



# COURSE MANUAL

**MAINTENANCE AND REPAIR**  
*MANAGEMENT LEVEL*



**PROJECT:** COMPETING  
**PROJECT NO:** 601165-EPP-1-2018-1-NL-EPPKA2-SSA  
**AUTHOR:** IMST University of Craiova  
**DATE:** August 1, 2022

# PREFACE

To assist education and training entities to meet the requirements of the Standards of competence for inland navigation personnel, 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 Maintenance and Repair 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 Maintenance and Repair for Management Level 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 crew members at Management Level, to be able to organise safe maintenance and repair of the craft and its equipment.



# TABLE OF CONTENTS

<b>PREFACE</b> .....	<b>3</b>
<b>1. GENERAL INFORMATION</b> .....	<b>6</b>
<b>2. INSTRUCTOR MANUAL</b> .....	<b>7</b>
2.1 Introduction .....	7
2.2 Lesson plan .....	7
2.3 Background materials .....	7
2.4 Practical training.....	8
2.5 Classroom facilities and educational tools.....	8
2.6 Examination & assessment.....	8
<b>3. REGULATION AND CERTIFICATION</b> .....	<b>9</b>
<b>4. LESSON MATERIALS</b> .....	<b>10</b>
5.1 The Boatmaster shall be able to organise safe maintenance and repair of the craft and its equipment.....	10
<b>5. EFFECT OF THE HUMAN ELEMENT ON SUSTAINABLE SHIPPING</b> .....	<b>11</b>
<b>6. REFERENCE TO NQF, EQF, ECTS</b> .....	<b>13</b>
<b>Annex 1</b> .....	<b>16</b>
Reference documents .....	16
<b>Annex 2</b> .....	<b>17</b>
Practical scenarios .....	17
<b>Annex 3</b> .....	<b>18</b>
Standards for practical examination for obtaining a certificate of qualification as a boatmaster - module 5 - Maintenance & repair .....	18
<b>Annex 4</b> .....	<b>20</b>
Thematic content.....	20
Competences of Maintenance and repair - ML.....	20
5.1 The Boatmaster shall be able to organise safe maintenance and repair of the craft and its equipment.....	20

# 1. GENERAL INFORMATION

<b>1</b>	<b>Aim</b>	Provide training to meet the requirements of Directive (EU) 2017/2397 on the recognition of professional qualifications in inland navigation and ES-QIN- Standards of competence - Maintenance and Repair for crew members at the Management Level.
<b>2</b>	<b>Objective</b>	Provide training and practical guidance for trainees in order to be able to organise safe maintenance and repair of the craft and its equipment.
<b>3</b>	<b>Entry standards</b>	See Directive (EU) 2017/2397 - Annex 1.
<b>4</b>	<b>Course certificate</b>	On successful completion of the course, a document may be issued, stating that the holder graduated this learning module.
<b>5</b>	<b>Course intake limitation</b>	Admittance may be limited by the capacity of the educational infrastructure used for this learning module.
<b>6</b>	<b>Staff requirements</b>	The trainer should meet the requirements of Directive (EU) 2017/2397, Art. 18.
<b>7</b>	<b>Training facilities, equipment and teaching aids</b>	The theoretical part of the course requires a classroom with video presentation equipment, teaching aids, etc. The practical part of the course requires a School vessel laboratory equipped with full machines and installations or an adequate on board practice.
<b>8</b>	<b>Learning objectives</b>	<p><i>The Boatmaster shall be able to organise safe maintenance and repair of the craft and its equipment.</i></p> <p>At the end of the course the trainee shall be able to:</p> <ul style="list-style-type: none"><li>• Ensure safe behaviour of crew members with regard to the use of materials and additives;</li><li>• Define, monitor and ensure work orders so that crew members are able to perform maintenance and repair work independently;</li><li>• Purchase and control material and tools with regard to health and environmental protection;</li><li>• Ensure wires and ropes are being used according to the manufacturer's specifications and intended purpose.</li></ul>
<b>9</b>	<b>Assessment &amp; evaluation</b>	Minimum requirements for assessment & evaluation of the trainees for graduating 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 Maintenance and Repair ML and has been arranged under the four 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 2.1 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 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.

### 2.3 Background materials

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

#### **Competence 5.1.1 The Boatmaster shall be able to ensure safe behaviour of crew members with regard to the use of materials and additives**

Learning objective

Learning outcomes

Required equipment

Lesson structure			
Learning activity	Didactical method (ABC method)	Materials	Time

## 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 secure that every participant actively participates.

### Teamwork

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 teamwork assignments 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 and practical scenarios which are useful for practical training and examination of the trainees.

The ETRB is the tool on which the students can be tested.

## 2.5 Classroom facilities and educational tools

The theoretical part of the course requires a classroom with video presentation equipment, teaching aids, etc. The practical part of the course requires a school ship or laboratory equipped with specific devices.

## 2.6 Examination & assessment

According to Directive (EU) 2017/2397, Article 17, assessment of competences:

The Commission shall adopt delegated acts in accordance with Article 31 to supplement this Directive by laying down the standards for competences and corresponding knowledge and skills in compliance with the essential requirements set out in Annex II.2. Member States shall ensure that persons who apply for the documents referred to in Articles 4, 5 and 6 demonstrate, where applicable, that they meet the standards of competence referred to in paragraph 1 of this Article 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 requirements set out in Annex II of Directive (EU) 2017/2397 for Maintenance and repair - Management Level are:

The Boatmaster shall be able to:

- The Boatmaster shall be able to ensure safe behaviour of crew members with regard to the use of materials and additives;
- The Boatmaster shall be able to define, monitor and ensure work orders so that crew members are able to perform maintenance and repair work independently;
- The Boatmaster shall be able to purchase and control material and tools with regard to health and environmental protection;
- The Boatmaster shall be able to ensure wires and ropes are being used according to the manufacturer's specifications and intended purpose.

To assess the progress and level of understanding of the students it is necessary to test the students in a formative way. The main goal of these tests is to give feedback to the student.

A standard for practical examination for Boatmaster is developed in CESNI QP.

The Illias platform provides examples of assessments for the separated competences for 'Maintenance and repair' at Management Level.

### 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 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);
- In Annex I of Directive (EU) 2017/2397 the minimum requirements for certification as a Boatmaster are included, such as:

Every applicant for a Union certificate of qualification shall:

- (a)
  - Be at least 18 years of age;
  - Have completed and approved a training programme as referred to in Article 19, which was a duration of at least three years and which covered the standards of competence 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's certificate.

or

- (b)
  - Be at least 18 years of age;
  - Hold a Union certificate of qualification as a helmsman or a certificate recognised in accordance with Article 10 (02) or 10 (03);
  - 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's 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 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's 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 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;
  - Hold a radio operator's 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.

As already mentioned in Chapter 2, background materials and practical activities can be found in Annex 1 and Annex 2 of this Course Manual respectively. The background materials referenced can be used as additional documentation for the teachers to create their lessons and/or add more details. Annex 2 consists of suggestions and examples of exercises, case studies and/or practical scenarios.

Thematic content of the Course Manual for MAINTENANCE AND REPAIR - ML is presented in Annex 4 of this document, which is linked to the European Standard for Qualifications in Inland Navigation (ES-QIN), Part I, Chapter 2, Point 5 Maintenance and repair<sup>1</sup>.

