

**Electrical & Mechanical
Services Industry**

Ship Repair Engineering Branch

**Specification of Competency
Standards**

1st Edition

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Chapter 1

Preface

Background of the Industry

Ship Repair Engineering has been playing an important role in Hong Kong industry and commerce. Since 1950s, the Hong Kong economy has been changing proactively and shifted its emphasis from manufacturing-oriented in early stage to service-oriented later on and developed into a high value-added industry, hoping to keep pace with some of the economic powers (developed countries). The shipping industry has always been an important sector in Hong Kong, with fleets of ships for inland water transport and being the shipping hub in Asia Pacific. While many industries did not survive the economic changes as they could not follow the development, Ship Repair Engineering industry always keeps abreast of the times and has diversified its development as Hong Kong did. Ship Repair Engineering industry has a history of more than a hundred years in Hong Kong. In the past, during the economic surge of Hong Kong and the bloom of the manufacturing industry, mechanical engineering courses were offered by tertiary institutes. The industry has laid extremely great emphasis on on-the-job training for long, and many organizations have their own comprehensive, versatile and systematic training mechanism. Nevertheless, if there is integrated and systematic staff competency training for all related organizations, it will certainly give greater benefits to the enhancement of the staff competency and the standard of the Industry.

Current Situation of the Industry

2. Hong Kong has become a financial centre in Asia, with an undeniable international status. However, Hong Kong's success today is definitely built on the long-term silent endeavours of a group of enthusiastic and enterprising professionals in various sectors. The Ship Repair Engineering team has created for Hong Kong an efficient, stable and competitive system for Ship Repair Engineering industry. In future, it is necessary for the Ship Repair Engineering industry to keep stable in order to maintain the long-term development of Hong Kong. Ship Repair Engineering will also play an important part in operation management of industry and commerce of Hong Kong.

3. The development of Ship Repair Engineering industry has been relatively stable and adaptable to the economic impact. With all the changes and adjustments that the industry has gone through, its manpower demand, both onboard and onshore, has become stable. Ship Repair Engineering talents, therefore, are always in demand no matter what economic cycle we are in. The industry also enjoyed the good result of the economic development. New opportunities are being brought by the long-term plans for the port development. It is expected that relevant projects will create good job opportunities for Ship repair engineering, making it an industry with growing potential.

4. The surge of Mainland's economy, China's entry to World Trade, the Closer Economic Partnership Arrangement (CEPA) signed by the Mainland and Hong Kong, and the launch of individual visitor scheme, etc. have opened up new opportunities for local ship repair engineering personnel. As people's living standard rises, business opportunities in the Mainland are found everywhere. The good picture of heavy industry, light industry, manufacturing industry, port and Ship repair engineering industry, etc. has attracted many manufacturers to invest in the Mainland, thus consolidating China's economic status invisibly. It can be seen that the demand in the Mainland for related technical manpower will become stronger in order to cope with the development of the industries. Backed by China and facing the world, the elite of the Ship repair engineering industry in Hong Kong will be an ideal choice for many Mainland manufacturers that intend to enter the international market.

5. Nowadays, although individual universities, training institutes or some large enterprises have provided pre-employment technical or on-the-job training courses related to mechanical engineering industry, these courses cannot fully cater for the development of ship repair engineering in different domains. As a result, for the frontline practitioners in some domains like technical staff, designers and maintenance technicians, etc., they in general can only learn from their experienced colleagues or masters to deal with common routine work upon employment. Along with the downfall of traditional "apprenticeship", quite many practitioners become unable to fully master formal professional knowledge and the application of new technology related to the industry.

Specification of Competency Standards

6. In view of the industry's current status and future development trend, it is imminent that the Specification of Competency Standards (SCS) be formulated to provide a solid framework for training with unified course contents to enhance the industry's technical capability, competitiveness and quality of service.

7. The SCS consists of competency standards of different levels. Competency standards are benchmarks for the industry-specific knowledge, professional skills and soft skills required for performing different job functions of the industry. The functional areas and competency standards under SCS will be practical and competence-based. The SCS not only sets out the professional knowledge and skills required for today, but also takes into account factors such as the developmental trend of both the industry and the society.

8. In the long run, the industry-recognized SCS will become the blueprint for training. It will not only ensure that training providers can meet the industry's present and future needs by offering training courses covering all the knowledge and skills required by the industry, but also provide employees with a clear set of learning pathways, so that they can draw up their own learning and career roadmaps. As such, the SCS will complement the full-scale implementation of the Qualifications Framework by the Government.

9. The Electrical & Mechanical Services Industry Training Advisory Committee (ITAC), comprising representatives of employers, employees, Hong Kong Government and professional bodies of the industry, has prepared a preliminary version of SCS for the industry with reference to its current status and development trend, as well as the standard and format adopted in the Mainland and overseas, with a view to providing employees with clear guidelines for devising their own learning and career roadmaps.

Chapter 2

Qualifications Framework

Hong Kong Qualifications Framework

10. In January 2005, the Electrical & Mechanical Services Industry Training Advisory Committee (ITAC) was set up by the Education Bureau to facilitate the implementation of the Hong Kong Qualifications Framework (QF) in the industry. The proposed QF is a voluntary system. It is a seven-level hierarchy that provides benchmarks for determining the level of complexity and difficulty of individual competencies. It is also used to order and support qualifications of different natures and titles. The QF has in place an independent quality assurance (QA) system that would enhance recognition and acceptance of the qualifications in the industry, irrespective of the mode and source of learning.

11. The Electrical & Mechanical Services Industry Training Advisory Committee (ITAC) is responsible for the development of its industry-specific, task-based Specification of Competency Standards (SCS) for the identified core functional areas. The SCS, in the form of Units of Competencies (UoCs), provides not only quantitative and qualitative specifications on the competencies required for specific tasks, but also the integrated outcome standards required as well as information on the QF level and credit.

12. The SCS may be used to aid vocational curriculum design by vocational education and training providers, or in-service employee development by HR personnel, or best practice recognition and qualifications by awarding bodies within the industry. SCS is the cornerstone to enhance workforce competitiveness and industry sustainability in the long run.

13. The QF aims to provide clear learning pathways for individuals to draw up their own roadmaps to obtain quality assured qualifications. Learners can either pursue a specific learning pathway to upgrade their skills in a particular area of specialization in a gradual and orderly manner (vertical development), or progress through traversing learning pathways to become multi-skilled (horizontal development). Through the full-scale implementation of the QF, we will foster a vocational environment and culture conducive to lifelong learning and continuing education in the industry. With the active participation of employers and employees as well as the wide acceptance of the industry, the QF will also encourage the development of quality training programmes by providers to meet the needs of the community and the industry.

Qualifications Framework levels

14. The QF has seven levels, from level 1 to level 7, where level 1 is the lowest and level 7 the highest. The outcome characteristic of each level is depicted by a set of generic level descriptors (GLD) (Appendix 1). The GLD specifies for each QF level its generic complexity, demand and challenges in the four dimensions below:

- a. Knowledge and intellectual skills;
- b. Process;
- c. Application, autonomy and accountability; and
- d. Communications, IT skills and numeracy.

The UoCs (See Chapter 4) are benchmarked to the QF levels in accordance with the GLD. It is worth noting that competency elements in a UoC may fall in some or all of the GLD dimensions as what it naturally should be. The QF level assignment is essentially a holistic judgement on the unit's integrated outcome requirement.

15. QF levels are discrete. That is, there cannot be assignment of UoC in-between QF levels. Also, UoCs that may not fully match the characteristic requirement of one or more dimensions of a level would be "rounded" to the level below.

Chapter 3

Competency Standards

Major Functional Areas of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

16. As proposed by the Electrical & Mechanical Services Industry Training Advisory Committee (ITAC), functional areas of the ship repair engineering Sector should focus on (i) design (ii) installation (iii) inspection, testing and commissioning (iv) repair and maintenance (v) project management (vi) operation management (vii) safety, health and environmental protection (viii) quality management (ix) marketing and sales. The Specification of Competency Standards (SCS), therefore, may consist of the following major functional areas:

(i)	Design
	This functional area covers the application of knowledge and skills in ship repair engineering and electrical and mechanical technologies in designing ship building / repair and related modification projects. Practitioners should be able to formulate documents and drawings for the engineering design of various parts of ship hull structure and equipment system installations. They should also master the rules and standards, engineering theories, work processes, regulations and specifications and technological applications for ship building / repair and modifications as well as knowledge of the use of computer, so as to apply them to various processes of design.
(ii)	Installation
	This functional area covers installation knowledge for ship repair engineering and technical skills in the assembly of materials and installation of marine equipment components. Practitioners should understand installation drawings and the use of tools/auxiliaries/instruments/meters. They should be able to use the knowledge and skills in ship engineering for installing various kinds of ship hulls and marine equipment according to design layouts, engineering specifications of marine equipment components, assembling procedures and relevant rules and regulations.

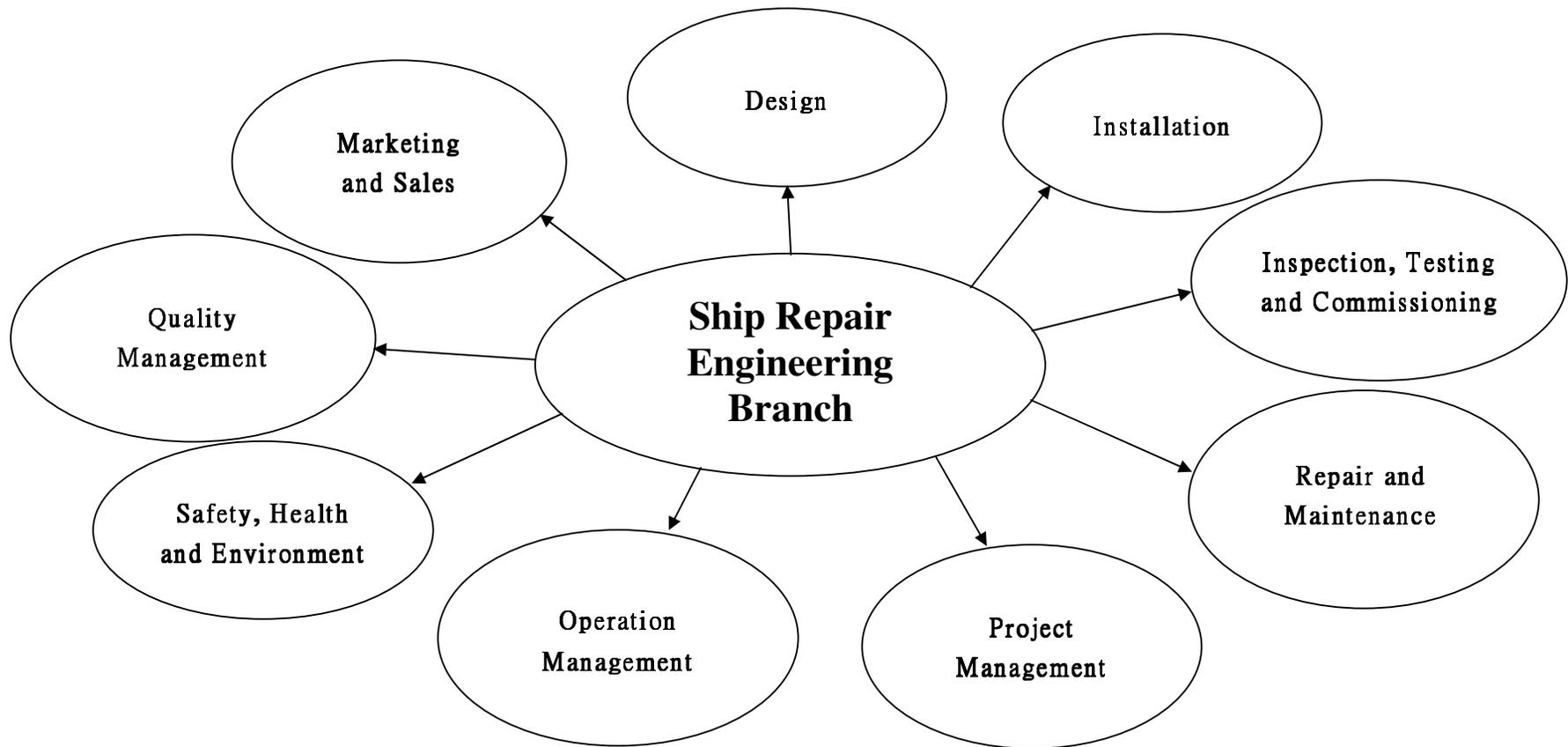
(iii)	Inspection, Testing and Commissioning
	<p>This functional area mainly covers the inspection of the installation of marine systems and equipment, ensuring that the equipment is fit for operation and complies with relevant regulations and standards. Through scheduled arrangements for the ship hull structure and equipment, practitioners should be able to carry out testing procedures to examine various devices and equipment to see if they meet the operational and using requirements prescribed by the law. Practitioners should understand that the purpose of the testing procedure is to optimize the efficiency and safety of the marine systems and equipment.</p>
(iv)	Repair and Maintenance
	<p>This functional area covers all kinds of repairs and maintenance of marine systems and equipment after being set up, including scheduled maintenance, minor repair, overhaul, emergency repair, updating /upgrading, safety inspection and testing. Practitioners should master knowledge and skills in hull structure maintenance and repair, have substantial knowledge of the properties of materials, carry out fault diagnosis, use appropriate instruments to identify the causes of faults and eliminate them, and repair the parts according to repairing procedures.</p>
(v)	Project Management
	<p>This functional area requires practitioners to apply knowledge and skills in ship repair / maintenance project management in planning, organizing, coordinating, monitoring and controlling the ship building / repair and modification projects for higher efficiency and performance. Thus, all engineering processes can complete on time through effective project management and the cost effectiveness of the enterprise be enhanced.</p>
(vi)	Operation Management
	<p>This functional area requires practitioners to analyze the performance of marine systems and equipment, and to apply ship repair / maintenance knowledge and skills in system enhancement so that they can operate in the best status and achieve the best performance. It covers the knowledge, planning, organization and control of business operation in the areas of purchase, sales, installation, maintenance, repair and contract of marine equipment, mechanical and electrical equipment and marine instruments, aiming to enhance the management efficiency and performance of the enterprise. Practitioners should master basic knowledge of mechanical principles, controlling technologies, engineering management, finance, logistics, commercial laws and human resources, etc. so as to perform operation management.</p>

(vii)	Safety, Health and Environmental Protection
	This functional area requires practitioners to apply safety, health and environmental protection management knowledge and skills in conducting risk assessment, and formulating safety, health and environmental protection guidelines and codes of practice for ship works according to relevant legislations. They should be able to provide the staff of the project with occupational safety, health and environmental protection information in order to protect their personal safety and occupational health, and to prevent environmental pollution.
(viii)	Quality Management
	This functional area requires practitioners to apply quality management knowledge and skills in formulating and implementing quality management systems and procedures for ship engineering services, so as to ensure the quality of the engineering services. Practitioners should master the methods of inspecting and controlling the quality of ship and equipment installation, repairs and maintenance, ensuring that the quality complies with client's requirements and relevant standards.
(ix)	Marketing and sales
	This functional area requires practitioners to possess sales and marketing knowledge and techniques and to understand the market demand and product / service positioning, in order to formulate and implement marketing and promotion plans effectively. They should be able to apply sales technique in promoting engineering products and services to clients, and establish client networks so that customers may know and ultimately buy the products and services of the company. They should also know how to make quotations for products or services, analyze the engineering contracts and explain to clients all the engineering details.

Please refer to Diagram 1 for further information.

17. Based on the generic level descriptors and the major functional areas, the E&M ITAC has formulated a “List of Competencies” (Chapter 4) for the industry. The list provides details of the training requirements of the industry in regard to the different competency levels and functional areas. It is designed to provide clear and unified guidelines for drawing up individual learning roadmaps. Learners may either pursue a specific learning pathway to upgrade their skills in a particular area of specialisation in a gradual and orderly manner (vertical development), or progress along a number of learning pathways to become multi-skilled (horizontal development) in a specialized area.

Functional Map showing the Major Functional Areas of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry



Competency Standards

18. Competency standards refer to the skills and knowledge required for a particular job function. They represent the industry benchmarks for the skills, knowledge and attributes required to perform competently in a particular job. Thus they are the most important part of the SCS.

Units of Competencies

19. The Ship repair engineering ITAC has set out the competency standards for various job functions in the form of units of competencies, which describe the performance and standard required for each competency. Please refer to Chapter 4 for details.

Every “unit of competency” comprises eight basic items:

1. Title
2. Code
3. Range
4. Level
5. Credit
6. Competency
7. Assessment Criteria
8. Remarks

Recognition of Prior Learning

20. A major concept of QF is that individuals may acquire knowledge and skills from their work experience, apart from attending formal training courses. People may, through the Recognition of Prior Learning (RPL) mechanism, obtain relevant qualifications if their experience, skills and knowledge gained in the workplace meet the competency standards set by the ITAC.

21. Since mentoring system and in-house training have long been the major training opportunity for employees of the Ship repair engineering industry, it is extremely difficult to determine whether such training has met the competency standards. Therefore, the ITAC will consult members of the industry to develop an appropriate RPL mechanism.

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels									
1		Use typical electrical meters (3 Credits) <u>EMCUDE101A</u> (P.55)	Use typical electrical meters (3 Credits) <u>EMCUDE101A</u> (P.55)	Use typical electrical meters (3 Credits) <u>EMCUDE101A</u> (P.55)					
	Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.56)	Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.56)	Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.56)	Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.56)		Identify general properties of different types of typical electrical and mechanical engineering materials (3 Credits) <u>EMCUDE109A</u> (P.56)			
		Use general machining equipments (9 Credits) <u>EMCUIN101A</u> (P.57)		Use general machining equipments (9 Credits) <u>EMCUIN101A</u> (P.57)					
		Use general loading and lifting equipment (9 Credits) <u>EMCUIN102A</u> (P.58)		Use general loading and lifting equipment (9 Credits) <u>EMCUIN102A</u> (P.58)			Use general loading and lifting equipment (9 Credits) <u>EMCUIN102A</u> (P.58)		
		Apply basic bench fitting techniques and use small typical hand tools (9 Credits) <u>EMCUIN106A</u> (P.60)		Apply basic bench fitting techniques and use small typical hand tools (9 Credits) <u>EMCUIN106A</u> (P.60)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels									
1	Identify different types of pipe materials and their range of application (3 Credits) <u>EMCUIN109A</u> (P.62)	Identify different types of pipe materials and their range of application (3 Credits) <u>EMCUIN109A</u> (P.62)	Identify different types of pipe materials and their range of application (3 Credits) <u>EMCUIN109A</u> (P.62)	Identify different types of pipe materials and their range of application (3 Credits) <u>EMCUIN109A</u> (P.62)		Identify different types of pipe materials and their range of application (3 Credits) <u>EMCUIN109A</u> (P.62)			
		Use general plate bending machines (9 Credits) <u>EMCUIN110A</u> (P.63)		Use general plate bending machines (9 Credits) <u>EMCUIN110A</u> (P.63)					
		Use air-conditioning and refrigeration instruments and tools (3 Credits) <u>EMCUMA101A</u> (P.64)		Use air-conditioning and refrigeration instruments and tools (3 Credits) <u>EMCUMA101A</u> (P.64)					
		Non-destructive test (NDT) – Liquid Penetrant Testing (2 Credits) <u>EMCUMA102A</u> (P.66)	Non-destructive test (NDT) – Liquid Penetrant Testing (2 Credits) <u>EMCUMA102A</u> (P.66)	Non-destructive test (NDT) – Liquid Penetrant Testing (2 Credits) <u>EMCUMA102A</u> (P.66)					
	Basic knowledge of electrical and mechanical services management (6 Credits) <u>EMCUOM102A</u> (P.67)	Basic knowledge of electrical and mechanical services management (6 Credits) <u>EMCUOM102A</u> (P.67)	Basic knowledge of electrical and mechanical services management (6 Credits) <u>EMCUOM102A</u> (P.67)	Basic knowledge of electrical and mechanical services management (6 Credits) <u>EMCUOM102A</u> (P.67)	Basic knowledge of electrical and mechanical services management (6 Credits) <u>EMCUOM102A</u> (P.67)	Basic knowledge of electrical and mechanical services management (6 Credits) <u>EMCUOM102A</u> (P.67)	Basic knowledge of electrical and mechanical services management (6 Credits) <u>EMCUOM102A</u> (P.67)	Basic knowledge of electrical and mechanical services management (6 Credits) <u>EMCUOM102A</u> (P.67)	Basic knowledge of electrical and mechanical services management (6 Credits) <u>EMCUOM102A</u> (P.67)

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>								
QF Levels									
1		Perform quality assurance (3 Credits) <u>EMCUQM101A</u> (P.68)		Perform quality assurance (3 Credits) <u>EMCUQM101A</u> (P.68)					
	Use general personal protective equipment (3 Credits) <u>EMCUSH108A</u> (P.69)								
		Perform manual handling operation (3 Credits) <u>EMCUSH109A</u> (P.70)	Perform manual handling operation (3 Credits) <u>EMCUSH109A</u> (P.70)	Perform manual handling operation (3 Credits) <u>EMCUSH109A</u> (P.70)		Perform manual handling operation (3 Credits) <u>EMCUSH109A</u> (P.70)	Perform manual handling operation (3 Credits) <u>EMCUSH109A</u> (P.70)		
		Safety operation in confined spaces (3 Credits) <u>EMCUSH110A</u> (P.71)							
	Comply with the legal requirements on electrical and mechanical occupational safety and health (3 Credits) <u>EMCUSH111A</u> (P.72)	Comply with the legal requirements on electrical and mechanical occupational safety and health (3 Credits) <u>EMCUSH111A</u> (P.72)	Comply with the legal requirements on electrical and mechanical occupational safety and health (3 Credits) <u>EMCUSH111A</u> (P.72)	Comply with the legal requirements on electrical and mechanical occupational safety and health (3 Credits) <u>EMCUSH111A</u> (P.72)	Comply with the legal requirements on electrical and mechanical occupational safety and health (3 Credits) <u>EMCUSH111A</u> (P.72)	Comply with the legal requirements on electrical and mechanical occupational safety and health (3 Credits) <u>EMCUSH111A</u> (P.72)	Comply with the legal requirements on electrical and mechanical occupational safety and health (3 Credits) <u>EMCUSH111A</u> (P.72)	Comply with the legal requirements on electrical and mechanical occupational safety and health (3 Credits) <u>EMCUSH111A</u> (P.72)	Comply with the legal requirements on electrical and mechanical occupational safety and health (3 Credits) <u>EMCUSH111A</u> (P.72)

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>								
QF Levels									
1	Comply with the legal requirements on environmental protection (3 Credits) <u>EMCUSH112A</u> (P.73)	Comply with the legal requirements on environmental protection (3 Credits) <u>EMCUSH112A</u> (P.73)	Comply with the legal requirements on environmental protection (3 Credits) <u>EMCUSH112A</u> (P.73)	Comply with the legal requirements on environmental protection (3 Credits) <u>EMCUSH112A</u> (P.73)	Comply with the legal requirements on environmental protection (3 Credits) <u>EMCUSH112A</u> (P.73)	Comply with the legal requirements on environmental protection (3 Credits) <u>EMCUSH112A</u> (P.73)	Comply with the legal requirements on environmental protection (3 Credits) <u>EMCUSH112A</u> (P.73)	Comply with the legal requirements on environmental protection (3 Credits) <u>EMCUSH112A</u> (P.73)	Comply with the legal requirements on environmental protection (3 Credits) <u>EMCUSH112A</u> (P.73)
	Handle general chemicals safely (3 Credits) <u>EMCUSH113A</u> (P.74)								
	Read main basic ship hull drawings (3 Credits) <u>EMSRIN101A</u> (P.75)	Read main basic ship hull drawings (3 Credits) <u>EMSRIN101A</u> (P.75)	Read main basic ship hull drawings (3 Credits) <u>EMSRIN101A</u> (P.75)	Read main basic ship hull drawings (3 Credits) <u>EMSRIN101A</u> (P.75)	Read main basic ship hull drawings (3 Credits) <u>EMSRIN101A</u> (P.75)	Read main basic ship hull drawings (3 Credits) <u>EMSRIN101A</u> (P.75)			
		Checking of and working on ironwork materials (3 Credits) <u>EMSRIN102A</u> (P.76)		Checking of and working on ironwork materials (3 Credits) <u>EMSRIN102A</u> (P.76)					
		Woodwork and production of glassfibre-reinforced plastic (3 Credits) <u>EMSRIN103A</u> (P.77)		Woodwork and production of glassfibre-reinforced plastic (3 Credits) <u>EMSRIN103A</u> (P.77)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas QF Levels	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
1				Repairs of marine engineering equipment and machines (3 Credits) EMSRRM101A (P.78)					
				Repair and maintain general marine devices (6 Credits) EMSRRM102A (P.80)					
				Basic maintenance of marine electrical installation (5 Credits) EMSRRM103A (P.82)					
		Assist in ship painting works (6 Credits) EMSRRM104A (P.84)		Assist in ship painting works (6 Credits) EMSRRM104A (P.84)					
						Follow relevant codes of practice at workplaces, on environmental protection, and on occupational safety and health (3 Credits) EMSRSH101A (P.86)	Follow relevant codes of practice at workplaces, on environmental protection, and on occupational safety and health (3 Credits) EMSRSH101A (P.86)		

