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FIRE PRECAUTIONS

1. GENERAL

Fire is the single biggest cause of serious casualties on ships and loss of life at sea.

The majority of recorded incidents of fire at sea would not have occurred had proper precautions been taken. Fire is a major hazard, and all precautions must be taken to avoid it.

It is very important that strict fire prevention measures are in place and the following sections will outline some of these measures.

Firefighting on a ship is difficult and dangerous owing to the confined areas in which the fire can be tackled and also the restricted means of escape. These difficulties and dangers can be greatly reduced with the regular exercising and training in fire drills.

Ship's officers should be familiar with the operation of the fixed and portable firefighting systems, the main and emergency fire pumps, the donning of breathing apparatus and use of oxygen resuscitation equipment etc. Crew members shall be trained to be familiar with the location and operation of any fire-fighting systems and appliances that they may be called upon to use.

Reference should be made to the ship specific Fire Safety Operational Booklet, a copy of which should be available in each of the officer's and crew's day rooms. These manuals should be read in conjunction with the SOLAS Training Manual, the Fire Fighting Training Manual and the Company Safety Equipment Manual.

Shipboard personnel shall exercise due care and comply with applicable regulations. All efforts shall be made to ensure that all firefighting equipment is maintained in good order and ready for use. The integrity of the constructional features provided on board to prevent fires, shall not be disturbed in any manner.

Regular maintenance of all Fire Fighting Appliances (FFA) on board has to be undertaken as per the PMS and records shall be maintained. FFA shall at all times be ready for immediate use. Any defects beyond the vessel's scope of repair have to be brought to the attention of the company.

All FFA must be stowed according to the ships approved FFA plan

Reference should be made to "Fire precautions" chapter in CSWP publication.

2. CAUSES OF FIRE

The causes for fires on board may include but not limited to the following:

- oil spray from loose or broken pipe fittings splashing on high temperature surfaces;
- accumulation of soot in uptakes and exhaust gas economizers;
- flammable liquids leaking through faulty or damaged pipework;
- ignition of oil soaked insulation;
- overheating of hot surfaces in close proximity of oil lines;
- overheating of machinery;
- defects in lagging;
- carrying out hot work without proper precautions;
- spontaneous combustion of oil-soaked rags;
- poor housekeeping;
- overheating of flammable liquids and fats;
- overheating of deep-fat fryers;
- greasy flues;
- defective electrical connections;
- overloaded electrical points;
- build-up of hydrogen in the battery room;
- ignition of cargoes liable to self-heating and spontaneous combustion;
- ignition of bulk cargoes liable to emit flammable vapours and gases;
- accumulation of flammable material in sweepings etc;
- smoking in bed and other undesignated smoking areas;
- cigarette butt thrown around casually/ accidentally;
- hanging clothes near machinery;
- funnel sparks;
- Use of unauthorized portable electrical stoves/hot plates, immersion water heaters, cabin heaters etc onboard.[1]
- Incorrectly stowed or maintained Lithium batteries[2]

[1] W 19 / 2019
[2] W 52 / 2023

3. GALLEY FAT FIRES

Galley fires are often caused by:

- Overheating of cooking oil within a pan by auto-ignition;
- Oil seeping over the sides of a pan;
- Wet ingredients added to very hot oil which spills the oil onto the hotplate;
- Clothes or other combustible material coming in contact with the hotplate;
- Unattended galley;
- Greasy extraction vent.

The most common types of galley fires are caused by the heating of oils and fats to their self -ignition temperatures. Serious fires have occurred as a result of ignition of cooking oil in deep fryers and these must never be left unattended.

Fires can spread readily through grease-coated vent ducts and these must be cleaned regularly.

The Chief Cook is responsible for ensuring that the Galley stove and other electrical appliances are switched off before the Galley is vacated. He will also ensure that the stoves, hot plates and ventilation exhausts are kept free from accumulations of fat and grease at all times.

Accumulations of grease and oil on the surfaces of stoves, ventilator grills and in uptake trunking not only presents a risk of self-ignition but can cause a fire to spread rapidly. Unburned fuel or fatty deposits in galley ranges, within flue pipes and in the filter cowls of galley vents can cause fire and must be maintained in a clean condition.

