COURSE MANUAL

HEALTH AND SAFETY, PASSENGER RIGHTS AND ENVIRONMENTAL PROTECTION

MANAGEMENT LEVEL

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FOREWORD

To assist education and training entities in building their institutional and organisational capacity so as to match the Standards of competence for inland navigation personnel - Management level - **ML 7 – Health and safety, passenger rights and environmental protection**, required by Directive (EU) 2017/2397 on the recognition of professional qualifications in inland navigation, and Delegated Directive (EU) 2020/12 supplementing Directive (EU) 2017/2397 as regards the standards of competences and corresponding knowledge and skills, for the practical examinations, for the approval of simulators and for medical fitness, the transnational Course Manual on **HEALTH AND SAFETY, PASSENGER RIGHTS AND ENVIRONMENTAL PROTECTION for Management Level Personnel** was developed.

This Course Manual will be a useful transnational training tool for conducting the 'Train the Trainer' session and is intended to assist education and training providers and their teaching staff in organising and introducing new education & training programmes, or in enhancing, updating and supplementing existing didactical materials with the ultimate end results of raising quality and effectiveness of the education & training programmes.

Since education & training systems as well as the cultural background of inland navigation topics differ considerably from one country to another, the Course Manual on HEALTH AND SAFETY, PASSENGER RIGHTS AND ENVIRONMENTAL PROTECTION - ML has been designed so as to support the preparation, organisation and planning of effective teaching and training and to be used as a part of the quality assurance of the education and training institutes.

Technical content and levels of knowledge and abilities are in line with the applicable Delegated Directive (EU) 2020/12 supplementing Directive (EU) 2017/2397 as regards the standards of competences and corresponding knowledge and skills, for the practical examinations, for the approval of simulators and for medical fitness, being an essential tool for Boatmasters, to adhere to safe working rules, understand the importance of health and safety rules, maintain safety and security for persons on board, and compliance with requirements for environmental protection.

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1. GENERAL INFORMATION

1.1 Course curriculum - general requirements

1.	**Aivm**	Provide training to assist in the implementation of Directive (EU) 2017/2397 and ES-QIN- Standards of competence - HEALTH AND SAFETY, PASSENGER RIGHTS AND ENVIRONMENTAL PROTECTION, for crew members at ML.
2.	**Objective**	Provide training and practical guidance for trainees in order to be able to monitor the applicable legal requirements and take measures to ensure safety of life, to maintain safety and security for persons on board including direct assistance to disabled persons with reduced mobility, to set up emergency and damage control plans, and handle emergency situations, and to ensure compliance with requirements for environmental protection.
3.	**Entry standards**	See Directive (EU) 2017/2397 - Annex 1.
4.	**Course certificate**	On successful completion of the course, a document may be issued, stating that the holder graduated this learning module.
5.	**Course intake limitation**	Admittance may be limited by the capacity of the educational infrastructure used for this learning module.
6.	**Staff requirements**	The trainer should at least: • Have professional specialisation in this field and/or be a holder of the certificate of competence as a deck crew member on board of inland craft; • Hold the appropriate 'Train the Evaluator certificate'; • Hold the appropriate 'Train the Instructor certificate', and; • Meet the requirements of Directive (EU) 2017/2397, Art. 18.
7.	**Training facilities, equipment and teaching aids**	**Training facilities and equipment** For the **theoretical part of the course** ordinary class room facilities and an overhead projector are sufficient. In addition, a demonstration table and an available Internet connection would be advantageous. For the **practical part of the course**, the following structure and equipment are required: **Safety of work:** (Protective eyewear; Protective suits; Protective hearing devices; Safety helmets; Dust masks and respirators; Protective gloves; Safety shoes; Safety belt; Explosion meter with accessories; Oxygen meter with accessories; Flue gas analyser with accessories; Breathing apparatus). **Medical first aid:** (Life-size dummy for practical resuscitation training; Stretcher; Various splints, braces, etc.; Automatic defibrillator for training; Dressings, bandages). **Personal survival techniques:** (Lifejackets; Inflatable lifejackets; Lifebuoys; Rigid liferaft with a complete set of accessories; Six-person inflatable liferaft; Immersion suits). The practical lessons require access to water, i.e. swimming pool. **Fire-fighting:** (Steel fire trays; Fire hydrants, each with outlets or a similar water supply from open water and fire pump; A large supply of carbonaceous and hydrocarbon fuels (wood, diesel and lubricating oils, etc.) for the fire trays; Dummy, for search and rescue procedures; Fire hoses; Branch pipes; Fire nozzles (standard, diffuser and jet spray); Foam generator; Stand pipes, with keys and bars to operate the hydrant supply; water, foam, carbon dioxide and dry powder extinguishers; Sets of protective clothing, overalls, gloves, fire-boots, helmets and rainproof clothing; Breathing apparatus; Smoke generator; Smoke helmets with air pump; Stretcher; Sets of fire protective clothing; Helmets with visor and neck protector; Intelligent training system for fire fighting). For the practical part of the course a training campus equipped with a special building for smoke and fire drills or a similar facility must be used. **Environmental protection:** (Floating debris boom; Absorbent pads; Oil absorbent granules; Glass sample jar; Mailing tube; Explosion meter with accessories; Oxygen meter with accessories; Flue gas analyser with accessories).

8.	**Learning outcomes**	At the end of the course the trainee shall be able to: **Health and Safety** • Apply national and international legislation and take appropriate measures for health protection and the prevention of accidents; • Control and monitor the validity of the craft's certificate and other documents relevant to the craft and its operation; • Comply with safety regulations during all working procedures by using relevant safety measures in order to avoid accidents; • Control and monitor all safety measures necessary for cleaning enclosed spaces before opening, entering and cleaning those facilities; • Select the correct personal protective equipment for shipboard tasks. **Safety and security on board of passenger vessels** • Use life-saving appliances and apply life-saving procedures for victims' and own personal safety; • Organise crisis management training exercises for behaviour in emergency situations; • Give instructions related to fire prevention, personal protective equipment, methods, fire-fighting material, respirators and possible application of these devices in emergencies ; • Perform first aid; • Establish an effective on-board system to control life-saving appliances and correct application of personal protection equipment; • Organise assistance for disabled persons and persons with reduced mobility. **Emergency situations** • Initiate preparations for rescue plans for different types of emergencies; • Train in methods to prevent fire, recognition of origin of the fire and fire-fighting according to the different skills of crew members; • Train in the use of life-saving appliances; • Give instructions on rescue plan, escape routes and internal communication alarm systems. **Environmental protection** • Take precautions to prevent environmental pollution and use relevant equipment; • Apply environmental protection laws; • Use equipment and materials in an economical and environmentally friendly way; • Instruct and monitor sustainable waste disposal.
9.	**Assessment & evaluation**	Minimum requirements for assessment & evaluation of the trainees for graduation from the learning module (i.e. minimum score for theoretical evaluation, for practical evaluation, etc.). I.e. Online training record book as a pathway for the course.

2. INSTRUCTOR MANUAL

2.1 Introduction

This instructor manual provides guidance on the material that is to be presented during the training course for HEALTH AND SAFETY, PASSENGER RIGHTS AND ENVIRONMENTAL PROTECTION - ML, and has been arranged under the 19 (nineteen) Learning Outcomes (competences) identified in the course outline.

The reference material indicated may be supplemented by additional texts or material at the discretion of the teacher/trainer.

The course outline and provisional timetable also provide guidance on the time allocation for the course, because the time actually taken for each subject area may vary - especially in respect of time allocated to practical activities. The detailed teaching syllabus must be carefully studied and appropriate lesson plans or lecture notes compiled. A template of a lesson plan is presented under point 2.2 of this Chapter.

Each lesson should commence with a statement of the learning outcomes it is intended to achieve. At the end of each lesson, the participants should be told which associated portions of the reference material they should read and any activity they should undertake. Questions arising from such readings and activities must be given priority at an appropriate time.

The presentation of the various subject areas should be done in such a way that those taking part in the course are involved in an interactive participation during the lessons and learning process. Questions from the course participants should be encouraged, as should answers to such questions from other course participants.

The lessons should aim at conveying as much practical instruction and practice as possible to the participants, in order to develop their knowledge of and their skills in the tasks they will be expected to carry out.

Course materials for additional study must be prepared and distributed if required.

2.2 Lesson plan

This lesson plan is just a template to give the teachers/trainers a general idea on how to create their lessons for the various competences. This template can be used for every competence and adjusted as suitable for the institute to use.

Competence 7.1.1 Apply national and international legislation and take appropriate measures for health protection and the prevention of accidents;			
Learning objective			
Learning outcomes			
Required equipment			
Lesson structure			
Learning activity	Didactical method (ABC method)	Materials	Time

2.3 Background materials

Bibliographical materials, reference documents, and other didactical materials are presented in Annex 1 of this Course Manual.

2.4 Practical training

This practical training links the theoretical content of the lessons to their practical use.

Case studies
Theoretical subjects are elaborated by the candidates autonomously in case studies. The candidate should deepen his or her knowledge in defined theoretical subjects by elaborating on a variety of facts and figures about this topic and present them in front of his or her classmates afterwards.

Discussions and reflection, interactive learning
Possible solutions to theoretical and practical subjects can be discussed within (parts of) the learning group. Different views and opinions on a defined subject are exchanged and discussed by the participants in order to broaden the view of the individual on this problem and show different possible solutions and their respective advantages and disadvantages. A discussion should be monitored and steered (stimulated or consolidated) if necessary, in order to ensure that every participant actively participates.

Team work
Assignments can be individual as well as group assignments, depending on the objective. An individual assignment should stimulate and show the competences of the individual. In a team work assignment the participants will have exposure to a wide range of experiences from quick problem-solving involving synergy to experiences which may relate to such items as interpersonal difficulties in a group setting. Depending on the purpose of the assignment the team should be defined in advance and the assignment and the rules of the working process, if there are any, should be communicated to the group in a very clear and formal manner.

Annex 2 of this Course Manual presents a few exercises, case studies, practical scenarios, etc. which are useful for practical training and examination of the trainees.

2.5 Classroom facilities and educational tools

For the theoretical part of the course, a classroom is required with video presentation equipment, teaching aids, etc. For the practical part of the course, the equipment mentioned in the course curriculum is needed.

2.6 Examination & assessment

According to **Article 17 - Assessment of competence, of Directive (EU) 2017/2397** on the recognition of professional qualifications in inland navigation, Member States shall ensure that persons who apply for the Boatmaster certificate demonstrate that they meet the standards of competence by passing an examination that was organised:

(a) under the responsibility of an administrative authority in accordance with Article 18 or;
(b) as part of a training programme approved in accordance with Article 19.

The essential competence requirements set out in **Annex II of Directive (EU) 2017/2397** for Health and safety, passenger rights and environmental protection – Management Level are:

The Boatmaster shall be able to:

- Monitor the applicable legal requirements and take measures to ensure safety of life;
- Maintain safety and security for persons on board, including providing direct assistance to disabled persons and persons with reduced mobility in accordance with the training requirements and instructions of Annex IV of Regulation (EU) No 1177/2010;
- Set up emergency and damage control plans, and handle emergency situations;
- Ensure compliance with requirements for environmental protection.

3. REGULATION AND CERTIFICATION

According to **Chapter 2, Union Certificates of Qualification, Article 4, Obligation to carry a Union certificate of qualification as a deck crew member of the Directive (EU) 2017/2397** on the recognition of professional qualifications in inland navigation:

- Member States shall ensure that deck crew members who navigate on Union inland waterways carry either a Union certificate of qualification as a deck crew member issued in accordance with Article 11 or a certificate recognised in accordance with Article 10(2) or (3);
- **Annex I of Directive (EU) 2017/2397** sets out the minimum requirements for certification as a Boatmaster, such as:

  Minimum requirements for certification as a Boatmaster:
  Every applicant for a Union certificate of qualification shall:
  (a)
  - Be at least 18 years of age;
  - Have completed an approved training programme as referred to in Article 19, which was of a duration of at least three years and which covered the standards of competences for the management level set out in Annex II;
  - Have accumulated navigation time of at least 360 days as part of this approved training programme or after completion thereof;
  - Hold a radio operator certificate;

  or

  (b)
  - Be at least 18 years of age;
  - Hold a Union certificate of qualification as a helmsman recognised in accordance with Article 10 (2) or (3);
  - Have accumulated navigation time of at least 180 days;
  - Have passed an assessment of competence by an administrative authority as referred to in Article 18 to verify that the standards of competence for the management level set out in Annex II are met;
  - Hold a radio operator certificate,

  or

  (c)
  - Be at least 18 years of age;
  - Have accumulated navigation time of at least 540 days, or have accumulated navigation time of at least 180 days, if the applicant can also provide proof of work experience of at least 500 days that the applicant acquired on Botmaster a sea-going ship as a member of the deck crew;
  - Have passed an assessment of competence by an administrative authority as referred to in Article 18 to verify that the standards of competence for the management level set out in Annex II are met;
  - Hold a radio operator certificate,

  or

  (d)
  - Have a minimum of five years' work experience prior to the enrolment in an approved training programme, or have at least 500 days' work experience on a sea-going ship as a member of the deck crew prior to the enrolment in an approved training programme, or have completed any vocational training programme of at least three years' duration prior to the enrolment in an approved training programme;
  - Have completed an approved training programme referred to in Article 19, which was of a duration of at least one and a half years, and which covered the standards of competence for the management level set out in Annex II;
  - Have accumulated navigation time of at least 180 days as part of that approved training programme and at least 180 days after completion thereof;
  - Hold a radio operator certificate.

4. LESSON MATERIALS

The lesson materials referred to in this course manual are for inspiration and are free to use for the teachers of the educational institutes. The lesson materials will be available on the Edinna website (https://www.edinna.eu/) until the end of the project.

Subject content of the Course Manual for HEALTH AND SAFETY, PASSENGER RIGHTS AND ENVIRONMENTAL PROTECTION - ML is presented below.

The numbering of the chapters is in accordance with the Standards of Competence for Management Level - 7. HEALTH AND SAFETY, PASSENGER RIGHTS AND ENVIRONMENTAL PROTECTION.

COMPETENCE 7

7.1 Safety of work

Competences

The Boatmaster shall be able to monitor the applicable legal requirements and take measures to ensure the safety of life. The Boatmaster shall be able to:

7.1.1 Apply national and international legislation and take appropriate measures for health protection and the prevention of accidents;
7.1.2 Control and monitor the validity of the craft's certificate and other documents relevant to the craft and its operation;
7.1.3 Comply with safety regulations during all working procedures by using relevant safety measures in order to avoid accidents;
7.1.4 Control and monitor all safety measures necessary for cleaning enclosed spaces before persons open, enter and clean those facilities.

7.1.1 Apply national and international legislation and take appropriate measures for health protection and the prevention of accidents

Knowledge and skills

7.1.1.1 Knowledge of legislation for health protection and prevention of accidents

Communication (2014) 332 final from the Commission to the European Parliament, the Council, the European Economic and Social Committee of the regions on an EU Strategic Framework on Health and Safety at Work 2014-2020.

This communication sets out key strategic objectives and a range of actions for promoting workers' health and safety, based on an identification of the outstanding problems and major challenges.

Communication COM (2004) 62 final from the Commission to the European Parliament, the Council, the European Economic and Social Committee and Committee of Regions on the practical implementation of the provisions of the **Health and Safety at Work Directives 89/931 (Framework), 89/654 (Workplaces), 89/655 (Work Equipment), 89/656 (Personal Protective Equipment), 90/269 (Manual Handling of Loads) and 90/270 (Display Screen Equipment)**.

Prevention is the guiding principle for occupational health and safety legislation in the European Union. In order to prevent accidents from happening and occupational diseases from occurring, EU-wide minimum requirements for health and safety protection at the workplace have been adopted. The aforementioned EU Directives were already transposed and implemented into the national laws of EU Member States, and this report examines how these Directives have been transposed and applied within the Member States.

The 1989 Directive lays down the principles for the introduction of measures to encourage improvements in the safety and health of workers and provides a framework for specific workplace environments, developed in individual directives.

The EU legislation reportedly has had a positive influence on the national standards for occupational health and safety. At the same time, the health and safety measures at the workplace are reported to have widely contributed towards improved working conditions, boosting productivity, competitiveness and employment.

The Commission will continue its work towards a simplification and rationalisation of the Community legal framework by making the necessary legislative proposal for, on one hand, the consolidation of existing directives to make them more comprehensible and, on the other, for the simplification of the provisions of the various Directives related to the implementation reports in view to foreseeing a single report on their implementation.

- Provide adequate means and organisation and should establish a suitable policy on the safety and health of crew members consistent with international and national laws and regulations;
- Ensure that design of their vessels takes account of ergonomic principles and conforms to relevant international and national laws, regulations, standards or codes of practice;
- Provide and maintain vessels, equipment, tools, operating manuals and other documentation, and organise all planning and operations in such a manner that, as far as it is reasonably practicable, there is no risk of accident or injury to crew members. In particular, activities should be planned, prepared and undertaken so that:
  - Dangers likely to arise on board vessel are prevented;
  - Excessively or unnecessarily strenuous work positions and movements are avoided;
  - Organisation of all work takes into account the safety and health of crew members;
  - Materials and products are used safely and pose no danger to crew members' health; and
  - Working methods are employed which protect crew members against the harmful effects of chemical, physical and biological agents.

General duties and responsibilities of the Boatmaster

The Boatmaster should ensure that:

- Work carried out on or from the vessel is carried out in such a way as to avoid the possibility of accidents and the exposure of crew members to conditions which may lead to injury or damage to their health;
- Operating manuals, vessel plans, national laws and regulations, safety procedures and other such information are available to those crew members who need such information to conduct their work safely;
- Any necessary instructions and notices concerning the safety and health of the crew are posted in prominent and suitable places or brought to the crew's attention by other effective means;
- Safety equipment, including all emergency and protective equipment, is maintained in good order and stowed properly;
- All statutory drills are carried out realistically, effectively and conscientiously at the required intervals and in compliance with any applicable rules and regulations;
- Practice and training are given in emergency procedures; the use of any special emergency equipment should be demonstrated to the crew members at regular intervals.

7.1.1.2 Ability to apply safety procedures based on applicable legislation in the field of safety and working conditions

Health and safety at work regulations strongly emphasise the need to provide employees with instruction, information and training necessary to ensure their health and safety. Providing employees with health and safety information and training reduces the chance of them suffering injuries or ill health. It helps them acquire the skills, knowledge and attitude to make them competent in the safety and health aspects of their work and instils a positive health and safety culture.

The crew members should be provided with information on:

- The hazards and risks within the workplace;
- The hazards and risks affecting specific tasks or operations carried out by the person;
- The control measures in place to minimise exposure to these risks;
- Information and instructions on the job to be carried out and how to work safely;
- Measures to be taken in an emergency.

Training means showing a person the correct method of doing a task and making sure that he or she can carry out the task correctly and safely. It can be a formal, mandatory training course on safety or informal on the job training such as showing a person the correct method of doing a job, pointing out dangers and ensuring that the person understands and can do the job safely. All crew must be trained in safe work practices. This may include training in the safe use of equipment, safe work practices for the activities on board and any unique or unusual characteristics of the craft.

Work practices and the effectiveness of any training provided should be monitored. Where unsafe work practices are detected and health and safety measures are not being followed by any member of the crew, the work or activity should be stopped until corrective action has been taken and safety controls are fully complied with. New or young crew members may also require extra supervision.

Advantages of safe working practices

A well designed and executed occupational health and safety programme is often said to be good for business as well as being a key legal and social obligation (making sure that employees in any size or type of business go home in the same condition that they came to work). Furthermore, so-called "best-practice" organisations not only recognise the basic value of good occupational health and safety, but recognise that extra efforts to ensure that its people are not harmed or made ill in any way at work (even at a minor level) is also an essential part of a truly excellent enterprise.

These best practice organisations therefore believe that occupational health and safety:

- Helps demonstrate to all stakeholders that a business is socially responsible;
- Protects and enhances an organisation's reputation and credibility;
- Helps maximise the performance and/or productivity of employees;
- Enhances employees' commitment to the team/ organisation as a whole;
- Builds a more competent, happier and healthier workforce;
- Reduces business costs and disruption;
- Enables organisations to meet customers' occupational health and safety expectations; and
- Encourages the workforce in general to stay longer in active life.

Simple improvements to workplace safety practices can quickly increase competitiveness, profitability and the motivation of employees. In addition, the implementation of a new occupational health and safety management system can rapidly provide an effective framework to prevent or minimise accidents and workplace related ill-health and thereby show an immediate return on investment.

7.1.2 Control and monitor validity of the craft's certificate and other documents relevant to the craft and its operations

7.1.2.1 Knowledge of legislation on periodic checking of equipment and construction parts

The specific legislation regarding the periodic checking of equipment and construction parts is ES-TRIN- European Standards - Technical Requirements for Inland Waterway Vessels, adopted by Directive (EU) 2016/1629 laying down technical requirements for inland waterway vessels.

The periodic checking of equipment and construction parts of the inland vessels is carried out through technical inspections.

According to this Directive, Member States shall ensure that the competent authorities carry out the initial, periodical, special and voluntary inspections.

Those competent authorities may refrain from subjecting the vessel in whole or in part to technical inspection where it is evident from a valid attestation, issued by a recognised classification society according to the Directive's provisions, that the vessel satisfies, in whole or in part, the technical requirements referred to in Annexes II and V of the Directive.

Each Member State shall draw up a list of its competent authorities which are responsible for carrying out technical inspections and shall notify the European Commission thereof, including any changes to the list. The European Commission shall maintain an up-to-date list of competent authorities and inspection bodies on an appropriate website.

Each Member State shall comply with the specific requirements as regards inspection bodies and the request for inspection, provided for in Annexes II and V of Directive (EU) 2016/1629.

Annex II sets out the minimum technical requirements applicable to craft on inland waterways of zones 1, 2, 3 and 4, which are those set-out in the ES-TRIN standards.

Annex V sets out detailed procedural provisions as regards inspection bodies, presentation of the craft for inspection, particulars in and amendments to the Union inland navigation certificate, periodic inspection, voluntary inspections, expenses, information, register of Union inland navigation certificates, unique European vessel identification number, notifications.

Presentation of the craft for inspection

The owner, or the owner's representative, shall present the craft in an unladen, cleaned and equipped state. The owner shall provide any assistance needed for inspection, such as providing an appropriate dinghy and staff, and uncovering any parts of the hull or fittings that are not directly accessible or visible.

The inspection body shall demand a dry inspection on the first occasion. That dry inspection may be dispensed with if a classification certificate from a recognised classification society to the effect that the construction meets the requirements can be produced or if a certificate is produced which shows that a competent authority has already carried out a dry inspection for other purposes. Where there is a periodic inspection or an inspection in case of major alterations or major repairs of the craft, the inspection body may require an inspection out of the water.

The inspection body shall conduct trial runs during an initial inspection of motor vessels or convoys or where major changes are made to the propulsion or steering equipment.

The inspection body may require further operational tests and other supporting documents. The provision shall also apply during the building of the craft.

Particulars in and amendments to the Union inland navigation certificate

The owner of a craft, or the owner's representative, shall bring to the notice of the competent authority any change in the name of ownership of the craft, any re-measurement, and any change in the registration or home port, and shall send the Union inland navigation certificate to that authority for amendment.
Any competent authority may add any information or change to the Union inland navigation certificate.
Where a competent authority adds an alteration or information to a Union inland navigation certificate, it shall inform the competent authority which issued the Union inland navigation certificate thereof.

Periodic inspection

Craft shall be subjected to a periodic inspection before expiry of their Union inland navigation certificate.

The competent authority shall again lay down the period of validity of the Union inland navigation certificate in accordance with the results of that inspection.

The period of validity shall be entered on the Union inland navigation certificate and be brought to the attention of the authority having issued that Union inland navigation certificate.

If, rather than have its period of validity extended, a Union inland navigation certificate is replaced by a new version, the earlier Union inland navigation certificate shall be returned to the competent authority which issued it.

Voluntary inspection

The owner of a craft, or his representative, may voluntarily request an inspection at any time. The request for an inspection shall be acted upon.

7.1.2.2 Ability to check the validity of certificates and other documents relevant to the craft and its operation

Member States shall ensure that their competent authorities may at any time check whether a vessel is carrying a valid certificate and whether it satisfies the requirements for the issuance of such certificate. In the case of failure to comply with the requirements, the competent authorities shall take appropriate measures. They shall also request that the owner of the vessel or the owner's representative take all necessary measures to remedy the situation within a time limit set by the competent authorities.

The competent authority which issued the certificate carried on the vessel shall be informed of such failure within seven days of the check.

Where a valid certificate is not being carried, the vessel may be prevented from proceeding with its voyage.

The competent authorities may also prescribe proportionate measures which will enable the vessel to proceed safely, where appropriate on termination of its transport operations, to a place where it will either be inspected or repaired.

A Member State which has prevented a vessel from proceeding with its voyage, or has notified the owner of the vessel or the owner's representative of its intention to so prevent it if the defects found are not corrected, shall inform the competent authority in the Member State which issued or last renewed the vessel's certificate, within seven days of the decision which it has taken or intends to take.

Any decision to interrupt the passage of a vessel pursuant to the Directive shall state in detail the reasons on which it is based. Such decision shall be notified without delay to the party concerned, who shall at the same time be informed of the appeal procedures available under the laws in force in the Member State concerned and of their time limits.

7.1.3 Comply with safety regulations during all working procedures by using relevant safety measures in order to avoid accidents

7.1.3.1 Knowledge of safe working practices and safe working procedures

Living on board: occupational health and safety risks

Occupational health and safety risks may lead to death, permanent disability, temporary disability or reduced work capability. Occupational health and safety risks may arise from work-related hazards or from the general living and working conditions on board, sometimes referred to as ambient factors. In cases where some risks are unavoidable, appropriate control measures should be implemented to minimise exposure to hazards that may cause injury, disease or death. Harmful exposure may have short-term or long-term adverse health effects.

Risks inherent in the working environment must be identified and evaluated ('risk assessment'), and measures must be taken to remove or minimise those risks, to protect seafarers and others from harm, so far as is reasonably practicable.

These risks include, but are not limited to:

- Ambient factors, such as noise, vibration, lighting, ultra-violet light, non-ionising radiation and extreme temperatures;
- Inherent hazards, such as the vessel's structure, means of access, ergonomic hazards and hazardous materials such as asbestos;
- Hazards arising from work activities, such as work in enclosed spaces, use of equipment and machinery, working on and below deck in adverse weather, dangerous cargo and ballast operations, and exposure to biological hazards or chemicals;
- Health risks, such as fatigue and impacts on mental occupational health; and
- The emergency and accident response.

In addition, there are risks from violence in the workplace, tobacco smoking, drug abuse, alcohol misuse and drug or alcohol dependence.

Duties of vessel owners

It is the duty of vessel owners and employers to protect the health and safety of crew members and others so far as is reasonably practicable. The principles that should underpin health and safety measures are:

- The avoidance of risks, which among other things includes the combating of risks at source and the replacement of dangerous practices, substances or equipment by non-dangerous or less dangerous practices, substances or equipment;
- The evaluation of unavoidable risks and the taking of action to reduce them;
- The adoption of work patterns and procedures that take account of the capacity of the individual, especially in respect of the design of the workplace and the choice of work equipment, with a view in particular to alleviating monotonous work and to reducing any consequent adverse effect on workers' health and safety;
- The adaptation of procedures to take account of new technology and other changes in working practices, equipment, the working environment and any other factors that may affect health and safety;
- The adoption of a coherent approach to management of the vessel or undertaking, taking account of health and safety at every level of the organisation;
- Giving collective protective measures priority over individual protective measures; and
- The provision of appropriate and relevant information and instruction for workers.

The **Company** and other employers owe a duty of care to other workers on board who may be affected. Where passengers are also covered, this will normally be stated.

The Company is also responsible for ensuring that crew members have the appropriate information, training and instruction to enable them to work safely, making arrangements for consultation with crew members about health and safety matters, and having systems for recording and investigating safety incidents and accidents on board.

The **Boatmaster** is the representative of the owner Company.

Duties of crew members

Crew members are required to:

- Take reasonable care for their own health and safety and that of others on board who may be affected by their acts or omissions;
- Cooperate with anyone else carrying out health and safety duties, including compliance with control measures identified during the employer's or Company's risk assessment;
- Report any identified serious hazards or deficiencies immediately to the appropriate officer or other responsible person; and
- Make proper use of plant and machinery, and treat any hazard to health or safety (such as a dangerous substance) with due caution.

7.1.3.2 Ability to organise safe working procedures, to motivate and monitor crew members to apply safe working rules

Crew members, like shore workers, have the right and expectation that they will remain safe at work.

The Company and employers have a responsibility to ensure the health, safety and welfare at work of all crew members and other workers on board.

Crew members have a duty to take reasonable care for the occupational health and safety of themselves and others, and to cooperate with their employer and the Company in matters of health, safety and welfare.

By creating a culture where everyone takes responsibility for a safe working environment and takes care of themselves and one another, many work-related accidents and incidents can be avoided.

What does a safe working culture look like? Extensive research has identified certain elements that contribute greatly to maintaining a safe working culture. These can be described as:

- Clearly defined expectations;
- Good communications;
- Clear leadership;
- Good planning;
- Risk awareness;
- Accountability;
- Good safety culture; and
- Effective knowledge management.

These elements should be both put in place at a Company level within the safety management system and implemented on board the vessel by the Boatmaster and crew. It is important that the entire workforce, from the most junior crew members through to the senior managers ashore, are involved in the development of these elements for them to be fully successful. Many of them are already present within management systems but often some are missing, which can create weaknesses in the management system.

A good approach is to conduct a gap analysis to identify those elements that are missing or weak, and amend the systems accordingly. The more developed and comprehensive the systems are, the more effective they can be.

Clearly defined expectations

It is important that seafarers at all levels of the organisation clearly understand what is expected of them and what standards are required.

On every vessel:

- The Company has overall responsibility to establish a safety management system and occupational health and safety policies and programmes, and to ensure that the Boatmaster is provided with the necessary resources and facilities to operate the ship safely and in accordance with the Company's policies and procedures;
- The Boatmaster has responsibility to implement the Company's policies and procedures on board the ship, and to report any deficiencies to shore-based management for rectification;
- Every person on board has a responsibility for their own occupational health and safety and that of others, including:
  - Complying with instructions, safety procedures and any other measures in place for their own or others' safety;
  - Reporting any defects in equipment or unsafe conditions to a responsible person; and
  - Not interfering with or altering any safety device provided on board.

All crew members should have a job description. In addition, any crew member should feel confident to stop work if they feel unsafe – sometimes known as 'stop work authority'. It is important that a comprehensive and clear induction process is carried out, with respect to Company and vessel-specific requirements, for every joining member of the crew. The inductions should be used to explain the rules and expectations in a format that is easily understood.

All crew members should be given copies or overviews of rules appropriate to them, along with information on where the full information can be found. Examples of these rules may include:

- The Company handbook;
- The vessel guidebook; and
- Pocket cards.