The competences of Maintenance and Repair are:

### 5.1 The Boatmaster shall be able to organise safe maintenance and repair of the craft and its equipment

Competence	Knowledge and skills
1. Ensure safe behaviour of crew members with regard to the use of materials and additives	<ol style="list-style-type: none"> <li>1. Knowledge of safe and effective maintenance and repair procedures.</li> <li>2. Ability to monitor and supervise crew to apply precautions and contribute to the prevention of pollution of the marine environment.</li> <li>3. Ability to apply and observe the applicable labour regulations and safe working rules and ensure they are respected.</li> </ol>
2. Define, monitor and ensure work orders so that crew members are able to perform maintenance and repair work independently	<ol style="list-style-type: none"> <li>1. Knowledge of cost effective and efficient maintenance work and of applicable legal requirements.</li> <li>2. Ability to use (digital) maintenance planning programmes effectively.</li> <li>3. Ability to control the maintenance and repair of the craft's inner and outer parts considering applicable legal requirements such as safety datasheets.</li> <li>4. Ability to manage the hygiene of the craft.</li> <li>5. Ability to organise the waste management taking into account environmental regulations such as the Convention on the collection, deposit and reception of waste generated during navigation on the Rhine and other inland waterways (CDNI Convention).</li> <li>6. Ability to elaborate the periodic programme of maintenance for the craft.</li> <li>7. Ability to monitor and control technical documents of the craft and keep maintenance logs.</li> </ol>
3. Purchase and control material and tools with regard to health and environmental protection	<ol style="list-style-type: none"> <li>1. Ability to administer the craft's stocks.</li> <li>2. Ability to organise a safe working system on board including the use of hazardous materials for cleaning and conservation work.</li> <li>3. Ability to check the quality of the repairs.</li> </ol>
4. Ensure wires and ropes are being used according to the manufacturer's specifications and intended purpose	<ol style="list-style-type: none"> <li>1. Ability to instruct and supervise the crew in accordance with the working procedures and safety limitations when using ropes and wires according to the craft's certificate and datasheets.</li> </ol>

1 <https://www.cesni.eu/en/standards-and-explanatory-notice/#02>

## 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.

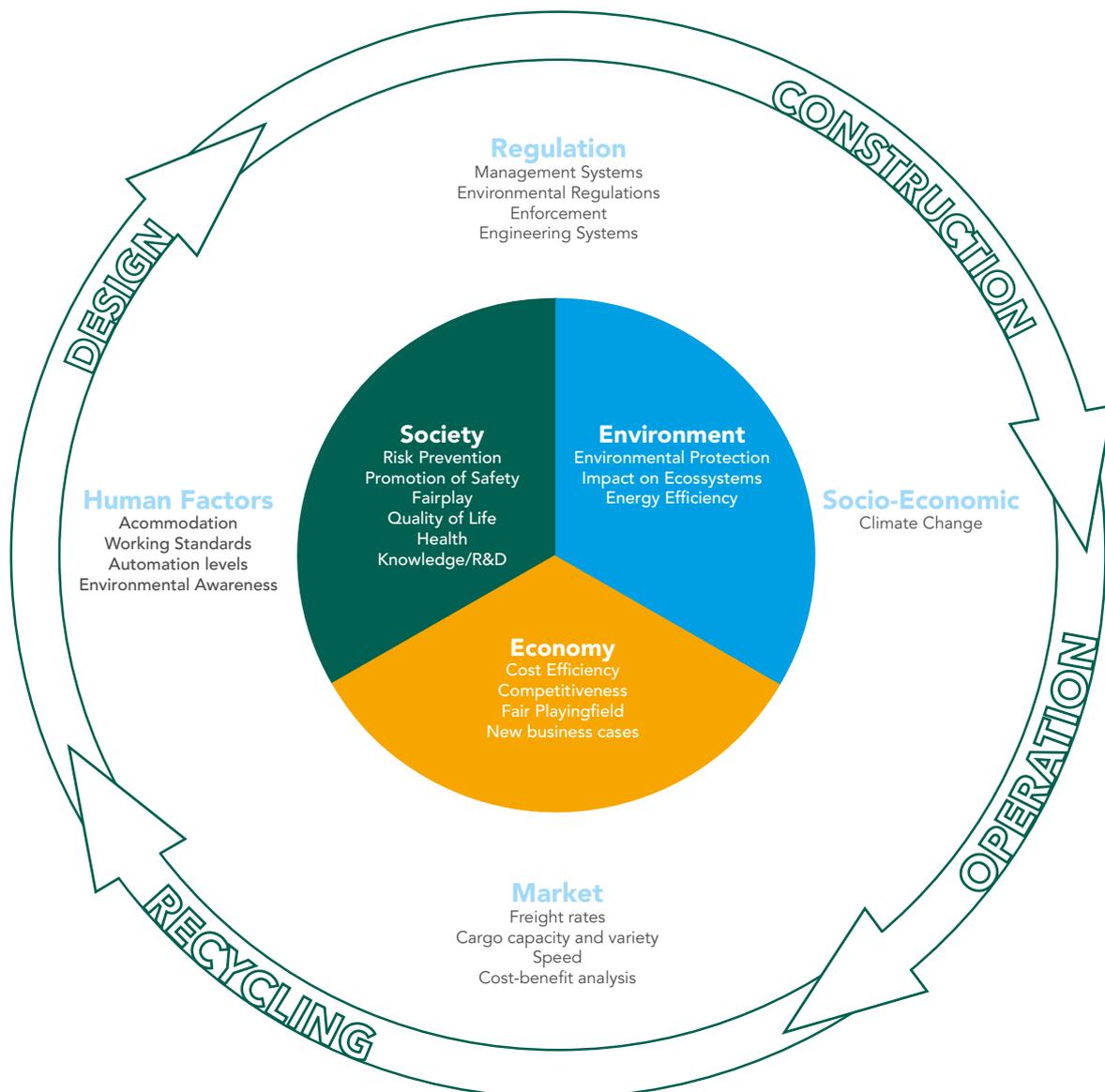


Figure 1 <https://www.maintworld.com/R-D/Application-of-European-Qualification-Framework-EQF-in-Maintenance>

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.

The eight aspects of human nature are:

**1. People actively make sense of things**

What's obvious to you may be far from apparent to somebody else. We explain how it is that most of what you see and understand is down to you and your expectations, rather than a response to 'what's out there'. The key problem is ensuring that the sense you make of things is enough for you to deal effectively with the reality of a continuously unfolding situation – a situation that you must also share with your colleagues.

**2. People take risks**

Everybody takes risks all the time. In a world that is essentially uncertain, this is not only normal but inescapable. We explain how the human perception of risk is quite different from the probability with which events actually occur. The key problem is in ensuring that your own perception of risk maps well onto the world with which you are interacting.

**3. People make decisions**

We explain the difference between how people think they make decisions and how they actually do it – and how experts make decisions is quite different from the way they did it when they were learning. We also explain why experience does not always lead to expertise, but that expertise always requires experience – and lots of it. The key problem is to understand what the components of a good decision are, and how to recognise when you are about to make a bad one.

**4. People make mistakes**

A fundamental human strength depends directly on the ability to make, and then recover from, mistakes. Without error there can be no learning or development. And without these, organisations cannot achieve their goals. The important aspect is in ensuring that potentially harmful or expensive mistakes are prevented, caught or minimised before they have a chance to get far enough to matter. We explain how this depends as much on organisational culture as on individual competence.

**5. People get tired and stressed**

We explain the causes and consequences of fatigue and stress, and explain what you can do to avoid them or lessen their impact. We also explain why workload turns out to be as much to do with your own experience, as the actual demands placed on you by the job.

**6. People learn and develop**

People learn all the time. They can't stop themselves. The main problem is in ensuring that they learn the right things at the right time. People also have aspirations which can be managed by an organisation to further its own safety and profitability. However, in the absence of good management, people's aspirations will either be ignored or permitted to dominate – with potentially disastrous consequences either way. We explain the enormous power that effective, well-timed training can give to an organisation.

**7. People work with each other**

Working with each other sometimes requires us to work as individuals in pursuit of our own goals, and at other times as members of a team with a common purpose. The key problem is in ensuring that we have effective 'people' skills, as well as technical task skills. We explain what these other skills are, why they are important and what can go wrong when they are absent.

**8. People communicate with each other**

Successful communication involves the clear transmission of a message. We explain what has to happen for communication to be successful. We explain the responsibilities of both listener and messenger.

These are eight things we do that help to make us human. They are inescapable and will not go away. Understanding a little more about their nature, and how you can deal with them more effectively, will change your behaviour – and, maybe, that of those around you.

