Maritime Occupational Safety and Health Training

I.0 Introduction

I.1 Course overview

This course aims to provide knowledge and awareness to seafarers who will be designated as Shipboard Safety and Health Officer (SSHO) or to all officers and engineers on board as will be required by their respective companies, in compliance to the Department of Labor's Department Order 132 Series of 2013, in conjunction with the provisions of Maritime labor Convention 2006 (MLC 2006), Article IV, paragraph 1, Seafarers right to a safe and secure workplace that complies with safety standards; and paragraph 4, the right to health protection, medical care, welfare measures and other forms of social protection.

I.2 Competences to be achieved

Competencies required to be acquired by the trainees is the knowledge of duties and responsibilities of SSHO, safety procedures on board, accident prevention and selected provisions in the MLC 2006.

I.3 Maritime Accidents

Shipping is perceived to be a relatively dangerous industry. However, there is a lack of statistics in the area of Maritime Occupational Safety and Health (MOSH) due to the limited accessibility and reliability of reports of occupational accidents, incidents and diseases in flag States. This is mostly as a result of significant differences in data collection methodologies, poor recording, limited coverage, and limited statistics on the overall seafarer population.

However other information can be sourced from interested institution like the Protective and Indemnity (P & I) Clubs.

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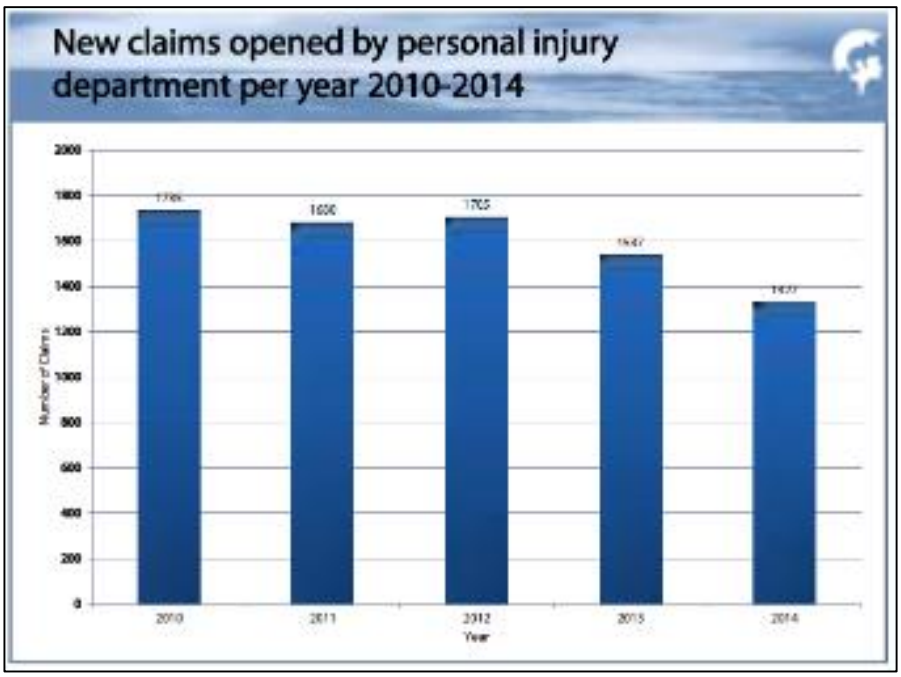
I.3 Maritime Accidents

Sample statistics as follows:



Courtesy by Britannia P & I

Courtesy by Britannia P & I

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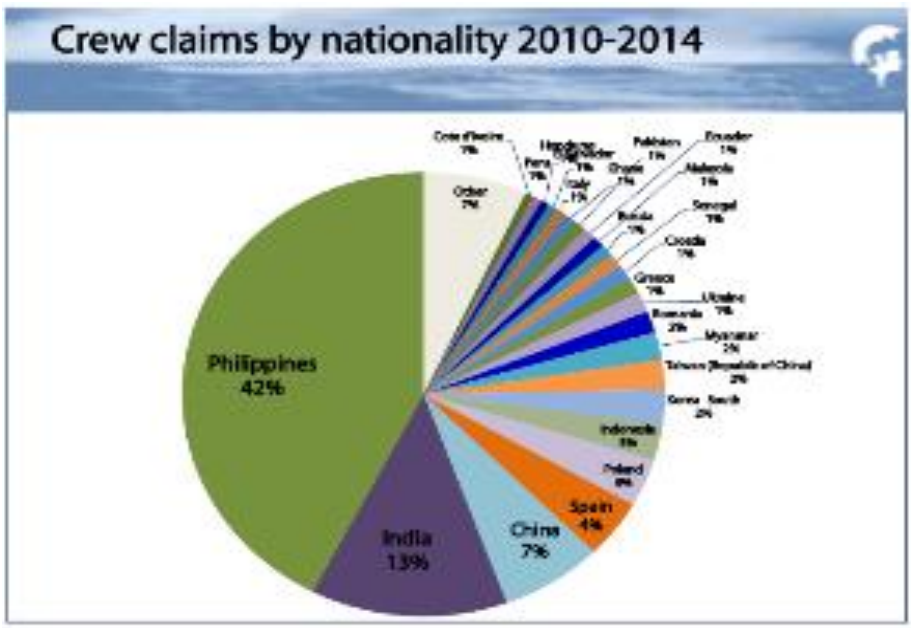
I.3 Maritime Accidents

Sample statistics as follows:

Most common personal Injury/illness claims2013-2014

Claim Type	Percentage of Claims	Average Amounts
Bruising/Fractures/Dislocations/ Cuts	30%	$27,202
Heart/Diabetes Related	10.5%	$46,463
Back Conditions	6%	$21,758
Kidney Problems	4.5%	$14,868
Appendicitis	4%	$20,057
Burns/Scalds	3%	$47,160
Malaria	1.5%	$24,175

Courtesy by Britannia P & I



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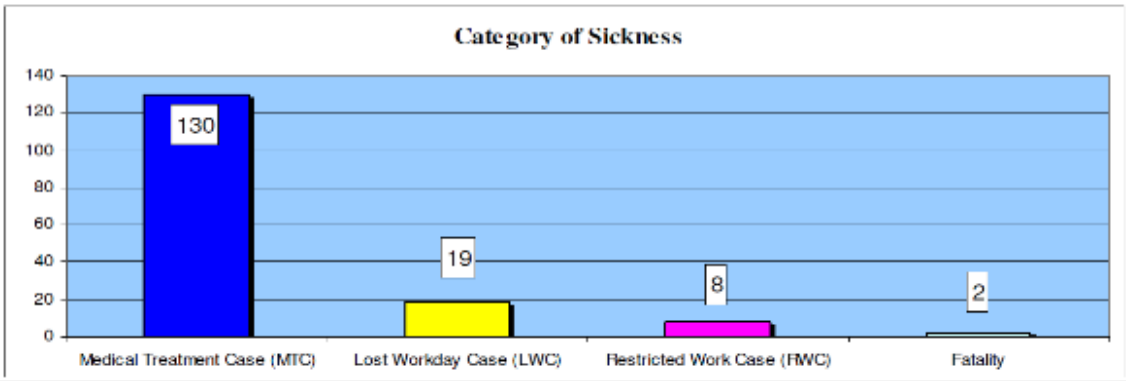
Others sources are from each company's data and analysis of accidents and incidents and the resulting impact on the health of the crew and the operation of the company.

Following are from a certain company for the first half of 2015.

