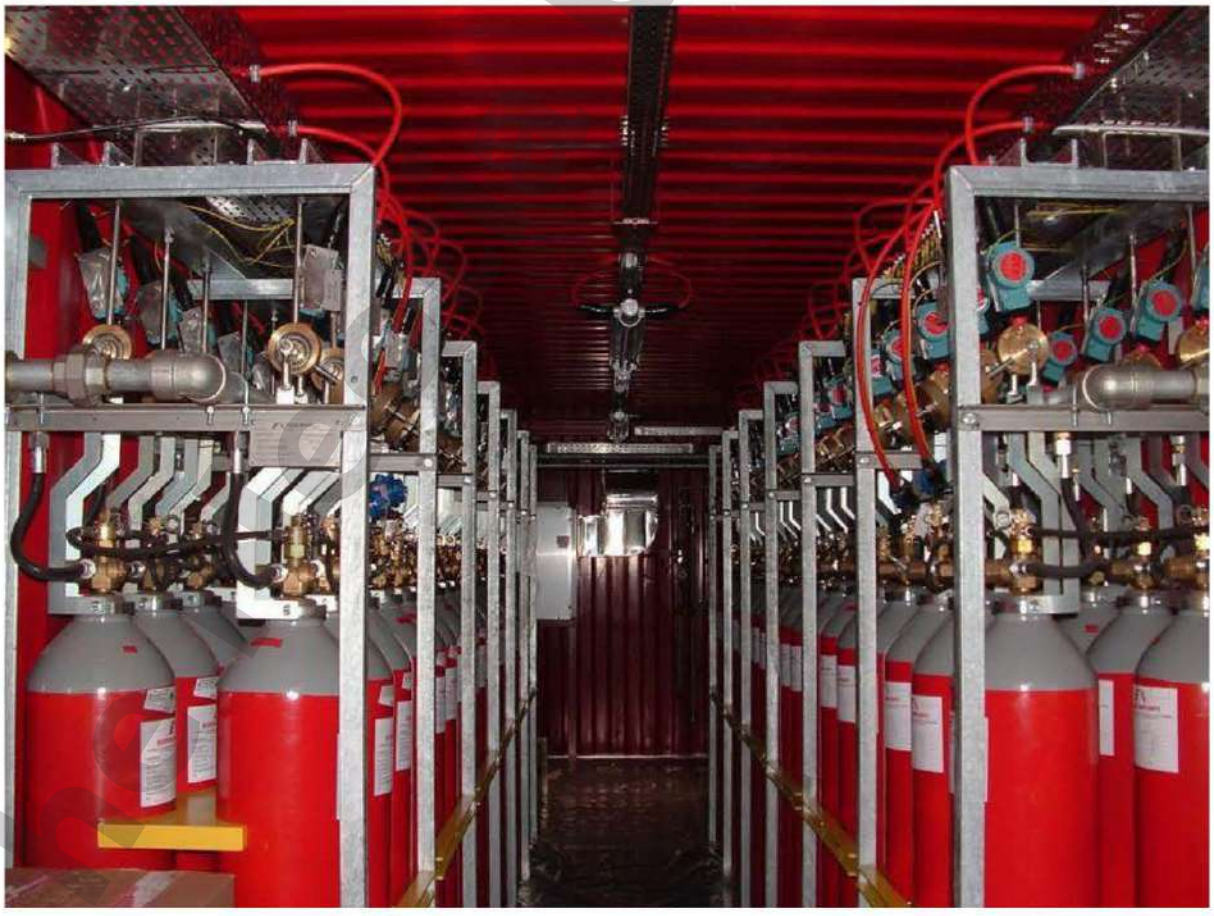
79. Assignment : Identify emergency exits, Fire extinguisher position

a) Safety plan and what it containe
b) IMO symbols
c) Mandatory shipboard familiarisation on joining a vessel
d) Location of emergency exits, Muster points and Fire extinguisher location and

