

TALLINN SHIPYARD

HEALTH AND SAFETY GUIDELINES

SAFETY RULES

GENERAL INFORMATION

AS A GUEST AT TALLINN SHIPYARD YOUR WELL-BEING IS OUR PRIMARY CONCERN, WITH THAT IN MIND, YOU HAVE TO CAREFULLY READ AND FOLLOW MENTIONED YARD RULES!

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- SHIP IN DOCK
- WORKING IN A CONFINED SPACES
- WORKING IN OIL TANKS AND BUNKER TANKS
- RISKS OF FIRE AND EXPLOSION
- INSTALLING YARD'S EQUIPMENT
- INSTALLING ENERGY SOURCES
- WORKING ALOFT
- HANDLING TOOLS
- HANDLING ORGANISATION
- HOT WORK
- CLEANING HULL TREATMENT
- HARMFUL PRODUCTS
- PERSONAL PROTECTION EQUIPMENT
- LOCKOUT TAG OUT TEST AND TRIALS

**IF IN DOUBT - DO NOT START
NO JOB IS WORTH YOUR LIFE
OR HEALTH!**



Dock is a hazardous place to work. In spite of providing a series of measures for ensuring personal safety to seafarers and dock workers, accidents could occur.

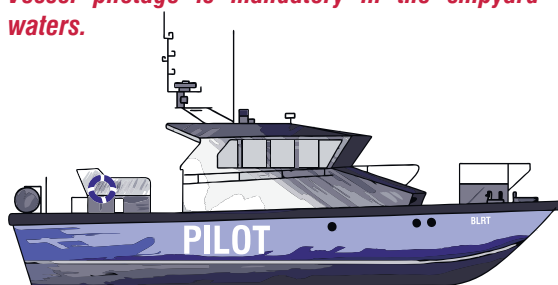
Ship's crew has to follow all the requirements of the Yard representatives:

- Safety;
- Management;
- Operations with ship's equipment.

BEFORE ENTERING THE DOCK

- Take all possible measures to eliminate or reduce the list and trim of the vessel (in exceptional cases, with dockmaster's agreement, it is allowed to lift the vessel with a list of up to 1 degree);
- Inform the Project Manager about all known and suspected damage to the shell plating of the vessel, their locations, the condition of the side keels;
- In winter time, take measures to protect the vessel from the formation of an "ice bow!" (keeping holds closed, heating of tanks, etc.).
- Prepare mooring lines, heaving lines, fenders;
- Take off all equipment which is out of vessel dimensions;
- Prior entering the dock, switch off vessel radar.

Vessel pilotage is mandatory in the shipyard waters.



Number of tugboats for docking depends on weather condition, ship Master/pilot/Port Vene-Balti requirements.

DURING DOCKING OPERATION PROHIBITED

- Usage of ship propeller;
- Transferring of fuel or cargo shifting;
- Pumping out ballast without informing the dockmaster;
- Pumping overboard liquids with concentrations of substances above 15 ppm.

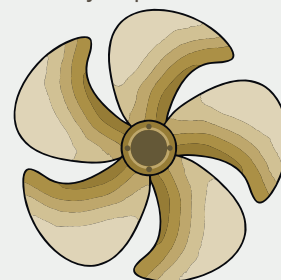
AFTER ENTERING DOCK

YARD HAS TO:

- Install 2 gangways from dock to the ship; (each gangway to be with safety net)
- Connect Dock Fire Main to ship's Fire Main;
- Install Emergency Fire button.

IN DRY DOCK PROHIBITED WITHOUT PERMISSION

- To pump fuel and lubricants (fuel, oil) without agreement with the project manager;
- To bunker without agreement with Project Manager;
- Pump out ship's oil residues and fuel oil on dock's deck;
- Irregularly consume fuel from wing tanks or to fill in ship spaces with water (without agreement with the dockmaster);
- Remove the gangways without permission;
- To use tools and equipment located on the dock without agreement with project manager;
- To interfere internal works of the dock's staff;
- To enter machinery and STAFF ONLY rooms of the dock without dock master permission;
- To connect to power-, water-, air-, oxygen, natural gas supply systems or to make self switching over, without dock's staff permission;
- To throw away ship's domestic garbage, except for special designated places;
- Carry out objects, equipment, etc. beyond the dimension of the vessel. In case MOB buoys (on the wings of the brick protruding beyond the dimensions of the ship, the above-mentioned buoys must be removed before the ship is docked);
- Launching the floating facilities without agreement with the port authorities and Project Manager;
- To execute hot works without written permission of the shipyard's fire safety inspector.



STRICTLY PROHOBITED:
to rotate the propeller, rudder blade during docking repair without agreement with Project Manager and safety check of propeller / rudder area.

No air means no life!
The compartments of a ship are confined spaces.

THREE MAJOR RISKS

Atmosphere controls can detect these risks:

- ANOXIA, it is asphyxiation by lack of oxygen;
- INTOXICATION, by noxious or toxic fumes;
- EXPLOSION, it is the very rapid inflammation of fumes or gas;
- **Check with portable Gas Detectors.**

PREVENTIVE ACTIONS

- Seek for the type of products previously contained in the capacity, type of residues or products used for the works;
- Seclude, separate the compartment in order to avoid accidental pollution;
- Refer to the "Work in confined spaces" checklist.
- Avoid heating sources that could start a fire: check temporary lighting, welding cables;
- Make sure to have the atmosphere controlled before and during the works by the Safety Assistant, AND ABOVE ALL!

VENTILATE

Gas pollutants create the risk. They are eliminated by dilution, or better by collecting them from their origin with fans from main deck, portable fans or ejectors.

Collect noxious fumes from their emission. Vent them outside without recycling.

Never use oxygen to air a compartment, you would create an explosion risk!

LACK OF OXYGEN BY PRO-DUCTION OF RUST

- In a wet atmosphere, iron oxides and absorbs the oxygen existing in air;
- The normal content of oxygen in air is 21 %. Under 16 %, there is a high fatality risk since there is no more exchange inside the lungs;
- In a non airtight compartment where the access manhole has not been opened for months, the oxygen content can be lower than 13 %;
- Before entering check content of oxygen with portable Gas Detector!

RISKS WORSENING

- Tripping or falling, handling, electricity, fire... These risks can be made worse due to difficult access and evacuation, sometimes by the very small size of compartments.
- The magnetic badge with your name on that you leave on the metallic panel near the tank entrance shows the presence of people and helps direct the rescue team.

IT DID HAPPEN!

« Explosion on a barge in St-Nazaire. One worker dead, another one seriously burnt... Both men were doing paint works.»

« Paint solvent: in Brest, 2 workers faint... they were applying epoxy paint with a brush in a sanitary tank. Ventilation was very poor.»

« Intoxicated by nitrous fumes two workers die a few hours later... They had taken part in a rudder stock tiller removal: heating up with high flow gas burners had taken only 18 minutes.»