Marine Sickness Data Statistics

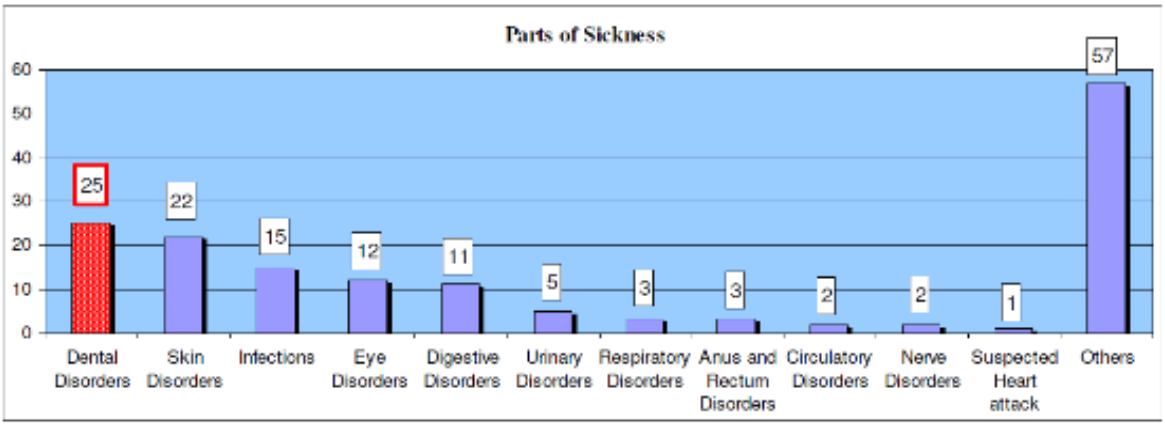
Category of Sickness

The number of sickness cases reported in first half of 2015 was 159. We have 82% of the cases of Medical treatment cases.



Parts of Sickness

The below table shows data segregated based on body parts of sickness. Especially, dental disorders count 25 cases, which is 16% of all reports and largest proportion. This trend is continued for several past years.



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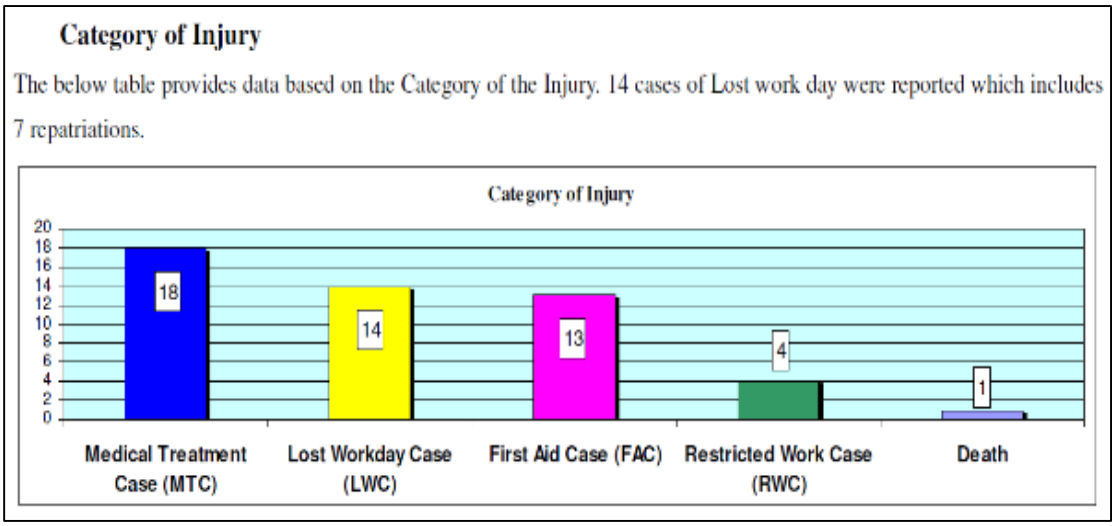

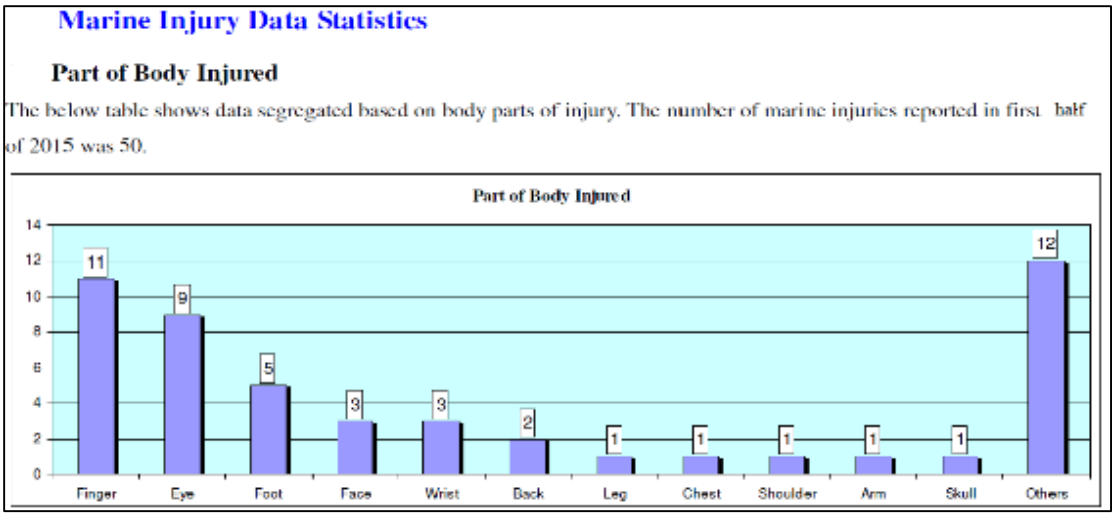

The graphs shows illnesses and injuries suffered by crew during the period and the impact to the operation.

I.4 Legal Requirements

The legal requirement for a Ship Safety Officer onboard is set up in the following International Conventions and National Regulation:

1. Safety of Life at Sea (SOLAS), Chapter IX, Management for the Safe Operation of Ships
   -incorporated the ISM Code as part of SOLAS amendments to ensure implementation of the ISM Code by the Parties signatory to the Convention.

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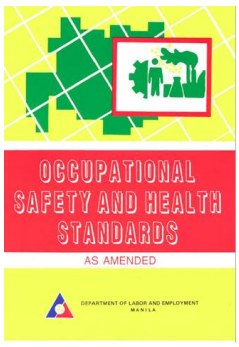
2. Maritime Labor Convention 2006 (MLC 2006)
   -sets out seafarers' rights to decent conditions of and fair competition for shipowners, it sets out:
   -minimum requirements for seafarers to work on a ship; Conditions of employment; Accommodation, recreational facilities, food and catering; Health protection, medical care, welfare and social security protection; Compliance and enforcement

3. International Safety Management Code (ISM Code),
   -objectives of the Code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment, and to property.

4. Occupational Health and Safety Management System (OHSAS 1801)
   - is an internationally applied British Standard for occupational health and safety management systems. It help all kinds of organizations to put in place demonstrably sound occupational health and safety performance.
   -a widely recognized and popular occupational health and safety management system

5. Standards of Training, Certification and Watchkeeping for Seafarers, amended.
   -based on the guidelines given in the STCW Code 2010 Table A-II/2 & A-III/2

6. Occupational Safety and Health Standards
   -formulated in 1978 in compliance with the constitutional mandate to safeguard the worker's social and economic well-being as well as his physical safety and health, on the authority of Department of Labor and Employment under Article 162 of the Labor Code of the Philippines



7. Department of Labor, Department Order 132, series of 2013
   -requirements on the Maritime Occupational Safety and Health (MOSH) training for the designated safety and health officer

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I.4.1 Maritime Labor Convention 2006 (MLC 2006)

The MLC 2006, being the fourth pillar of International maritime laws under International Labor Organization (ILO) that deals with the protection of the rights of seafarers, following are selected provisions in the MLC 2006.

I.4.1.1 Title 2, Regulation 2.3 - Hours of work and hours of rest

The purpose of this regulation is to ensure that seafarers have regulated hours of work or hours of rest

It is required to establish maximum hours of work or minimum hours of rest over given periods that are consistent with the provisions in the Code.

Definition of terms:
(a) hours of work - time during seafarers are required to do work on account of the ship;
(b) hours of rest- time outside hours of work; but does not include short breaks.

It is also required that either a **maximum number of hours of work** which shall not be exceeded in a given period of time,

or

a **minimum number of hours of rest** which shall be provided in a given period of time.

The normal working hours' standard for seafarers shall be based on an (8) eight-hour day with one day of rest per week and rest on public holidays.
However, this shall not prevent the Member from having procedures to authorize or register a collective agreement which determines seafarers' normal working hours on a basis no less favourable than this standard.

Should also take account of the danger posed by the fatigue of seafarers, especially those whose duties involve navigational safety and the safe and secure operation of the ship.