There should be clear and concise policies, procedures and safety rules contained within the safety management system and associated documentation. These should be reviewed regularly to ensure that they are appropriate, remain valid and can be communicated to the crew in various ways including:

- During the Company and vessel inductions;
- As part of the on-board and external training programmes;
- Through on-board supervision and monitoring; and
- In safety committee meetings.

Effective communications and workforce involvement is crucial in ensuring a safe living and working environment. Communication is a two-way process. There is a need to be able to gain information and knowledge that can be acted upon and passed on to others who need it, and systems need to be in place to facilitate this at all levels in the organisation. Some examples include:

- Ensuring everyone understands their roles and responsibilities;
- Ensuring orders and instructions are properly understood, acknowledged and acted upon;
- Ensuring information posters, signs and instructions are clear and can be understood;
- Ensuring safety alerts, memos and newsletters are clear and can be understood;
- Encouraging feedback, improvement suggestions and safety observations, and acting on the information received;
- Safety meetings should be minuted and the reports distributed and acted upon where appropriate; and
- Ensuring a good, clear and reliable system of emergency response communications is in place.

7.1.4 Control and monitor all safety measures necessary for cleaning enclosed spaces before persons open, enter and clean those facilities

7.1.4.1 Ability to organise safety control and monitor safety procedures if crew or other persons enter enclosed spaces (e.g. ballast tanks, cofferdams, tanks, double hull spaces) including keeping watch

The Safety Management System should provide instructions and procedures to ensure the safe operation of the vessel and protection of the environment. Companies are required to establish procedures, plans, and instructions, including check-lists as appropriate, for key shipboard operations concerning the safety of the personnel, ship, and protection of the environment.

The safety management system should provide clear instructions on procedures for entry into enclosed spaces. It should provide the vessel's crew with the following:

- A training schedule which should include training and drills on the dangers of enclosed space entry, entry procedures, and rescue of personnel from enclosed spaces;
- Guidance on how to determine whether a space may be hazardous;
- Procedures to be followed during all stages of entry into an enclosed space;
- Guidance on standards and duties of personnel involved in enclosed space entry;
- Guidance on safety equipment to be used in enclosed space entry;
- Emergency procedures including the evacuation of a casualty in an enclosed space.

The safety management system should address managing subcontracted workers, technicians, welders, and shore cleaning staff engaged to work on the ship. Such staff must always be managed to work safely and comply with the enclosed entry and working procedures laid down by the company. At times this may be challenging, and during occasions such as drydocking, agreements have to be made as to who is responsible for the safety procedures of the shore personnel.

As a part of the audit process of the safety management system it should be confirmed that all personnel are:

- Trained in and aware of the enclosed space entry procedure;
- Aware of the dangers that an enclosed space can present;
- Aware of the precautions necessary to enter an enclosed space.

7.1.4.2 Ability to conduct a risk assessment before entering enclosed space

There are many ways of conducting a risk assessment. The company should provide guidance on how to carry out risk assessments and any hazard identification techniques that must be used. One of the outcomes of a risk assessment should be a hazard register.
The hazard register records all the hazards that have been identified by the various risk assessments and any hazard identification techniques, showing representative causes, consequences and safeguards for each. It is sensible to maintain a portfolio of hazard registers specific to tasks or operations on board the vessel, including entry into enclosed spaces. When a non-routine or particularly hazardous activity is to be conducted, the register can be referred to in order to see which hazards apply and the safety measures to be put in place. Whilst not all of the hazards may be present on each occasion, there may be additional hazards that have not previously been identified. The register is therefore a guidance document to be consulted, and should not replace an assessment of the risks on each occasion.

There is a move with some authorities requiring a register of safeguards to be produced rather than hazards, since these have more specific management requirements. Risk assessments and any hazard identification techniques are well suited to identifying safeguards, especially safety-critical ones, as well as hazards.

Such registers should be 'living documents' – continually reviewed and updated. The following table is an example of a list of typical enclosed space entry hazards, methods for controlling the hazards and mitigating measures – steps that can be taken that should reduce the impact of any incident:

Incident	Cause	Preventative measures	Mitigating measures
Person entering collapses in the space	Poor atmosphere	• All lines leading into the space secured • Space emptied • SPace remotely cleaned prior to entry if possible, i.e. COW washing of oil tanks or filling tanks with water then pumping out • Atmosphere tested and found safe prior to entry • Atmosphere tested at regular intervals • Continuous ventilation of the space	• Personnel entering the space trained in enclosed space entry procedures • Attendant at entrance • Contact with bridge • Regular communication between attendant and entry personnel • Emergency signal established • Entrants wearing personal monitors • Rescue equipment on stand-by including breathing apparatus, harness, and lifeline
Fire/explosion in the space	• Dust cloud • Flammable atmosphere • Hot work • Equipment failure • Oxygen-rich atmosphere • Hydrogen rich	• Monitor atmosphere • Use only intrinsically safe equipment in potentially flammable atmospheres i.e. fuel oil tanks • Follow hot work procedures • Do not use defective equipment • Do not ventilate with pure oxygen	• Sufficient personnel on board to form a fire party • Training and drills in fire-fighting • First aid equipment available
Slip/trip	• Poor lighting • Poor housekeeping • Inadequate PPE • Hazardous structural arrangement • Worker fatigue • Slippery surfaces • Poor visibility from dust/ smoke/mist, etc.	• Good lighting arrangements • Monitor and maintain good housekeeping • Relevant PPE worn as appropriate • Briefing/awareness of space arrangement before entry • Assessment of personnel before entry and throughout. Proper rest periods and rehydration • Good ventilation and dust prevention measures	• Stretcher and first aid kit available • Drills in first aid incidents, including procedures for communication to shore-side assistance
Fall from height	• Unguarded edges • Structural failure of ladders and platforms • Unsafe use of ladders/ staging	• Wear fall prevention devices where appropriate • Guards/rails on platforms • Inspection of ladders and platforms • Training in the use of portable ladders and staging • Personnel assisting where portable ladders are used and where equipment is to be moved • Proper securing of portable ladders and staging	• Stretcher and first aid kit available • Drills in first aid incidents, including procedures for communication to shore-side assistance

Incident	Cause	Preventative measures	Mitigating measures
Illness of person entering	• Dust • Smoke • Fumes • Noise • Humidity/heat/cold • Phobias, fatigue, mental and physical condition • Heat fatigue	• Monitor and ventilate atmosphere • Ear protection, personal protective equipment (PPE) • Rehydration (drinks)/ rest periods/ adequate clothing/PPE • Suitability of crew according to risk assessment before entry • Pre-employment medical examinations	• Stretcher and first aid kit available • Drills in first aid incidents, including procedures for communication to • Stretcher and first aid kit available • Drills in first aid incidents, including procedures for communication to shore-side assistance
Rescue equipment not usable	• Falling objects • Electrical/mechanical equipment in the space	• Harnesses for tools and equipment at height • Hard hats (PPE) • Pumps and mechanical equipment in the space isolated • Analysis of the job hazards and equipment before entry • Protection of electrical equipment from fluids	• Stretcher and first aid kit available • Drills in first aid incidents, including procedures for communication to shore-side assistance
Rescue equipment not usable	• Equipment does not fit through access	• Drills on board confirm suitability of rescue equipment • Discussion before entry about available rescue equipment for the space	• Stretcher and first aid kit available • Drills in first aid incidents, including procedures for communication to shore-side assistance

7.1.4.3 Knowledge of precautions to take before entering an enclosed space and while work is being carried out in an enclosed space

The hazards associated with enclosed spaces include:

Toxic Atmosphere

A toxic atmosphere may cause various acute effects, including impairment of judgement, unconsciousness and death. A toxic atmosphere may occur due to the presence or ingress of hazardous substances. These substances may be present in the enclosed space for various reasons such as:

- Remaining from previous processing or storage;
- Arising from the disturbance of sludge and other deposits;
- The presence of a fire or flames within the space;
- Seepage from improperly isolated adjoining plant;
- Formation during the work processes carried out in the space;
- Being released from under scale and in brickwork as a result of the work process.

Oxygen Deficiency

Oxygen can be lacking a confined space for the following reasons:

- Displacement of air by another gas;
- Various biological processes or chemical reactions (such as rotting of organic matter, rusting of metals, burning, etc.);
- Absorption of air onto steel surfaces, especially where these are damp.

Oxygen Enrichment

An excess of oxygen, in the presence of combustible materials, results in an increased risk of fire and explosion. Some materials, which do not burn in air, may burn vigorously or even spontaneously in an enriched oxygen atmosphere.

Flammable or Explosive Atmospheres

A flammable atmosphere presents a risk of fire or explosion. Such an atmosphere can arise from the presence in the confined space of flammable liquids or gases or of a suspension of combustible dust in air. If a flammable atmosphere inside a confined space ignites, an explosion may occur, resulting in the expulsion of hot gases and the disintegration of the structure.

Flowing Liquid or Free Flowing Solids

Liquids or solids can flow into the confined space causing drowning, suffocation, burns and other injuries. Solids in powder form may also be disturbed in a confined space resulting in an asphyxiating atmosphere.

Excessive Heat

The enclosed nature of a confined space can increase the risk of heat stroke or collapse from heat stress, if conditions are excessively hot. The risk may be exacerbated by the wearing of personal protective equipment or by lack of ventilation

Precautions on entering in enclosed spaces

Before a space is entered, the following precautions should be taken, as appropriate, to make it safe for entry without the need for breathing apparatus, and to ensure that it remains safe whilst crew members are inside:

- A competent person should make an assessment of the space and a responsible officer should be appointed to take charge of the operation;
- The potential hazards should be identified;
- The space should be prepared and secured for entry;
- The atmosphere should be tested;
- A "permit-to-work" system should be used;
- Entry procedures should be established and followed;
- Continuous ventilation should be maintained throughout.

Additional precautions, including the use of breathing apparatus, should be taken where the aforementioned precautions have been followed and an unsafe atmosphere has been established.

A crew member should not enter a dangerous space to attempt a rescue without first having called for assistance and then having donned a breathing apparatus. Even then entry should not be made until assistance arrives.

Duties and responsibilities of a competent person and of a responsible crew member

The designated competent person should be capable of making an informed assessment of the likelihood of a dangerous atmosphere being present or arising subsequently in a space. The competent person should have sufficient theoretical knowledge and practical experience of the hazards that might be met in order to be able to assess whether precautions are necessary. The assessment should include any potential hazards which might be met, and should take into account any dangers from neighbouring or unconnected spaces, as well as the work needing to be done in the space itself.

A responsible crew member should be designated to take charge of every operation where entry into a potentially dangerous space is necessary. This officer may be the same person as the competent person.

The responsible officer must decide on the basis of the competent person's assessment the procedures which must be followed for entry into the space.

These will depend on whether the assessment shows:

- No risk is envisaged to the life or health of a person entering the space;
- No immediate risk to life or health but that a risk could arise during the course of work in the space;
- An immediate risk to life or health.

If no risk to life or health is envisaged, and it is considered that conditions in the space will not change, then entry may be made. The space should be monitored as long as anyone is inside.

Preparing and securing the space for entry

Care should be taken to avoid the effects of a possible release of pressure or vapour when opening the entrance to the space.

The space should be isolated and secured against the escape of dangerous substances by blanking off pipelines or other openings or by closing valves. Valves should then be tied, or some other method employed to show that they must not be opened.

The space should be cleaned or washed if necessary, to remove as much as possible of the sludge or other deposit liable to give off dangerous fumes. Special precautions may be necessary.

The space should be thoroughly ventilated by natural or mechanical means, to ensure that all harmful gases are removed and no pockets of oxygen-deficient atmosphere remain. Compressed oxygen should not be used to ventilate any space.

The persons in charge, on the bridge, on the deck, in the engine-room, or the cargo control room should be informed as necessary of any space to be entered so that, for example, fans are not stopped, equipment not started or valves not opened by remote control.

Appropriate warning notices should be placed on the relevant controls or equipment. Where necessary, pumping operations or cargo movements, should be suspended when entry is being made into a dangerous space.

Testing the atmosphere of confined and enclosed spaces

Only persons trained in the use of the equipment should test the atmosphere of a space. Equipment should be properly calibrated before use.

Testing of the atmosphere should be carried out before entry and at regular intervals thereafter. Testing of the atmosphere before entry should be made by remote means. If not possible, the competent person should ensure that all attempts have been made to reduce the danger posed by the atmosphere and only then should entry be made with the additional precautions.

Testing of the atmosphere should be carried out on different levels, where appropriate.
Personal monitoring equipment designed purely to provide a warning against oxygen deficiency and hydrocarbon concentrations should not be used as a means of determining whether a dangerous space is safe to enter.

Use of a permit-to-work system

A "permit-to-work" system should be used. Entry into a space should be planned in advance and if unforeseen problems or hazards arise during the operation, then work should be stopped and the space evacuated immediately. Permits to work should be withdrawn, and the situation reassessed. Permits to work should be revised as appropriate after the reassessment. Everyone should leave the space on expiry of a "permit to work", and the entrance should be closed or otherwise secured to prevent re-entry, or declared safe for normal entry when it is no longer dangerous.
Procedures and arrangements before entry
Access to and lighting within the space should be adequate.

No sources of ignition should be taken or put into the space unless the master or responsible officer is satisfied that it is safe to do so. A rescue team and resuscitation equipment should be available for immediate action. The resuscitation equipment should be positioned ready for use at the entrance.

Only trained personnel should be assigned duties at entry, functioning as attendants or as members of rescue teams.

The number entering should be limited to those persons who actually need to work in the space and could be rescued in the event of an emergency.
At least one person, trained in entry procedures and the action to be taken in the event of an emergency, should be detailed to stay by the entrance whilst it is occupied.

A communication system should be agreed and tested by all involved, to ensure that persons entering the space can keep in touch with the person stationed at the entrance.

A communication system should be set up between the responsible officer and the person stationed at the entrance. It should be checked that entry with breathing apparatus is possible before entry is allowed. The extent by which movement could be restricted, or the removal of a casualty could be hampered, by the use of breathing apparatus, lifelines or harnesses should be ascertained.

Rescue harness lifelines should be long enough for the purpose and easily detachable by the wearer, but should not otherwise come away from the harness.

Procedures and arrangements during entry

The space should be continuously ventilated whilst occupied and during temporary breaks. All persons in the space should leave it immediately should the ventilation system fail.

Whilst the space is occupied the atmosphere should be tested periodically. Should there be any deterioration in the conditions all persons should leave immediately.

Work should stop and all persons should leave the space if unforeseen difficulties or hazards occur. The situation should then be reassessed.

If any person working in a space feels in any way adversely affected he or she should give a pre-arranged signal to the person standing by the entrance and immediately leave the space.

A rescue harness should be worn to facilitate recovery in the event of an accident.

The general (or crew) alarm should be sounded in the event of an emergency, so that immediate back-up can be given to the rescue team. Additional requirements for entry into a space where the atmosphere is suspect or known to be unsafe.

Where the atmosphere is considered suspect or unsafe to enter without breathing apparatus and provided all reasonable attempts at gas-freeing have been carried out, entry may be made if this is essential for testing purposes, the working of the ship, the safety of life or the safety of the ship. The number of persons entering should be the minimum necessary to undertake the work.

Breathing apparatus should always be worn. Respirators must not be used because they do not provide a supply of clean air from a source independent of the atmosphere in the space.

Two air supplies should be available to the wearer of breathing apparatus, except in the case of emergency, or where this is impractical because movement in the space would be seriously impeded. A continuous supply provided from outside the space should normally be used. Should it prove necessary to change over to the self-contained supply, the person should immediately vacate the space.

Precautions should be taken to safeguard the continuity of the outside source of air during occupation of the space by the wearer of breathing apparatus.

Special attention should be given to supplies originating from the engine-room. A single air supply may be acceptable, where remote testing of the space is not reasonably practicable provided prolonged presence in the space is not required and the person is situated so that he or she can be hauled out immediately in case of emergency.

A rescue harness should be worn. Lifelines should be used where practicable, and should be attended by a person stationed at the entrance who has received training in how to pull an unconscious person from a dangerous space. If hoisting equipment would be needed to effect a rescue, the availability of persons to operate the equipment in the event of an emergency should be ensured.

Portable lights and other electrical equipment should be of a type approved for use in a flammable atmosphere.Personal protective equipment should be worn where there is a hazard due to chemicals, in liquid, gaseous or vapour form.

A pre-arranged plan should be drawn up to deal with the rescue of collapsed persons within a dangerous space, which should take into account the design of the individual ship and of the equipment and manpower on board. The need to allocate personnel to relieve or back-up those first into the space should be considered.

If a person working in the space indicates that he or she is being affected by the atmosphere, using the agreed communication system, the person stationed by the entrance should immediately raise the alarm. On no account should the person stationed at the entrance to the space attempt to enter it before additional help has arrived. No one should attempt a rescue without wearing breathing apparatus and a rescue harness and, whenever possible, the use of a lifeline.

If air is being supplied through an air-line to the person who has become unwell, an immediate check should be made that his or her air supply is being maintained at the correct pressure.

An incapacitated person should be removed from the space as quickly as possible, unless he or she is gravely injured, e.g. a broken back, when essential first-aid treatment should be administered first. The restoration of the casualty's air supply at the earliest possible moment must be the first priority.

Breathing apparatus and resuscitation equipment. Every crew member likely to use breathing apparatus should be instructed in its use by a competent person. The full, pre-wearing check and donning procedures recommended by the manufacturer should be

undertaken by the master, or the responsible officer, and the person about to enter the space. In particular the following should be checked:

- That there will be sufficient clean air at the correct pressure;
- That low pressure alarms are working properly;
- That the face mask fits correctly against the user's face, so that, combined with pressure of the air coming into the mask, there will not be an ingress of oxygen deficient air or toxic vapours when the user inhales. It should be noted that facial hair or spectacles may prevent the formation of an airtight seal between a person's face and the face mask;
- That the wearer of the breathing apparatus understands whether or not his or her air supply may be shared with another person and if so is also aware that such procedures should only be used in an extreme emergency;
- That when work is being undertaken in the space the wearer should keep the self-contained supply for use when there is a failure of the continuous supply from outside the space.

When in a dangerous space:

- No one should remove his or her own breathing apparatus;
- Breathing apparatus should not be removed from a person unless it is necessary to do so to save his or her life.

Where any person may be required to enter a dangerous space appropriate resuscitators should be provided, and if entry is expected to occur at water the vessel should be provided with the appropriate equipment. If the appropriate equipment has not been provided entry should not take place.

Maintenance of equipment and training

A competent person should maintain and periodically inspect and check for correct operation of all breathing apparatus, rescue harnesses, lifelines, resuscitation equipment and any other equipment provided for use in, or in connection with, entry into dangerous spaces or during emergencies. A record should be kept of the inspections and checks. All items of breathing apparatus should be inspected and checked for correct operation before and after use.

Equipment for testing the atmosphere of dangerous spaces should be kept in good working order and, where applicable, regularly serviced and calibrated. The manufacturer's recommendations should be kept with the equipment and should be followed.

Vessel owners should provide crew members with the necessary training, instructions and information on entry into dangerous spaces, which should include:

- Recognition of the circumstances and activities likely to lead to the presence of a dangerous atmosphere;
- Recognition of the hazards associated with entry into dangerous spaces, and the precautions to be taken;
- The use and proper care of equipment and clothing required for entry into dangerous spaces;
- Instructions and drills in rescue from dangerous spaces.

7.1.4.4 Ability to take appropriate actions in the event of an emergency

Should a **rescue from an enclosed space** be necessary, the attendant at the entrance to the space is usually the person who will notify the officer on watch of the emergency. The general alarm should be sounded in order that the crew muster and a rescue party can be formed. The rescue party will don PPE and prepare breathing apparatus. Ideally, all the equipment required to rescue the casualty should already be at the entrance to the space, prepared for use by the rescue team.

No one must enter the enclosed space until the atmosphere in the space has been checked and is safe. For a rescue to be efficient the right equipment must be on board and the crew well trained in its use. Regular drills should be held to avoid unwelcome surprises during a real emergency.

If the unconscious casualty is in an enclosed space:

- It must be assumed that the atmosphere in the space is unsafe and the rescue team must not enter unless wearing breathing apparatus;
- Personnel MUST NOT enter the enclosed space unless they are a trained member of a rescue team acting upon instruction;
- Help should be summoned and the master informed;
- Separate breathing apparatus or resuscitation equipment should be fitted on the casualty as soon as possible;
- The casualty should be moved quickly to the nearest safe area outside the enclosed space, unless his or her injuries and the likely time of evacuation make treatment essential before he or she is moved.

Time lapse	Activity	Duration
0 – 03 minutes	Enclosed space incident occurs and rescue team is called	03 minutes
03–13 minutes	Rescue team arrives at the scene	10 minutes
13–23 minutes	Rescue team sizes up and prepares to initiate rescue	10 minutes
23–38 minutes	Rescue team reaches and rescues the casualty	15 minutes
38–53 minutes	Casualty is transported and arrives at the ship's hospital	15 minutes

Rescue response time goal

The following table provides a guide to response time. This is based on a scenario where the vessel is properly equipped and the crew are well drilled in enclosed space rescue.

Even so, almost an hour elapses before the casualty reaches the ship's hospital.
An ill-equipped and unprepared team will take substantially longer in recovering the casualty.

Rescue action plan

Safety precautions

- Do not rush in;
- Do not try to act alone – do not enter until help arrives;
- Call back-up;
- Standby team to assist;
- Ventilate the atmosphere.

Emergency response

- Follow correct procedures;
- Stay alert and be ready to get out quickly if there are any worrying signs.

Casualty assessment and care

- Approach with care – don't become a casualty too;
- If the atmosphere is safe, begin primary assessment;
- If the atmosphere is unsafe, remove the casualty immediately.

Methods of casualty evacuation from an enclosed space

Evacuation of casualties from enclosed spaces can be difficult and risky for both casualty and rescuers. The following methods may be adopted in an emergency evacuation.

How effective is your stretcher in confined spaces?

Stretchers are available that are specifically designed for use in confined spaces where rigid stretchers would not be suitable or might not even reach.

Stretchers are available that roll up and can be stowed away in a backpack. Flexible stretchers and spine boards like these are ideal for use where a casualty may have to be transported through lightening holes or around other structures in tank and void space arrangements.

A stretcher is the ideal means of transporting a casualty. Where the stretcher is too large, or not available, the following methods can be used:

- Forward drag (rescue crawl or neck drag);
- Cross chest method;
- Collar pull;
- Leg pull;
- Blanket.

If the atmosphere and environment are safe, and the casualty has suffered a physical injury, it is advisable to seek professional medical advice before moving him/her, particularly where it is suspected that the casualty has a spinal injury.

Collar pull method

- Employed when methods described earlier cannot be used;
- Casualty's head is positioned in direction of exit.

Leg pull method

- Last resort in very enclosed spaces under life threatening situation;
- If casualty's legs are in direction of exit and casualty cannot be repositioned.

7.2 Safety of life, fire fighting and medical first aid

Competences

The Boatmaster shall be able to maintain safety and security for persons on board including direct assistance to disabled persons and persons with reduced mobility in accordance with the training requirements and instructions of Annex IV to Regulation (EU) No. 1177/2010.

The Boatmaster shall be able to:

7.2.1 Use life-saving appliances and apply life-saving procedures for victims and own personal safety;

7.2.2 Organise crisis management training exercises for behaviour in emergency situations, e.g. fire, leakage warning, explosion, collision, "person over board" and evacuation;

7.2.3 Give instructions related to fire prevention, personal protective equipment, methods, firefighting material, respirators and possible application of these devices in emergencies;

7.2.4 Perform first aid;

7.2.5 Establish an effective on-board system to control life-saving appliances and correct application of personal protective equipment;

7.2.6 Organise assistance for disabled persons and persons with reduced mobility.

7.2.1 Use life-saving appliances and apply life-saving procedures for victims and own personal safety

7.2.1.1 Knowledge of available life-saving equipment

Lifebuoys including relevant equipment

Every lifebuoy shall:

- Have an outer diameter of not more than 800 mm and an inner diameter of not less than 400 mm;
- Be constructed of inherently buoyant material; it shall not depend upon rushes, cork shavings or granulated cork, any other loose granulated material or any air compartment which depends on inflation for buoyancy;
- Be capable of supporting not less than 14.5 kg of iron in fresh water for a period of 24 hours;
- Have a mass of not less than 2.5 kg;
- Not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 seconds;
- Be constructed to withstand a drop into the water from the height at which it is stowed above the waterline in the lightest condition, without impairing either its operating capability or that of its attached components;
- It is intended to operate the quick-release arrangement provided for the self-activated signals and self-igniting lights, have a mass of not less than 4 kg; and
- Be fitted with a grabline not less than 9.5 mm in diameter and not less than four times the outer diameter of the body of the buoy in length. The grabline shall be secured at four equidistant points around the circumference of the buoy to form four equal loops.

Lifebuoy self-igniting lights

Self-igniting lights shall:

- Be such that they cannot be extinguished by water;
- Be of white colour and capable of either burning continuously with a luminous intensity of not less than 2 cd in all directions of the upper hemisphere or flashing at a rate of not less than 50 flashes and not more than 70 flashes per minute with at least the corresponding effective luminous intensity;
- Be provided with a source of energy.

On board craft there shall be at least three lifebuoys, in accordance with European Standards EN 14144: 2003, or in accordance with the 1974 SOLAS Convention, Chapter III, Regulation 7.1, and the LSA Code, sub-section 2.1.

They shall be ready for use and attached to the deck at appropriate points without being attached to their mounting. At least one lifebuoy shall be in the immediate vicinity of the wheelhouse and shall be equipped with a self-ignition, battery-powered light that will not be extinguished in water.

In addition, all parts of the deck intended for passengers and not enclosed shall be equipped with suitable lifebuoys, which shall be positioned on both sides of the vessel not more than 20 m apart.
Half of the prescribed lifebuoys shall be fitted with a buoyant cord of at least 30 m with a diameter of 8 to 11 mm. The other half of the prescribed lifebuoys shall be fitted with a self-igniting, battery-powered light which will not be extinguished in water.

Lifejackets shall be provided in three sizes in accordance with the table below.

Lifejacket marking	Infant	Child	Adult
User's size:			
Weight (kg)	Less than 15	15 or more but less than 43	43 or more
Height (cm)	Less than 100	100 or more but less than 155	155 or more

Lifejackets including relevant equipment on lifejackets, such as fixed or flashing lights and whistle firmly secured by a cord

A lifejacket shall not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 seconds.

If a lifejacket fully complies with the requirements of two adjacent size ranges, it may be marked with both size ranges, but the specified ranges shall not be divided. Lifejackets shall be marked by either weight or height, or by both weight and height.

If an adult lifejacket is not designed to fit persons weighing up to 140 kg and with a chest of up to 1750 mm, suitable accessories shall be available to allow it to be secured to such persons.

An adult lifejacket shall be constructed so that:

- At least 75% of persons who are completely unfamiliar with the lifejacket can correctly don it within a period of 1 min without assistance, guidance or prior demonstration;
- After demonstration, all persons can correctly don it within a period of time of 1 min, without assistance;
- It is clearly capable of being worn in only one way or inside-out and, if donned incorrectly, it is not injurious to the wearer;
- The method of securing the lifejacket to the wearer has quick and positive means of closure that do not require tying of knots;
- It is comfortable to wear;
- It allows the wearer to jump into the water from a height of at least 4.5 m while holding on to the lifejacket, and from a height of at least 1 m with arms held overhead, without injury and without dislodging the lifejacket or its attachments.

Adult lifejackets shall have sufficient buoyancy and stability in calm fresh water to:

- Lift the mouth of exhausted or unconscious persons;
- Turn the body of unconscious, face-down persons in the water;
- Incline the body backwards from the vertical position;
- Lift the head above horizontal;
- Return the wearer to a stable face-up position after being destabilised when floating in the flexed position.

An adult lifejacket shall allow the person wearing it to swim a short distance and to board a survival craft. An infant or child lifejacket shall perform the same as an adult lifejacket except as follows:

- Donning assistance is permitted for small children and infants.

The requirements for infant lifejackets:

- Facilitate the rescue of the infant by a caretaker;
- Allow the infant to be fastened to a caretaker and contribute to keeping the infant close to the caretaker;
- Keep the infant dry, with free respiratory passages;
- Protect the infant against bumps and jolts during evacuation; and
- Allow a caretaker to monitor and control heat loss by the infant.

A lifejacket shall have buoyancy which is not reduced by more than 5% after 24 hours submersion in fresh water.

The buoyancy of a lifejacket shall not depend on the use of loose granulated materials. Each lifejacket shall be fitted with a whistle firmly secured by a lanyard.

Lifejacket lights and whistles shall be selected and secured to the lifejacket in such a way that their performance in combination is not degraded.

A lifejacket shall be provided with a releasable buoyant line or other means to secure it to a lifejacket worn by another person in the water.

A lifejacket shall be provided with a suitable means to allow a rescuer to lift the wearer from the water into a survival craft or rescue boat.

Inflatable lifejacket

A lifejacket which depends on inflation for buoyancy shall have not less than two separate compartments and shall:

- Inflate automatically upon immersion, be provided with a device to permit inflation by a single manual motion and be capable of having each chamber inflated by mouth.

Lifejacket lights

Each lifejacket light shall:

- Have a luminous intensity of not less than 0.75 cd in all directions of the upper hemisphere;
- Have a source of energy capable of providing a luminous intensity of 0.75 cd for a period of at least 8 hours;
- Be visible over as great a segment of the upper hemisphere as is practicable when attached to a lifejacket; and
- Be of white colour.

A personalised, automatically inflatable lifejacket shall be within reach of every person who is regularly on board a craft. Such lifejackets shall conform to: European Standards EN ISO 12402-2:2006, EN ISO 12402-3: 2006, EN-ISO 12402-4:2006, or SOLAS Convention 1974, Chapter III, Regulation 7.2, and the LSA Code, sub-section 2.2.

Non-inflatable lifejackets in accordance with these Standards shall also be admissible for children. In addition, on passenger vessels, life-saving equipment shall be within reach for all shipboard personnel. For shipboard personnel not responsible for undertaking duties according to the safety rota, non-inflatable or semi-automatically inflatable lifejackets are allowed.

Individual life-saving equipment shall be available for 100% of the maximum permitted number of passengers. Non-inflatable or semi-automatically inflatable lifejackets are also allowed.

7.2.1.2 Ability to use life-saving appliances and to apply life-saving procedures for victims and own personal safety

Life-saving appliances shall be stowed on board in such a way that they can be reached easily and safely when required. Concealed storage places shall be clearly marked.

Life-saving equipment shall be inspected in accordance with the manufacturer's instructions.

Personal protective equipment, also known as PPE, is designed to protect the wearer against health and safety risks in the workplace. It includes items such as helmets, Hi-Vis clothing, footwear, safety goggles, harnesses and plenty more. It can also include the use of hearing and breathing protection, such as respirators and ear guards, for dangers that are more internal.

The regulations require that PPE should be used for shipboard duties as required and no employee should be put in any dangerous situations. It should only be used in circumstances that cannot be controlled in any other way.