Assessment

- Draw a safety plan for a deck with a muster point

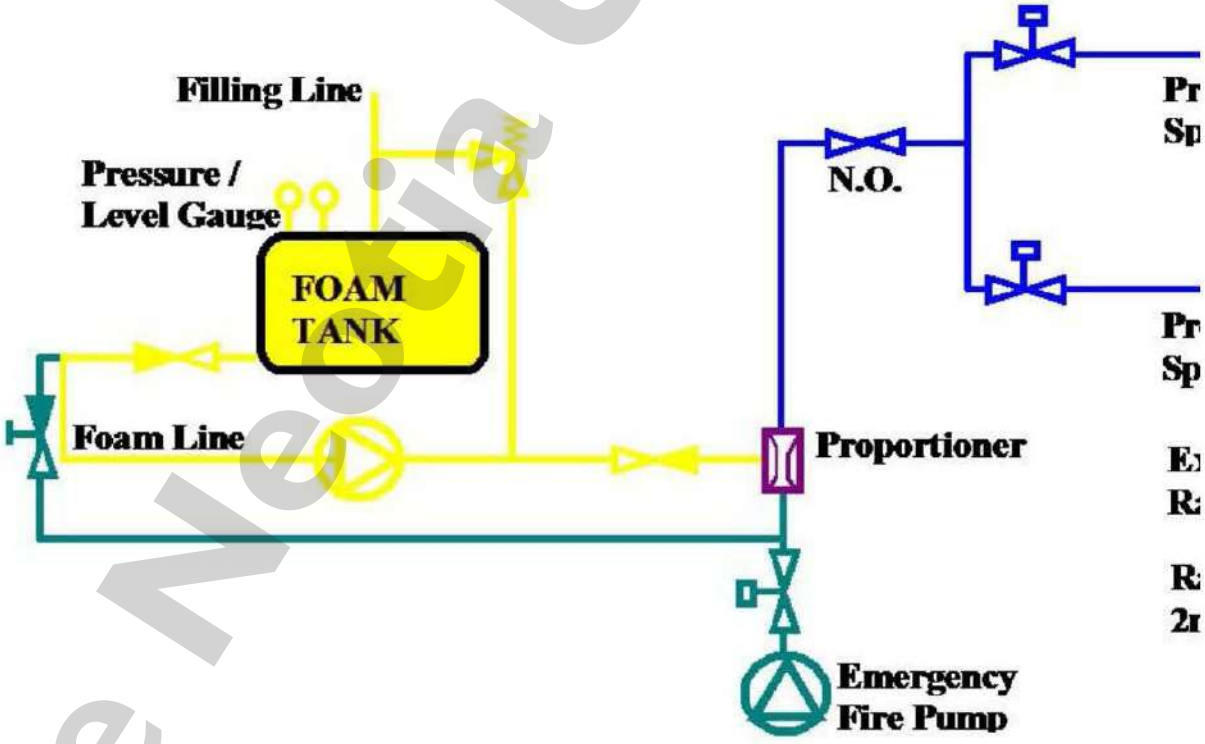




80. Assignment : Total flooding CO2 system operation

a) Safety procedures associated with the system
b) Read and understand the CO2 system diagram
c) Alarms and trips
d) Operating procedures
e) Restarting operations after the fire is extinguished
f) System testing

Assessment
- How to release CO2 into cargo holds
- Safety procedures
- Draw and outline of a CO2 system.