The limits on hours of work or rest shall be as follows:
(a) maximum hours of **work** shall not exceed:
(i) 14 hours in any 24-hour period; and
(ii) 72 hours in any seven-day period;
or
(b) minimum hours of **rest** shall not be less than:
(i) ten hours in any 24-hour period; and
(ii) 77 hours in any seven-day period.

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I.4.1 Maritime Labor Convention 2006 (MLC 2006)

I.4.1.1 Regulation 2.3 - Hours of work and hours of rest

Hours of rest may be divided into no more than two periods, one of which shall be at least six hours in length, and the interval between consecutive periods of rest shall not exceed 14 hours.

Musters, fire-fighting and lifeboat drills, and drills shall be conducted in a manner that minimizes the disturbance of rest periods and does not induce fatigue.

When a seafarer is on call, such as when a machinery space is unattended, the seafarer shall have an adequate compensatory rest period if the normal period of rest is disturbed by call-outs to work.

If no collective agreement or arbitration award exists or if the competent authority determines that the provisions in the agreement or award are inadequate, the competent authority shall determine such provisions to ensure the seafarers concerned have sufficient rest.

It shall be required the posting, in an easily accessible place, of a table with the shipboard working arrangements, which shall contain for every position at least:

(a) the schedule of service at sea and service in port; and

(b) the maximum hours of work or the minimum hours of rest required by national laws or regulations or applicable collective agreements.

The table shall be established in a standardized format in the working language or languages of the ship and in English.

It will be required that records of seafarers' daily hours of work or of their daily hours of rest be maintained to allow monitoring of compliance

The records shall be in a standardized format established by the competent authority taking into account any available guidelines of the International Labour Organization or shall be in any standard format prepared by the Organization. They shall be in the languages required by above provision.

The seafarers shall receive a copy of the records pertaining to them which shall be endorsed by the master, or a person authorized by the master, and by the seafarers.

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I.4.1 Maritime Labor Convention 2006 (MLC 2006)

I.4.1.1 Regulation 2.3 - Hours of work and hours of rest

Nothing in this Standard shall prevent a flag state from having national laws or regulations or a procedure to authorize or register collective agreements permitting exceptions to the limits set out. Such exceptions shall, as far as possible, follow the provisions of the Standard but may take account of more frequent or longer leave periods or the granting of compensatory leave for watchkeeping seafarers or seafarers working on board ships on short voyages.

Nothing in the Standard shall be deemed to impair the right of the master of a ship to require a seafarer to perform any hours of work necessary for the immediate safety of the ship, persons on board or cargo, or for the purpose of giving assistance to other ships or persons in distress at sea.

The master may suspend the schedule of hours of work or hours of rest and require a seafarer to perform any hours of work necessary until the normal situation has been restored. As soon as practicable after the normal situation has been restored, the master shall ensure that any seafarers who have performed work in a scheduled rest period are provided with an adequate period of rest.

(Maritime Labor Convention 2006, Title 2 Condition of Employment, Regulation 2.3 – Hours of work and hours of rest, page 30)

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I.4.1 Maritime Labor Convention 2006 (MLC 2006)

I.4.1.2 Regulation 3.1 - Accommodation and recreational facilities

This regulation ensure that seafarers have decent accommodation and recreational facilities on board.

This also requires flag states to ensure that ships that fly its flag provide and maintain decent accommodations and recreational facilities for seafarers working or living on board, or both, consistent with promoting the seafarers' health and well-being.

I.4.1.3 Standard A3.1 - Accommodation and recreational facilities (paragraph 4)

The competent authority for the flag states shall ensure in implementation of the requirements of this Convention relating to:

(a) the size of rooms and other accommodation spaces;
(b) heating and ventilation;
(c) noise and vibration and other ambient factors;
(d) sanitary facilities;
(e) lighting; and
(f) hospital accommodation.

With respect to general requirements for accommodation:

(a) there shall be adequate headroom in all seafarer accommodation; minimum headroom in all seafarer accommodation shall be not less than 203 centimetres; limited reduction in headroom maybe where it is satisfied that such reduction: (i) is reasonable; and (ii) will not result in discomfort to the seafarers;
(b) the accommodation shall be adequately insulated;
(c) in ships other than passenger ships, sleeping rooms shall be situated above the load line amidships or aft, except that in exceptional cases, where the size, type or intended service of the ship renders any other location impracticable, sleeping rooms may be located in the fore part of the ship, but in no case forward of the collision bulkhead;

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I.4.1 Maritime Labor Convention 2006 (MLC 2006)

I.4.1.3 Standard A3.1 - Accommodation and recreational facilities (paragraph 4)

(d) in passenger ships, and in special ships, the competent authority may, on condition that satisfactory arrangements are made for lighting and ventilation, permit the location of sleeping rooms below the load line, but in no case shall they be located immediately beneath working alleyways;

(e) there shall be no direct openings into sleeping rooms from cargo and machinery spaces or from galleys, storerooms, drying rooms or communal sanitary areas; that part of a bulkhead separating such places from sleeping rooms and external bulkheads shall be efficiently constructed of steel or other approved substance and be watertight and gas-tight;

(f) materials used to construct internal bulkheads, panelling and sheeting, floors and joinings shall be suitable for the purpose and conducive to ensuring a healthy environment;

(g) proper lighting and sufficient drainage shall be provided; and

(h) accommodation and recreational and catering facilities shall meet the requirements in Regulation 4.3, and the related provisions in the Code, on health and safety protection and accident prevention, with respect to preventing the risk of exposure to hazardous levels of noise and vibration and other ambient factors and chemicals on board ships, and to provide an acceptable occupational and on-board living environment for seafarers.

With respect to requirements for ventilation and heating:

(a) sleeping rooms and mess rooms shall be adequately ventilated;

(b) ships, except those regularly engaged in trade where temperate climatic conditions do not require this, shall be equipped with air conditioning for seafarer accommodation, for any separate radio room and for any centralized machinery control room;

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I.4.1 Maritime Labor Convention 2006 (MLC 2006)

I.4.1.3 Standard A3.1 - Accommodation and recreational facilities (paragraph 4)

(c) all sanitary spaces shall have ventilation to the open air, independently of any other part of the accommodation; and

(d) adequate heat through an appropriate heating system shall be provided, except in ships exclusively on voyages in tropical climates.

With respect to requirements for lighting, subject to such special arrangements as may be permitted in passenger ships, sleeping rooms and mess rooms shall be lit by natural light and provided with adequate artificial light.

With respect to requirements for mess rooms:

(a) mess rooms shall be located apart from the sleeping rooms and as close as practicable to the galley; ships of less than 3,000 gross tonnage may be exempted by the competent authority from this requirement after consultation with the shipowners' and seafarers' organizations concerned; and

(b) mess rooms shall be of adequate size and comfort and properly furnished and equipped (including ongoing facilities for refreshment), taking account of the number of seafarers likely to use them at any one time; provision shall be made for separate or common mess room facilities as appropriate.

With respect to requirements for sanitary facilities:

(a) all seafarers shall have convenient access on the ship to sanitary facilities meeting minimum standards of health and hygiene and reasonable standards of comfort, with separate sanitary facilities being provided for men and for women;

(b) there shall be sanitary facilities within easy access of the navigating bridge and the machinery space or near the engine room control centre;

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I.4.1 Maritime Labor Convention 2006 (MLC 2006)

I.4.1.3 Standard A3.1 - Accommodation and recreational facilities (paragraph 4)

(c) in all ships a minimum of one toilet, one wash basin and one tub or shower or both for every six persons or less who do not have personal facilities shall be provided at a convenient location;

(d) with the exception of passenger ships, each sleeping room shall be provided with a washbasin having hot and cold running fresh water, except where such a washbasin is situated in the private bathroom provided;

(e) in passenger ships normally engaged on voyages of not more than four hours' duration, consideration may be given by the competent authority to special arrangements or to a reduction in the number of facilities required; and

(f) hot and cold running fresh water shall be available in all wash places.

With respect to requirements for hospital accommodation, ships carrying 15 or more seafarers and engaged in a voyage of more than three days' duration shall provide separate hospital accommodation to be used exclusively for medical purposes;

Appropriately situated and furnished laundry facilities shall be available.