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 2	Select general electrical materials and electrical equipment (6 Credits) <u>EMCUDE204A</u> (P.88)	Select general electrical materials and electrical equipment (6 Credits) <u>EMCUDE204A</u> (P.88)		Select general electrical materials and electrical equipment (6 Credits) <u>EMCUDE204A</u> (P.88)					
	Use computer to draw mechanical drawings (8 Credits) <u>EMCUDE212A</u> (P.89)								
	Use computer to draw electrical drawings (8 Credits) <u>EMCUDE213A</u> (P.90)								
		Perform general electrical assembly and fitting (6 Credits) <u>EMCUIN201A</u> (P.91)		Perform general electrical assembly and fitting (6 Credits) <u>EMCUIN201A</u> (P.91)					
		Assemble power unit according to installation drawing (4 Credits) <u>EMCUIN205A</u> (P.92)		Assemble power unit according to installation drawing (4 Credits) <u>EMCUIN205A</u> (P.92)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 2		Perform routine wiring tasks (9 Credits) <u>EMCUIN208A</u> (P.93)		Perform routine wiring tasks (9 Credits) <u>EMCUIN208A</u> (P.93)					
		Basic metal inert gas (MIG)/gas metal arc welding (GMAW) (5 Credits) <u>EMCUIN211A</u> (P.95)		Basic metal inert gas (MIG)/gas metal arc welding (GMAW) (5 Credits) <u>EMCUIN211A</u> (P.95)					
		Basic tungsten inert gas (TIG) / gas tungsten arc welding (GTAW) (5 Credits) <u>EMCUIN212A</u> (P.96)		Basic tungsten inert gas (TIG) / gas tungsten arc welding (GTAW) (5 Credits) <u>EMCUIN212A</u> (P.96)					
		Use all kinds of machining equipment for electrical and mechanical engineering parts processing (9 Credits) <u>EMCUIN214A</u> (P.97)		Use all kinds of machining equipment for electrical and mechanical engineering parts processing (9 Credits) <u>EMCUIN214A</u> (P.97)					
				Operate gondolas (4 Credits) <u>EMCUIN215A</u> (P.98)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 2		Install general plastic pipes and fittings (3 Credits) <u>EMCUIN216A</u> (P.99)		Install general plastic pipes and fittings (3 Credits) <u>EMCUIN216A</u> (P.99)					
		Install metallic (steel/stainless steel/galvanized iron) pipes and fittings (3 Credits) <u>EMCUIN217A</u> (P.100)		Install metallic (steel/stainless steel/galvanized iron) pipes and fittings (3 Credits) <u>EMCUIN217A</u> (P.100)					
		Install non-metallic (copper/aluminium) pipes and fittings (3 Credits) <u>EMCUIN218A</u> (P.101)		Install non-metallic (copper/aluminium) pipes and fittings (3 Credits) <u>EMCUIN218A</u> (P.101)					
		Install water pumps (3 Credits) <u>EMCUIN220A</u> (P.102)		Install water pumps (3 Credits) <u>EMCUIN220A</u> (P.102)					
		Replace mechanical parts and devices of electric motors (3 Credits) <u>EMCUIN221A</u> (P.104)		Replace mechanical parts and devices of electric motors (3 Credits) <u>EMCUIN221A</u> (P.104)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 2		Basic manual metal arc welding (MMAW)/shielded metal arc welding (SMAW) (6 Credits) <u>EMCUIN225A</u> (P.105)		Basic manual metal arc welding (MMAW)/shielded metal arc welding (SMAW) (6 Credits) <u>EMCUIN225A</u> (P.105)					
		Basic oxy-acetylene welding (OAW) / oxyfuel and arc cutting (OAC) (5 Credits) <u>EMCUIN226A</u> (P.107)		Basic oxy-acetylene welding (OAW) / oxyfuel and arc cutting (OAC) (5 Credits) <u>EMCUIN226A</u> (P.107)					
		Basic weld joint edge production and assembly (15 Credits) <u>EMCUIN227A</u> (P.109)		Basic weld joint edge production and assembly (15 Credits) <u>EMCUIN227A</u> (P.109)					
		Non-destructive test (NDT) - magnetic particle inspection (2 Credits) <u>EMCUMA201A</u> (P.110)	Non-destructive test (NDT)- magnetic particle inspection (2 Credits) <u>EMCUMA201A</u> (P.110)	Non-destructive test (NDT) - magnetic particle inspection (2 Credits) <u>EMCUMA201A</u> (P.110)					
		Non-destructive test (NDT) - ultrasonic testing (3 Credits) <u>EMCUMA202A</u> (P.111)	Non-destructive test (NDT) - ultrasonic testing (3 Credits) <u>EMCUMA202A</u> (P.111)	Non-destructive test (NDT) - ultrasonic testing (3 Credits) <u>EMCUMA202A</u> (P.111)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 2				Repair diesel engines (4 Credits) <u>EMCUMA203A</u> (P.112)					
				Service protection and indicator of diesel engines (3 Credits) <u>EMCUMA204A</u> (P.113)					
				Service generators and accessories (4 Credits) <u>EMCUMA205A</u> (P.114)					
				Service control, protection and indicator of generators (4 Credits) <u>EMCUMA206A</u> (P.116)					
		Analysis of non-destructive test (NDT) - Liquid penetrant Testing (3 Credits) <u>EMCUMA207A</u> (P.118)	Analysis of non-destructive test (NDT) - Liquid penetrant Testing (3 Credits) <u>EMCUMA207A</u> (P.118)	Analysis of non-destructive test (NDT) - Liquid penetrant Testing (3 Credits) <u>EMCUMA207A</u> (P.118)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>								
2	Apply effective communication skills in discussions of electrical and mechanical issues (3 Credits) <u>EMCUOM204A</u> (P.119)	Apply effective communication skills in discussions of electrical and mechanical issues (3 Credits) <u>EMCUOM204A</u> (P.119)	Apply effective communication skills in discussions of electrical and mechanical issues (3 Credits) <u>EMCUOM204A</u> (P.119)	Apply effective communication skills in discussions of electrical and mechanical issues (3 Credits) <u>EMCUOM204A</u> (P.119)	Apply effective communication skills in discussions of electrical and mechanical issues (3 Credits) <u>EMCUOM204A</u> (P.119)	Apply effective communication skills in discussions of electrical and mechanical issues (3 Credits) <u>EMCUOM204A</u> (P.119)	Apply effective communication skills in discussions of electrical and mechanical issues (3 Credits) <u>EMCUOM204A</u> (P.119)	Apply effective communication skills in discussions of electrical and mechanical issues (3 Credits) <u>EMCUOM204A</u> (P.119)	Apply effective communication skills in discussions of electrical and mechanical issues (3 Credits) <u>EMCUOM204A</u> (P.119)
	Know about common Chinese terminologies of electrical and mechanical services (6 Credits) <u>EMCUOM207A</u> (P.120)	Know about common Chinese terminologies of electrical and mechanical services (6 Credits) <u>EMCUOM207A</u> (P.120)	Know about common Chinese terminologies of electrical and mechanical services (6 Credits) <u>EMCUOM207A</u> (P.120)	Know about common Chinese terminologies of electrical and mechanical services (6 Credits) <u>EMCUOM207A</u> (P.120)	Know about common Chinese terminologies of electrical and mechanical services (6 Credits) <u>EMCUOM207A</u> (P.120)	Know about common Chinese terminologies of electrical and mechanical services (6 Credits) <u>EMCUOM207A</u> (P.120)	Know about common Chinese terminologies of electrical and mechanical services (6 Credits) <u>EMCUOM207A</u> (P.120)	Know about common Chinese terminologies of electrical and mechanical services (6 Credits) <u>EMCUOM207A</u> (P.120)	Know about common Chinese terminologies of electrical and mechanical services (6 Credits) <u>EMCUOM207A</u> (P.120)
	Apply basic risk assessment methods (3 Credits) <u>EMCUSH205A</u> (P.121)								
		Implement work site occupational health and safety management (3 Credits) <u>EMCUSH206A</u> (P.122)	Implement work site occupational health and safety management (3 Credits) <u>EMCUSH206A</u> (P.122)	Implement work site occupational health and safety management (3 Credits) <u>EMCUSH206A</u> (P.122)	Implement work site occupational health and safety management (3 Credits) <u>EMCUSH206A</u> (P.122)	Implement work site occupational health and safety management (3 Credits) <u>EMCUSH206A</u> (P.122)	Implement work site occupational health and safety management (3 Credits) <u>EMCUSH206A</u> (P.122)		
		Handle general industrial accidents (3 Credits) <u>EMCUSH208A</u> (P.123)							

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>						
QF Levels									
2							Obtain data and information of occupational safety and health and environmental protection to compile relevant statistics (3 Credits) <u>EMCUSH211A</u> (P.124)		
	Implement preventive measures on general occupational safety and health (3 Credits) <u>EMCUSH212A</u> (P.125)	Implement preventive measures on general occupational safety and health (3 Credits) <u>EMCUSH212A</u> (P.125)	Implement preventive measures on general occupational safety and health (3 Credits) <u>EMCUSH212A</u> (P.125)	Implement preventive measures on general occupational safety and health (3 Credits) <u>EMCUSH212A</u> (P.125)	Implement preventive measures on general occupational safety and health (3 Credits) <u>EMCUSH212A</u> (P.125)	Implement preventive measures on general occupational safety and health (3 Credits) <u>EMCUSH212A</u> (P.125)	Implement preventive measures on general occupational safety and health (3 Credits) <u>EMCUSH212A</u> (P.125)	Implement preventive measures on general occupational safety and health (3 Credits) <u>EMCUSH212A</u> (P.125)	Implement preventive measures on general occupational safety and health (3 Credits) <u>EMCUSH212A</u> (P.125)
		Gas test in confined spaces (3 Credits) <u>EMCUSH213A</u> (P.126)							
	Draw ship hull engineering drawings (3 Credits) EMSRDE201A (P.127)								
	Apply computer aids to produce ship drawings (3 Credits) EMSRDE202A (P.128)								

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels									
2	Lofting and modelling according to hull-line diagrams (3 Credits) EMSRDE203A (P.129)								
	Basic layout and assembly of ship power units (6 Credits) EMSRIN201A (P.130)	Basic layout and assembly of ship power units (6 Credits) EMSRIN201A (P.130)	Basic layout and assembly of ship power units (6 Credits) EMSRIN201A (P.130)	Basic layout and assembly of ship power units (6 Credits) EMSRIN201A (P.130)					
	Basic layout of marine electrical installations (3 Credits) EMSRIN202A (P.132)	Basic layout of marine electrical installations (3 Credits) EMSRIN202A (P.132)	Basic layout of marine electrical installations (3 Credits) EMSRIN202A (P.132)						
		Install and maintain devices of pneumatic and hydraulic systems (3 Credits) EMSRIN203A (P.133)		Install and maintain devices of pneumatic and hydraulic systems (3 Credits) EMSRIN203A (P.133)					
		Use ship's lifting appliances (3 Credits) EMSRIN204A (P.135)	Use ship's lifting appliances (3 Credits) EMSRIN204A (P.135)	Use ship's lifting appliances (3 Credits) EMSRIN204A (P.135)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 2		Install non-metallic ship materials and produce woodwork (3 Credits) <i>EMSRIN205A</i> (P.136)		Install non-metallic ship materials and produce woodwork (3 Credits) <i>EMSRIN205A</i> (P.136)					
		Installation and repairs of low or medium pressure pipes (4 Credits) <i>EMSRIN206A</i> (P.137)		Installation and repairs of low or medium pressure pipes (4 Credits) <i>EMSRIN206A</i> (P.137)					
		Install and repair low or medium pressure valves (5 Credits) <i>EMSRIN207A</i> (P.139)		Install and repair low or medium pressure valves (5 Credits) <i>EMSRIN207A</i> (P.139)					
			Test the physical strength of materials (3 Credits) <i>EMSRIT201A</i> (P.141)						
		Frontline inspection and acceptance of ship painting works (3 Credits) <i>EMSRIT202A</i> (P.142)	Frontline inspection and acceptance of ship painting works (3 Credits) <i>EMSRIT202A</i> (P.142)	Frontline inspection and acceptance of ship painting works (3 Credits) <i>EMSRIT202A</i> (P.142)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 2				Apply metal fabrication skills to ship repairs and maintenance (3 Credits) EMSRRM201A (P.144)					
				Repair and maintain ship's main engine equipment (8 Credits) EMSRRM202A (P.145)					
				Repair and maintain ship pipes (8 Credits) EMSRRM203A (P.147)					
				Repair and maintain ship auxiliary equipment (8 Credits) EMSRRM204A (P.149)					
				Repair and maintain machinery components below the waterline and dockyard repair work (8 Credits) EMSRRM205A (P.150)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 2				Repair and maintain ship hull and its structural elements (8 Credits) EMSRRM206A (P.151)					
				Repair and maintain ship-deck installations (8 Credits) EMSRRM207A (P.153)					
				Repair diesel engines (4 Credits) EMSRRM208A (P.154)					
		Ship-painting works (6 Credits) EMSRRM209A (P.156)		Ship-painting works (6 Credits) EMSRRM209A (P.156)					
		Surface treatment before painting the ship (3 Credits) EMSRRM210A (P.157)		Surface treatment before painting the ship (3 Credits) EMSRRM210A (P.157)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3	Use computer to draw complicated mechanical engineering drawings (5 Credits) <u>EMCUDE315A</u> (P.159)								
	Use computer to draw for complicated electrical engineering drawings (5 Credits) <u>EMCUDE316A</u> (P.160)								
	Choose typical materials for electrical and mechanical work (3 Credits) <u>EMCUDE318A</u> (P.161)	Choose typical materials for electrical and mechanical work (3 Credits) <u>EMCUDE318A</u> (P.161)	Choose typical materials for electrical and mechanical work (3 Credits) <u>EMCUDE318A</u> (P.161)	Choose typical materials for electrical and mechanical work (3 Credits) <u>EMCUDE318A</u> (P.161)					
				Repair and rewind three-phase motors (9 Credits) <u>EMCUIN304A</u> (P.162)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3		Perform electrical and mechanical installation and testing according to the drawings and specifications of electrical devices and wiring (4 Credits) <u>EMCUIN306A</u> (P.163)	Perform electrical and mechanical installation and testing according to the drawings and specifications of electrical devices and wiring (4 Credits) <u>EMCUIN306A</u> (P.163)	Perform electrical and mechanical installation and testing according to the drawings and specifications of electrical devices and wiring (4 Credits) <u>EMCUIN306A</u> (P.163)					
		Perform general lifting machinery and lifting equipment inspection (3 Credits) <u>EMCUIN313A</u> (P.165)	Perform general lifting machinery and lifting equipment inspection (3 Credits) <u>EMCUIN313A</u> (P.165)	Perform general lifting machinery and lifting equipment inspection (3 Credits) <u>EMCUIN313A</u> (P.165)					
		Operate and maintain abrasive wheels safely (3 Credits) <u>EMCUIN315A</u> (P.166)		Operate and maintain abrasive wheels safely (3 Credits) <u>EMCUIN315A</u> (P.166)					
		Perform manual metal arc welding (MMAW)/shielded metal arc welding (SMAW) at specified positions (20 Credits) <u>EMCUIN316A</u> (P.167)		Perform manual metal arc welding (MMAW)/shielded metal arc welding (SMAW) at specified positions (20 Credits) <u>EMCUIN316A</u> (P.167)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels									
3		Perform tungsten inert gas (TIG) / gas tungsten arc welding (GTAW) at specified positions (5 Credits) <u>EMCUIN317A</u> (P.169)		Perform tungsten inert gas (TIG) / gas tungsten arc welding (GTAW) at specified positions (5 Credits) <u>EMCUIN317A</u> (P.169)					
		Perform oxy-acetylene welding (OAW) / oxyfuel and arc cutting(OAC) at specified positions (20 Credits) <u>EMCUIN318A</u> (P.171)		Perform oxy-acetylene welding (OAW) / oxyfuel and arc cutting(OAC) at specified positions (20 Credits) <u>EMCUIN318A</u> (P.171)					
		Perform metal inert gas (MIG) / gas metal arc welding (GMAW) at specified positions (20 Credits) <u>EMCUIN319A</u> (P.172)		Perform metal inert gas (MIG) / gas metal arc welding (GMAW) at specified positions (20 Credits) <u>EMCUIN319A</u> (P.172)					
		Perform weld joint edge production and assembly according to drawings (15 Credits) <u>EMCUIN320A</u> (P.174)		Perform weld joint edge production and assembly according to drawings (15 Credits) <u>EMCUIN320A</u> (P.174)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3		Perform manual metal arc welding (MMAW) / shielded metal arc welding (SMAW) on different kinds of steel according to drawings (4 Credits) <u>EMCUIN321A</u> (P.175)		Perform manual metal arc welding (MMAW) / shielded metal arc welding (SMAW) on different kinds of steel according to drawings (4 Credits) <u>EMCUIN321A</u> (P.175)					
		Perform metal inert gas (MIG) / gas metal arc welding (GMAW) according to drawings (4 Credits) <u>EMCUIN322A</u> (P.177)		Perform metal inert gas (MIG) / gas metal arc welding (GMAW) according to drawings (4 Credits) <u>EMCUIN322A</u> (P.177)					
		Perform oxy-acetylene welding (OAW) / oxyfuel and arc cutting(OAC) according to drawings (4 Credits) <u>EMCUIN323A</u> (P.178)		Perform oxy-acetylene welding (OAW) / oxyfuel and arc cutting(OAC) according to drawings (4 Credits) <u>EMCUIN323A</u> (P.178)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3		Perform tungsten inert gas (TIG) / gas tungsten arc welding (GTAW) according to drawings (4 Credits) <u>EMCUIN324A</u> (P.179)		Perform tungsten inert gas (TIG) / gas tungsten arc welding (GTAW) according to drawings (4 Credits) <u>EMCUIN324A</u> (P.179)					
		Repair air-conditioning and refrigeration systems (6 Credits) <u>EMCUMA304A</u> (P.180)		Repair air-conditioning and refrigeration systems (6 Credits) <u>EMCUMA304A</u> (P.180)					
		Analysis of non-destructive test (NDT) – Ultrasonic Testing (3 Credits) <u>EMCUMA311A</u> (P.182)	Analysis of non-destructive test (NDT) – Ultrasonic Testing (3 Credits) <u>EMCUMA311A</u> (P.182)	Analysis of non-destructive test (NDT) – Ultrasonic Testing (3 Credits) <u>EMCUMA311A</u> (P.182)					
		Analysis of non-destructive test (NDT) - magnetic particle testing (3 Credits) <u>EMCUMA313A</u> (P.184)	Analysis of non-destructive test (NDT) - magnetic particle testing (3 Credits) <u>EMCUMA313A</u> (P.184)	Analysis of non-destructive test (NDT) - magnetic particle testing (3 Credits) <u>EMCUMA313A</u> (P.184)					
		Test diesel engines (3 Credits) <u>EMCUMA314A</u> (P.186)	Test diesel engines (3 Credits) <u>EMCUMA314A</u> (P.186)	Test diesel engines (3 Credits) <u>EMCUMA314A</u> (P.186)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>	
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)	
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	
QF Levels 3						Procure simple electrical and mechanical engineering equipment and materials (3 Credits) <u>EMCUOM301A</u> (P.187)				
							Handle and review customers' complaints about electrical and mechanical product or service quality (3 Credits) <u>EMCUQM302A</u> (P.188)			
		Implement quality control and quality assurance (4 Credits) <u>EMCUQM303A</u> (P.189)	Implement quality control and quality assurance (4 Credits) <u>EMCUQM303A</u> (P.189)	Implement quality control and quality assurance (4 Credits) <u>EMCUQM303A</u> (P.189)						
								Formulate simple quality assurance plan and quality assurance reports (6 Credits) <u>EMCUQM304A</u> (P.190)		

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3		Record quality issues on electrical and mechanical services (3 Credits) <u>EMCUQM306A</u> (P.191)	Record quality issues on electrical and mechanical services (3 Credits) <u>EMCUQM306A</u> (P.191)	Record quality issues on electrical and mechanical services (3 Credits) <u>EMCUQM306A</u> (P.191)	Record quality issues on electrical and mechanical services (3 Credits) <u>EMCUQM306A</u> (P.191)	Record quality issues on electrical and mechanical services (3 Credits) <u>EMCUQM306A</u> (P.191)		Record quality issues on electrical and mechanical services (3 Credits) <u>EMCUQM306A</u> (P.191)	
							Investigate general industrial accidents (3 Credits) <u>EMCUSH305A</u> (P.192)		
							Perform occupational safety and health supervision (3 Credits) <u>EMCUSH308A</u> (P.193)		
									Apply sales and marketing techniques (3 Credits) <u>EMCUMS301A</u> (P.194)
				Repair faults in generator and its accessories (9 Credits) <u>EMCUOR307A</u> (P.195)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3				Repair faults in diesel engines (9 Credits) <u>EMCUOR308A</u> (P.196)					
				Repair faults in control and protection device of diesel engines and generators (9 Credits) <u>EMCUOR309A</u> (P.197)					
	Basic calculations for ship design (9 Credits) <u>EMSRDE301A</u> (P.199)				Basic calculations for ship design (9 Credits) <u>EMSRDE301A</u> (P.199)	Basic calculations for ship design (9 Credits) <u>EMSRDE301A</u> (P.199)			
		Assemble and install marine engineering system and mechanical equipment (9 Credits) <u>EMSRIN301A</u> (P.201)		Assemble and install marine engineering system and mechanical equipment (9 Credits) <u>EMSRIN301A</u> (P.201)					
		Position and assemble ship-deck equipment (3 Credits) <u>EMSRIN302A</u> (P.203)		Position and assemble ship-deck equipment (3 Credits) <u>EMSRIN302A</u> (P.203)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3		Install and disassemble marine electronic instruments (3 Credits) <i>EMSRIN303A</i> (P.205)		Install and disassemble marine electronic instruments (3 Credits) <i>EMSRIN303A</i> (P.205)					
		Inspect, repair and install general piping (6 Credits) <i>EMSRIN304A</i> (P.207)		Inspect, repair and install general piping (6 Credits) <i>EMSRIN304A</i> (P.207)					
			Examine the shapes and dimensions of prefabricated pieces according to standards (3 Credits) <i>EMSRIT301A</i> (P.209)						
			Test automatic installations (3 Credits) <i>EMSRIT302A</i> (P.210)	Test automatic installations (3 Credits) <i>EMSRIT302A</i> (P.210)					
			Hull-stability examination and inclination test (3 Credits) <i>EMSRIT303A</i> (P.212)						

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3			Test diesel engines (3 Credits) EMSRT304A (P.213)	Test diesel engines (3 Credits) EMSRT304A (P.213)					
			Test marine engineering equipment (3 Credits) EMSRT305A (P.214)						
			Test propulsion devices (3 Credits) EMSRT306A (P.216)						
			Supervise ship painting works (3 Credits) EMSRT307A (P.218)						
				Repair hull structures of non-steel ships (6 Credits) EMSRRM301A (P.220)					
				Maintenance of and urgent repairs to vessels at port (6 Credits) EMSRRM302A (P.222)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3				Maintenance and repairs of ships in dock (on slip) (6 Credits) <i>EMSRRM303A</i> (P.225)		Maintenance and repairs of ships in dock (on slip) (6 Credits) <i>EMSRRM303A</i> (P.225)			
				Ship woodwork and laying of insulation (3 Credits) <i>EMSRRM304A</i> (P.227)					
		Repair and maintain paint coatings of ships (3 Credits) <i>EMSRRM305A</i> (P.229)		Repair and maintain paint coatings of ships (3 Credits) <i>EMSRRM305A</i> (P.229)					
				Repair and maintain marine electrical equipment and systems (8 Credits) <i>EMSRRM306A</i> (P.231)					
				Repair ship piping system (6 Credits) <i>EMSRRM307A</i> (P.234)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3				Repair protection and indication devices of diesel engines (3 Credits) EMSRRM308A (P.236)					
				Repair faults with diesel engines, generators and their control equipment (9 Credits) EMSRRM309A (P.237)					
				Machining of heavy and large work pieces (6 Credits) EMSRRM310A (P.239)					
				Repair high power diesel engines (about 3000 kW (or 4000 BHP) or above) (9 Credits) EMSRRM311A (P.241)					
				Aluminium alloy ship painting works (3 Credits) EMSRRM312A (P.243)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 3		Heat-treatment operations of steel (3 Credits) <i>EMSRRM313A</i> (P.244)		Heat-treatment operations of steel (3 Credits) <i>EMSRRM313A</i> (P.244)					
				Repair hull plates and hull structures (6 Credits) <i>EMSRRM314A</i> (P.245)					
				Repair high-speed engines and water-jet propellers of ships (6 Credits) <i>EMSRRM315A</i> (P.247)					
						Basic operational requirements for material management (3 Credits) <i>EMSROM301A</i> (P.249)			
4				Formulate effective storage and updating system for drawings (3 Credits) <i>EMCUDE405A</i> (P.251)	Formulate effective storage and updating system for drawings (3 Credits) <i>EMCUDE405A</i> (P.251)			Formulate effective storage and updating system for drawings (3 Credits) <i>EMCUDE405A</i> (P.251)	

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 4					Implement quality management in electrical and mechanical engineering services (6 Credits) <u>EMCUQM402A</u> (P.252)	Implement quality management in electrical and mechanical engineering services (6 Credits) <u>EMCUQM402A</u> (P.252)		Implement quality management in electrical and mechanical engineering services (6 Credits) <u>EMCUQM402A</u> (P.252)	
					Promote quality management culture at working level (3 Credits) <u>EMCUQM403A</u> (P.253)	Promote quality management culture at working level (3 Credits) <u>EMCUQM403A</u> (P.253)		Promote quality management culture at working level (3 Credits) <u>EMCUQM403A</u> (P.253)	
		Conduct site survey and quality control (3 Credits) <u>EMCUQM404A</u> (P.254)	Conduct site survey and quality control (3 Credits) <u>EMCUQM404A</u> (P.254)	Conduct site survey and quality control (3 Credits) <u>EMCUQM404A</u> (P.254)	Conduct site survey and quality control (3 Credits) <u>EMCUQM404A</u> (P.254)	Conduct site survey and quality control (3 Credits) <u>EMCUQM404A</u> (P.254)	Conduct site survey and quality control (3 Credits) <u>EMCUQM404A</u> (P.254)	Conduct site survey and quality control (3 Credits) <u>EMCUQM404A</u> (P.254)	
	Calculation of ship buoyancy (3 Credits) EMSRDE401A (P.256)	Supervise non-destructive test (NDT) inspection (6 Credits) <u>EMCUMA402A</u> (P.255)	Supervise non-destructive test (NDT) inspection (6 Credits) <u>EMCUMA402A</u> (P.255)	Supervise non-destructive test (NDT) inspection (6 Credits) <u>EMCUMA402A</u> (P.255)					
	Calculation of ship stability (3 Credits) EMSRDE402A (P.257)								

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 4	Marine engineering equipment power calculations (6 Credits) EMSRDE403A (P.258)								
	Design marine electrical equipment (6 Credits) EMSRDE404A (P.259)								
	Use computer software to assist in ship-design projects (3 Credits) EMSRDE405A (P.260)								
	Organize and arrange ships' outfitting works (3 Credits) EMSRIN401A (P.261)								
	Organize and arrange installation of ships' propulsion devices (3 Credits) EMSRIN402A (P.263)								

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 4		Organize and arrange assembly of ship hulls (3 Credits) <i>EMSRIN403A</i> (P.265)		Organize and arrange assembly of ship hulls (3 Credits) <i>EMSRIN403A</i> (P.265)					
		Organize and arrange installation of marine automatic equipment (3 Credits) <i>EMSRIN404A</i> (P.267)		Organize and arrange installation of marine automatic equipment (3 Credits) <i>EMSRIN404A</i> (P.267)					
		Organize and arrange installation of communication equipment on ships (3 Credits) <i>EMSRIN405A</i> (P.269)		Organize and arrange installation of communication equipment on ships (3 Credits) <i>EMSRIN405A</i> (P.269)					
		Plan lifting work (3 Credits) <i>EMSRIN406A</i> (P.271)	Plan lifting work (3 Credits) <i>EMSRIN406A</i> (P.271)	Plan lifting work (3 Credits) <i>EMSRIN406A</i> (P.271)					
		Organize and arrange assembly of aluminium-alloy ships (3 Credits) <i>EMSRIN407A</i> (P.272)							

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 4			Arrange for ship inspection according to class registration / certification (3 Credits) EMSRT401A (P.274)						
			Supervise ship works to meet seaworthiness standards (3 Credits) EMSRT402A (P.275)						
			Marine inspection and ship survey (5 Credits) EMSRT403A (P.276)						
			Inspect and test high power diesel engines (3 Credits) EMSRT404A (P.277)						
			Inspection and testing of ship lifting appliances (3 Credits) EMSRT405A (P.279)						

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 4			Plan and analyze hull stability and inclination tests (3 Credits) EMSRIT406A (P.281)						
			Test marine glass-reinforced plastic (GRP) (3 Credits) EMSRIT407A (P.282)						
			Examine welded, fabricated and rolled pieces (3 Credits) EMSRIT408A (P.283)						
				Lead workgroups to maintain and repair main power units of ships (3 Credits) EMSRRM401A (P.284)					
				Lead workgroups to maintain and repair auxiliary units of ships (3 Credits) EMSRRM402A (P.286)					

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas QF Levels	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
4				Supervise hull and ship structure repairs (6 Credits) EMSRRM403A (P.288)					
				Supervise difficult welding, duct overhaul and hull outfitting (3 Credits) EMSRRM404A (P.290)					
		Supervise ship painting works for repairs and maintenance (3 Credits) EMSRRM405A (P.292)		Supervise ship painting works for repairs and maintenance (3 Credits) EMSRRM405A (P.292)					
				Supervise the repairs of high-speed engines and water-jet propellers for ships (9 Credits) EMSRRM406A (P.294)					
						Manage ship systems' operations (3 Credits) EMSROM401A (P.297)			