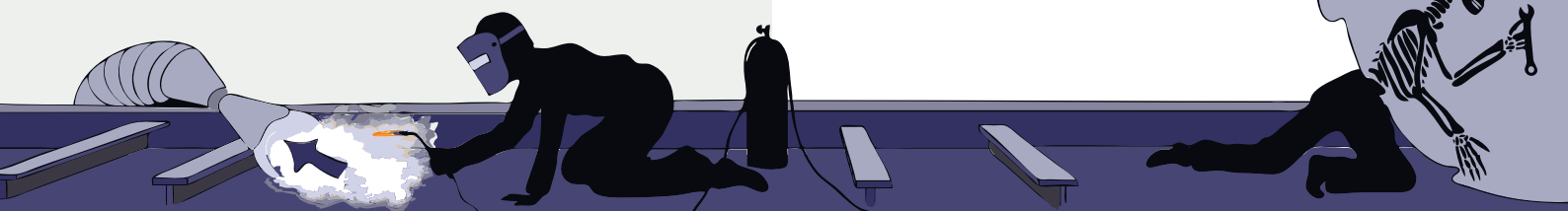
« After the collision a man goes down below checking for damage. He enters a void space where there is not enough oxygen and dies on the spot. »

Before entering, even for a few seconds, a compartment where there is nobody, have the atmosphere controlled and make sure the ventilation is on!

- Oxygen or acetylene leakages
- Greasy residues combustion
- Paint combustion
- Welding smoke
- Zinc, cadmium fumes
- Nitrous gas from heating burners
- Hydrocarbon residues
- Welding inert gas
- Tanks inerting
- CO2 fire fighting
- Steam
- Exhaust gas
- Diesel engine
- Flying baskets, mobile cranes
- Engine driven pumps
- Fuel
- CO, CO2
- Paint, glue, solvents
- Chemical products
- Batteries (hydrogen)
- Hydrogen sulphide
- Ammonia leakage
- Refrigerating fluid (freon)
- Human breathing
- Cereals dust (explosion)
- Fruits, citrus breathing
- Vegetal oil oxidation
- Production of rust
- Decomposition of mud...



WORKING IN A CONFINED SPACE





Ships carrying or having carried flammable liquids or flammable liquid gas...

FOUR POSSIBILITIES

- The rules are transposed for any other tank, capacity, bunker tank...
- These ships can be loaded, but more frequently, when under repairs, empty of any cargo.
- Depending on the capacity conditions, a ship can only be in one of these situations:
 - 1 - Ship in inert condition;
 - 2 - Ship in gas condition;
 - 3 - Ship on gas freeing operations;
 - 4 - Ship is "Gas Free".**
- **The last is the most frequent case in ship repairing. For any other case, specific instructions have to be stated.**

GAS-FREE VESSEL

- This term "Gas Free" is improper and dangerous!
- In fact a situation is never frozen, and residues release flammable vapours that are sometimes toxic.
- One must always suspect the presence of gas in:
 - bunkers: fuel for boilers or diesel engines...
 - piping, pumps, ancillary accessories might have been washed in a poor way...
 - heating coils: often broken or holed, they retain product from the previous cargoes.
 - cofferdams, void spaces, ballast tanks... might have been accidentally polluted following structure defects, cracks, corrosion.

INERTED SHIP

- **The air of the tanks is replaced by engine or boiler exhaust gas, or by nitrogen.**
- There is a risk of asphyxiation due to lack of oxygen and a toxic risk due to the presence of carbon oxide (CO) as well as nitrous gas in the exhaust gas.

Before entering a capacity, make sure that you are allowed to undertake the works you have been assigned to and put your card to the dedicated case to show your presence in the tank.



- Access to the tank is forbidden. Tank has not been checked yet or gas is building up again.



- Hot work forbidden. (It is also forbidden to smoke but this rule applies everywhere on board!)



- Hot work is permitted in the areas where planned, when handled in accordance with the prevention measures stated in the Hot Work Permit. Refer to that document.



PERMANENT SMOKING BAN ON ALL SHIPS, EVEN IF THERE ARE NO "NO SMOKING" SIGNS!

ATMOSPHERE MONITORING

- Every entering before the work starts, the worker records the atmosphere in all tanks using portable **Gas Detector!**
- At anytime, anyone may ask for further checks even by Laboratory if they feel that safety or healthiness is at stake.

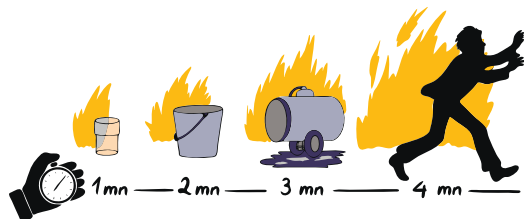
TOXIC EFFECTS OF HYDROCARBON VAPOURS

- Some crude oils, sulphurous crude oil, contain hydrogen sulphide (H₂S). Its very bad smell can be detected at as low concentration as 1 to a million.
- However, its toxic effect consists in paralysing the nervous system, one of the first senses to become inoperative being smell.
- Although H₂S is flammable its presence is not detected by a standard explosimetre and a specific 4 Gas Detectors H₂S, O₂, CO, CH₄.

THREE CLASSES OF RESIDUES

Hydrocarbon residues are classed in three types:

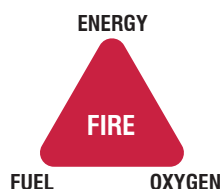
- A - Do not start burning when in presence of a flame.
- B - Start burning when in presence of a flame, but stop burning when the flame is removed. This type of residues can cause restricted fires.
- C - Start burning and keep burning!



During the first minute you need a glass of water to kill the fire, during the second minute a bucket of water, during the third minute a tank of water, After that, you do what you can...

THE FIRE TRIANGLE

- The Fire triangle shows the three elements that are necessary for combustion. If only one of these elements is missing the fire cannot start or will stop.



- The CO2 fire fighting installations and inerting systems that suppress oxygen are based on this principle. There is a risk of asphyxiation.
- In case of CO2 alarm, vacate at once the place where you work!

PREVENTION ACTIONS

- Be aware of the posted signs and work permits;
- Remove flammable wastes, saw dust, greasy rags, cardboards, plastics, empty wrappings, garbage bins;
- Use fire-retardant tarpaulins to protect machinery and staging (no polyethylene sheets);
- Do not obstruct door closing with cables, hoses, ventilation ducts;
- Fence off the areas where are undertaken works using flammables products, paint, solvents;
- Remove hydrocarbon residues;
- Do not trample on sediments;
- Keep your work station clean;
- Install the fire fighting equipment;
- Check what is in the adjacent capacities.

EXPLOSION

- An explosion is an extremely fast inflammation of a mixture of gas causing a brutal increase of pressure (4 to 30 bars).
- When the gas content in air reaches a certain level, the mixture can explode if exposed to a flame or a spark. This limit is called LEL (Lower Explosivity Level).