Firstly, all PPE must be properly assessed before it is used in order to make sure it is fit for purpose. This means it needs to be maintained and stored properly and that the necessary instructions are provided for safe use. The crew members should get familiarised with the different types of equipment to ensure that they are using the PPE in the correct way.

Assessing PPE

The conditions in every workplace will be different, which means that a risk assessment needs to be carried out to see what PPE is required. If you are unsure, then ask your company or superior about the suitability of equipment for different tasks. In some cases, this may involve getting specialist advice from the manufacturer.

You will need to answer certain questions before making your decision. This includes whether the PPE will reduce overall risk and is it suitable to the environmental conditions? Can it be adjusted to fit the employee correctly in all situations? And if more than one item of PPE is needed, will they be compatible?

Choosing PPE

You need to make sure you are choosing PPE that is up to standard. Look for the CE mark which means it complies with the PPE Regulations from 2002. Make sure you are choosing equipment that is suitable for the person who will be wearing it. You are also required to provide adequate training in the correct use of the equipment.

Maintenance

Under the regulations you are obliged to make sure all equipment is in good working order. This includes storing it in the correct way when not being used, for example, by use of a dedicated space such as a dry, clean cupboard. Equipment should be regularly inspected for cleanliness and state of repair. Any specific repair work should be carried out by a specialist, including fitting spare parts.

PPE exists to keep us all safer at work, so having thorough knowledge of PPE is not only required by law, but helps to prevent accident and injury.

Safety organisation

According to the provisions of the European Standard laying down Technical Requirements for Inland Navigation vessels (ES-TRIN) adopted by CESNI, safety organisation on board of the inland vessels consists of: A safety rota shall be provided on board passenger vessels. The safety rota describes the duties of the crew and the shipboard personnel in the following eventualities:

- Breakdown;
- Fire on board;
- Evacuation of passengers;
- Person overboard.

Specific safety measures for persons with reduced mobility shall be taken into consideration. The crew members and shipboard personnel designated in the safety rota should be assigned their various duties, depending on the posts they occupy. Special instructions to the crew shall ensure that, in the event of danger, all doors and openings in the watertight bulkheads will be hermetically closed immediately.

The safety rota includes a safety plan, in which at least the following are clearly and precisely designated:

- Areas intended for use by persons with reduced mobility;
- Escape routes, emergency exits and muster and evacuation areas;
- Life-saving equipment and ship's boat;
- Fire extinguishers and fire extinguishing and pressurised sprinkler systems;
- Other safety equipment;
- The alarm system;
- The bulkhead doors and the position of their controls, as well as the other openings;
- Doors;
- Fire dampers;
- Fire alarm system;
- Emergency power plant;
- Ventilation system control units;
- Shore connections;
- Fuel line shut-offs;
- Liquefied gas installations;
- Public address systems;
- Radio-telephone equipment;
- First-aid kits.

The safety rota shall:

- Be duly stamped by the inspection body, and
- Be prominently displayed at an appropriate point of each deck.

Safe escape routes

Safe escape routes should be provided on board of passenger vessels, which must meet the following requirements:

- Escape routes should be maintained in a safe condition, clear of obstacles;
- Additional aids for escape should be provided as necessary to ensure accessibility, clear marking, and adequate design for emergency situations;
- Stairways, ladders and corridors serving crew spaces and other spaces to which the crew normally have access should be arranged so as to provide ready means of escape to a deck from which embarkation into survival craft may be effected.

There should be at least two means of escape, as widely separated as possible, from each section of accommodation and service spaces and control stations.

The normal means of access to the accommodation and service spaces below the open deck should be arranged so that it is possible to reach the open deck without passing through spaces containing a possible source of fire (e.g. machinery spaces, storage spaces of flammable liquids).

The second means of escape may be through portholes or hatches of adequate size and preferably leading directly to the open deck.

At least two means of escape should be provided from machinery spaces, except where the small size of a machinery space makes it impracticable. Escape should be by steel ladders that should be as widely separated as possible.

7.2.2 Organise crisis management training exercises for behaviour in emergency situations, (e.G. Fire, leakage warning, explosion, collision, "person over board" and evacuation)

7.2.2.1 Knowledge of emergency procedures

Types of emergencies

- Firefighting;
- Abandon ship;
- Man overboard;
- Engine Room Flooding;
- Cargo Hold Flooding;
- Oil spills.

Crew members should be informed of the location to which they must go on hearing the emergency signal and of their duties when they arrive at that station. The location should be well marked.

The Boatmaster should ensure that a muster list is compiled and kept up to date and that copies are displayed in conspicuous places throughout the vessel. The muster list should contain details of the general

alarm signal and other emergency signals and the action to be taken when such signals are activated. The means by which the order to abandon ship is given should also be included. The muster list should indicate the individual duties of all personnel on board and all crew members should be given written details of their own duties.

All crew members concerned should muster at a drill wearing the appropriate clothing.

The purpose of drills is to familiarise personnel with their respective duties and to ensure that they can carry out those duties in an appropriate manner. Each crew member should participate in drills in accordance with national and international requirements.

The timing of drills should be varied to ensure that crew members who because of their duties have not taken part in a particular drill, may participate in the next drill.

Crew members should receive training as soon as possible, if possible before joining the vessel, to ensure that there is no period of time when the crew member is incapable of carrying out safety-related responsibilities.

Drills often involve the whole crew but it might be preferable to confine certain drills to crew members with specific tasks.

Although drills are an essential part of emergency training, a training scheme should consist of more than just drills. Information should be given to the entire crew on saving life and instructions provided to certain crew members on the use of particular items of equipment.

7.2.2.2 Ability to instruct crew members on emergency procedures

An emergency situation on board the craft must be handled with confidence and calmness, as hasty decisions and "jumping to conclusions" can make the matters even worse. Efficient tackling of emergency situations can be achieved by continuous training and by practical drills on board craft. However, it has been seen that in spite of adequate training, people get panic attacks and eventually do not do what they should in an emergency situation.

As far as the crew member is concerned, first and foremost, he or she must be aware of the different types of emergency situations that can arise on board craft. This may help in better understanding the real scenario, and also lead to taking correct actions to save life, property, and the environment.

A brief instruction guide must be prepared and given to all the crew members on board to tackle different emergency situations, such as:

Emergency Situation Guide

All the crew members should familiarise themselves thoroughly with the Fire Training Manual and the training manual on Life Saving Appliances of the craft.

General Alarm

In case of a general alarm:

- Rush to muster station with life jacket, and act according to the craft's Muster Lists;
- Act as per the emergency explained by the in-charge officer.

Fire alarm

In case of a fire alarm:

- Inform Boatmaster / responsible crew member on watch;
- Check if it is a false or true alarm;
- Report back on findings;
- In case of fire, raise the Fire/General alarm as soon as possible. Try to stop fire and if it is not possible, muster according to the Fire Muster List.

Man Overboard signal

In case of Man Overboard Signal:

- Rush to the deck and try to locate the crew member who has fallen in the water;
- Throw lifebuoy and inform deck.

Abandon Ship Signal

In case of Abandon Ship Signal:

- Rush to the muster station;
- Carry as much rations, water, and warm clothing as you can carry;
- Act according to the vessel's Muster Lists.

Engine Room Flooding

In case of engine room flooding, the Chief Mechanical Engineer/Boatmaster should be called immediately and general alarm should be raised.
Immediate action should be taken in preventing more water to enter the engine room and Emergency bilging from the Engine Room should be established in accordance with the responsible crew member.

Cargo Hold Flooding

In case of cargo hold flooding, the Boatmaster must be informed immediately. All precaution must be taken to contain the flooding to that hold. General alarm must be raised.

Pollution prevention

In case of any oil spill/pollution immediate action should be taken according to the vessel's "Oil Pollution Prevention Plan".

Emergency Plan and Onboard Equipment should be used in case of Oil Spill. In case of any other emergency situations, call for help either by using the phone or by activating the EMERGENCY CALL. Whatever might be the situation, keep the Boatmaster informed of the situation all the time.

In the event of an accident or incident aboard or in the vicinity of your craft:

- INFORM your owner and/or manager;
- NOTIFY the local correspondent;
- INVESTIGATE the accident or incident;
- COLLECT and retain any evidence or documentation;
- ASK witnesses to write down what happened;
- KEEP detailed records of all relevant facts;
- TAKE photographs wherever possible.

On board the vessels, one very important task is to communicate and alert each and every passenger and crew members of the situation and dictate the necessary steps and instructions to be followed.

Any miscommunication or lack of communication can have disastrous ramifications. Hence these systems also form a part of life-saving equipment. All vessels are fitted with general alarm systems so as to alert and summon the crew to their fire stations or boat stations.

Passenger vessels are to be equipped with public address systems. Communication systems also include Portable Very High Frequency (VHF) Radios (commonly referred to as walkie-talkies) and are provided for emergency crew communications.

All passenger vessels shall have internal communication facilities according to Article 7.08, of ES TRIN. Such facilities shall also be available in the service rooms and, where there is no direct communication from the steering position, in the access and muster areas for passengers.

All passenger areas shall be reachable via a loudspeaker system. The system shall be designed in such a way as to ensure that the information transmitted can be clearly distinguished from background noise. Loudspeakers are optional where direct communication between the wheelhouse and the passenger area is possible.

The vessel shall be equipped with an alarm system. The system shall include:

- An alarm system enabling passengers, crew members and shipboard personnel to alert the vessel's command and crew.

This alarm should be given only in areas assigned to the vessel's command and to the crew; it should only be possible for the vessel's command to stop the alarm. The alarm shall be capable of being triggered from at least the following places:

- In each cabin;
- In the corridors, lifts and stairwells, with the distance to the nearest trigger not exceeding 10 m and with at least one trigger per watertight compartment;
  - In lounges, dining rooms and similar recreation rooms;
  - In toilets, intended for use by persons with reduced mobility;
  - In engine rooms, galleys and similar rooms where there is a fire risk;
  - In the cold-storage rooms and other store rooms.
- An alarm system enabling the vessel's command to alert passengers.

This alarm shall be clearly and unmistakably audible in all rooms accessible to passengers. It shall be capable of being triggered from the wheelhouse and from a location that is permanently staffed;

- An alarm system enabling the vessel's command to alert the crew and shipboard personnel.

The alarm system shall also reach the recreation rooms for the shipboard personnel, the cold-storage rooms and other store rooms.

Alarm triggers shall be protected against unintentional use.

7.2.2.3 Ability to organise periodic training of the crew on board the vessel in preparation for an emergency situation including organisation of fire fighting and abandon craft drills

A fire on board may happen in every vessel and has to be managed not only successfully, but also quickly, in order to prevent greater damage or even loss of vessel and crew, which could happen if the fire spreads.
A muster drill, sometimes referred to as a lifeboat drill or a boat drill, is an exercise that is conducted by the crew of a vessel prior to embarking on a voyage. Effective action is only possible if pre-planned and practical procedures have been developed and are frequently exercised. The practical procedures prescribe various operating and training procedures designed to cope with emergency situations or to prevent such situations occurring. A muster drill prepares passengers for safe evacuation, in the event of an emergency on board the vessel, and familiarises the crew and the passengers with escape routes. EMERGENCY.

This may include:

- Being informed of the different response procedures in all areas along the route;
- Ensuring that if an incident occurs, it is properly and rapidly assessed by people knowledgeable in responding to incidents;
- Ensuring that proper emergency instructions are carried on board the vessel;
- Facilitating a prompt response by the vessel owner and crew in the emergency situation based on practice and experience, with the following objectives.

Fire on board is one of the most dangerous emergencies for a vessel. Establish procedures to IDENTIFY potential vessel board emergency situations. The general emergency signal is a signal used on board vessels in times of emergency.

Abandon vessel drills and fire drills are covered by the provisions on occupational health on board vessel and must be planned, arranged and carried out in a way that is in every respect reasonable from a safety and health perspective.

Musters, lifeboat and firefighting drills, and drills prescribed by national laws and regulations and by international instruments must be conducted in a manner that minimises the disturbance of rest periods and does not induce fatigue.

Maintenance of safety equipment

Check and maintain the equipment in accordance with the manufacturer's instructions, while observing all necessary precautionary measures. It is important to pay attention to the condition of the equipment and, not least, to abnormal conditions of wear and tear or corrosion, of which the Boatmaster must be notified immediately.

Importance of training

Drills should be carried out at reasonable speed. During drills, emphasis should be placed on learning so that everybody becomes familiar with their functions and with the equipment, so that among other things, they will be able to take appropriate action in an emergency situation.

If necessary, breaks should be held to explain especially difficult elements of drills.

For example, the crew's experience is decisive for how fast a drill or certain drill elements should be carried out.

Arrangement of drills

The drills should be, to as great an extent as possible, carried out as if there were an actual emergency. This means that the entire drill should, as far as possible, be carried out. The point is that, at the same time, it must be ensured that the drill can be held in a way that is in every respect reasonable from a safety perspective. Consequently, the elements of the drill that may involve an unnecessary risk demand special attention.

Fire drills have given rise to accidents, and for this reason, elements involving an unnecessary risk should be left out of such drills. Here are a couple of examples:

- When watertight doors are closed, there might be a risk of persons getting jammed in the doors that are closing at great force. For this reason, watertight doors should not be closed by means of remote control during drills;
- The remote release of fire doors can also involve a risk of personal injury. Before fire doors are remotely released, a warning hereof should, insofar as possible, be announced by the public address system;
- Some vessels are provided with an arrangement for the recovery of a hoist stretcher, for example from the pump room. Training of the recovery of a hoist stretcher should be carried out without persons on the stretcher. A similar load can be used instead;
- Reduced visibility caused by smoke can, for example, be simulated by darkening the glass of the smoke-helmet. This makes it possible for a person who can see to walk next to the firefighter with reduced visibility and take action if he/she is about to get into difficulties.

Man overboard recovery presents some difficult issues. The first problem is that of locating the casualty and the second is that of recovering him/her. If the casualty is seen to fall overboard or is subsequently located, it is vital that as many persons as is practically possible are detailed to continuously visually observe the position of the person overboard. Once the casualty has been found or if seen to fall overboard the location can be marked with a lifebuoy.

Practice has shown that different man overboard manoeuvres may be required depending upon the situation prevailing and the type of vessel involved.

Actually recovering a person from the water is usually achieved by use of a lifeboat. In some conditions practiced and skilled crew members may use the lifeboat to recover the casualty. The condition of a man overboard casualty will depend on a number of factors including how they have responded to the "cold shock", what they are wearing and how long they have been in the water. They must be rescued with great care or their condition may worsen considerably. Getting the person on board can be difficult, particularly if the casualty is unconscious or otherwise unable to help him-/herself.

If there is no specific recovery equipment a short strap can be quickly made from a length of rope and a parbuckle can be improvised using ropes or nets.

If possible the casualty should be recovered horizontally rather than vertically, particularly if they have been in the water for some time.

7.2.3 Give instructions related to fire prevention, personal protective equipment, methods, firefighting material, respirators and possible application of these devices in emergencies

7.2.3.1 Knowledge of applicable fire prevention laws and regulation on the use of tobacco and possible ignition sources

Causes of fire

Smoking and naked lights

Careless smoking tops the list of causes of fire. Smoking is a deep-seated habit and as such people not only tend to smoke without any regard to circumstances or location but they may also be careless with regard to the safe disposal of lit cigarettes, cigars, pipe tobacco and matchsticks.

The temperature of a burning cigarette is about 500oC. Thus glowing ashes and tobacco contain enough heat to start a fire in such materials as dunnage, paper, cardboard, cordage, linen and bedding.

If a person is tired after a busy day and smoking in bed, a smouldering fire can result if the glowing tobacco touches the bedding. The resulting smoke will most certainly cause drowsiness and possibly suffocation or asphyxiation of this person before the fire is discovered.

A person who has been drinking alcohol as well as smoking tends to be careless and has to be observed carefully by other crew members so that his/her careless actions do not jeopardise the safety of crew and vessel.

Thus open flames, glowing embers and smoke can prove dangerous as well as unhygienic.

Smoking is therefore permitted on board a ship, only in designated smoking areas. These areas must be identified and clearly marked as such. In port, shore personnel boarding vessel for various works should be apprised of shipboard smoking regulations as well as locations of designated smoking areas on board.

Safety matches and/or cigarette lighters must never be carried on person outside ship's accommodation. Many terminals expressly forbid smoking or even carrying on person of matchboxes and/or cigarette lighters, around their premises.

Spontaneous combustion and auto ignition

Some materials when damp or soaked with paints or oils of vegetable origin in particular can ignite without external application of heat.

Auto ignition temperature of a material is the temperature at which a flammable material will ignite without initiation of a spark or flame.

Spontaneous combustion is the process of gradual increase in temperature of a material as a result of oxidation, without drawing any heat from its surrounding. This process finally results in ignition of the material concerned.

Lagging on steam pipes or cotton rags if soaked with oils and or paints and stocked in a warm area without ventilation is prone to spontaneous combustion. This oil begins to oxidise and produces heat in the process. This heat causes the remaining oil to oxidise faster and produce still more heat that will start building up around the rag. This in turn will ignite any other flammable substance resulting in a major fire.

Petroleum liquids when heated sufficiently will ignite without the application of a naked flame. When fuel or lube oil under pressure sprays onto a hot surface, it will get hotter and will auto ignite as a result.

Electrical circuits and electrical equipment

Electricity is a safe and convenient source of power if the equipment concerned is properly insulated and wired. If worn out, misused or poorly wired electrical energy is converted into heat and the equipment concerned becomes a source of ignition and thus a fire hazard.

Only approved electrical equipment for shipboard use that will stand the strenuous conditions are installed and/or used on board a vessel. Any electrical equipment on board must be installed, maintained, tested and repaired in accordance with existing regulations and only by qualified personnel.

Radio transmitting antenna

During medium and high frequency radio transmission, significant energy is radiated which can induce an electrical potential capable of producing an incentive spark, in unearthed receivers within 500 m range from transmitting antennae. In case antenna insulators have a surface coating of salt, dirt or water, high or medium frequency transmission can cause arcing. Low energy transmissions such as satellite communication or use of

UHF/VHF communication is not considered dangerous. All stays, cranes, derricks and fittings must be earthed. During cargo loading/transfer/discharge, cargo tank washing, cargo tank purging operations, MF-HF transceiver to be switched off.

Properly sited radars do not present any ignition hazard on board a vessel but use of ship's 10 cm radar is capable of including an electrical potential into nearby conductors ashore.

Flammable liquids used on board vessels

Most commonly found on board are bunker fuels, lube oils of various grades, diesel oils, kerosene, paints and thinners. For some flammable liquids, the rate of vapour release is over a wide temperature range e.g. gasoline gives off vapour even at minus 43 °C thus proving itself a continuous fire hazard.

Heating increases the rate of vapour release. This vapour is heavier than air, will seek low places and can spread to a distant source of ignition and dissipate slowly.

Bunker fuels and lube oils must be heated to release sufficient vapour for combustion. But once a light or heavy flammable liquid is burning, radiation feedback and the chain reaction quickly increase flame production.

Classes of fire

Class A

Class A fires are fires in ordinary combustibles such as wood, paper, cloth, trash and plastics. These solid substances are mainly of organic origin and contain carbon and its compounds.

Irrespective of the causes of ignition, a class A fire burns solid fuel. It can be extinguished either by water, foam or multi-purpose dry chemical powder. However, for complete extinguishment, class A fires should be entirely cooled down below the ignition temperature of the burning substance.

Class B

Class B fire refers to a fire involving flammable liquids such as petroleum (gasoline, kerosene, petrol, diesel, octane, etc.), paint, alcohol, solvent, oil and tar, etc. that normally do not leave any embers or residues (or very low amounts of residues). Most of these liquids have high carbon content and the compounds in them and are highly combustible.

A class B fire does not leave embers or ashes and can be best extinguished by providing a wall between the fuel and the oxygen, a technique known as smothering. The most effective extinguishing agent against a class B fire is foam. However, the type of foam to be used depends on whether it is water soluble or hydrocarbon.

A small class B fire can also be extinguished by multipurpose dry chemical powder or by water mist that can effectively cool the fire. Re-ignition may also occur if the sources of heating the substance (above the ignition temperature) are not removed. One should never use water stream on a class B fire as it helps to spread the fire since these liquids are lighter than the water.

Class C

Class C fires include flammable gases such as propane and butane.

Class C fires do not include fires involving cooking oils and grease. These gases are highly combustible and may cause large scale fires and explosions if mixed with enough oxygen.

A class C fire does not leave embers or ashes and can be best extinguished by dry chemical powder and CO_2. Before trying to extinguish a class C fire, the source of the gaseous substance must be found and cut off. This could be by closing the valve of the gas containing cylinder. A spark in the presence of any of these gasses, with the required amount of oxygen, may also cause an explosion.

Class E

These fires can be a severe hazard to firefighters using water or other conductive agents, as electricity may be conducted from the fire, through water, to the firefighter's body, and then earth. Electrical shocks have caused many firefighter deaths.

Electrical fire may be fought in the same way as an ordinary combustible fire, but water, foam, and other conductive agents are not to be used. While the fire is or possibly could be electrically energised, it can be fought with any extinguishing agent rated for electrical fire. Carbon dioxide CO_2, NOVEC 1230, FM-200 and dry chemical powder extinguishers such as PKP (Purple-K) and even baking soda are especially suited to extinguishing this sort of fire. PKP should be a last resort solution to extinguishing the fire due to its corrosive tendencies. Once electricity is shut off to the equipment involved, it will generally become an ordinary combustible fire.

Class D

Class D fires are fires in combustible metals such as potassium, sodium, aluminium, and magnesium.

Metal fires represent a unique hazard because people are often not aware of the characteristics of these fires and are not properly prepared to fight them. Therefore, even a small metal fire can spread and become a larger fire in the surrounding ordinary combustible materials. Certain metals burn in contact with air or water (i.e. sodium), which exaggerate this risk.

Care must be taken when extinguishing metal fires. Water and other common firefighting agents can excite metal fires and make them worse.

The most common agents are sodium chloride granules and graphite powder. In recent years, powdered copper has also come into use. These dry powder extinguishers should not be confused with those that contain dry chemical agents. The two are not the same, and only dry powder should be used to extinguish a metal fire. Using a dry chemical extinguisher in error, in place of dry powder, can be ineffective or actually increase the intensity of a metal fire.

Class F

Class F fires are fires in cooking oils and greases such as animals fats and vegetable fats. Class F fires involve unsaturated cooking oils in well-insulated cooking appliances located in commercial kitchens.

Though such fires are technically a subclass of the flammable liquid/gas class, the special characteristics of these types of fires, namely the higher flash point, are considered important enough to recognise separately. Water mist can be used to extinguish such fires. Appropriate fire extinguishers may also have hoods over them that help extinguish the fire. Sometimes fire blankets are used to stop a fire in a kitchen or on a stove.

7.2.3.2 Ability to comply with relevant regulations on fire detection systems; fixed and mobile fire extinguishing equipment and related appliances e.g. pumping, rescue, salvage, personal protective and communication equipment

Fire detection systems are a vital part of the firefighting systems on most vessels. Fire detectors are designed to provide a visible and audible alarm on the vessel to indicate the location of a fire. The detectors throughout the vessel are wired to a fire control panel that provides visual and auditory alerts and possibly alarms in other parts of the vessel as well.

When tripped, detectors send a signal to the fire control panel in a location manned around the clock, usually on the bridge. There may also be fire alarm panels in other manned spaces, such as the engine room or the gangway, which may be the only manned spaces at times when the vessel is in port.

Depending on the type of fire control system, the alarm signal may generate an automatic activation of the fire suppression system, but most often the alarm will be investigated before the crew activates the suppression devices.

Some types of detectors may sense a rapid rise in temperature in a brief period of time, for instance in a reefer flat or the engine room. In some installations, the automatic detector and fire suppression system are one unit, such as a sprinkler head that starts spraying water or foam when the temperature rises enough to set off the detector.

The manual side of the system is pull boxes, similar to those found in schools and other buildings. Any crew member sighting a fire can pull the handle and activate the alarm.

There are five common technologies used for fire detection on vessels. Infrared flame detection reacts to infrared radiation emitted by flicking flames. The photoelectric smoke detector reacts to visible, mainly light coloured smoke that generally occurs during early stages of slow smouldering fires. The ionisation smoke detector responds to visible products of combustion during the early stages of a small smouldering fire prior to an increase in temperature. Engine rise and overheat detectors respond to an abnormal increase in temperature.

The detection system selected will depend on the mission of the particular vessel, based on conversations with both the owner and the builder. It could also be that more than a single detection system might be required.

Most fire alarms are investigated by crew members before the fire suppression system is activated, due to the incidence of false alarms.

With improvements in technology over the years, most false alarms today are an indication of a lack of maintenance or other issues. It doesn't matter how well designed the detector is, if it gets blocked by improper loading, or if the sprinkler is not covered during painting or other work and it gets blocked, it can have a negative effect on the alarms going off. A good preventive maintenance program will handle the false alarms.

Vessels often use a mix of automatic and manual stations. An intelligent fire detection system's loop is integrated with a manual call point, which digitally signals to the indicating equipment.

While fire-detection system technology is slow to change, one innovation has been the development of addressable fire control panels. Basically, an addressable system can be configured to indicate where an alarm is located, such as the galley, a stateroom or the engine room. The alarm panel displays the name of the location where the alarm is sounding.

In a non-addressable system, the alarm panel indicates location by number. The crew must memorise the locations or consult a list to translate the alarm number to a location on the vessel.

The addressable system is designed to give more information to the crew faster.

Extinguishing equipment

Water extinguisher

Signal Red

Best for: Fires involving organic solid materials such as wood, cloth, paper, plastics, coal, etc.
Danger: Do not use on burning fat or oil or on electrical appliances.
How to Use: Point the jet at the base of the flames and keep it moving across the area of the fire. Ensure that all areas of the fire are out.
How it Works: Water has a great cooling effect on the fuel's surface and thereby reduces the pyrolysis rate of the fuel.

Water spray extinguisher (water with additive)

Signal Red

Best For: Fires involving organic solid materials such as wood, cloth, paper, plastics, coal. etc. These offer significantly improved firefighting capability compared to traditional jet type water fire extinguishers.
Danger: Do not use on burning fat or oil or on electrical appliances.
How to Use: Point the jet at the base of the flames from a safe distance of approx. 3 m and keep it moving across the area of the fire. Ensure that all areas of the fire are out.
How it Works: Water has a great cooling effect on the fuel's surface and thereby reduces the pyrolysis rate of the fuel. Instead of a jet nozzle a spray nozzle is used, with a higher pressure, which creates a fine spray. This allows for a given quantity of water to have a considerable increase in the surface area presented to the fire. This makes extinguishing more efficient by more rapid extraction of heat, formation of steam, etc. They can also contain surfactants which help the water penetrate deep into the burning material which increases the effectiveness of the extinguisher.

Water mist extinguisher ("dry" water mist)

Signal Red on a White Background

Best For: The first broad spectrum extinguisher to tackle A, B, C rated risks as well as fats and deep fat fryers (Class F). Models with dielectric test to 35k Volts can be safely used on electrical fires (up to 1000 Volt) if a safety distance of 1 m is adhered to, as their mist (de-ionised water) does not conduct electricity and the extinguisher does not normally form puddles, which could conduct electricity.
How to Use: Point the jet at the base of the flames from a safe distance of approx. 3 m and keep it moving across the area of the fire. Ensure that all areas of the fire are out. The fire draws the microscopic water particles into the fire.
How it Works: Water is turned into microscopic particles in the supersonic nozzle. The water mist is drawn to the fire where it cools and suffocates the fire. The mist also forms a safety barrier between user and fire, which keeps some of the heat back.

CO_2 portable fire extinguishers

Signal Black

Best For: Live electrical equipment, although it allows re-ignition of hot plastics. Now mainly used on large computer servers, although care has to be taken not to asphyxiate people when using the extinguisher in small server rooms.
Danger: Do not use on chip or fat pan fires, as it can carry burning fat out of the container. This type of extinguisher does not cool the fire very well and you need to ensure that the fire does not start up again. Fumes from CO_2 extinguishers can asphyxiate if used in confined spaces: ventilate the area as soon as the fire has been controlled. Only use CO_2 extinguishers with frost-free horns, as the hand holding the horn can otherwise be frozen to the horn, as the gas gets very cold during the discharge. How to Use: The discharge horn should be directed at the base of the flames and the jet kept moving across the area of the fire. Recommended distance of use 2 m.
How it Works: Carbon dioxide extinguishers work by suffocating the fire. Carbon dioxide displaces oxygen in the air. However, once discharged, the CO_2 will dissipate quickly and allow access for oxygen again, which can re-ignite the fire.

Foam portable extinguishers

Signal Cream

Best For: Fires involving solids and burning liquids, such as paint and petrol but not suitable for chip or fat pan fires.
Danger: Do not use on chip or fat pan fires, electrical fires.
How to Use: For fires involving solids, point the jet at the base of the flames and keep it moving across the area of the fire. Ensure that all areas of the fire are out. For fires involving liquids, do NOT aim the jet straight into the liquid. Where the liquid on fire is in a container, point the jet at the inside edge of the container or on a nearby surface above the burning liquid. Allow the foam to build up and flow across the liquid. Use from a safe distance of approx. 3 meters.
How it Works: They are mainly water based, with a foaming agent so that the foam can float on top of the burning liquid and break the interaction between the flames and the fuel surface.

Powder extinguisher multi-purpose

Signal Blue

Danger: Safe on live electrical equipment, although does not penetrate the spaces in equipment easily and the fire may re-ignite. This type of extinguisher does not cool the fire very well and care should be taken that the fire does not flare up again. Smouldering material in deep seated fires such as upholstery or bedding can cause the fire to start up again. Do not use on domestic chip or fat pan fires. There is danger of inhalation if powder extinguishers are used within buildings. Due to this, and the potential for powder to impair vision, powder extinguishers are no longer recommended for use within enclosed spaces.

How to Use: Point the jet or discharge horn at the base of the flames and, with a rapid sweeping motion, drive the fire towards the far edge until all the flames are out. If the extinguisher has a hand control, wait until the air clears and if you can still see the flames, attack the fire again. Recommended safe distance 3-5 m.

How it Works: Similarly to almost all extinguishing agents the powder acts as a thermal ballast making the flames too cool for the chemical reactions to continue. Some powders also provide a minor chemical inhibition, although this effect is relatively weak. These powders thus provide rapid knockdown of flame fronts, but may not keep the fire suppressed.

Chemical extinguisher

Signal Canary Yellow

Best For: Wet chemical fire extinguishers are ideal for Class F fires, involving cooking oils and fats, such as lard, olive oil, sunflower oil, maize oil and butter.

Danger: Check manufacturer's instructions for suitability of use. These extinguishers are usually not recommended for class B fires such as petrol.

How to Use: Apply the wet chemical using the extended applicator in slow circular movements, which gives a gentle, yet highly effective application. Apply the fine spray onto the burning fat until the surface of the burning cooking oil changes into a soapy like substance which prevents re-ignition. The gentle application helps to prevent burning oil splashing out of the container. Make sure that you empty the entire content of the wet chemical extinguisher onto the oil/fat, as the fire can re-ignite otherwise.