## 6. REFERENCE TO NQF, EQF, ECTS

Nowadays, the European Union (EU) consists of 27 member states, and each state has a different education system. The European Commission (EC) therefore prepared the **European Qualifications Framework (EQF)** because it wanted to:

- Make national qualifications more readable across Europe;
- Harmonise national qualification systems of different countries to 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 eight reference levels (Figure 2), each level describes what a learner has to know, understand and be able to do<sup>2</sup>.

Inland waterway transport (IWT) plays an important role in the EU in cargo exchange, especially at the international level in 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.

EQF LEVEL 8	ACADEMIC LEVEL	DOCTORATE	
EQF LEVEL 7		MASTER	MAINTENANCE MANAGERS AND SUPERVISORS VOCATIONAL TEACHERS
EQF LEVEL 6	POST UPPER SECONDARY LEVEL	BACHELOR	
EQF LEVEL 5		HIGHER NATIONAL DIPLOMA	MAINTENANCE TECHNICIANS
EQF LEVEL 4	UPPER SECONDARY LEVEL	HIGHER NATIONAL CERTIFICATE, UPPER SECONDARY DIPLOMA	MAINTENANCE MECHANICS
EQF LEVEL 3	SECONDARY LEVEL	SECONDARY DIPLOMA OR VOCATIONAL DIPLOMA	
EQF LEVEL 2	PRIMARY LEVEL	SECONDARY SCHOOL WITH NO DIPLOMA	
EQF LEVEL 1		PRIMARY SCHOOL	

**Figure 2** EQF levels compared with achieved education and maintenance personnel positions

2 <https://www.maintworld.com/R-D/Application-of-European-Qualification-Framework-EQF-in-Maintenance>, 1 December 2016

Germany		<a href="http://www.dqr.de">www.dqr.de</a>
The Netherlands		<a href="http://www.nlqf.nl">www.nlqf.nl</a>
Romania		<a href="http://www.anc.edu.ro">www.anc.edu.ro</a>
Slovakia		<a href="http://www.trexima.sk/new">www.trexima.sk/new</a>

**Table 1** Overview of national organisations in the EQF context

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.

Slovakia used to have two vocational schools which prepared students for jobs in IWT but they were closed because of low interest of young people to work in this field. Nowadays, the Transport Authority examines the candidates for lower job positions in IWT such as skipper, captains, boatmen (EQF 2 and 4). Before the exams it organises the courses for applicants. The exam has oral and written forms and consists of various areas of IWT. The Department of Water Transport at the University of Zilina educates students for higher positions (EQF 6, 7, 8) in IWT.

The curricula are approved by the Ministry of Education, Science, Research and Sport of the Slovak Republic and its control body (Accreditation Commission). They are prepared according to the requirements of practice and standards of higher education in Slovakia.

In Germany there is a combined system of education at school and in a shipping company ending in centralised exams held by the chamber of commerce. Both schools and companies have to follow the curricula, but they are not responsible for the exams. The exams consist of two parts, one focussing on knowledge and one focussing on the skills. Therefore both school and shipping company contribute to the education of the students enabling them to pass the centralised exams.

In Romania there are dedicated programmes for IWT boatman (EQF 2). There are vocational schools for boatmen in Galati and Orsova, offering courses for boatmen qualification.

In the Netherlands there are qualifications set for the different levels of education within the IWT sector. For each educational level there is a set of qualifications given by the national contact point in cooperation with the work field and educational institutes.

The Netherlands government decided to place the Captain/Manager IWT qualification in NQF level 5 (EQF5), but at a later stage it was withdrawn and placed in NQF level 4 (EQF4).

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 in the cooperation with the international or national authorities (the Rhine Commission, the Danube Commission, the Ministries of Education), shipping companies and other authorities that work in the field of IWT in the Rhine or Danube Regions. It depends on the level of general education (higher or lower) per country.

## Reference documents

- Directive (EU) 2017/2397 on the recognition of professional qualifications in inland navigation;
- Delegated Directive (EU) 2020/12 supplementing Directive (EU) 2017/2397 as regards the standards for competences and corresponding knowledge and skills, for the practical examinations, for the approval of simulators and for medical fitness;
- Owner Manuals for maintenance of the main engines and generators engines - elaborated for crew member usage;
- Labour protection norms for the navigation activity - Ministry of Transport 1982;
- International Chamber of Shipping, "Guidelines on the application of The ILO Maritime Labour Convention", Third Edition;
- "Compendium of maritime labour instruments.", Third revised Edition, 2021;
- Shanghai Jiao Tong University, "Journal of Ocean Engineering and Science", 2021;
- World Health Organization, "Guide to Ship Sanitation", Third Edition, 2011;
- World Health Organization, "Handbook for Inspection of Ships and Issuance of Ship Sanitation Certificates", 2005;
- J. Tijerina, "Ship's LOG", Publishing House TheBoatGalley, 2018;
- I.D. Visvikis, P.M. Panayides, "Shipping Operations Management", Publishing House Springer, 2014;
- Ö. Uğurlu, S. Kum, Y.V. Aydoğdu, "Maritime Policy and Management. The flagship journal of international shipping and port research", Publishing House Routledge, Volume 44, 2017;
- D.B. Cox, "Hazardous Material Management. Desk Reference", 2014;
- R. Schnepf, "Hazardous Materials. Awareness and Operations", Third Edition, Publishing House Navigate, 2009.

# ANNEX 2

## Practical scenarios

### Case study 1

#### **The planned “maintenance and repair” activity is an integral part of all the voyage preparation actions (Competence 1.2.3, 1.2.6, 1.2.7, 1.3.1, 1.3.3)**

The staging of the maintenance works is done on the basis of the evaluation of the voyage planning activity and implicitly of the operation times of the main machines, auxiliary machines and of the installations. Once the times are determined, e.g. 90 days of voyage x 24 hours / day of operation, the maintenance guides of the installations submitted by their builders through “Owner manuals” are used and it is established which works are scheduled to meet the different operating times. The need for consumables (oil change, oil and fuel filter, filling of waste water treatment tanks, air filter, engine oil, Vaseline, etc.) and spare parts and materials (belts, injectors, various parts and sub-assemblies) is determined, with terms of change after a certain number of operating hours given by the operating instructions, tying and manoeuvring ropes, labour protection materials.

#### **Lessons learned / Conclusions**

For the smooth running of the voyage, the planned maintenance and repair activity must be integrated in the voyage planning activities.

### Case study 2

#### **The planned activity of maintaining the cleanliness and hygiene of the ship, corroborated with the type of goods transported, the planning of disinsection and deratization (Competence 1.2.4, 1.2.5, 1.3.2)**

The scheduling of the cleaning works is part of the continuous activity of the crew on board the ship. The captain plans a daily, weekly, monthly and half-yearly schedule for the ship’s sanitation. In correlation with the type of goods transported, it organises the disinsection and deratization programme carried out by specialised companies. Voyage planning will take these activities into account. The removal of mites and rodents on board is a substantial measure for maintaining the health of the crew and eliminating the possibility of transmitting various diseases from one port to another.

#### **Lessons learned / Conclusions**

The planning of on-board sanitation activities is an important requirement for eliminating the effects of the transmission of possible epidemics carried by ships, as well as the possible illness of the crew. The use of appropriate protective equipment by the crew is essential. The commander draws up “data sheets” or “checklists” for this purpose and monitors their application.

### Case study 3

#### **The activity of keeping and replacing the vegetal, synthetic and metallic ropes on board, their use in safe conditions and with the observance of the manufacturers’ specifications (Competence 1.4, 1.4.1)**

The captain follows the change and the replacement of the used parts, as well as their use in accordance with the qualities and working parameters given by the manufacturer. Calibrating them on different activities is essential to control the wear of the ropes and to avoid accidents. The use of calibrated ropes for different activities and for different manoeuvring and lifting installations is done based on the instructions of the manufacturers of both the installations and the ropes. The crew working with ropes must be properly equipped (Competence 1.4.1, 1.1.3).

#### **Lessons learned / Conclusions**

The selective use of the ropes on board the ship and their handling according to the norms is an essential condition for avoiding their premature wear as well as for preventing accidents.