- The best possible prevention is ventilation which keeps the concentration below the danger level.
- Low voltage lighting (24 Volts) is not intrinsically safe. If a risk of explosion appears in a tanks, get out immediately and switch electricity off from a place which is OUTSIDE the dangerous area.
- Works in an explosive atmosphere are totally forbidden!**

GAS DETECTOR

- Gas Detector enables to detect a risk of explosion;
- Hot works must be stopped if the gas detector is giving an alarm;
- For sake of healthiness, works will be undertaken when the pointer sticks to the zero reading.



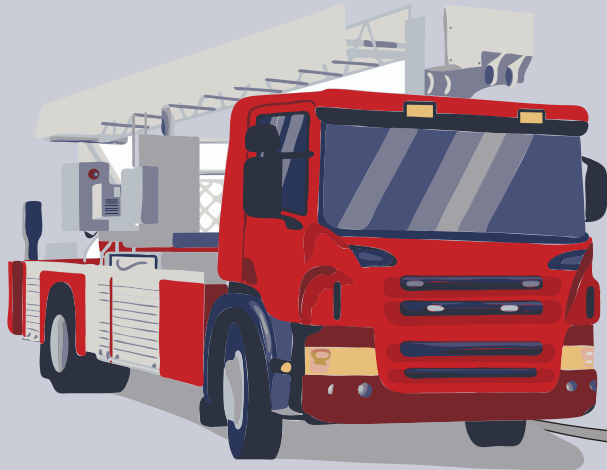
RISKS OF EXPLOSION

Explosions can originate from some products:

- Hydrocarbon vapours;
- Acetylene;
- Oxygen, when in contact with a greasy product;
- Paint, solvents, glue;
- Hydrogen released by batteries;
- Hydrogen released by magnesium anodes that are; sometimes used in tanks for braking rust away;
- Hydrogen sulphide on sulphur tankers or some crude oil cargoes;
- Refrigerating plants fluids, which can also be toxic.
- Very fine dust of cereals, sugar, magnesium, aluminium;
- Methane released by decomposition of mud;
- ...You certainly know others...

WHEN YOU QUIT YOUR WORK STATION...

- Cool down the parts that have been heated by watering them;**
- Arrange for a patrol: there is a risk of smouldering fire;**
- Switch your welding cable off;**
- Disconnect your oxygen / acetylene pressure reducer on deck;**
- Remove oxygen / acetylene hoses from the area of work.**



Alarm must be raised by any means available...

- Ship's public address system,
- Radio station (channel 11),
- Mobile phone,
- Ship's telephone.

Shipyard's deck and engine room sirens should be used for instructing to evacuate the ship.

WHO TO ALERT?

IN CASE OF EMERGENCY:

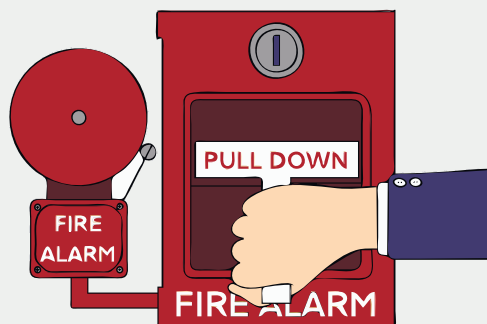
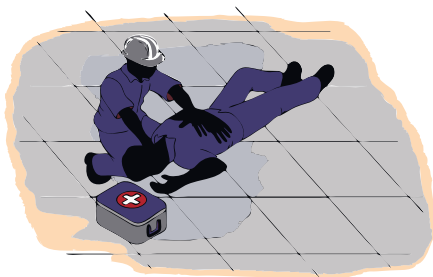
+372 610 2448

EMERGENCY PHONE NUMBERS:

1. FIRE SERVICE **112**
2. AMBULANCE **112**
3. POLICE **112**

IN CASE OF ACCIDENT

- Protect the people in order to avoid another accident, never move an injured person except in case of imminent danger;
- Raise the alarm, or even better, have someone; raising the alarm;
- Call **+372 6410 2448**;
- Give precise information:
 - Describe what happened and where;
 - State the name of the person reporting the accident;
 - Number of injured persons;
 - Cause and nature of injuries: "...the man can breathe, but he is unconscious ...";
 - State where you are.
- Mobilise quickly workers and ship's crew for the first aid, 1st intervention team, crane, flying basket, guiding the Fire Men and hospital Emergency Squad.

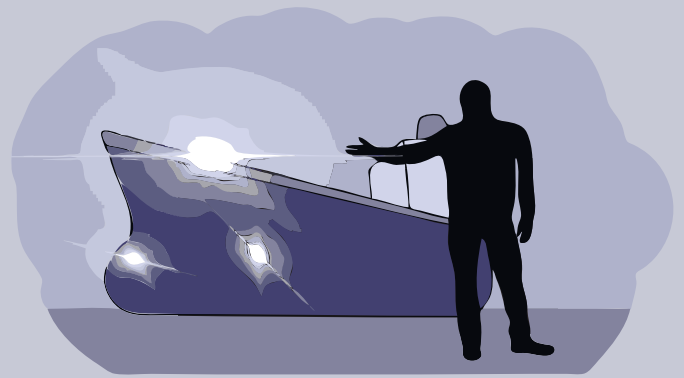


EVACUATION

- If a serious or imminent danger is detected, inform immediately shipyard's personnel or managers;
- Have the danger zone evacuated using the alarm means;
- Check man holes. Workers could be in a place that is supposed to be empty;
- Fence off the danger area;
- Go to the safe place on the pier;
- Make yourself seen and report to a Yard security team (SEB);
- Evacuation tags will be used for calling out the workers and make sure that everyone is evacuated.

MAKE SURE THAT EVERYONE IS OUT!

**MAKE YOUR JOB
PROFESSIONALLY!**



CIRCULATION

- Ships have been designed for sailing, not for being repaired.
- During the works, one must replace ship's installations which have been "disconnected", and keep the ship safe, enable safe access, supply energy for the works through hoses, cables, ducts.
- All those taking part in the works must bring in a dogged will and all their know how to prevent the site from turning into a mess!

INSTALLING YARD'S UTILITIES STEP BY STEP

- Ship's earthing;
- Access gangways;
- Tank atmosphere recording;
- Authorization to start works;
- Information panels on tanks and dangerous areas;
- Fire fighting devices;
- Ventilation and lighting;
- Energies (electricity, cranes, compressed air, oxygen, acetylene...);
- Staging and access.