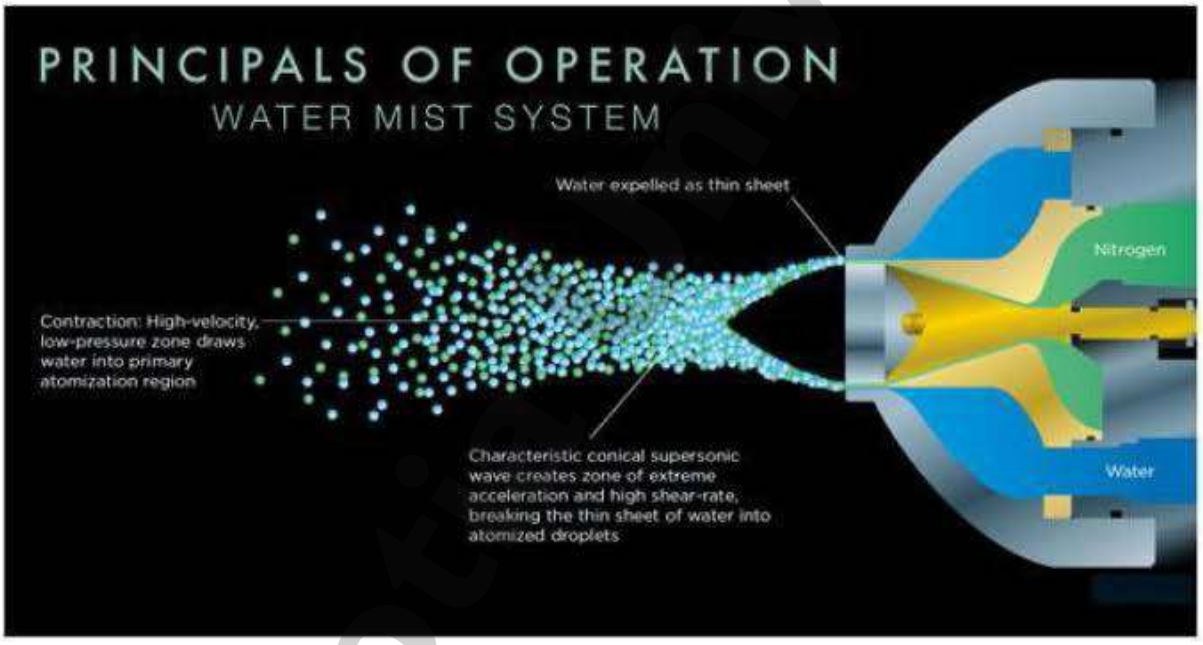


81. Assignment : Deck foam system

a) Type of foam used and why
b) Operation of the system
c) Maintenance and safety procedures

Assessment:

- Start the system and produce foam at the monitor.



82. Assignment : Water mist system.

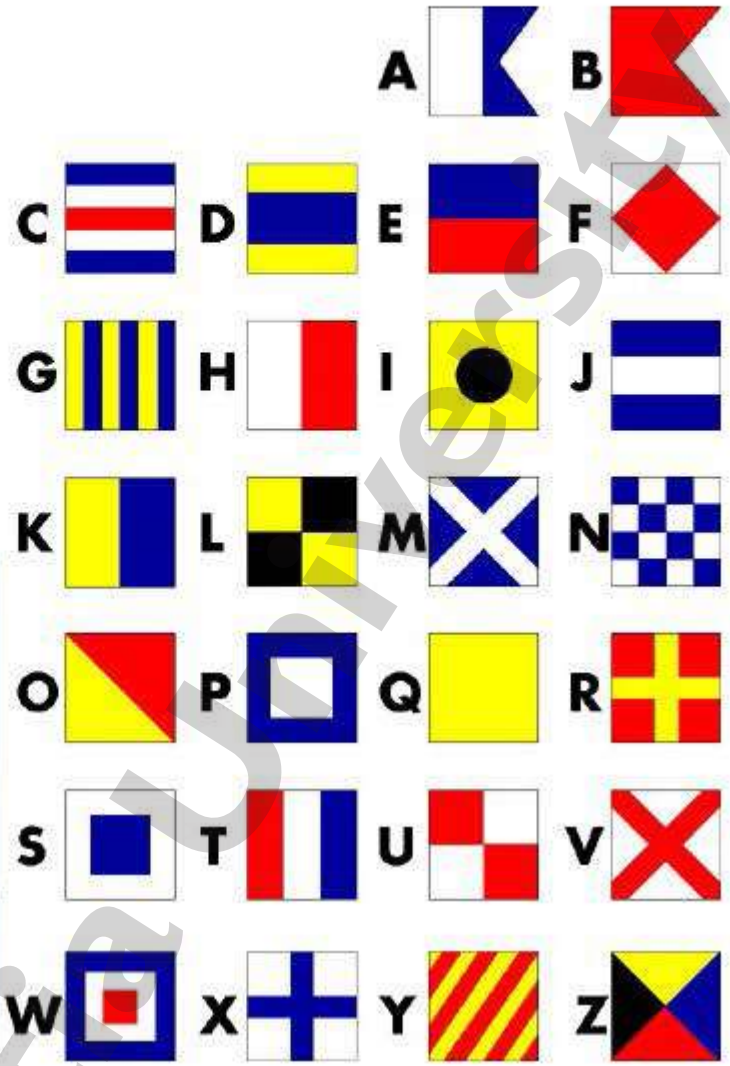
a) Principle of the system

b) Operation of the system

c) Maintenance requirements and safety procedures

Assessment:

- Demonstrate how to test the system



COMMUNICATION

83. Assignment : Signalling

Objective to be attained by the cadet:

a) Flag signalling, Meaning & recognize A to Z Flag.
b) Flashing light signalling , Morse symbols
c) Distress signals as the International Regulations for the Prevention of Collisions at Sea

Assessment:

a) Achieve 90% accuracy in the light signalling test.
b) Identify 4 INTERCO flags and their meanings
c) 2 distress signals