How it Works: Most class F extinguishers contain a solution of potassium acetate, sometimes with some potassium citrate or potassium bicarbonate. The extinguishers spray the agent out as a fine mist. The mist acts to cool the flame front, while the potassium salts saponify the surface of the burning cooking oil, producing a layer of foam over the surface. This solution thus provides a similar blanketing effect to a foam extinguisher, but with a greater cooling effect. The saponification only works on animal fats and vegetable oils, so most class F extinguishers cannot be used for class B fires. The misting also helps to prevent splashing the blazing oil.

Use of fire extinguishers

Even though extinguishers come in a number of shapes and sizes, they all operate in a similar manner. Here's an easy acronym for fire extinguisher use:
PASS: Pull, Aim, Squeeze, and Sweep.
General instructions for use:

- Before using the fire extinguisher, ensure you have selected the correct extinguisher for the class of fire that you intend to fight;
- Ensure that you are positioned between the fire and a safe exit or escape route. Pull out safety pin firmly (this will be held in by an anti-tamper seal device);
- Apply the powder rapidly sweeping in bursts across the flame front and/or sweeping up the flames - keeping out of the smoke & powder;
- If the fire is not out upon complete emptying of the extinguisher's contents, then leave immediately by a safe route from the building, closing all doors behind you.

Understanding the different types of fire is usually a good way to understand which type of fire extinguisher one should use. It is essential to understand which extinguisher works, because the 'one size fits all' approach may endanger lives. The extinguishers are often colour coded to ensure people are able to identify which ones should be used where. The colours are Signal Red, Signal Red on a White Background, Blue, Cream, Black, and Canary Yellow.

Before you tackle a fire

Many people put out small fires quite safely. However, some people die or are injured by tackling a fire which is beyond their capabilities. Here is a simple fire code to help you decide whether to put out or get out:

- Only tackle a fire in its very early stages;
- Always put your own and other people's safety first;
- On discovering the fire, immediately raise an alarm;
- Make sure you can escape if you need to and never let a fire block your exit;
- If you cannot put out the fire or if the extinguisher becomes empty, get out and get everyone else out of the space immediately, closing all doors behind you as you go.

Preparation prior to a fire or incident is vital.
The responsible person and crew members must learn the basic procedures indicated on the Station Bill and any special procedures to cover special loads or hazards. Intimate knowledge of the ship's facilities shown on the ship's fire safety plan is essential to control the fire in the early stages.

The crew must be fully aware of their tasks and use of their equipment and it must be tested during a fire drill.

All the equipment used in controlling a fire must be in a perpetual state of readiness, from the ventilation controls through to the batteries fully charged in the lamps - everything is important.

The crew members of the vessel are required to have basic skills and competence for efficient intervention in case of fire.

These requirements are as follows:
- Use of various portable fire extinguishers;
- Use of BA (breathing apparatus);
- Extinguishing smaller fires, electrical, oil, etc.;
- Extinguishing fires using jet and spray nozzles with water;
- Extinguish fires using foam, powder and chemical agents;
- Entering and passing through a compartment with high expansion foam using no Breathing Apparatus;
- Fighting fires in enclosed spaces using Breathing Apparatus;
- Use fog or steam for fire suppression.

Personal protective equipment

The personal protective equipment consists of:
- Protective clothing;
- Boots;
- Rigid helmet;
- Electric safety lamp;
- Axe;
- Safety harness;
- Safety lines.

The protective clothing is to be used to protect from heat radiated from a fire and should be used in close proximity to a fire.

Do not use the protective clothing in a fire – they are not fire entry suits.

The boots shall be of electrical non-conducting materials.

The helmet shall provide effective protection against impact.

The helmet shall be supplied with a full-face visor and a neck curtain.

The safety lamp is operated by batteries, which shall have a duration of at least three hours. The safety lamps shall be of an approved type and shall be electrically safe (on tankers) or explosion proof(if intended to be used in a hazardous atmosphere or area).

Fire blankets are made of fire resistant materials. They are useful for smothering small pan fires or for wrapping round a person whose clothing is on fire.

Fire blankets should generally be disposed of after use.
Best For: Small pan fires where oil or fat has caught fire and clothing fires.
Danger: If the blanket does not completely cover the fire, it will not be able to extinguish the fire.
While kite marked fire blankets have been successfully tested on deep fat fryers, modern frying fats are difficult to extinguish with a fire blanket. We therefore recommend wet chemicals for deep fat fryers.
How to Use: Place carefully over the fire. Keep your hands shielded from the fire. Do not waft the fire towards you. Make sure that you remove the heat source.
How it Works: Smothers the fire and prevents oxygen getting to the fire.

Breathing apparatus

Safety instructions when using breathing apparatus

A breathing apparatus wearer brings him- or herself in potentially dangerous situations.

Smoke and heat can make tasks difficult and they may also have to deal with stressful situations such as searching for casualties, which increases the problems.

A BA-wearer must act decisively but be able to recognise dangerous situations and act accordingly.

Your own safety and the safety of your body is of the utmost importance.

In order to increase safety it is important, when working with BA, to act and work according to predefined and well trained procedures. Procedures are developed for:
- Donning of the face mask;
- The use and control of the face mask;
- Replacing the cylinder.

Preparing breathing apparatus sets (BA-sets) for storage

By preparing the BA-sets in the fire station the first step for a swift intervention is made.

By preparing in advance we can prevent loss of time for a BA-team to be ready. The BA-team can assume that all the equipment is prepared and has been checked to ensure that the cylinders are full. When preparing the BA-sets it is important that a number of actions are carried out.

First the cylinder, backpack and mask must be checked for visual flaws. After this visual inspection the cylinder is mounted on the backpack. By opening the valve on the cylinder the pressure in the cylinder can be checked (pressure gauge) and the system can be checked for leakages. If no problems are found, the valve can be closed.

The system is still under pressure and the next test that can be executed is the testing of the alarm signal (whistle). To do this the air in the system should be released very slowly.

As soon as the pressure in the system is lower than 55 bars the alarm signal will be activated.

The next procedure is adjusting the carrying straps on the backpack to the maximum.

The facemask must be packed in a plastic bag and when dealing with a strap mask the straps must be loosened to the maximum. The BA-sets are now ready to use and can be stored in the fire station.

Preparing BA-sets for use

In case of an incident the fire team must wear BA as soon as possible in order to be ready for duty. Preparing always takes place in a safe environment.

Use of breathing apparatus

Upon donning the BA-set it is possible that the fireman's outfit becomes disarranged. The collar on the helmet may cause problems so in order to protect the fire team members it is important that clothing is checked and where necessary adjusted. Now the plastic protection bag can be removed from the mask and the straps of the mask should be adjusted to the maximum. The mask is hanging around the neck with the carrying strap until the wearer goes into action. Previous to an action the mask is placed on the face and the regulator is clicked onto the mask.

Breathing apparatus & working in a hot, humid environment

The connection of the regulator onto the mask needs to be checked. Finally the helmet is placed on the head, the collar is closed and the gloves are put on. When necessary, supplementary clothing can be donned. Due to the fact that it is essential that the fire team is fast but properly dressed operationally, it is wise to use a "dress man" (with enough personnel available).

A dress man is a person who can help members of a fire team when dressing up and preparing for an action.

Emergency Escape Breathing Devices (EEBD)

In addition to the escape route, the vessels shall be provided with EEBD. Within the accommodation spaces at least two EEBD shall be stored with the rescue party equipment. In machinery spaces the EEBD shall be positioned at the foot of the ladders in the engine room and in control rooms, workshops, etc. in sufficient numbers for the personnel normally present in that area. At least one spare EEBD shall be carried.

The EEBD must not be used for firefighting, entering oxygen deficient enclosed spaces but may be used only for escape from a compartment in the event of an emergency.

All vessels shall be provided with a training unit which crew members must be made familiar with during drills. The training unit shall be clearly marked to this effect.

The EEBD will have autonomy for at least 10 minutes.

7.2.3.3 Ability to control the monitoring and maintenance of fire detection and extinguishing systems and equipment

Maintaining reliability throughout the entire lifecycle of a fire alarm system involves three distinct and equally important tasks which must be performed on a periodic basis:

- Visual inspections;
- Functional testing; and
- Maintenance activities.

Many overlook the need to visually inspect the fire system and concentrate only on the functional testing of the components. However, each of these tasks is necessary and contributes to the assurance of a fire system that is ready to perform in the case of a fire.

Periodic Visual Inspections

Fire inspection and testing

A periodic inspection is a visual examination of the equipment to verify that nothing has changed from the initial design and installation that would affect its performance. Those charged with performing an inspection should be looking for a number of conditions which might affect the system's ability to perform when called upon. A proper visual inspection should consider whether building modifications or occupancy changes would have an impact. A fire alarm strobe light designed and located to disperse light throughout an entire room may now be ineffective due to a reconfigured floor plan. Another important consideration is a change in environmental conditions. Increased cooling systems to support greater heat loads might be producing airflow rates impacting the need to adjust the design spacing of the ceiling smoke detectors. Building owners should also ensure that a visual inspection of the equipment includes identification of changes such as physical obstructions, device orientation, physical damage, degree of cleanliness and any other obvious problem that may not be indicated by the control panel automatically through electrical supervision.

Periodic Testing

Periodic testing is intended to validate the functionality of the fire protection system. Tests are performed by operating each component of the system to assure it

performs as required in the case of an actual emergency event. A simple example of this sort of testing is to pull the lever of each Manual Fire Alarm Pull Station to ensure it performs as intended and initiates the required alarm condition. A proper testing programme should also include testing the operation of all Emergency Control Functions in the system such as elevator recall or HVAC shutdown. The standards in this field require these functions to be tested at the same frequency as the device which initiates the action. For instance, if corridor smoke detectors activate the closure of fire doors, then this function must be tested annually to match the testing requirement of the smoke detector. Beyond just a simple functional test, the test method for many components may also involve the use of calibrated test equipment. One example of this is a duct smoke detector used to control the spread of harmful smoke. A proper test of this device not only must verify smoke will initiate an alarm, but also that the airstream of the ductwork is effectively being sampled. So in addition to the functional smoke entry test for the smoke detector, a pnumometer is used to measure the airflow from the sampling tube. This measurement is then compared to the acceptable range published in the manufacturer's instructions to determine if the device is performing as designed.

Maintenance

Maintenance is the work necessary to keep the fire system operating properly. One form of maintenance is simply a response to a failure identified by a visual inspection or a test of the equipment. Service personnel should notify the system owner immediately whenever deficiencies are found during routine inspection and testing procedures. Considering the fact that life safety and/or mission continuity may be at risk, repairs should be made as soon as feasibly possible by qualified personnel. Whenever repairs are not made immediately, a temporary alternative means of protection should be put in place until the fire system is returned to an acceptable level of readiness. Another important form of maintenance is of a preventative nature. Many components in a fire protection system will require preventative maintenance at a prescribed frequency.

These maintenance activities address components that degrade over time, have a finite lifespan or require periodic resetting or calibration. For example, most fire alarm systems utilise lead-acid type batteries as a secondary (backup) power supply. Although the existing standards require routine testing to verify voltage levels are at an acceptable level, a preventative maintenance requirement exists requiring their replacement at 5 years from the date of manufacture. Another important preventative maintenance task involves regular cleaning of smoke detectors. Typically the detector manufacturer's published instructions will provide both the recommended frequency and method for cleaning, but consideration should be given to adjusting these based on the environment where they are located.

Monitor a fire extinguisher

Examine the extinguisher for obvious physical damage, corrosion, leakage, or clogged nozzle. Confirm the pressure gauge or indicator is in the operable range or position, and lift the extinguisher to ensure it is still full. Make sure the operating instructions on the nameplate are legible and facing outward.

Portable fire extinguishers are oftentimes our first line of defence against small fires and chances are you aren't too far from one right now. Like any lifesaving equipment you want to ensure that it is operable at all times so it will work when you need it most. With proper inspection, testing and maintenance protocols fire extinguishers can be long lasting, reliable options for combating a small fire early on.

The requirements are broken down into three different sections on **inspection, maintenance and testing.**

Inspection Procedures

Performing an inspection is the easiest thing you can do to ensure your extinguisher can be used reliably and effectively in an emergency. At a minimum, inspection needs to consist of the following steps:

- Make sure it is located in its designated place;
- Make sure the extinguisher is visible or that there is signage indicating where the extinguisher is located;
- Make sure you can easily access the extinguisher;
- Ensure the pressure gauge is in the operable range or position;
- Make sure it is full, this can be done by just lifting the extinguisher or you can weigh it;
- For wheeled extinguishers, make sure the condition of tires, wheels, carriage, hose, and nozzle are acceptable;
- For non-rechargeable extinguishers, operate the push-to-test pressure indicators.

Qualifications

You are not required to be certified in order to perform an inspection; any knowledgeable, competent person should be able to do it.

Frequency

The standard requires extinguishers to be inspected when they are initially installed and once a month after that. You should inspect extinguishers more frequently if they are installed in locations where they are more prone to rust, impact or tampering.

Record keeping

Records of the monthly inspections need to be maintained by either putting a tag or label on the extinguisher or by having it recorded on paper or electronic files. The following items need to be recorded:

- The month and year of the inspection;
- The person conducting the inspection.

These records need to be maintained for at least 12 months.

Maintenance Procedures

Maintenance procedures must include the procedures detailed in the manufacturer's service manual and a thorough examination of the basic elements of the fire extinguisher, including the following:

- Mechanical parts of all fire extinguishers;
- Extinguishing agent;
- Expelling means;
- Physical condition.

This is completed by doing an external examination. An internal examination can also be required as part of your maintenance. Details on how to do an internal examination are located in your fire extinguisher service manual.

Qualifications

Maintenance needs to be performed by a certified person.

Frequency

Fire extinguishers need to have an external maintenance examination conducted on a yearly basis, at the time of hydrostatic test, or when specifically indicated by an inspection discrepancy. Extinguishers need to have an internal examination conducted at anywhere from 1-6 year intervals depending on the type of extinguisher.

Record keeping

Each fire extinguisher shall have a tag or label securely attached that indicates that maintenance was performed. The tag or label needs to identify the following:

- Month and year maintenance was performed;
- Person performing the work;
- Name of the agency performing the work.

Extinguishers also need a verification-of-service collar located around the neck of the container if an internal examination was conducted. That collar needs to have:

- Month and year the work was performed;
- Name of the agency performing the work.

Hydrostatic Testing Procedures

A hydrostatic test always begins with an internal and external examination of the extinguisher as described in the maintenance section. The extinguisher then has many of its components removed so it is stripped down to pretty much just the shell and hose and is filled with water at a certain pressure for a certain time. The extinguisher must then be completely dried to get rid of all of the water and is then reassembled and recharged. If there is any leakage, distortion or permanent moving of couplings the cylinder fails the hydrostatic test and it must be condemned.

Qualifications

People who do hydrostatic testing need to know what they are doing because it can be dangerous if performed incorrectly. They need to be trained, certified, and have the correct equipment and facility to perform the testing.

Frequency

Like internal maintenance, hydrostatic testing is done at different intervals based on the type of extinguisher you have.

Record keeping

For low pressure cylinders a label is required to be attached to the extinguisher. It needs to contain:

- The name of the person conducting the test
- The date of the test
- The pressure at which the test was performed

For high pressure cylinders the tester's identification number and the date must be stamped onto the shoulder, top, head, neck or foot ring.

7.2.3.4 Ability to instruct crew and shipboard personnel to apply safe working rules and to maintain personal protective and personal safety equipment

Fire is the rapid oxidation of any combustible material. It is a chemical reaction involving fuel, heat, and oxygen. These three elements commonly referred to as the fire triangle, in the right proportions, will always produce a fire. Remove any one side of the triangle and the fire will be extinguished.

Further fire research determined that a fourth element, a chemical chain reaction, was a necessary component of fire. The fire triangle was changed to a fire tetrahedron to reflect this fourth element. A tetrahedron can be described as a pyramid which is a solid having four plane faces. Essentially all four elements must be present for fire to occur, fuel, heat, oxygen, and a chemical chain reaction.

Once ignited, a chain reaction must take place whereby fires can sustain their own heat by the further release of heat energy in the process of combustion

and may propagate, provided there is a continuous supply of an oxidizer and fuel. Removal of any one of these essential elements will result in the fire being extinguished.

Combustion process

The combustion process occurs in two modes:

- The flaming;
- The non-flaming, smouldering or glowing embers.

For the flaming mode it is necessary for solid and liquid fuels to be vaporised. The solid fuel vapours are thermally driven off, or distilled and the liquid fuel vapours evaporated. It is this volatile vapour from the solid or liquid fuels that we see actually burning in the flaming mode. This gas or vapour production, emitted from the fuel, is referred to as pyrolysis. Once a flame has been established, heat transfer from the flame to the fuel surface continues to drive off more volatile gases and perpetuates the combustion process. Continued burning in the flaming mode requires a high burning rate, and the heat loss associated with transfer of heat from the flame area by conduction, convection, and radiation must be less than the energy output of the fire. If the heat loss is greater than the energy output of the fire, the fire will extinguish.

Both modes, flaming and non-flaming surface modes, can occur singly, or in combination. Flammable liquids and gases only burn in the flaming mode. Wood, straw, and coal are examples where both modes may exist simultaneously.

Stages of a fire

Incipient – This first stage begins when heat, oxygen and a fuel source combine and have a chemical reaction resulting in fire. This is also known as "ignition" and is usually represented by a very small fire which often (and hopefully) goes out on its own, before the following stages are reached. Recognising a fire in this stage provides your best chance at suppression or escape.

Growth – The growth stage is where the structures, fire load and oxygen are used as fuel for the fire. There are numerous factors affecting the growth stage including where the fire started, what combustibles are near it, ceiling height and the potential for "thermal layering". It is during this shortest of the 4 stages when a deadly "flashover" can occur; potentially trapping, injuring or killing firefighters.

Fully Developed – When the growth stage has reached its max and all combustible materials have been ignited, a fire is considered fully developed. This is the hottest phase of a fire and the most dangerous for anybody trapped within.

Decay – Usually the longest stage of a fire, the decay stage is characterised by a significant decrease in oxygen or fuel, putting an end to the fire. Two common dangers during this stage are firstly the existence of non-flaming combustibles, which can potentially start a new fire if not fully extinguished. Secondly, there is the danger of a backdraft when oxygen is reintroduced to a volatile, confined space.

Fire is considered one of the most challenging emergencies on board because, if not properly addressed from the beginning, it entails the risk of total loss of the ship and of injuries/fatalities. One way to address this emergency is proper training through efficient and regular drills which ensure that crew members are ready to handle a fire on board.

The quick response to fire emergencies on board is of utmost importance, taking into consideration that almost half of fire incidents take place while the vessel is in voyage.

When a fire breaks out on board, the reality is that the vessel's crew is all alone to respond to a fire. Even if the vessel is at port, the initial stages of response on board, which are vital to control the fire, should be taken by the crew.

Therefore, properly trained crew members on board should be the focal point of shipping companies and crew providers in order to prevent fire incidents and enhance safety.

Key factors

For an effective firefighting response, there are three important factors:

Firefighting equipment

The safety certificate of each vessel includes all portable and fixed firefighting equipment of the vessel. Crew members must support, check, inspect and maintain the good operational condition of this equipment. Additionally, during surveys and annual inspections Classification Societies must verify the condition of such equipment. An additional safety barrier and check is the Managing Company's inspection procedures through audits, superintendent inspections, etc.

Crew training

Crew members have to achieve a minimum level of competence through basic training. The advanced firefighting course is the next stage of training and refers mainly to management level crew members or those in charge of firefighting teams. On board familiarisation is the next step of crew training as there are additional specific items that crew members should be trained on on board each specific ship.

On scene training

This is the most challenging factor to be successfully developed and achieved as it requires step-by-step training through frequent focused drills. The most important thing to be achieved through such training is the team spirit and team response during fire emergencies. However, taking into consideration the frequent rotation of crew on board the same vessel, it is difficult to maintain a satisfactory overall response.

If you discover a fire you should immediately raise the alarm and notify the Boatmaster or the responsible person. The alarm should be raised using the appropriate alarm raising equipment like local push buttons and by shouting "Fire, fire, fire!". Some people, however, are killed or injured as a result of tackling a fire that is beyond their capabilities. Here are some simple rules to help you decide whether you should tackle a fire:

- Only tackle a fire when it is in its very early stages;
- Follow the approved procedures for firefighting on board;
- Give consideration to your own safety and the safety of other people and make sure you can escape from the fire if you need to. Never let a fire block your exit;
- Think about the position of yourself, the fire and the escape route;
- Remember that fire extinguishers are only for fighting a fire in its very early stages. Never tackle a fire if it is starting to spread (or has spread) to other items in the room or if the room is filling with smoke. More people are killed by the smoke than by the fire (in the order of 70% of fire deaths are caused by smoke and fumes);
- Go to the muster station and follow the instructions given.

7.2.4 Perform first aid

7.2.4.1 Ability to act in compliance with first aid standards and practices

General principles of first aid aboard vessel

European Resuscitation Council Guidelines for Resuscitation 2015 - ERC, published in 2015 based on the 2015 Consensus on Science and Treatment Recommendations, provide important evidence-based support for current first aid practice.

According to these Guidelines, first aid is defined as the helping behaviours and initial care provided for an acute illness or injury. First aid can be initiated by anyone in any situation. A First Aid Provider is defined as someone trained in first aid who should:

- Recognise, assess and prioritise the need for first aid;
- Provide care using appropriate competences;
- Recognise limitations and seek additional care when needed.

The main goals of first aid are to preserve life, alleviate suffering, prevent further illness or injury, and promote recovery.

The definition for first aid addresses the need to recognise injury and illness, the requirement to develop a specific skill base and need for first aid providers to simultaneously provide immediate care and to activate Emergency Medical Services or other medical care as required.

First aid assessment and interventions should be medically sound and based on scientific evidence-based medicine, or in the absence of such evidence, on expert medical consensus. The scope of first aid is not purely scientific, as both training and regulatory requirements will influence it.

First aid must be administered immediately to:

- Restore breathing and heartbeat;
- Control bleeding;
- Remove poisons;
- Prevent further injury to the patient (for instance, removal of the patient from a room containing carbon monoxide or smoke).

A rapid, emergency evaluation of the patient should be made immediately at the scene of the injury to determine the type and extent of the trauma. Because every second may count, only the essential pieces of the patient's clothing should be removed.

In case of injured limb, get the sound limb out of clothing first, and then peel the clothes off the injured limb. If necessary, cut clothes to expose the injured part.

Keep workers from crowding round.
The patient's pulse should be taken. If it cannot be felt at the wrist, it should be felt at the carotid artery at the side of the neck.

If there is no pulse, heart compression and artificial respiration must be started.
The patient should be treated for shock if the pulse is weak and rapid, or the skin pale, cold, and possibly moist, with an increased rate of shallow, irregular breathing.

Remember that shock can be a great danger to life, and its prevention is one of the main objectives of first aid.

The patient should be kept in the position that best provides relief from his/her injuries. Usually this is a lying-down position, which increases circulation of the blood to the head.

The patient should be observed for type of breathing and possible bleeding. If he/she is not breathing, artificial respiration must be given.

Severe bleeding must be controlled.
During this time, the patient, if conscious, should be reassured and told that all possible help is being given. The rescuer should ask about the location of any painful areas.

The patient should be kept in a lying-down position and moved only when absolutely necessary. The general appearance of the patient should be observed, including any signs and symptoms that may indicate a specific injury or illness.

The patient should not be moved if injuries of the neck or spine are suspected. Fractures should be splinted before moving a patient. No attempt should be made to set a fracture.

Wounds and most burns should be covered to prevent infection. Once life-saving measures have been started or deemed not necessary, the patient should be examined more thoroughly for other injuries.

The patient should be covered to prevent loss of body heat. If necessary, protect the patient from heat as well. The patient should not be given alcohol in any form. Never underestimate and do not treat as being minor injuries:

- Unconsciousness;
- Suspected internal bleeding;
- Stab or puncture wounds;
- Wounds near joints;
- Possible fractures;
- Eye injuries.

Never consider anyone to be dead, until you and others agree that:

- No pulse can be felt, and no sounds are heard when the examiner's ear is put to the chest;
- Breathing has stopped;
- The eyes are glazed and sunken;
- There is progressive cooling of the body (this may not apply if the surrounding air temperature is close to normal body temperature).

Emergency first aid procedures consist of the following:

- Assessment of the situation and rescuing the victim from danger;
- Securing breathing;
- Securing circulation;
- Stopping bleeding and treatment of shock.

When the situation has been stabilised, the actual treatment and the possible transportation of the patient to shore for further treatment can be started. On arrival at the scene, a rapid evaluation of what has happened must be made. If the dangerous situation continues, the patient must be rescued from it. The helper must at all times make sure that he/she is not in danger himself/herself (electric shock, gas, fire, etc.).

First aid administration must be started immediately when it is safe to do so. The patient's own breathing is assessed and mouth-to-mouth respiration started, if necessary. If the patient's heart is not beating, cardiac massage is started.

A breathing patient is placed on his/her back, and an unconscious patient on his/her side. It must be ensured that the lungs are getting oxygen, the respiratory tract is open and the pulse can be felt. External bleeding must be stopped.

When the patient is no longer in imminent danger, he/she is examined more carefully, his/her wounds are bound more carefully, and fractures are supported. The patient is protected and settled as comfortably as possible. Any necessary further medical treatment is initiated, and the patient's condition is monitored constantly, and, if necessary, his/her transportation to shore is arranged.

Priorities

On finding a casualty:

- Look to your own safety, do not become the next casualty;
- If necessary, remove the casualty from danger or remove danger from the casualty (but see observation below on a casualty in an enclosed space). If there is only one unconscious or bleeding casualty (irrespective of the total number of casualties), give immediate treatment to that casualty only, and then send for help.

If there is more than one unconscious or bleeding casualty:

- Send for help;
- Then start giving appropriate treatment to the worst casualty in the following order of priority: severe bleeding; stopped breathing/heart; unconsciousness.

If the casualty is in an enclosed space, do not enter that space unless you are a trained member or a rescue team acting under instructions. Send for help and inform the Boatmaster.

It must be assumed that the atmosphere in the space is hostile. The rescue team must not enter unless wearing breathing apparatus which must also be fitted to the casualty as soon as possible.

The casualty must be removed quickly to the nearest safe adjacent area outside the enclosed space unless his/her injuries and the likely time of evacuation make some treatment essential before he/she can be moved.

Position casualty

The priority management of a breathing but unresponsive victim, including one whose circulation has been successfully restored following cardiac arrest, is the maintenance of an open airway. Victims with agonal breathing should not be placed in the recovery position.

Although the available evidence is weak, the use of the recovery position places a high value on the importance of decreasing the risk of aspiration or the need for more advanced airway management. Given the absence of high quality evidence, the recovery position is recommended due to the lack of demonstrated associated risk.

In situations such as trauma, it may not be appropriate to move the individual into a recovery position.

Position individuals who are unresponsive but breathing normally into a lateral, side-lying recovery position as opposed to leaving them supine (lying on back). In certain situations such as resuscitation related agonal respirations or trauma, it may be not appropriate to move the individual into a recovery position.

ERC recommends the following sequence of actions:

- Kneel beside the victim and make sure that both legs are straight; place the arm nearest to you at right angles to the body, elbow bent with the hand palm uppermost;
- Bring the far arm across the chest, and hold the back of the hand against the victim's cheek nearest to you;
- With your other hand, grasp the far leg just above the knee and pull it up, keeping the foot on the ground;
- Keeping the hand pressed against the cheek, pull on the far leg to roll the victim towards you onto his or her side;
- Adjust the upper leg so that both hip and knee are bent at right angles;
- Adjust the hand under the cheek if necessary, to keep the head titled and facing downwards to allow liquid material to drain from the mouth;
- Check breathing regularly.

If the victim has to be kept in the recovery position for more than 30 minutes turn him or her to the opposite side to relieve the pressure on the lower arm.

Apply resuscitation techniques

The sequences of steps for the initial assessment and treatment of the unresponsive victim are:

- Unresponsive and not breathing normally;
- Call Emergency Services - EMS;
- Give 30 chest compressions;
- Continue CPR 30:2;
- As soon as AED (Automated External Defibrillator) arrives, switch it on and follow instructions.

Sequences:

Opening the airway and checking for breathing
The trained provider should assess the collapsed victim rapidly to determine if they are responsive and breathing normally.

Open the airway using the head tilt and chin lift technique whilst assessing whether the person is breathing normally. Do not delay assessment by checking for obstructions in the airway. The jaw thrust and finger sweep are no longer recommended for the lay provider. Check for breathing using the technique described in the above figure, noting the critical importance of recognising agonal breathing.

Agonal breathing is the medical term for the gasping that people do when they're struggling to breathe because of cardiac arrest or other serious medical emergency. The desperate gasping for air is usually a symptom of the heart no longer circulating oxygenated blood, or there is an interruption of lung activity that is reducing oxygen intake. It can often signal that death is imminent.

If you see someone struggling to breathe, call your local emergency medical services immediately. Agonal breathing may occur with cardiac arrest or a stroke. So it's possible the person may lose consciousness while gasping. Stroke symptoms include:

- Weakness on one side of the body;
- Lack of coordination;
- Poor speech or an inability to understand speech;
- A sudden headache.

Alerting emergency services

112 is the European emergency phone number, available everywhere in the EU, free of charge. It is possible to call 112 from fixed and mobile phones to contact any emergency service: an ambulance, the fire brigade or the police. Some European countries provide an alternative direct access number to emergency medical services, which may save time. Bystanders should therefore follow national guidelines on the optimal phone number to use.

Early contact with the emergency services will facilitate the dispatcher in the recognition of cardiac arrest, telephone instruction on how to perform CPR,

emergency medical service/first responder dispatch, and on locating and dispatching of an AED.
If possible, stay with the victim while calling the emergency services. If the phone has a speaker facility switch it to speaker as this will facilitate continuous dialogue with the dispatcher including (if required) CPR instructions. It seems reasonable that CPR training should include how to activate speaker phone. Additionally bystanders may be used to help call the emergency services.

Starting chest compression

In an adult needing CPR, there is a high probability of a primary cardiac cause. When blood flow stops after cardiac arrest, the blood in the lungs and arterial system remains oxygenated for some minutes. To emphasise the priority of chest compression, it is recommended that CPR should start with chest compression rather than initial ventilations. Manikin studies indicate that this is associated with a shorter time to commencement of CPR.

When providing manual chest compression:

1. Deliver compressions in the centre of the chest;
2. Compress to a depth of at least 5 cm but not more than 6 cm;
3. Compress the chest at a rate of 100-120 compressions/min with as few interruptions as possible;
4. Allow the chest to recoil completely after each compression; do not lean on the chest.

Hand position

Experimental studies show better hemodynamic responses when chest compressions are performed on the lower half of the sternum. It is recommended that this location be taught in a simplified way, such as "place the heel of your hand in the centre of the chest with the other hand on top". This instruction should be accompanied by a demonstration of placing the hands on the lower half of the sternum.