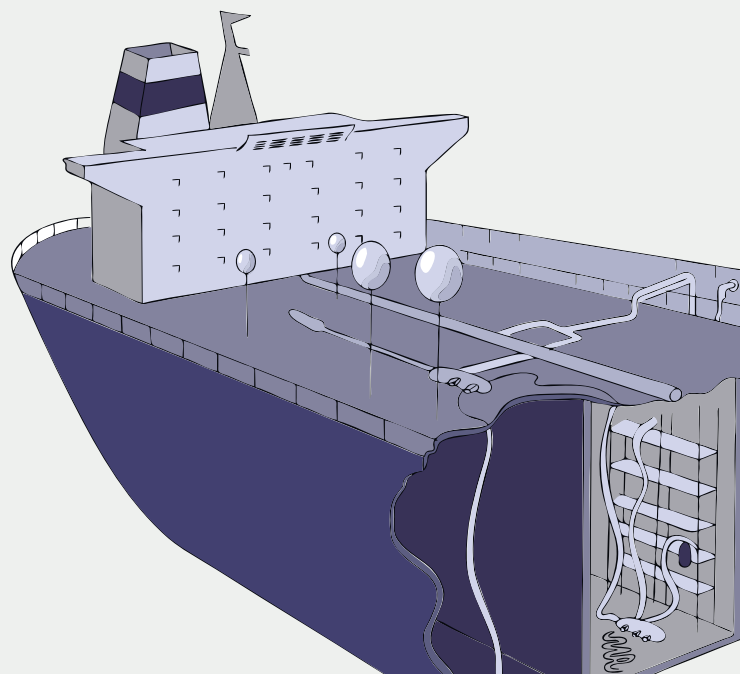
Tripping can cause serious accidents!

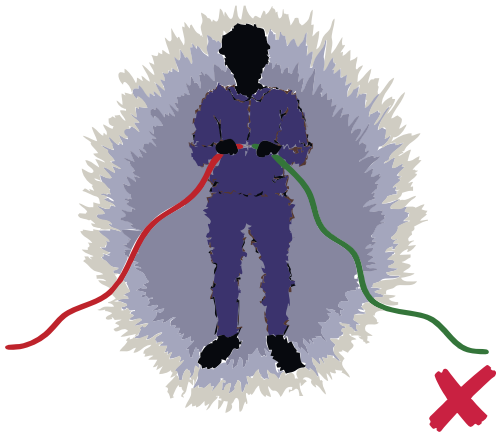
FIRE FIGHTING MEANS

Before starting any hot work, fire fighting devices must be set in place.

- When entered the dock, ship's Fire Main has to be connected dock Fire Main;
- Deck fire hoses are arranged in sufficient number to reach any place on main deck, including poop deck, forecastle and tanks;
- According to requirements of Yard Fire inspector, fire hoses to be arranged to the HOT WORK area.
- Do not forget to protect areas with risk in the dry dock;
- Hoses are kept under pressure through out the works duration;
- Test your hoses and foam generators every time you set to work. Check the foam flow and the emulsion level.

Checking the hose pressure by walking on it is not sufficient! Only a full size test can prove the water flow.





Only electricians are allowed to work on electric installations

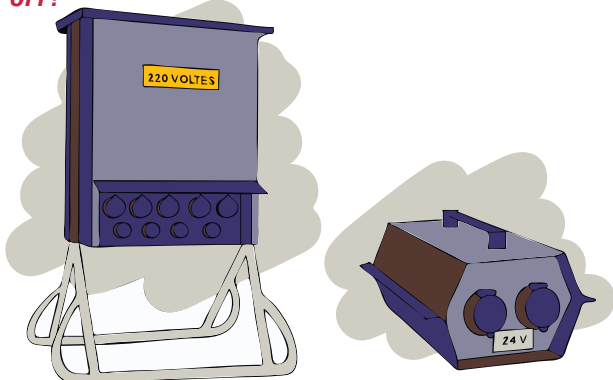
ELECTRIC NETWORK

- Report any defect you notice, do not correct them yourself.
- Electric Shock: The higher the amps, the longer the contact, the more serious the injury to the body. Humidity makes the passage of electricity easier.
- Yard's electric cabinets are equipped with differential disconnections. In case of defect, power supply is triggered off and the risk of electric shock is lessened.

The ship's installation and cables connecting the cabinets to the shore power do not have that protection. Do not damage the electric cables. Never connect portable light to ship's electric plugs.

- **Ventilation:** portable ventilation fans are arranged blowing air into the tanks. Also dedicated fans are used to pick up pollution or smoke from their origin.
- **Lighting:** Floodlights are a source of heat. Keep them away from wood, rags, paint, flammable products, but do not disturb the general lighting arrangement! Torch lights are a necessity in case of lighting failure.
- **24V-Safety Very low voltage** - By reducing voltage, the amount of current going through the body is reduced. It must be used whenever there is a specific risk: humidity, confined conducting space, works inside engines...

DURING WORK POWER SOURCE TO BE TURNED OFF!



COMPRESSED GAS

Compressed gas can give their compression energy back very brutally. In order to avoid projections or whipping, arrange hoses away from passage ways.

- **Compressed air:** secure connections; install a manifold with stop valve close to your work station.
- **Butane and propane are flammable gases that are forbidden on board!**

Heavier than air they can accumulate in the bilge and cause explosions. Acetylene is lighter than air and is the only flammable gas authorised on board.

- **Oxygen and acetylene:**

When renewing the cylinders, follow the instructions given on panels posted on the pressure reducers

- Replace immediately any faulty equipment. There is a very high risk of explosion in case of leakage.
- Never apply grease on cylinders stop valves or on connectors.
- Never allow grease to come into contact with oxygen (risk of explosion).
- Never allow copper to come into contact with acetylene (risk of explosion).
- A maximum of 8 cutting torches can be connected to a rack of cylinders. Above that number, there is a risk of solvent being taken out together with the gas.

Acetylene: maximum pressure 1.5 bars. Above that pressure acetylene could explode spontaneously...

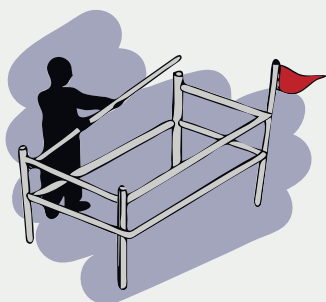
WHEN YOU QUIT WORK DISCONNECT YOUR PRESSURE REDUCER FROM THE OXYGEN-ACETYLENE SUPPLY!



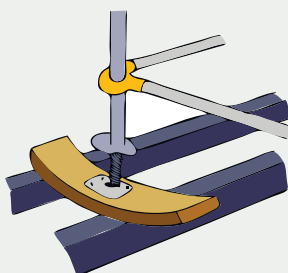
On a ship under repair, works are to be done at heights that change through the day.

SCAFFOLDING

- Erecting and dismantling scaffoldings is the work of specialists;
- Never use partly erected or dismantled scaffolding;
- Never store material on a scaffolding platform;
- Never modify a scaffolding. Before using a scaffolding, always check the following safety elements: green tag, upper railing and intermediate railing, access ladder.



Preparing to cut a deck opening: protection railing is installed prior to steel cutting removal.



Scaffolding to be installed only on a firm ground!