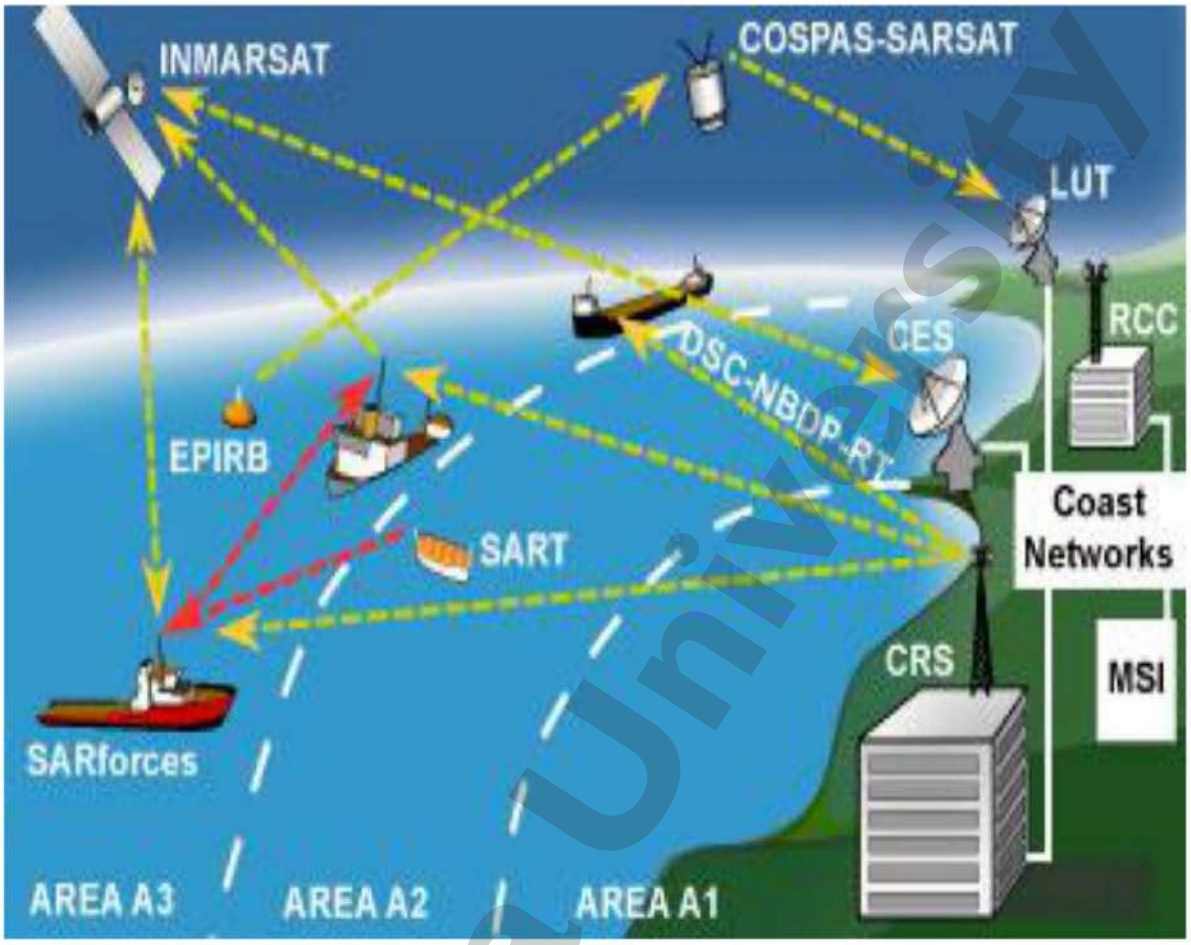
84. Assignment : Hand held radio

Learning Outcome:

a) Use survival craft hand held radio on the simulator
b) Use UHF hand held radio

Assessment:

Ability to change channels, charge, change batteries, transmit and receive using UHF hand held radio's.