Oil shall not be allowed to overheat. Oil and deep fat fryers should be fitted with thermostats to cut off the electrical power and prevent overheating.

Clothes or other combustible material shall not be placed close to the cooking area.

Galleys shall be adequately ventilated.

Care shall be taken to ensure that pans or fat are not left unattended in the oven or on hot plates/burners.

Galley equipment is only to be used by authorized catering staff.

4. PREVENTION OF ELECTRICAL FIRES

All electrical appliances should be firmly secured and served by permanent connections whenever possible.

Flexible leads should be as short as practicable and so arranged as to prevent their being chafed or cut in service.

Makeshift plugs, sockets and fuses should not be used.

Circuits should not be overloaded since this causes the wires to overheat, destroying insulation and thus resulting in a possible short-circuit which could start a fire.

Electrical equipment which is to be used in any cargo area should be of an approved design.

Electric lights and appliances must not be left switched on in unattended spaces.

Regular inspections should be made to ensure that electrical fittings are safe. The removal of light glasses or the shading of electric light bulbs is dangerous and is forbidden.

5. SPONTANEOUS COMBUSTION

Oily rags pose risk of self-heating (spontaneous combustion). Some materials when damp or soaked with oil, are liable to ignite without the external application of heat as the result of gradual heating within the material produced by oxidation.

Dirty or damp waste, rags, sawdust, and other rubbish – especially if contaminated with oil – may generate heat spontaneously, which may be sufficient to ignite flammable mixtures or set the rubbish itself on fire.

Oil undergoes a chemical process known as oxidation that releases energy in the form of heat when exposed to air. It is oxidation that creates the potential for spontaneous combustion.

The possibility of spontaneous combustion increases when the surrounding air is also warm and dry. Also, heat radiating from nearby sources, such as machinery or a non-insulated steam line, can accelerate the self-heating process by heating the combustible materials and the surrounding air.

Fires have occurred on board due to oily rags lying in stores in stores, oily rags kept on AE filter, Oil contaminated sorbent roll housed in store etc.

Certain chemicals used for boiler treatment are also oxidizing agents and although carried in diluted form, are capable of spontaneous combustion if permitted to evaporate.

In the case of oily rags, it's a relatively simple process of oil oxidizing generating heat, which if not dissipated, will build up until combustion occurs. Generally, this can happen when the materials are left in a container, which provide a source of insulation, trapping the heat that is generated.

5.1 Handling Oily Rags/ Materials Subject to Spontaneous Combustion

- Cotton waste, rags, canvas, bedding, jute sacking, sawdust, or wood any similar absorbent material therefore should not be stowed in the same compartment as oil, paint etc and should not be left lying on decks, on equipment, on or adjacent to pipelines etc. If such material become damp, they should be dried before being stowed away. If soaked with oil, they should be cleaned or destroyed.
- Oily rags should be removed from the site and not left lying around on deck, stores, accommodation, engine room spaces.
- Oily rags should be placed in allotted garbage drums (category F - metallic drums) with tightly covered lids to limit the oxygen exposure. Metallic container shall be kept out of direct sunlight, away from heat sources and high temperature areas
- Oil-soaked rags should never be left together with packing, gaskets, wooden boxes etc.
- Oily rags should be incinerated at the earliest opportunity or disposed to reception facility.
- If sawdust is carried on board, care should be taken to ensure that, while unused, it is stowed in a dry condition and, if possible, in a cool location. Moist sawdust is susceptible to spontaneous combustion.
- When sawdust has been used to clean up a minor oil spill, the contaminated sawdust should be stowed separately, in a sealed container and in a safe location, clear of the accommodation.
- Any absorbent material used in spill clean-up should be incinerated or disposed ashore as soon as possible.
- Senior Officers must pay special attention of oily rags/material during their routine rounds and ensure proper handling of the oily rags.