- After erection, a scaffolding must be commissioned green tag, to be installed:

SCAFFOLD no. / location			
CLIENT			
SCAFFOLDING CATEGORY			
LOAD CAPACITY		KN/m ²	
MEASURES	length		m
	height		m
	width		m
ERECTION DATE	SCAFFOLDER		
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INSPECTION DATE	INSPECTOR		
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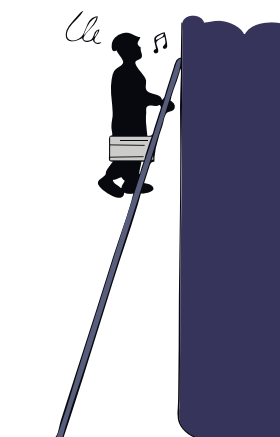
ROLLING SCAFFOLDING

- No one is allowed to stay on the scaffolding while it is rolled along;
- Ground must be clear; rolling by hand only;
- Wheels must be locked while used;
- Stabilisers must be arranged if $H > = 3.5 \times \text{width}$.

LADDERS

- Mark the area with a tape/sign if there is a risk of collision with a vehicle;
- Keep both hands free;
- Use a rope to take this toolbox down.

A ladder must always be fastened!



FLYING BASKETS

- If the vessel is afloat, always take into account the ship's movements!
- Lifting people is authorised only with duly certified cherry-pickers. Drivers must have been trained and certified. Wearing a safety harness is mandatory.
- Exceptionally, a specific flying basket hanging from a crane hook can be used only if other means of access cannot reasonably be arranged. Written instructions must be established stating the safety precautions. The workers' safety harness must be fastened to the crane hook. They must always be in the driver's sight unless a man guides the driver. Two ropes fastened at each end of the basket must be held reasonably tight by an assistant who must stand at least 2 metres away from the berth edge.

Never:

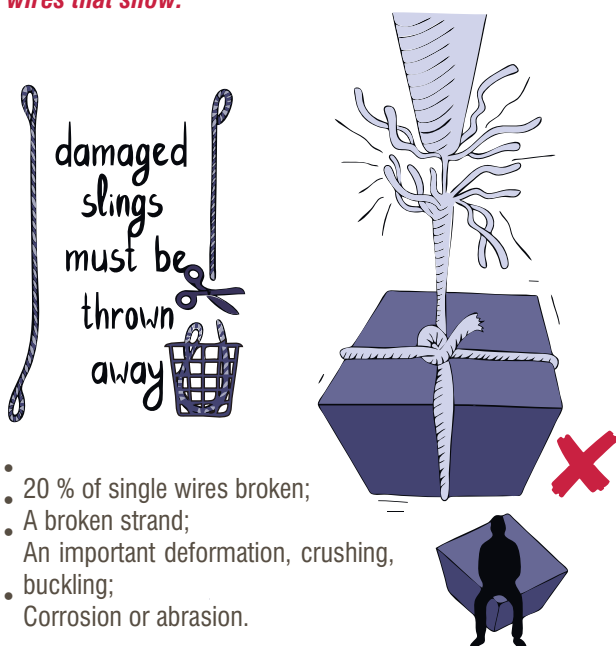
- Wrap the ropes around your hands or arms;
- Use a single rope passing around your back.



CHECK THE EQUIPMENT

- Before manoeuvring, equipment must be checked by the user!
- Never use equipment that does not comply with the rules or does not belong to BLRT. (Using of ship's equipment by Yard personnel - strictly prohibited!)
- Check the color tag to make sure that the equipment has not passed the expiry date.
- Faulty equipment must be utilized.
- Test the chain blocks brake.

Throw away slings and steel wires that show:



- 20 % of single wires broken;
- A broken strand;
- An important deformation, crushing, buckling;
- Corrosion or abrasion.

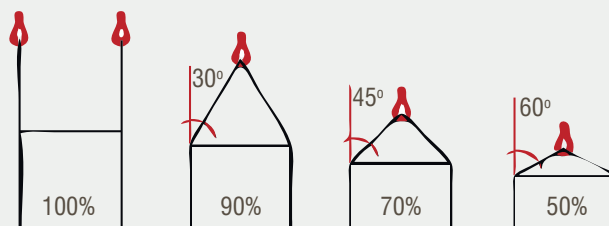
Never stay under handled equipment!

SLINGS

- **Hemp ropes** do not give any guarantee of strength. They are not allowed for lifting purposes.
- **Nylon straps** can be affected by heat, chemicals, sharp edges, ... This is why they are not allowed at BLRT.
- **Sharp edges:** without specific protection the Safe Working Load (SWL) of a strap might be divided by 7.
- Spliced steel slings, chain slings, webbing slings are the only authorised slings to be used at Tallinn Shipyard (BLRT). It is the strongest to face the constraints of our industry. Refuse any other type.

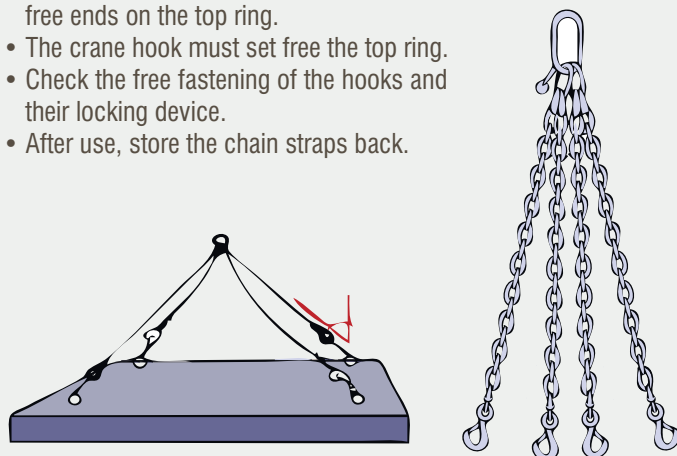
SLING ANGLE

- The strength varies according to the angle:



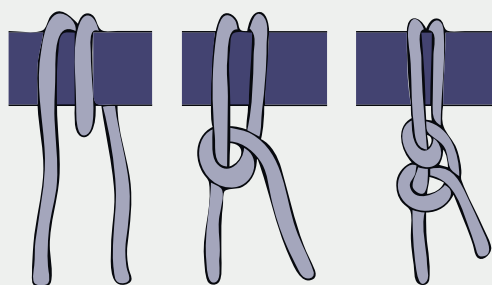
CHAIN STRAPS

- The loose ends of a chain strap may dangerously swirl around. Do hook the free ends on the top ring.
- The crane hook must set free the top ring.
- Check the free fastening of the hooks and their locking device.
- After use, store the chain straps back.

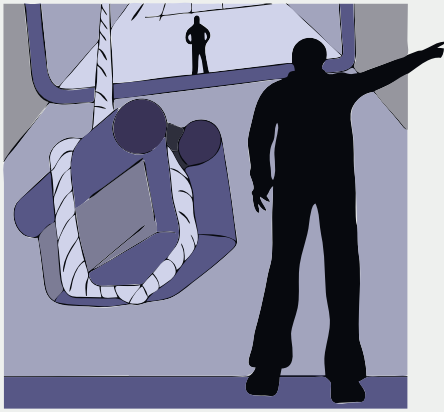


Watch it!