## Standards for practical examination for obtaining a certificate of qualification as a boatmaster - module 5 - Maintenance & repair

Standards for practical examination for obtaining a certificate of qualification as a Boatmaster was adopted by Commission 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 the 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 Maintenance & repair module, such as:

No.	Competences	Examination elements	Category I - II
25.	5.1.1	Ensure safe behaviour of crew members with regard to the use of materials and additives;	II
26.	5.1.2	Define, monitor and ensure work orders so that crew members are able to perform maintenance and repair work independently;	II
27.	5.1.3	Purchase and control material and tools with regard to health and environmental protection;	II
28.	5.1.4	Ensure wires and ropes are being used according to the manufacturer's specifications and intended purpose.	II

Elements are grouped in Categories I and II according to their importance.

### Journey execution

Applicants are required to demonstrate that they are capable of executing a journey.

The individual elements to be tested, elements related to the Maintenance & repair module, can be found in the table below:

No.	Competences	Examination elements
8.	5.1.2	Handle the craft in such a way as to be able to anticipate the possibility of an accident and avoid unnecessary wear and tear; frequent checking of the available indicators.

**Annex II, Chapter V** of the aforementioned Delegated Directive includes 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, elements related to the Maintenance & repair module, can be found in the table below:

No.	Competences	Examination elements	Category I - II
21.	0.5.1	Clean all accommodation spaces, the wheelhouse and keep the household in a proper way, complying with the rules of hygiene including responsibility for their own accommodation space;	II
22.	0.5.1	Clean the engine rooms and engines using the appropriate cleaning materials;	I
23.	0.5.1	Clean and preserve the outer parts, the hull and the decks of the craft in the correct order using the appropriate materials according to environmental rules;	II
24.	0.5.1	Take care of the craft and household waste disposal according to environmental rules;	II
25.	0.5.2	Maintain and take care of all technical equipment according to technical instructions and use maintenance programmes (including digital);	I
26.	0.5.3	Use and store ropes and wires according to safe working practices and rules;	II
27.	0.5.4	Splice wires and ropes, apply knots according to their use and maintain wires and ropes.	I

## Thematic content

This annex contains the thematic content of the competences of Maintenance and Repair at Management Level as indicated in Chapter 4.

## COMPETENCES OF MAINTENANCE AND REPAIR - ML

*The numbering of the chapters is in accordance with the Standards of competence for Management Level 5. MAINTENANCE AND REPAIR.*

### 5.1 The Boatmaster shall be able to organise safe maintenance and repair of the craft and its equipment

Competences:

1. The Boatmaster shall be able to ensure safe behaviour of crew members with regard to the use of materials and additives.
2. The Boatmaster shall be able to define, monitor and ensure work orders so that crew members are able to perform maintenance and repair work independently.
3. The Boatmaster shall be able to purchase and control material and tools with regard to health and environmental protection.
4. The Boatmaster shall be able to ensure wires and ropes are being used according to the manufacturer's specifications and intended purpose.

#### 5.1.1 The Boatmaster shall be able to ensure safe behaviour of crew members with regard to the use of materials and additives

##### Knowledge and skills

#### 5.1.1.1 Knowledge of safe and effective maintenance and repair procedures

The objectives that include what must be done to carry out a minor maintenance or repair activity are included in the manufacturers' manuals or are deduced from these manuals. The objectives for large current and

capital repairs are also deduced from these manuals but are managed by contracting repair companies. Lastly, the boatmaster signs for receiving the repaired installations if the contract does not mention that the repairing company shall present and obtain the inspection certificates on behalf of the shipowner.

#### Organisation and supervision of naval repairs

The repairs are aimed at preventing the occurrence of defects, a goal achieved by replacing or reconditioning parts and sub-assemblies that are no longer safe in operation. This type of operation is called preventive repair and is planned after a cycle corresponding to the duration of operation of the ship from its commissioning. The planned repairs also have a preventive purpose, therefore, their realisation together with the rational maintenance and operation of the ship and its installations ensure the maintenance of a proper technical condition and the avoidance of damage whose consequences can often be particularly serious.

Unlike "Preventively planned repairs", another type of repair is "Accidental repairs" which aim to restore the operation of components of the ship or its installations as a result of damage during their operation. The occurrence of accidental damage must be avoided through a sustained prevention activity. The planned repairs have a scheduled cycle, which corresponds to the cycle of inspections carried out by technical inspectorates that carry out inspections and issue technical condition certificates.

The types of repairs that are performed during the cycle are:

#### TECHNICAL REVISION - TR

is performed annually and aims to maintain the proper technical condition of the ship through small-scale preventive repairs. As part of the technical revision, the verification of measuring and control devices is performed, with the application of seals where appropriate, the repair of defects in the sealing devices of watertight spaces, inspection, operation, installation and repair of defects found, measurement of crankshaft breaks of main and auxiliary motors and bringing them within the limits provided by the documentation, as well as other small-scale works necessary to maintain the appropriate technical condition both for the vital components for the security of the ship and for ensuring optimal conditions of activity on board the ship.

### **CURRENT REPAIR GRADE 1 - RC 1**

is carried out at an interval of two to five years and aims to carry out works to maintain the proper technical condition of the hull, deck and machine equipment. For inland waterway vessels, a Class Confirmation (R.C.) repair may also be performed under RC 1 without the strict need to dock the ship.

### **CURRENT REPAIR GRADE 2 - RC 2**

represents the basic form of the planned preventive repair system and includes a set of complex works that are performed at an interval of 4 years and aims to perform larger operations on the entire ship and its installations.

The current grade 2 repair must correspond to the reclassification inspection that is performed in the same time interval, including the volume of works provided for the current grade 1 repair and technical overhaul.

### **CAPITAL REPAIR - RK**

is performed once every 12 years at most and does not have a well-defined corresponding activity during the inspections, which provide for the third inspection, or starting with it, an increased volume and a shorter interval for measuring corrosion of the inspected elements.

The main aim is to replace the corroded parts of the body, the installations, the replacement of some units in an advanced state of wear so as to achieve an appropriate technical condition for the next period of operation of the ship, which represents for most ships approximately one more cycle of repairs, until the end of the normal duration of service and their scrapping.

### **Naval repairs**

Ship repair cycles and inspections.

### **Class of the ship classification inspections**

The planned repairs are intended to grant, renew, restore or confirm the class of the ship. Adequate technical inspections are carried out by recognised technical inspection bodies, which issue specific documents attesting the good functioning of the ship's installations.

Ships are generally classified or reclassified for a period of 6 years, however in some cases based on technical considerations, classification bodies may classify and reclassify ships for shorter periods of time. If some changes are made to a classified ship or if some of the conditions taken into account when class is not complied with, but it is nevertheless considered that they are not likely to lead to the loss of the class in its entirety, they may be cancelled or changed accordingly.

The initial inspection aims to ascertain the possibility of granting the class of a ship presented for the first time for classification. The class, once granted, is maintained on ships in operation following periodic or occasional inspections.

Periodic inspections are carried out on the basis of a programme in which the scope of each examination, measurement or sample is established on the basis of the instructions in force and the concrete conditions at the time of the inspection.

As the scope of the inspection according to the programme provided in the Rules is quite large, in order to ensure the reduction of the time allocated to it, the continuous inspection was introduced, in which the inspection operations are no longer performed simultaneously but are distributed over the entire cycle under the condition to comply with the time limits for inspection for each component of the vessel or installation under supervision.

In case of justified requests of the shipowner, the terms of the periodic inspections may be postponed as follows:

- The reclassification inspection, by a maximum of 6 months, at the request of the shipowner, with the consent of the classification society;
- The confirmation inspection, by a maximum of 3 months; this does not attract the automatic postponement of the next periodic inspection.

Occasional inspections – these are carried out on request, in addition to periodic inspections, in connection with the ship or its components to which the technical requirements extend. The scope of these inspections is established according to the object of the inspection, the age and the technical condition of the ship. There are two main types of occasional inspections:

1. Inspection after damage, that aims to ascertain the damage, to approve in connection with the scope of necessary remedies and to determine the existence of the possibility and conditions in which the class can still be maintained.
2. Exceptional inspections are carried out at the request of shipowners, port authorities, insurance companies, etc. and aim to ascertain the technical condition of the ship at that time.