Chest compressions are most easily delivered by a single CPR provider kneeling by the side of the victim, as this facilitates movement between compressions and ventilations with minimal interruptions. Over-the-head CPR for single CPR providers and straddle-CPR for two CPR providers may be considered when it is not possible to perform compressions from the side, for example when the victim is in a confined space.

Compression depth

Fear of doing harm, fatigue and limited muscle strength frequently result in CPR providers compressing the chest less deeply than recommended. Four observational studies, published after 2010 Guidelines, suggest that a compression depth range of 4.5-5.5 cm in adults leads to better outcomes than all other compression depths during manual CPR.

The ERC (European Resuscitation Council) endorses the ILCOR (International Liaison Committee on Resuscitation) recommendations that it is reasonable to aim for a chest compression of approximately 5 cm but not more than 6 cm in the average sized adult. In making this recommendation the ERC recognises that it can be difficult to estimate chest compression depth and, compressions that are too shallow are more harmful than compressions that are too deep. The ERC therefore decided to retain the 2010 guidance that chest compressions should be at least 5 cm but not more than 6 cm. Training should continue to prioritise achieving adequate compression depth.

Compression rate

Chest compression rate is defined as the actual rate of compressions being given at any one time. It differs from the number of chest compressions in a specific time period, which takes account of any interruptions in chest compressions.

The ERC recommends, therefore, that chest compressions should be performed at a rate of 100-120 compressions/min.

Minimising pause in chest compressions

Delivery of rescue breath, shocks, ventilations and rhythm analysis lead to pauses in chest compressions. Pre-and post-shock pauses of less than 10 s, and chest compression fraction >60% are associated with improved outcomes. Pauses in chest compressions should be minimised, by ensuring CPR providers work effectively together.

Firm surface

CPR should be performed on a firm surface whenever possible. Air-filled mattresses should be routinely deflated during CPR. The evidence of using back-boards is equivocal. If the back-board is used, take care to avoid interrupting CPR and dislodging intravenous lines or other tubes during board placement.

Chest wall recoil

Leaning on the chest preventing full chest wall recoil is common during CPR. Allowing complete recoil of the chest after each compression results in better venous return to the chest and may improve the effectiveness of CPR. CPR providers should, therefore, take care to avoid leaning after each chest compression.

Duty cycle

Optimal duty cycle (ratio of the time chest is compressed to the total time from one compression to the next) has been studied in animal models and simulation studies with inconsistent results. A recent human observational study has challenged the previously recommended duty cycle of 50:50 by suggesting compression phases >40% might not be feasible, and may be associated with decreased

compression depth. For CPR providers, the duty cycle is difficult to adjust, and is largely influenced by other chest compression parameters. In reviewing the evidence, the ERC acknowledges there is very little evidence to recommend any specific duty cycle and, therefore, insufficient new evidence to prompt a change from the currently recommended ratio of 50%.

Feedback on compression technique

The use of CPR feedback and prompt devices during CPR in clinical practice is intended to improve CPR quality as a means of increasing the chances of ROSC (Return of Spontaneous Circulation) and survival. The forms of feedback include voice prompts, metronomes, visual dials, numerical displays, waveforms, verbal prompts and visual alarms.

The use of CPR feedback or prompt devices during CPR should only be considered as part of a broader system of care that should include comprehensive CPR quality improvement initiatives, rather than as an isolated intervention.

Rescue breaths

In non-paralysed, gasping pigs with unprotected, unobstructed airways, continuous-chest-compression CPR without artificial ventilation resulted in improved outcome. Gasping may be present early after the onset of cardiac arrest in about one third of humans, thus facilitating gas exchange.

During CPR, systemic blood flow, and thus blood flow to the lungs, is substantially reduced, so lower tidal volumes and respiratory rates than normal can maintain effective oxygenation and ventilation.

Mouth-to-nose ventilation

Mouth-to-nose ventilation is an acceptable alternative to mouth-to-mouth ventilation. It may be considered if the victim's mouth is seriously injured or cannot be opened, the CPR provider is assisting a victim in the water, or a mouth-to-mouth seal is difficult to achieve.

Compression-ventilation ratio

A ratio of 30:2 was recommended in Guideline 2010 for the single CPR provider attempting resuscitation of an adult. ERC recommends a compression ventilation ratio of 30:2. The ERC, therefore, endorses the ILCOR recommendations that all CPR providers should perform chest compression for all patients in cardiac arrest.

Control bleeding

The human body contains approximately 5 litres of blood. A healthy adult can lose up to half a litre of blood without harmful effects, but the loss of more than this can be life-threatening.

Haemorrhage from major blood vessels of the arms, neck, and thighs may occur so rapidly and extensively that death occurs in a few minutes. Haemorrhage must be controlled immediately to prevent excessive loss of blood.

Bleeding may occur externally following an injury to the outside of the body, or internally from an injury in which blood escapes into tissue spaces or the body cavity.

The signs and symptoms of excessive loss of blood are:

- Weakness or fainting;
- Dizziness;
- Pale, moist and clammy skin;
- Nausea;
- Thirst;
- Fast weak and irregular pulse;
- Shortness of breath;
- Dilated pupils;
- Ringing in the ears;
- Restlessness; and
- Apprehension.

The patient may lose consciousness and stop breathing. The number of symptoms and their severity are generally related to how fast the blood is lost and in what amount.

Once the bleeding has been controlled, the patient should be placed in a reclining position, encouraged to lie quietly and treated for shock.
Fluid should not be given by mouth when internal injury is suspected.

Control

Bleeding may be controlled by direct pressure, elevation, and pressure at pressure points.
A tourniquet should be applied only when every other method fails to control the excessive bleeding.

Direct pressure

The simplest and preferred method for controlling severe bleeding is to place a dressing over the wound and apply pressure directly to the bleeding site with the palm of the hand.

Ideally a sterile dressing should be applied. Otherwise, the cleanest cloth available should be used. In the absence of a dressing or cloth, the bare hand may be used until a dressing is available. If the dressing becomes soaked with blood, another dressing should be applied over the first one with firmer hand pressure.

The initial dressing should not be removed because this will disturb the clotting process.

The bandage should be tied over the dressing to provide additional pressure.

Do not cut off the circulation. A pulse should be felt on the side of the injured part away from the heart. If the bandage has been applied properly, it should be allowed to remain in place undisturbed for at least 24 hours. If the dressing is not soaked with blood and the circulation beyond the pressure dressing is adequate, it need not be changed for several days.

Elevation

When there is a severely bleeding wound of an extremity or the head, direct pressure should be applied on a dressing over the wound with the affected part elevated. This elevation lowers the blood pressure in the affected part and the flow of blood pressure in the affected part and the flow of blood are lessened.

Tourniquet

A tourniquet should be applied to control bleeding only when all other means have failed. Unlike direct and hand pressure, a tourniquet shuts off all normal blood circulation beyond the site of application. Lack of oxygen and blood may lead to the destruction of tissue, possibly requiring amputation of a limb. Releasing the tourniquet periodically will result in loss of blood and danger of shock. If the tourniquet is too tight or too narrow, it will damage the muscles, nerves and blood vessels; if to loose, it may increase blood loss. Also, there have been cases where tourniquets have been applied and forgotten. If a tourniquet is applied to save a life, immediate Radio Medical Advice must be obtained.

A tourniquet must be improvised from a wide band of cloth. An improvised tourniquet may be made from folded triangular bandages, clothing or similar material.

Record the time the tourniquet was applied. If you are sending the casualty to hospital, attach a sheet of paper to his/her clothing or an extremity, indicating the time.

Note:

- Never cover the tourniquet with clothing or bandages, or hide it in any way;
- Never loosen the tourniquet, unless a physician advises such.

Apply appropriate measures of basic shock management

Shock following an injury is the result of a decrease in the vital functions of the various organs of the body. These functions are depressed because of inadequate circulation of blood or an oxygen deficiency.
Shock usually follows severe injuries such as extensive burns, major crushing injuries (particularly of the chest and abdomen), fractures of large bones, and other extensive or extremely painful injuries.

Shock follows:

- The loss of large quantities of blood;
- Allergic reactions;
- Poisoning from drugs, gases, and other chemicals;
- Alcohol intoxication; and
- Rupture of a stomach ulcer.

It also may be associated with many severe illnesses such as infections, strokes and heart attacks.

In some individuals the emotional response to trivial injuries or even to the mere sight of blood is so great that they feel weak and nauseated and may faint. This reaction may be considered to be an extremely mild form of shock which is not serious and will disappear quickly if the patient lies down.

Severe shock seriously threatens the life of the patient.

Signs and symptoms of shock are:

- Paleness: The skin is pale, cold, and often moist. Later it may develop a bluish, ashen colour. If the patient has dark skin, the colour of mucous membranes and nail beds should be examined;
- Rapid and shallow respirations: Alternatively, breathing could be irregular and deep;
- Thirst, nausea and vomiting: These frequently occur in a haemorrhaging patient in shock;
- Weak and rapid pulse: Usually the pulse rate is over 100;
- Restlessness, excitement and anxiety: These occur early, later giving way to mental dullness and still later to unconsciousness. In this late stage the pupils are dilated, giving the patient a vacant, glassy stare.

Although these symptoms may not be evident, all seriously injured persons should be treated for shock to prevent its possible development.

Treatment:

- Eliminate the causes for shock: This includes controlling bleeding, restoring breathing and relieving severe pain;
- Have the injured person lie down: The patient should be placed in a horizontal position. The patient's legs may be elevated approximately 30 cm to assist the flow of blood to the heart and head. The legs should not be elevated if there is injury to the head, pelvis, spine, or chest, or if there is difficulty in breathing;
- Keep the patient warm, but not hot: Too much heat raises the surface temperature of the body and diverts the blood supply away from vital organs to the skin;
- Relieve pain as quickly as possible: If pain is severe, 10 mg of morphine sulphate may be given by intramuscular injection. If the blood pressure is low, morphine sulphate should not be given because it may cause an additional drop in the pressure. Also, it should not be given to injured patients unless pain is severe. The dosage should be repeated only after obtaining Radio medical advice;
- Administer fluids: Liquids should not be given by mouth if the patient is unconscious, drowsy, convulsing, or about to have surgery. Also, fluids should not be given if there is a puncture or crush wound to the abdomen, or a brain injury. If none of the above conditions is present, give the patient a solution of oral rehydration salts (half a glass every 15 minutes). Alcohol should never be given.

Apply appropriate measures in the event of burns and scalds, including accidents caused by electric current

Clothing on fire

If someone's clothing is on fire, by far the best way to put the fire out is to use a dry-powder extinguisher at once. If a dry-powder extinguisher is not available, then lay the person down and smother the flames by wrapping him/her in any available material, or throw bucketfuls of water over him/her, or use a hose, if available. Make sure that all smouldering clothing is extinguished.

The powder from a fire extinguisher will not cause much, if any, eye damage. Most people shut their eyes tightly if sprayed with powder. Any powder in the eye should be washed out immediately after the fire has been extinguished and while burns are being cooled.

Heat burns and scalds

All heat burns should be cooled as quickly as possible with running cold water, applied for at least 10 minutes, or by immersion in basins of cold water. If it is not possible to cool a burn on the spot, the casualty should be taken to a place where cooling can be carried out. Try to remove clothing gently but do not tear off any that adhered to the skin. Then cover the burned areas with a dry, non-fluffy dressing larger than the burns, and bandage in place.

Electrical burns and electrocution

Make sure you do not become the next casualty when approaching any person who is in contact with electricity. If possible, switch off the current. Otherwise insulate yourself before approaching and touching the casualty, by using rubber gloves, wearing rubber boots, or standing on an insulating rubber mat.

Electrical lines may be removed from the casualty with a wooden pole, a chair, an insulated cord, or other non-metal object.

Then check casualty immediately for breathing and heartbeat. If casualty is not breathing give artificial respiration. If heart is stopped, apply heart compression. Send for help.

When the casualty is breathing, cool any burnt areas with cold water and apply a clean, dry, non-fluffy covering to these areas. The treatment for electrical burns is the same as for thermal burns. It includes relief of pain, prevention and treatment of shock and control of infection. Electrical burns may be followed by paralysis of the respiratory centre, unconsciousness and instant death.

Rescue and transport a casualty

The removal of a sick or injured person either from the site of an accident or ashore is a matter of importance, since his/her life may depend on the arrangements made, particularly if he/she has spinal injuries, a heart condition, or a severe fracture, with any of which he/she is likely to be suffering from shock. So use the utmost gentleness, reassure your patient, try to have a clear picture in your mind of the nature of the disability you are dealing with, and exercise common sense. Unless there is danger from fire, explosion or toxic substances, do not move a casualty until:

- Suspected fractures have been immobilised; and
- Severe bleeding has been stopped.

Then check out the best route for transport, lift the casualty gently and carry him/her smoothly - remember that every jolt causes unnecessary pain.

The method of transport will depend on the situation of the casualty and the nature of the injury.

If the vessel is in port, it is usually best to await the arrival of an ambulance because the attendants will be expert in handling casualties. You can assist them and give them the benefit of your knowledge. For instance, if a patient has fallen to the bottom of a hold, the best procedure is to take down a stretcher, give first aid treatment, then place the stretcher on a hatch cover or similar flat platform and have the patient lifted by

vessel's crane over the side. This lift can be a frightening experience for a helpless and shocked person and he/she will be reassured if the person in charge stands on the hatch cover with legs astride the stretcher, maintaining balance by holding on to the guy wires. Similarly, if the patient is on deck and the gangway is narrow or unsteady, it may be far less unnerving for him/her if he/she is lowered over the side on a hatch cover or something similar.

Manhandling

Ordinary manhandling may be possible, in which case two helpers carry a casualty, with each one using an arm to support the casualty's back and shoulders and his/her spare hand to hold the casualty's thighs. If conscious, the casualty may help to support him-/herself with his/her hands on the shoulders of the helpers.

The simple pick-a-back method is useful only where the casualty is conscious and able to hold on by putting his/her arms round the carrier's neck.

In a narrow space, the simple for-and-aft carry may be best. One helper supports the patient under his/her arms and the other under his/her knees.

One advantage of the three-handed seat, is that one of the helpers has a free arm and hand that can be used either to support an injured limb or as a back support for the casualty. Which of the two helpers has the free arm will depend on the nature of the injury.

As a last resort, the drag-carry method may have to be used in narrow spaces, particularly where there is wreckage following an explosion and where it may be possible for only one man to reach a trapped patient and rescue him/her. After the initial rescue, two people may be able to undertake further movement through a narrow space.

Stretcher

A good general purpose stretcher for use on board of the vessels: it is easily carried, gives firm support to the patient and is particularly useful in narrow spaces, when difficult corners have to be hoisted.

First aid is all about treating injuries and illnesses before seeking medical help. If you do not have a first aid kit available on board you can improvise using common household items.

It is recommended, however, that you pick up a comprehensive first aid kit containing the appropriate sterile first aid dressings and items.
Items to use for the improvised first aid kit:

Clingfilm

Clingfilm can be used to cover burn and scald injuries one they have cooled for at least ten minutes. Burns should be covered with a non-fluffy dressing to reduce the risk of infection developing in the burn. Clingfilm is ideal to use as it won't stick to the burn and is an effective barrier against infection.
Don't wrap the cling film tightly around the burn, instead just lay it loosely to cover the injury. Burn injuries will swell so it is important to give the injured area space to swell and expand.
Also, make sure you use clean clingfilm!

Frozen Food

A bag of frozen food (for example, frozen peas or other vegetables) is great to use on a sprain/strain or minor head injury. The cold will reduce the swelling and associated inflammation from an injury and may improve healing.

Remember never to apply ice or other freezing items directly to the skin as this could cause cold burns. Instead, wrap the ice or bag of frozen food in a towel in place over the injury.

Clean Towels or Clothes

Direct pressure over a wound is the most effective way to control major bleeding. Elevating the injury will help but is unlikely to completely stop the bleeding.

If you don't have a pressure bandage available then you can improvise using any clean towels or clothes to hand. Apply firm direct pressure over the wound whilst awaiting the arrival of EMS.

Monitor the victim for the development of shock and keep the pressure applied until further help arrives.

7.2.5 Establish an effective on board system to control life saving appliances and correct application of personal protective equipment

7.2.5.1 Knowledge of legislation applicable to life-saving appliances and safe working conditions regulations

According to ES-TRIN, life-saving appliances on board the vessels are:

Lifebuoys and lifejackets

On board craft there shall be at least three lifebuoys:

- In accordance with European Standard EN 14144 : 2003; or
- In accordance with the 1974 International Convention for the Safety of Life at Sea (SOLAS 1974), Chapter III, Regulation 7.1, and the International Life-Saving Appliance (LSA) Code, sub-section 2.1.

They shall be ready for use and attached to the deck at appropriate points without being attached to their mounting. At least one lifebuoy shall be in the immediate vicinity of the wheelhouse and shall be equipped with a self-igniting, battery-powered light that will not be extinguished in water.

A personalised, **automatically inflatable lifejacket** shall be within reach of every person who is regularly on board a craft. Such lifejackets shall conform to:

- European Standards EN ISO 12402-2 : 2006, EN ISO 12402-3 : 2006, EN ISO 124024 : 2006; or
- The 1974 International Convention for the Safety of Life at Sea (SOLAS 1974), Chapter III, Regulation 7.2, and the International Life-Saving Appliance (LSA) Code, sub-section 2.2.

Non-inflatable lifejackets in accordance with these Standards shall also be admissible for children. Lifejackets shall be inspected in accordance with the manufacturer's instructions.

Life-saving equipment on board passenger vessels according to ES-TRIN

In addition to the lifebuoys specified in Article 13.08(1) ES-TRIN, all parts of the deck intended for passengers and not enclosed shall be equipped with suitable lifebuoys, which shall be positioned on both sides of the vessel not more than 20 m apart. Lifebuoys shall be considered as suitable if they comply with:

- The European Standard EN 14144 : 2003; or
- The International Convention for the Safety of Life at Sea (SOLAS 1974) Chapter III Regulation 7.1 and the International Life-Saving Appliance (LSA) Code, (2.1).

Half of all the prescribed lifebuoys shall be fitted with a buoyant cord at least 30 m long with a diameter of 8 to 11 mm. The other half of the prescribed lifebuoys shall be fitted with a self-igniting, battery-powered light which will not be extinguished in water.

In addition to the lifebuoys referred to in (1), **individual life-saving equipment** according to Article 13.08(2) of ES-TRIN shall be within reach for all shipboard personnel. For shipboard personnel not responsible for undertaking duties according to the safety rota, non-inflatable or semi-automatically inflatable lifejackets according to the Standards mentioned in Article 13.08(2) of ES-TRIN are allowed.

Passenger vessels shall have appropriate equipment to enable persons to be transferred safely to shallow water, to the bank or to another craft.

In addition to the life-saving equipment mentioned above, individual life-saving equipment according to Article 13.08(2) of ES-TRIN shall be available for 100% of the maximum permitted number of passengers. Non-inflatable or semi-automatically inflatable lifejackets according to the Standards mentioned in Article 13.08(2) of ES-TRIN are also allowed.

The term 'collective life-saving appliances' covers ship's boats according to Article 13.07 of ES-TRIN and liferafts.

Liferafts shall:

- Bear a notice indicating their purpose and the number of persons for whom they are approved;
- Offer adequate seating space for the permitted number of persons;
- Provide a buoyancy of at least 750 N per person in fresh water;
- Be provided with a rope linked to the passenger vessel to prevent them drifting away;
- Be made of suitable materials and be resistant to oil, oil products and temperatures up to 50 °C;
- Assume and maintain a stable trim and, in this respect, be fitted with appropriate devices enabling them to be grabbed by the indicated number of persons;
- Be fluorescent orange in colour or have fluorescent surfaces, visible from all sides, of at least 100 cm^2;
- Be such that they can be released from their stowed position and put overboard quickly and safely by one person, or can float free from their stowed position;
- Be provided with appropriate means of evacuation from the evacuation areas referred to in Article 19.06(8) of ES-TRIN, onto the life rafts if the vertical distance between the deck of the evacuation areas and the plane of maximum draught is greater than 1 m.

Additional collective life-saving appliances are items of life-saving equipment which ensure the buoyancy of several persons in the water. These shall:

- Bear a notice indicating their purpose and the number of persons for whom they are approved;
- Provide a buoyancy of at least 100 N per person in fresh water;
- Be made of suitable materials and be resistant to oil, oil products and to temperatures of up to 50°C;
- Assume and maintain a stable trim and, in this respect, be fitted with appropriate devices enabling them to be grabbed by the indicated number of persons;
- Be fluorescent orange in colour or have fluorescent surfaces, visible from all sides, of at least 100 cm2;
- Be such that they can be released from their stowed position and put overboard quickly and safely by one person, or can float free from their stowed position.

Inflatable collective life-saving appliances shall in addition:

- Comprise at least two separate air compartments;
- Inflate automatically or by manual command when launched;
- Assume and maintain a stable trim irrespective of the load to be supported, even when only half the air compartments are inflated.

The life-saving appliances shall be stowed on board in such a way that they can be reached easily and safely when required. Concealed storage places shall be clearly marked.

Life-saving equipment shall be inspected according to the manufacturer's instructions.

The ship's boat shall be equipped with an engine and a searchlight.
A suitable stretcher shall be available.

Safe working conditions according to ES-TRIN

General

Vessels shall be built, arranged and equipped in such a way as to enable persons to work and move about in safety in passageways.

Permanently installed facilities that are necessary for working on board shall be arranged, laid out and secured in such a way as to permit safe and easy operation, use and maintenance. If necessary, mobile or high-temperature components shall be fitted with protective devices.

Protection against falling

Decks and side decks shall be flat and at no point be likely to cause tripping; it shall be impossible for puddles to form.

Decks, side decks, engine room floors, landings, stairways and the tops of side deck bollards shall have non-slip surfaces.

The tops of side deck bollards and obstacles in passageways, such as the edges of steps, shall be painted in a colour contrasting with the surrounding deck.

The outer edges of decks and side decks, as well as work stations where persons might fall more than 1 m, shall be fitted with bulwarks or coamings that are at least 0.90 m high or with a continuous guard rail in accordance with European Standard EN 711 : 2016.

Where the shipside guard rails are retractable:

- A continuous handrail 0.02 to 0.04 m in diameter shall additionally be secured to the coaming at a height of 0.7 to 1.1 m; and
- Signs in accordance with Annex 4, Figure 10 of ES-TRIN, at least 15 cm in diameter, shall be affixed in clearly visible positions at the point where the side deck begins.

At work stations where there is danger of falling more than 1 m the inspection body may require appropriate fittings and equipment to ensure safe working.

Dimensions of work stations

Work stations shall be large enough to provide every person working in them with adequate freedom of movement.

Side decks

The clear width of a side deck shall be at least 0.60 m. This requirement applies up to a height of 2.00 m above the side deck.

Access to work stations

Points of access and passageways for the movement of persons and objects shall be of sufficient size and so arranged that:

- In front of the access opening, there is sufficient room not to impede movement;
- The clear width of the passageway shall be appropriate for the intended use of the working space and shall be not less than 0.60 m, except in the case of craft less than 8 m wide, where it may be reduced to 0.50 m;
- The clear height of the passageway including the sill is not less than 1.90 m.

Doors shall be so arranged that they can be opened and closed safely from either side. They shall be protected against accidental opening or closing. Appropriate stairs, ladders or steps shall be installed in accesses, exits and passageways where there is more than a 0.50 m difference in floor level.

Work stations which are manned continuously shall be fitted with stairs if there is a difference in floor level of more than 1.00 m. This requirement shall not apply to emergency exits.

Vessels with holds shall have at least one permanently installed means of access at each end of each hold.

Exits and emergency exits

The number, arrangement and dimensions of exits, including emergency exits, shall be in keeping with the purpose and dimensions of the relevant space. Where one of the exits is an emergency exit, it shall be clearly marked as such.

Emergency exits or windows or the covers of skylights to be used as emergency exits shall have a clear opening of not less than 0.36 m2, and the smallest dimension shall be not less than 0.50 m.

Ladders, steps and similar devices

Stairs and ladders shall be securely fixed. Stairs shall be not less than 0.60 m wide and the clear width between handrails shall be not less than 0.60 m; steps shall be not less than 0.15 m deep; steps shall have non-slip surfaces and stairs with more than three steps shall be fitted with handrails.

Ladders and separately attached rungs shall have a clear width of not less than 0.30 m; rungs shall be not more than 0.30 m apart and the distance between rungs and structures shall be not less than 0.15 m. Ladders and separately attached rungs shall be clearly recognisable from above and shall be equipped with safety handles above exit openings.

Movable ladders shall be at least 0.40 m wide, and at least 0.50 m wide at the base; it shall be possible to ensure that they will not topple or skid; the rungs shall be securely fixed in the uprights.

Interior rooms

The dimensions, arrangement and layout of interior work stations shall be in keeping with the work to be carried out and shall meet the health and safety requirements. They shall be equipped with sufficient non-dazzle lighting and with sufficient ventilation arrangements. If necessary, they shall be fitted with heating appliances capable of maintaining an adequate temperature.

The floors of interior working spaces shall be solid and durable, and shall be designed not to cause tripping or slipping. Openings in decks and floors shall, when open, be secured against the danger of falling. Windows and skylights shall be so arranged and fitted that they can be operated and cleaned safely.

Protection against noise and vibration

Working spaces shall be so situated, equipped and designed that employees are not exposed to harmful vibrations.

Permanent working spaces shall, in addition, be so constructed and sound-proofed that the health and safety of employees are not affected by noise.
For persons who are likely to be exposed to noise levels exceeding 80 dB(A) every day, individual acoustic protection devices shall be available. In working spaces where the noise level can exceed 85 dB(A) it shall be indicated that wearing of acoustic protection devices is mandatory by a symbol 'Wear acoustic protection device'.

Hatch covers

Hatch covers shall be easily accessible and safe to handle. Hatch-cover components weighing more than 40 kg shall be designed to slide or pivot or be fitted with mechanical opening devices. Hatch covers operated by lifting gear shall be fitted with adequate and easily accessible attachment devices. Non-interchangeable hatch covers and upper sills shall be clearly marked to show the hatches to which they belong and their correct position on those hatches. Hatch covers shall be secured against being tilted by the wind or by loading gear. Sliding covers shall be fitted with catches to prevent accidental horizontal movement of more than 0.40 m; they shall be capable of being locked in their final position. Appropriate devices shall be fitted to hold stacked hatch covers in position.

The power supply for mechanically operated hatch covers shall be cut off automatically when the control switch is released.

Hatch covers shall be capable of bearing the loads to which they are likely to be subjected: Hatch covers designed to be walked on shall be capable of bearing concentrated loads of at least 75 kg. Hatch covers not designed to be walked on shall be marked as such. Hatch covers designed to receive deck cargo shall have the permissible load in t/m2 marked on them. Where supports are needed to achieve the maximum permissible load this shall be indicated in an appropriate place; in this case the relevant drawings shall be kept on board.

Winches

Winches shall be designed in such a way as to enable work to be carried out safely. They shall be fitted with devices that prevent unintentional load release. Winches that do not lock automatically shall be fitted with a brake that is adequate to deal with their tractive force.

Hand-operated winches shall be fitted with devices to prevent kickback of the crank. Winches that are both power and manually driven shall be designed in such a way that the motive-power control cannot actuate the manual control.

Cranes

Cranes shall be built in accordance with best practice. The forces arising during their operation shall be safely transmitted into the vessel's structure; they shall not impair its stability.

A manufacturer's plate containing the following information shall be affixed to cranes:

- Manufacturer's name and address;
- The CE marking, together with the year of manufacture;
- Series or type reference;
- Where applicable, serial number.

The maximum permissible loadings shall be permanently marked in a clearly legible manner on cranes.

Where a crane's safe working load does not exceed 2000 kg, it will be sufficient if the safe working load at the maximum reach is permanently marked in a clearly legible manner on the crane.

The presence of devices to protect against crushing or shearing hazards is mandatory. The outer parts of the crane shall leave a minimum safety clearance of 0.50 m relative to fixed superstructure in workstations and passageways.

It shall be possible to protect power driven cranes against unauthorised use. It shall only be possible to start these up from the crane's driving position. The control shall be of the automatic-return type (buttons without stops); their operating direction shall be unambiguously clear.

If the motive power fails, it shall not be possible for the load to drop in an uncontrolled manner. Unintentional crane movements shall be prevented.

Any upward movement of the hoisting device and any exceeding of the safe working load shall be limited by an appropriate device. Any downward movement of the hoisting device shall be limited if under any envisaged operating conditions at the moment of attaching the hook there can be less than two cable windings on the drum. The corresponding counter movement shall still be possible after the automatic limiting devices have been actuated.

The breaking load of the cables for running rigging shall correspond to five times the cable's permissible loading. The cable construction shall be faultless and the design shall be suitable for use on cranes.
Cranes shall be inspected by an expert:

- Before being put into service for the first time;
- Before being put back into service after any major modification or repair, and;
- Regularly, at least every ten years.

In this inspection proof of adequate strength and stability shall be provided by calculations and an on-board load test.

Where a crane's safe working load does not exceed 2000 kg the expert may decide that the proof by calculation may be fully or partly replaced by a test with a load 1.25 times the safe working load carried out over the full working range.

An inspection attestation shall be issued, signed by the expert and showing the date of the inspection.

Cranes shall be checked regularly and in any case at least every year, by a competent person. During that inspection the safe working condition of the crane shall be determined by a visual check and an operating check.

An inspection attestation shall be issued, signed by the competent person and showing the date of the inspection.

Cranes with a safe working load exceeding 2000 kg, or which are used for transhipment of cargo, or which are mounted on board lifting jacks, pontoons and other floating equipment or worksite craft shall in addition meet the requirements of one of the Member States.

The crane manufacturer's operating instructions shall be kept on board. These shall include at least the following information:

- Operating range and function of the controls;
- Maximum permissible safe working load as a function of the reach;
- Maximum permissible inclination of the crane;
- Assembly and maintenance instructions;
- General technical data.

Storing flammable liquids

To store flammable liquids with a flash point of less than 55 °C there shall be a ventilated cupboard made of non-combustible material on deck. On its outside there shall be a symbol 'Fire, naked flame and smoking prohibited'' with a diameter of at least 10 cm in accordance with Figure 2 of Annex 4 of ES-TRIN.

7.2.5.2 Ability to maintain and perform periodic check of operational condition of life-saving, fire-fighting and other safety equipment and systems

The requirements for inspection and maintenance of safety equipment can be found in a large number of statutory instruments. Establishing an easy, user-friendly and practical overview of such requirements has proven to be challenging.

DNV GL intends to address this challenge and provides a compact and practical tool in the format of a list of such requirements for ship owners and operators (users) at the time of issuance of the document.

Users may use this document to establish or validate inspection and maintenance routine in their Planned Maintenance Systems. When establishing the maintenance and inspection procedures it should be noted that certain jobs may be performed by competent crew members, while others shall be performed by specially trained persons.

As a general rule, all periodical checks of such equipment shall be carried out in accordance with the manufacturer's instructions and safety precautions. If equipment is undergoing maintenance or testing, then suitable arrangements shall be made to ensure safety is not diminished through the provision of alternate equipment or other measures.

Records of the inspections shall be carried on board the vessel, or be accessible in digital format on board.