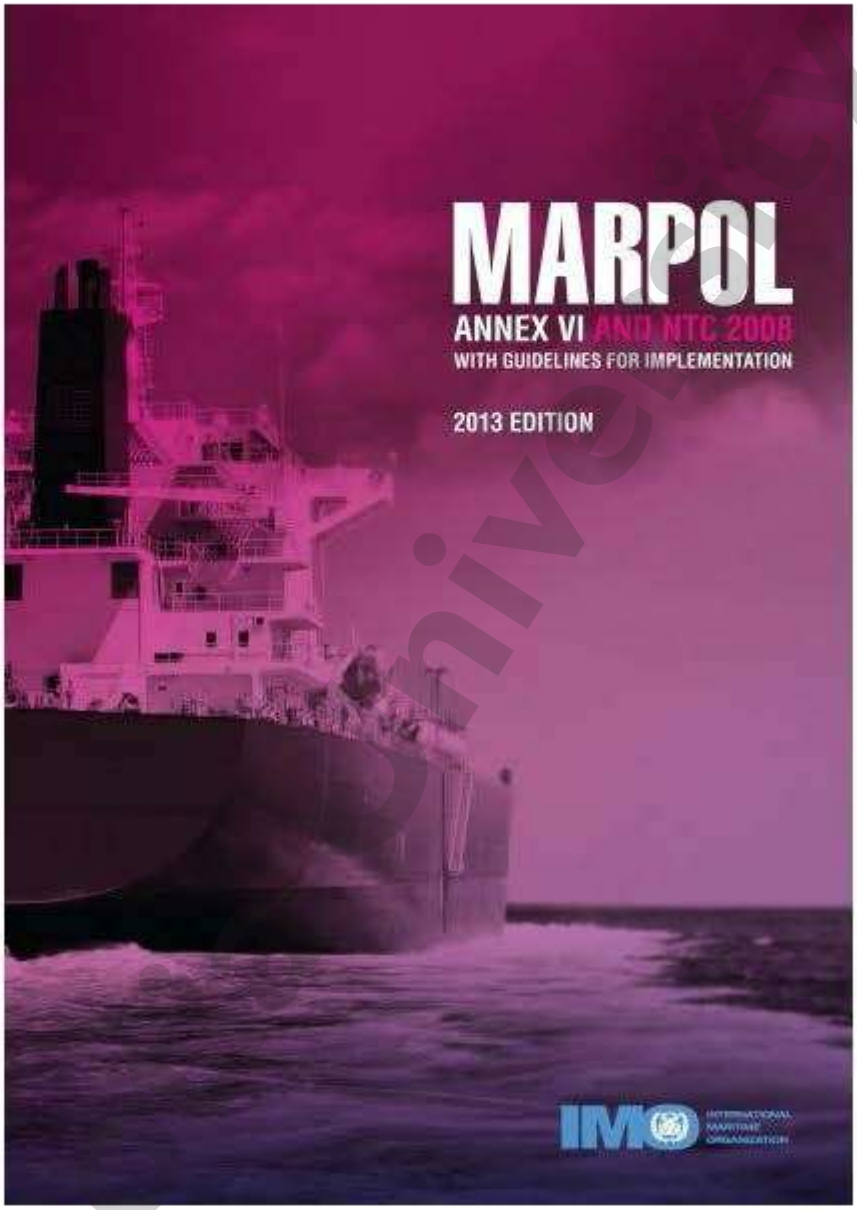
85. Assignment : Identification of GMDSS equipment

Learning outcome

a) Familiarisation with GMDSS simulator

Assessment:

- Identify and switch on 2 types of equipment



86. Environmental Protection

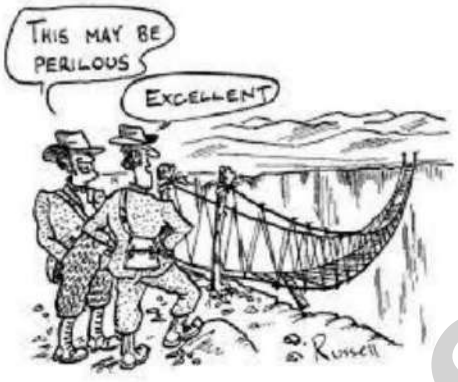
Learning Outcome

- Understanding the methods of disposal of Garbage, Sludge and Sewage as per Marpol in order to avoid pollution at sea.
- Use of incinerator.
- Entries in Garbage Record book and Oil Record book.
- Use of SOPEP and SOPEP Locker
- Understanding special areas.
- Minimising air pollution as per Marpol

Assessment

- Oral questions
- Practically make entries in GRB and ORB
- Carry out an Oil Spill Drill.

Victorian risk assessment



87. RISK ASSESSMENT

Learning Outcomes:

1. Understanding Risk Assessment as per COWSP.
2. As per ISM code Risk Assessment has become an important tool. Every non routine/hazardous job requires Risk Assessment.

Assessment

1. To make a risk assessment for a job as per guidelines provided in COWSP.

Recommended Books

1. NICHOLLS SEAMANSHIP
2. SEAMANSHIP TECHNIQUES BY D.J.HOUSE

INSTITUTE MEMBERSHIP OF VIDEOTEL LIBRARY (FOR LATEST SAFETY VIDEOS)

Text Books

1. DANTAN'S SEAMANSHIP