### **The volume of supervision during periodic inspections**

Technical conditions for presentation of the vessel for inspection. Monitoring and inspection of ships during periodic inspections is performed based on a programme that aims to ascertain the technical condition of the ship at the time of inspection

depending on the type of inspection (confirmation or renewal). The scope of inspections is different and complex considering the period elapsed since the last inspection and from the date of commissioning.

The main activities of the inspection programme are:

- **L - verification of legality** - refers to the verification of the existence of technical status certification documents for devices, aggregates or their components.
- **E - external examination** - which aims to ascertain the technical condition of some static elements of the ship (body parts), fixed parts of deck installations, emergency inventory, spare parts, fixed parts of machine installations.
- **F - function verification** - applies to the mobile components of the installations, aggregates, devices and it first involves completing the previous stages (legality verification and external examination).
- **I - inspection** - represents a more detailed inspection of the ship's components and installations to detect possible visible defects and damage; the ship will ensure the opening or dismantling of parts necessary for access and internal examination, the interior parts to be inspected will be presented in a clean state, in the same conditions as at the external examination.
- **M - measurements** - are performed to quantitatively track (unlike previous types of activities that had mainly a qualitative character) a series of parameters that ensure the proper functioning of the components or assembly inspected.
- **H - hydraulic tests** - are performed to ascertain the strength and tightness of the structural spaces inside the ship, of other containers for liquids under pressure, of the pipes and fittings, of the liquid transport installations as well as of the seals of the propellers.

## Organisational measures regarding the maintenance of ships in operating conditions

*Maintenance systems - organisation, definition, fields of application, advantages, objectives, specific works and operations*

### Maintenance and repair systems

The main objectives for maintenance and repairs are:

- Maintaining the equipment in good working order;
- Avoiding accidental stops and eliminating the possibilities of triggering damage;
- Limiting to a minimum the maintenance and repair costs by optimising these observations.

In the concept of organising the maintenance and repair activity, the following aspects are taken into account:

- Unique coordination and realisation of the maintenance and repair of equipment and aggregates;
- Specialisation of maintenance personnel by specific works;
- Separation of the current maintenance activity, from the repair activity;
- Creation of an information system that allows the use of computer programs for the recording of equipment, aggregates and installations, operating hours from commissioning and last inspection, repair, repaired and replaced parts.

Regarding the form of organisation, the following systemic configuration was adopted:

- Corrective maintenance system;
- Preventive-planned maintenance system;
- The system of technical revisions and repairs;
- The palliative maintenance and repair system.

### "Corrective Maintenance" system

Corrective maintenance is defined as the set of measures taken by suppliers and customers of equipment, machinery and installations to ensure:

- Constructive improvement by redesigning parts and sub-assemblies that do not meet the practical requirements;
- Functional improvements, i.e. for certain reasons, the machine works under the designed parameters;
- Removing deficiencies related to the reliability and maintenance of the machine or installation.

Reliability means the probability that a certain product (machine, machine or installation) will fulfil the function for which it was created, under given working conditions, for a certain time. Maintainability is the property required for the respective aggregates, machines and systems throughout their life, to keep them in working order by eliminating premature wear, reducing maintenance and operating costs. Such corrective actions modify the general condition of the machine, leading to superior performance.

Corrective maintenance is applied throughout the warranty period provided by the manufacturer of the equipment, particularly during the period of commissioning, then periodically, based on the results obtained in relation to the operation and maintenance of the product in question. This is possible thanks to the collaboration between the supplier and the customer by providing data on the in-service behaviour of the products, even after the expiration of the warranty time. These data are used by the construction company that adapts or corrects the detected malfunctions.

### “Planned preventive” maintenance system

Preventive maintenance is defined as the activity carried out to reduce wear, maintain the aggregates and systems in good operating condition and avoid unforeseen shutdowns caused by accidents.

The planned preventive type maintenance aims to discover and prevent defects at an early stage and prevent damage from arising. It seeks to maintain the equipment and systems properly, i.e. fewer repairs, lower maintenance costs, lower repair costs. The planned preventive maintenance system involves specific work that detects defective parts or sub-assemblies through inspections and examinations and proceeds to replace or repair them before they are completely and unexpectedly damaged.

The preventive maintenance activity generally includes the following specific operations:

- Cleaning and care of technical equipment;
- Lubrication of equipment and installations;
- Daily monitoring of the behaviour in operation;
- Periodic verification of controls, indicators and actuation mechanisms;
- Partial overhaul of equipment and installations;
- General revision of the technical endowment.

The planned preventive maintenance consists mainly of the following activities:

- Commissioning and regulation of machines, equipment and installations with the recommendation to follow precisely the operating regulations and instructions;
- Following of maintenance and operating instructions by maintenance personnel;
- Establishing the period of partial verifications (of sub-assemblies);
- Establishing the general verification period (date, who performs, which parameters are intended to be verified after verification).

Advantages of the system:

- Reducing the number of accidental stops by decreasing the frequency of malfunctions;
- Replacement of repairs that occur as a result of failures (accidents) through scheduled maintenance;
- Lower expenses of planned repairs because some repairs are performed before defects occur;
- Discovering the parts whose maintenance is expensive, creating the possibility of studying the causes that lead to their wear and tear with the possibility of eliminating these causes;
- Reducing the number of important repairs and eliminating the repetition of identical work;
- Establishing with greater precision the need for spare parts and diminishing stocks;
- Increasing the safety in the operation of equipment and installations.

The main objectives of the planned preventive maintenance system are:

- Avoiding ageing and prolonging the life of the equipment through periodic inspections, adjustments, partial and general revisions, modernisations, replacement of parts, etc.;
- Maintaining the efficiency of the aggregate at the parameters given by the constructor;
- Avoiding the accidental decommissioning of the respective unit or installation;
- Reducing costs by timely repairs and replacement of parts.

The main activities that are included in the planned preventive maintenance system are the following:

- Periodic overhaul of machines, aggregates, installations to prevent accidental stops;
- Maintenance of machines, aggregates, installations to prevent the conditions preceding the damage;
- Organising the evidence and operating system to know in advance the wear of the parts and the possibilities of damage and maintenance.

### Cleaning of equipment and installations

Prolonging the service life, maintaining the technical and economic parameters and limiting wear over time starts with cleaning the machine and installation, as due to the working environment of thermal and corrosive agents, impurities are deposited on the machine parts that increase the degree of wear and finally shut down the machine or system. That is why it is recommended that all aggregates and installations be kept clean and wiped whenever needed.

These operations often lead to the detection of significant defects or losses of oil, fuel, etc. The cleaning and wiping operations of each machine and system are usually entrusted to those who operate them and allow the early detection of any leaks due to loss of seals, seals and glands or cracks in installations that work in high vibration regimes.

### Organisation of lubrication operations

In general, maintenance operations have a significant effect on the degree of wear of the machine and for this reason, the correct and rational organisation of lubrication activities is one of the main measures to be taken for the proper maintenance of equipment and installations.

The organisation of the lubrication gives to those who deal with this aspect the following attributes:

- Regulates and distributes the lubrication loads on each servicer;
- Establishes the lubrication regime on types of equipment;

- Establishes and regulates the specific lubrication consumption;
- Storage and handling of lubricants according to the handling and storage norms in compliance with the PSI rules;
- Establishing measures to reduce lubricant losses that can turn into sources of pollution.

Measures for the rational organisation of lubrication operations, as well as those initiated to reduce losses and recover them, are one of the important tasks on board ships.

#### **Daily monitoring of operating behaviour**

The activity of tracking the behaviour when a machine or system is in operation is carried out daily and aims to verify how the elements under review perform the technological operations from a technical point of view. Tracking in operation is a simple method, and can be carried out by the navigation crew, provided that they have the necessary qualifications.