All ships shall be provided with separate offices or a common ship's office for use by deck and engine departments; ships of less than 3,000 gross tonnage may be exempted by the competent authority from this requirement after consultation with the shipowners' and seafarers' organizations concerned.

Ships regularly trading to mosquito-infested ports shall be fitted with appropriate devices as required by the competent authority.

Appropriate seafarers' recreational facilities, amenities and services, as adapted to meet the special needs of seafarers who must live and work on ships, shall be provided on board for the benefit of all seafarers,

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I.4.1 Maritime Labor Convention 2006 (MLC 2006)

I.4.1.4 Regulation 4.3 - Health and safety protection and accident prevention

Regulation 4.3 is about ensuring health and safety protection and accident prevention on the work environment on board ships and promotion of occupational safety and health

Seafarers should be provided with occupational health protection and live, work and train on board ship in a safe and hygienic environment.

Member (Flag States) shall develop and promulgate national guidelines for the management of occupational safety and health on board ships after consultation with representative shipowners' and seafarers' organizations and taking into account applicable codes, guidelines and standards recommended by international organizations, national administrations and maritime industry organizations.

Member (flag states) shall adopt laws and regulations and other measures addressing the matters specified in the Code, taking into account relevant international instruments, and set standards for occupational safety and health protection and accident prevention on ships

I.4.1.5 Standard A4.3 - Health and safety protection and accident prevention paragraphs 1, 2, 4, 6 and 7

Standard A4.3 – Paragraph 1
The laws and regulations and other measures to be adopted in accordance with this regulation, shall include the following subjects:

(a) adoption and effective implementation and promotion of occupational safety and health policies and programmes on ships, including risk evaluation as well as training and instruction of seafarers;

(b) reasonable precautions to prevent occupational accidents, injuries and diseases on board ship, including measures to reduce and prevent the risk of exposure to harmful levels of ambient factors and chemicals as well as the risk of injury or disease that may arise from the use of equipment and machinery on board ships;

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I.4.1 Maritime Labor Convention 2006 (MLC 2006)

I.4.1.5 Standard A4.3 - Health and safety protection and accident prevention paragraphs 1, 2, 4, 6 and 7

Standard A4.3 – Paragraph 1

(c) on-board programmes for the prevention of occupational accidents, injuries and diseases and for continuous improvement in occupational safety and health protection, involving seafarers' representatives and all other persons concerned in their implementation, taking account of preventive measures, including engineering and design control, substitution of processes and procedures for collective and individual tasks, and the use of personal protective equipment; and

(d) requirements for inspecting, reporting and correcting unsafe conditions and for investigating and reporting on-board occupational accidents.

Standard A4.3 – Paragraph 2
The provisions referred to in paragraph 1 of this Standard shall:

(a) take account of relevant international instruments dealing with occupational safety and health protection in general and with specific risks, and address all matters relevant to the prevention of occupational accidents, injuries and diseases that may be applicable to the work of seafarers and particularly those which are specific to maritime employment;

(b) clearly specify the obligation of shipowners, seafarers and others concerned to comply with the applicable standards and with the ship's occupational safety and health policy and programme with special attention being paid to the safety and health of seafarers under the age of 18;

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I.4.1 Maritime Labor Convention 2006 (MLC 2006)

I.4.1.5 Standard A4.3 - Health and safety protection and accident prevention paragraphs 1, 2, 4, 6 and 7

Standard A4.3 – Paragraph 2

(c) specify the duties of the master or a person designated by the master, or both, to take specific responsibility for the implementation of and compliance with the ship's occupational safety and health policy and programme; and

(d) specify the authority of the ship's seafarers appointed or elected as safety representatives to participate in meetings of the ship's safety committee. Such a committee shall be established on board a ship on which there are five or more seafarers.

Standard A4.3 – Paragraph 4

Compliance with the requirements of applicable international instruments on the acceptable levels of exposure to workplace hazards on board ships and on the development and implementation of ships' occupational safety and health policies and programmes shall be considered as meeting the requirements of the MLC 2006.

Standard A4.3 – Paragraph 6

Reporting and investigation of occupational safety and health matters shall be designed to ensure the protection of seafarers' personal data, and shall take account of the guidance provided by the International Labour Organization on this matter.

Standard A4.3 – Paragraph 7

The competent authority shall cooperate with shipowners' and seafarers' organizations to take measures to bring to the attention of all seafarers information concerning particular hazards on board ships, for instance, by posting official notices containing relevant instructions.

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I.4.2 Duties and Responsibilities (Under MEMOSH/2014/6 Guidelines for Implementing the occupational safety and health provisions of the Maritime Labour Convention

I.4.2.1 Shipowners' responsibilities and obligations

-ensure that masters have adequate support to carry out their responsibility for OSH management while on board effectively.
-establish a safety culture with high standards for OSH on board ship.
-consult with seafarers and, where appropriate, the representative seafarers' organizations, on the drafting and implementation of OSH policies;
-establish policies and programmes on OSH of seafarers which are consistent with international standards and national laws and regulations, and put in place systems for continuous improvement, taking into account the national guidelines for the management of occupational safety and health on board ships;
-establish safety committees
-establish systems to conduct on-board investigations into occupational accidents, injuries and, where applicable, diseases, and provide reports to the competent authority
-provide accommodation and recreational services, at no cost to the seafarer, in accordance with Regulation 3.1 and Standard A3.1, which are safe, promote the seafarers' health and well-being, and are inspected to ensure initial and ongoing compliance with minimum standards, including Regulation 4.3 and the associated provisions of the Code of the MLC, 2006

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I.4.2.2 Duties of the Master

-implement shipowner's OSH policy and programme on board ship and clearly communicate them to all crew;
-ensure positive safety culture exists on the ship, including reasonable precautions and continuous safety improvement to prevent occupational accidents, injuries and diseases on board ship
-encourage seafarers to participate actively and express their views on safe and healthy working conditions and risk assessments, without fear of dismissal or other prejudicial measures;
-ensure work is planned, carried out and supervised so as to minimize the possibility of accidents, injuries or diseases

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I.4.2.2 Duties of the Master

-ensure seafarers are assigned only to work to which they are suited by age, state of health and skills, and no seafarer under the age of 18 is assigned inappropriate duties

-appropriate notices and instructions are issued in a clear and easily understood manner, in a language or languages verified to be understood by the entire crew

-safety equipment, including all emergency and protective equipment, is maintained in good order and stowed properly

-all statutory drills and musters are conducted realistically, effectively and conscientiously at the required intervals and comply with any applicable rules and regulations

-practice and training is given in emergency procedures and special emergency equipment usage is demonstrated to the crew at regular intervals

-operating manuals, vessel plans, national laws and regulations, safety procedures and so on are available to seafarers requiring such information to conduct their work safely;

-one or more safety representatives are appointed or elected, and regular meetings of the safety committee are held on board a ship on which there are five or more seafarers. If such a committee is not required, information on safety and health should be communicated in other ways;

-all seafarers on board as well as the shipowner are informed of the membership of the safety committee, and its members are competent to perform their duties

-the safety committee is informed of notices issued by both the competent authority and the shipowner related to the safety and health of seafarers

-all accidents or near accidents, injuries and diseases are investigated, recorded and reported in compliance with national laws and regulations and the shipowner's procedures

-The master may designate a person to take specific responsibility for the implementation of, and compliance with, the ship's occupational safety and health policy and programme.

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I.4.2.3 Duties of Shipboard Safety and Health Officer

Where appointed, the safety officers should:

-implement the ship's OSH policies and programmes;
-conduct or supervise regular risk assessments and the appropriate follow-up measures to ensure continuous improvement of the safety and health of the working environment;
-work closely with the safety representatives to promote a safety culture
-improve the crew's awareness of OSH;
-encourage individual seafarers to behave responsibly to promote proactive safe and healthy working conditions on board, including mental well-being;
-ensure that those working on board handling chemicals are given adequate information on the intrinsic properties of the chemicals and the precautionary measures and to check that chemicals are used only in workspaces and by methods appropriate to the chemical in order to provide effective protection against accidents, injuries and diseases
-check that machinery, protective equipment and other technical aids are designed and used appropriately to prevent or significantly reduce risk;
-identify and investigate any OSH problems;
-report investigations to the safety committee and to the individual involved, where necessary;
-investigate, together with the safety committee, accidents and incidents and make appropriate recommendations to prevent recurrence of such incidents;
-conduct OSH inspections;
-monitor and provide on-board OSH training of seafarers; and
-should be a member of the safety committee.