6. GENERAL PRECAUTIONS TO AVOID SHIPBOARD FIRES

The following general precautions shall be taken to prevent shipboard fires:

- Any oil leakage shall be rectified as soon as possible and any leakage or spillage cleaned up immediately.
- All insulating material, which has been removed for inspection of equipment, shall always be replaced.
- Do not allow oil accumulation in drip trays.
- Special attention should be given to the precautions to avoid Spontaneous Combustion. Sawdust has a high risk of spontaneous combustion when soaked in oil (including vegetable

oils) and is not to be used to soak up oil spills. Wood shavings pose less risk and may be used as an alternative.

- Dirty waste, rags, sawdust/sorbent material and other rubbish should not be left lying around. (It also is bad practice, and it looks unsightly).
- Do not store flammable material in machinery spaces, particularly around boiler casings or engine exhausts and uptakes or in the funnel.
- Bilges shall be kept practically oil free, clean and dry at all times.
- Battery rooms shall be kept clear of any equipment, including other electrical equipment, likely to provide a source of ignition. This room shall not be used as a store room. Battery room shall be effectively ventilated to avoid accumulation of hydrogen.
- Persons entering the battery room shall ensure that they do not introduce any source of ignition, for example by smoking, lighting matches or taking in an open flame or an un-approved portable lamp for inspection.
- No hot work shall be carried out in or above a space carrying flammable cargo or in an adjacent compartment.
- Laundry equipment is to be switched off when not in use. Electric irons must not be left unattended when switched on.
- Strainer (lint) for the laundry drier shall be regularly cleaned, as it is a fire hazard.
- When not in use, TV sets, radios, record players, electric fans and other similar appliances should be switched off and disconnected from power source.
- Cooking shall be confined to galley only and not permitted in any other place like cabins or mess rooms.[3]
- Use of unauthorized portable electrical stoves/hot plates, immersion water heaters, cabin heaters etc is strictly prohibited on board. Master shall check for these unauthorized items during weekly rounds. If any unauthorized equipment is found, it shall be reported to company, removed and destroyed immediately.[4]
- Clothes and other flammable materials must be kept clear of radiators, hot equipment and systems.
- Paints and painting materials are to be returned to the paint store on completion of daily work.
- Oxygen and Acetylene cylinders shall be stowed in either the special lockers provided or at a secure safe location on deck. Care must be taken to ensure that the cylinders and fittings in these lockers are kept free of oil and grease at all times. Cylinders when not in use shall be capped and valves shut. The fitting of flashback arrestors at both the cylinders and the workstation is recommended. Oxygen and Acetylene should be kept in separate compartments except in the case of the cylinders that are in use, which may be stored in the same compartment. Cylinders should be stowed away from heat sources and should

[3] W 19 / 2019
[4] W 19 / 2019

not be in heavy traffic areas to prevent accidental knocking over or damage from passing or falling objects. Full and empty cylinders should be segregated. Cylinders should be stored with the valve end up. Storage areas should be free of combustible material and not exposed to salt or other corrosive chemicals.

- On moving around the vessel, particularly during safety rounds, be on the lookout for signs of possible fire hazards. If sighted, they are to be reported to the officer of the watch. Any suspicious smells are also to be reported to the officer of the watch immediately.
- Make sure you clear away all materials when you complete a job.
- Ensure high housekeeping standards
- Particular care should be taken during hot work – see Hot Work procedures.

7. FIXED FIRE DETECTION SYSTEM

The purpose of the fire detection system is to give an alarm automatically by detection of a fire at the initial stage. Depending on the makers as well as on the characteristics of the detected compartment the detection of the fire is carried out through various types of detectors.

The Fire Alarm System should normally be kept ON at all times.

The switching on or off of the system as well as the deactivation/reactivation of the zones takes place on the control panel of the fixed fire detection system. Usually, the control panel of the fixed fire detection system is installed on the bridge.

It is common practice some specific fire zones of the fire detection system (on top of main engine and/or engine room workshop) to be deactivated to prevent the activation of fire alarm when blowing through main engine on air takes place or when hot work is carried out in the work shop.