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>					
QF Levels 4						Organization and arrangement of dockyard work (3 Credits) EMSROM402A (P.299)			
						Supervise projects according to legislations and regulations related to ship operations (3 Credits) EMSROM403A (P.301)			
						Supervise ship repairs and demolition works (6 Credits) EMSRSH401A (P.302)			
5	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.305)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.305)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.305)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.305)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.305)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.305)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.305)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.305)	Write all kinds of electrical and mechanical engineering reports in Chinese (6 Credits) <u>EMCUDE506A</u> (P.305)

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	Design	Installation	Inspection, Testing and Commissioning	Repair and Maintenance	Project Management	Operation Management	Safety, Health and Environment	Quality Management	Marketing and Sales
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	Unit of Competency								
QF Levels 5	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.306)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.306)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.306)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.306)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.306)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.306)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.306)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.306)	Write all kinds of electrical and mechanical engineering reports in English (6 Credits) <u>EMCUDE507A</u> (P.306)
		Manage general lifting machinery and lifting equipment operation (3 Credits) <u>EMCUIN502A</u> (P.307)		Manage general lifting machinery and lifting equipment operation (3 Credits) <u>EMCUIN502A</u> (P.307)	Manage general lifting machinery and lifting equipment operation (3 Credits) <u>EMCUIN502A</u> (P.307)	Manage general lifting machinery and lifting equipment operation (3 Credits) <u>EMCUIN502A</u> (P.307)			
						Implement engineering operation and supervisory management (6 Credits) <u>EMCUOM502A</u> (P.308)			
					Formulate project procedures and schedule (9 Credits) <u>EMCUPM501A</u> (P.309)				

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 5					Implement risk management for electrical and mechanical services (9 Credits) <u>EMCUSH502A</u> (P.310)	Implement risk management for electrical and mechanical services (9 Credits) <u>EMCUSH502A</u> (P.310)	Implement risk management for electrical and mechanical services (9 Credits) <u>EMCUSH502A</u> (P.310)		
					Formulate occupational safety and health management system (3 Credits) <u>EMCUSH504A</u> (P.312)	Formulate occupational safety and health management system (3 Credits) <u>EMCUSH504A</u> (P.312)	Formulate occupational safety and health management system (3 Credits) <u>EMCUSH504A</u> (P.312)		
					Formulate occupational safety and health and environmental protection schemes (6 Credits) <u>EMCUSH505A</u> (P.313)	Formulate occupational safety and health and environmental protection schemes (6 Credits) <u>EMCUSH505A</u> (P.313)	Formulate occupational safety and health and environmental protection schemes (6 Credits) <u>EMCUSH505A</u> (P.313)		
					Perform risk assessment for electrical and mechanical work (3 Credits) <u>EMCUSH506A</u> (P.315)	Perform risk assessment for electrical and mechanical work (3 Credits) <u>EMCUSH506A</u> (P.315)	Perform risk assessment for electrical and mechanical work (3 Credits) <u>EMCUSH506A</u> (P.315)		

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 5					Formulate environmental protection management system (3 Credits) <u>EMCUSH507A</u> (P.316)	Formulate environmental protection management system (3 Credits) <u>EMCUSH507A</u> (P.316)	Formulate environmental protection management system (3 Credits) <u>EMCUSH507A</u> (P.316)		
					Implement occupational safety and health and environmental protection courses and training programmes (3 Credits) <u>EMCUSH508A</u> (P.317)	Implement occupational safety and health and environmental protection courses and training programmes (3 Credits) <u>EMCUSH508A</u> (P.317)	Implement occupational safety and health and environmental protection courses and training programmes (3 Credits) <u>EMCUSH508A</u> (P.317)		
								Formulate and implement quality management courses and training programmes (4 Credits) <u>EMCUQM503A</u> (P.318)	
		Formulate and analyze quality assurance reports (3 Credits) <u>EMCUQM504A</u> (P.319)		Formulate and analyze quality assurance reports (3 Credits) <u>EMCUQM504A</u> (P.319)	Formulate and analyze quality assurance reports (3 Credits) <u>EMCUQM504A</u> (P.319)	Formulate and analyze quality assurance reports (3 Credits) <u>EMCUQM504A</u> (P.319)	Formulate and analyze quality assurance reports (3 Credits) <u>EMCUQM504A</u> (P.319)	Formulate and analyze quality assurance reports (3 Credits) <u>EMCUQM504A</u> (P.319)	

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 5					Formulate schemes to enhance staff's awareness of quality management (5 Credits) <u>EMCUQM505A</u> (P.320)	Formulate schemes to enhance staff's awareness of quality management (5 Credits) <u>EMCUQM505A</u> (P.320)		Formulate schemes to enhance staff's awareness of quality management (5 Credits) <u>EMCUQM505A</u> (P.320)	
								Implement quality management training courses (9 Credits) <u>EMCUQM506A</u> (P.321)	
					Implement quality management standards of International Organization for Standardization (ISO) (3 Credits) <u>EMCUQM507A</u> (P.322)	Implement quality management standards of International Organization for Standardization (ISO) (3 Credits) <u>EMCUQM507A</u> (P.322)		Implement quality management standards of International Organization for Standardization (ISO) (3 Credits) <u>EMCUQM507A</u> (P.322)	
	Strength calculation of ships (3 Credits) EMSRDE501A (P.323)								
	Ship's stability design (3 Credits) EMSRDE502A (P.324)								

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
5			Sea-trial inspection and seaworthiness tests (3 Credits) EMSRIT501A (P.325)						
6					Apply project management skills and professional knowledge to handle unfulfilled or unperformed contracts effectively (20 Credits) EMCUPM601A (P.328)				
						Formulate overall safety, health and environmental protection policy (20 Credits) EMCUSH601A (P.329)	Formulate overall safety, health and environmental protection policy (20 Credits) EMCUSH601A (P.329)		
						Formulate improvement plans for occupational safety and health (20 Credits) EMCUSH602A (P.331)	Formulate improvement plans for occupational safety and health (20 Credits) EMCUSH602A (P.331)		

List of Competencies for Practitioners of the Ship Repair Engineering Branch in the Electrical & Mechanical Services Industry

Functional Areas	<u>Design</u>	<u>Installation</u>	<u>Inspection, Testing and Commissioning</u>	<u>Repair and Maintenance</u>	<u>Project Management</u>	<u>Operation Management</u>	<u>Safety, Health and Environment</u>	<u>Quality Management</u>	<u>Marketing and Sales</u>
	(DE)	(IN)	(IT)	(RM/OR/MA)	(PM)	(OM)	(SH)	(QM)	(MS)
	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>	<u>Unit of Competency</u>
QF Levels 6						Formulate environmental protection improvement plans (20 Credits) <u>EMCUSH603A</u> (P.333)	Formulate environmental protection improvement plans (20 Credits) <u>EMCUSH603A</u> (P.333)		
						Formulate quality management strategy (20 Credits) <u>EMCUQM601A</u> (P.335)		Formulate quality management strategy (20 Credits) <u>EMCUQM601A</u> (P.335)	
						Implement total quality management plan (20 Credits) <u>EMCUQM602A</u> (P.336)		Implement total quality management plan (20 Credits) <u>EMCUQM602A</u> (P.336)	
					Lead and supervise management of large engineering projects (6 Credits) <u>EMSRPM601A</u> (P.338)				
7						Formulate overall operation development direction and strategy (20 Credits) <u>EMCUOM701A</u> (P.340)			

Competency Level 1

1. Title	Use typical electrical meters
2. Code	EMCUDE101A
3. Range	With regard to electrical and mechanical engineering services, have basic understanding in electrical terms, units and calculations, and electrical components; and use typical electrical meters for general measurement.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic electrical concepts</p> <ul style="list-style-type: none"> ◆ Understand basic electrical concepts, including: <ul style="list-style-type: none"> • Stating briefly the names and uses of common electrical components from distribution board to all final circuits • Distinguish and apply basic electrical terms such as electric current, electric voltage, electric resistance, electric energy and electric power, etc., and their basic units and calculations ◆ Understand the working principles of common meters, including: <ul style="list-style-type: none"> • Structure and working principles of moving coil, moving iron and electric meter • Uses and the pros and cons of the above three types of meters • Structure, working principles and uses of traditional multimeter ◆ Understand the code of safety and operation for using common meters <p>6.2 Use of meters</p> <ul style="list-style-type: none"> ◆ Use typical meters <ul style="list-style-type: none"> • Capable to use multimeters safely and correctly to measure electric current, electric voltage and electric resistance of simple circuits • Capable to use appropriate common meters safely and correctly to measure electric energy (kWh) and electric power (kW) • Know how to maintain typical meters
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to use multimeters to measure electric current, electric voltage and electric resistance of simple circuits according to the code of safety and operation, and make simple calculations of electricity; and</p> <p>(ii) Capable to use appropriate typical meters to measure electric energy and electric power of simple circuits according to the code of safety and operation.</p>
8. Remarks	This unit of competency is applicable to new entrants of electrical and mechanical engineering services.

1. Title	Identify general properties of different types of typical electrical and mechanical engineering materials
2. Code	EMCUDE109A
3. Range	Capable to identify the general properties and range of application of different types of typical electrical and mechanical engineering materials for electrical and mechanical design, installation, repair and maintenance.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 General properties of typical electrical and mechanical engineering materials ♦ Understand the general properties of typical electrical and mechanical engineering materials including metals and non-metals:</p> <ul style="list-style-type: none"> • Mechanical properties such as strength, hardness, resilience, etc. • Density • Electric conductivity • Thermal conductivity • Melt ability <p>6.2 Identify properties and range of application of typical electrical and mechanical engineering materials ♦ Capable to identify different types of typical electrical and mechanical engineering materials, including metal type: steel, copper, aluminium, iron, etc., and non-metal type: wood, plastic, resin, etc.</p> <ul style="list-style-type: none"> ♦ Capable to identify basic range of application of different types of typical electrical and mechanical engineering materials ♦ Capable to perform simple design, installation, repair and maintenance engineering works according to the general properties and range of application of different types of typical electrical and mechanical engineering materials
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to identify the general properties and range of application of different types of typical electrical and mechanical engineering materials.</p>
8. Remarks	This unit of competency is applicable to new entrants of electrical and mechanical engineering services.

1. Title	Use general machining equipments
2. Code	EMCUIN101A
3. Range	Use general-purpose machining equipments for servicing, manufacturing and grinding at industrial plants. This unit of competency does not include the ability in making parts according to drawings.
4. Level	1
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Principles of machining equipments and code of safety</p> <ul style="list-style-type: none"> ◆ Understand the code of safety and operation of machining equipments ◆ Understand major components of general machining equipments: the transmission part, the part to hold and rotate the work piece, and the part to hold and move the cutting tool ◆ Understand the operation and limitations of general machining equipments ◆ Understand how to choose and install general machine tools <p>6.2 Use general machine tools correctly</p> <ul style="list-style-type: none"> ◆ Follow the codes of safety and operation to use common machining equipments correctly, including general lathes, milling machine, drilling machine, slotting machine, grinding machine, etc. ◆ Capable to operate and adjust general machine tools, including: <ul style="list-style-type: none"> • Cutting speed • Feeding method • Rotational speed adjustment • Feeding speed • Cutting depth ◆ Capable to maintain general machining equipments correctly, including routine cleaning ◆ Capable to use general machining equipments for servicing, manufacturing and grinding simple electrical and mechanical parts
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to follow the codes of safety and operation procedures to correctly operate general lathe, milling machine, drilling machine, slotting machine, grinding machine, etc. for servicing, manufacturing and grinding simple electrical and mechanical parts.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic workshop mechanical knowledge.

1. Title	Use general loading and lifting equipment
2. Code	EMCUIN102A
3. Range	Use general loading and light duty lifting equipment, not including heavy duty lifting equipment, in industrial plants or workplaces where lifting is involved.
4. Level	1
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the principles of common lifting machines and devices operation</p> <ul style="list-style-type: none"> ◆ Understand the types, use, functions, operation and maintenance of general loading and lifting machines and devices; and noting points when using them <ul style="list-style-type: none"> • Lifting machines include: crane, gin block, winch, rolling wheel, lift purchase and gin wheel • Lifting devices include: hook, chain, rope and overhead conveyor <p>6.2 Understand the code of safety and legal requirements for goods handling</p> <ul style="list-style-type: none"> ◆ Understand the code of safety and legal requirements for goods handling <ul style="list-style-type: none"> • Understand the danger of moving and using lifting machines and devices • Understand the safety inspection requirements for handling goods • Understand the safety operation of lifting device and sling, and the requirements for pre-use inspection • Understand the code of safety for using lifting machines and the requirements for pre-use inspection ◆ Inspect the safety of the working environment, and clear all obstacles and potential dangers to goods handling work before starting the lifting and loading operations <p>6.3 Apply general loading methods and lifting equipment correctly</p> <ul style="list-style-type: none"> ◆ Use general loading and lifting machines and devices correctly <ul style="list-style-type: none"> • Use general loading and lifting machines and devices correctly under clear instruction, including: <ul style="list-style-type: none"> ▸ Using chains and ropes to tie the goods ▸ Using lifting devices such as ropes, chain, hook and overhead conveyor to lift up and convey the goods ▸ Using hydraulic lifting machines to handle heavy goods ▸ Using electric lifting machines to handle goods ▸ operating truck lifting platform ◆ Use general loading methods correctly <ul style="list-style-type: none"> • Carry out basic manual handling operation correctly • Simple ways of using ropes, such as tying knots and rings

7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use general loading and lifting machines and devices correctly and safely for handling general electrical and mechanical equipment.</p>
8. Remarks	<p>(i) This unit of competency is applicable to electrical and mechanical practitioners in general.</p> <p>(ii) The credit value of this unit of competencies is set on the presumption that the person already possesses the competency of the following unit of competency: The competencies of EMCUSH109A “Perform manual handling operation”.</p>

1. Title	Apply basic bench fitting techniques and use small typical hand tools
2. Code	EMCUIN106A
3. Range	Apply basic bench fitting techniques, including marking, sawing, filing, grinding, drilling and chiseling, in tasks of production, installation and maintenance and repairs for electrical and mechanical works.
4. Level	1
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about basic bench fitting techniques and small typical hand tools</p> <ul style="list-style-type: none"> ◆ Understand basic bench fitting techniques, including marking, sawing, filing, grinding, drilling and chiselling ◆ Understand the operation of small typical hand tools, including cutting tools, measuring instruments, files, assembling and dismantling tools, marking-out tools, portable power drills, drilling machines, and relevant concerns <p>6.2 Apply basic bench fitting techniques and small typical hand tools in tasks of production, installation and maintenance and repairs</p> <ul style="list-style-type: none"> ◆ Understand the correct use of small typical hand tools <ul style="list-style-type: none"> • Capable to use various types of cutting tools correctly, such as bow saws and shears • Capable to use metric and imperial measuring instruments correctly, such as steel rules, verniers, inside callipers and outside callipers • Capable to use steel rules and beam squares to measure the length and to check horizontal, vertical and curved surfaces correctly • Capable to select and use files correctly, such as single cut files, flat files, round files, half-round files, triangular files, double cut files, rough-cut and smooth files of different degree of fineness • Capable to select and use scrapers correctly • Capable to use assembling and dismantling tools correctly, such as open-ended spanners, adjustable spanners, box spanners, hexagon ring spanners, screw drivers, jaw vices, hand vices and hammers, to assemble or dismantle simple mechanical devices • Capable to use various types of marking-out tools correctly, such as line needle, hook needle, centre punches, pin punches and dividers • Capable to use portable power drills and drilling machines correctly

	<ul style="list-style-type: none"> ◆ Apply basic bench fitting techniques and use small typical hand tools <ul style="list-style-type: none"> • Identify and select common metals <ul style="list-style-type: none"> ▸ Capable to identify various types of common metals ▸ Capable to select suitable common metals according to uses ◆ Capable to apply basic bench fitting techniques, including marking, sawing, filing, grinding, drilling and chiselling, to trim materials, to measure work pieces and to make metal work pieces to required dimensions, according to templates or simple drawings <p>6.3 Code of practice for bench fitting</p> <ul style="list-style-type: none"> ◆ Capable to use small typical hand tools and bench fitting techniques in completing tasks of production, installation, maintenance and repairs according to the code of safety
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to make metal pieces to required dimensions according to templates or simple drawings; apply the techniques of marking, sawing, filing, grinding, drilling and chiseling in tasks of production, installation, maintenance and repairs; capable to observe the code of safety.</p>
8. Remarks	<p>This unit of competency is applicable to new entrants of the electrical and mechanical trade.</p>

1. Title	Identify different types of pipe materials and their range of application
2. Code	EMCUIN109A
3. Range	Capable to identify different types of pipe materials and their range of application in general industrial plants, power plants, and workplaces where ship engineering, fire engineering, plumbing or gas engineering is involved.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Pipe materials and their range of application</p> <ul style="list-style-type: none"> ◆ Understand different types of pipe materials, such as: <ul style="list-style-type: none"> • Cast iron • Low-carbon steel • Stainless steel • Copper • Aluminium • Plastic ◆ Understand the properties of different types of pipe materials, such as: <ul style="list-style-type: none"> • Bend ability • Pressure resistance • Heat resistance • Resilience • Weldability • Corrosion resistance ◆ Understand the characteristics of pipeline manufacturing <ul style="list-style-type: none"> • Casting • Plastic moulding • Lining • Electric welding • Seamless • Continuous welding, etc. ◆ Understand the range of application of different types of pipes <p>6.2 Identify the application of different types of pipes</p> <ul style="list-style-type: none"> ◆ Identify the properties and range of application of different types of pipe materials for general pipe installation
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Identify the properties and range of application of different types of pipe materials for general pipe installation.</p>
8. Remarks	This unit of competency is applicable to new entrants of electrical and mechanical engineering services.

1. Title	Use air-conditioning and refrigeration instruments and tools
2. Code	EMCUMA101A
3. Range	Use common air-conditioning and refrigeration instruments and tools to perform installation, repair and maintenance in workplaces with air-conditioning and refrigeration systems.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Working principles of air-conditioning and refrigeration instruments and tools</p> <ul style="list-style-type: none"> ◆ Understand basic working principles of instruments and tools, including: <ul style="list-style-type: none"> • Functions and working principles of dry-bulb thermometer, web-bulb thermometer, anemometer, vacuum pump, gauge manifold and vacuum pressure gauge, etc. • Functions of copper tubing tools • Functions of insulation work tools <p>6.2 Operation method of air-conditioning and refrigeration instruments and tools</p> <ul style="list-style-type: none"> ◆ Use air-conditioning and refrigeration instruments, including: <ul style="list-style-type: none"> • Anemometer • Vacuum pump • Gauge manifold • Vacuum pressure gauge • Use dry-bulb thermometer and web-bulb thermometer to measure the dry-bulb temperature and web-bulb temperature of objects ◆ Use copper tubing tools <ul style="list-style-type: none"> • know how to use tube cutter, flaring tool, swaging tool and tube bender for cutting, flaring , swaging and bending copper tubes • know how to fabricate simple copper tube assemblies, including cutting, flaring,swaging, bending, flare joining , and performing leak checking for copper tube assemblies ◆ Use refrigerant leak detector <ul style="list-style-type: none"> • Know how to use soap solution and electronic leak detector to detect refrigerant leaks from the refrigeration system ◆ Identify and handle refrigerant cylinders <ul style="list-style-type: none"> • Identify the types of refrigerant according to different colours of the refrigerant cylinders • Understand how to use refrigerant cylinders • Capable to store and transport refrigerant cylinders safely

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to use air-conditioning and refrigeration instruments correctly; and (ii) Capable to operate air-conditioning and refrigeration tools, make simple copper tube assemblies, and perform installation, repair and maintenance works.
8. Remarks	This unit of competency is applicable to new entrants of air-conditioning and refrigeration engineering services.

1. Title	Non-destructive test (NDT) – Liquid Penetrant Testing
2. Code	EMCUMA102A
3. Range	Use liquid penetrant, at servicing centres or locations with operating equipment, to inspect equipment or materials for surface cracks and make a simple analysis.
4. Level	1
5. Credits	2
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Techniques and principles of inspecting mechanical equipment or materials for surface cracks</p> <ul style="list-style-type: none"> ◆ Perform visual inspection to locate suspected surface cracks ◆ Understand the techniques and principles of inspecting equipment or materials for surface cracks ◆ Understand the chemical hazards caused by penetrant and developers, and relevant concerns for use ◆ Understand that liquid penetration inspection is not applicable to high temperature materials <p>6.2 Methods and procedures of analyzing and identifying external cracks on metal equipment or materials</p> <ul style="list-style-type: none"> ◆ Capable to use liquid penetrant and developers effectively to inspect the surface cracks of equipment or materials ◆ Capable to mark the position with cracks effectively <p>6.3 Code of practice for using penetrant and developers</p> <ul style="list-style-type: none"> ◆ Use penetrant and developers safely to complete the non-destructive test
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use liquid penetrant and developer inspection method safely and correctly to identify equipment or materials for surface cracks which are not easily seen; and to mark the cracks correctly.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of reading mechanical drawings and manuals for materials.

1. Title	Basic knowledge of electrical and mechanical services management
2. Code	EMCUOM102A
3. Range	Capable to understand the basic concepts of electrical and mechanical services management, to build up team spirit and to assist the company to perform routine duties.
4. Level	1
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about basic management theory</p> <ul style="list-style-type: none"> ◆ Understand team building and maintain team spirit, including: <ul style="list-style-type: none"> • Building of working team • Definition of working team • Classification of working team • Formulating clear and tangible goals • Trusting each other • Taking the initiative to listen carefully • Formulating practical and challenging goals ◆ Understand organization's basic way of operation, including: <ul style="list-style-type: none"> • Engineering workforce organizational chart • Engineering project schedules • Working procedure flow chart • Basic concept of logistics management for materials, tools, instruments, etc <p>6.2 Apply basic management theory in daily electrical and mechanical engineering works</p> <ul style="list-style-type: none"> ◆ Know how to apply basic management theory in daily electrical and mechanical engineering works, including: <ul style="list-style-type: none"> • Enhancing the efficiency of company's daily work • Fostering the spirit of cooperation among staff members • Minimizing misunderstanding of work • Strengthening self-confidence
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to know about basic theory of electrical and mechanical services management, to build up team spirit and to enhance the efficiency of organizational routines.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Perform quality assurance
2. Code	EMCUQM101A
3. Range	With regard to electrical and mechanical engineering quality assurance, assist to control and monitor the engineering quality under supervision.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about quality assurance standards and rules</p> <ul style="list-style-type: none"> ◆ Understand the organizational quality management scheme, including: <ul style="list-style-type: none"> • Mode of quality management such as the implementation of ISO 9000, quality circle, etc. • Duties of quality management committee • Quality management training ◆ Understand the organizational and international quality assurance standards and rules <p>6.2 Perform quality assurance and monitoring procedures</p> <ul style="list-style-type: none"> ◆ Assist to perform quality assurance and monitoring for the electrical and mechanical engineering works under supervision according to organizational instructions and international standards ◆ Capable to record quality test results
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to master and apply the organizational and international quality management standards and rules, and assist in quality assurance and monitoring of the electrical and mechanical engineering works under supervision.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Use general personal protective equipment
2. Code	EMCUSH108A
3. Range	Use general personal protection device correctly at electrical and mechanical work sites to protect personal safety and health.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Various types of personal protective equipment</p> <ul style="list-style-type: none"> ◆ Understand the types, utilization, maintenance and limitations of personal protection device such as safety belt, eye protector, safety shoes, insulating gloves, protective guard, helmet and ear plug, etc. ◆ Understand the basic maintenance of personal protective equipment <p>6.2 Use of personal protective equipment</p> <ul style="list-style-type: none"> ◆ Capable to use general personal protection device such as safety belt, eye protector, safety shoes, insulating gloves, protective guard, helmet and ear plug, etc. ◆ Capable to choose and use general personal protection device correctly by following systematic safety procedures for the best protection ◆ Capable to use and maintain personal protection device correctly according to safety guidelines and procedures so as to comply with the law
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand various types of personal protection device and their limitations;</p> <p>(ii) Capable to choose and use general personal protection device correctly; and</p> <p>(iii) Capable to use and maintain personal protection device correctly in daily working environment according to safety guidelines and procedures so as to comply with the law.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Perform manual handling operation
2. Code	EMCUSH109A
3. Range	Apply the correct way of manual lifting and handling at electrical and mechanical work sites to avoid bodily injuries.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Correct way of manual lifting and handling ♦ Understand the effects of incorrect lifting and handling, including:</p> <ul style="list-style-type: none"> • The impact on the waist and the back • Causes of manual lifting injuries • Basic knowledge of waist and back care <p>6.2 Application of the correct way of manual lifting and handling ♦ Capable to apply the way of manual lifting and handling correctly and properly to avoid bodily injuries</p> <p>♦ Capable to implement the recommendations of the risk assessment for the manual handling operation</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to illustrate the importance of applying the correct way of manual lifting and handling so as to avoid bodily injuries; and</p> <p>(ii) Capable to apply the correct way of manual lifting and handling for materials that need to be handled manually in routine operation.</p>
8. Remarks	This unit of competency is applicable to frontline electrical and mechanical practitioners in general.

1. Title	Safety operation in confined spaces
2. Code	EMCUSH110A
3. Range	Apply the basic knowledge of safety operation in confined spaces and understand the hazards when working in confined spaces so as to prevent accidents.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of safety operation in confined spaces</p> <ul style="list-style-type: none"> ◆ Understand potential hazards and causes for working in confined spaces, including explosion, fire, anoxia, poisonous gas, etc. ◆ Understand the types of confined spaces and relevant legal requirements ◆ Understand the safety procedures, including the use of general protective equipment, for working in confined spaces <p>6.2 Basic safety for working in confined spaces</p> <ul style="list-style-type: none"> ◆ Possess basic safety knowledge of carrying out electrical and mechanical engineering works in confined spaces ◆ Capable to work in confined spaces according to safety procedures, preventive measures of working in confined spaces and relevant legal requirements
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to work in confined spaces according to safety procedures, preventive measures of working in confined spaces and relevant legal requirements.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic safety knowledge.

1. Title	Comply with the legal requirements on electrical and mechanical occupational safety and health
2. Code	EMCUSH111A
3. Range	Comply with the codes of practice and legal requirements on occupational safety and health when working at electrical and mechanical work sites.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Codes of practice and ordinances for occupational safety and health ♦ Understand the requirements for site workers imposed by the codes of practice and ordinances for occupational safety and health, and how to ensure personal occupational safety with correct working procedures. These codes and ordinances include:</p> <ul style="list-style-type: none"> • Occupational Safety and Health ordinance and Regulations • Factories and Industrial Undertakings Ordinance and Regulations • Factories and Industrial Undertakings (Electricity) Regulations • Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations <p>6.2 Comply with codes of practice and ordinances for occupational safety and health ♦ Capable to comply with the legal requirements on occupational safety and health to carry out routine, repetitive or clearly defined electrical and mechanical engineering work safely</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand the requirements for site workers imposed by the codes of practice and ordinances for occupational safety and health; and to carry out routine, repetitive or clearly defined electrical and mechanical engineering work with proper working procedures.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic safety knowledge.

1. Title	Comply with the legal requirements on environmental protection
2. Code	EMCUSH112A
3. Range	Comply with the legal requirements on environmental protection when working at electrical and mechanical work sites.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Environmental protection legislations ♦ Understand the legal requirements for electrical and mechanical engineering work on environmental protection, such as:</p> <ul style="list-style-type: none"> • Noise Control Ordinance • Waste Disposal Ordinance • Water Pollution Control Ordinance • Ozone Layer Protection Ordinance • Dumping at Sea Ordinance • Air Pollution Control Ordinance <p>6.2 Application of environmental protection legislations ♦ Capable to comply with the legal requirements on environmental protection to carry out routine, repetitive or clearly defined electrical and mechanical engineering work</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to comply with the legal requirements on environmental protection to carry out routine, repetitive or clearly defined electrical and mechanical engineering work with correct working procedures.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses general awareness of environmental protection.