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I.4.2.4 Powers of safety representatives

Shipowners should make appropriate arrangements to appoint or elect safety representatives. The ship's master should record the appointment of safety representatives in the ship's official logbook or in the minutes of the committee meeting. To ensure sufficient on-board experience, it is recommended that the safety representatives should have more than two years of sea service.

Safety representatives should:

-be elected by or appointed from their work groups or departments and should participate in meetings of the safety committee;

-be allowed sufficient time off from their main shipboard duties without loss of pay to be able to fulfil their functions or receive training required to fulfil their functions;

-not be subject to dismissal or other prejudicial measures for conducting functions assigned to the role;

-have access to all relevant information and documentation, including investigation reports, and all parts of the ship;

-take part in the planning of on-board tasks, including applying preventive measures and conducting risk assessments;

-participate in the investigation of accidents and incidents. A safety representative who has been involved in the accident or incident should not be a member of the investigation team;

-have the unrestricted right to communicate directly with the relevant competent authorities and seafarers' organizations

-receive appropriate training and instructions.

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I.4.2.5 Health and Safety Committee

MLC 2006 Standard A4.3, paragraph 2(d), requires the establishment of a safety committee and the appointment or election of safety representatives on board ships on which there are five or more seafarers.

Purpose and objective:

The purpose and objective of a safety committee is to ensure that the shipowner and seafarers at all levels and all departments on ships work together to develop and promote safety and health and to address problems related to the ship's working environment.

This collaborative effort between the shipowner and the seafarers should facilitate the implementation of the shipowner's OSH policy and programme.

The functions of the safety committee may include, but are not limited to:

-cooperating with the master and the shipowner in the implementation of the OSH policy and programme. The committee should provide seafarers with a forum to influence OSH matters;

-taking part in the planning, managing and coordinating safe and healthy working conditions on board. The committee should take all preventive measures important to OSH, including the mental well-being, of seafarers, and provide advice to resolve safety and health problems;

-taking part in the investigation, identification and analysis of occupational accidents, injuries and diseases;

-proposing and taking part in the implementation of measures to prevent any recurrence, in consultation with the master;

-keeping up to date on OSH provisions for the protection of seafarers;

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-contributing to defining principles for appropriate and necessary training and instructions specific to on-board working conditions;
-continuously inspecting the observance of safety procedures;
-cooperating with any relevant occupational health service;
-making representations and recommendations on behalf of the crew through the master to the shipowner
-discussing and taking appropriate action in respect of any OSH matter affecting the crew, and evaluating appropriate protective and safety equipment, including lifesaving equipment.

Composition and responsibilities;

The safety committee should include the master, and/or a person designated by the master, to take specific responsibility for the implementation of, and compliance with, the ship's occupational safety and health policy and programme, and safety representatives.

The number of safety representatives should reflect the number of seafarers on board and, where appropriate, the number of different departments or working groups.

The composition of the safety committee should, as far as possible, be such that the entire crew at all levels has effective representation. There are a number of ways in which a safety committee may be composed.

For ships with less than five crew members, the master should ensure that cooperative activities are actively promoted by seafarers, like information sharing, training and consultations in the area of occupational safety and health in the maritime sectors.

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Safety committee meetings:

Meetings should be held in compliance with the requirements of the competent authority. They should take place regularly, taking into account the pattern of operation of the ship and the arrangement for manning and with sufficient frequency to ensure continuous improvement.

The chairperson should also convene meetings when two or more committee members request a meeting to address a particular issue. Whenever possible, OSH issues should be dealt with at the shipboard level through the safety committee.

Meetings should also be convened after serious accidents or incidents as part of the regular investigation and reporting procedures.

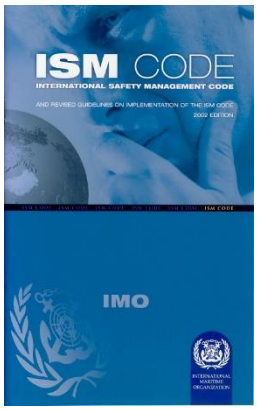
It is also recommended that hazardous situations should be treated as opportunities for safety improvement to prevent future accidents or incidents from harming seafarers or causing damage to the ship.

To avoid any delays between committee meetings, safety representatives should communicate regularly to identify potential or existing OSH issues and endeavour to resolve them. In so doing, they should cooperate with those responsible for tasks in the respective departments, including catering.

Minutes of the meetings should be distributed to the committee members, made available to those working on board and sent to the shipowner. The content of the minutes should be brought to the notice of the competent authority, upon request.

Maritime Occupational Safety and Health Training

I.4.3 ISM Code Safety Management System Procedures



http://www.mandibooks.com/ProductDetail.asp?PID=23262

The ISM Code requires each company to developed, document and implement their specific company Safety Management System (SMS).

There are duties and responsibilities of a Safety Officer that is embodied to the requirements in the ISM to name a few, such as;

I.4.3.1 Safety inspection

Onboard, the Master has the ultimate responsibility for the safety of the ship, crew, environment and cargo.

With the assistance of the Safety Officer, the Master is responsible for ensuring that the objectives of the SMS are achieved.

The safety officer shall inspect all areas of the vessel on a regular basis for safety compliance and to report any deficiencies noted, to Master.

The Regulations require the safety officer to carry out health and safety inspections of each accessible part of the ship at least once every three months, or more frequently if there have been substantial changes in the conditions of work.

Maritime Occupational Safety and Health Training

I.4.3 ISM Code Safety Management System Procedures

I.4.3.2 On Board Safety Training

The company should develop high quality safety training programs, seeking and acting upon crews' views and empowering them to become actively involved with onboard health and safety issues on a daily basis

It is also important to understand the function, scope and characteristics of safety training. Areas that should be considered with regard to safety training include the selection and use of different training methods, monitoring and reinforcement of the training already held, i.e. ongoing communication through presentations, discussions and meetings to continuously check behaviour and raise awareness.

I.4.3.3 Understand the importance of reporting near misses and accidents.

A near miss is an unplanned event that did not result in injury, illness, or damage – but had the potential to do so. Only a fortunate break in the chain of events prevented an injury, fatality or damage; in other words, a miss that was nonetheless very near (https://en.wikipedia.org/wiki/Near_miss_(safety))

Recognizing and reporting near miss incidents can make a major difference to the safety of workers within organizations.

Maritime Occupational Safety and Health Training

II.0 Accidents, Hazard and Risk

The Safety committee must ensure it complies with the company's accident/incident investigation and reporting procedures. Generally, every accident/incident should be investigated and reported on with recommendations to prevent re-occurrence.

The committee should be able to assess and manage occupational risks through the application of preventive and protective measures.

In this context, the difference between a "hazard" and a "risk" should be clearly defined

II.1 Accident and accident investigation.

An accident is the final event in an unplanned process that results in injury or illness to an employee and possibly property damage. It is the final effect of multiple causes.

An accident may be the result of many factors (simultaneous, interconnected, cross-linked events) that have interacted in some dynamic way.

Accident analysis is carried out in order to determine the cause or causes of an accident or series of accidents so as to prevent further incidents of a similar kind. It is also known as accident investigation. (*https://en.wikipedia.org/wiki/Accident_analysis)*

II.2 Accident reduction/prevention

The objective of accident analysis/investigation is to find out the root cause of the accident to be used as basis in formulating system or procedures to prevent the same accident from happening again. By identifying the hazards and managing the risk, accident can be prevented.

Maritime Occupational Safety and Health Training

II.3 Hazard identification

A hazard is the inherent potential to cause injury, harm or damage to a seafarer's health. It can come from many sources, for example intrinsic properties, situations, potential energy, the environment or human factors.

II.4 Risk assessment

A risk is the likelihood that a seafarer will be harmed or experience adverse health effects or that property will be damaged if exposed to a hazard.