Although during the above activities the compartments corresponding to de-activated zones are manned, it has been noticed that the zones have been kept de-activated after completion of the work because the crew has failed to reactive the zones.

In order to prevent such unsafe acts, the following actions should be taken:

i) Order for deactivation of any fire zone must be given by the chief engineer only after Master’s permission. The reason and duration shall be informed to ship staff.

ii) The time of deactivation and reactivation of the zone to be entered in the engine / bridge log books.

iii) Time of deactivation of the fire zone to be also mentioned in the ECR whiteboard.

iv) Deactivation and reactivation of fire zones to be carried out by responsible officer. A fire patrol must be maintained in the zone which has been isolated

v) Chief engineer is finally responsible for ensuring that fire zone is reactivated after completion of job.

vi) Watch keeping officer on bridge and engine room shall handover status of fire zones isolated during change of watch.

Note: In case of any fire alarm, the fire alarm must not be reset without a proper investigation to determine the cause of the alarm being triggered. Shielding or malicious damage to detector heads will result in disciplinary action being taken against the crew member

8. SPRINKLER HEAD DISCHARGE OBSTRUCTION

8.1 As per National Fire Protection Agency NFPA guidance, drums or tins or other items of any kind may not be stowed closer than 460mm (18 inches) from the bottom of the sprinkler. If this minimum distance cannot be maintained using the uppermost rack, then that upper rack is to be left unused and explicit and clear instructions to that effect to be displayed prominently.

9. SMOKING

Environmental Tobacco Smoke (ETS) which also includes alternatives such as “e-cigarettes” and “vaping” is a substantial health risk to non-smokers. There is no degree of exposure to ETS that is considered safe. Passive smoking entails the inhalation of ETS. ETS is a complex mixture of chemicals and particles (particulate matter) that is released into the air when a person smokes a cigarette, cigar, or pipe. Non-smokers may face a variety of adverse health consequences as a result of ETS.[5]

The objectives of smoking procedures are:

- To promote the health and welfare of seafarers
- To provide and maintain a safe and healthy shipboard environment
- To minimise the risks of tobacco smoke to non-smokers
- To educate seafarers about the harmful effects of smoking and
- To provide support and assistance to any seafarer who smoke and express a desire to quit.[6]

The Company recognizes that smoking has a serious detrimental effect on the health of smokers and non-smokers and smoking can cause fires on board resulting in destruction of property, incapacity and sometimes loss of life.[7]

[5] W 48 / 2022
[6] W 48 / 2022
[7] W 42 / 2022

Everyone, regardless of rank or department, is responsible for ensuring that the action of smokers do not jeopardize the safety of the ship, nor the people on it which includes protection from secondary or passive smoke.[8]

Smoking is not allowed on board the vessel at any place except in the following Designated Areas which may be further reduced as per the requirement of the port/berth/terminal regulations, and at the Master's discretion[9]

At sea:[10]

- Bridge wings (Demarcated area)
- Poop deck (Demarcated area well clear of fuel tank vents)
- Officers smoke room (Permitted only during rain / bad weather and during hours of darkness)

In port:[11]

- Engine room workshop (Demarcated area)
- Officers smoke room

Where reasonably practicable, designated smoking areas should be adequately ventilated and not ventilated into a smoke-free place.[12]

Smoking outside above spaces including galley, pantries, food storing, preparing and handling areas, cabins, alleyways, deck, tally room, stores, cargo holds etc is strictly prohibited and may be a dismissible offence. The smoking procedure applies to the ship staff as well as to all visitors. Stevedores are not permitted to smoke anywhere on board. Other visitors like inspectors, port officials, surveyors, agents, service personnel, supernumeraries etc are permitted to smoke only in the designated smoking areas. Ship staff shall inform stevedores and visitors of the smoking procedure verbally or by directing them to this poster.[13]

Secret smoking is dangerous and may be a dismissible offence. When in a port, local smoking regulations are to be adhered to at all times. Severe penalties may be levied under local regulations for non-compliance. These areas shall be clearly marked. The careless discarding of smoking materials is dangerous and is prohibited. Ashtrays or other suitable containers should be provided and used in designated smoking areas. Extinguish matches and cigarette butts properly before discarding them. Do not flick cigarette ash. Where an employee observes another deliberately flouting this procedure, he shall report the matter immediately to the Master. Any non-compliance with this procedure shall be reported to the Company.[14]