The class guideline for maintenance of safety equipment - DNV-CG-0058/2016, available free of charge on the following address: www.dnvgl.com, can be used as a guide for performing periodic check of life-saving, fire-fighting and other safety equipment and systems on board inland navigation vessels.

7.2.5.3 Ability to instruct on, to motivate and supervise the correct use of (personal) safety equipment by crew members and shipboard personnel

It is important to conduct drills to ensure the crew on board are prepared and able to deal with real-life situations in an appropriate manner. It is possible to learn the correct way to use life-saving appliances by reading instruction folders and manuals. However, by using practice drills, the crew is able to test the appliances and gain experience.

It is always important to take time to plan ahead of a drill, making sure that all information has been provided and is understood. The drill must be stopped if a dangerous situation is detected. Make sure to report any defective or deficient life-saving appliances. Drills should help people gain knowledge and experience, not cause injuries.

Evacuation operations may be experienced differently. No man or vessel is the same, and weather conditions and currents may affect the evacuation drill. All hazards and situations must be assessed before the drill starts, and everyone must have a conscious attitude towards the focus areas of the drill.

A thorough review of the appliances and the procedure ahead could have a preventive effect on injuries and make sure the drill is carried out safely and securely. Installation errors, for instance, can be detected by a thorough examination of the appliances to make sure they are properly installed prior to the drill.

Drills carried out on board should be as realistic as possible, yet of no danger to the persons participating. Training tools such as photos, videos, online courses, etc. should be used for the part involving launching and evacuation that cannot be carried out during the drills. The drills must take into account the normal function, alternative function and emergency procedures.

7.2.6 Organise assistance for disabled persons and persons with reduced mobility

7.2.6.1 Knowledge of training requirements and instructions of Annex IV to Regulation (EU) 1177/2010

According to **Article 14 - Training and instructions of Regulation (EU) 1177/2010**, carriers and, where appropriate, terminal operators shall establish disability-related training procedures, including instructions, and ensure that:

- Their personnel, including those employed by any other performing party, providing direct assistance to disabled persons and persons with reduced mobility are trained or instructed as described in Annex IV, Parts A and Parts B of this Regulation;
- Their personnel who are otherwise responsible for the reservation and selling of tickets or embarkation and disembarkation, including those employed by any performing party, are trained or instructed as described in Annex IV, Part A; and
- The categories of personnel referred to in the above points maintain their competences, for example through instructions or refresher training courses when appropriate.

Annex IV - Disability-related training, including instructions, as referred in Article 14

A. **Disability-awareness training, including instructions,** includes:

- Awareness of and appropriate responses to passengers with physical, sensory (hearing and visual), hidden or learning disabilities, including how to distinguish between the different abilities of persons whose mobility, orientation or communication may be reduced;
- Barriers faced by disabled persons and persons with reduced mobility, including attitudinal, environmental/physical and organisational barriers;
- Recognising assistance dogs, including the role and the needs of an assistance dog;
- Dealing with unexpected occurrences;
- Interpersonal skills and methods of communication with people with hearing impairments, visual impairments or speech impairments and people with a learning disability;
- General awareness of IMO guidelines relating to the Recommendation on the design and operation of passenger ships to respond to elderly and disabled persons' needs
- The use of boarding and deboarding assistance equipment used and knowledge of the appropriate boarding and deboarding assistance procedures that safeguard the safety and dignity of disabled persons and persons with reduced mobility;
- Understanding of the need for reliable and professional assistance. Also awareness of the potential of certain disabled persons and persons with reduced mobility to experience feelings of vulnerability during travel because of their dependence on the assistance provided;
- A knowledge of first aid.

B. **Disability-assistance training, including instructions,** includes:

- How to help wheelchair users transfer into and out of their wheelchair;
- Skill in providing assistance to disabled persons and persons with reduced mobility travelling with a recognised assistance dog, including the role and the needs of the dogs;
- Techniques for escorting passengers with visual impairments and for the handling and carriage of recognised assistance dogs;
- An understanding of the types of equipment which can assist disabled persons and persons with reduced mobility and a knowledge of how to carefully handle such equipment.

7.2.6.2 Ability to perform and organise direct assistance to disabled persons and persons with reduced mobility

According to **Article 10 - Right to assistance in ports on board ships** of Regulation (EU) 1177/2010,

Carriers and terminal operators shall, within their respective areas of competence, provide assistance free of charge to disabled persons and persons with reduced mobility, as specified in Annexes II and III, in ports, including embarkation and disembarkation, and on board ships. The assistance shall, if possible, be adapted to the individual needs of the disabled person or person with reduced mobility.

Annex II - Assistance in ports, including embarkation and disembarkation

1. Assistance and arrangements necessary to enable disabled persons and persons with reduced mobility to:
   - Communicate their arrival at a port terminal or, if possible, a port and their request for assistance;
   - Move from an entry point to the check-in counter, if any, or the ship;
   - Check in and register baggage, if necessary;
   - Proceed from the check-in counter, if any, to the ship, through emigration and security points;
   - Embark the ship, with the provision of lifts, wheelchairs or other assistance needed, as appropriate;
   - Proceed from the ship door to their seats/area;
   - Store and retrieve baggage on the ship;
   - Proceed from their seats to the ship door;
   - Disembark from the ship, with the provisions of lifts, wheelchairs or other assistance needed, as appropriate;
   - Retrieve baggage, if necessary, and proceed through immigration and customs points;
   - Proceed from the baggage hall or disembarkation point to a designated point of exit;
   - If required, make their way to the toilet facilities (if any).
2. Where the disabled person or person with reduced mobility is assisted by an accompanying person, that person must, if requested, be allowed to provide the necessary assistance in the port and with embarking and disembarking.
3. Handling of all necessary mobility equipment, including equipment such as electric wheelchairs.
4. Temporary replacement of damaged or lost mobility equipment with equipment which is a suitable alternative.
5. Ground handling of recognised assistance dogs, when relevant.
6. Communication in accessible formats of information needed to embark and disembark.

Annex III - Assistance on board ships

1. Carriage of recognised assistance dogs on board the ship, subject to national regulations.
2. Carriage of medical equipment and of the mobility equipment necessary for the disabled person or person with reduced mobility, including electric wheelchairs.
3. Communication of essential information concerning a route in accessible format.
4. Making all reasonable efforts to arrange seating to meet the needs of disabled persons or persons with reduced mobility on request and subject to safety requirements and availability.
5. If required, assistance in moving the toilet facilities (if any).
6. Where a disabled person or person with reduced mobility is assisted by an accompanying person, the carrier shall make all reasonable efforts to give such person a seat or cabin next to the disabled person or person with reduced mobility.

7.3 Emergency situations

Competences

The Boatmaster shall be able to set up emergency and damage control plans, and handle emergency situations.

The Boatmaster shall be able to:

7.3.1 Initiate preparations for rescue plans of different types of emergencies;

7.3.2 Train in methods to prevent fire, recognition of origin of fire and firefighting according to the different skills of crew members;

7.3.3 Train in the use of life-saving appliances;

7.3.4 Give instructions on rescue plans, escape routes and internal communication and alarm systems.

7.3.1 Initiate preparations for rescue plans of different types of emergencies

7.3.1.1 Knowledge of different types of emergencies which may occur such as collision, fire, flooding, sinking

Collision

Even with the latest developments in navigational equipment and communication systems, collision accidents between vessels continue to occur around the world. Some of the main reasons for such accidents are negligence, incompetence and miscommunication. Vessel collision is the name given to the physical impact that occurs between two vessels resulting in a damaging accident.

This particular collision can also occur between a vessel and a stable or a floating structure like an offshore drilling platform or even a port.

In the majority of such cases the impact is devastating to say the least. The damage that such an accident causes cannot just be measured in terms of costing or money, in fact it goes beyond that.

When a vessel collision occurs it has immeasurable consequences. Firstly, the loss of life is always an irreparable damage and something that can never be compensated for. Unfortunately the possibilities of loss of life in such cases are very high. Secondly, the environmental impact is very negative especially if any one of the vessels in the collision happens to carry any chemicals or any other harmful material that could be dangerous for marine life.

An oil tanker is a very good example of this and the world has seen many accidents involving tankers. Oil spills not only create a biological crisis but also remain damaging for a very long time thereby resulting in financial losses. In such cases the communities residing in the coastal area near the site of the vessel collision suffer the most.

The next big sufferers are obviously the owners of the vessels or those who had some financial stakes in the cargo or any one of the vessels. Although there are laws that govern the calculation of the damage and the subsequent penalty, in any case the loss plus the financial penalty if any is a huge setback to the owners. And finally, the damage to the infrastructure is also something that has to be taken into consideration.

Fire

Fire on board the vessel is one of the most serious risks for property and persons, as well as for the surrounding environment. A vessel is evidently subject to the same risks with regard to fire as a civil or industrial land structure. On board vessel there are liquid fuel, electrical equipment, air-conditioning plants, engines, boilers, stores of flammable material and crew accommodation areas. To all this we must add the load, which in cargo vessels consists of a high percentage of solid and liquid goods that are flammable or at least combustible, and often of a dangerous nature. In passenger vessels the load consists of accommodation and entertainment facilities for the passengers and, in ferries, of a large garage for motor vehicles.

Thus a fire on board vessel during navigation represents an extremely high risk situation which may cause physical harm or death to crew members and passengers, and loss of the vessel or considerable damage to its structures and equipment. Furthermore, when the vessel is carrying mineral oils, chemical or

gas products, gases will certainly escape into the atmosphere and very probably liquids and solids harmful to the environment will be spilt into the water.

Flooding

A flooding is the result of water ingress on board and can affect the watertight integrity and finally the stability of the vessel. Vessel flooding can be caused by damage in the vessel's hull due to collision with another vessel, contact or grounding. This will cause a change in draft to the point where the displacement of the undamaged (intact) part of the vessel will be equal to the displacement before damage less the weight of the water that entered the ship after flooding.

Sinking

Vessels can sink due to a few main reasons - wind and other forces forcing the vessel to lean at dangerous angles to the port or starboard sides, waves on the deck adding weight to the vessel and forcing it lower into the water, or waves crashing into the side of the vessel and causing flooding. Flooding is the most common reason why vessels sink.

Once a collision occurs, the hull of the vessel may rupture, leading to imminent flooding. In addition, there is a high chance that equipment such as the rudders or propellers may be damaged by the collision. A collision can also lead to loss of cargo which can destabilise the vessel leading to loss of stability.

7.3.1.2 Ability to organise shipboard contingency plans for response to emergencies and to assign specific duties to crew members including monitoring and control

Contingency plans formally establish the processes and procedures to protect employees, core business elements, critical processes, information systems and the environment in the event of an emergency, business disruption, or disaster.

The integrated contingency plan for response to emergencies should provide a framework for the many individual contingency plans tailored for a variety of potential emergencies, for a uniform and modular designated structure.

The structure of an integrated contingency plans, should be the following:

I. **Introduction - Introduction text**

II. **Provisions**
   a. Basic information;
   b. Maintenance of the system and associated plans
   c. Consistency between the system and the associated plans.

III. **Planning, preparedness and training**
   a. Provisions and information for emergency training and education;
   b. Familiarisation with the vessel and shore side system associated plans;
   c. Responsibilities/communication lines established with all parties involved;
   d. Information of external coordinating authorities/ provisions for regular drills.

IV. **Response actions**
   a. Damage to vessel (fire, cargo-related accidents, pollution, personnel accidents, emergency assistance to other vessels, etc.);
   b. Initial actions;
   c. Subsequent response activities.

V. **Reporting procedures**
   a. When to report;
   b. How to report;
   c. Whom to contact;
   d. What to report.

VI. **Annexes**
   a. Plans and diagrams concerning details of the vessel's general arrangements;
   b. Bunker and ballast information;
   c. Additional documents (e.g. list of contact points);
   d. Industry guidelines;
   e. Cargo information.

The system and plans will be of little value if the personnel who are to use them are not made familiar with them. Chapter III - Planning, preparedness and training should therefore provide practical information which enables each key member of the vessel crew members to know in advance what their duties and responsibilities are and to whom they are to report under the plans.

Successful management of an emergency situation depends on the ability of the vessel crew members, the company, and external emergency coordinating authorities to muster sufficient resources in the right position quickly.

An important goal of planning, preparedness and training programmes should be to increase awareness of safety and environmental issues.

Training and education should be at regular intervals and, in particular, be provided to crew members transferred to new assignments.

Records of all emergency drills and exercises conducted ashore and on board should be maintained and be available for verification. The drills and exercises should be evaluated as an aid to determining the effectiveness of documented procedures and identifying systems improvements.

When developing plans for drills and exercises, a distinction should be made between full-scale drills involving all of the parties that may be involved in a major incident and exercises limited to the vessel and/or company.

Feedback is essential for refining emergency response plans and emergency preparedness based on the lessons learned from previous exercises or real emergencies, and provides an avenue for continuous improvement.

7.3.2 Train on methods to prevent fire, recognitions of origin of fire and fire-fighting according to the different skills of crew members

7.3.2.1 Knowledge of fire-fighting procedures with particular emphasis on tactics and command

Fire-fighting organisation

Preparation prior to a fire or incident is vital. The responsible officer and crew members must learn the basic procedures indicated on the Station Bill and any special procedures to cover special loads or hazards. Intimate knowledge of the vessel's facilities shown on the vessel's fire safety plan is essential to control the fire in the early stages.

The crew must be fully aware of their tasks and use of their equipment and it must be tested during a fire drill. All the equipment used in controlling a fire must be in a perpetual state of readiness, from the ventilation controls through to the batteries being fully charged in the lamps, everything is important.
The crew members of the vessel are required to have basic skills and competence for efficient intervention in case of fire.

These requirements are as follows:

- Use of various portable fire extinguishers;
- Use of BA (breathing apparatus);
- Extinguishing smaller fires, electrical, oil, etc.;
- Extinguishing fires using jet and spray nozzles with water;
- Extinguishing fires using foam, powder and chemical agents;
- Entering and passing through a compartment with high expansion foam using no Breathing Apparatus;
- Fighting fires in enclosed spaces using Breathing Apparatus;
- Use fog or steam for fire suppression;
- The above standards can be tested during the compulsory fire drill.

Fire drill

The purpose of the fire drill is to test the efficiency of the organisation. The crew must be challenged in order to make it interesting and more importantly to learn from mistakes.

The danger is to make the drill a routine that does not test the organisation.

One focused drill is more beneficial than repeating a routine drill many times.

Change the drill each time to stimulate and challenge thought.

The drill can also be used to check and test equipment in the drill environment, required in accordance with the certificate - fire pumps, breathing apparatus, fire suits and communications.

A successful meaningful drill requires thought before the drill begins, firstly defining the learning objectives, setting the timing and allocating time to debrief afterwards.

The objectives must reflex key tasks to be performed and must be measurable against a standard, i.e. one objective could be to dress effectively in fire outfits and breathing apparatus within a fixed time frame, effectively meaning skin is fully protected and the start-up tests are performed on the breathing apparatus.

Once the objectives are set, a scenario can be written, which incorporates specific events and consequences of certain actions; the script should test all of the crew.

The drill begins with a report of fire and subsequent sounding of the alarm, indicating that it is a drill, but trying to bring an element of surprise and realism. Occasionally begin the drill by a report of fire from sources other than the bridge. The speed of reaction, mustering, and specific duties performed, setting up of the command and communications should be analysed.

The attack on the fire will depend upon the scenario, however, the leadership, assessment of the situation and subsequent decisions should be evaluated. Create chaos to see if the team can control and react to the ever changing situations a fire can create.

Fire-fighting intervention

Evaluate the drill; by assessing if the objectives were reached, being critical about actions so that the lessons learned can be incorporated in the procedures. The crew should be encouraged to participate uninhibited, without fear of making mistakes. The drill will go wrong, but then lessons are learned. A drill that is perfectly conducted is not challenging the crew.

The level of competence can be improved through drilling. Specific skills can be identified, taught, demonstrated and practised. Slow down the task and repeat until the person or team demonstrates a set level of competence. Endeavour to share information and experience gained by all members of the crew.

Document the fire drill for future reference, to assess improvements in the organisation.

The drill begins with a report of fire and subsequent sounding of the alarm, indicating that it is a drill, but trying to bring an element of surprise and realism. Occasionally begin the drill by a report of fire from sources other than the bridge.

The speed of reaction, mustering, and specific duties performed, setting up of the command and communications should be analysed.

7.3.2.2 Knowledge of the use of water for fire-extinguishing with regard to the effect on vessel stability, and ability to take appropriate measures

Fire-fighting water allowed to accumulate aboard a vessel eventually will affect the vessel's buoyancy and stability. The higher the amount of water allowed to accumulate above a vessel's centre of gravity, the more it will adversely influence its stability.

There have been many tragic stories of fire departments valiantly fighting a fire aboard vessel for hours, and even days, only to have the ship capsize or sink at the dock because of the weight of the fire-fighting water that was applied. The results are embarrassing, frustrating, expensive and sometimes fatal.

There are only three ways to prevent this disaster.

- One way would be to remove all of the fire-fighting water as quickly as it is being applied;
- The second way would be to use less water, or no water;
- The third way would be to move the water to a part of the vessel where it will be less destabilising.

Removing all the water with dewatering pumps is the best.

But before moving this water it is important to learn why it is important to do anything at all about this water.

All the information you need to know about vessel stability is that any weight added to a vessel, beyond that which it is designed for, may cause the vessel to sink. The higher up in the vessel that this weight is added, the worse the problem. Anyone who might ever be in command of a vessel fire, must have an understanding of the principles of stability.

One of the measures is to move the water to a location where it will be less destabilising.

Fire-fighting water that accumulates on the upper levels of a vessel will be more likely to decrease stability than water accumulating in lower areas due to the raising of the centre of gravity which leads to listing and eventual capsizing.

If all of the water went directly to the lowest part of the vessel it could actually help to make a vessel more stable by lowering the centre of gravity – up to a limited amount of course. This is just the same as when water is added to an empty vessel to provide ballast. Ideally, the first measure is to remove this water from the vessel, but that can't always be done. Some reasons that might prevent personnel from removing the water overboard are: lack of pumps, lack of power or pollutants mixed with water.

In these cases the next best solution is to transfer this water as low in the vessel as possible. If there are pumps but the personnel are unable to pump overboard due to the height, then you can pump the water down into the vessel bilge where it can then either be pumped overboard by the vessel's own bilge pumps or it can remain at this safer, lower area, although you will still have to be monitoring the ships draft.

One trick that has been used successfully at many vessel fires to send water to lower levels, and which doesn't require the use of pumps, is to break apart toilets in any flooded upper level accommodation spaces. This will allow the water to drain into the vessel sanitary tanks which are located in the lower levels of the vessel.

To sum up, anytime you are going to be putting fire-fighting water on a vessel you must simultaneously begin removing or relocating that water. When starting any dewatering operation you must realise that the priority must be given to upper areas especially those that are subject to the "Free Surface Effect".

One of the first calls in the event of a vessel fire would be to the fire brigade on shore to send someone to monitor stability, as they know what they are doing and can relieve you of this task. Until they arrive it will be up to you but it's worth noting that the vessel's licensed crew members should also have a good knowledge of vessel stability.

7.3.2.3 Ability to communicate and coordinate during fire-fighting operations including communication with external organisations and to actively take part in rescue and fire-fighting operations

This section deals with leadership, how to manage an incident effectively involving fire or spillage of a dangerous product.

The approach to leadership in emergency situations is based on a system used by fire and emergency services; it is called functional leadership which analyses the functions involved in dealing with an emergency. Previous approaches made assumptions that leaders were born with the qualities to lead. Certain qualities, courage, integrity, common sense, etc., may help in showing leadership but a good leader need not display these characteristics.

Another approach suggests that the leader having the skill or knowledge to deal with a situation makes the best leader. There is a little truth in this approach; however this is not the whole picture in dealing with an emergency.

A better approach is to analyse the functions involved. Leadership can only be applied to groups which are confronted with a need to take action or make decisions.

Within a group, 3 areas of need exist:

1. Task needs;
2. Team maintenance needs;
3. Individual needs.

Task needs

Groups formed to undertake a task too complex or too impractical for one person to accomplish.

Team maintenance needs

To achieve the task the group must be held together as a cohesive team.

Individual needs

The group has individuals, who have their own demands, which contribute to the functioning of the group.

The functions of a good leader are to recognise the 3 areas of need, thus be aware of the needs of the group and perform the thought processes, communications and actions to satisfy the needs of the group.

Task functions:

- Defining the task;
- Making a plan;
- Allocating work and resources;
- Controlling quality and resources;
- Checking performance against plan;
- Adjusting plan.

Team maintenance functions:

- Setting standards;
- Maintaining discipline;
- Building team spirit;
- Praising, motivating and giving a sense of purpose;
- Ensuring communications within the group;
- Training the group.

Individual functions:

- Attending to personal problems;
- Praising individuals;
- Giving status;
- Recognising and using individual abilities;
- Training the individual.

In an emergency the task needs are going to take priority and less attention is given to the other two, unless the team or an individual is not performing, in which case attention must be given to these in order to control the situation. In the training periods the team and individual needs can be built up in preparation for the high task priorities.

To simplify the thought processes the following 6 functions must be addressed by the leader to meet the needs of the group:

- Planning;
- Briefing;
- Control;
- Support;
- Informing;
- Evaluating.

Failure to perform any one of these functions will result in partial or total failure of the group to achieve its aim.

Planning

This process concerns obtaining all available information, determining the extent of the task, deciding on a plan of action and an order of priorities. The initial alarm will initiate the fire organisation which will have already allocated key roles and duties to help contain the fire. However, follow-up works on fire location, size and possibilities of escalation will dictate further actions; the control of compartments, fuel cut and ventilation are important initials actions, which should be performed as early as possible.

Limitations on manpower and equipment can give serious restrictions, thus a quick response to control the incident is essential; to prevent escalation use of passive protection (fire resisting bulkheads) and active measures (fixed fire-fighting systems, fire teams) must be placed effectively. The main priority in formulating an attack plan comes with safety of the crew. Assessment of the risk involved must be performed before committing teams, particularly in the engine room where temperatures can increase rapidly in a short time. The next priority to be considered is rescue. If a missing person has a chance of survival then a

quick response has to be made, but again assess the risk to the rescuers. The incident may be dealt with in one of two ways, direct attack on the fire or indirect attack, meaning controlling the growth of the incident (i.e. surround the fire with boundary cooling until the fire suffocates itself). The choice depends on the extent of the fire, the time required to begin the attack and possible casualties.

Before an attack, first consider dangers such as BLEVE (Boiling Liquid Expanding Vapour Explosion) if closed containers are involved. The following list will help establish the priorities:

- Safety of the crew and fire teams;
- Rescue of endangered personnel;
- Exposure of containers to fire, which could result in additional fires;
- Confinement of the fire, preventing fire spread to surrounding area, i.e. fire can;
- Spread in 6 directions, thus the fire needs to be blocked and confined;
- Extinguish the fire when it is safe to do so and when the correct means are available;
- Overhaul, returning the scene back to safe condition.

Control

Once the team is set to work, the role of the leader or a delegated officer is to control the effectiveness of the crew and the working environment continuously. Ensure that all actions are contributing to the aim of maintaining crew standards and if necessary influence the tempo of the actions which will affect the outcome. The working environment will need to be monitored, particularly the stability of the vessel and growth of the fire, both of which effect the safety of the working teams.

Supporting

In order to maintain the team and individual needs, it will be necessary to help the group emotionally with encouragement or physically with back-up and support.

Less time can be spent on this function, if it is addressed in the training sessions with team building. However, long protracted incidents may still require emotional supporting actions to be taken.

Informing

The communications links should be set up to assist in the flow of information two ways. The command must inform crews of all matters affecting their activities, particularly matters concerning their own safety and the command must have reports back from the crews, in order to carry out an evaluation of the progress.

Evaluating

The achievements need to be compared with the original plan. The performance needs to be checked against the plan.

In each situation the plan needs to be modified or remedial action taken. The situation on the ship may change rapidly; therefore the command must monitor conditions regularly. Debriefing after an incident can also be very effective at highlighting good work, problems and weaknesses in the performance.

Decision making

The style of leadership in an emergency will be autocratic, due to the urgency of the situation. However leaders will vary their style to be democratic if the situation and time pressures allow. Decision sharing will produce sounder decisions when skills and knowledge come from within the group. The styles of leadership vary from autocratic to democratic, as follows:

- Autocratic;
- Bureaucratic;
- Laissez–faire;
- Democratic.

7.3.3 Train on the use of life-saving appliances

7.3.3.1 Knowledge of particular characteristics and facilities of rescue devices

Shipboard life-saving appliances

Liferafts

General requirements

Every liferaft shall be so constructed as to be capable of withstanding exposure for 30 days afloat in all water conditions.

The liferaft shall be so constructed that when it is dropped into the water from a height of 18 m, the liferaft and its equipment will operate satisfactorily.

The floating liferaft shall be capable of withstanding repeated jumps onto it from a height of at least 4.5 m above its floor both with and without the canopy erected.

The liferaft and its fittings shall be so constructed as to enable it be towed at a speed of 3 knots (approx. 5 km/k) in calm water when loaded with its full complement of persons and equipment and with one of its anchors streamed.

The liferaft shall have a canopy to protect the occupants from exposure which is automatically set in place when the liferaft is launched and waterborne.

Lifelines shall be securely bucketed around the inside and outside of the liferaft. The liferaft shall be fitted with an efficient painter of length equal to not less than 10 m plus the distance from the stowed position to the waterline in the lightest water condition or 15 m, whichever is the greater. A manually controlled exterior light shall be fitted to the uppermost portion of the liferaft canopy or structure. The light shall be white and be capable of operating continuously for at least 12 h with a luminous intensity of not less than 4.3 cd in all directions of the upper hemisphere. However, if the light is a flashing light it shall flash at a rate of not less than 50 flashes and not more than 70 flashes per minute for the 12 h operating period with an equivalent effective luminous intensity.

A manually controlled interior light shall be fitted inside the liferaft capable of continuous operation for a period of at least 12 h.

Rigid liferafts shall comply with the life rat general requirements and, in addition, with the following requirements.,

Construction

The buoyancy of the liferaft shall be provided by approved inherently buoyant material placed as near as possible to the periphery of the liferaft. The buoyant material shall be fire-retardant or be protected by a fire-retardant covering.

The floor of the liferaft shall prevent the ingress of water and shall effectively support the occupants out of the water and insulate them from cold.

Access into rigid liferafts

At least one entrance shall be fitted with a boarding ramp, capable of supporting a person weighing 100 kg sitting or kneeling and not holding onto another part of the liferaft, to enable persons to board the liferaft from the water.

Entrances not provided with a boarding ramp shall have a boarding ladder, the lowest step of which shall be situated not less than 0.4m below the liferaft's light waterline.

There shall be means inside the liferaft to assist persons to pull themselves into the liferaft from the ladder.

Marking on rigid liferafts

The liferaft shall be marked with:

- Name and port of registry of the vessel to which it belongs;
- Serial number;
- Name of approving authority;
- Number of persons it is permitted to accommodate over each entrance in characters not less than 100 mm in height of a colour contrasting with that of the liferaft;
- Type of emergency pack enclosed;
- Length of painter;
- Launching instructions.

Lifeboats

General requirements for lifeboats

Construction of lifeboats

All lifeboats shall be properly constructed and shall be of such form and proportions that they have ample stability on the water and sufficient freeboard when loaded with their full complement of persons and equipment, and are capable of being safely launched under all conditions of trim. All lifeboats shall have rigid hulls and shall be capable of maintaining positive stability when in an upright position in calm water and loaded with their full complement of persons and equipment and holed in any one location below the waterline, assuming no loss of buoyancy material and no other damage.

Each lifeboat shall be fitted with a permanently affixed approval plate, containing at least the following items:

- Manufacturer's name and address;
- Lifeboat model and serial number;
- Month and year of manufacture;
- Number of persons the lifeboat is approved to carry.

All lifeboats shall be of sufficient strength to:

- Enable them to be safely launched into the water when loaded with their full complement of persons and equipment; and
- Be capable of being launched and towed when the vessel is making headway at a speed of 5 knots (approx. 7 km/h) in calm water.

Hull and rigid covers shall be fire-retardant or non-combustible.

Seating shall be provided on thwarts, benches or fixed chairs which are constructed so as to be capable of supporting a static load equivalent to the number of persons, each weighing 100 kg.

Each lifeboat to be launched by falls shall have sufficient strength to withstand a load, without residual deflection on removal of that load.

Lifeboat buoyancy

All lifeboats shall have inherent buoyancy or shall be fitted with inherently buoyant material which shall not be adversely affected by water, oil or oil products, sufficient to float the lifeboat with all its equipment on board when flooded and open to the waterway.

Lifeboat propulsion

Every lifeboat shall be powered by a compression-ignition engine. No engine shall be used for any lifeboat if its fuel has a flashpoint of 43°C or less. The engine shall be provided with either a manual starting system, or a power starting system, or a power starting system. Any necessary starting aids shall also be provided.

Lifeboat fittings

All lifeboats shall be provided with at least one drain valve fitted near the lowest point in the hull which shall automatically open to drain water from the hull when the lifeboat is not waterborne and shall automatically close to prevent entry of water when the lifeboat is waterborne. Each drain valve shall be provided with a cap or plug to close the valve, which shall be attached to the lifeboat by a lanyard, a chain or other suitable means. Drain valves shall be readily accessible from inside the lifeboat and their position shall be clearly indicated.

All lifeboats shall be provided with a rudder and tiller.

Lifeboat markings

The number of persons for which the lifeboat is approved.

The name and port of registry of the vessel to which the lifeboat belongs shall be marked on each side of the lifeboat's bow.

7.3.3.2 Ability to launch and recover a ship's boat and instruct crew members and shipboard personnel on the use of a ship's boat

Preparation and safety of the ship's boat

The vessel's boat hangs outboard from the davit. This is a small crane with a hand winch. It is required by law that the ship's boat can be launched by someone within five minutes. This makes it necessary to regularly check that the davit is and maintain the davit in good and safe condition.

This can be done in the following way:

- Check that the equipment of the ship's boat is complete (oars, mooring rope and bailer);
- Check the lifting wire and the four jumps for wear;
- Lubricate the winch and check that it is still working properly;
- Check that the davit can still turn outboard;
- Check whether the drainage plug can still close and remove sand and dirt;
- A ship's boat has a drainage plug. This ensures that rainwater can drain. The drainage plug is therefore often open when the ship's boat is not in use. When you are going to use the ship's boat, you must first close the drainage plug.

When crew members are going to use the ship's boat, they must also wear the right clothing. These are:

- Warm and not too loose clothing;
- Sturdy non-slip shoes (no boots);
- A life jacket.

A ship's boat is intended as a means of rescue and is part of the mandatory equipment of an inland vessel. The ship's boat must be stable and not sink. The legally required equipment for a ship's boat consists of:

- A set of oars;
- A mooring rope;
- A bailer.

Two oars must be used for rowing with the ship's boat. These are on the sides of the boat. When rowing, the blades of the oars (the lower parts) are moved through the water.