The essential purpose of OSH is to prevent occupational accidents, injuries and diseases by managing occupational hazards and risks.

Procedures for hazard identification and risk assessment have to be conducted to identify what could cause harm to seafarers and property and the environment, especially the working environment, so that appropriate preventive and protective measures can be developed and implemented.

Gathering and analysing reliable data and statistics play a key role in conducting risk assessment effectively.

Maritime Occupational Safety and Health Training

III.0 Risk Involved on Board Ships

III.1 Overall introduction

Any occupational health risk may lead to disability, temporary disability or to reduced work capability.

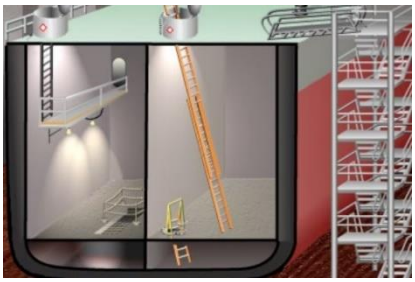
Occupational health risks to seafarers arise from exposure to hazards or harmful levels of ambient factors in the working environment. In cases where some risks are unavoidable, appropriate control measures should be implemented to minimize exposure to hazards that may cause injuries, diseases or death. Harmful exposure may have short-term and long-term adverse health effects

III.2 Safety and Direct Hazards

III.2.1 Work in enclosed spaces

The atmosphere in any enclosed space may be oxygen-deficient or oxygen-enriched and/or contain flammable and/or toxic gases or vapours.

Such unsafe atmospheres could also subsequently occur in a space previously found to be safe. Unsafe atmospheres may also be present in spaces adjacent to those spaces where a hazard is known to be present.



https://www.osha.gov/SLTC/etools/shipyard/standard/access/index_ac.html

http://www.turbosquid.com/3d-models/max-lathe-machine/540630

III.2.2 Use of equipment and machinery

Specific equipment and machinery should only be operated by competent personnel.

When operating and carrying out respective risk assessments, it is important that manufacturer's instructions are taken into consideration, including instructions related to equipment maintenance.

Maritime Occupational Safety and Health Training

III.2.3 Special safety measures on and below deck

Working on and below deck may pose additional hazards, especially in adverse weather conditions.

Work should not commence on open decks in conditions considered adverse by the master, unless it is considered necessary by the master for the safety of the vessel, its crew and cargo, the safety of life at sea and the protection of the marine environment.

III.2.4 Dangerous cargo and ballast

Relevant Conventions, codes and practices should be considered as they set out the requirements for the safe transport, stowage, segregation, loading, unloading and securing of cargoes, and regulations in relation to ballast water.

Should ensure that associated risks and hazards are identified and preventative measures are implemented.

III.2.5 Work at high places and over the sides.

Work at High Places:
When having work done in a high place of 2 or more meters from the floor and in a place where there is a risk of falling, the following measures must be taken.

a) use a protective helmet and safety belt.
b) If bosun's chair is used, must not be driven by a machine.
c) If work is carried out near a funnel, whistle, radar, wireless communications antenna, etc. and there is a danger of harming the worker with the operation of the equipment in question, advise the time and nature of the work beforehand to the person handling the equipment.

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d) Advise the Duty Officer/Engineer when the work starts and when it ends.
e) Restrict passage under the work place
f) Station a lookout for the purpose of communicating with the worker on the job. Not necessary when conditions are such that, when an accident occurs, measures necessary for rescue can be promptly taken and there are two or more workers on the job at the same time.
g) Have one of the workers or the lookout and the Duty Officer/Engineer carry transceivers so that communication between the two parties is ensured.

Work over Sides:
When having work done which has potential danger of dropping onto the sea, the following measures must be taken.

a) Use a safety belt and a work life jacket.
b) Use safe ladders.
c) When the work place can not be easily seen from deck, post a sign on the bulwark over the work place, or on the handrail, or near the suspended scaffolding, etc., that work is being done.
d) No discharge or throwing overboard of bilge, sewage, waste, etc.
e) Advise the Duty Officer/Engineer when the work starts and when it ends.
f) Station a lookout for the purpose of communicating with the worker on the job. Not necessary when conditions are such that, when an accident occurs, measures necessary for rescue can be promptly taken and there are two or more workers on the job at the same time.
g) Have one of the workers or the lookout and the Duty Officer/Engineer carry transceivers so that communication between the two parties is ensured.
h) Ready near the work place, life buoys, buoyant smoke signals, self-igniting lights and other lifesaving appliances that can be used immediately.

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III.2.6 Hot work

Hot Work means welding work, fusing and melting work, heating work using fire, chipping and scaling operations, use of mechanically powered tools, hand tools, grit blasting and other work that generate sparks and/or heat which could lead to fires or explosions.

III.2.7 Painting and paint scraping work

When having painting and paint scraping work done, the following measures must be taken.

a) No smoking and use of fire at the work place.
b) Do not use tools and equipment at the work place that let off sparks or become so hot as to be become a source of combustion.
c) Do not leave rags used for the work and paint pilled or scraped.
d) No persons other than those on the job approach the work place.
e) Ready near the work place an appropriate fire extinguisher.
f) Worker use a mask, protective gloves and other protective gear.

III.2.8 Descaling work and work using machine tools

When having de-scaling work or work using machine tools done, the worker must be made to wear goggles and other necessary protective gear.

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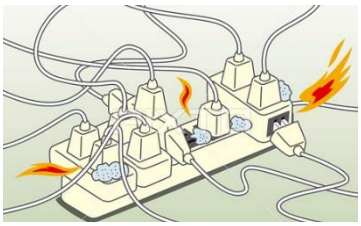
III.2.9 Working on electrical equipment.

When carrying out jobs on Electrical Motors (220V or higher),GSP, Alternators, MSB, ESB, Power distribution Transformers, Radars, Radio Communication Systems:

a) Prior to carry out these jobs, ensure that circuit has been isolated and all personnel involved are aware of the emergency procedures and controls
b) Persons should be properly attired for the job and area should be well marked.
c) Duty Engineer and duty Officer must be informed.
d) The area must be adequately illuminated.

Eliminate Octopus Connections:

a) Do not plug several power cords into one outlet
b) Pull the plug, not the cord
c) Do not disconnect power supply by pulling or jerking the cord from the outlet. Pulling the cord causes wear and may cause shock.



https://www.pixtastock.com/illustration/9747687

Effect of Current on Human Body:
Women – Let go current – if 6mA
Men- Let go current- if 9mA

Carrying out Cold Work:

When carrying out any job in a hazardous area which does not involve generation of high temperature conditions which in turn may cause ignition of combustible gases, vapours, or liquids within the area or an adjacent area for e.g. Connecting Disconnecting pipes etc.:

https://www.google.com.ph/search?q=connecting+pipes&biw+ON+TANKER+SHIPS

a) Ensure that the area is properly illuminated and adequate persons are available for the job.
b) The duty watch keepers must be informed and the area must be well marked.
c) Persons involved must be properly attired.
d) It may also be required to comply with enclosed space entry requirements.

Maritime Occupational Safety and Health Training

III.2.10 Personal Protective Equipment (PPE)

Personal protective equipment (PPE) refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection.

The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter.

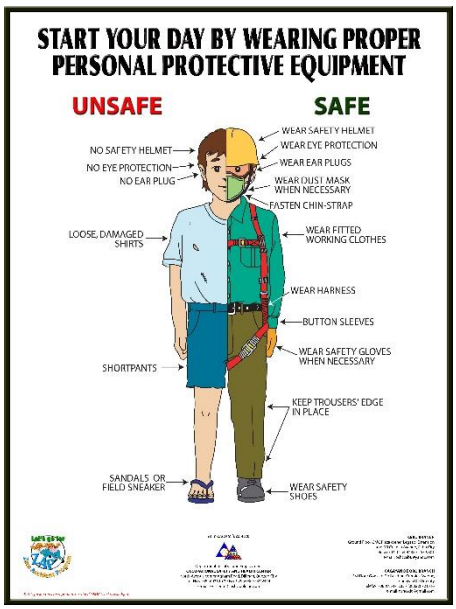
Any item of PPE imposes a barrier between the wearer/user and the working environment. This can create additional strains on the wearer; impair their ability to carry out their work and create significant levels of discomfort. Any of these can discourage wearers from using PPE correctly, therefore placing them at risk of injury, ill-health or, under extreme circumstances, death. Good ergonomic design can help to minimise these barriers and can therefore help to ensure safe and healthy working conditions through the correct use of PPE. *(https://en.wikipedia.org/wiki/Personal_protective_equipment)*

The PPE must be considered only after engineering and administrative controls have been found ineffective, not feasible or insufficient. It must be used only as a last resort or last line of defence. PPE must comply with existing OSH standards.