[8] W 42 / 2022
[9] W 42 / 2022
[10] W 42 / 2022
[11] W 42 / 2022
[12] W 48 / 2022
[13] W 42 / 2022
[14] W 42 / 2022

Whilst the above spaces have been designated as smoking spaces, of concern is 2nd hand smoking. All should be considerate regarding 2nd hand smoking. For example, smokers should refrain from smoking in officers smoke rooms whilst non-smokers are present. Likewise, it is not an automatic right to be able to smoke in designated areas. Inconsiderate smoking habits of the crew should be brought to Vessel senior management's attention for resolution, consideration foremost being 2nd hand smoking of crew who do not smoke.[15]

Permanent notices should be displayed in the designated smoking areas[16]. Also "NO SMOKING" notices to be displayed in galley, pantry and food storing, preparing and handling areas.[17]

10. SOCIAL EVENTS ON DECK[18]

Social events on deck like barbecue is at the discretion of the Master.

Hot work permit shall be completed prior any barbecue event. The hot work request will include the location of the intended barbecue event.[19]

The Master shall consider the weather conditions, nature of cargo, distance from fuel tank vents etc prior deciding the location. The Ship Manager will review the permit and decide upon the location.[20]

Tool box meeting and risk assessment shall be completed prior barbecue event.[21]

Risks of fire and explosion shall be considered when igniting and sustaining barbeque on board.[22]

The Master shall ensure that appropriate fire fighting precautions are taken prior organising any social event on deck. Portable extinguisher shall be kept at the site.[23]

At no time should inappropriate accelerants (any substance that "accelerates" the development of fire) like thinner, petrol, diesel etc be used. Use of inappropriate fuel can cause fire or explosion at the site and 2nd and 3rd degree burns to ships personnel.

Master shall appoint a responsible person who shall ensure that the fire is lit in the proper manner and completely extinguished after use.

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[15] W 42 / 2022
[16] W 42 / 2022
[17] W 48 / 2022
[18] W 41 / 2020 (Entire section added)
[19] W 49 / 2022
[20] W 49 / 2022
[21] W 49 / 2022
[22] W 49 / 2022
[23] W 49 / 2022

11. LITHIUM ION BATTERY[24]

Lithium -ion batteries may be found on laptops , tablets , GMDSS radios , battery-powered equipment and tools etc.

Explosions of lithium-ion battery has led to a fire on board vessels. Li-ion battery fires can be far more dangerous than a traditional fire on a vessel, as they produce toxic and corrosive fumes, can require over 10 times more water to extinguish and have the potential to re-ignite hours after being extinguished.

Lithium-ion battery cell explosions are typically caused by a thermal runaway, a chemical reaction which causes the internal temperature of the battery to rise uncontrollably that can cause the cell to ignite and explode. A lithium-ion battery cell can spontaneously experience a thermal runaway if damaged, shorted, heated, defective or overcharged.

When a battery is found damaged, it no longer adheres to the manufacturer's intended safety standards, introducing unforeseen levels of risk. Damaged batteries are particularly prone to thermal runaway and short circuits, requiring extremely careful handling.

Ship's Crew can prevent thermal runaways and fires by:

- Following manufacturers' instructions for the storage, handling care and maintenance of lithium-ion batteries (MSDS)
- Checking battery casing are not damaged, distorted or cracked.
- Avoiding unsupervised charging, short circuiting and overheating.
- Keeping batteries and chargers away from heat sources and flammable materials.
- Keeping them in a dry area at all times
- Properly disposing of damaged batteries; The batteries shall not be incinerated.

If a lithium-ion battery fire occurs, crew can attempt to extinguish the fire with water, CO2, or other dry chemical or powdered agents designed for use on Class A (combustible) fires as mentioned in the MSDS. The container to be moved to open spaced as soon as possible.

[24] W 52 / 2023