Before you start rowing, you have to learn to put the oars in and out of the water correctly and safely. You can easily lose a belt. In a stationary boat, oars are always with the blade on the stern deck with the handle forward. There is then one oar on the port side and one on the starboard side. When there is enough space around the boat, you can put the oars in the row rolls. These are on the sides of the ship's boat. To do this, you grab the oar with your hand by the handle and place the oar in the row roller.

While rowing. it is important to sit well in the middle of the ship's boat. Keep the oars equally deep in the water on both sides. Then pull the straps towards you. Try to distribute the force evenly between the two belts. If you do not do this correctly, you will go in circles.

There are two expressions used in rowing. Those are:

- Retrieval is pulling the oars towards you so that the boat moves forward;
- Ironing is pushing the oars away from you so that the boat moves backwards.

Sailing with an outboard motor

Before using an outboard motor, check the following:

- Whether there is enough fuel in the tank;
- Whether the motor is properly secured and secured with a chain or rope;
- That the fuel hoses are connected properly and in the correct direction.

You usually start an outboard motor by hand. You do that like this:
- Open the fuel tank vent;
- Move the clutch of the outboard motor to the neutral position;
- Squeeze the pump to get the fuel from the tank to the engine;
- Set the throttle to start;
- Give the starter rope a big tug to start the engine.

When the engine is running, you can put the clutch in forward gear. Then accelerate with the throttle to set sail. To be on the safe side, always take a pair of oars with you as the engine can fail.

Safety when sailing with an outboard motor
Sailing with an outboard motor is faster than when you are rowing or prying. That's why everyone has to get on board. If you don't do this, you could hit the water when making a sharp turn. That's why you also have to wear your life jacket.

Some outboards are equipped with a dead man's switch. This is a special cord that you put on your wrist. When the cord becomes tight, for example because you fall overboard, the motor stops automatically. Always put this cord on your wrist when sailing an outboard motor.

You are sailing with a dangerous substance: petrol. Petrol is highly flammable and the petrol vapour in particular is highly explosive. So no fire may be lit on board while using the outboard motor. You are therefore not allowed to smoke!

7.3.4 Give instructions on rescue plans, escape routes and internal communication and alarm system

7.3.4.1 Knowledge of legislation applying to rescue plans and safety rota

According to the provisions of the European Standard laying down Technical Requirements for Inland Navigation vessels - ES-TRIN, adopted by CESNI, safety organisation on board of the inland vessels consists of:
A safety rota shall be provided on board passenger vessels. The safety rota describes the duties of the crew and the shipboard personnel in the following eventualities:
- Breakdown;
- Fire on board;
- Evacuation of passengers;
- Person overboard.

Specific safety measures for persons with reduced mobility shall be taken into consideration.
The crew members and shipboard personnel designated in the safety rota should be assigned their various duties, depending on the posts they occupy.
Special instructions to the crew shall ensure that, in the event of danger, all doors and openings in the watertight bulkheads will be hermetically closed immediately.

The safety rota includes a safety plan, in which at least the following are clearly and precisely designated:
- Areas intended for use by persons with reduced mobility;
- Escape routes, emergency exits and muster and evacuation areas;
- Life-saving equipment and ship's boat;
- Fire extinguishers and fire extinguishing and pressurised sprinkler systems;
- Other safety equipment;
- The alarm system;
- The bulkhead doors and the position of their controls, as well as the other openings;
- Doors;
- Fire dampers;
- Fire alarm system;
- Emergency power plant;
- Ventilation system control units;
- Shore connections;
- Fuel line shut-offs;
- Liquefied gas installations;
- Public address systems;
- Radio-telephone equipment;
- First aid kits.

The safety rota shall:
- Be duly stamped by the inspection body; and
- Ne prominently displayed at an appropriate point of each deck.

7.3.4.2 Ability to give instructions on rescue plans, escape routes and internal communication and alarm systems

Safe escape routes should be provided on board of passenger vessels, which must meet the following requirements:
- Escape routes should be maintained in a safe condition, clear of obstacles;
- Additional aids for escape should be provided as necessary to ensure accessibility, clear marking, and adequate design for emergency situations;
- Stairways, ladders and corridors serving crew spaces and other spaces to which the crew normally have access should be arranged so as to provide ready means of escape to a deck from which embarkation into survival craft may be effected.

There should be at least two means of escape, as widely separated as possible, from each section of accommodation and service spaces and control stations.

The normal means of access to the accommodation and service spaces below the open deck should be arranged so that it is possible to reach the open deck without passing through spaces containing a possible source of fire (e.g. machinery spaces, storage spaces of flammable liquids).

The second means of escape may be through portholes or hatches of adequate size and preferably leading directly to the open deck.

At least two means of escape should be provided from machinery spaces, except where the small size of a machinery space makes it impracticable. Escape should be by steel ladders that should be as widely separated as possible.

Internal communication facilities on board

There shall be internal communication facilities on board vessels with a wheelhouse designed for radar navigation by one person. It shall be possible to establish communication links from the steering position:

- With the bow of the vessel or convoy;
- With the stern of the vessel or convoy if no direct communication is possible from the steering position;
- With the crew accommodation;
- With the boatmaster's cabin.

Reception at all positions of these internal communication links shall be via loudspeaker, and transmission shall be via fixed microphone. The link with the bow and the stern of the vessel or convoy may be of the radio-telephone type.

Special provisions applicable to passenger vessels

Electrical equipment

Only electrical equipment shall be permitted for lighting.

For the following rooms and locations, adequate lighting and emergency lighting shall be provided:

- Location where life-saving equipment is stored and where such equipment is normally prepared for use;
- Escape routes, access for passengers, including gangways, entrances and exits, connecting corridors, lifts, companionways, cabin areas and accommodation areas;
- Markings on the escape routes and emergency exits;
- In other areas intended for use by persons with reduce mobility;
- Operation rooms, engine rooms, steering equipment rooms and their exits;
- Wheelhouse;
- Emergency electrical power source room;
- Points at which extinguishers and fire extinguishing equipment controls are located;
- Areas in which passengers, shipboard personnel and crew muster in the event of danger.

There shall be an emergency power plant, consisting of an emergency electrical power source and emergency switchboard, which, in the event of a failure of the supply to the following electrical equipment, can immediately take over as their replacement supply, where the equipment does not have its own electrical power source:

- Navigation lights;
- Audible warning devices;
- Emergency lighting;
- Radio-telephone installations;
- Alarm, loudspeaker and on-board message communications systems;
- Searchlights;
- Fire alarm system;
- Other safety equipment such as automatic pressurised sprinkler systems or fire extinguishing pumps;
- Lifts and lifting equipment.

The light fittings for the emergency lighting shall be marked as such.

The emergency power plant shall be installed outside the main engine room, outside the rooms housing the power sources and outside the room where the main switchboard is located.

Cables feeding the electrical installations in the event of an emergency shall be installed and routed in such a way as to maintain the continuity of supply of these installations in the event of fire and flooding. These cables shall never be routed through the main engine room, galleys or rooms where the main power source and its connected equipment is installed, except insofar as it is necessary to provide emergency equipment in such areas.

The emergency power plant shall be installed either above the margin line or as far away as possible from the power sources, so as to ensure that, in the event of flooding it is not flooded at the same time as these power sources.

Alarm system
There shall be an independent alarm system enabling the accommodation, engine rooms and, where appropriate, the separate pump rooms to be reached. The helmsman shall have within reach an on/off switch controlling the alarm signal; switches which automatically return to the position when released are not acceptable.

The sound pressure level for the alarm signal shall be at least 75 dB (A) within the accommodation area. In engine rooms and pump rooms the alarm signal shall take the form of a flashing light that is visible on all sides and clearly perceptible at all points.

7.4 Environmental protection

Competences:
The Boatman shall be able to: Protect the environment in accordance with relevant regulations;
1. Take precautions to prevent pollution of the environment;
2. Use resources efficiently;
3. Dispose of waste in an environmentally friendly fashion.

7.4.1 Take precautions to prevent environmental pollution and use relevant equipment

7.4.1.1 Knowledge of procedures to prevent pollution of the environment
Pollution prevention is any practice that reduces, eliminates, or prevents pollution at its source. Reducing the amount of pollution produced means less waste to control, treat, or dispose of. Less pollution means less hazards posed to public health and the environment.

Specific pollution prevention approaches
Pollution prevention approaches can be applied to all potential and actual pollution-generating activities, including those found in the energy, agriculture, federal, consumer and industrial sectors. Prevention practices are essential for preserving wetlands, groundwater sources and other critical ecosystems - areas in which we especially want to stop pollution before it begins.

In the energy sector, pollution prevention can reduce environmental damage from extraction, processing, transport and combustion of fuels. Pollution prevention approaches include:
- Increasing efficiency in energy use;
- Use of environmentally benign fuel sources.

In the agricultural sector, pollution prevention approaches include:
- Reducing the use of water and chemical inputs;
- Adoption of less environmentally harmful pesticides or cultivation of crop strains with natural resistance to pests; and
- Protection of sensitive areas.

In the industrial sector, examples of pollution prevention practices include:
- Modifying a production process to produce less waste;
- Using non-toxic or less toxic chemicals as cleaners, degreasers and other maintenance chemicals;
- Implementing water and energy conservation practices;
- Reusing materials such as drums and pallets rather than disposing of them as waste.

Why is pollution prevention important?
Pollution prevention reduces both financial costs (waste management and clean up) and environmental costs (health problems and environmental damage). Pollution prevention protects the environment by conserving and protecting natural resources while strengthening economic growth through more efficient production in industry and less need for households, businesses and communities to handle waste.

7.4.1.2 Ability to take precautions to prevent pollution of the environment
The inland water transport is of great importance in the European economy. It is necessary to implement wide safety rules to achieve environmentally friendly types of transportation – mainly occupational safety, fire protection and environmental measures, to avoid oil and oil-based products leakage into the water environment. If an accident nevertheless occurs, immediate action has to be taken to minimise the negative impacts of the oil spill on the environment. Even if all the safety measures are taken and implemented, the risk of accidents is still present. Prompt action is therefore required to reduce negative environmental impacts, using oil barriers, oil absorbers, chemical agents, oil collectors and other devices.

Inland navigation can contribute to making transport more sustainable, particularly where it substitutes for road transport, but inland shipping and especially the development of waterways for navigation can have considerable environmental impacts.

Waterways for inland navigation can have significant impacts on the ecological value and water quality of water bodies.

Water pollution or damage caused by inland vessels and dredging pose a threat to the aquatic environment. Another significant threat to the environment is caused by operational discharges of mineral oil and lubricants, as well as organic substances (mainly PAHs) due to shipping operations. The nature and extent of the impacts depends on the vessel types and on the characteristics of the body of water itself.

The kinds of mitigation techniques that can be employed can also differ markedly, for example between sections of river with rocky bed and banks, and reaches with sandy or muddy bottoms situated in flood plains. In some cases new works for navigation can be designed to improve water quality or biodiversity and create valuable habitats. Altering the shape of river courses to improve navigation affects bottom and bank characteristics and the dynamics of sediment transportation.

Effects can spread up- and downstream over many years. Without careful attention, alterations can interfere with communication between the main channel, side branches and backwaters. Permanent changes to water levels and flows affect the whole river valley bottom and notably the ecology of floodplains. This can affect the habitats and biodiversity. The greatest attention in the paper (THE ENVIRONMENTAL IMPACTS OF INLAND WATER TRANSPORT AND POSSIBILITIES OF OIL SPILLS CLEANING) is paid to the oil spills and oily-based liquid spills into the water environment and possibilities of negative effects mitigation. http://acta.fih.upt.ro/pdf/2010-3/ACTA-2010-3-11.pdf

7.4.1.3 Ability to apply safe bunkering procedures

Safe Bunkering operations and procedures

Spillages and leakages during bunkering operations are a primary source of oil pollution. Experience has shown that many of the bunker overflows and spillages that do occur can be attributed to human error.
All bunkering operations should be carefully planned and executed in accordance with applicable regulations.

Personnel involved in the bunkering operation on board should have no other tasks and should remain at their workstations during topping-off. Generally, bunkering during cargo operations is not considered to be best practice owing to the need to avoid conflicts of interest for operational personnel. Spillages often occur when crew members are distracted by another task. Companies should require that all bunkering operations are controlled under procedures that are incorporated in a Safety Management System.

These procedures should ensure that the risks associated with the operation have been assessed and that controls are in place to mitigate these risks. The procedures should also address contingency arrangements in the event of a spill.

The Company should consider the following items when producing the procedures:

- Determining that there is adequate space for the volume of bunkers to be loaded;
- Establishing maximum loading volume for all tanks;
- Controls for the setting of bunker system valves;
- Determining loading rates for the start of loading, bulk loading and topping-off;
- Special precautions when loading into double bottom tanks;
- Arrangements of bunker tank ventilation;
- Overflow arrangements;
- Verification of gauging system operation and accuracy;
- Alarm settings on overfill alarm units;
- Bunker overfill protection (in general, the bunker overfill protection is an emergency stopping device only. It should not be used as a standard method of stopping bunkering);
- Communication between the supplier and receiver must be established before bunkering can be undertaken, including communication procedures for the bunkering operation and emergency stop;
- Manning requirements to execute the operation safely (including e.g. deck watch);
- Monitoring of the bunkering operation and checking it conforms to the agreed procedure;
- Changing over tanks during bunkering;
- Containment arrangements and clean-up equipment to be available.

Once the procedure is produced, it should be implemented by use of a check-list (model from Appendix 5 – ISGINTT - International Safety Guide for Inland Navigation Tank-barges and Terminals).
Prior to commencing the operation, all pre-loading checks should be carried out and communication systems verified as working.

The loading rate should be checked regularly.
When changing over from one tank to another, care should be taken to ensure that an excessive back pressure is not put on the hose or loading lines.
When topping-off tanks, the loading rate should be decreased to reduce the possibility of air locks in the tank causing mist carry over through the vents, and to minimise the risk of the supplier not stopping quickly enough.

On completion of bunkering, all hoses and lines should be drained to the tank or, if applicable, back to the delivery bunker supplier, prior to disconnection. The practice of blowing lines with air into bunker tanks has a high risk of causing a spillage unless the tank is only part full and has sufficient ullage on completion of loading.

Responsibility and accountability for the safe conduct of bunker operations is shared jointly between the receiver and the supplier. Before the bunkering operation commences, the responsible personnel should:

- Agree in writing the handling procedures, including the maximum transfer rates;
- Agree in writing the action to be taken in the event of an emergency during transfer operations;
- Complete and sign the Bunkering Safety Check-List for Bunker Delivery to Inland Ships.

The Check-List is primarily structured for loading bunkers from a barge, a jetty or when loading bulk lubricating oil or gas oil from a road tanker.

7.4.1.4 Ability to take measures and give instructions in the event of damage, collision and running aground including the sealing of leaks

Environmental effects of oil spills

An oil spill is the release of a liquid petroleum hydrocarbon into the environment, especially the marine and inland ecosystem, due to human activity, and is a form of pollution. The term is usually given to marine oil spills, where oil is released into the maritime and inland waters, but spills may also occur on land. Oil spills may be due to releases of crude oil from tankers, offshore platforms, drilling rigs and wells, as well as spills of refined petroleum products (such as gasoline, diesel) and their by-products, heavier fuels used by large ships such as bunker fuel, or the spill of any oily refuse or waste oil.

When an oil spill occurs, many elements of the environment may be affected. Depending on the magnitude of the spill and its location, the effects can vary, ranging from minimal to serious ones. For instance, oil spills can have a major impact on the temporary loss of animal and fish habitat. Heavy oils may affect several organism functions like respiration, feeding, and thermo-regulation. At the same time, the entire ecosystem can change temporarily because of the chemical components and elements of the spilled oil that are toxic to the environment.

The general fate and transport of spilled oil dictates its environmental effects and mainly involves:

- The ability of oil to accumulate on top of water bodies forming oil slicks or non-aqueous phase liquids which are generally more resistant to degradation and natural attenuation than the dissolved compounds. From such oil slicks evaporation of many volatile components of oil spill is the dominant process when the oil slick is in contact with air, such as in marine spills;
- The dissolution of certain more soluble oil compounds happens in time along with some dispersion, diffusion, and advection;
- The persistence of many individual oil components makes them accumulate in the environment and living organisms.

The effects of oil spills are not limited to the environment. There are immediate effects on humans, fish, animals, birds and wildlife in general, mainly due to:

- Direct contact with the spilled oil including breathing of volatilised oil components (hydrocarbons) from the spill;
- Direct contact with the environment polluted with spilled oil components (some of which may persist a long time), such as drinking polluted water or breathing polluted dust particles;
- Consumption of polluted food - at any level within the food chain, with a higher risk for food pollution at the higher levels of the food chain, i.e. humans and animals.

Prevention of further damage after a collision accident by vessels

It is important while navigating the vessel that the crew members understand practical procedures to avoid collision guided by Boatmaster standing orders. These procedures are only indicative, not exhaustive in nature and one must always be guided by practices of good seamanship. Call attention of other vessels that are in adjacent waters by turning on deck lights, putting up the lights or shaped objects to show 'not under command', using VHF, and other possible means. Upon collision with another vessel, 'Go Astern' as early as possible to limit the damage and to avoid further contact. But if the bow of the vessel has penetrated into the side shell of the other vessel, reverse the engine only after an initial damage assessment as one of the vessels may suddenly lose her buoyancy and sink, or cause/increase oil pollution.

Damage survey and measures against flooding
Survey the degree of damage to the hull by sounding all compartments likely to be affected by the collision. Limit any flooding by using available means on board. If the leakage is small, wooden plugs, blankets, tarpaulin, cement boxes or the like can be used to reduce the flooding rate.

An increase in draft due to flooding can cause flooding through openings that are usually above waterlines, to which serious attention must be given.

If high rate flooding is likely to cause the vessel to sink, an intentional stranding should be considered.
In case of a leakage in the fore peak tank, proceed with reduced speed so that excessive pressure on the collision bulkhead is kept to a minimum, and move the vessel to safer waters. Ballast aft tanks if possible to regain freeboard forward.

Salvage contract and evacuation
Follow the Company's instructions to conclude a salvage contract, for which communication must be established between the Company and the vessel as soon as possible after the accident.
When there is imminent danger, when there is absolutely no time to wait for the Company's decision, however, the Boatmaster may request salvage using his/her professional judgment.
If danger is imminent to human lives on board the vessel, every effort should be taken to evacuate everyone from the vessel.

Cargo Leakage into Double Hull Tanks
If a cargo leak is discovered, the first step should be to check the atmosphere in the double hull or double bottom tank to establish the cargo content.
It should also be borne in mind that the hazards associated with cargo leakage may also relate to the cargo's toxicity, corrosiveness or other properties and additional measurements may have to be performed to confirm safe conditions for entry.

If a leakage is discovered, the tanker's captain should immediately contact the Company for consultation. It is strongly recommended that operators develop guidelines, taking into account the tank structure and any limitations of the available atmosphere monitoring system, which could assist the tanker's personnel to select the appropriate method of rendering the atmosphere safe. The guidelines should also include the process for contacting authorities and/or the tanker's Classification Society.

Filling or partially filling the double hull or double bottom tank with ballast in order to render the atmosphere safe and/or stop any further leakage of cargo into the tank must take into account prevailing stress, trim, stability and load line factors. It must also be borne in mind that all ballast loaded into a tank after a leak has been found, and all tank washings associated with cleaning the tank, will be classed as 'polluted ballast' and must be processed in accordance with legislation. This means that they must be transferred directly to a cargo or slop tank for further processing. The spool piece used to connect the ballast system to the cargo system should be clearly identified and it should not be used for any other purpose.

If the quantity of cargo leaking into the space is determined to be pumpable, it should be transferred to another cargo tank via the emergency ballast/cargo spool piece connection, if available (see above), or other emergency transfer method, in order to minimise contamination of the space and to facilitate subsequent cleaning and gas freeing operations.

7.4.2 Apply environmental protection laws

7.4.2.1 Knowledge of environmental regulations

International regulations concerning the protection of the environment

CEVNI – European Code for Inland Waterways

General obligation to exercise vigilance
The Boatmaster, other crew members and other persons on board shall exercise every care required by the circumstances in order to avoid polluting the waterway and to restrict to the maximum the amount of waste occurring on board and to avoid as far as possible any mixing of the various categories of waste.

Prohibition on discharging and dumping
Vessels shall be prohibited from throwing, discharging or allowing to run into the waterway oily or greasy waste occurring during the operation of the vessel or household refuse, sludge, slops and other special waste.

Vessels shall be prohibited from throwing, discharging or allowing to spill into the waterway any parts of the cargo or cargo related waste. This also includes packaging and means of stowage.

Domestic waste water shall not be discharged or allowed to flow into the waterway except in accordance with the respective national regulations.

Discharge into the waterway of water separated by approved oil separator vessels shall be exempted from the prohibition for discharging into the water if the maximum content of residual oil after separation is consistently and without prior dilution in accordance with national requirements.

In the event of the accidental discharge of waste or the threat of such discharge, the Boatmaster shall notify the nearest competent authority without delay, indicating as precisely as possible the nature, quantity and position of the discharge.

On board collection and processing of waste
The Boatmaster shall ensure the separate collection on board of oily and greasy waste occurring during the operation of the vessel in receptacles provided for the purpose and the collection of bilge water in the engine room bilges. The receptacles shall be stored on board in such a way that any leakage of the contents may be noticed in time and easily prevented.

The Boatmaster shall ensure the separate collection on board and delivery to a reception facility of the waste such as household refuse, sludge, slops and other special waste. If possible, household refuse shall be deposited separately according to the following categories: paper, glass, other recyclable materials and other refuse.

Pollution prevention register (used oil log), requirements for delivery to reception facilities
All vessels equipped with an engine, excluding small crafts, shall carry on board a valid pollution prevention register.

The pollution prevention register shall be issued and identified by the competent authorities.
The oil and greasy waste occurring during the operation of the vessel shall be delivered, against a receipt, to the reception facilities at regular intervals, depending on the condition and operation of the vessel. The receipt shall consist of an entry in the pollution prevention register by the reception facility.
Painting and external cleaning of vessels
It shall be prohibited to oil or clean the outside of vessels using products which may not be discharged into water.

Nor shall it be permitted to use anti-fouling systems containing the following substances or preparation thereof:
- Mercury compounds;
- Arsenic compounds;
- Organotin compounds which act as biocides;
- Hexachlorocyclorexane.

As an interim measure, pending complete removal and replacement of an anti-fouling system containing substances indicated above, it shall be permitted to apply to a vessel's hull a coating to inhibit the introduction into the water of the aforementioned substances from the anti-fouling systems under the coating.

CCNR initiatives on environmental protection of inland waterways

Environmental protection is of particular importance for a form of transport that - in part - uses natural infrastructure. Major rivers represent the backbone of a network of waterways that also encompasses estuaries, lakes and canals. Sustainable use of this infrastructure, which is mostly natural, places major demands on its users.

A number of recent studies have shown how environmentally friendly inland navigation is. Targeted measures help strengthen this profile. There is thus a close link between safety-related measures and those relating to environmental protection. In fact, safety and environmental protection go hand in hand in many fields.

General considerations with respect to inland navigation also apply to navigation on the Rhine. These efforts to protect the environment are reflected in practice by an on-going fight against all forms of pollution.

Among the various activities to be mentioned are the protection against pollution resulting from accidents ("accidental pollution") and the protection at the level of working procedures on board vessels as well as the techniques used for the treatment of waste produced ("operational pollution").

Protection against accidental pollution
In inland navigation, accidents may take place as a result of technical faults or human error, just like in any human activity. The risks in question are a major consideration when drafting safety guidelines. An in-depth analysis of the various potential scenarios, as well as of actual accidents, provides a basis for a coherent set of measures designed to ensure a high level of passive safety in the field of water transportation (technical guidelines and measures regarding the transportation of dangerous goods).

Protection in the context of working practices and everyday operations
- Reducing emissions of harmful exhaust fumes:

Inland navigation almost exclusively uses diesel engines for propulsion, which are obviously fuelled by diesel. The emission of exhaust fumes containing harmful substances is thus inevitable. The Central Commission has introduced rules designed to control these constituent compounds. A type approval is required for new engines installed on board inland vessels (CCNR 1 since 2003 and CCNR 2 since 2007). In this respect, reference is also made to community directives on mobile machinery (Directive 97/68/EC of the European Parliament and of the Council of 16 December 1997)

- Reducing carbon gas emissions:
  The reduction of CO2 emissions is a primary focus of the Central Commission as part of its major climate change project. Accordingly, serious consideration is given to means of achieving major savings in fuel consumption, the use of alternative forms of energy such as natural gas and indeed the use of other combustion technologies, such as fuel cells.
- Handling of waste generated on board vessels:
  Water transportation, by its very nature, whether involving passengers or cargo, generates waste. This waste must be handled in line with applicable regulations governing temporary storage on board vessels and transfer to recycling and disposal networks. Measures designed to prevent the generation of waste as well as the financing of the collecting, storage and disposal of this material are specific aspects. Given the very nature of inland navigation, including the mobile and international nature inherent in this mode of transport, the States most closely affected have drawn up, with the support of the Central Commission, an international convention known as the CDNI (Convention on Collection, Deposit and Reception of Waste Produced during Navigation on the Rhine and Inland Waterways). This Convention came into force in November 2009. It covers waterways in Belgium, Germany, the Netherlands, part of the waterways in France (Rhine and Moselle), Luxembourg and Switzerland (Rhine). Introducing a ban on surface water discharges, the Convention and its implementing regulation set out detailed rules on waste prevention, how to handle waste generated on board vessels and the procedures governing transfer to land installations. The Convention also details the responsibilities with respect to the disposal of this waste. As the rules vary depending on the type of waste, they have been compiled together into separate annexes of the implementing regulation in accordance with the source of the waste on board vessels.

Convention on Cooperation for the Protection and Sustainable use of the Danube River (Danube River Protection Convention)

This convention, which was signed in 1994 in Sofia by 11 of the Danube Countries (Austria, Bulgaria, Croatia, the Czech Republic, Germany, Hungary, Moldova, Romania, Slovakia, Slovenia and Ukraine) and the EU, forms the overall legal instrument for cooperation and transboundary water management in the Danube River Basin.

One of the main objectives of this Convention is in line with the water management cooperation which shall be oriented on sustainable water management, i.e. on the criteria of a stable, environmentally sound development, which are at the same time directed to:

- Maintain the overall quality of life;
- Maintain continuing access to natural resources;
- Avoid lasting environmental damage and protect ecosystems;
- Exercise preventing approach.

Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy.

The purpose of this Directive is to establish a framework for the protection of inland waters which:

- prevents further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems;
- Promotes sustainable water use based on a long-term protection of available water resources;
- Aims an enhanced protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation of phasing-out of discharges, emissions and losses of the priority hazardous substances; and
- Ensures the progressive reduction of water pollution.

7.4.2.2 Ability to motivate crew members and board personnel to take relevant measures for environmentally friendly behaviour or to behave in an environmentally friendly way

"Environment friendly processes, or environmental-friendly processes (also referred to as eco-friendly, nature-friendly, and green), are sustainability and marketing terms referring to goods and services, laws, guidelines and policies that claim reduced, minimal, or no harm upon ecosystems or the environment."
(Source: Wikipedia)

The Environmentally Friendly Business

Becoming an environmentally friendly business is more complicated than just signing on to a cap and trade agreement.

Everything from the way that products are displayed and advertised, how waste is recycled, whether or not changes can be made to the basic operations of a business will all work towards making them more environmentally responsible.A large emphasis on non-producing businesses can be placed on the management of supplies. Buying local may not always be the most responsible way to get supplies, but it can be. How a business works to support their community in their environmental conservation efforts is also another important task of the environmentally friendly business.

The Environmentally Friendly Community

In an environmentally friendly community, there is more than just a good recycling programme in place. Communities that are committed to conservation and preservation of resources work to encourage options like community playgrounds, public transportation, green construction, and also to change the way that fossil fuels and other resources are used to support community services.

The Environmentally Friendly Person

The environmentally friendly person is the person who moves through life with an awareness of how natural resources are used to create and support the life that they live.

They recycle, conserve water and fuel, and make other choices that not only lessen their impact on the environment but also support industries that are working towards being more environmentally responsible.

It is critical to protect the environment so as to reduce the destruction of eco-systems caused by a myriad of anthropogenic activities. It is more of a moral obligation for humans to protect the environment from pollution and other activities that lead to environmental degradation. Importantly, environmental degradation is detrimental since it threatens the long-term health of animals, humans and plants.

Air and water pollution, global warming, smog, acid rain, deforestation, wildfires are just a few of the environmental issues that we are facing right now. It is everyone's responsibility to take care of the environment to make this planet a wonderful place to live. One does not need to spend a lot of money to go green, simple changes in daily lifestyle is all that is required to reduce your carbon footprint on the environment.

7.4.3 Use equipment and materials in an economical and environmentally friendly way

7.4.3.1 Knowledge of procedures to make sustainable use of resources

Measures for reducing fuel consumption and emissions in IWT

Emissions reduction measures in inland shipping can be categorised into three main groups:

- **Technical measures:** measures related to the propulsion system, vessel design and vessel equipment, exhaust after treatment, engine internal measures, use of alternative fuel/energy (LNG, electricity, hydrogen, biofuel);
- **Operational measures:** measures related to speed reduction, smart steaming, journey planning, on board information systems, optimal maintenance;
- **Traffic and transport management:** measures related to the organisation of the logical chain, to the interface between inland waterway vessels and other transport modes, to the interface of inland vessels and infrastructure (locks, terminals in inland seaports, etc.)

Research and development needs in support of greening the IWT fleet

Emission reductions in IWT depend on further R&D, in particular to adopt existing technologies to the specific context and to lower the cost of deployment. The following non-exclusive list of topics has been identified as requiring further R&D efforts:

- Clean technology needs to be developed for using LNG as mono-fuel as well as dual-fuel in the IWT context, and/or gas-electric applications, in order to further reduce fuel costs and to reduce the engine-out performance as regards NOx and PM;
- Stage V diesel engines need to be developed, possibly using a combination of techniques that have been developed for smaller engines but are currently still considered experimental for large engines;
- Research on technical solutions to prevent or reduce methane emissions, for instance by using pressure LNG technologies or methane slip catalysts;
- Capacity building of systems integrators that provide Stage IV and V engines by integrating components from various suppliers.

Technologies and procedures for monitoring compliance with emission standards.

7.4.3.2 Ability to instruct crew in using equipment and materials in an economical and environmentally friendly way

Efficient energy use, sometimes simply called **energy efficiency**, is the goal to reduce the amount of energy required to provide products and services. Improvements in energy efficiency are generally achieved by adopting a more efficient technology or production process or by application of commonly accepted methods to reduce energy losses.

In order to reduce emissions of greenhouse gases from international shipping, the energy efficiency measures have been made compulsory for all new vessels. Several steps in the form of new technologies and efficient design features have already been taken to ensure that the energy efficiency design is met.