Seafarers who are required to wear personal protective equipment should be trained on how to do the following:

- Use protective equipment properly,
- Be aware of when personal protective equipment is necessary,
- Know what kind of protective equipment is necessary,
- Understand the limitations of personal protective equipment in protecting workers from injury,
- Put on, adjust, wear, and take off personal protective equipment, and
- Maintain protective equipment properly.

(https://www.osha.gov/OshDoc/data_General_Facts/ppe-factsheet.pdf)



Maritime Occupational Safety and Health Training

III.3 Industrial Health

III.3.1 Noise

Working in areas with excessive noise may cause accidents, injuries and diseases, and may have short- and long-term adverse effects on health.

Excessive noise may also interfere with communication on board ship, which could increase the risk of accidents.

Allowable time a worker can stay in a work area without hearing protection:

8 hrs.(90db), 4 hrs.(95db), 2 hrs. (100db), 1 hr.(105db)

III.3.2 Vibrations

Vibrations are oscillating movements transmitted through solid material. They may affect the whole body due to the movement of the ship or when working near vibrating machinery, or may be focused on the hands and arms when using vibrating tools.

They may induce adverse health effects, either directly, or indirectly through the impact of reflex muscle activity on body structures.

III.3.3 Artificial lighting

Excessive or insufficient artificial lighting or the incorrect positioning of lighting may lead to inappropriate working conditions that could harm seafarers or damage property.

Adverse health effects associated with inadequate lighting include discomfort in the eyes, headaches, neck strains and temporary blurred vision or after-images (such as black spots caused by glare).

Such effects may, in turn, contribute to incidents involving injuries to personnel and damage to property.

Lighting should be well placed and sufficient for all working areas on board and the type of work conducted. Adequate lighting levels should be determined by the competent authority, after consultations with the shipowners' and seafarers' organizations concerned, taking into account national and international standards.

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III.3.4 Ultraviolet light

The major source of ultraviolet light (UV) affecting seafarers is the sun. The level of risk to harmful exposure to UV light depends upon the intensity of the light, the duration of the exposure, the use of protective clothing and the sensitivity of the seafarer.

Adverse health effects due to such an exposure may include premature ageing symptoms among seafarers under the age of 18, actinic keratosis and cancers such as carcinoma or melanoma.

III.3.5 Non-ionizing radiation

Seafarers may be exposed to non-ionizing radiation – a form of electromagnetic radiation that includes radio, microwave and infrared radiation – when working with various types of equipment, such as radar systems or welding equipment. The level of exposure varies depending on the strength of the fields generated from such equipment and the proximity of the work station.

Short-term exposure to high-intensity non-ionizing radiation causes tissue heating, in particular damage to the lens of the eye. Other possible health effects may include headaches, dizziness and sleep disturbance, which may lead to incidents. There is academic uncertainty about harmful effects of long-term exposure.

III.3.6 Extreme temperatures

Hyperthermia occurs when the human body fails to cool down by regulating its own temperature when exposed to high ambient temperatures and humidity for prolonged periods. Such conditions may also be present in engineering spaces on board ships.

It is important to note that seafarers suffering from secondary illnesses that involve dehydration are more susceptible to hyperthermia.

Adverse health effects from hyperthermia include profuse sweating, headaches, dizziness, fainting, lethargy, nausea, cramps in major muscles, rapid breathing and pulse, and high body temperatures. In extreme cases this condition may lead to death.

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Hypothermia occurs when the human body's core temperature falls below 35°C, the point at which normal body function is impaired.

Loss of life may occur when the deep body temperature falls below 30°C.

Seafarers may be exposed to cold water due to immersion in the sea or exposure to cold air while working on cold geographical trading routes.

Adverse health effects from hypothermia could include loss of muscle control leading to muscle incoordination; confusion and muddle-headedness; trouble following simple instructions; unconsciousness and, ultimately, death.

III.3.7 Structural features of the ship, means of access and asbestos- related risks

By nature of ships construction, jobs and work on board pose identified specific risk and hazards to the safety and health of seafarers which may result in fatalities or major injuries.

Special attention should be taken to identify and mitigate asbestos-related risks

Prolonged inhalation of asbestos fibers can cause serious and fatal illnesses including lung cancer, mesothelioma, and asbestosis (a type of pneumoconiosis).

Maritime Occupational Safety and Health Training

III.4 Occupational Health

III.4.1 Mental occupational health

Working at sea have a range of adverse effects on mental health. It is associated with stress, anxiety, depression, post-traumatic stress disorder (PTSD) and suicide.

In the short term, mental distress may have a negative effect on work performance, safety behaviour and well-being. In the longer term it may have a severe impact on a seafarer's life and on their ability to work.

Mental distress may be associated with factors beyond the workplace, such as concerns about events at home. At times a mix of work, non-work and personal issues may all combine and lead to distress. These interactions need to be recognized and competent support may need to be obtained to help with their resolution.

A range of work-related factors may contribute to mental distress. These can arise from the inherent physical constraints of living and working at sea; from the way in which a seafarer is treated by those with whom they work; from incidents that lead to mental trauma; or from a lack of personal fulfilment from work.

Seafarers should be provided with effective advice on measures to minimize the adverse effects of work-related factors on mental health.

May include steps to identify and reduce workplace stressors; increasing awareness of the signs of early mental distress to enable an early response; access to recreational and welfare facilities (MLC, 2006, Regulations 3.1 and 4.4), and organizational arrangements that enable seafarers to raise issues about mental stressors and to secure remedies for them.

Maritime Occupational Safety and Health Training

III.4.2 Violence in the workplace

"Workplace violence" - any action, conduct, threat or gesture of a person towards a seafarer in their workplace that expected to cause harm, injury or illness to that seafarer.

Should develop a workplace violence prevention policy; identify factors that contribute to workplace violence; assess the potential for workplace violence; develop procedures to be followed in the event that threats of violence or aggression against a seafarer, and/or others working on board ship, occur review the effectiveness of the prevention measures develop emergency notification procedures; and provide information and training on the factors that contribute to workplace violence.

III.4.3 Ergonomic hazards

Ergonomics is the study and design of workspaces (such as the workstation and ship bridge) and their components, work practices and procedures to benefit workers' productivity, health, comfort and safety.

Ship design and layout, including engineering, should provide a work environment that fosters effective procedures, safe work patterns and seafarers' health, and should minimize or prevent occupational accidents, injuries and diseases which may degrade human performance or increase potential for error.

A ship as a workplace comprises several specific types of workspaces.

On cargo ships, examples include the bridge, engine room, hatches, decks and accommodation.

On passenger ships, in addition to the technical workspaces related to the ship's engine operations, there are also workspaces used for the on-board hotel and catering services.

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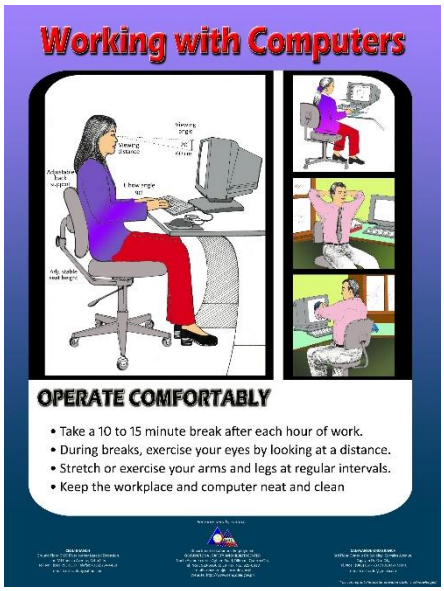
To ensure that work is carried out safely, certain basic ergonomic requirements should be adhered to in order to prevent seafarers from working for long periods in awkward positions such as on their knees, with arms and shoulders raised or with back and neck bent, or from repeating these postures and movements frequently.