1. Title	Handle general chemicals safely
2. Code	EMCUSH113A
3. Range	Capable to handle general chemicals safely in workshops or work sites, and understand the hazards and preventive measures for these chemicals so as to protect oneself and other people during daily operation or accident happened.
4. Level	1
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of handling general chemicals safely in workshops or work sites</p> <ul style="list-style-type: none"> ◆ Possess basic knowledge of handling chemicals safely, including: <ul style="list-style-type: none"> • Hazards of chemicals • Labelling of chemicals • Ways of chemicals entering human bodies • Safety measures for handling chemicals • Personal protective equipment • Compliance of contingency measures ◆ Understand the classification of general chemical substances, including: <ul style="list-style-type: none"> • Explosive substance • Flammable substance • Strong supporter of combustion • Gas • Harmful or poisonous substance • Organic solvent • Corrosive fluid <p>6.2 Way of handling general chemicals</p> <ul style="list-style-type: none"> ◆ Handle chemicals correctly and prevent chemical hazards, including making use of personal protection device ◆ Capable to prevent occupational health hazards caused by chemicals
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to handle general chemicals safely and prevent chemical hazards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of occupational safety and health.

1. Title	Read main basic ship hull drawings
2. Code	EMSRIN101A
3. Range	Obtain information on ship structure from the content of ship drawings in the course of reading the drawings (for the works such as ship structural repairs, ship facility design, assisting in maintenance work, etc.) in order to participate in discussions on locating system failures, structure assembly or repairs.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of ship hull drawing specifications and basic ship overall arrangement</p> <ul style="list-style-type: none"> ◆ Understand specification content of general ship hull drawings <ul style="list-style-type: none"> • Meanings of symbols • Dimension marking patterns • International standard abbreviations ◆ Understand the distribution of ship hull structure and basic overall arrangement <ul style="list-style-type: none"> • Ship (anti-sinking) subdivision arrangement • Compartment arrangement • Access arrangement <p>6.2 Techniques of reading ship drawings</p> <ul style="list-style-type: none"> ◆ Read main basic ship hull drawings in order to obtain information and participate in relevant works, such as: <ul style="list-style-type: none"> • Overall arrangement drawing • Structural drawings of decks, storage and oil and water tanks • Piping layout • main power system and machine room layout
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to read main basic ship drawings in order to obtain information and participate in relevant works.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the knowledge of reading basic engineering drawings.

1. Title	Checking of and working on ironwork materials
2. Code	EMSRIN102A
3. Range	Apply basic material checking skills and ironwork craftsmanship under instruction to assist in ironwork tasks related to ship repairs and general checking of materials as a trainee.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of ironwork materials and working methods for basic trades</p> <ul style="list-style-type: none"> ◆ Identify various kinds of iron materials (such as: wrought iron, pig iron, carbon steel and high-speed steel), non-steel metals (such as: aluminium, copper, tin, zinc) and alloys (such as: copper alloy and aluminium alloy) ◆ Know the working methods for basic ironwork trades and assist in implementing the checking of special materials such as: aluminium alloy, titanium, honeycomb panels, carbon fibre <p>6.2 Techniques and procedures of checking and working on ironwork materials</p> <ul style="list-style-type: none"> ◆ Make arrangements for the checking of materials needed for the repairs ◆ Carry out simple tasks of the basic ironwork trade in the course of work
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to correctly select and use appropriate tools and materials to implement relevant ironwork tasks; and</p> <p>(ii) Capable to meet the skill level comparing to the standard model used as a benchmark for assessing craftsmanship.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of physics and common tools.

1. Title	Woodwork and production of glassfibre-reinforced plastic
2. Code	EMSRIN103A
3. Range	Apply the techniques for woodwork and production of glassfibre-reinforced plastic under instruction to assist in ship repairs or works related to general woodwork and laying of glassfibre-reinforced plastic.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of timber and glassfibre-reinforced plastic commonly used in ships</p> <ul style="list-style-type: none"> ◆ Identify the types and know the characteristics of timber commonly used <ul style="list-style-type: none"> • Identifying the common flaws of timber • Use of preservatives • Natural and artificial drying methods • Differences of various kinds of plywood ◆ Understand the use and applications of various types of glassfibre-reinforced plastic <p>6.2 Techniques and procedures for woodwork and production of glassfibre-reinforced plastic production</p> <ul style="list-style-type: none"> ◆ Effectively use common hand tools and machinery for woodwork and production of glassfibre-reinforced plastic to assist in: <ul style="list-style-type: none"> • Production and checking of wooden structure including jointing, planning and scribing • Arranging deck timber and keel • Laying glassfibre-reinforced plastic <p>6.3 Professionalism in woodwork and production of glassfibre-reinforced plastic</p> <ul style="list-style-type: none"> ◆ Consider the stress characteristics of timber and the position to be worked on before working on it ◆ Master the basic requirements for laying glassfibre-reinforced plastic
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to assist in implementing production procedures for woodwork; and</p> <p>(ii) Capable to assist in implementing production procedures for glassfibre-reinforced plastic.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of woodwork and assembly.

1. Title	Repairs of marine engineering equipment and machines	
2. Code	EMSRRM101A	
3. Range	Apply the techniques of workshop mechanical operation and fitting and assembly to assist in scheduled maintenance or dock repairs of marine engineering equipment, and in implementing the tasks of mechanical fitting assistant and general tasks of a workshop trainee in dockyards or mechanical repair workshops.	
4. Level	1	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of mechanical repair</p> <ul style="list-style-type: none"> ◆ Know about the basic principles and correct methods of operation of standard machinery and equipment for dockyards and workshops ◆ Know about the functions and uses of general instruments and tools for repairing marine engineering equipment and steps of using them <p>6.2 Methods and procedures for simple repairs and fitting of marine engineering equipment</p> <ul style="list-style-type: none"> ◆ Systematically implement relevant repair steps, such as: <ul style="list-style-type: none"> • Stopping or starting the power supply, water supply or compressed air supply of relevant equipment before and after the work • Applying hydraulic lifting appliances to disassemble marine engineering equipment • Basic fastening and disassembly of screws • Correctly assembling modular units, including sawing, flat filing, chiselling, brush scraping, drilling, bolting and riveting; the use of materials and ship cradle wedge ◆ Operate machines to perform simple repairs and fitting on marine engineering equipment accessories ◆ Understand the basic techniques of fastening and disassembling screws <p>6.3 Professionalism in simple repairs and fitting of marine engineering equipment</p> <ul style="list-style-type: none"> ◆ Correctly select and operate repairing instruments and materials, maintain the repairing equipment and instruments in good condition and assist in storing the repairing materials correctly ◆ Understand and follow basic environmental protection measures when performing repairs ◆ Follow instructions to independently carry out simple repairs and fitting work of marine engineering equipment ◆ Follow the safety codes of practice at work to implement urgent tasks under supervision 	

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to assist in repairs and mechanical fitting of marine engineering equipment; and (ii) Capable to correctly select and use appropriate instruments to carry out relevant works, and follow the instructions to assist in repairing marine engineering equipment accessories.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of mechanical engineering repair and of using hand tools and power tools, and is able to carry out simple mechanical fitting of marine engineering equipment.

1. Title	Repair and maintain general marine devices	
2. Code	EMSRRM102A	
3. Range	Assist in helping tasks of repairing and maintaining marine engineering equipment and power units and general care such as cleaning of machines when handling elementary routines related to ship repair and mechanical engineering.	
4. Level	1	
5. Credit	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Common knowledge and terminology of marine engineering equipment</p> <ul style="list-style-type: none"> ◆ Identify different types of energy conversion devices suitable for the following three chemical fuel states: <ul style="list-style-type: none"> • Solid state: steam turbine and boiler • Liquid state: steam turbine and boiler, gas turbine and internal combustion engine • Vapour state: steam turbine and boiler, gas turbine ◆ Know about elementary and common marine power equipment and basic accessories such as: internal combustion engine, steam turbine and boiler, gas turbine ◆ Know about elementary and standard auxiliaries on ships such as: pump, compressor, refrigeration equipment, heating and cooling, auxiliary boiler and purifying equipment ◆ Understand common terms for related work <p>6.2 Methods of simple repair and maintenance of marine engineering equipment and power units</p> <ul style="list-style-type: none"> ◆ Understand safe practices, the use of tools and working procedures in machine room, and make use of them in repair work ◆ Assist in taking care of machine room such as cleaning parts and components of equipment, like boilers and marine engineering equipment, in the machine room ◆ Assist in repairing marine engineering equipment, know about common parts and tools, and carry out non-technical maintenance for marine engineering equipment <p>6.3 Professionalism in simple repairs and maintenance of marine engineering equipment and power units</p> <ul style="list-style-type: none"> ◆ Correctly select and use repairing tools and materials, maintain the repairing tools and equipment in good condition and assist in storing the materials correctly ◆ Understand and follow basic environmental protection measures when performing repairs ◆ Follow instructions to independently carry out the cleaning and maintenance of marine engineering equipment ◆ Follow the safety codes of practice at work to implement urgent tasks under supervision 	

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to implement the cleaning and maintenance of general marine main and auxiliary engines; and (ii) Capable to correctly select and use appropriate tools to carry out relevant work, and follow the instructions to assist in repairing marine engineering equipment.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic mechanical knowledge.

1. Title	Basic maintenance of marine electrical installation	
2. Code	EMSRRM103A	
3. Range	Apply elementary knowledge of basic operation of marine electrical installation to assist in repairs of circuits and electrical equipment and implement tasks of an electrical trainee in general shipyards when handling routines related to marine electrical repairs.	
4. Level	1	
5. Credit	5	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Construction and working principles of common marine electrical equipment</p> <ul style="list-style-type: none"> ◆ Know about the basic construction and principles of marine electrical equipment, including: <ul style="list-style-type: none"> • Single-phase and three-phase current lines, earthing, insulating and conductive materials, switches, fuses, circuit breakers and insulators • Motors, AC generators, transformers and starters • Circuit diagrams, symbols and specifications • Simple calculations and use of formulas ◆ Know about the basic principles and correct operating methods of common repair tools for electrical equipment in dockyards and repair workshops ◆ Understand the functions, uses and operation steps of general repair tools for circuits and electrical equipment ◆ Possess basic knowledge of the use of power tools and testing equipment (such as testing tools) in order to carry out simple circuit and electrical repairs <p>6.2 Methods of repairing marine electrical equipment and systems</p> <ul style="list-style-type: none"> ◆ Read and understand simple electrical specifications, circuit diagrams and power supply diagrams for use in maintenance work ◆ Assist in installing, testing, maintaining and repairing electrical systems such as lighting, control, air conditioning, ventilation and power supply systems <p>6.3 Professionalism in repairing marine electrical equipment and systems</p> <ul style="list-style-type: none"> ◆ Correctly select and operate equipment and materials necessary for the repair, maintain the repairing tools and testing equipment in good condition and assist in storing the materials correctly ◆ Understand and follow basic measures for personal and environmental protection when performing repairs ◆ Follow instructions to independently carry out maintenance and simple repairs of electrical equipment ◆ Follow the safety codes of practice at work to implement urgent tasks under supervision 	

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to assist in the maintenance and repairs of marine circuits and electrical equipment; and (ii) Capable to correctly select and use appropriate instruments to carry out relevant work, and follow instructions to assist in repairing marine electrical equipment and system accessories.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical and mechanical knowledge.

1. Title	Assist in ship painting works
2. Code	EMSRRM104A
3. Range	Assist in paint stripping and mixing and primer/undercoat applying at locations where painting works are involved; tidy up the painting workshop and store paints properly according to supervisor's instructions; store relevant materials at appropriate places or for easy access.
4. Level	1
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic principles of painting and relevant code of practice</p> <ul style="list-style-type: none"> ◆ Know about the following basic principles of painting techniques: <ul style="list-style-type: none"> • Care and maintenance of coats, including the causes of oxidation and rusting • Inspection and rectification of coat defects ◆ Know about the safety codes of practice and basic procedures for works, such as: <ul style="list-style-type: none"> • Safety measures for treating the surfaces to be painted • Proper and safe use of painting equipment and spraying tools • Identification of the basic categories of dangerous goods and the safety codes of practice for painting works ◆ Know about the basic layout of a painting workshop and the safety codes of practice for dangerous goods stores <p>6.2 Assisting in paint stripping and applying procedures</p> <ul style="list-style-type: none"> ◆ Safely use proper tools, such as general hand tools for paint stripping and power equipment like rotary paint removal machines, electric paint stripper rivet guns and pneumatic paint removal jet chisel, to remove rust and strip paint according to supervisor's instructions ◆ Apply proper primers or undercoats as protective coating after rust removal according to supervisor's instructions ◆ Correctly erect working gangways and apply practical skills for painting according to supervisor's instructions ◆ Use paint strippers and store relevant materials safely according to supervisor's instructions

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to apply the basic knowledge of storing dangerous goods to painting works according to supervisor's instructions; and (ii) Capable to correctly erect working gangways, place painting equipment properly and use and maintain relevant painting tools according to supervisor's instructions.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of paints.

1. Title	Follow relevant codes of practice at workplaces, on environmental protection, and on occupational safety and health
2. Code	EMSRSH101A
3. Range	Apply the knowledge of basic codes of practice at workplaces, on environmental protection, and on occupational safety and health to general ship repairs.
4. Level	1
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of occupational safety and health and environmental protection when working at dockyards and onboard</p> <ul style="list-style-type: none"> ◆ Understand the nature of dockyard or onboard operation, and safety, health and environmental hazards ◆ Understand the contribution of a clean worksite to environmental protection, occupational safety and health ◆ Understand the causes of accidents commonly happened in workplaces and their preventives, including: <ul style="list-style-type: none"> • Manual handling operation • Contingency measures • Basic guidelines for safe operation <p>6.2 Follow relevant codes of practice at work</p> <ul style="list-style-type: none"> ◆ Follow relevant codes of practice at work , such as: <ul style="list-style-type: none"> • Follow safety rules and practices at work • Correctly use safety equipment and personal protection equipment • Safely operate machines for work • Accurately report any incident happened <p>6.3 Professionalism in following relevant codes of practice at work</p> <ul style="list-style-type: none"> ◆ Follow in-house or regulatory bodies' guidelines to work ◆ Stress one' s own responsibilities, such as: <ul style="list-style-type: none"> • Take initiative to locate the emergency brake button, fire extinguisher and first-aid kit, and respond immediately when necessary • Strictly abide by the rule of keeping the worksite clean and contribute to environmental protection, occupational safety and health
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to meet general relevant codes of practice at workplaces, on environmental protection, and on occupational safety and health when carrying out engineering work; and</p> <p>(ii) Capable to follow relevant codes of practice to correctly select and use appropriate tools and measures.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of occupational safety and health.

Competency Level 2

1. Title	Select general electrical materials and electrical equipment
2. Code	EMCUDE204A
3. Range	Select general electrical materials and electrical equipment to perform electrical installation work.
4. Level	2
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Functions, properties and application conditions of general electrical materials and electrical equipment and devices</p> <ul style="list-style-type: none"> ◆ Understand the functions, properties and application conditions of general electrical materials and electrical equipment and devices, including: <ul style="list-style-type: none"> • General electrical materials <ul style="list-style-type: none"> ▸ Basic configuration, colour code, types, nominal, current-carrying capacity and skin effect of different cables ▸ Electrical materials generally used in wiring systems, such as switch, switch box, distribution board, metallic and non-metallic conduits, conduit accessories, trunking and trunking accessories, etc. ▸ Electrical materials generally used for motor control, such as electromagnetic switch, relay, timer, push-button switch, travel switch, overload protector, limit switch and water level controller, etc. ▸ Limitations of materials in voltage, current and temperature • General electrical equipment and devices <ul style="list-style-type: none"> ▸ General power supply and distribution equipment such as transformer, distribution board, busbar system and rising main ▸ General electrical equipment for buildings, such as electric pump and lighting, etc. <p>6.2 Select general electrical materials and electrical equipment and devices</p> <ul style="list-style-type: none"> ◆ Capable to select general electrical materials and electrical equipment correctly for electrical installation work according to the application requirements as well as the functions, properties and limitations of the materials and equipment ◆ Capable to select and check the materials and equipment in order to ensure that they comply with the safety standards and specifications
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to select general electrical materials and electrical equipment and devices correctly for general power distribution systems for buildings and building services installations according to the application requirements and ensure that they comply with the safety specifications.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Use computer to draw mechanical drawings
2. Code	EMCUDE212A
3. Range	Use typical computer software to draw mechanical drawings for electrical and mechanical work according to design.
4. Level	2
5. Credits	8
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Computer drawing techniques and methods</p> <ul style="list-style-type: none"> ◆ Understand the computer drawing techniques and methods, including the knowledge of drawing specifications, machinery to be drawn and pneumatic symbols <p>6.2 Application of computer drawing</p> <ul style="list-style-type: none"> ◆ Use the computer to set the drawing specifications <ul style="list-style-type: none"> • Set the drawing specifications • Use all types of lines, layers and typeface • Open and save file ◆ Use the computer to draw geometric figures, including mechanical and pneumatic symbols ◆ Use the computer to draw mechanical drawings according to design <ul style="list-style-type: none"> • Draw mechanical layouts • Draw projected mechanical parts • Draw sectional views for mechanical parts ◆ Use the computer to draw the pneumatic system according to design <ul style="list-style-type: none"> • Draw the pneumatic system's layout according to the pneumatic design • Draw the electric control circuit of the pneumatic system according to the circuit design
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use computer to draw mechanical layouts, projection and sectional views of mechanical equipment and parts according to design; and</p> <p>(ii) Capable to use computer to draw the pneumatic control layouts for a whole pneumatic system unit of an industrial plant with general requirements and specifications according to design.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic computer knowledge.

1. Title	Use computer to draw electrical drawings
2. Code	EMCUDE213A
3. Range	Use typical computer software to draw electrical drawings for electrical and mechanical work according to design.
4. Level	2
5. Credits	8
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Computer drawing techniques and methods</p> <ul style="list-style-type: none"> ◆ Understand the computer drawing techniques and methods, including the knowledge of drawing specifications, electrical wiring symbols and layout <p>6.2 Application of computer drawing</p> <ul style="list-style-type: none"> ◆ Use the computer to lay down the drawing specifications <ul style="list-style-type: none"> • Set the drawing specifications • Use all types of lines, layers and typeface • Open and save file ◆ Use the computer to draw geometric figures and electrical symbols ◆ Use the computer to draw electrical drawings according to design <ul style="list-style-type: none"> • Draw the main circuit layout according to the circuit design • Draw the wiring layout according to design • Draw the control circuit layout according to design
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use computer to draw the main circuit, wiring and control circuit layouts for a whole power system unit of a multi-storey building with general requirements and specifications according to design.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic computer knowledge.

1. Title	Perform general electrical assembly and fitting
2. Code	EMCUIN201A
3. Range	Capable to perform general electrical assembly and fitting for electrical and mechanical engineering installation.
4. Level	2
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Requirements on general electrical assembly and fitting craftmanship</p> <ul style="list-style-type: none"> ◆ Understand the requirements on general electrical assembly and fitting craftmanship, including: <ul style="list-style-type: none"> • Mastering general electrical assembly and fitting craftmanship • Knowing how to use general electrical fitting tools • Understanding the physical properties and fitting methods of different metals <p>6.2 Implement general electrical assembly and fitting</p> <ul style="list-style-type: none"> ◆ Assist in general electrical assembly and fitting work in non live conditions under supervision by using all kinds of basis electrical materials, electrical equipment, tools, etc. ◆ Implement general electrical equipment assembly and fitting for low-voltage power supply system, such as: <ul style="list-style-type: none"> • Main switch and distribution board assembly • Power unit installation and base adjustment • Dismantlement, assembly and calibration of low-voltage cabinet • Busbar system assembly, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand the technical requirements on general electrical assembly and fitting craftmanship; and</p> <p>(ii) Capable to implement general electrical assembly and fitting.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Assemble power unit according to installation drawing
2. Code	EMCUIN205A
3. Range	Assemble the power unit in its installation venue according to the installation drawing as well as the actual situation of the work site.
4. Level	2
5. Credits	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Content of document and drawing for general power unit installation</p> <ul style="list-style-type: none"> ◆ Understand the content of drawing for general power unit installation, including the unit assembly drawing, guidelines for unit installation, acceptance specifications for the unit installation, etc. <p>6.2 Perform general power unit assembly</p> <ul style="list-style-type: none"> ◆ Examine the actual restrictions of the work site and plan for the power unit installation procedures, including safety issues, according to the work site situation ◆ Know how to use appropriate tools to perform general power unit assembly ◆ Know how to use appropriate measuring tools to ensure that the power unit installation meets the specifications for acceptance
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to assemble general power units safely and efficiently according to specified installation specifications, manufacturer's assembly and design drawings as well as the actual situation of the site.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Perform routine wiring tasks
2. Code	EMCUIN208A
3. Range	Apply the techniques of electrical wiring and the understanding of relevant code of practice in routine wiring tasks for electrical and mechanical works.
4. Level	2
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 General principles of electrical wiring</p> <ul style="list-style-type: none"> ◆ Understand the basic requirements, code of practice and relevant standards for wiring, including: <ul style="list-style-type: none"> • Uses and installation methods of conduits and trunkings • Techniques for installation of low voltage sheathed cables and armoured cables • Code of practice for wiring, such as identification of markings • Insulation and continuity testing • Methods of circuit terminal connection <p>6.2 Perform regular wiring tasks</p> <ul style="list-style-type: none"> ◆ Make electrical wiring conduits according to instructions <ul style="list-style-type: none"> • Use relevant techniques and conduit cutting, bending and assembling tools to make metallic conduits for electrical wiring according to requirements • Make PVC wiring conduits • Install wiring conduits correctly ◆ Make electrical wiring trunkings according to instructions <ul style="list-style-type: none"> • Use relevant techniques and trunking cutting and assembling tools to make metallic trunkings for electrical wiring, according to requirements • Make earthing arrangement correctly • Install wiring trunkings correctly ◆ Make electrical wiring trunkings according to instructions <ul style="list-style-type: none"> • Install low voltage sheathed cables and armoured cables correctly ◆ Undertake electrical wiring properly according to instructions <ul style="list-style-type: none"> • Classify electrical circuits properly according to wiring requirements and the code of practices • Apply relevant techniques in electrical wiring • Attach correct identification markings to cables ◆ Perform insulation and continuity tests for circuits according to instructions <ul style="list-style-type: none"> • Use an insulation tester and continuity tester to perform insulation and continuity tests for circuits according to relevant code of practice and standards

	<ul style="list-style-type: none"> • Undertake terminal connection of circuits • Use proper assembling tools and termination accessories to connect cables to electrical devices
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to install wiring for general electrical equipment and systems correctly and safely according to instructions, wiring requirements and the code of practice; make conduits and trunkings, undertake wiring work, install low voltage metal-sheathed cables and armoured cables; and carry out terminal connection and validity tests.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical knowledge.</p>

1. Title	Basic metal inert gas (MIG)/gas metal arc welding (GMAW)
2. Code	EMCUIN211A
3. Range	Perform MIG/GMAW tasks on parent materials like carbon steel and aluminum alloy at electrical and mechanical welding workshops or work sites.
4. Level	2
5. Credits	5
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Code of practice and preparations for MIG/GMAW</p> <ul style="list-style-type: none"> ◆ Understand relevant code of practice for MIG/GMAW, including to: <ul style="list-style-type: none"> • Operate MIG/GMAW equipment and accessories correctly and safely • Wear proper personal protective gear • Protect against electric shock • Protect against fire and explosion • Protect against harmful arc ray effectively • Protect against harmful gases and poisonous fumes ◆ Know about the preparations for MIG/GMAW, including to: <ul style="list-style-type: none"> • Understand the general applications and their limitations of MIG/GMAW • Understand the types of MIG/GMAW machines, including the wire feeding system and gas supply system • Identify the requirements on welding materials of MIG/GMAW, such as welding wire and shielding gas <p>6.2 Methods and procedures for operating MIG/GMAW</p> <ul style="list-style-type: none"> ◆ Apply MIG/GMAW in the following areas: <ul style="list-style-type: none"> • Perform surface build up at flat position • Perform square edge butt weld at flat position and horizontal positions • Perform fillet weld at flat position and horizontal positions ◆ Identify various types of common and simple surface weld defects at welded joints, such as undercut, overlap and porosities ◆ Avoid causing the simple surface weld defects mentioned above <p>6.3 Professionalism in MIG/GMAW</p> <ul style="list-style-type: none"> ◆ Perform MIG/GMAW tasks according to relevant safety guidelines and code of practice
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to complete basic MIG/GMAW tasks without causing obvious surface weld defects; and</p> <p>(ii) Capable to perform MIG/GMAW tasks safely.</p>
8. Remarks	This unit of competency is applicable to general electrical and mechanical welding practitioners.

1. Title	Basic tungsten inert gas (TIG) / gas tungsten arc welding (GTAW)
2. Code	EMCUIN212A
3. Range	Perform TIG/GTAW tasks for electrical and mechanical works on parent materials like carbon steel, stainless steel and aluminum alloy, at electrical and mechanical welding workshops or work sites.
4. Level	2
5. Credits	5
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Code of practice and Preparations for TIG/GTAW</p> <ul style="list-style-type: none"> ◆ Understand relevant code of practice for TIG/GTAW, including to: <ul style="list-style-type: none"> • Operate TIG/GTAW equipment and accessories correctly and safely • Wear proper personal protective gear • Protect against electric shock • Protect against fire and explosion • Protect against harmful arc ray effectively • Protect against harmful gases and poisonous fumes • Follow the safety requirements and instructions on TIG/GTAW ◆ Know about the preparations for TIG/GTAW, including: <ul style="list-style-type: none"> • Understand the general applications and their limitations of TIG/GTAW • Understand the types of TIG/GTAW machines and polarity requirements • Identify the requirements on welding materials of TIG/GTAW, such as tungsten electrode, welding rod and shielding gas <p>6.2 Apply TIG/GTAW in welding</p> <ul style="list-style-type: none"> ◆ Apply TIG/GTAW in the following areas: <ul style="list-style-type: none"> • Perform square edge butt weld at flat position and horizontal positions • Perform lap weld at flat position and horizontal positions • Perform fillet weld at flat position and horizontal positions ◆ Identify various types of common and simple surface weld defects at welded joints, such as under cut, overlap and porosities ◆ Avoid causing the simple surface weld defects mentioned above <p>6.3 Professionalism in TIG/GTAW</p> <ul style="list-style-type: none"> ◆ Perform TIG/GTAW tasks according to relevant safety guidelines and code of practice
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to complete basic TIG/GTAW tasks without causing obvious surface weld defects; and</p> <p>(ii) Capable to perform TIG/GTAW tasks safely.</p>
8. Remarks	This unit of competency is applicable to general electrical and mechanical welding practitioners.

1. Title	Use all kinds of machining equipment for electrical and mechanical engineering parts processing
2. Code	EMCUIN214A
3. Range	Capable to use general machining equipment independently for electrical and mechanical engineering part in plants according to the dimensions and tolerance required by the part drawing.
4. Level	2
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Operating principles and functions of different types of machining equipment</p> <ul style="list-style-type: none"> ◆ Understand the operating principles and functions of different types of machining equipment, including lathe, milling machine, drilling machine, slotting machine, grinding machine, etc., in order to perform more complex part manufacturing ◆ Understand the limitations of precision of different types of machining equipment ◆ Understand the dimension and tolerance requirements of the part drawing <p>6.2 Electrical and mechanical engineering parts processing</p> <ul style="list-style-type: none"> ◆ Capable to perform machining the work piece safely and independently according to the tolerance requirements of the work piece processing drawing, including: <ul style="list-style-type: none"> • Setting the conditions for cutting according to the characteristics of the work piece (such as the type of material, hardness, etc) • Using appropriate fixtures for different machining procedures • Setting machining sequence according the requirements on the work piece • Using measuring tools to measure the precision of the work piece
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use general machining equipment safely and independently for electrical and mechanical engineering part according to the dimensions and tolerance required by the part drawing.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUIN101A ‘Use general machining equipment’.