Technically, the job under this endeavour is to achieve "greener" vessels through appropriate design and operational measures. Reduction in fuel consumption

and carbon emissions by using alternative fuels is one of the many ways to achieve the ultimate green vessel. Moreover, it's a difficult task to use new technologies efficiently and safely to achieve the desired objectives. Solar and wind power are renewable resources which have been harnessed and utilised efficiently in some projects such as Skysails and Eco Marine Power's wind-solar ship.

The reduction of fuel consumption through imaginative voyage planning should engage attention of management level crew members on board vessels. Voyage planning or continuous route review is an important exercise that should be carried out throughout the voyage. Reduction in speed under governor control during the period when there are head winds and adverse currents/swell is the single most important thing that must always be done by every vessel. It has been noted several times that crew members are not careful about this and actions are taken only when the propeller comes out of the water and the main engine trips on high speed.

A lot of study is also being conducted to improve the hull form and propeller efficiency. Some studies were done in the past on the forward side of the vessel and improvements were incorporated, but now, as one example, a single propeller twin-rudder system is being used on larger ocean going vessels, though, of course, several systems have been in use for the same purpose on coastal vessels for quite some years.

Hull cleaning and paint technology to reduce resistance are areas that need further exploration to increase the overall efficiency of the vessels. Systems have been developed to achieve optimum trim. We should always be mindful that the vessel is not underway in a head down condition, say, consequent to consumption of fuel from the aft tanks.

The garbage disposal method has been successful only up to a certain level as at several places only "convenient" garbage is accepted. On all vessels scavenge under the piston space is cleaned and scrapings are collected, but no one accepts this material. If this were to be burnt in the incinerator, soot would be produced (normal sludge burning does not produce too much smoke), which ultimately defeats the purpose of reducing emissions. Moreover, repeated handling of the shovel (it is a very slow process requiring several feeds) spoils the refractory as well.

Greater co-operation from ports is solicited because several port operations need to go green. Also, technology such as Cold Ironing should be implemented on ports.

Ports are not only for making money on berth charges, crane charges, tug charges but also for assisting vessels to carry out maintenance by granting immobilisation as far as practicable.

7.4.4 Instruct And Monitor Sustainable Waste Disposal

7.4.4.1 Knowledge of legislation on waste disposal

Applicable regulations concerning waste

CEVNI – European Code for Inland Waterways

On board collection and processing of waste

The Boatmaster shall ensure the separate collection on board of oily and greasy waste occurring during the operation of the vessel in receptacles provided for the purpose and the collection of bilge water in the engine room bilges. The receptacles shall be stored on board in such a way that any leakage of the contents may be noticed in time and easily prevented.

The Boatmaster shall ensure the separate collection on board and delivery to a reception facility of the waste such as household refuse, sludge, slops and other special waste. If possible, household refuse shall be deposited separately according to the following categories: paper, glass, other recyclable materials and other refuse.

Convention on collection, deposit and reception of waste produced during Navigation on the Rhine and Inland Waterway

Inland waterway transport is deemed to be the most environmentally friendly mode of transport. The treatment of waste that inevitably occurs during the operation of vessels is of particular concern for river operators.

As the management and the disposal of waste is a matter that is being regulated in a land-based context and taken into account through appropriate procedures and infrastructure on a national level, some rules for the various parties concerned by inland waterway transport had to be established in view of the necessary interface. These rules envisage to:

- Encourage the prevention of waste generation;
- Canalise the disposal to the dedicated waste reception facilities along the waterway network;
- Ensure adequate funding in view of the "polluter pays principle";
- Facilitate compliance with the prohibitions of discharge of the waste into surface water.

Recommendations relating to the organisation of the collection of waste from vessels navigating on the Danube

Vessels are prohibited from throwing, pouring or dropping or flowing in the waters of the Danube, objects, substances and products of a nature to cause an obstruction or danger to navigation or pollute water.

Waste on board must be stored and unloaded in reception facilities at ports or other points for reception ship waste.

The discharge of bilge water into the waterway is forbidden to vessels. Water bilges must be unloaded at approved reception facilities.

Garbage should be collected and put back, if possible after having been sorted according to type of waste: paper, glass (white, coloured), materials synthetic materials, metals and other wastes, including food waste.

Boatmasters and any other person mentioned in these Recommendations should also observe local rules on the collection of ship waste that is issued by the competent authorities and Special River Administrations for their sectors of river and port basins.

Reception areas must be equipped with:

- A waste collection vessel serving areas of the Danube; and/or
- A stationary-floating or coastal reception installation, for the receipt of vessel waste;
- Unloading and discharge pipe, discharge connections for bilge water and household slops meeting the European Standard EN 1305.

7.4.4.2 Ability to ensure sustainable waste disposal and to instruct crew members and board personnel accordingly

In the absence of harmonised development plans, Danube riparian countries began constructing a ship-borne waste management system on their own. Certain developments have taken place everywhere. The most advanced waste management systems are in place in highest-traffic Germany and Romania. On-board waste, primarily hazardous (oily and greasy) materials, can generally be deposited at ports and bunkering stations, with other types of waste being collected mostly at ports. In addition to the stationary facilities, there are also mobile collection vessels operating in the port areas in most countries.

Bilge water, waste oils and other (solid) oily and greasy ship wastes can be categorised under oily and greasy ship wastes. Their characteristic feature is that they are hazardous wastes with a high hazard potential. Therefore, special attention has to be paid to proper collection and treatment processes and conditions that are taken into account in regulations on both national and supranational level. However, these regulations can be seen as a basis for the development and implementation of waste reception facilities.

Bilge water is oil-contaminated water from the bilge of vessels. It is generated by cleaning procedures or leakages of the body shell and gets contaminated with oil, gas oil or grease. The oil content of bilge water averages 14.3 % (push boats: 16.7 %), the fluctuation range varies from 5 % and 15 %. The amount of bilge water generated is influenced by the age, construction, equipment and maintenance of the vessels as well as the demanded engine activity, which itself depends on several other factors (upstream or downstream way, cargo load, etc.). For the Danube region, approximations were made in the late 1990s, stating that the average quantity for cargo vessels in the Danube region would be about 4.2 m³/ship/service due to the high age of the fleet. For passenger vessels, floating cranes and other types of working units 2.1 m³/service, for pleasure boats and motor yachts 0.05 m³/ship/service were stated. Based on the assumption that all vessels included in Danube Commissions statistics were in operation, the total amount of generated bilge water in the Danube Region was about 15,000 m³/year.

Waste oils are used oil or other unusable oil from engines, gear or hydraulics. They are produced sporadically, especially at times of oil changes for engines and aggregates. In Germany, the average amount of waste oils, collected by (mobile) bilge water collection vessels together with bilge water, ranges between 100 and 125 litres per ship and service. If the whole amount of oil is changed, the amount can be up to 500 litres in twin-engine vessels.

Other (solid) oily and greasy wastes are used filters (used oil and air filters), used rags (polluted floor clothes and cleaning rags), containers (empty, polluted bins) and packaging materials. In Germany the amount of other oily and greasy ship wastes collected average between 10 and 20 kg/ship service.

5. EFFECT OF THE HUMAN ELEMENT ON SUSTAINABLE SHIPPING

The human activities of deck crew members on board of vessels have a direct relation with sustainability in Inland Shipping. Due to the uniformisation of training and conformity with Directive (EU) 2017/2397 on the recognition of professional qualifications in inland navigation, there will be an increase of navigational safety. Different factors affect the development of sustainability in shipping, from regulatory to socio-economic factors, market related aspects and human factors, which all together contribute in different ways to the development of these three pillars. Since many different stakeholders are involved in the process, it follows that one of the main factors in supporting Sustainable Shipping is the understanding of all parties' concerns, needs and expectations.

The shipping industry is run by people, for people. People design ships, build them, own them, crew them, maintain them, repair them and salvage them. People regulate them, survey them, underwrite them and investigate them when things go wrong. While these people vary in all sorts of ways, they are all, nevertheless, people – with the same basic set of capabilities and vulnerabilities. Humans are not simply an element like the weather. They are at the very centre of the shipping enterprise. They are the secret of its successes and the victims of its failures. It is human nature that drives what happens every day at work – from the routine tasks of a ship's rating, right through to policy decisions.

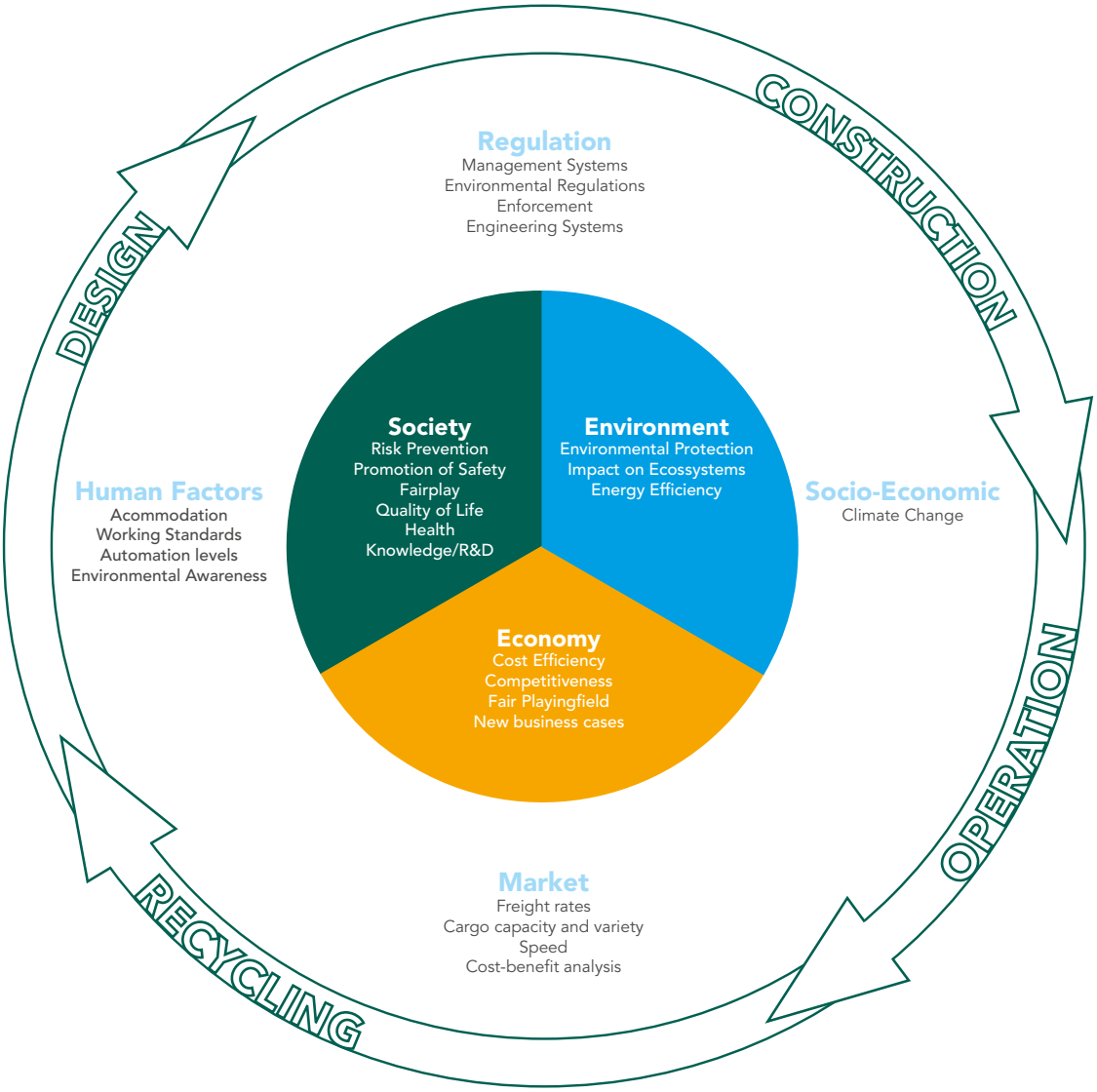

Figure 1 https://www.maintworld.com/R-D/Application-of-European-Qualification-Framework-EQF-in-Maintenance

6. REFERENCE TO NQF, EQF, ECTS

Nowadays, the European Union (EU) consists of 27 member states, and each state has a different education system. Therefore, the European Commission (EC) prepared the **European Qualifications Framework (EQF)** because it wanted to:

- Make national qualifications more readable across Europe;
- Harmonise national qualification systems of different countries in a common European reference framework;
- Promote workers' and learners' mobility between the countries of the EU and to facilitate their lifelong learning.

The EQF system has got eight reference levels (Figure 2), each level describes what a learner has to know, understand and be able to do.[1]

Inland waterway transport (IWT) plays a relevant role in the EU in cargo exchange, especially in the international scale on the network of the European waterways. On the one hand the transport is still more economical than any other mode of transport for many types of cargo, particularly such as bulk, general, liquid cargo and containers. On the other hand, it is the friendliest mode to the environment.

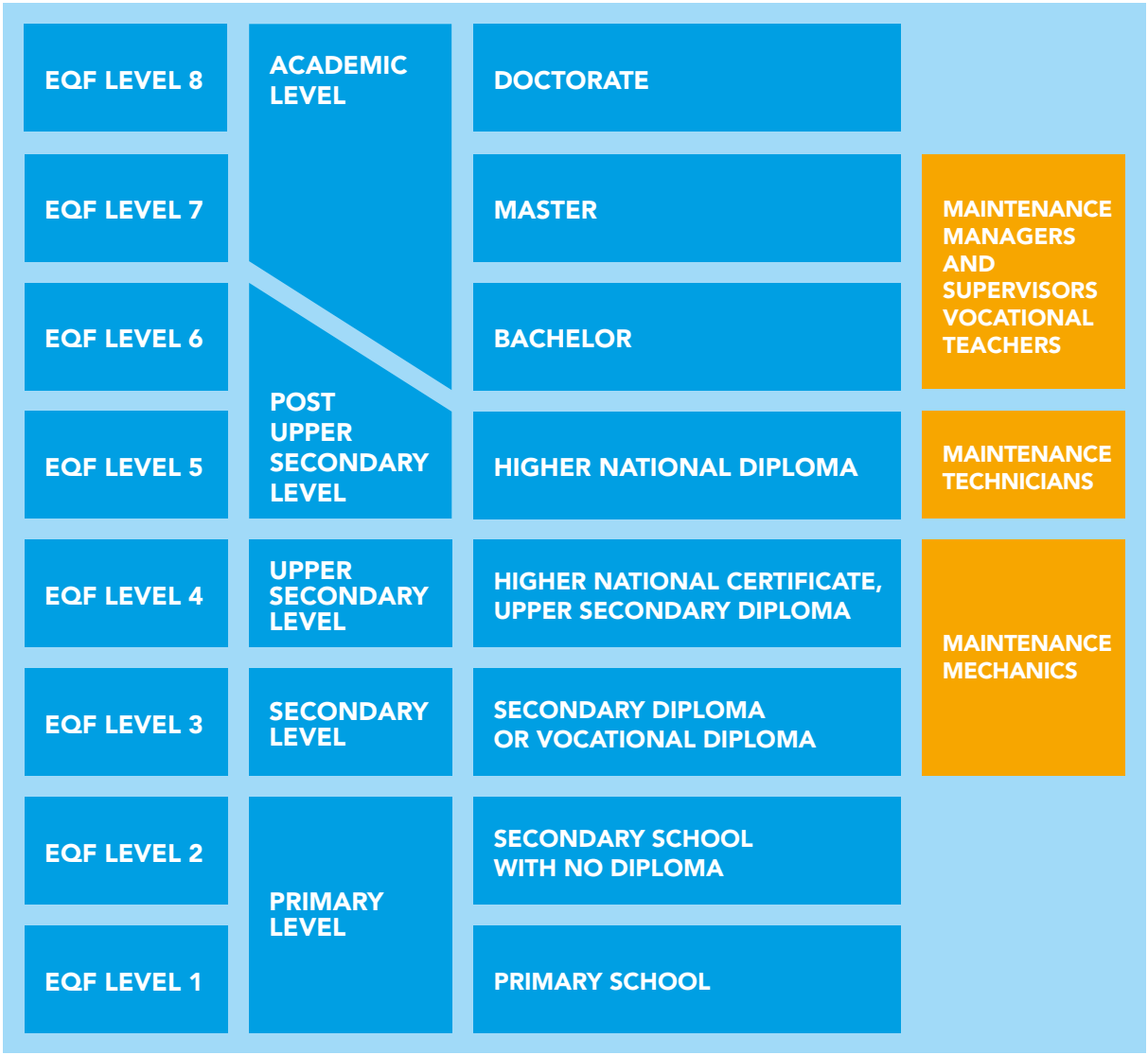

Figure 2 EQF levels compared with achieved education and maintenance personnel positions

1 http://www.maintworld.com/R-D/Application-of-European-Qualification-Framework-EQF-in-Maintenance, 1 December 2016

The field of IWT includes various job positions that are related to its segments such as vessels, ports and waterways. Project IWTCOMP focused on EQF and the job qualifications in IWT in 4 countries (Germany, the Netherlands, Romania and Slovakia) because each country uses a different education system.

In all the EU countries involved in the project there are organisations dedicated to the use of EQF in the national context.

The IWTCOMP project outlined the fact that regarding international sectoral qualifications there is (still) not an agreement on the approach and international process of comparing the EQF levels via the National QFs (NQFs). Some member states do not want to adjust their procedures and this means all member states all still have their own NQF procedure.

In conclusion, although the EQF system in the field of inland water transport has been accepted in all EU countries, this EQF system is not used by all countries. This is due to the fact that some institutes have to focus on the professional competences based on national and international legislation. The curricula at schools, universities and training centres are prepared according to the international or national standards and these curricula are approved/or not by national designated authorities in each country.
The educational programmes developed in the COMPETING project can be considered to fit level 2 for Operational Level and 3 for Management Level.

ANNEX 1

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ANNEX 2

Exercises, case studies, practical scenarios

I. Exercises

1. The Course Manual on Health and Safety, Passenger Rights and Environmental Protection was developed based on ES-QIN. Was ES-QIN adopted by an EU Directive? If yes, indicate the EU Directive.

ES-QIN means European Standards for Qualifications in Inland Navigation, and was approved by Delegated Directive (EU) 2020/12 supplementing Directive (EU) 2017/2397 of the European Parliament and of the Council as regards the standard for competences and corresponding knowledge and skills, for the practical examinations, for the approval of simulators and for medical fitness.

2. Each trainee must list some specific national regulations applicable by the owner company on board the vessels on which they work.

3. List some duties and responsibilities of the Boatmaster for safety of work. Give a few examples of good practices from the own vessel.

- Work carried out on or from the vessel is carried out in such a way as to avoid the possibility of accidents and the exposure of crew members to conditions which may lead to injury or damage to their health;
- The availability of operating manuals, vessel plans, national laws and regulations, safety procedures and other such information to those crew members who need such information to conduct their work safely;
- Any necessary instructions and notices concerning the safety and health of the crew are posted in prominent and suitable places or brought to the crew's attention by other effective means;
- Safety equipment, including all emergency and protective equipment, is maintained in good order and stowed properly;
- All statutory drills are carried out realistically, effectively and conscientiously at the required intervals and in compliance with any applicable rules and regulations;
- Practice and training are given in emergency procedures; the use of any special emergency equipment should be demonstrated to the crew members at regular intervals.

4. Each trainee must describe one existing procedure on board in relation to the periodic check of certain equipment.

5. List some hazards associated with entering in enclosed spaces.

- Toxic Atmosphere;
- Oxygen Deficiency;
- Oxygen Enrichment;
- Flammable or Explosive Atmospheres;
- Flowing Liquid or Free Flowing Solids;
- Excessive Heat.

6. List a few types of emergencies which can occur on board the vessel. Explain the intervention procedure for one of them.

- Fire on board;
- Abandon ship;
- Man overboard;
- Engine Room Flooding;
- Cargo Hold Flooding;
- Oil spills;
- Causes of fire.

7. The main causes of fire are: Smoking and naked lights, Spontaneous combustion and auto ignition, Electrical circuits and electrical equipment, Radio transmitting antenna, Flammable liquids used on board vessels.

From the causes of fire listed above, name the most common one. The causes of fire listed above are not exhaustive. Can you name other causes of fire?

8. Each trainee must list some pollution prevention measures which were taken on board the vessel on which they were embarked.

9. CEVNI – European Code for Inland Waterways, CDNI - Convention on Collection, Deposit and Reception of Waste Produced during Navigation on the Rhine and Inland Waterways, Convention on Cooperation for the Protection and Sustainable use of the Danube River (Danube River Protection Convention), Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy, European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN), are legal documents relating to the protection of the environment in inland waterways.

Name other legal documents or initiatives in the field of the protection of the environment in the inland waterway sector.

10. What is the meaning of the risk assessment matrix ?

		Impact			
		Minor	Moderate	Major	Extreme
Probability	Rare	Low	Low	Low	Medium
	Unlikely	Low	Medium	Medium	Medium
	Moderate	Medium	Medium	Medium	High
	Likely	Medium	Medium	High	High
	Very likely	Medium	High	High	High

II. CASE STUDIES

1. Death in the Forward Locker

Months prior to the incident, unauthorised alterations were made to the bulk carrier's ventilation systems which had created a situation where air from the ship's holds could enter the forward locker.

No one had ever reported such alterations.
While at port the Boatmaster had already been concerned about the amount of vapour coming off the cargo when it was being loaded, but accepted the assurances of others that it was okay. During the voyage, two crew members entered the forward locker that had never really been regarded as a hazardous area.

They had not told anyone where they were going because they did not regard the locker as a danger, nor did they take any precaution. The vessel was carrying a cargo of damp steel turnings that resulted in the oxygen levels in the hold falling to dangerously low levels which caused the forward locker to become a death trap. The seafarers who were inside the locker died as a result.

Questions for Discussion:

1. What factors caused the accident? Could these factors be related to communication culture, operational atmosphere, procedures, stress/ workload or sleep/fatigue?
2. What could have been done to avoid the accident?
3. What can we learn from this?

2. Report on the investigation of the fatal accident of a crew member on the Woolwich ferry Ernest Bevin

London City Council operates a toll-free ferry service between the north (N) and south (S) banks of the River Thames in the parish of Woolwich, which is the primary connecting link between London's inner orbital roadways (N and S Circular).

In its heyday, the ferry was a major transport link in the capital city for both foot commuters and vehicles. Improved infrastructure within the city had since caused a decline in foot passengers, with vehicles now the major user of the service.

The provider of the service was Transport for London (TfL), operating through its wholly owned subsidiary, London River Services (LRS). In 2008 LRS awarded management and operation of the ferries to Serco Limited Marine Services (SLMS) after the previous operator of the service exercised its option to not renew its contract.

The service usually comprised two vessels plying between the N and S terminals. For several months prior to the accident, Woolwich Free Ferry had been operating an extended service to provide additional crossing capacity while the nearby Blackwell Tunnel was undergoing repairs. This extended service consisted of a single ferry operating for an extra 2 hours from 2000 until 2200 hours. Since this extra service required both N and S berths to be available, the ferry not in use from 2000 (*Ernest Bevin*) was secured overnight to river mooring buoys about 250 m upriver from the S terminal. Once the last run of the day was complete, the ferry that had been conducting the extended service moored overnight at her normal berth on the S side terminal.

It is most likely that Benjamin Woollacott was dragged violently against *Ernest Bevin's* bulwark prior to being carried overboard by a mooring rope which had become entangled in the vessel's propeller and was being wound in at a speed in excess of 20mph. He suffered severe facial injuries and was almost certainly unconscious when he entered the water. Benjamin subsequently drowned, despite his lifejacket bringing him to the surface and the quick actions of his colleagues.

In the absence of a written procedure, the five ferry crews had each developed their own systems for unmooring which, although similar, were not identical:

- Some mates positioned themselves by the car deck barriers where they could oversee the mooring deck and also have clear line of sight to the master; others preferred to be on the mooring deck closer to the deckhands;
- Some deck crews worked as a unit with all hands letting go the down-tide end before moving to the up-tide end; others would split into a down-tide and up-tide team. This could result in the number of crewmen participating in the release and recovery of a slip rope varying between one and four.

On the morning of the accident, the deck crew on *Ernest Bevin* had split themselves between the fore and aft mooring decks, but once the down-tide rope had been recovered, Benjamin quickly made his way to the up-tide end to assist. This might have been a result of his general eagerness, or he might have been aware that the deck crew was without a mate and therefore shorthanded at the more critical up-tide station.
Other aspects of the unmooring operation that varied across the fleet included:

- The method of bringing the slip rope on board: some crews brought the rope over the bulwark, others recovered the rope through the fairlead;
- The means of hauling the ropes in: some crews hauled hand over hand, others put the ropes over their shoulder and "walked" them towards the bulkhead;
- Releasing the mooring ropes and insurance wire from the buoy: this task was recognised by all as needing at least two men on the workboat, but in practice varied between two and three.

3. Report on the investigation of a barbecue fire in the galley of Pride of Bath

Shortly after starting a pleasure cruise on the River Avon in Bath, *Pride of Bath* suffered a galley fire, which required the evacuation of her passengers and crew. The gas-fired barbecue in the galley, located at the forward end of the enclosed well deck, was lit when the vessel left her berth at 1230 on 20 July 2002.

At about 1245, hot fat, from the greasy food, dripped on to the hot coals of the barbecue and ignited. Although the gas to the barbecue was turned off, the flames continued to flare up, and eventually reached the overhead extract filters. They were drawn through the filters by the extractor

fan located further along the galley exhaust duct. The flames ignited residual grease in the ductwork.

The crew smothered the barbecue flames with damp tea towels, but attempts to extinguish the duct fire were unsuccessful. A considerable amount of smoke built up in the well deck.

At about 1300, the vessel was brought alongside the riverbank, and the 52 passengers and eight crew evacuated without injury. The fire brigade was called. It extinguished the fire and ventilated the well deck. The well deck of the vessel was extensively damaged, and required a complete refit.

Fortunately, there was no structural damage.

III. Practical exercises

1. Fill in the permit below to enter a ballast tank for a structural inspection job:

Location/name of enclosed space	**Yes**	**No**
Reason for entry: **This permit is valid From: hrs Date:** **To: hrs Date:**		
Has the space been thoroughly ventilated?		
Has the space been segregated by blanking off or isolating all connecting pipelines or valves and electrical power/equipment		
Has the space been cleaned where necessary?		
Has the space been tested and found safe for entry?		
Pre-entry atmosphere test readings:	**Yes**	**No**
Oxygen % by volume (21%) **By Hydrocarbon % LFL (Less than 1%)**		
Toxic gases ppm (Specific gas and PEL) Time		
Have arrangements been made for frequent atmosphere checks		
to be made while the space is occupied and after work breaks?		
Have arrangements been made for the space to be continuously		
ventilated throughout the period of occupation and during work breaks?		
Are access and illumination adequate?		
Is rescue and resuscitation equipment available for immediate use by the entrance to the space?		
Has a responsible person been designated to be in constant attendance at the entrance to the space?		
Has the officer of the watch (bridge, engine room, cargo control room) been advised of the planned entry?		
Has a system of communication between all parties been tested and emergency signals agreed?		
Are emergency and evacuation procedures established and		
understood by all personnel involved with the enclosed space entry?		
Is all equipment used in good working condition and inspected prior to entry?		
Are personnel properly clothed and equipped?		

2. Using different types of fire extinguishers, create an exercise to extinguish different types of fires like class A, B, C or electrical fires.

ANNEX 3

Standards for practical examination for obtaining a certificate of qualification as a boatmaster - module 7 - health and safety, passenger rights and environmental protection

Standards for practical examination for obtaining a certificate of qualification as a Boatmaster was adopted by the Commission in Delegated Directive (EU) 2020/12 supplementing Directive (EU) 2017/2397 of the European Parliament and of the Council as regards the standards for competences and corresponding knowledge and skills, for the practical examinations, for the approval of simulators and for medical fitness.

Standards for practical examination for obtaining a certificate of qualification as a Boatmaster are included in **Annex II, Chapter IV** of this aforementioned Delegated Directive, and referred to under:

1. Specific competences and assessment situations

The examination comprises two parts: one on journey planning and, a second one, on journey execution.

Journey planning

The part of the examination on journey planning comprises the elements listed in the table below, elements related to the **Health and Safety, Passenger Rights and Environmental Protection Module**, such as:

Elements are grouped in categories I and II according to their importance.

No.	Competences	Examination elements	Category I - II
32.	7.1.1	Apply national and international legislation and take appropriate measures for health protection and prevention of accidents;	II
33.	7.1.2	Control and monitor validity of the craft's certificate and other documents relevant to the craft and its operation ;	I
34.	7.1.3	Comply with safety regulations during all working procedures by using relevant safety measures in order to avoid accidents;	I
35.	7.1.4	Control and monitor all safety measures necessary for cleaning enclosed spaces before persons open, enter and clean those facilities;	II
36.	7.2.5	Control life-saving appliances and the correct application of personal protection equipment;	II
37.	7.3.1	Initiate preparation for rescue plan of different types of emergencies;	II
38.	7.4.1	Take precautions to prevent environmental pollution and use relevant equipment;	II
39.	7.4.2	Apply environmental protection laws;	II
40.	7.4.3	Use equipment and materials in an economical and environmentally friendly way.	II

Journey execution

Applicants are required to demonstrate that they are capable of executing a journey.
The individual elements to be tested and elements related to the **Health and Safety, Passenger Rights and Environmental Protection Module** can be found in the table below:

No.	Competences	Examination elements
11.	7.3.3	Deal with an emergency situation (to be stimulated, where appropriate - e.g. man overboard, breakdown incident, fire on board, the escape of hazardous substances, leaks) by means of prompt and prudent rescue and/or damage limitation manoeuvres and measures. Notifying and informing the relevant individual and competent authorities in the event of an emergency;
12.	7.3.4	Communicate with the persons concerned in the event of malfunctions (on board) and with other players (use of radio telephone, telephone) so that problem can be resolved;

Annex II, Chapter V of the aforementioned Delegated Directive sets out Standards for the additional module on supervision in the context of the practical examination for obtaining a certificate of qualification as a Boatmaster.

Candidates who have neither completed an approved training programme based on the standards of competence for the operational level nor passed an assessment of competence by an administrative authority aimed at verifying that the standards of competence for the operational level are met, have to pass this module.

The requirements below need to be met in addition to those referred to under the standards for the practical examination for obtaining a certificate of qualification as a Boatmaster.

The individual elements to be tested and elements related to the **Health and Safety, Passenger Rights and Environmental Protection Module** can be found in the table below:vv

No.	Competences	Examination elements	Category I - II
29.	0.7.1	Prevent dangers related to on board hazards;	I
30.	0.7.1	Prevent activities which might be hazardous to personnel or craft;	I
31.	0.7.2	Use personal protective equipment;	I
32.	0.7.3	Use swimming skills for rescue operation;	II
33.	0.7.3	Use rescue equipment in the case of rescue operations and rescue and transport casualty;	II
34.	0.7.4	Keep escape routes free;	II
35.	0.7.5	Use emergency communication and alarm systems and equipment;	I
36.	0.7.6 0.7.7	Apply various methods of fire fighting and extinguish equipment and fixed installations;	I
37.	0.7,8	Perform medical first aid.	I

COMPETING

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