Poor ergonomic layout, design and arrangement of the ship and its equipment may lead to both short- and long-term adverse health effects due to stressful working postures. These effects include, but are not limited to:

(a) musculoskeletal disorders;
(b) soreness, pain, stiffness and fatigue in muscles and joints;
(c) tingling in the fingers and changes in sensitivity altering the feeling in fingers, feet and legs;
(d) pain, soreness and swelling due to irritation around the tendons; and
(e) damage such as tennis elbow and inflammation of the tendons, which may last several weeks and may cause a recurrent chronic condition.



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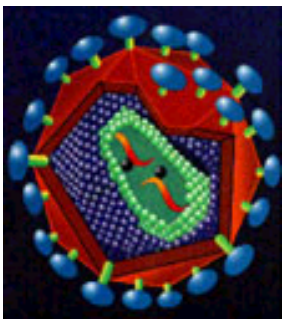
III.4.4 Biological Hazards

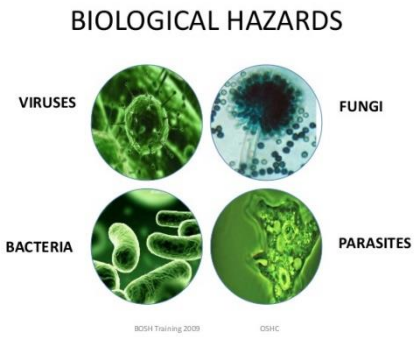
Work on board ships may lead to seafarers being exposed to biological agents. "Biological agents" could means micro-organisms which may provoke an infection, allergy or toxicity.

For example, seafarers may be exposed to biological agents when cleaning and maintaining sewage tanks on board ships, or resulting from poor food hygiene, contaminated food or drinking water, dirty or wet linen, inappropriate personal hygiene, unhygienic treatment in the ship's hospital, and the spread of bacteria and viruses such as influenza.

The adverse health effects of exposure to biological agents include infectious diseases, allergies and toxicity, such as:

- Tuberculosis
- Hepatitis
- Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS)
- Sexually Transmitted Disease (STD)





Maritime Occupational Safety and Health Training

III.4.5 Chemical Hazards

"Chemicals" may refer to chemical substances – elements and their compounds – and chemical materials – compounds of two or more substances.

Chemicals may be in solid, liquid or gas/vapour form. They may be absorbed by the skin in liquid or vapour form or through inhalation of vapours from dust or aerosol sprays.

Chemicals are regarded as dangerous if they are classified and marked with a hazard symbol or statement, if they have a threshold limit value, or on the basis of their physical/chemical or toxicological properties or their use on board.

Work with chemicals should always be planned and carried out on the basis of an individual and an overall assessment of the short-term and long-term occupational health effects.

Harmful chemical exposure could occur during handling, storage, transportation, disposal, utilization and other work in close proximity with chemicals such as paints, cleaners or oils. There may also be exposure to chemicals transported either as packaged dangerous goods, or transported in bulk as a gas, liquid or solid (dust).

In addition, chemicals may also be developed during work processes, for example by fumes and particles in welding or from vehicle exhausts on roll-on/roll-off ships.

The short- and long-term adverse effects on health of exposure to chemicals may lead to acute chronic and delayed (remote) effects or consequences.

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Safety Data Sheets (SDS)
Summary of important health, safety and toxicological information on the chemical or the mixture ingredients. Should contain:

a) identification
b) hazard(s) identification
c) composition/information on ingredients
d) first aid measures
e) fire-fighting measures
f) accidental release measures
g) handling and storage
h) exposure control/personal protection
i) physical and chemical property
j) stability and reactivity
k) toxicological information
l) ecological information
m) disposal consideration
n) transport information
o) regulatory information
p) other information

SDS should conform to the Globally Harmonized System(GHS), an international standard for classifying chemicals and communicating its hazards.

https://www.ccohs.ca/oshanswers/chemicals/whmis_ghs/labels.html

Pictogram- use for hazard communication

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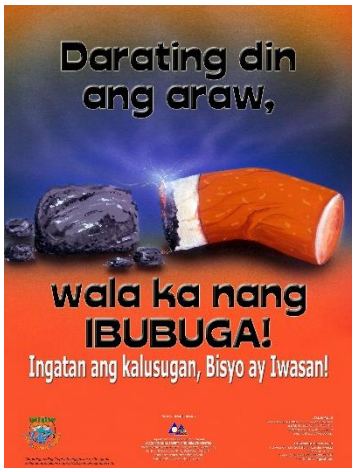
III.3.6 Tobacco Smoking

The health dangers of smoking have been recognized for many years, and the link between passive smoking and other health disorders has been proven by numerous studies.

It should be ensure:

(a) reduce the risks to non-smokers from tobacco smoke on board ship;
(b) inform seafarers of the harmful effects of smoking;
(c) provide support and assistance to any seafarers who express a wish to stop smoking;
(d) designate non-smoking and smoking areas, with signs featuring the respective international symbols, which may be displayed at any entrance to the ship and in all common areas as appropriate.



III.4.7 Drug and Alcohol Abuse and Dependence

Abuse of and dependency on drugs and alcohol by seafarers while on board can affect work performance, lead to problems of discipline and supervision, and become dangerous to persons and the ship.

Alcohol may impair judgement and increase the risk of accidents. In the long term, alcohol abuse may lead to ill health and, in extreme cases, death.

Drug abuse by seafarers is extremely dangerous. Individuals who abuse drugs are likely to pose a serious hazard to themselves and other persons on board, and the ship.

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III.4.8 Fatigue

There is no universally accepted definition of fatigue. However, common to all the definitions is degradation of human performance.

The following definition is found in the IMO's MSC/Circ.813/MEPC/Circ.330, List of Human Element Common Terms:

"A reduction in physical and/or mental capability as the result of physical, mental or emotional exertion which may impair nearly all physical abilities including: strength; speed; reaction time; coordination; decision-making; or balance."

The most common causes of fatigue known to seafarers are lack of sleep, poor quality of rest, stress and excessive workload.

Hours of work and/or rest are a key issue when considering the working environment. Lack of rest may have consequences for the overall safety and cooperation on board, as well as individuals' well-being, health and general quality of life.

Studies and research carried out by various organizations and administrations have shown the increasing human, financial and environmental impact of maritime accidents and frequently cite fatigue as a contributory cause due to lack of sleep.

Lack of sleep may lead to adverse health effects including but not limited to:

(a) poor concentration;
(b) increased risk of error and slower reaction times, which can mean that incidents are not averted in time;
(c) reduced ability to handle duties safely and to perform tasks optimally; and
(d) damaging health effects over a long period of time.

Maritime Occupational Safety and Health Training

IV.0 Emergency and accident response

Needs to develop Emergency and Accident Response Action Pans and to conducts the necessary training and drills for ships as part of overall safety and health policy within the occupational safety and health policies and programmes.

Emergency and accident response plans are an efficient and effective means of minimizing the risks to human life.

Maritime Occupational Safety and Health Training

V.0 References

R1 *MEMOSH/2014/6 Guidelines for implementing the occupational safety and health provisions of the Maritime Labour Convention*

R2 *(Maritime labor Convention 2006, Title 2, Condition of Employment, Regulation 2.3- Hours of work and hours of rest, page 30*

R3 *(Maritime labor Convention 2006, Title 3, Accommodation, recreational facilities, food and catering, page 41*

R4 *(Maritime labor Convention 2006, Title 4, Health protection, medical care, welfare and social security protection, page 54*

R5 *https://en.wikipedia.org/wiki/Maritime_Labour_Convention*

R6 *https://www.osha.gov/OshDoc/data_General_Facts/ppe-factsheet.pdf*

R7 *http://rcontrols.com/safety_article/personal-protective-equipment*

R8 *https://en.wikipedia.org/wiki/OHSAS_18001*

R9 *https://en.wikipedia.org/wiki/Personal_protective_equipment*

R10 *https://en.wikipedia.org/wiki/Accident_analysis*

R11 *https://en.wikipedia.org/wiki/Near_miss_(safety)*