1. Title	Operate gondolas
2. Code	EMCUIN215A
3. Range	Operate gondolas safely in general industrial plants, power plants, ships or areas where gondolas are needed for electrical and mechanical engineering work.
4. Level	2
5. Credits	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Operating principles of gondola ♦ Understand the operating principles of gondola, including:</p> <ul style="list-style-type: none"> • Way to support and stabilize the gondola • Use of climber • Use of winch • Operating techniques of brake system <p>6.2 Operating method and procedures for gondola ♦ Capable to operate a gondola safely, including:</p> <ul style="list-style-type: none"> • Estimate in advance whether the load of the gondola will exceed its safe working load • Follow the legal requirements on carrying people in gondolas <p>6.3 Professionalism in gondola operation ♦ Perform the duties according to local labour legislations in the course of operation, including:</p> <ul style="list-style-type: none"> • Checking all the ropes of the gondola everyday before working with it • Wearing a full-length safety belt and tie on the life rope • Ensuring that safety equipment is adequate at the site and users use the equipment correctly
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to operate a gondola efficiently for work at height; and</p> <p>(ii) Capable to ensure the safe operation of and provision of appropriate working conditions for gondola.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of personal safety equipment.

1. Title	Install general plastic pipes and fittings
2. Code	EMCUIN216A
3. Range	Perform simple installation of general plastic (e.g. PVC,ABS and UPVC) pipes and fittings, and common parts at general industrial plants, power plants or premises/work sites where boat, fire fighting, water, gas or pipe works is involved.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Types of pipes and fitting materials</p> <ul style="list-style-type: none"> ◆ Know about the types of pipes, accessories and materials, including: <ul style="list-style-type: none"> • Types of pipes • Bends and tees • Extension joints • Joint accessories • Fill materials • Bedding and coating materials ◆ Understand hazards of solvent cement to individuals and the environment <p>6.2 Methods of installing and jointing pipes</p> <ul style="list-style-type: none"> ◆ Capable to apply general repairing and bench fitting techniques in pipe installation according to requirements ◆ Capable to joint pipes by solvent cement, etc. ◆ Capable to apply common methods of cold or thermal bending in simple installation of pipes ◆ Place rubber gaskets or pads at proper positions to prevent leakage <p>6.3 Professionalism in pipe overhaul and installation</p> <ul style="list-style-type: none"> ◆ Capable to use correct tools in simple installation of plastic pipes according to requirements ◆ Perform pipe installation according to legal requirements and the code of safety; pass the leakage test
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to install common plastic pipes and fittings correctly and safely according to pipe-laying and legal requirements and the code of safety; and pass the leakage test.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of mechanics and installation skills.

1. Title	Install metallic (steel/stainless steel/galvanized iron) pipes and fittings
2. Code	EMCUIN217A
3. Range	Perform simple installation of metallic (steel/stainless steel/galvanized iron) pipes and fittings, and common parts at general industrial plants, power plants or premises/work sites where boat, fire fighting, water, gas or pipe works is involved.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Types of pipes and fitting materials ♦ Know about the types of pipes, accessories and materials, including:</p> <ul style="list-style-type: none"> • Types of pipes • Types of flanges • Bends and tees • Expansion joints • Joint accessories • Fill materials • Bedding and coating materials • Heat preservation materials <p>6.2 Methods of installing and jointing pipes ♦ Capable to apply general repairing and bench fitting techniques, including marking, sawing, chiselling, drilling, scraping, grinding, jointing and sealing, in pipe installation according to requirements</p> <ul style="list-style-type: none"> ♦ Capable to joint pipes by argon arc welding, electric arc welding, compressing, threading, flanging, etc. ♦ Capable to apply typical methods of cold or thermal bending in simple installation of pipes ♦ Place rubber gaskets or pads at proper positions for prevent leakage <p>6.3 Professionalism in pipe overhaul and installation ♦ Capable to use correct tools in simple installation of metallic (steel/stainless steel/galvanized iron) pipes according to requirements</p> <ul style="list-style-type: none"> ♦ Perform pipe installation according to legal requirements and the code of safety; pass the leakage test
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to install common metallic (steel/stainless steel/galvanized iron) pipes and fittings correctly and safely according to pipe-laying and legal requirements and the code of safety; pass the leakage test.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of mechanics and installation skills.

1. Title	Install non-metallic (copper/aluminium) pipes and fittings
2. Code	EMCUIN218A
3. Range	Perform simple installation of typical copper or aluminum pipes and fittings, at general industrial plants, power plants, ship repair, fire & plumbing, gas engineering or work sites where installation work is involved.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Types of pipes and fitting materials</p> <ul style="list-style-type: none"> ◆ Know about the types of pipes, accessories and materials, including: <ul style="list-style-type: none"> • Types of pipes • Bends and tees • Expansion joints • Joint accessories • Fill materials • Bedding and coating materials • Heat preservation materials <p>6.2 Methods of installing and jointing pipes</p> <ul style="list-style-type: none"> ◆ Capable to apply general repairing and bench fitting techniques, including marking, sawing, chiselling, drilling, scraping, grinding, jointing and sealing, in pipe installation according to requirements ◆ Capable to joint pipes by silver soldering, copper brazing, tin soldering, compressing, etc. ◆ Capable to apply common methods of cold or thermal bending in simple installation of pipes ◆ Place rubber gaskets or pads at proper positions to prevent leakage <p>6.3 Professionalism in pipe overhaul and installation</p> <ul style="list-style-type: none"> ◆ Capable to use correct tools in simple installation of copper or aluminium pipes according to requirements ◆ Perform pipe installation according to legal requirements and the code of safety; pass the leakage test
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to install common copper or aluminum pipes and fittings correctly and safely according to pipe-laying and legal requirements and the code of safety; pass the leakage test.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of mechanics and installation skills.

1. Title	Install water pumps
2. Code	EMCUIN220A
3. Range	Work at general industrial plants, power plants, ship repair, plumbing workplaces pumping involved.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of and requirements for installation of water pumps</p> <ul style="list-style-type: none"> ◆ Understand the installation requirements for various types of water pumps when reading assembly drawings: <ul style="list-style-type: none"> • requirements for pump foundations • requirements for couplings • requirements for the pump inlet and outlet system <p>6.2 Methods and procedures for installation of water pumps</p> <ul style="list-style-type: none"> ◆ Capable to use alignment and levelling instruments to take measurements of a water pump and its motor foundation, including: <ul style="list-style-type: none"> • Methods of alignment and levelling and calculation of adjustments; • Methods of centring and calculation of adjustments ◆ Capable to use various types of levelling and alignment instruments, such as level gauges and steel wire, to take measurements on-site, including: <ul style="list-style-type: none"> • Horizontal level of foundation surface • Vertical level of foundation bolts ◆ Capable to draw the layout of gaskets according to the dimensions of the foundation ◆ Capable to adjust the radial direction and face deviation of couplings ◆ Capable to fasten foundation bolts to specified torque systematically ◆ Capable to inspect the large moving parts of water pumps after fastening <ul style="list-style-type: none"> • Measure and adjust the impeller swing of vertical water pumps • Measure and adjust the axial jitter <p>6.3 Professionalism in water pump installation</p> <ul style="list-style-type: none"> ◆ Install water pumps according to drawings and works specifications ◆ Control the progress of installation to meet works specifications and quality standards ◆ Understand the legal requirements on work safety, the code of practice and the supplier's guidelines when performing tasks of water pump installation ◆ Capable to use installation tools and equipment effectively

7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to install water pumps efficiently; (ii) Capable to complete work tests, including proper execution of leveling and alignment procedures and installation procedures, recording data and adjusting of equipment to required standards; and (iii) Capable to compile reports on installation of water pumps and state clearly their operation.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of mechanics and installation skills.</p>

1. Title	Replace mechanical parts and devices of electric motors
2. Code	EMCUIN221A
3. Range	Capable to replace mechanical parts and devices of electric motors in electrical and mechanical workshops or worksites.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Operating principles of motor machinery ♦ Understand the operating principles of motor machinery and method of replacing the mechanical parts and devices</p> <p>6.2 Mechanical parts and devices of electric motors ♦ Operate mechanical parts and devices of an electric motor, such as the driving units like bearing, connector, gear, etc., and replace mechanical parts and devices of the motor</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand the principles and methods of operating motor machinery; and</p> <p>(ii) Capable to replace mechanical parts and devices safely of the specified motor.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical and mechanical knowledge.

1. Title	Basic manual metal arc welding (MMAW)/shielded metal arc welding (SMAW)
2. Code	EMCUIN225A
3. Range	Perform basic MMAW/SMAW on typical carbon-steel metals at electrical and mechanical welding workshops or work sites.
4. Level	2
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Code of practice and safety regulations for MMAW/SMAW</p> <ul style="list-style-type: none"> ◆ Understand relevant code of practice and safety regulations for MMAW/SMAW, including: <ul style="list-style-type: none"> • Wearing proper personal protective gear • Protecting against electric shock • Protecting against fire and explosion • Protecting against harmful arc ray effectively • Protecting against harmful gases and poisonous fumes ◆ Know about the preparations for MMAW/ SMAW, including: <ul style="list-style-type: none"> • Understanding the general application and their limitations of MMAW/SMAW • Understanding the types of MMAW/SMAW machines and their functions • Knowing about the specifications, applications, uses and storage of common mild-steel electrodes (such as E6013) for MMAW/SMAW • Knowing about the maintenance of MMAW/SMAW equipment <p>6.2 Methods and procedures for operating MMAW/SMAW</p> <ul style="list-style-type: none"> ◆ Apply MMAW/SMAW technique in welding <ul style="list-style-type: none"> • Select proper parameters for welding, such as polarity, current, welding speed and angle of electrode • Perform tasks including: <ul style="list-style-type: none"> ▸ Performing linear surface build up at flat position ▸ Joining two or more work pieces together at flat position ▸ Performing two sides square edge butt welding at flat position ▸ Performing fillet weld at flat position ◆ Maintenance of electric arc welding equipment <ul style="list-style-type: none"> • Undertake maintenance of MMAW/SMAW equipment • Use and store common instruments and welding materials <p>6.3 Professionalism in MMAW/SMAW</p> <ul style="list-style-type: none"> ◆ Perform MMAW/SMAW tasks according to relevant safety guidelines and code of practice

7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to complete basic MMAW/SMAW tasks without causing obvious surface weld defects; and (ii) Capable to perform MMAW/SMAW tasks safely.
8. Remarks	This unit of competency is applicable to general electrical and mechanical welding practitioners.

1. Title	Basic oxy-acetylene welding (OAW) / oxyfuel and arc cutting (OAC)
2. Code	EMCUIN226A
3. Range	Perform OAW / OAC tasks for electrical and mechanical works at electrical and mechanical welding workshops or work sites.
4. Level	2
5. Credits	5
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Code of practice and preparations for OAW / OAC</p> <ul style="list-style-type: none"> ◆ Understand relevant code of practice and safety regulation for OAW / OAC, including: <ul style="list-style-type: none"> • Operating OAW / OAC equipment and accessories, including handling of gaseous cylinder, correctly and safely • Wearing proper personal protective gear • Protecting against fire and explosion • Protecting against harmful arc ray effectively • Protecting against harmful gases and poisonous fumes • Following the legislations and safety guidelines on OAW / OAC ◆ Know about the preparations for OAW / OAC: <ul style="list-style-type: none"> • Understand the general application and their limitations of OAW / OAC • Understand functions of various OAW / OAC equipment, including high pressure gaseous cylinder, pressure regulator, flashback arrestor, welding torch and cutting torch , etc. • Identify the requirements of welding materials for oxyacetylene welding and cutting such welding rods, welding flux, etc ◆ Perform quality inspection on weld profile <ul style="list-style-type: none"> • Identify various types of common and simple surface weld defects at welded joints, such as undercut, overlap and porosities • Avoid causing the simple surface weld defects mentioned above <p>6.2 Methods and procedures for operating OAW / OAC</p> <ul style="list-style-type: none"> ◆ Apply OAW / OAC techniques <ul style="list-style-type: none"> • Select proper parameters for welding, such as gas flowrate and pressure, angle of welding and cutting torch, welding or cutting speed, etc. • Perform following tasks: <ul style="list-style-type: none"> ▸ Perform linear surface build up at flat position ▸ Perform plate cutting at flat position

	<ul style="list-style-type: none"> ‣ Perform two sides square edge butt weld at flat position and horizontal position ‣ Perform fillet weld at flat position and horizontal position ‣ Perform plate cutting at horizontal position and vertical position <p>6.3 Professionalism in OAW / OAC ♦ Perform OAW / OAC tasks according to relevant safety guidelines and code of practice</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to complete basic OAW / OAC tasks without causing obvious surface weld defects; and</p> <p>(ii) Capable to perform OAW / OAC tasks safely.</p>
8. Remarks	This unit of competency is applicable to general electrical and mechanical welding practitioners.

1. Title	Basic weld joint edge production and assembly	
2. Code	EMCUIN227A	
3. Range	Produce and assemble weld joint edge in electrical and mechanical welding workshops or work sites	
4. Level	2	
5. Credits	15	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Weld joint</p> <ul style="list-style-type: none"> ◆ Understand the application of basic weld joint, such as butt joint, T joint, lap joint, fillet joint and edge joint, etc. ◆ Understand the application of different types of basic weld joint edge, such as those in rectangular shape, single groove, single J shape, double groove, double J shape, V shape and U shape, etc. ◆ Understand the impact of the main parts of weld joint on the weld metal ◆ Understand the application of methods to produce weld joints in different shapes ◆ Understand the code of safety for basic production and assembly of weld joint edge <p>6.2 Basic weld joint edge production and assembly</p> <ul style="list-style-type: none"> ◆ Capable to produce different types of basic weld joint edge safely ◆ Capable to use different types of assembling tools such as try square, ruler, feeler gauge, anchor plate, and different types of jigs and fixture, etc. for weld joint assembly ◆ Master the method and procedures of cleaning the weld joint prior to and after the work <p>6.3 Professionalism in weld joint edge production and assembly</p> <ul style="list-style-type: none"> ◆ Follow codes of safety and practice for weld joint edge production and assembly to perform basic weld joint edge production and assembly 	
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to follow codes of safety and practice for weld joint edge production and assembly to perform basic weld joint edge production and assembly.</p>	
8. Remarks	This unit of competency is applicable to electrical and mechanical welding practitioners in general.	

1. Title	Non-destructive test (NDT) - magnetic particle inspection
2. Code	EMCUMA201A
3. Range	Use magnetic particle inspection method, at servicing centres or locations with operating equipment, to inspect equipment or materials for surface and sub-surface cracks and weld defects.
4. Level	2
5. Credits	2
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Techniques and working principles of inspecting equipment or materials for cracks</p> <ul style="list-style-type: none"> ◆ Understand the principles of magnetic particle inspection used to inspect equipment or materials for surface and sub-surface cracks ◆ Understand that the magnetic particle inspection method is applicable to magnetic metals or materials only ◆ Understand the advantages and limitations of using dry particles, wet particles and fluorescent particles in magnetic particle inspection <p>6.2 Methods and procedures of inspecting equipment and materials for cracks</p> <ul style="list-style-type: none"> ◆ Capable to apply the magnetic particle inspection method effectively to inspect the surface and sub-surface of equipment or materials for cracks and record the findings ◆ Capable to use different magnetic particle inspection tools for testing according to work pieces and cracks ◆ Capable to inspect different positions for surface and sub-surface cracks ◆ Select dry particles, wet particles or fluorescent particles for inspection according to work pieces and required precision ◆ Capable to mark the position with cracks clearly
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use magnetic particle inspection method correctly to inspect equipment or materials for surface and sub-surface cracks; record and mark the positions and size of the cracks; and</p> <p>(ii) Capable to point out the advantages and limitations of dry particles, wet particles and fluorescent particles in magnetic particle inspection.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person is familiar with liquid penetration inspection.

1. Title	Non-destructive test (NDT) - ultrasonic testing
2. Code	EMCUMA202A
3. Range	Use ultrasonic testing instruments, at servicing centres or locations with operating equipment, to detect and examine internal damages of metallic equipment and material thickness.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Techniques and working principles of applying ultrasound to inspect internal damages of metallic equipment and material thickness</p> <ul style="list-style-type: none"> ◆ Understand the principles of ultrasonic detection and examination technology used to inspect internal damages of metallic equipment and material thickness ◆ Understand the processing requirements for work piece surface before conducting ultrasonic inspection <p>6.2 Methods and procedures of inspecting internal damages of metallic equipment and material thickness</p> <ul style="list-style-type: none"> ◆ Capable to process work piece surface properly according to work pieces that need ultrasonic inspection ◆ Capable to use ultrasonic testing instruments to detect and examine internal damages of metallic equipment and material thickness ◆ Capable to use ultrasonic testing instruments to measure and calculate crack positions and size ◆ Capable to mark the position with cracks clearly
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use ultrasonic testing technology correctly to inspect internal damages of metallic equipment and material thickness; measure and calculate crack positions and size; and record and mark the positions and size of the cracks.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person is familiar with liquid penetration inspection.

1. Title	Repair diesel engines
2. Code	EMCUMA203A
3. Range	Use typical or tailor-made mechanical tools to repair or maintain diesel engines at servicing workshops or locations with diesel engines according to servicing instructions and standards. This unit of competency is applicable to diesel engines of 2000kW or below.
4. Level	2
5. Credits	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and basic working principles of diesel engine</p> <ul style="list-style-type: none"> ◆ Understand the structure and basic working principles of various component systems of a diesel engine, including: <ul style="list-style-type: none"> • The working principles of a diesel engine - suction, compression, power and exhaust • Engine cylinder and its mechanical devices • Fuel supply system • Fuel injector and fuel filter • Governor and its control devices • Supercharger and turbo-charger • Cooling system and equipment • Lubrication system and equipment <p>6.2 Methods and procedures of servicing diesel engines</p> <ul style="list-style-type: none"> ◆ Capable to assemble, dismantle, and align the mechanical jointing of a diesel engine and its loading equipment ◆ Capable to service various component systems and fittings of a diesel engine effectively, including checking, cleaning, measurement, maintenance and commissioning, according to servicing instructions and standards ◆ Capable to use common and tailor-made mechanical tools effectively <p>6.3 Professionalism in diesel engine repair and maintenance</p> <ul style="list-style-type: none"> ◆ Capable to perform general repair and maintenance of diesel engines according to servicing instructions and standards ◆ Understand the legal requirements on work safety and the code of practice when performing repair and maintenance of diesel engines
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to check and maintain the core systems of a diesel engine effectively and correctly according to servicing guidelines and standards; and</p> <p>(ii) Capable to commission various components of a diesel engine effectively.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of servicing mechanical equipment.

1. Title	Service protection and indicator of diesel engines
2. Code	EMCUMA204A
3. Range	Use common servicing and inspection instruments and tools to repair, maintain and set protection and indicator of diesel engines at servicing workshops or locations with diesel engines according to servicing instructions and standards.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Working principles of protection and indicator of diesel engines</p> <ul style="list-style-type: none"> ◆ Understand the uses and working principles of various types of protection and indicator of diesel engines, including: <ul style="list-style-type: none"> • Engine speed indication and protection device • Engine temperature indication and protection device • Engine lubrication system protection device • Fuel filter system protection device <p>6.2 Methods and procedures of servicing protection and indicator of diesel engines</p> <ul style="list-style-type: none"> ◆ Capable to service protection and indicator of diesel engines effectively, including checking, cleaning, measurement, maintenance and commissioning, according to servicing instructions and standards ◆ Capable to test and set various types of protection and indicator of diesel engines according to standards ◆ Capable to use common servicing and inspection instruments and tools effectively <p>6.3 Professionalism in repairing and maintaining protection and indicator of diesel engines</p> <ul style="list-style-type: none"> ◆ Capable to perform general repair and maintenance of protection and indicator of diesel engines according to servicing instructions and standards ◆ Understand the code of practice when performing repair and maintenance of protection and indicator of diesel engines
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to check and maintain the core protection and indicator of diesel engines effectively and correctly according to servicing standards; and</p> <p>(ii) Capable to commission and set various protection and indicator effectively.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of servicing electrical and mechanical equipment.

1. Title	Service generators and accessories
2. Code	EMCUMA205A
3. Range	Use typical servicing and inspection instruments and tools or tailor-made mechanical tools to repair or maintain single-phase or three-phase AC and DC generators and accessories at generator and accessories servicing workshops or locations with generators.
4. Level	2
5. Credits	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and working principles of generators and accessories</p> <ul style="list-style-type: none"> ◆ Understand the structure and working principles of single-phase or three-phase AC and DC generators, including: <ul style="list-style-type: none"> • Stator and winding • Rotor and winding • Exciter winding rectifier • Other kinds of winding e.g. interlope freed compensation • Mechanical parts e.g. bearing • Commutator ◆ Understand the structure and working principles of generator accessories, including: <ul style="list-style-type: none"> • Charging device • Battery <p>6.2 Methods and procedures of servicing generators and accessories</p> <ul style="list-style-type: none"> ◆ Capable to service a generator effectively, including checking, cleaning, measurement, maintenance and commissioning, according to servicing instructions and standards ◆ Capable to service generator accessories effectively, including checking, cleaning, measurement, maintenance and commissioning, according to servicing instructions and standards ◆ Capable to test various devices of generator accessories according to standards ◆ Capable to use typical servicing and inspection instruments and tools or tailor-made tools for generator installation and dismantling effectively <p>6.3 Professionalism in repairing and maintaining generators and accessories</p> <ul style="list-style-type: none"> ◆ Capable to perform general repair and maintenance of generators and accessories according to servicing instructions and standards ◆ Understand the legal requirements on work safety and the code of practice when performing repair and maintenance of generators and accessories

7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to check and maintain a three-phase generator effectively and correctly according to servicing standards; and (ii) Capable to commission and set various core accessories effectively.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of servicing electrical equipment.</p>

1. Title	Service control, protection and indicator of generators	
2. Code	EMCUMA206A	
3. Range	Use typical servicing and inspection instruments and tools to repair, maintain and set control, protection and indicator of single-phase or three-phase AC and DC generators at servicing workshops or locations with generators according to servicing instructions and standards.	
4. Level	2	
5. Credits	4	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Working principles of control, protection and indicator of generators</p> <ul style="list-style-type: none"> ◆ Understand the working principles of control, protection and indicator of single-phase or three-phase AC and DC generators, including: <ul style="list-style-type: none"> • Output voltage control • Load regulator • Speed regulator ◆ Understand the working principles of control, protection and indicator of generators, including: <ul style="list-style-type: none"> • Output voltage protection • Short circuit protection • Leakage protection • Unbalanced load protection • Overspeed protection • Output voltage, current and frequency indication • Other relevant output data indication <p>6.2 Methods and procedures of servicing control, protection and indicator of generators</p> <ul style="list-style-type: none"> ◆ Capable to service control, protection and indicator of single-phase or three-phase AC and DC generators effectively, including checking, cleaning, measurement, maintenance and commissioning, according to servicing instructions and standards ◆ Capable to test and set control, protection and indicator of generators according to standards ◆ Capable to use typical servicing and inspection instruments and tools effectively <p>6.3 Professionalism in repairing and maintaining control, protection and indicator of generators</p> <ul style="list-style-type: none"> ◆ Capable to perform general repair and maintenance of control, protection and indicator of generators according to servicing instructions and standards ◆ Understand the legal requirements on work safety and the code of practice when performing repair and maintenance of control, protection and indicator of generators 	

7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to check, maintain and set control, protection and indicator of three-phase generator effectively and correctly according to servicing standards; and (ii) Capable to commission and set various control, protection and indicator effectively.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of servicing electrical equipment.</p>

1. Title	Analysis of non-destructive test (NDT) – Liquid penetrant Testing
2. Code	EMCUMA207A
3. Range	Use liquid penetrant, at servicing centres or locations with operating equipment, to inspect equipment or materials for surface cracks and make a simple analysis.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Techniques and principles of inspecting mechanical equipment for cracks</p> <ul style="list-style-type: none"> ◆ Understand the advantages and limitations of liquid penetrant testing, especially in reference to those of magnetic particle inspection ◆ Understand that liquid penetrant testing is applicable to various types of metals, and some plastic and ceramic materials ◆ Know about the procedural adjustments to be made for inspecting different sizes of surface cracks ◆ Understand that the tools (such as black light lamp) and working procedures used for coloured penetrant and fluorescent penetrant are different ◆ Understand the chemical hazards caused by penetrant and developers, and relevant concerns for use <p>6.2 Methods and procedures of analyzing and identifying cracks on metal equipment</p> <ul style="list-style-type: none"> ◆ Capable to use liquid penetrant and developers effectively; make a simple analysis of the surface cracks of equipment or materials ◆ Capable to identify surface cracks, surface defects and various types of residues left on the surface ◆ Capable to mark the position with cracks effectively ◆ Capable to keep record of inspection and analysis effectively <p>6.3 Professionalism in using penetrant and developers</p> <ul style="list-style-type: none"> ◆ Have adequate hands-on practice in liquid penetration inspection according to international standards or in-house guidelines; record and analyze detected surface cracks according to requirements
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use liquid penetration and developer inspection method safely and correctly; identify equipment or materials for surface cracks and make a simple analysis.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUMA102A “Analysis of non-destructive test (NDT) – Liquid penetrant Testing”.

1. Title	Apply effective communication skills in discussions of electrical and mechanical issues
2. Code	EMCUOM204A
3. Range	With regard to electrical and mechanical operation management, apply effective communication skills to actively discuss, exchange ideas and respond to electrical and mechanical related issues (e.g. design, installation, inspection, commissioning, testing, running, repair, maintenance, occupational safety and health, project management, quality management, sales and marketing, etc.).
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Effective communication skills</p> <ul style="list-style-type: none"> ◆ Understand effective communication skills, including speaking skill, listening skill, summarizing skill and interpersonal skill ◆ Understand the functions of different communication media / tools <ul style="list-style-type: none"> • Using email or fax • Using telephone for liaison and communication • Holding meetings, etc. ◆ Understand common terminology and technical terms used in the electrical and mechanical engineering services industry <p>6.2 Understand work scope of the electrical and mechanical services, and apply effective communication skills to exchange ideas and foster discussion</p> <ul style="list-style-type: none"> ◆ Understand the work scope of the electrical and mechanical services, such as design, installation, inspection, commissioning, testing, running, repair, maintenance, occupational safety and health, project management, quality management, sales and marketing, etc.; and be capable to apply effective communication skills to exchange ideas and foster discussion so as to achieve the purpose of idea exchange and information delivery
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply effective communication skills and common terminology and technical terms used in the industry to take part in the discussion of electrical and mechanical issues.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Know about common Chinese terminologies of electrical and mechanical services
2. Code	EMCUOM207A
3. Range	Capable to identify common Chinese terminologies and basic technical terms of electrical and mechanical services to meet basic need of daily operation in order to communicate effectively and complete the specified tasks in electrical and mechanical workplaces.
4. Level	2
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about common Chinese terminologies of electrical and mechanical services ♦ Know about common Chinese terminologies and basic technical terms of the following electrical and mechanical branches:</p> <ul style="list-style-type: none"> • Railway electrical and mechanical engineering • Electrical engineering • Air-conditioning and refrigeration engineering • Lift and escalator engineering • Gas engineering • Fire services • Plumbing services • Mechanical (plant) engineering • Ship repair engineering • Aircraft engineering <p>6.2 Apply common Chinese terminologies of electrical and mechanical services in daily work ♦ Apply common Chinese terminologies of electrical and mechanical services in daily work to communicate effectively in order to complete the specified tasks</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand common Chinese terminologies and basic technical terms of electrical and mechanical services; and</p> <p>(ii) Capable to apply common Chinese terminologies of electrical and mechanical services in daily work to communicate effectively in order to complete the specified tasks.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of Chinese language.