The role of observing the behaviour in operation is to notice and remove in time some abnormal phenomena during operation, which could evolve in an undesirable direction and to urgently apply the necessary measures to limit/stop serious failures that may occur (substantial damage resulting in decommissioning of the ship, total loss of the ship, fires, explosions, etc.). It is worth mentioning that monitoring during the operation of the equipment is especially necessary with regard to systems with an advanced degree of technical wear, and where the level of automation is low. In recent years, due to high standards of design, construction and automation, the importance of daily monitoring by staff of operating behaviour has decreased but has not lost its importance. This activity is done by automated computer systems, through sensors mounted in installations, which sound an acoustic and auditory alarm in case of malfunctions and also display the type of alert through written text.

#### **Periodic verification of controls, indicators and actuation mechanisms**

The verification is done periodically and aims to detect early risks of damage and generally includes the same operations as in the case of tracking operating behaviour (with a daily frequency) supplemented by checking certain controls, indicators, actuators, levers, joints, etc. In case deviations are signalled, measures are taken with regard to the malfunction of the systems in question; the remedy depends on the emergency in question.

#### **Organising a partial inspection**

A partial inspection involves a competent examination of the operation of the basic assemblies of the equipment being inspected. The state of cleanliness of

the machine, the way the lubrication was performed, abnormal noises during operation, the state of wear and tear are monitored. Adjustments of sub-assemblies are made, worn parts are replaced, defective parts are repaired.

A partial inspection is performed by a specialist, who must be well acquainted with the overhauled machines and equipment, preferably by the service department that also takes care of the maintenance of the systems. The frequency of partial overhauls varies between one and six months, depending on the type and importance of the equipment in operation.

#### **Organising general inspections**

A general inspection aims to check all sub-assemblies and wear parts. On this occasion, the following operations are performed:

- Adjustments are made;
- Used parts are replaced;
- The gaskets are changed;
- The operating parameters are checked, bringing them within the allowed limits in case there are deviations.

A general overhaul enables the gathering of information that is recorded in the machine file/ software memory for tracking operating parameters (e.g. MINIGUARD or engine computer) and which is used later in the preparation of future overhaul or repair programmes. In order to establish the optimal frequency of inspection, a diagram can be drawn up in which the various deficiencies found in certain aggregates, the frequency of failure of certain parts, etc. are followed. In the case of automatic monitoring, the diagrams are automatically downloaded from the tracking program, which records all operating parameters and compares them with the optimal parameters.

It should be noted that the application of this preventive system requires the removal of any malfunction when it is found, without waiting for the fulfilment of planned deadlines for revisions or verifications. Automatic tracking programs may indicate the early replacement of parts or sub-assemblies that have suffered advanced wear. Personnel performing such operations must be well trained and knowledgeable in the handling, adjustment and operation of the machines provided, to ascertain their actual technical condition, they must be self-confident and have the ability to take immediate decisions to stop, repair, replace parts, etc. At present, the development of service and maintenance contracts is generalised with companies specialised in machines and installations, which are part of the companies producing machines and naval installations, which have trained personnel and

sufficient endowments to carry out repairs on the produced installations. Any finding that exceeds the limited intervention capacity on board the ship is taken over by such companies that travel on board the ships and carry out the necessary remedies.

### System of technical revisions and repairs

A system of technical revisions and repairs refers to the totality of the technical-organisational measures used to maintain the working capacity of the aggregates and installations in conditions of safety in operation.

The system of technical revisions and repairs is designed as follows:

- Repairs as needed without prior planning;
- Repairs based on technical findings made on the occasion of revisions;
- Preventive repairs with planning based on a standard;
- Preventive repairs - with controlled planning, which due to its advantages has been adopted as a unique system under the name "Preventive-planning system of technical revisions and repairs."

This system has the following categories of interventions:

- 1 - RT technical revisions;
- 2 - RC current repairs;
- 3 - RK capital repairs.

Carrying out on time and to a high standard the types of repairs described above leads to the elimination of damage and the reduction of stationary equipment required for the elimination of the noted deficiencies.

### Palliative maintenance and repair system

The palliative system currently improves a condition, without suppressing its cause. In other words, it provides a temporary improvement. It is generally applied to very old equipment, for which preventive maintenance is not economical. This type of maintenance is, therefore, a compromise for maintaining in operation a machine that cannot be abandoned for the time being.

### Documentation necessary for the preparation of naval repairs

For the proper preparation of ship repairs and establishing their scope in accordance with the provisions of the technical regulations for the repair of means of ship transport regarding the category of planned repairs, cost and duration of immobilisation within the technical provisions, it is necessary to provide and ensure promptly the following documentation:

- Specification (list) of works;
- Additional specification of works;
- Specifications;
- The report of finding;
- The results of the thermo-technical tests;

- Ship documentation;
- The list of equipment, aggregates and spare parts to be replaced and whose supply is the responsibility of the repair site.

Specification of works - represents the basic document which determines the volume of repair works for all categories of planned repairs. It includes a brief but clear description of the repair work of the main units or installations so that the category of repair of the ship and its mechanisms can be determined.

The additional specification of works is drawn up after the introduction of the ship at the repair site when the dismantling of the mechanisms and installations provided for repairs is carried out to verify, measure and establish the defect.

Specifications - the document that clarifies the purpose and content of major repairs, including improvements, replacements of aggregates or special works to be performed during major repairs and specifies all technical requirements.

The report ascertaining the technical condition of the ship and its mechanisms is drawn up only for self-propelled ships before entering the shipyard, following tests of operation with the ship in operation in which the representatives from the specialised compartment of the navigation unit, representatives of the shipyard and the classification society participate. Parameters, faults and general condition of the ship, aggregates, mechanisms and its installations found during the inspection and the samples shall be recorded in the report of the finding. Defects found on this occasion, not included in the initial specification of works, will be introduced in the additional specification.

The results of the thermo-technical tests - the documentation that includes the parameters obtained following the last tests performed during operation, including:

- Combustion and compression pressures at the main and auxiliary engines;
- Engine operating parameters;
- Breaking values at crankshafts;
- Games, wear, deviations from collinearity of intermediate shafts and propeller shafts;
- Operating parameters of the main installations of the ship, etc.

This document is drawn up by the chief engineer based on measurements carried out under his/her direct supervision, of the existing documentation on board (car log, technical condition register, previous travel reports, test protocols), etc.

Ship documentation - represents the construction documentation and operating instructions delivered with the ship or after repairs, availability on board (plans, descriptions, operating instructions, maintenance and repairs) including documents issued by the classification society. These documents are kept in the technical library of the ship or, if there is no technical library, in the personal storage of the heads of compartments, i.e. the chief engineer and the captain.

### **5.1.1.2 Ability to monitor and supervise crew to apply precautions and contribute to the prevention of pollution of the marine environment**

Ability to monitor and supervise the crew to apply precautions and help prevent pollution of the aquatic environment. The boatmaster shall take care to carry out the activity of handing over the waste according to the rules for preventing water pollution, by making the handover entries in the Waste Log, which the boatmaster shall keep up to date, and shall request the terminal or waste collector to sign for handing over, entering them into the Journal.

### **5.1.1.3 Ability to apply and observe the applicable labour regulations and safe working rules and ensure they are respected**

Within the deadlines provided by the rules, the boatmaster shall instruct the crew on labour protection. Whenever the situation requires it, e.g. the ship transports goods with a special character that requires additional/special protection training with special equipment, training can be done by the boatmaster or by specially trained persons in the respective field when the requirements demand this (use of special equipment, use of special substances and working in special conditions). The activity will start only after the boatmaster is convinced that the crew has learned to use the new equipment and to work in special conditions without risk or with minimum risk. The crew signs the training sheets for each training.

### **5.1.2.1 The boatmaster shall be able to define, monitor and ensure work orders so that crew members are able to perform maintenance and repair work independently**

#### **Knowledge and skills**

### **5.1.2.1 Knowledge of cost effective and efficient maintenance work and of applicable legal requirements**

The boatmaster reads and checks the repair estimates to be convinced of the reality of the works. Participates directly or indirectly, through crew members, who have

assigned tasks, in the tests on the installations and signs / countersigns / approves the minutes of the tests.