On a 4 point arrangement only two take the full weight!



Learn: One round and 2 half hitches will never let you down!



HANDLING PREPARATION

- Make the handling area clear;
- Think about access for hanging chain blocks up or down, make sure of safe areas for chain blocks operators;
- Check lugs and structure strength for the full load;
- Air driven chain blocks: make sure there are stop valves and name a worker to control each one in case of incident;
- Think of the different handling phases in advance. Check that equipment will not be overloaded and or bear hard against the structure;
- Protect the equipment, especially slings and chains in case if someone is cutting or welding around.

ORGANISATION

- **Take all precautions so that no one will be in the dangerous area;**
- Locate the workers in such a manner that in case of unforeseen failure they would not be harmed;
- Lifting a load with several chain blocks is a tricky job that must be prepared and directed by a single experience person.

BEFORE LIFTING

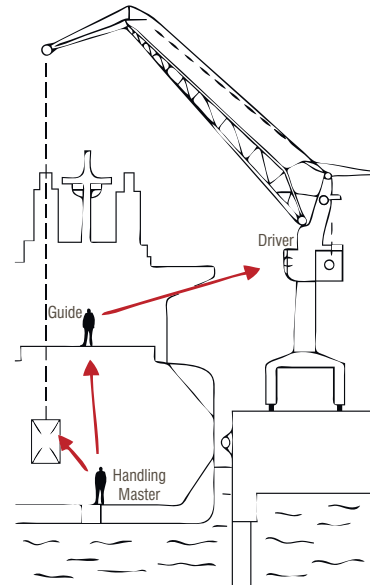
- Make sure the shackle is clear in the lifting hoo;
- Check that the hook safety pawl sets correctly or devise a steel wire locking;
- Never use the lifting wire as a sling;
- Check the load for any loose parts or left tools;
- If the load is composed of several parts, make sure that all parts are safely rigged and will not move relatively to the others;
- Make sure there is no cause of overload: suction force, sticky parts, hidden strap, bolt that has not been removed... If necessary use jacking screws;
- Secure long ropes to the load to control it during the lift up.

WHEN THE CRANE IS TAKING THE LOAD

- Do not hold the slings, keep your hands away from the blocks.
- Some equipment have their own lifting gear (welding generators, bins, ...). When starting lifting make sure that the chains straps and the chain links are clear. Same for chain blocks.
- Step back when starting lifting.
- Take care of the ship's possible movements.

HANDLING MASTER

- Everyone taking part in the handling must know who is the Handling Master;
- When he is out of sight from the crane driver the handling master nominates a crane driver guide and if necessary relays who will transmit hand signs in case of walky-talky failure;
- **Only trained and certified workers can guide a crane driver or drive forklifts or overhead cranes.**

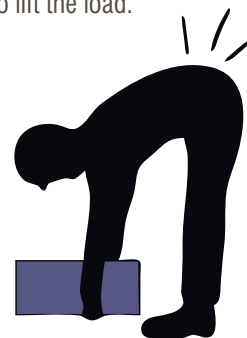


LOWERING THE LOAD

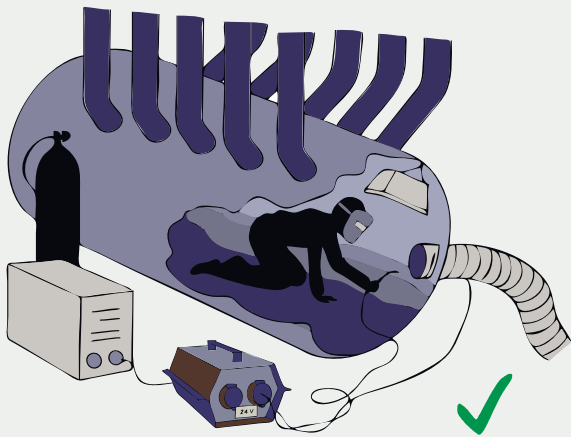
- Set the load down on wooden chocks in order not to pinch the slings. Pull the slings away by hand, not with a crane!
- Make sure the place where you lower the load will be able to hold it. Check the strength of the decks...
- Before removing the slings, make sure the load is not unstable. Arrange chocks to block the parts that could roll.
- Leave the drive ways clear (crane, vehicles, fire brigade access).
- Protect equipment (especially chain blocks and slings) from grit and sea water.

MANUAL HANDLING

- Handling by hand is one of the major causes of accident (one in three): broken bones, torn muscles, pinched hands or feet, cuts, lower back pain.
- One must learn the correct position: the spine being vertical (same as when standing), use the force of your legs to lift the load.



Your back is fragile!!!



Grinding, cutting, welding
All hot works require:

- **Ventilation;**
- **Fire fighting equipment;**
- **Hot work permit.**

WORKS ON PIPING, PUMPS AND ACCESSORIES

- Check or have someone check that the pipe or apparatus is empty;
- Brake flange bolts loose with a spanner. Crack the flange open on the side opposite to the operator.

When opening:

- Stop all hot work;
- Have all welding cables wound back on deck;
- Check explosivity level;
- Fit blind flanges to isolate equipment and capacities.

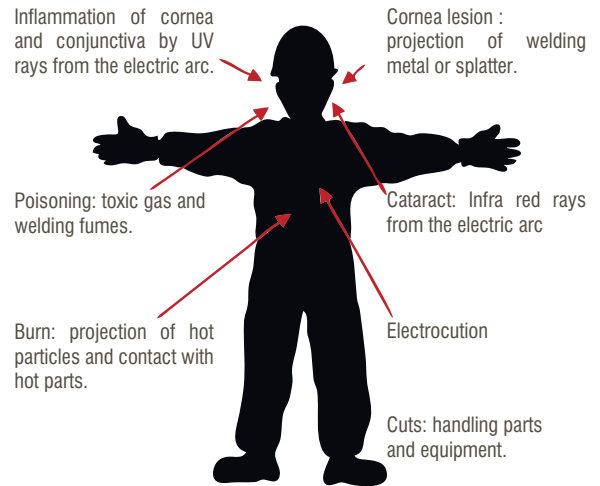
Before any hot work is undertaken:

- Cleaning, ventilation, explosivity control, work permit;
- For instance heating coils normally carry steam to make HFO more fluid. When they bear cracks or holes they can fill up with gas oil or petrol depending on the type of the cargo;
- Before testing heating coils, they must be exposed on their full length in order to see if some product is coming out. All sediments must be cleared away;
- Rinse the coils before brazing;
- Flange bolts can be burnt off only after instruction; and control by the Foreman. After a bolt has been cut off, it must be replaced immediately by a new one correctly tightened in order to keep the flange tight and prevent any leakage of gas;
- Never rely on the nature of the last cargo transported.