1. Title	Apply basic risk assessment methods
2. Code	EMCUSH205A
3. Range	Capable to apply basic risk assessment methods to perform basic risk assessment related to electrical and mechanical engineering in electrical and mechanical work sites.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic risk assessment methods ♦ Understand basic risk assessment methods, including</p> <ul style="list-style-type: none"> • Manual handling operation • Works in confined spaces • Work site hazards • Simple mechanism for risk grading • Risk assessment guidelines • Operating hazards analysis <p>6.2 Conduct basic risk assessment ♦ Apply basic risk assessment methods to conduct simple risk assessment of the hazards and risks likely to occur in the electrical and mechanical work site, including the identification of hazards, the acceptability of risks, the clearance and minimization of risks, etc.</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply basic risk assessment methods to effectively conduct simple risk assessment related to electrical and mechanical engineering services.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety knowledge and competency of the following units of competency:</p> <p>EMCUSH108A Use general personal protective equipment</p> <p>EMCUSH109A Perform manual handling operation</p> <p>EMCUSH110A Safety operation in confined spaces</p> <p>EMCUSH111A Comply with the legal requirements on electrical and mechanical occupational safety and health.</p>

1. Title	Implement work site occupational health and safety management						
2. Code	EMCUSH206A						
3. Range	Apply basic occupational health and safety management in electrical and mechanical workshops or work sites to assist in performing work site occupational health and safety management so as to minimize the risks in work sites.						
4. Level	2						
5. Credits	3						
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Basic knowledge of occupational safety management</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Understand general knowledge of occupational health and safety and its application ◆ Understand the basic requirements on occupational health and safety for general work sites </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Application of basic occupational health and safety management</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Capable to apply basic knowledge of occupational safety management to assist in performing occupational health and safety management in work sites so as to minimize the risks. <p>Management items include:</p> <ul style="list-style-type: none"> • Work site safety inspection • Follow-up of protective measures • Basic risk assessment • Follow-up investigation of accident • Assisting in safety promotion events • Assisting in the implementation of safety policy and management targets for the company or clients • Assisting in organizing group meetings </td> </tr> </table>	6.1	Basic knowledge of occupational safety management	<ul style="list-style-type: none"> ◆ Understand general knowledge of occupational health and safety and its application ◆ Understand the basic requirements on occupational health and safety for general work sites 	6.2	Application of basic occupational health and safety management	<ul style="list-style-type: none"> ◆ Capable to apply basic knowledge of occupational safety management to assist in performing occupational health and safety management in work sites so as to minimize the risks. <p>Management items include:</p> <ul style="list-style-type: none"> • Work site safety inspection • Follow-up of protective measures • Basic risk assessment • Follow-up investigation of accident • Assisting in safety promotion events • Assisting in the implementation of safety policy and management targets for the company or clients • Assisting in organizing group meetings
6.1	Basic knowledge of occupational safety management	<ul style="list-style-type: none"> ◆ Understand general knowledge of occupational health and safety and its application ◆ Understand the basic requirements on occupational health and safety for general work sites 					
6.2	Application of basic occupational health and safety management	<ul style="list-style-type: none"> ◆ Capable to apply basic knowledge of occupational safety management to assist in performing occupational health and safety management in work sites so as to minimize the risks. <p>Management items include:</p> <ul style="list-style-type: none"> • Work site safety inspection • Follow-up of protective measures • Basic risk assessment • Follow-up investigation of accident • Assisting in safety promotion events • Assisting in the implementation of safety policy and management targets for the company or clients • Assisting in organizing group meetings 					
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to perform occupational health and safety management and implement management items correctly and effectively in electrical and mechanical workshops or work sites.</p>						
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety knowledge.						

1. Title	Handle general industrial accidents
2. Code	EMCUSH208A
3. Range	Handle general industrial accidents in electrical and mechanical engineering workplaces according to the code of practice for industrial accidents.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Common industrial accidents</p> <ul style="list-style-type: none"> ◆ Understand types and causes of general industrial accidents, including: electric shock, fall of person, fire, burn, gas poisoning, explosion, contusion, etc. ◆ Understand ways of handling and preventing general industrial accidents, such as preventive measures, working guidelines, working permit system, emergency handling measures, safety management system, occupational safety and health scheme, personal protection facilities, etc. <p>6.2 Handle general industrial accidents</p> <ul style="list-style-type: none"> ◆ Capable to handle general industrial accidents on site, including adopting simple contingencies, according to the code of practice for accidents <p>6.3 Professionalism in handling industrial accidents</p> <ul style="list-style-type: none"> ◆ Handle general industrial accidents properly according to the requirements of the code of practice for industrial accidents ◆ Timely report to the supervisor
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to understand types and causes of general industrial accidents; and</p> <p>(ii) Capable to implement and complete measures on handling general industrial accidents, including adopting simple contingencies, according to the code of practice for accidents, and timely report to the supervisor.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety knowledge.

1. Title	Obtain data and information of occupational safety and health and environmental protection to compile relevant statistics
2. Code	EMCUSH211A
3. Range	Obtain data and information of occupational safety and health and environmental protection, and use percentage and graphic data to make simple analysis and statistics.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Data and information of occupational safety and health and environmental protection ♦ Understand how to use percentage and graphic data to make simple calculations and statistics for the performance of occupational safety and health and environmental protection</p> <ul style="list-style-type: none"> • Analyze information and data of occupational safety and health and environmental protection; use percentage and graphs to make simple calculations and statistics based on the data obtained, and come up with simple conclusions <p>6.2 Compile relevant statistics according to data and information of occupational safety and health and environmental protection ♦ Use percentage and graphs to compile relevant statistics based on the data and information of occupational safety and health and environmental protection</p> <ul style="list-style-type: none"> ♦ Obtain data and information of occupational safety and health and environmental protection to compile relevant statistics, and come up with simple conclusions • Obtain data required from all kinds of engineering information including accident investigation report, risk assessment report, operational hazards analysis report, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to obtain data required from engineering information to make analysis for the performance of occupational safety and health and environmental protection; use percentage and graphs to compile statistics, and come up with simple conclusions</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic calculation knowledge.

1. Title	Implement preventive measures on general occupational safety and health
2. Code	EMCUSH212A
3. Range	Understand the characteristics and limitations of the workplace and take preventive measures on general occupational safety and health for occupational safety and avoid accidents in electrical and mechanical engineering workplaces.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Protection for general occupational safety and health ♦ Understand ways for occupational safety and health, and hazards that may occur, and to prevent accidents</p> <p>♦ Understand the restrictions of electrical and mechanical engineering workplace, and follow the safety working procedures to take effective protection steps for the following:</p> <ul style="list-style-type: none"> • Work at height • Chemicals • Noisy environment • Biohazard • High humidity and temperature • Remote areas <p>6.2 Preventive measures on occupational safety and health ♦ Implement preventive measures on general occupational safety and health according to safety legislations and working instructions for occupational safety and health and avoid accidents during electrical and mechanical engineering works.</p> <p>Preventive measures include:</p> <ul style="list-style-type: none"> • Eye protector • Ear protector • Safety belt • Chemical handling procedures • Environmental hygiene, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Under different conditions/environments, choose different working procedures and use appropriate preventive measures on occupational safety and health so as to comply with the legal requirements and work safety instructions.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety knowledge.

1. Title	Gas test in confined spaces
2. Code	EMCUSH213A
3. Range	Conduct gas test in a confined electrical and mechanical engineering space according to work safety procedures, and decide whether the air condition of the confined space is safe to enter according to the test result.
4. Level	2
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of gas test</p> <ul style="list-style-type: none"> ◆ Understand the work safety procedures for gas test ◆ Know about the harmful gases generally existing in confined spaces like sewage. These gases include carbon oxide(CO), hydrogen sulphide(H₂S), methane(CH₄) and other flammable gases ◆ Know how to use appropriate test equipment and correct testing method ◆ Know how to calibrate and maintain test instruments and devices as advised by the manufacturers ◆ Know how to choose the location and way of obtaining samples from the confined space <p>6.2 Gas test</p> <ul style="list-style-type: none"> ◆ Follow the work safety procedures to test the gas, including the oxygen content in the air, and whether the oxygen consists of flammable, poisonous or harmful gases, smoke or vapour ◆ Use test instruments and devices correctly as advised by the manufacturers ◆ Calibrate and maintain test instruments and devices <p>6.3 Determine what types of gases need testing</p> <ul style="list-style-type: none"> ◆ Determine what types of gases need testing with reference to the characteristics of different confined spaces and items previously stored or now storing in these spaces
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to conduct gas test correctly with gas test instruments and devices in a confined electrical and mechanical engineering space according to work safety procedures to ensure that the environment is safe to enter.</p> <p>(ii) Capable to determine what types of gases need testing in different confined spaces.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of safety.

1. Title	Draw ship hull engineering drawings
2. Code	EMSRDE201A
3. Range	Apply the knowledge of engineering drawing to draw ship hull engineering drawings when handling normal duties related to ship-engineering design or drawing.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Uses of and concerns for various kinds of drawings</p> <ul style="list-style-type: none"> ◆ Understand the uses of various kinds of drawings and concerns when drawing them <ul style="list-style-type: none"> • Selecting appropriate proportion and deciding the method of expression for hull assembly • For example, laying strong emphasis on the tolerance and coordination of hull assembly when drawing assembly diagram to ensure the accuracy of production <p>6.2 Techniques of drawing ship hull engineering drawings</p> <ul style="list-style-type: none"> ◆ Draw suitable diagrams according to their characteristics and working requirements of different diagrams, such as: <ul style="list-style-type: none"> • Schematic diagram • Cross-section diagram • Layout diagram <p>6.3 Professionalism in drawing ship hull engineering drawings</p> <ul style="list-style-type: none"> ◆ Identify the uses of drawings and decide the focus of drawing <ul style="list-style-type: none"> • Assembly diagrams: from the aspect of assembly • Structural diagrams for work pieces: listing the content of components in detail
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to correctly select and use appropriate tools for drawing; and</p> <p>(ii) Capable to draw general 2D and 3D ship structures.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the knowledge of drawing basic engineering drawings.

1. Title	Lofting and modelling according to hull-line diagrams									
2. Code	EMSRDE203A									
3. Range	In ship design, apply the techniques and knowledge of figure drawing and picture drawing to produce ships' hull-line diagrams by elementary lofting and modeling (2D such as: folding graphics in oblique angle) .									
4. Level	2									
5. Credit	3									
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Principles of lofting and modeling according to ship line-diagrams</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Master drawing and model techniques and apply geometric principles to produce ship line-diagrams ◆ Understand the principles of lofting and modelling and points to note of relevant procedures </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Methods of hull lofting and modeling</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Effectively use appropriate tools and equipment to loft and model hull line-diagrams </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in hull lofting and modeling</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Follow the specification requirements of drawings or models to make models of ship components with handicraft skills </td> </tr> </table>	6.1	Principles of lofting and modeling according to ship line-diagrams	<ul style="list-style-type: none"> ◆ Master drawing and model techniques and apply geometric principles to produce ship line-diagrams ◆ Understand the principles of lofting and modelling and points to note of relevant procedures 	6.2	Methods of hull lofting and modeling	<ul style="list-style-type: none"> ◆ Effectively use appropriate tools and equipment to loft and model hull line-diagrams 	6.3	Professionalism in hull lofting and modeling	<ul style="list-style-type: none"> ◆ Follow the specification requirements of drawings or models to make models of ship components with handicraft skills
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7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to correctly select and use appropriate tools to loft and model hull line-diagrams; and</p> <p>(ii) Capable to pass the comparison of standard gauge as an assessment of skill level.</p>									
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of reading ship-hull drawings.									

1. Title	Basic layout and assembly of ship power units
2. Code	EMSRIN201A
3. Range	For ship power and mechanical system installation, apply the knowledge of ship power unit technology to combination and assembly of general ship power systems.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Power layout and system arrangement for motor ships</p> <ul style="list-style-type: none"> ◆ Know about the machine types of ships and mechanical theory, such as: <ul style="list-style-type: none"> • Inboard machine and outboard machine • Gasoline engine and diesel engine • Power generation process • High-speed engine, gas turbine and injection system ◆ Know about the basic layout of ships' power units and the combination arrangement of main mechanical accessories ◆ Know about the layout and circulation flow of various systems of power units and the assembly arrangement of the peripherals <p>6.2 Methods of assembling ship power units</p> <ul style="list-style-type: none"> ◆ Effectively use installation tools required and appropriately apply assembly techniques to ship power unit assembly ◆ Identify the characteristics, limitations and applicability of different ship power unit assembly tools and materials ◆ Assist in performing different auxiliary tasks for ship power and mechanical system installation, such as making preparations, collecting materials, transferring tools and cleaning up the site <p>6.3 Professionalism in assembling ship power units</p> <ul style="list-style-type: none"> ◆ Correctly understand important information on assembling power components of typical motor ships, such as supervisor's instructions and installation manual guidelines ◆ Follow guidelines to assemble power units and main mechanical accessories of typical ships and peripheral systems ◆ Consider the limitations of the actual environment and of work when installing and assembling systems and accessories

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to correctly select and use appropriate tools assist in performing auxiliary tasks for ship power unit assembly, and correctly understand relevant assembly guidelines; and (ii) Capable to consider the impact of the layout of ship power system units on the installation work of ship power and marine engineering equipment systems.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic mechanical knowledge and the ability to read common ship work drawings.</p>

1. Title	Basic layout of marine electrical installations										
2. Code	EMSRIN202A										
3. Range	Implement basic layout and installation of general ship electrical systems on ships, repair workshops or dockyards.										
4. Level	2										
5. Credit	3										
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Basic layout of marine electrical installations</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Identify different types of ship cables and their basic applications and installation ◆ Know about circuit protectors for all kinds of ship models ◆ Know about onboard earthing devices and the needs and operation modes for connecting onshore electrical facilities </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Methods and procedures of electrical wiring</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Calculate the size of cables required and select ship electrical facility configuration with correct type of cable according to specified information and conditions ◆ Use appropriate metal or plastic conduits for electrical wiring to make it safe and durable ◆ Effectively apply earthing devices and method </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in electrical wiring</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Follow the guidelines of relevant personal safety measures to implement tasks related to ship electrical system </td> </tr> </table>		6.1	Basic layout of marine electrical installations	<ul style="list-style-type: none"> ◆ Identify different types of ship cables and their basic applications and installation ◆ Know about circuit protectors for all kinds of ship models ◆ Know about onboard earthing devices and the needs and operation modes for connecting onshore electrical facilities 	6.2	Methods and procedures of electrical wiring	<ul style="list-style-type: none"> ◆ Calculate the size of cables required and select ship electrical facility configuration with correct type of cable according to specified information and conditions ◆ Use appropriate metal or plastic conduits for electrical wiring to make it safe and durable ◆ Effectively apply earthing devices and method 	6.3	Professionalism in electrical wiring	<ul style="list-style-type: none"> ◆ Follow the guidelines of relevant personal safety measures to implement tasks related to ship electrical system
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6.3	Professionalism in electrical wiring	<ul style="list-style-type: none"> ◆ Follow the guidelines of relevant personal safety measures to implement tasks related to ship electrical system 									
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to efficiently implement basic layout and installation of general ship electrical systems.</p>										
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical knowledge.										

1. Title	Install and maintain devices of pneumatic and hydraulic systems	
2. Code	EMSRIN203A	
3. Range	When installing and arranging layout of ships' control and automatic devices and systems, apply the knowledge of pneumatic and hydraulic devices to install and maintain ships' pneumatic and hydraulic control systems.	
4. Level	2	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Formation of pneumatic and hydraulic systems</p> <ul style="list-style-type: none"> ◆ Know about the principles, pros and cons of open-loop and close-loop control ◆ Know about circulation diagram of pneumatic and hydraulic systems ◆ Know about the working principles of various types of pneumatic and hydraulic pumps ◆ Know about the classification, characteristics and working principles of the following accessories: <ul style="list-style-type: none"> • pneumatic and hydraulic tanks • pneumatic and hydraulic control valves ◆ Know about the effect of chemical and physical characteristics of the working media of pneumatic and hydraulic systems on the systems ◆ Know about the classification and materials of seals ◆ Know about the formation of all auxiliaries (such as pneumatic and hydraulic pipes) <p>6.2 Methods of installing and maintaining pneumatic and hydraulic equipment</p> <ul style="list-style-type: none"> ◆ Connect all kinds of compressors, hydraulic pumps and motors ◆ Install all kinds of pressure receivers and hydraulic tanks ◆ Connect all kinds of pneumatic and hydraulic control valves ◆ Perform simple clean-up and replacement of working media ◆ Connect all auxiliaries <p>6.3 Professionalism in installing and maintaining pneumatic and hydraulic equipment</p> <ul style="list-style-type: none"> ◆ Follow the guidelines to install general ship pneumatic and hydraulic equipment ◆ Follow the guidelines to connect general ship pneumatic and hydraulic systems and all kinds of control loops ◆ Be aware of and correctly locate the source of pneumatic and hydraulic system vibrations and noises 	

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to implement the installation and basic maintenance of general ship pneumatic and hydraulic systems; and (ii) Capable to correctly select and use appropriate tools to carry out relevant work, and follow instructions to complete the connection of auxiliaries and the installation of all kinds of pneumatic and hydraulic system equipment °
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of automatic devices and systems.</p>

1. Title	Use ship's lifting appliances
2. Code	EMSRIN204A
3. Range	Erect jibs and lay out riggings on ships, or assist in directing cranes to lift and move objects to the positions specified.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Range of application and operating principles of lifting appliances ♦ Understand the range of application and operating principles of general lifting appliances on ships, such as offshore cranes, winches, lifeboats hangers and anchor windlasses</p> <p>6.2 Techniques and procedures of using ship riggings and cranes for lifting ♦ Correctly operate ship's lifting appliances, including:</p> <ul style="list-style-type: none"> • Pre-operation safety inspection (equipment and machinery) • Adopt appropriate measures when necessary (such as weather or wind and tide change, equipment failures) • Operate according to the instructions of commanding officers (including the use of hand signals) • Complete the storage and safe stacking of cargo <p>6.3 Professionalism in using ship's riggings and cranes for lifting ♦ Follow relevant codes (such as the code of marine safety) to work</p> <ul style="list-style-type: none"> ♦ Correctly assess the cargo weight and verify the safe load of machines and tools ♦ Understand the relationship between angle of multi-leg slings and safety loads and able to put it into practice
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to implement lifting procedures on ships, including correctly erecting jibs and laying out riggings, using signals and controlling the lifting operation; and</p> <p>(ii) Capable to use safety inspection lists.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the knowledge of using general personal safety gear.

1. Title	Install non-metallic ship materials and produce woodwork
2. Code	EMSRIN205A
3. Range	Apply the techniques of woodwork and glass-fibre-reinforced plastic production to implement and plan ship repairs or works related to general woodwork and laying of glass-fibre-reinforced plastic.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Application of commonly-used ship timber and glass-fibre-reinforced plastic</p> <ul style="list-style-type: none"> ◆ Understand the types and characteristics of commonly-used timber <ul style="list-style-type: none"> • Identifying the common flaws of timber • Use of preservatives • Natural and artificial drying methods • Differences of various kinds of plywood ◆ Understand usage methods of various types of glass-fibre-reinforced plastic <p>6.2 Techniques and procedures for production of woodwork and glass-fibre-reinforced plastic</p> <ul style="list-style-type: none"> ◆ Correctly select common hand tools and machinery for production of woodwork and glass-fibre-reinforced plastic and effectively carry out: <ul style="list-style-type: none"> ◆ Wooden structure Production and checking, including jointing, planing and scribing of wooden structure • Arranging deck timber and keel • Laying glass-fibre-reinforced plastic <p>6.3 Professionalism in the production of woodwork and glass-fibre-reinforced plastic</p> <ul style="list-style-type: none"> ◆ Analyze the stress characteristics of timber and the position to be worked on before working on it ◆ Point out the requirements for laying glass-fibre-reinforced plastic ◆ Be responsible for the production procedures of woodwork and glass-fibre-reinforced plastic ◆ Check requirements for production of woodwork and glass-fibre-reinforced plastic
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to implement and plan woodwork production procedures; and</p> <p>(ii) Capable to implement and plan glass-reinforced plastic production procedures.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of woodwork and assembly.

1. Title	Installation and repairs of low or medium pressure pipes
2. Code	EMSRIN206A
3. Range	Install and repair of general low or medium pressure (below 30bar) pipes at shipyards, workshops, on board or at other workplaces.
4. Level	2
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Content and illustration methods of pipe and valve assembly drawings</p> <ul style="list-style-type: none"> ◆ Understand the content and illustration methods of pipe and valves' parts drawings and assembly drawings ◆ Understand pipe and valve systems' expansion plans ◆ Understand pipe and valve system plan, the content and illustration methods for installation of piping systems ◆ Understand the illustration methods of pipe accessories in piping system plans ◆ Understand the overall arrangement of marine pipe and valve system ◆ Understand the overall arrangement of the pipe and valve system of ship boiler system <p>6.2 Install and inspect low or medium pressure pipes and select appropriate materials for installation and repairs</p> <ul style="list-style-type: none"> ◆ Disassemble, install and repair low or medium pressure pipes according to the standards ◆ Select appropriate ship hardware such as appropriate types and specifications for fastenings ◆ Select appropriate fillers, sealing, metal gaskets and non-metal gaskets ◆ Select appropriate detergents, coatings, grinding materials ◆ Select appropriate seal rings, safety valve seal rings, springs and orifice plates ◆ Select appropriate thermal insulation materials and lubricating materials <p>6.3 Professionalism in repairing low or medium pressure pipes</p> <ul style="list-style-type: none"> ◆ Follow the law and the code of practice to implement the following work processes: <ul style="list-style-type: none"> • Identifying the causes and hazards of water hammer and the ways to prevent it • Eliminating common faults in pressure piping systems • Identifying common faults and defects with ship pipes and their causes

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to systematically install and repair low or medium pressure ship pipes; and (ii) Capable to make correct and detail reports on safety inspection items.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses general bench fitting or pipe work techniques.</p>

1. Title	Install and repair low or medium pressure valves	
2. Code	EMSRIN207A	
3. Range	Implement installation and repairs of general low or medium pressure (below 30bar) valves at shipyards, workshops, on board or at other workplaces. The competencies in this unit do not include the welding procedure.	
4. Level	2	
5. Credit	5	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Content and illustration methods of pipe and valves' assembly drawings</p> <ul style="list-style-type: none"> ◆ Understand the content and illustration methods of pipe and valves' parts drawings and assembly drawings ◆ Understand pipe and valve system expansion plans ◆ Understand pipe and valve system plan, the content and illustration methods for installation of piping systems ◆ Understand the illustration methods of pipe accessories in piping system plans ◆ Understand the overall arrangement of marine pipe and valve system ◆ Understand the overall arrangement of the pipe and valve system of ship boiler system <p>6.2 Install and inspect general valves and select appropriate materials for installation and repairs</p> <ul style="list-style-type: none"> ◆ Disassemble, install and repair general valves according to the standards ◆ Grinding and testing of valve disc and seat, implement valve core and base grinding and testing ◆ Use angle grinders and various types of grinding tools for valve discs and seats ◆ Select and use appropriate grinding materials to adjust the valves ◆ Adjust and repair the valve stroke and torque ◆ Adjust and test steam water system safety valves ◆ Select appropriate ship hardware such as appropriate types and specifications for fastenings ◆ Select appropriate fillers, sealing, metal gaskets and non-metal gaskets ◆ Select appropriate detergents, coatings, grinding materials ◆ Select appropriate seal rings, safety valve seal rings, springs and orifice plates ◆ Select appropriate thermal insulation materials and lubricating materials to wrap and seal valves 	

	<p>6.3 Professionalism in repairing general ship valve equipment and systems</p> <ul style="list-style-type: none"> ◆ Follow the law and the code of practice to implement the following work processes: <ul style="list-style-type: none"> • Identifying the causes, and hazards of water hammer and the ways to prevent it from happening • Eliminating common faults in pressure pipe valve systems • Identifying common faults with valve bodies, stems, bonnets and methods of repairing them • Identifying common faults and defects with ship pipes and valves and their causes <ul style="list-style-type: none"> ▸ Elimination of valve flange, joint head blowholes or cracks ▸ Defects with valve seals and their treatment ▸ Defects with valve structures and their treatment ▸ Elimination of safety valve malfunctions
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to systematically install and repair ship valves; and (ii) Capable to make correct and detail reports on repaired items.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses general benchfitting techniques.</p>

1. Title	Test the physical strength of materials
2. Code	EMSRIT201A
3. Range	For general inspection, commissioning and testing works related to ship repairs and mechanical engineering, test the physical strength of materials in order to assess whether the materials meet the specified requirements.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of testing the physical strength of materials</p> <ul style="list-style-type: none"> ◆ Know about the physical strength of all kinds of materials and its importance to engineering structure, such as: <ul style="list-style-type: none"> • Basic relationship of hardness and tensile stress • Tensile strength, bending stress, broken surface shrinkage, extension rate • flexibility, plasticity, forgeability and toughness <p>6.2 Techniques and procedures of testing the physical strength of materials</p> <ul style="list-style-type: none"> ◆ Effectively use testing instruments to test the physical strength of materials ◆ Use the test results to draw related graphs (such as tensile strength test graph) <p>6.3 Professionalism in testing the physical strength of materials</p> <ul style="list-style-type: none"> ◆ Assess the test results according to the technical specifications of the materials to see whether they meet the test requirements ◆ Use data of the materials to classify the properties and strength of the materials
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to correctly implement tests of the physical strength of general materials ; and</p> <p>(ii) Capable to use data obtained from the test to clearly illustrate the test results.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of inspection, commissioning and testing.