### **5.1.2.2 Ability to use (digital) maintenance planning programs effectively**

Maintenance programs are used in the digital surveillance systems of modern naval engines in particular. These programs are designed by the manufacturer, who instructs the crew in the commissioning of the engines or installations, in two parts. The access part by the crew for information on maintenance times (change or washing of fuel filters, oil, water, air) and the follow-up part of the manufacturer that completely supervises the working parameters.

In this way, the boatmaster knows, by using dedicated software, the date when current maintenance must be performed by the crew. In case a fault alarm is triggered, the software also displays written text as to which installation or sub-assembly is in danger. The crew can cancel the first alarm and if it is repeated, under the boatmaster's authority, the system can be partly stopped, engine speed can be reduced, anchor can be dropped, the vessel can stop running and the intervention of companies specialised in remedies can be requested.

### **Knowledge of safe and efficient maintenance and repair procedures**

The objectives that include what must be done to carry out a minor maintenance or repair activity are included in the builders' manuals or are deduced from these manuals. The objectives for major current and capital repairs are also deduced from these manuals but are managed by contracting repair companies. In this case, the boatmaster requests the repairs on time, assists them with the repairs, confirms their performance and possibly / if necessary the tests for checking / parameterising the repaired installations. Finally, the boatmaster signs for receiving the repaired installations if the works contract does not provide for the repairer to present and obtain the inspection certificates on behalf of the shipowner.

### **5.1.2.3 Ability to control the maintenance and repair of the craft's inner and outer parts considering applicable legal requirements such as safety data sheets**

Use check and control sheets to determine how accidental or planned maintenance and repairs were performed. All the stages inserted in the checklists will be completed, the commander checking the observance of the stages and their fluency in chronological order.

#### 5.1.2.4 Ability to manage the hygiene of the craft

The boatmaster organises and monitors the daily, weekly, monthly/half-yearly and annual cleaning activity of the ship.

The daily activity concerns the ongoing maintenance preceding the weekly cleaning. This activity includes collection of the waste that is to be disposed of upon arrival of the ship in port. The weekly activity involves cleaning the living quarters and, if necessary, washing the decks. A more laborious cleaning activity is carried out monthly, with the sanitation of the storage spaces of the consumer goods for the crew.

Cargo holds are subject to disinsection whenever necessary and/or as a requirement for acceptance of the holds for loading. Every year, in spring, the ship is painted, after which a general cleaning is carried out. The cleaning activity is scheduled and supervised by the boatmaster. Before starting the general cleaning activity, the boatmaster provides labour protection training, depending on the complexity of the activity, cleaning areas and material used.

Technological cleaning, before and/or after repairs, is an operation that involves the use of dedicated protective equipment. When scheduling such activities the boatmaster/shipowner can use external qualified/specialised labour. Before starting the activity, labour protection training is provided for the crew that will work on cleaning the water, fuel, double-deck, double-bottom tanks.

The activity of technological cleaning, cleaning of holds, cleaning of double-deck and double-bottom compartments (ballast tanks) is necessary. The rodent control activity is carried out by specialised teams at the commander's request. The preparation of the ship for rodent control or disinsection is done by the crew with the coordination of the ship's master. The vessel is manoeuvred into a berth specially designed for rodent control: the isolated area with controlled access designated for this purpose.

#### Preparation for rodent control, DERATIZATION, VENTILATION of the ship

The operation of rodent control by gassing will be performed whenever necessary, regardless of whether the vessel has a rodent certificate valid at the date of rodent detection. The gassing operation is performed only by specialised, authorised personnel, in compliance with the instructions and legal norms in force regarding the regime of toxic substances. Ships are gassed with super-toxic gases that are lighter than air and can be easily evacuated from the ship's warehouses and rooms. It is forbidden to gas in a double berth with another vessel with personnel on board the ship.

At the request of the technical manager of the gassing works, the boatmaster shall make available to the technical manager the plans of the vessel's subdivision, as well as the tonnage documents, in order to establish exactly the volumes of all the compartments to be gassed.

Under the coordination of the boatmaster, the ship's personnel will also take the following measures to prepare the ship for gassing:

- The covers of the bilges (straw) will be opened from place to place so that the gases can penetrate everywhere;
- All portholes and vents in all compartments will be closed and tightened;
- The gasket will show all the holes and gaps on the outside that are harder to notice, so as not to be forgotten when sealing;
- Absolutely all the compartments of the ship will be opened, regardless of whether or not they require rodent control;
- The doors and drawers of offices, cabinets, etc. will be open in all cabins and compartments.

Having completed the operation of preparing the ship with the help of the crew, the quarantine flag (Q) will be raised to the mast, the auxiliaries will be stopped and the entire crew will leave the ship.

On disembarkation, the boatmaster shall take with him/her the logbook and the ship's stamp. The time of disembarkation is recorded in the log.

Throughout the rodent control, the boatmaster shall arrange for a watch on the quays, which shall be near the ship, taking care to inspect the area as often as possible, to supervise the ship and to record any observations in the logbook.

The boatmaster shall ensure that the watch is carried out in accordance with orders and that the ship is safe. The rodent control team, after gassing the ship, will disembark and hand over the watch duties and controlling access to the ship to the watch. Warning signs "DANGER OF DEATH! TOXIC GASES" must be posted on the side of the ship and near the staircase. After the time set for gassing, the first person to board the ship will be the head of the rodent control team together with the team support staff, who will open all doors and portholes, vents and all holes sealed with paper, as well as all compartments of the ship for ventilation.

Crew will only be allowed to board after the technical supervisor (team leader) has ascertained that the concentration of gas in the air inside the ship is below the dangerous limit for humans and therefore the crew can operate on board of the ship.

In cases where in some compartments (warehouses, helm room, etc.) ventilation was not completed, the team leader will warn the crew when boarding to bypass these areas until they are completely ventilated. Before entering the ship's compartments, the crew will be instructed that if they find a door to a compartment with unbroken sealing tapes, they must immediately notify the head of the rodent control team, who will ventilate the compartment, taking the necessary safety measures in advance.

After packing the cartons and ventilating the barracks, the crew must wash their hands thoroughly with soap and water. It is forbidden to eat food with unwashed hands, as this can cause serious poisoning. Crew is prohibited from sleeping on board until the cabins are completely ventilated, a period that lasts at least 48 hours from the time the crew is allowed to board, and this only if there is adequate ventilation of the cabins during this period.

Intoxication in severe forms is manifested by fainting; gassing leads to a bruised skin colour, breathing slows down, and heartbeats become weak or imperceptible. In these cases, immediately remove the individual to fresh air and call an ambulance. Before starting the operation of aerating rodent control of the vessel, the boatmaster shall go over the specific instructions on rodent control and/or disinsection with the entire crew, regardless of whether they have been processed during another similar activity.

### **5.1.2.5 Ability to organise the waste management taking into account environmental regulations such as the CDNI**

Consistently apply the legal provisions regarding the management of residues on board the ship by applying CEVNI, Chapter 10 and the national regulations.

#### **General vigilance duties for the boatmaster / captain of the ship:**

The captain, members of the crew and other persons on board are required to exercise all due diligence in order to avoid pollution of the waterway, to limit to a maximum the amount of waste that appears on board and to avoid as much as possible any mixing of different categories of waste.

The ban on spillage and throwing waste overboard shall be strictly implemented by the commander of the ship and shall be respected by the crew.

Oily and greasy waste resulting from the operation of ships, as well as household waste, sewage sludge, sludge and other special waste, as well as parts of the cargo, are not to be spilled, dumped or allowed to flow into the Danube.

In the event of accidental spillage or leakage of the above waste, or in the event of a threat of such spillage in contravention of the applicable national waterway regulations on waste from ships navigating the Danube (of the Danube Commission), the boatmaster / captain shall without delay notify the nearest competent authorities to the extent possible, indicating as accurately as possible the place of discharge or leakage, the quantity, the nature of the waste and the measures taken.