CONFINED SPACE

Boiler water, steam drum, tank (oil, ballast) and other confined conducting spaces:

- Min 2 persons;
- Using portable Gas Detectors - **compulsory!**
- Safe lightning;
- Welding set outside the confined space;
- Mat to insulate the welder and avoid electric shock;
- Ventilate, especially in case of MIG/MAG/TIG welding;
- No unused welding cable or gas burner in a confined space!
- Never rely on the nature of the last cargo transported.



Risks related to welding works ...

SMOKE AND COMBUSTION OF GAS

- Welding rods, galvanisation and paint decompose when burning and release toxic fumes, zinc oxide, lead;
- Brazing flux release fluorine, barium, beryllium or cadmium, additives that improve the process;
- Gas combustion can cause asphyxiation by lack of oxygen, release of carbon dioxide CO₂ and carbon monoxide CO, which is a very toxic gas. Furthermore, heat causes air to decompose and produces very toxic nitrogen oxides NO_x causing eye irritation and heavy respiratory troubles.

...ventilate, pick up the smoke where it forms, wear a well fitted respiration mask!

WELDING CABLES

- A poor electric contact at the connection can cause heating and be the source of fire;
- Brush the connector clean before connecting;
- Never rely on the nature of the last cargo transported.

SAFETY DEVICES

- Non return valves are absolutely necessary for the safety of operators and installations;
- Never try to open them up. If you have a doubt about their operation, have them renewed.

ADJACENT CAPACITIES

Check the adjacent compartments ; if necessary, have someone equipped with a fire fighting device control projections while you work.





You need a lot of energy to prepare the surfaces so as to make a ship look like a new one.

HIGH PRESSURE CLEANING

- A HP washing gun is a VERY powerful tool;
- Close to the nozzle the jet can cut like a razor blade, so the risk of perforation or cutting off is high. Also, watch for leakages;
- The whipping caused by a broken hose or connection can be very dangerous;
- Check your equipment each time you start it up, especially watching for worn hose protecting wire mesh;
- Water jet is deflected by obstacles. Always wear your full protecting gear: helmet, visor, boots, oilskin, ear plugs;
- Never direct the jet towards electric cable;
- Never rely on the nature of the last cargo transported.

GRIT BLASTING

- To have an idea of injuries that can cause an accidental grit jet one should observe the impact of grits on a steel surface;
- Each time you install your equipment, check connections, safety pins, screws and hoses, especially at tank outlet and nozzle;
- Arrange the hoses away from alleyways and vehicle traffic;
- Connect your work helmet to the filter in order to protect yourself from dusts and toxic oily mists.

AIRLESS PUMPS

- Injuries caused by highly pressurised liquids can be very serious;
- In case of such injury the liquid jet can enter under the skin and the injured part (very often finger or hand) can be seriously damaged;
- Even if the injury seems minor it MUST be checked by a doctor to whom you must give the safety data sheet relative to the product.

PAINTS AND SOLVENTS

The base of paints used on ships are usually epoxy resins, phenol, polyurethane, bitumen, pitch, tar, chlorinated rubber.

- These paints often contain 25 to 50 % xylene inducing the following risks:
Fire;
Explosio;
Toxicity;
- Of course, these risks are increased when working in a confined space;
- A concentration of 1% xylene in air (LEL) represents a risk of explosion;
- Indeed, a 100 time lower concentration of xylene (0.01 %) is already toxic. It can be detected with a reactive tube, not with an explosimetre;
- Exposure to solvent fumes above concentration limit can have an impact on your health: irritation of mucous membrane, kidney, liver, nervous system. Symptoms appear in the form of headaches, dizziness and sometimes fainting;
- Some paint contain a small percentage of products whose names could make you run away, such as azapentanediamin or diisocyanate which are toxic at as low levels as 0.0000001 % of the air;
- In addition to ventilation, do wear certified protection mask.



Labels and Safety Data Sheets give precise information on risks and advice on safe use...

Always follow safety signs!

DANGEROUS PRODUCTS

- Dangerous products can cause intoxication, lesions, burns, irritation, fire or explosion;
- They can be either liquid, solid or gas;
- The commercial form of the product will be mentioned here but they can also be waste products or the result of decomposition...

NATURE OF RISKS

- Solid products can cause irritation or burn. Powder or fibres can be inhaled;
- Liquids can irritate or burn or permeate through the skin and contaminate the body. Very often, liquids emit vapours;
- Gaseous products enter the body through airways to the lung where they are transferred to the blood.

ASSESSMENT OF RISKS

- The first information on a product is given by the label. It usually includes one or two pictograms, signs of danger, risk information written R or safety information marked S;
- The Safety Data Sheet (FDS for "Fiche de Données de Sécurité" in French) gives detailed information;
- The product risk category is determined by the R information of item 15. The INRS (National Institute for Research on Safety) has categorised 4 risk categories ranging from -V- the highest down to -I- corresponding to products which are not compelled to labelling.



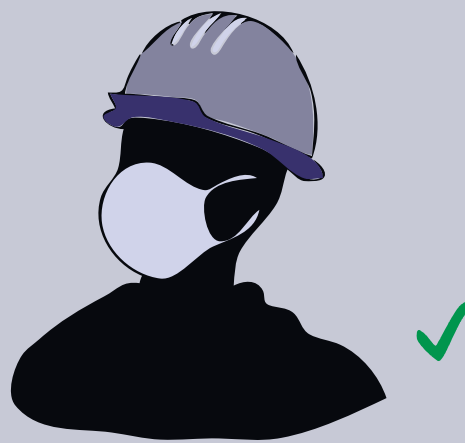
Products such as wastes, smoke or exhaust gas have no label! Yet they can be very dangerous!

PREVENTIVE ACTIONS

- Read the label and ask your team leader for instructions;
- These various phases must be considered: storage, transport, preparation, use, neutralisation, waste disposal;
- Avoid eye and skin contact; protect your hands, eyes and face;
- Ventilate the place where you use it and even better, pick up the vapours where they are produced;
- Wear the individual protection adapted to the chemical risk: gloves, oilskin, visor, boots;
- Never decant and above all never decant into a beverage bottle;
- Never mix products because you can start a chemical reaction producing toxic products. Also note that acid and base have a violent reaction when mixed;
- Pour acid slowly in water and not the opposite...!
- When cracking a flange open, start on the opposite side from you.

IN CASE OF INCIDENT

- However, should you be sprayed by chemical, do rinse or shower with fresh water for 20 minutes.



Beware!
These masks cannot be used to intervene in the case of a lack of oxygen!

PPE:

Personal Protection Equipment comes in addition to the collective means of protection when it is not sufficient or cannot be used.