1. Title	Frontline inspection and acceptance of ship painting works
2. Code	EMSRLT202A
3. Range	Inspect quality of painting and coordinate frontline ship-painting work processes according to relevant instructions and specifications.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Methods and procedures of coordinating ship painting</p> <ul style="list-style-type: none"> ◆ Ensure strict implementation of all ship-painting work processes, including: <ul style="list-style-type: none"> • Preparations for painting such as selecting correct type and adequate amount of paint, ensuring correct proportion and viscosity of paint mixture • Considerations for painting works such as the percentage of damaged area, cause or source of rust and thickness of painting • Inspect the painted parts to see if the colour scheme is correct, the thickness of painting is appropriate, etc. • Patch the defects during the drying process of paint, such as brushing, coating dryness and wetness, pores ◆ Master the defects after the coating is formed and their remedies: blisters, powder layer, cracks, flakes and slices ◆ Know the methods of testing thickness of paints ◆ Clearly understand quality standard requirements and commissioning methods for all kinds of surface treatment ◆ Know about and make reference to general testing data standards for ship painting for inspection, such as: <ul style="list-style-type: none"> • Appearance of coating • Drying time • Bendability • Impact resistance • Boiling water resistance • Salt water resistance • Acid resistance • Glossiness

	<p>6.2 Inspect and commission ship painting works</p> <ul style="list-style-type: none"> ◆ List the safety gear and concerns of work for workers who perform or assist in ship painting works ◆ Use all kinds of inspection tools to commission metal and non-metal surface treatments ◆ Use all kinds of inspection tools to inspect ship painting works ◆ Master general defects of ship painting and decide the acceptable level ◆ Inspect and commission painting works according to coating preparations, work specifications and standards of completion for relevant painting work
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to correctly master methods of ship painting and implement commissioning tasks; and</p> <p>(ii) Capable to carry out relevant inspection procedures, use testing tools and instruments, and decide the passing standards for inspections and test results.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of paints.</p>

1. Title	Apply metal fabrication skills to ship repairs and maintenance
2. Code	EMSRRM201A
3. Range	Apply metal fabrication skills to perform regular ship repair and maintenance tasks such as metal cutting and bonding or assist in general ship deck parts and components repairs, maintenance and replacement at worksites related to ship repair workshops or dockyards.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of metal fabrication skills for bulwark and components maintenance and repairs</p> <ul style="list-style-type: none"> ◆ Know about different types of metal cutting and fixed bonding methods, including: <ul style="list-style-type: none"> • Scope of application for ship repairs and maintenance • general safety rules • Concerns for processing of work ◆ Know about the main functions of and relevant metal fabrication skills for general ship's regular repair components <ul style="list-style-type: none"> • Sea chest • Gangway • Bulwark and handrails <p>6.2 Methods of using metal fabrication skills for ship maintenance</p> <ul style="list-style-type: none"> ◆ Follow instructions to cut, disassemble or repair and reinstall ship's regular repair components ◆ Effectively use hand tools and mechanical tools (such as planing, grinding, sawing, drilling, punching, riveting, electric arc welding and gas welding tools) to repair and maintain ship components <p>6.3 Professionalism in using metal fabrication skills for ship maintenance</p> <ul style="list-style-type: none"> ◆ Understand the positions usually being washed and crashed by waves, hit by objects and corroded, and give advice on repair if necessary ◆ Identify ship deck elements and components usually worn; assist in implementing preventives against deterioration ◆ Describe the details of repairs and maintenance clearly
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to apply metal fabrication craft skills to repair general bulwark (ship deck elements) and regular repair components; and</p> <p>(ii) Capable to correctly select and use appropriate tools to perform regular ship repairs and maintenance according to repair instructions.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic mechanical and welding knowledge.

1. Title	Repair and maintain ship's main engine equipment
2. Code	EMSRRM202A
3. Range	Apply, under instruction, the basic knowledge of marine engineering to repairing or replacing the fixed and moving components of ship's main engine equipment (such as internal combustion engines for ships and low to medium speed (below 1500RPM) diesel engines and transmission mechanisms); assist in removing relevant parts and components for repairs and reconditioning at dockyards or repair workshops.
4. Level	2
5. Credit	8
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of ship's main engine equipment</p> <ul style="list-style-type: none"> ◆ Know about the main parts and components of ship's main engine equipment and their basic operating principles <ul style="list-style-type: none"> • Overall layout of a turbine and steam cycle • Application of gear reducer/gearbox or power reduction • Co-ordination and lubrication of reduction gear • Layout and structure of internal combustion engines (diesel oil and gasoline) • Cooling and lubricating cycles of low to medium speed diesel engines • Overall layout of transmission system and propelling devices • Structure and maintenance of common ship boilers ◆ Know about the causes of common failures of engine equipment and the remedies <ul style="list-style-type: none"> • Difficult or unable to start • Insufficient power or stopping operation • Excessive vibration or abnormal sounds • Smoky or turbid exhaust • Thinning, deteriorating and dripping of lubricating oil • Running obstruction or discharge difficulty

	<p>6.2 Methods and procedures of repairing and maintaining ship's main engine equipment</p> <ul style="list-style-type: none"> ◆ Assist in cleaning, removing, repairing and reinstalling the fixed and moving components of an engine according to instructions ◆ Assist in repairing and reconditioning the main fixed and moving components of engine equipment, such as turbine shaft, turbine blades, gear, roller bearing, piston rods , cylinder heads, cylinders, thrust bearing, crossheads, crankshafts, overspeed governors, rotary devices, turbochargers, gearboxes and speed variators according to the maintenance procedures of machine manufacturers ◆ Use general repairing tools for the fixed and moving components of ship's main engine equipment effectively <p>6.3 Professionalism in repairing and maintaining ship's main engine equipment</p> <ul style="list-style-type: none"> ◆ Observe the parts positions which are usually subject to wear, burn, tear, oxidation and corrosion and give advice on repairs and replacement if necessary ◆ Identify the sections where failures usually occur and assist in implementing preventive measures against damage ◆ Describe the details of repairs and maintenance clearly
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to assist in repairing and maintaining the main fixed and moving components of general ship's main engine equipment; and</p> <p>(ii) Capable to select and use appropriate tools to perform relevant tasks according to the established maintenance procedures and maintenance manuals of machine manufacturers.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic mechanical knowledge and general competency of a mechanic.</p>

1. Title	Repair and maintain ship pipes
2. Code	EMSRRM203A
3. Range	Apply the knowledge of ship piping system to implement regular repairs and maintenance on the existing pipes and their accessories on board, repair workshops or dockyard related worksites.
4. Level	2
5. Credit	8
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of ship pipes and their accessories</p> <ul style="list-style-type: none"> ◆ Know about the characteristics, size and applications of materials commonly use for ship piping system <ul style="list-style-type: none"> • Alloys such as steel, copper, nickel, molybdenum and aluminum • Plastics such as PVC and ABS ◆ Know about the specifications of metallic and non-metallic pipes such as standard pipe, reinforced pipe, extra-strong pipe and classify and apply different types of pipes and pipelines ◆ Know about the basic knowledge of and main applications (such as feed water, exhaust, etc.) of general standard piping systems and regular repair accessories for ships <p>6.2 Methods of maintaining existing pipes</p> <ul style="list-style-type: none"> ◆ Master the methods of fastening and supporting general ship pipes ◆ Follow instructions to repair, disassemble, replace or reinstall ship pipes and regular repair accessories ◆ Effectively use pipe repairing tools to repair and maintain ship pipes and accessories, such as acid clean, degreasing, blow and purge, pressure testing, adjustment of coupling, etc. <p>6.3 Professionalism in repairing and maintaining ship pipes</p> <ul style="list-style-type: none"> ◆ Adjust the requirements for repair and maintenance in the course of work according to the characteristics of different types of pipes, such as: taking precautions against potential corrosion of all kinds of metallic pipes especially aluminum alloy pipes, selecting appropriate coating and cathodic protection ◆ Observe the sections of pipes and accessories usually displaced, forced, vibrate, exerted with high pressure and high temperature, and corroded, and give advice on repair if necessary ◆ Identify sections of pipes and accessories usually leak, and assist in implementing preventives against breaking of pipes ◆ Describe the details of repairs and maintenance clearly

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to repair, connect and check general ship pipes and accessories; and (ii) Capable to correctly select and use appropriate tools to implement regular repairs, maintenance and replacement on the existing pipes and their accessories according to repair instructions.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic ability to install simple metallic pipes and all kinds of pipe components</p>

1. Title	Repair and maintain ship auxiliary equipment
2. Code	EMSRRM204A
3. Range	Apply techniques and knowledge of ship auxiliary equipment repair and maintenance to clean, maintain and repair auxiliary equipment on board, at repair workshops, dockyard workshops or related work sites.
4. Level	2
5. Credit	8
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of ship auxiliary equipment</p> <ul style="list-style-type: none"> ◆ Know about general ship auxiliary equipment <ul style="list-style-type: none"> • Generator set • Pump-in and pump-out system • Refrigerating and air-conditioning system • Heating and cooling system • Oil purifier (centrifugal machine and oil-water separator) • Waste water device • Incinerator • Heating and cooling system ◆ Know about the basic construction, installation arrangement and working principles of equipment (such as main bearing, speed reducing gear, motor, compressor, blower and fan) <p>6.2 Methods and procedures of repairing and maintaining ship auxiliary equipment</p> <ul style="list-style-type: none"> ◆ Assist in cleaning, disassembling , repairing and reinstalling ship auxiliary equipment according to instructions ◆ Use general repairing tools for ship auxiliary equipment effectively to perform procedures of adding and replacing oil and grease, lubricating oil and coolant <p>6.3 Professionalism in repairing and maintaining ship auxiliary equipment</p> <ul style="list-style-type: none"> ◆ Observe the components positions which are usually worn, burnt, torn, oxidized and corroded and give advice on repairs if necessary ◆ Identify the sections where failures usually occur and assist in implementing preventives against damage ◆ Describe the details of repairs and maintenance clearly
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to repair and maintain general ship auxiliary equipment; and</p> <p>(ii) Capable to select and use appropriate tools to perform relevant tasks according to the repair instructions.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic mechanical knowledge.

1. Title	Repair and maintain machinery components below the waterline and dockyard repair work
2. Code	EMSRRM205A
3. Range	Apply techniques and knowledge of repairing and maintaining marine auxiliary machinery components to cleaning, maintaining, repairing and replacing auxiliary machinery components at dockyards, maintenance shipyards and related work sites.
4. Level	2
5. Credit	8
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of auxiliary machinery components below the waterline</p> <ul style="list-style-type: none"> ◆ Know about general components and propelling system below the waterline below the waterline <ul style="list-style-type: none"> • Thrust bearing, propeller • variable pitch propeller and accessory equipment • rudder blade and steering gear devices (inside the steering gear room) • stern tube bush, intermediate shaft and bearing • stern tube seal and its devices • bow thruster, various types of subsea valves, sand box and grid • stabilizer ◆ Know about the arrangement and basic working principles of the components <p>6.2 Methods and procedures of repairing and maintaining auxiliary machinery components below the waterline</p> <ul style="list-style-type: none"> ◆ Follow the instructions to clean, disassemble, repair and reinstall components ◆ Effectively use general repairing tools for marine auxiliary machinery components to perform repairs and maintenance <p>6.3 Professionalism in repairing and maintaining auxiliary machinery components below the waterline</p> <ul style="list-style-type: none"> ◆ Understand the components and sections usually worn, abraded and corroded, such as hull, propeller, stern rudder and stern tube seal below the waterline; and give advice on repair if necessary ◆ Identify the sections where failures usually occur and assist in implementing preventives against damage ◆ Describe the details of repairs and maintenance clearly
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to clean, disassemble, repair and reinstall below the waterline auxiliary machinery components ; and</p> <p>(ii) Capable to correctly select and use appropriate tools to implement relevant tasks according to repair instructions.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic mechanical knowledge.

1. Title	Repair and maintain ship hull and its structural elements	
2. Code	EMSRRM206A	
3. Range	Apply the techniques and knowledge of hull structures to assisting in regular repairs and maintenance of hull plate and its structural elements, or repairs or replacements of common hull structures at dockyards, maintenance shipyards or relevant locations.	
4. Level	2	
5. Credit	8	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of hulls and their components</p> <ul style="list-style-type: none"> ◆ Know about the general safety practice for pressing and jointing metal plates for ships ◆ Know about the methods of full position bonding, rolling and dynamic pressing and their application to ship structure repairs ◆ Know about the main functions of common hull plates and their structures <ul style="list-style-type: none"> • upper deck, hull plates and bilge motherboard, under-waterline plate, reinforced deck, hull frame, bow-to-stern frame, bulkhead plates and fabricated plates inside oil and water tank <p>6.2 Methods and procedures of repairing hull structures</p> <ul style="list-style-type: none"> ◆ Perform repair and maintenance routines such as pressing, forming and repairing hull metal plates according to instructions ◆ Use tools and common forming, bending and rolling machines effectively and carry out the processes of toughening metal plates and pressing metal plates <p>6.3 Professionalism in repairing hull structures</p> <ul style="list-style-type: none"> ◆ Inspect the positions of the hull structures which are frequently flushed, water-soaked, abraded and corroded, and give advice on repair if necessary ◆ Identify the hull sections which are usually worn out and their jointing conditions and adopt measures to stop deterioration ◆ Describe the details of repair and maintenance works clearly 	

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to perform tasks of repairing and maintaining common ship metal plates and hull structures so as to pass the error requirements of drawings; and (ii) Capable to select and use appropriate tools to perform routines of repairing and maintaining hull structures according to repair instructions.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses the basic techniques of using general workshop tools and metal jointing equipment.</p>

1. Title	Repair and maintain ship-deck installations
2. Code	EMSRRM207A
3. Range	Apply the techniques and knowledge of repairing and maintaining ship-deck installations to repairs and maintenance of deck machinery on board, at repair workshops, dockyard workshops or related work sites, and lifting appliances may be used for relevant tasks.
4. Level	2
5. Credit	8
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of deck installations</p> <ul style="list-style-type: none"> ◆ Know about the construction and basic working principles of general deck installations, such as: <ul style="list-style-type: none"> • winch and windlass • hatch cover lift on/lift off power units • loading equipment • lifeboat / raft and relevant installations • life-saving equipment • ventilation equipment • gangway elevator • fire-prevention facilities • handrails <p>6.2 Methods and procedures of repairing and maintaining ship deck installations</p> <ul style="list-style-type: none"> ◆ Follow instructions to repair deck machinery ◆ Effectively use the following types of repair and maintenance tools to implement procedures of maintaining ship-deck installations: <ul style="list-style-type: none"> • Engine oils or greases • Integrated rope, guide rope and chain • Bolt wench <p>6.3 Professionalism in repairing and maintaining ship deck installations</p> <ul style="list-style-type: none"> ◆ Identify the sections where failures usually occur and preventives against damage ◆ Describe the details of repairs and maintenance clearly
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to perform tasks of repairing and maintaining general ship deck installations; and</p> <p>(ii) Capable to correctly select and use appropriate tools to implement relevant tasks according to repair instructions.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic mechanical knowledge.

1. Title	Repair diesel engines
2. Code	EMSRRM208A
3. Range	Use common or tailor-made mechanical tools to repair or maintain diesel engines e.g. diesel engines below 3000kW (or 4000BHP), at repair workshops or locations with diesel engines according to repair instructions and standards.
4. Level	2
5. Credit	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and basic principles of diesel engine</p> <ul style="list-style-type: none"> ◆ Understand the structure and basic principles of various component systems of a diesel engine, including: <ul style="list-style-type: none"> • The principles of a diesel engine - suction, compression, power and exhaust • Engine cylinder and its mechanical devices • Fuel supply system • Fuel injector and fuel filter • Governor and its control devices • Cooling system and equipment • Lubrication system and equipment <p>6.2 Methods and procedures of repairing diesel engines</p> <ul style="list-style-type: none"> ◆ Capable to assemble, dismantle, and align the mechanical jointing of a diesel engine and its loading equipment ◆ Capable to repair various component systems and fittings of a diesel engine effectively, including checking, cleaning, measurement, maintenance and testing, according to repair instructions and standards ◆ Handle and eliminate faults in diesel engine effectively ◆ Test the overall performance of a diesel engine ◆ Capable to use common and tailor-made mechanical tools and inspection instruments effectively <p>6.3 Professionalism in diesel engine repair and maintenance</p> <ul style="list-style-type: none"> ◆ Capable to perform general repair and maintenance of diesel engines according to repair instructions and standards ◆ Understand the legal requirements on work safety and the code of practice when performing repair and maintenance of diesel engines

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to check and maintain the core systems of a diesel engine effectively and correctly according to repair standards; and (ii) Capable to adjust and test various component systems of a diesel engine effectively so as to accurately control the operational performance of the engine.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of repairing mechanical equipment.</p>

1. Title	Ship-painting works
2. Code	EMSRRM209A
3. Range	Perform paint mixing and primer/undercoat applying at locations where painting work is involved; assist in tidying up the painting workshop and store paints correctly; store relevant materials at appropriate places or for easy access.
4. Level	2
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Paint and paint applying procedures</p> <ul style="list-style-type: none"> ◆ Possess relevant knowledge of paints and paint applying techniques ◆ Select and safely use appropriate tools such as brush, paint roller, air and airless spray equipment, to performing painting task ◆ Select and apply appropriate primer or undercoat for surface protection after rust disassembly ◆ Master and correctly apply practical skills for paints ◆ Safely use thinner and store relevant materials <p>6.2 Concerns for paints and painting work</p> <ul style="list-style-type: none"> ◆ Follow safety codes of practice to erect gangways, arrange painting equipment and perform painting ◆ Handle properly and reduce the influence of environmental factor on painting work ◆ Finish the brushing and spraying and pass the basic quality inspection ◆ Finish the procedures of storing, classifying and safe keeping of paints and relevant materials <p>6.3 Professionalism in paints and painting work</p> <ul style="list-style-type: none"> ◆ Implement ship-painting work according to in-house guidelines
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to apply basic knowledge of storing dangerous goods to painting work; and</p> <p>(ii) Capable to correctly erect work platform and arrange painting equipment; select, use and maintain various relevant painting tools; implement painting work.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of paints (such as EMSRRM104A” Assist in ship painting works”.

1. Title	Surface treatment before painting the ship
2. Code	EMSRRM210A
3. Range	Apply the knowledge of metal and non-metal surface treatment to implement general surface treatment procedures before painting the ship; coordinate with other teams to work on the surface treatment projects and be responsible for the work quality of surface treatment.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Surface treatment preparation before painting the ship</p> <ul style="list-style-type: none"> ◆ Investigate and identify different surface treatment preparations such as: <ul style="list-style-type: none"> • Surface corrosion • Surface corrosion with pitting • Derusting and stripping of old surface paint <p>6.2 Surface treatment procedures before painting the ship</p> <ul style="list-style-type: none"> ◆ Safely use relevant tools and mechanical tools to implement surface treatment according to correct working procedures ◆ Implement surface treatment procedures with ultra high pressure water-jet <p>6.3 Professionalism in surface treatment before painting the ship</p> <ul style="list-style-type: none"> ◆ Know about the quality standards for surface treatment such as: <ul style="list-style-type: none"> • Paint supplier's requirements • ISO, BS or SA, ST ◆ Complete the work according to the quality standards for surface treatment
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to perform surface treatment according to approved practice for painting work and relevant standards; and</p> <p>(ii) Capable to understand the quality standards and required techniques for general surface treatment.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of the properties of paints and the painting procedures.

Competency Level 3

1. Title	Use computer to draw complicated mechanical engineering drawings
2. Code	EMCUDE315A
3. Range	Use computer to draw complicated mechanical engineering drawings in electrical and mechanical workplaces.
4. Level	3
5. Credits	5
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Computer engineering drawing techniques and methods ♦ Understand the techniques and methods of using computer to draw complicated mechanical engineering drawings</p> <p>6.2 Application of computer in drawing electrical and mechanical drawings ♦ Use the computer to draw complicated mechanical engineering drawings according to design</p> <ul style="list-style-type: none"> • Draw 3D drawings for mechanical parts <ul style="list-style-type: none"> ▸ Full 3D drawings ▸ Sectional 3D drawings ▸ Perspective 3D drawings • Draw different shapes of air ducts <ul style="list-style-type: none"> ▸ Cylindrical pipe ▸ Conical pipe ▸ Irregular surface pipe ▸ Air duct unit • Draw mechanical equipment assembly drawings <ul style="list-style-type: none"> ▸ Weld joints of pipes with different diameters ▸ Assembly of mechanical parts
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to draw a 3D mechanical equipment assembly drawings according to the design; and</p> <p>(ii) Capable to integrate several complicated mechanical components drawings into an integrated mechanical assembly drawing, including the developing drawings and assembly drawings, according to the design.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of drawing basic electrical and mechanical engineering drawings using computer.

1. Title	Use computer to draw for complicated electrical engineering drawings
2. Code	EMCUDE316A
3. Range	Use computer to draw complicated electrical engineering drawings in electrical and mechanical workplaces.
4. Level	3
5. Credits	5
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Techniques and methods of using computer to draw electrical engineering drawings ♦ Understand the techniques and methods of using computer to draw complicated electrical engineering drawings</p> <p>6.2 Use computer to draw complicated mechanical engineering drawings ♦ Use the computer to draw complicated electrical engineering drawings according to design</p> <ul style="list-style-type: none"> • Draw the main circuit layout of multi-layer power system and electrical installation with protection device according to design • Draw the circuit wiring layout of multi-layer power system and electrical installation with protective and control equipment according to design • Draw the complex control circuit layout according to design <ul style="list-style-type: none"> ▸ Logic electronic circuit ▸ Electrical and electronic control equipment circuits
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to draw a main circuit layout, control circuit layout and wiring layout of an electrical installation, including the electrical and electronic control equipment, according to design; and</p> <p>(ii) Capable to integrate several electrical distribution and wiring layouts into a comprehensive power supply and wiring layout for a multi-storey building according to design.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of drawing basic electrical and mechanical drawings with computer.

1. Title	Choose typical materials for electrical and mechanical work
2. Code	EMCUDE318A
3. Range	Choose appropriate materials commonly used in electrical and mechanical work to perform the work of design, installation and repair.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Functions, properties and range of application of common electrical and mechanical materials</p> <ul style="list-style-type: none"> ◆ Understand the functions, properties and range of application of common metallic and non-metallic materials, including: <ul style="list-style-type: none"> • Physical properties and chemical properties such as electric induction, thermal induction, expansion and contraction, anti-corrosion, solubility, etc. • Mechanical properties such as strength, hardness, resilience, fatigue limit, high-temperature strength, etc. • Processing properties such as casting, extension, welding, machining, heat treatment, etc. • Understand the functions and range of application of common metallic and non-metallic materials, such as their functions, application conditions and limitations for applying to the branches of electricity, air-conditioning, ship repair machinery and plant engineering, etc. <p>6.2 Choose electrical and mechanical materials needed</p> <ul style="list-style-type: none"> ◆ Capable to choose appropriate materials commonly used in electrical and mechanical work according to their properties and range of application as well as the engineering requirements and specifications in order to perform the work of electrical and mechanical design, installation and repair ◆ Capable to choose and check the materials to ensure that they comply with the safety specifications
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to choose appropriate materials commonly used in electrical and mechanical work according to their functions, properties and range of applications as well as the safety specifications in order to perform the work of electrical and mechanical design, installation and repair.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electrical and mechanical materials.

1. Title	Repair and rewind three-phase motors
2. Code	EMCUIN304A
3. Range	Understand the construction and types of three-phase motors, and repair and rewind them in servicing stations or work sites.
4. Level	3
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure, type, working principles and examination method of three-phase motor</p> <ul style="list-style-type: none"> ◆ Understand the structure, types, working principles and range of application of three-phase motor, including: <ul style="list-style-type: none"> • General induction motor • Multipolar three-phase motor • Two-speed three-phase motor ◆ Understand the winding design of three-phase motor, including number of slots for each pole, number of winds, method of winding connection, etc. ◆ Understand the methods to examine the faults of three-phase motor, including: <ul style="list-style-type: none"> • testing of short circuit • testing of circuit break • testing of earth fault • testing of wiring fault • testing of bearing fault ◆ Methods of dismantling and assembling three-phase motor ◆ Methods of replacing bearing <p>6.2 Repair three-phase motor faults</p> <ul style="list-style-type: none"> ◆ Identify the faults of a three-phase motor and repair them according to procedures ◆ Rewind a three-phase motor
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to understand the structure, types and working principles of three-phase motor;</p> <p>(ii) Capable to identify the faults of a three-phase motor and repair them according to procedures; and</p> <p>(iii) Capable to rewind a three-phase motor.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic electrical and mechanical knowledge.

1. Title	Perform electrical and mechanical installation and testing according to the drawings and specifications of electrical devices and wiring
2. Code	EMCUIN306A
3. Range	Interpret the engineering drawings of electrical devices, circuits and wiring and able to apply relevant information for electrical and mechanical works.
4. Level	3
5. Credits	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Uses of the drawings of electrical devices, circuits and wiring</p> <ul style="list-style-type: none"> ◆ Understand the uses of various types of engineering drawings of electrical works ◆ Identify different versions of engineering drawings of electrical works ◆ Capable to apply electrical symbols, scaling calculations and relevant engineering drawings of electrical works <p>6.2 Obtain relevant information of electrical devices, control circuits and wiring drawings to complete installation and testing of electrical systems</p> <ul style="list-style-type: none"> ◆ Obtain suitable electrical engineering drawings according to project requirements ◆ Capable to obtain relevant information of the main circuit, including: <ul style="list-style-type: none"> • Connection of the main circuit • Details of power distribution • Power switch interlock ◆ Capable to obtain relevant information of electrical equipment and control circuits, including: <ul style="list-style-type: none"> • Principles of control • Control circuits • Control components, including circuit breakers, relays, push-buttons and their contacts • Electronic control circuits ◆ Capable to obtain information of control circuit and wiring drawings, including: <ul style="list-style-type: none"> • Selection of cables • Classification of cables • Laying of cables • Wiring conduits • Wiring trunkings • Identification and marking of cables • Connection of cables

	<p>6.3</p> <ul style="list-style-type: none"> ◆ Capable to obtain relevant information from drawings of electrical devices, circuits and wiring for performing an electrical and mechanical task, such as the information below for installation and testing of a starter circuit for a three-phase AC motor: <ul style="list-style-type: none"> • Principles of control circuit interlock • Conduits and trunkings required • Laying of cables • Connection of cables • Identification and marking of cables
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to select suitable engineering drawings of electrical works, and obtain relevant information from drawings for completion of installation and testing of an electrical and mechanical system and equipment, such as the installation and testing of a power distribution system in a multi-storey building.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electricity.</p>

1. Title	Perform general lifting machinery and lifting equipment inspection
2. Code	EMCUIN313A
3. Range	Perform general lifting machinery and lifting equipment inspection, according to relevant legal requirements, in general industrial plants or electrical and mechanical workplaces where lifting and handling work is involved, and be capable to perform related inspection independently and assist the registered professional engineer in arranging trial loading test for large lifting machinery.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Operating principles of general lifting machinery and lifting equipment and legislations related to inspection</p> <ul style="list-style-type: none"> ◆ Understand the operating principles of general lifting machinery and lifting equipment ◆ Understand the legal requirements on general lifting machinery and lifting equipment inspection ◆ Understand the overhauling procedures for general lifting equipment, including the operation, repair, maintenance, inspection, complete check, testing and components of lifting machinery <p>6.2 General lifting machinery and lifting equipment inspection</p> <ul style="list-style-type: none"> ◆ Perform regular inspection on general lifting machinery according to legal requirements and working instructions, including performing routine check, assisting the registered professional engineer to conduct the overhaul and loading test, etc. ◆ Perform regular inspection on general lifting equipment according to legal requirements and working instructions
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to perform routine check for general lifting machinery and lifting equipment according to legal requirements, and assist the registered professional engineer to conduct thorough inspection and loading test.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of using general loading and lifting equipment.

1. Title	Operate and maintain abrasive wheels safely
2. Code	EMCUIN315A
3. Range	Operate all kinds of abrasive wheels in workshops or work sites.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Methods of operating abrasive wheels</p> <ul style="list-style-type: none"> ◆ Be familiar with the safe operation of abrasive wheels, including: <ul style="list-style-type: none"> • Maximum permissible speed of abrasive wheel in different size (speed of abrasive wheel) • Speed of spindle • Protective guard for moving abrasive wheel • Gap between the cutter block and abrasive wheel • Ensure that the abrasive wheel has been fitted securely before use • Effective devices to connect and disconnect power supply must be available for the abrasive wheel used in the machinery • Suitable working environment e.g. no materials without tied <p>6.2 Maintenance of abrasive wheel</p> <ul style="list-style-type: none"> ◆ Be familiar with the maintenance of abrasive wheel, including: <ul style="list-style-type: none"> • Repair of the protective guard • Repair of the rest • Reconditioning of the abrasive wheel <p>6.3 Operation and maintenance procedures for abrasive wheel</p> <ul style="list-style-type: none"> ◆ Know how to choose suitable abrasive wheels for different kinds of work ◆ Know the needs and principles of regularly repairing and maintaining abrasive wheel, including the procedures of inspection, maintenance and alignment ◆ Use general repairing and checking instruments and tools effectively
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to operate abrasive wheels safely;</p> <p>(ii) Capable to choose suitable abrasive wheels for different kinds of work; and</p> <p>(iii) Capable to perform routine maintenance and fault repair of abrasive wheels effectively.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of occupational safety and machinery/materials.