The boatmaster / captain shall ensure the separate collection on board of oily and greasy waste from the operation of the ship, with the exception of cargo parts and cargo-related waste or bilge water from the engine compartment, in containers provided for this purpose. Containers must be stored on board in such a way that any spillage can be easily detected and prevented in a timely manner.

The boatmaster shall ask the authorities to issue the Waste Oil Control Book. Each motorised/propelled vessel must have a valid waste oil control book on board, issued by a competent authority in accordance with the model in the Regulation. After renewal, the previous book must be kept on board for at least six months after the last registration.

Oily and greasy waste that appears during the operation of ships, slops and other special waste provided for in the regulation must be deposited in the reception / take-back stations at regular intervals, determined by the condition and operation of the ship. A ship may carry on board other documents relating to the storage of waste resulting from the operation of the ship in accordance with applicable regulations outside the waterways contained in the D.F.N.D. This proof may also be provided by the oil register as required by the International Convention for the Prevention of Pollution from Ships (MARPOL 73). The boatmaster / captain of the ship takes care, orders and supervises that the household waste and sewage sludge is deposited at the reception stations provided for this purpose.

Watch duties applied and requested by the boatmaster / captain when refuelling:

The boatmaster of the vessel shall only accept supplies from specially designated tanks designated by the competent authorities.

When refuelling with fuels or lubricants, the ship's captain shall ensure that all safety precautions are met:

- The ship to be refuelled shall be moored so that there is no pressure on the rigid and flexible pipes during the entire refuelling procedure;
- The quantity to be reloaded is within the readable areas of the control installation;

- When filling the individual tanks, the shut-off valves of the connecting pipes between the tanks are closed;
- The refuelling procedure is supervised.

The shipowner shall also ensure that the person in charge of the refuelling station, the refuelling vessel or the tanker truck and the crew member responsible for the refuelling procedure have completed and signed a checklist (in duplicate) and agreed on the following points before the start of supply operations:

- Ensuring the proper functioning of the automatic closing system (if any);
- A secure and direct means of communication;
- The quantity to be fed from the tank and the filling flow, in particular in relation to possible problems with the evacuation of air from the tanks;
- The order in which the tanks are filled;
- Speed of navigation in case of refuelling during the voyage.

The commander of the ship and the person in charge of the refuelling station, refuelling vessel or spot tanker truck shall start the upstream refuelling procedure only after consulting the checkpoints set out above.

The boatmaster of the vessel shall keep the checklist on board the vessel for at least six months.

The captain of the vessel may decide, as a transitional measure, pending the removal and replacement of all antifouling systems containing one of the above substances, on the application of a coating to the hull of the vessel to prevent the above-mentioned substances contained in antifouling systems from entering the water.

#### **5.1.2.6 Ability to elaborate the periodic programme of maintenance for the craft**

The maintenance programme is developed by the boatmaster for each installation and is the combined result of the provisions of Technical Directive 2016/1629 with those of the operation manuals. Mainly the shortest time is taken into account. The programme can be fulfilled using the vessel's own resources in simple cases or it can be realised by specialised companies under contract of maintenance and repairs.

Ship repairs are:

- Accidental minor repairs that are resolved with the resources on board if a maintenance and repair contract does not provide otherwise;
- Large/major maintenance or important repairs that are performed on the basis of a service contract with a specialised maintenance and repair company;
- Planned repairs - can be current repairs and major repairs.

The table on the next page summarises the timing of the tests for approval, including their frequency and the type of inspector required to perform them. The table is for information purposes only.

#### **5.1.2.7. Ability to monitor and control technical documents of the craft and keep maintenance logs**

Where the operating time is not recorded automatically and is not counted in a software program for the maintenance of installations and engines, the boatmaster shall keep the daily record of the operators as of the time they start, the number of hours in operation, the time set out in the installation or engine manual for maintenance activities of belts, oil, air filters, fuel, water, etc. The record is kept in a log for the maintenance of installations and engines established according to their maintenance manuals.

#### **5.1.3.1 The boatmaster shall be able to purchase and control material and tools with regard to health and environmental protection. Ability to administer the craft's stocks**

The necessary materials for labour protection, first aid and environmental protection are prepared by the boatmaster and are subject to the shipowner's procurement procedure. The necessary materials must provide for the coverage of consumption for a certain period of time - month, quarter, semester/season. It is not feasible for the equipment to be supplied for a long period of time, as some materials have a shorter warranty period and may be discontinued before being used.

#### **5.1.3.2 Ability to organise a safe working system on board including the use of hazardous materials for cleaning and conservation work**

The boatmaster shall instruct the crew to use the means of labour protection appropriate to the type of risk/activity. The boatmaster shall strictly impose the obligation to wear appropriate equipment in case of working with hazardous materials, tanks with oil or chemical residues, etc.

The boatmaster shall appoint crew members who shall be responsible for ventilating the enclosed spaces during work and for supervising the activity of those who actually carry out the work, in order to intervene in case of emergency.

### 5.1.3.3 Ability to check the quality of the repairs

The boatmaster shall attend the commissioning and testing operations of the installations and engines that have been under repair or maintenance and shall sign, comment or refuse to sign if the installations or engines do not meet the test parameters provided in the manufacturer's manual. This right is provided in a contract concluded with the company that performs the maintenance and repair of engines and installations.

### 5.1.4.1 Ability to instruct and supervise the crew in accordance with the working procedures and safety limitations when using ropes and wires according to the craft's certificate and datasheets

The boatmaster shall instruct the crew to work with plant or metal cordages. The boatmaster shall explain their properties, resistance to breakage by shock or effort, the elasticity of the cordages, resistance to weather/humidity or solar radiation, etc., the activity to be carried out (tying/untying the ship, reinforcing the deck crane, reinforcing and manoeuvring the coupling winches, lifting weights with the supply crane, lowering/lifting the car, etc.).

Regulation	Object	Maximum interval	Inspector
art. 6.03, para. 5	Cylinders, pumps and hydraulic motors	8 years	Competent company
art. 6.09, para. 3	Motorised steering installations	3 years	Competent person
art. 7.12, para. 11	Retractable wheelhouses and their devices	1 year	Competent person
art. 7.12, para. 12	Retractable wheelhouses and their devices	5 years	Expert
art. 8.01, para. 2	Pressured devices	5 years	Expert
art. 13.03, para. 5	Portable fire extinguishers	2 years	Competent person
art. 13.04, para. 6, a-c	Fixed fire extinguishing installations	-	Expert
art. 13.04, para. 6, d	Fixed fire extinguishing installations	2 years	Competent person or expert
art. 13.05, para. 9, a-c	Fixed fire extinguishing installations	-	Expert
art. 13.05, para. 9, b-d	Fixed fire extinguishing installations	2 years	Competent person or expert
art. 13.07, para. 3		According to specs.	-
art. 13.08, para. 3	Life jackets	According to specs.	-
art. 14.12, para. 6	Cranes	10 years	Expert
art. 14.12, para. 7	Cranes	1 year	Competent person
art. 17.13	Liquefied gas installations	3 years	Expert
Instructions ESI-II-2, section 3.1, a & b	Alarm installations in case of fire	-	Expert
Instructions ESI-II-12, section 3.1, c	Alarm installations in case of fire	2 years	Expert or competent person
Instructions ESI-III-4, section 8.1, a & b	Safety guidance installations	-	Expert
Instructions ESI-III-4, section 8.1, c	Safety guidance installations	5 years	Expert or competent person
Instructions ESI-III-5	Gas warning equipment	According to specs.	Expert or competent person



# COMPETING

*DISCLAIMER COMPETING is co-funded by the Erasmus+ Programme of the European Union. The views expressed in the working papers, deliverables and reports are those of the project consortium partners. These views have not been adopted or approved by the Commission and should not be relied upon as a statement of the Commission's or its services' views. The European Commission does not guarantee the accuracy of the data included in the working papers and reports, nor does it accept responsibility for any use made thereof.*



**Co-funded by  
the Erasmus+ Programme  
of the European Union**