BASIC EQUIPMENT

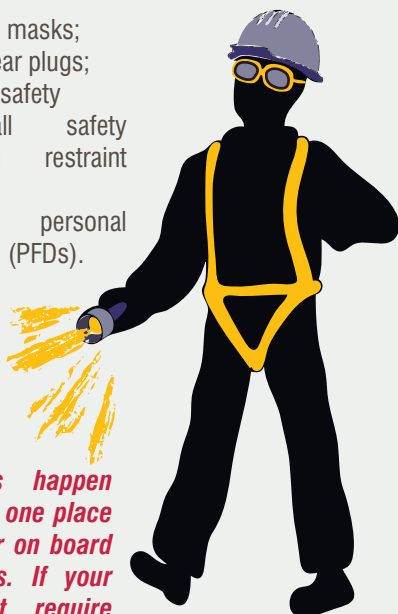
- Overall, helmet, shoes or boots, gloves;
- Goggles, visors, masks;
- Ear protection, ear plugs;
- Safety harness, safety strap, anti-fall safety systems;
- Life jackets, personal flotation devices (PFDs);
- A torch light is absolutely necessary in case of black out!



When a PPE is required, it will protect you efficiently only if you wear it continuously.

EYE ACCIDENTS

- Overall, helmet, shoes or boots, gloves;
- Goggles, visors, masks;
- Ear protection, ear plugs;
- Safety harness, safety strap, antifall safety systems, fall restraint systems, perch;
- Life jackets, personal flotation devices (PFDs).



Many accidents happen while going from one place to another, either on board or in workshops. If your work does not require specific protecting goggles, do wear simple goggles.

BREATHING PROTECTION

Definition of a few risks:

- **Dust:** Fine solid particles in suspension in air flying down to the ground under earth gravitation.
 - **Smoke:** Fine particles with a diameter smaller than 1 micron in suspension in air, produced when a solid material evaporates under the action of a very intense heat (like welding) and condensates.
 - **Mist:** Tiny liquid droplets formed by spraying or condensation of liquid matter. For instance, mists can be produced when spraying paint.
 - **Gas:** Chemical product in gaseous form at ambient temperature under atmospheric pressure.
 - **Vapour:** is produced by evaporation of a solid or liquid body at ambient temperature.
 - **Lack of oxygen:** filter masks cannot help in case of lack of oxygen. Only specialists can intervene with seal air supplied respirators.
- Particulate filters are different from filters for gas and vapours.
 - Dust protecting masks are categorised from P1 to P3 (higher filtration) according to their efficiency.
 - Gas and vapour filters are marked with a colour code according to the product they can trap.
 - There are two classes according to the amount of product they can trap before needing replacement. Class 2 has higher capacity.
 - The length of time you can use a breathing filter depends on the amount of dust or gas. Some filters can protect from gas and vapours as well as from particles: a A2P3(SL) filter gives a class 2 protection against organic vapours with a boiling point > 65 °C and a class 3 protection against liquid and solid particles.
 - **TWAEV** - Time-Weighted Average Exposure Value: The average airborne concentration of biological or chemical agent to which a worker may be exposed in a work day or a work week.
 - **STEV** - Short Term Exposure Value: The maximum airborne concentration of a chemical or biological agent to which a worker may be exposed in any 15 minute period, provided the TWAEV is not exceeded.
- PPM : Parts per million.

Each piece of equipment has been designed to protect you from a specific risk. Read the instructions.

Lockout tagout is a procedure that sets things in safe conditions to make sure that no device can be started by accident.

FIVE MEASURES

• Five steps can make and keep safe an equipment, a machinery, a room or a tank in/on which one must work:

1. **SEPARATE:** isolate all circuits: power, remote control, emergency from all forms of energy and fluids.
2. **LOCKOUT:** fit a specific locking device.
3. **BLEED** or release of remaining stored energy: return to atmospheric pressure, drain, clean, ventilate, block flywheels, block any instable piece of equipment, connect to earth.
4. **CHECK:** check atmosphere, check pressure, check electric tension.
5. **TAGOUT** and/or fence off: a panel must inform of the lockout status.

Before starting a job, ask your Team Leader if the lockout has been done properly!

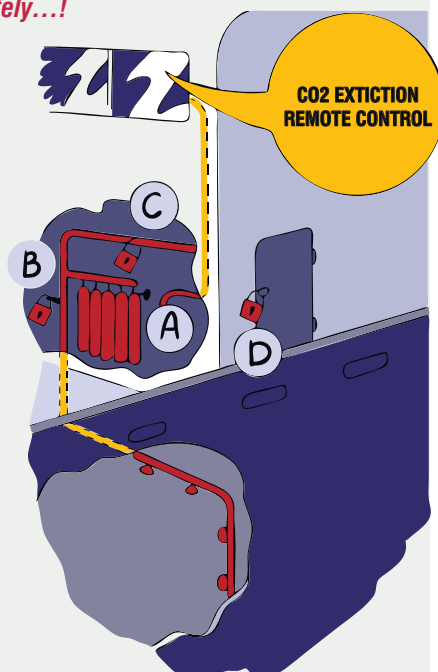
Co₂ LOCKOUT

- On all vessels equipped with a CO₂ fire fighting installation, this installation is locked out during the duration of repairs.
- This installation protects the engine room, the pump room and some electric rooms or panels.
- Fire fighting is achieved by replacing in less than 2 minutes the oxygen contained in air by carbon dioxide. There is a high risk of asphyxiation (*1).
- When a ship is in operation, i.e. on arrival or during trials, the installation is in use.

On the installation shown here, the lockout has been done as follows:

- A. Remote controls are disconnected
- B. 3-way valves are locked closed.
- C. Vent valves are locked venting to the atmosphere.
- D. CO₂ room door is locked.

In case of a CO₂ alarm, get out of the concerned room immediately...!



After entering to the Tallinn Shipyards (BLRT) for repair ship crew has to LOCKOUT CO₂ system!

Dry powder system on LNG/LPG ships has to be LOCKOUT also.

(*1) halon fire fighting devices are based on a completely different principle and do not induce the same type of risk. However, the decomposition of halon at high temperature creates a toxic product.

TESTS

- Tests are meant to prove the resistance of the equipment or piping...
- Keep away from the test area in case something would break by accident.
- Piping and pressure vessels (starting air vessels...) could explode with a brutal gas pressure release if they were to break accidentally.
- This is why pressure tests are made with liquid, water for instance. When filling up, make sure not to trap air in the high points.

NON DESTRUCTIVE TESTS

- Steel parts and welding are NDT checked (gamma rays for instance).
- Ionizing rays can cause biological lesions.



Keep away from the fenced off areas!

TRIALS AND RELEASE OF LOCKOUT

- Preparing to start up a ship includes ballasting, heaving the chain cables up, flooding the dock, flashing up and starting various pieces of equipment, adjustments, trials...
- This phase of the repair period is specifically dangerous, the locked out equipment must be unlocked and the ship prepared for trials.
- Ship's crew and shipyard must work very closely together. However, only your Team Leader can give you instructions. Settings and controls will be entrusted to trained and qualified workers.

AVOID THE MANY TRAPS

- Ballast transfer can push trapped gas out into another piping or a tank;
- Louvers can be closed automatically, auxiliary equipment and compressors can start automatically;
- Leaking superheated steam (60 bars – 500°C) is invisible;
- Main engine decompression cocks: take care of flame jets;
- Crankshaft casing: there is a risk of explosion at door opening.



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