1. Title	Perform manual metal arc welding (MMAW)/shielded metal arc welding (SMAW) at specified positions
2. Code	EMCUIN316A
3. Range	Perform MMAW/SMAW at specified positions of common carbon steel, high carbon steel or stainless steel, in electrical and mechanical welding workshops or work sites.
4. Level	3
5. Credits	20
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of MMAW/ SMAW</p> <ul style="list-style-type: none"> ◆ Understand the applications of electrodes of arc welding ◆ Know about properties of different type of metals, such as carbon steel and stainless steel ◆ Understand the technical requirements of different steels on different electrodes ◆ Understand the impact of different parameters, such as current, welding speed, angle and size of electrode ◆ Understand the type and functions of MMAW/SMAW and arc characteristics ◆ Understand the importance of weld joint ◆ Understand the classification, specifications and standards of different electrodes, such as high tensile steel and low alloy steel ◆ Understand the welding residues stresses ◆ Understand how to avoid weldment distortion ◆ Understand relevant code of practice for MMAW/ SMAW <p>6.2 Methods and procedures of operating MMAW/ SMAW</p> <ul style="list-style-type: none"> ◆ Capable to apply MMAW/SMAW in the following tasks: <ul style="list-style-type: none"> • Perform two sides double V groove weld at flat position • Perform two sides double V groove weld at horizontal position • Perform two sides fillet weld at horizontal/vertical position • Perform two sides double V groove weld at vertical up position • Perform two sides fillet weld at vertical up position • Perform two sides double V groove weld at overhead position • Perform two sides fillet weld at overhead position <p>6.3 Professionalism in MMAW/ SMAW</p> <ul style="list-style-type: none"> ◆ Capable to perform MMAW/ SMAW according to relevant safety guidelines and code of practice

7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to complete MMAW/SMAW at specified positions by different jointing methods, without causing obvious surface weld defects; (ii) Capable to identify the classification, specifications and applications of different electrodes; and (iii) Capable to perform MMAW/SMAW safely.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUIN225A “Basic manual metal arc welding (MMAW)/shielded metal arc welding (SMAW)”.</p>

1. Title	Perform tungsten inert gas (TIG) / gas tungsten arc welding (GTAW) at specified positions	
2. Code	EMCUIN317A	
3. Range	Perform TIG/GTAW tasks at specified positions for parent materials like carbon steel, stainless steel and aluminum alloy, in electrical and mechanical welding workshops or work sites.	
4. Level	3	
5. Credits	5	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Preparations for TIG/GTAW</p> <ul style="list-style-type: none"> ◆ Understand various functions of main TIG/GTAW equipment ◆ Understand the classification, specifications and standards of tungsten electrode ◆ Understand the impact of TIG/GTAW parameters such as current and gas flowrate, welding speed, end shape of tungsten electrode, protective gas and diameter of gas nozzle ◆ Understand the weldability of aluminium, stainless steel and their alloys ◆ Understand weld defects ◆ Understand weld joints ◆ Understand how to avoid weld distortion ◆ Understand code of practice for TIG/GTAW <p>6.2 Apply TIG/GTAW</p> <ul style="list-style-type: none"> ◆ Apply TIG/GTAW techniques in the following tasks: <ul style="list-style-type: none"> • Perform square edge butt weld at horizontal positions and at vertical-up position • Perform lap weld at horizontal position and at vertical-up position • Perform fillet weld at horizontal position and at vertical-up position • Perform butt weld for aluminium and stainless steel at horizontal position and at flat position • Perform lap weld for aluminium and stainless steel at horizontal position and at flat position • Perform fillet weld for aluminium and stainless steel at horizontal position and at flat position • Perform square edge butt weld at vertical-up position and at overhead position • Perform lap weld at vertical-up position and at overhead position • Perform fillet weld at vertical-up position and at overhead position • Perform one side full-penetration butt weld on pipe at fixed position of 45 degrees to horizontal 	

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to complete TIG/GTAW tasks for parent materials like carbon steel, stainless steel and aluminum alloy, at specified positions by different jointing methods, without causing obvious surface weld defects; and (ii) Capable to perform TIG/GTAW tasks safely.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUIN212A “Basic tungsten inert gas (TIG) / gas tungsten arc welding (GTAW)”.

1. Title	Perform oxy-acetylene welding (OAW) / oxyfuel and arc cutting (OAC) at specified positions
2. Code	EMCUIN318A
3. Range	Perform oxy-acetylene welding (OAW) / oxyfuel and arc cutting (OAC) at specified positions in electrical and mechanical welding workshops or work sites.
4. Level	3
5. Credits	20
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Preparations for OAW</p> <ul style="list-style-type: none"> ◆ Understand the classification of weld joint in oxy-acetylene welding ◆ Understand the application and adjustment of oxy-acetylene flame ◆ Understand OAW defects such as: <ul style="list-style-type: none"> • surface porosities • surface cracks • undercut, etc ◆ Understand types of steel and formulate the cutting procedures ◆ Understand the basic working principles of oxy-acetylene brazing ◆ know about the classification, specification and standard of oxy-acetylene brazed filler metals ◆ Understand code of practice for OAW / OAC <p>6.2 Apply OAW / OAC</p> <ul style="list-style-type: none"> ◆ Apply OAW/OAC techniques safely <ul style="list-style-type: none"> • Perform two sides square edge butt weld at vertical-up position and at overhead position • Perform fillet weld at vertical-up position and at overhead position • Perform plate cutting by hand-held cutting torch at overhead position <p>6.3 Professionalism in OAW</p> <ul style="list-style-type: none"> ◆ Capable to perform OAW tasks according to relevant guidelines and code of practice
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to complete OAW / OAC tasks at specified positions by different jointing methods, without causing obvious surface weld defects; and</p> <p>(ii) Capable to perform OAW / OAC tasks safely.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUIN226A “Basic oxy-acetylene welding (OAW) / oxyfuel and arc cutting (OAC)”

1. Title	Perform metal inert gas (MIG) / gas metal arc welding (GMAW) at specified positions	
2. Code	EMCUIN319A	
3. Range	Perform MIG/GMAW tasks for parent materials like carbon steel and aluminum alloy at specified positions in electrical and mechanical welding workshops or work sites.	
4. Level	3	
5. Credits	20	
6. Competency		<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Preparations for MIG/GMAW</p> <ul style="list-style-type: none"> ◆ Understand various functions of main MIG/GMAW equipment ◆ Understand the classification of welding wire for MIG/GMAW ◆ Understand the impact of MIG/GMAW parameters on weld profile, such as welding current, welding voltage, gas flowrate, welding speed and angle of welding gun, etc ◆ Understand the weldability of aluminium and its alloy ◆ Understand weld defects ◆ Understand weld joints ◆ Understand how to avoid weldment distortion ◆ Understand code of practice for MIG/GMAW <p>6.2 Apply MIG/GMAW</p> <ul style="list-style-type: none"> ◆ Apply techniques of MIG/GMAW in the following areas: <ul style="list-style-type: none"> • Perform square edge butt weld for aluminium alloy at horizontal position and at flat position • Perform lap weld for aluminium alloys at horizontal position and at flat position • Perform fillet weld for aluminium alloys at horizontal position and at flat position • Perform square edge butt weld at vertical-up position and at overhead position • Perform lap welding at vertical-up position and at overhead position • Perform fillet welding at vertical-up position and at overhead position • Perform one-side full-penetration butt weld on pipe at fixed position of 45 degrees to horizontal <p>6.3 Professionalism in MIG/GMAW</p> <ul style="list-style-type: none"> ◆ Capable to perform MIG/GMAW tasks according to relevant guidelines and code of practice

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to complete MIG/GMAW tasks for different parent materials at specified positions by different jointing methods, without causing obvious surface weld defects; and (ii) Capable to perform MIG/GMAW tasks safely.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUIN211A “Basic metal inert gas (MIG)/gas metal arc welding (GMAW)”.

1. Title	Perform weld joint edge production and assembly according to drawings		
2. Code	EMCUIN320A		
3. Range	Perform weld joint edge production and assembly according to drawings in electrical and mechanical welding workshops or work sites.		
4. Level	3		
5. Credits	15		
6. Competency		<p style="text-align: center;"><u>Performance Requirements</u></p>	
	6.1	Weld joint	<ul style="list-style-type: none"> ◆ Understand the effects of different weld joint parameters on weld profile, such as the bevel angle, groove angle, radius of root, land, depth of bevel, groove face, root face, etc., especially the effect of additional backing plate on the weld quality ◆ Understand basic classification of weld e.g. groove weld, fillet weld, plug weld, slot weld, etc. ◆ Understand the methods of production of weld joint and choose appropriate cutting tools for joint edge preparation, such as oxyacetylene cutting, plasma arc cutting, air-carbon arc cutting, etc. ◆ Understand the code of safety for weld joint edge production and assembly
	6.2	Perform weld joint edge production and assembly according to drawings	<ul style="list-style-type: none"> ◆ Use joint edge production methods and techniques safely to perform weld joint edge production and assembly according to drawings ◆ Use all checking and measuring tools to check the quality and dimensions of major parts of weld joints according to the details of drawings to see if they meet the engineering requirements
	6.3	Professionalism in weld joint edge production and assembly according to drawings	<ul style="list-style-type: none"> ◆ Follow the safety instructions and code of practice for weld joint edge production and assembly to perform basic weld joint edge production and assembly according to drawings
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to follow the safety instructions and code of practice for weld joint edge production and assembly to perform weld joint edge production and assembly according to drawings.</p>		
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUIN227A “Basic weld joint edge production and assembly”.		

1. Title	Perform manual metal arc welding (MMAW) / shielded metal arc welding (SMAW) on different kinds of steel according to drawings										
2. Code	EMCUIN321A										
3. Range	Perform general MMAW/SMAW tasks for common carbon steel, high carbon steel or stainless steel, according to drawings, at electrical and mechanical welding workshops or work sites.										
4. Level	3										
5. Credits	4										
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Preparations for MMAW/SMAW</td> <td> <ul style="list-style-type: none"> ◆ Read the drawings correctly (including symbolisation of welding symbols and welding processes) ◆ Understand the code of safety for MMAW/SMAW ◆ Understand the application of different electrodes ◆ Understand technical requirements of different kinds of steel on different electrodes ◆ Understand the classification of weld examination ◆ Understand the mechanical properties of metals ◆ Understand weld defects such as undercut, overlap, porosities, cracks and slag inclusions </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Perform MMAW/SMAW according to drawings</td> <td> <ul style="list-style-type: none"> ◆ Estimate the impact of welding procedure on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) according to the drawing ◆ Inspect the dimensions of weld and surface weld defects ◆ Select electrodes according to the properties of steels ◆ Use different electrodes for welding ◆ Perform welding tasks according to the properties of different kinds of steel </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in MMAW/ SMAW</td> <td> <ul style="list-style-type: none"> ◆ Perform MMAW/ SMAW tasks according to relevant safety guidelines and code of practice </td> </tr> </table>		6.1	Preparations for MMAW/SMAW	<ul style="list-style-type: none"> ◆ Read the drawings correctly (including symbolisation of welding symbols and welding processes) ◆ Understand the code of safety for MMAW/SMAW ◆ Understand the application of different electrodes ◆ Understand technical requirements of different kinds of steel on different electrodes ◆ Understand the classification of weld examination ◆ Understand the mechanical properties of metals ◆ Understand weld defects such as undercut, overlap, porosities, cracks and slag inclusions 	6.2	Perform MMAW/SMAW according to drawings	<ul style="list-style-type: none"> ◆ Estimate the impact of welding procedure on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) according to the drawing ◆ Inspect the dimensions of weld and surface weld defects ◆ Select electrodes according to the properties of steels ◆ Use different electrodes for welding ◆ Perform welding tasks according to the properties of different kinds of steel 	6.3	Professionalism in MMAW/ SMAW	<ul style="list-style-type: none"> ◆ Perform MMAW/ SMAW tasks according to relevant safety guidelines and code of practice
6.1	Preparations for MMAW/SMAW	<ul style="list-style-type: none"> ◆ Read the drawings correctly (including symbolisation of welding symbols and welding processes) ◆ Understand the code of safety for MMAW/SMAW ◆ Understand the application of different electrodes ◆ Understand technical requirements of different kinds of steel on different electrodes ◆ Understand the classification of weld examination ◆ Understand the mechanical properties of metals ◆ Understand weld defects such as undercut, overlap, porosities, cracks and slag inclusions 									
6.2	Perform MMAW/SMAW according to drawings	<ul style="list-style-type: none"> ◆ Estimate the impact of welding procedure on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) according to the drawing ◆ Inspect the dimensions of weld and surface weld defects ◆ Select electrodes according to the properties of steels ◆ Use different electrodes for welding ◆ Perform welding tasks according to the properties of different kinds of steel 									
6.3	Professionalism in MMAW/ SMAW	<ul style="list-style-type: none"> ◆ Perform MMAW/ SMAW tasks according to relevant safety guidelines and code of practice 									

7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to follow the safety instructions and code of practice to apply MMAW/ SMAW in ne-side full-penetration welding at flat position, at horizontal position, at vertical up position and at overhead position, according to drawings, on different kinds of steel; (ii) Capable to apply MMAW/ SMAW in fillet welding at flat position, at horizontal position, at vertical up position, at vertical down position and at overhead position, according to drawings, on different kinds of steel; and (iii) Capable to point out the classification, specification and application of different electrodes and to select proper electrodes according to the properties of different kinds of steel.
8. Remarks	<p>This unit of competency is suitable for enhancing the competency of electrical and mechanical welding practitioners. The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUIN225A “Basic manual metal arc welding (MMAW)/shielded metal arc welding (SMAW)”.</p>

1. Title	Perform metal inert gas (MIG) / gas metal arc welding (GMAW) according to drawings									
2. Code	EMCUIN322A									
3. Range	Perform general MIG/GMAW on parent materials like carbon steel and aluminium alloy according to drawings, at electrical and mechanical welding workshops or work sites.									
4. Level	3									
5. Credits	4									
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Preparations for MIG/GMAW</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Understand the types of MIG/GMAW machines, their functions and properties, including the wire feeding system and arc characteristics ◆ Understand the MIG/GMAW requirements on welding materials (e.g. welding wire) ◆ Read the drawings correctly (including symbolisation of welding symbols and welding processes) ◆ Understand the code of safety for MIG/GMAW </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Perform MIG/GMAW according to drawings</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Estimate the impact of welding procedure on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) and groove preparation (including preparing and cleaning the groove before welding) according to the drawings ◆ Inspect the dimensions of weld and surface weld defects ◆ Understand the weldability of the joint design </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in MIG/GMAW</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Perform MIG/GMAW tasks according to relevant safety guidelines and code of practice </td> </tr> </table>	6.1	Preparations for MIG/GMAW	<ul style="list-style-type: none"> ◆ Understand the types of MIG/GMAW machines, their functions and properties, including the wire feeding system and arc characteristics ◆ Understand the MIG/GMAW requirements on welding materials (e.g. welding wire) ◆ Read the drawings correctly (including symbolisation of welding symbols and welding processes) ◆ Understand the code of safety for MIG/GMAW 	6.2	Perform MIG/GMAW according to drawings	<ul style="list-style-type: none"> ◆ Estimate the impact of welding procedure on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) and groove preparation (including preparing and cleaning the groove before welding) according to the drawings ◆ Inspect the dimensions of weld and surface weld defects ◆ Understand the weldability of the joint design 	6.3	Professionalism in MIG/GMAW	<ul style="list-style-type: none"> ◆ Perform MIG/GMAW tasks according to relevant safety guidelines and code of practice
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6.2	Perform MIG/GMAW according to drawings	<ul style="list-style-type: none"> ◆ Estimate the impact of welding procedure on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) and groove preparation (including preparing and cleaning the groove before welding) according to the drawings ◆ Inspect the dimensions of weld and surface weld defects ◆ Understand the weldability of the joint design 								
6.3	Professionalism in MIG/GMAW	<ul style="list-style-type: none"> ◆ Perform MIG/GMAW tasks according to relevant safety guidelines and code of practice 								
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to follow the safety instructions and code of practice to apply MIG/GMAW in one-side full-penetration welding at flat position, at horizontal position, at vertical up position , at vertical down position and at overhead positions, according to drawings, on different parent materials; and</p> <p>(ii) Capable to apply MIG/GMAW in fillet welding at flat position, at horizontal position, at vertical up position, at vertical down position and at overhead positions, according to drawings, on different parent materials.</p>									
8. Remarks	This unit of competency is suitable for enhancing the competency of electrical and mechanical welding practitioners. The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUIN211A “Basic metal inert gas (MIG)/gas metal arc welding (GMAW)”.									

1. Title	Perform oxy-acetylene welding (OAW) / oxyfuel and arc cutting (OAC) according to drawings									
2. Code	EMCUIN323A									
3. Range	Perform OAW / OAC tasks according to drawings at electrical and mechanical welding workshops or work sites.									
4. Level	3									
5. Credits	4									
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Code of safety and preparations for OAW / OAC</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Understand the code of safety for OAW / OAC ◆ Know about the preparations for OAW / OAC ◆ Understand functions of various OAW / OAC equipment, including high pressure cylinder, pressure regulator, flashback arrestor, welding torch and cutting torch, etc. ◆ Understand the OAW / OAC technical requirements on welding materials (e.g. welding rods, welding flux etc.) ◆ Read the drawings correctly (including symbolisation of welding symbol and welding processes) </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Perform OAW / OAC according to drawings</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Estimate the impact of welding procedures on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) according to the drawing ◆ Perform visual examination on weld profile </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in handling OAW / OAC</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Perform OAW / OAC tasks according to relevant safety guidelines and code of practice </td> </tr> </table>	6.1	Code of safety and preparations for OAW / OAC	<ul style="list-style-type: none"> ◆ Understand the code of safety for OAW / OAC ◆ Know about the preparations for OAW / OAC ◆ Understand functions of various OAW / OAC equipment, including high pressure cylinder, pressure regulator, flashback arrestor, welding torch and cutting torch, etc. ◆ Understand the OAW / OAC technical requirements on welding materials (e.g. welding rods, welding flux etc.) ◆ Read the drawings correctly (including symbolisation of welding symbol and welding processes) 	6.2	Perform OAW / OAC according to drawings	<ul style="list-style-type: none"> ◆ Estimate the impact of welding procedures on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) according to the drawing ◆ Perform visual examination on weld profile 	6.3	Professionalism in handling OAW / OAC	<ul style="list-style-type: none"> ◆ Perform OAW / OAC tasks according to relevant safety guidelines and code of practice
6.1	Code of safety and preparations for OAW / OAC	<ul style="list-style-type: none"> ◆ Understand the code of safety for OAW / OAC ◆ Know about the preparations for OAW / OAC ◆ Understand functions of various OAW / OAC equipment, including high pressure cylinder, pressure regulator, flashback arrestor, welding torch and cutting torch, etc. ◆ Understand the OAW / OAC technical requirements on welding materials (e.g. welding rods, welding flux etc.) ◆ Read the drawings correctly (including symbolisation of welding symbol and welding processes) 								
6.2	Perform OAW / OAC according to drawings	<ul style="list-style-type: none"> ◆ Estimate the impact of welding procedures on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) according to the drawing ◆ Perform visual examination on weld profile 								
6.3	Professionalism in handling OAW / OAC	<ul style="list-style-type: none"> ◆ Perform OAW / OAC tasks according to relevant safety guidelines and code of practice 								
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to perform OAW / OAC at flat position, at horizontal position, at vertical up position and at overhead positions according to drawings.</p>									
8. Remarks	This unit of competency is suitable for enhancing the competency of electrical and mechanical welding practitioners. The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUIN226A “Basic oxy-acetylene welding (OAW) / oxyfuel and arc cutting (OAC)”.									

1. Title	Perform tungsten inert gas (TIG) / gas tungsten arc welding (GTAW) according to drawings									
2. Code	EMCUIN324A									
3. Range	Perform general TIG /GTAW on parent materials like carbon steel, stainless steel and aluminum alloy according to drawings, at electrical and mechanical welding workshops or work sites.									
4. Level	3									
5. Credits	4									
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Preparations for TIG /GTAW</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Understand the types of TIG /GTAW machines, their functions, arc characteristic and polarity ◆ Understand the TIG /GTAW requirements on welding consumable (e.g. tungsten electrode, welding wire, welding rod, shielding gas) ◆ Read the drawings correctly (including symbolisation of welding symbol and welding processes) ◆ Understand the code of safety for TIG /GTAW </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Perform TIG /GTAW according to drawings</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Estimate the impact of welding procedures on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) and groove preparation (including preparing and cleaning the groove before welding) according to the drawing ◆ Perform visual examination on weld profile </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in TIG /GTAW</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Perform TIG /GTAW tasks according to relevant safety guidelines and code of practice </td> </tr> </table>	6.1	Preparations for TIG /GTAW	<ul style="list-style-type: none"> ◆ Understand the types of TIG /GTAW machines, their functions, arc characteristic and polarity ◆ Understand the TIG /GTAW requirements on welding consumable (e.g. tungsten electrode, welding wire, welding rod, shielding gas) ◆ Read the drawings correctly (including symbolisation of welding symbol and welding processes) ◆ Understand the code of safety for TIG /GTAW 	6.2	Perform TIG /GTAW according to drawings	<ul style="list-style-type: none"> ◆ Estimate the impact of welding procedures on the dimensions of work piece ◆ Perform assembly (including root opening, tack weld and anti-distortion procedure) and groove preparation (including preparing and cleaning the groove before welding) according to the drawing ◆ Perform visual examination on weld profile 	6.3	Professionalism in TIG /GTAW	<ul style="list-style-type: none"> ◆ Perform TIG /GTAW tasks according to relevant safety guidelines and code of practice
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6.3	Professionalism in TIG /GTAW	<ul style="list-style-type: none"> ◆ Perform TIG /GTAW tasks according to relevant safety guidelines and code of practice 								
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to follow the safety instructions and code of practice to apply TIG /GTAW in one-side full-penetration butt welding at flat position, at horizontal position, at vertical-up position and at vertical-down positions, according to drawings, on different parent materials; and</p> <p>(ii) Capable to apply TIG /GTAW in fillet welding at flat position, at horizontal position, at vertical-up position, at vertical-down position and at overhead positions, according to drawings, on different parent materials.</p>									
8. Remarks	This unit of competency is suitable for enhancing the competency of electrical and mechanical welding practitioners. The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUIN212A “Basic tungsten inert gas (TIG) / gas tungsten arc welding (GTAW)”.									

1. Title	Repair air-conditioning and refrigeration systems	
2. Code	EMCUMA304A	
3. Range	Repair air-conditioning and refrigeration systems in servicing stations or external sites.	
4. Level	3	
5. Credits	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Construction and operating principles of air-conditioning and refrigeration systems</p> <ul style="list-style-type: none"> ◆ Understand the construction and operating principles of air-conditioning and refrigeration systems, including the refrigerant piping, condenser, filter and evaporator, etc. <p>6.2 Method of repairing air-conditioning and refrigeration systems</p> <ul style="list-style-type: none"> ◆ Clean and wash the air-conditioning and refrigeration systems, including: <ul style="list-style-type: none"> • Air filter • Using nitrogen to flush the refrigerant piping • Water-cooled condenser and defouling • Air-cooled condenser • Evaporator ◆ Pressure leak check and vacuuming of refrigeration system <ul style="list-style-type: none"> • Use nitrogen to perform pressure leak check for the refrigeration system • Vacuum the refrigeration system with the compressor • Vacuum the refrigeration system with the vacuum pump ◆ Charge the refrigeration system with refrigerant <ul style="list-style-type: none"> • Determine the correct amount of refrigerant to be charged • Understand the advantages and disadvantages of charging refrigerant • Charge a large refrigeration system with refrigerant at the charging valve • Charge liquid refrigerant at the discharge valve of compressor • Charge vapour refrigerant at the suction valve of compressor • Charge refrigerant to a hermetic compressor • Know the methods of liquid charging and vapour charging of refrigerant • Understand the safety precautions for charging liquid refrigerant 	

	<ul style="list-style-type: none"> ◆ Evacuate air and water from the refrigeration system <ul style="list-style-type: none"> • Understand the harm of air and water in the refrigeration system • Determine whether there is air and water in the refrigeration system • Evacuate the air from the refrigeration system • Evacuate the water from the refrigeration system ◆ Pump down and recover refrigerant from the refrigeration system <ul style="list-style-type: none"> • Understand the purpose of pumping down and recovering the refrigerant • Pump down the refrigerant from the refrigeration system to the liquid receiver or condenser • Use a refrigerant recovering machine to recover the refrigerant from the refrigeration system to the refrigerant recovery cylinder ◆ Add and remove refrigerant oil <ul style="list-style-type: none"> • Choose suitable refrigerant oil • Remove refrigerant oil from and add it to the hermetic reciprocating compressor • Remove refrigerant oil from and add it to the hermetic rotary compressor • Remove refrigerant oil from and add it to the open-type compressor <p>6.3 Professionalism in repairing air-conditioning and refrigeration systems</p> <ul style="list-style-type: none"> ◆ Perform air-conditioning and refrigeration systems repairing according to safety regulations and code of practice as required by the law
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to repair air-conditioning and refrigeration systems properly and efficiently, including filling and recovering refrigerant and filling and exhausting coolant oil, according to safety regulations and code of practice.</p>
8. Remarks	<p>This unit of competency is suitable for training air-conditioning and refrigeration engineering personnel. The credit value of this unit of competency is set on the presumption that the person already possesses basic air-conditioning and refrigeration knowledge.</p>

1. Title	Analysis of non-destructive test (NDT) – Ultrasonic Testing
2. Code	EMCUMA311A
3. Range	Use ultrasonic testing instruments, at servicing centres or locations with operating equipment, to detect, analyze and examine internal damages of metallic equipment.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Techniques and principles of ultrasonic testing for internal damages of metallic equipment</p> <ul style="list-style-type: none"> ◆ Understand techniques and principles of ultrasonic testing and examination for internal damages of metallic equipment ◆ Understand the advantages and limitations of ultrasonic testing, especially with reference to those of liquid penetrant testing, magnetic particle testing and x-ray testing <p>6.2 Methods and procedures of analyzing and examining damages on metal equipment</p> <ul style="list-style-type: none"> ◆ Understand the influence of the metallic internal structure on damage examination and analysis ◆ Use ultrasonic testing instruments effectively to analyze and examine internal damages or structure defects such as voids and pores on the metal equipment ◆ Use ultrasonic instruments to measure and calculate crack positions and size ◆ Mark the position with cracks effectively ◆ Base on the pros and cons of various types of NDTs to recommend on and conduct ultrasonic testing so as to confirm the positions and degree of work piece damages or structure defects ◆ Keep record of testing effectively <p>6.3 Professionalism in inspecting and examining damages on metal equipment</p> <ul style="list-style-type: none"> ◆ Have adequate hands-on practice in ultrasonic testing for internal damages according to professional qualification requirements, and record and analyze damages ◆ Inspect and analyze damages on metal equipment or structure defects safely according to guidelines on the use of materials and code of practice ◆ Understand international standards or in-house guidelines, and report the positions and size of damages or structure defects identified according to requirements

7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <ul style="list-style-type: none"> (i) Capable to use ultrasonic testing effectively to detect, examine and analyze internal damages or structure defects of the metallic equipment; to measure and calculate crack positions and size and to record and mark properly; and (ii) Capable to point out the pros and cons of ultrasonic testing with reference to those of liquid penetrant testing, magnetic particle testing and x-ray testing
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUMA202A “Non-destructive test (NDT) - ultrasonic testing”.</p>

1. Title	Analysis of non-destructive test (NDT) - magnetic particle testing		
2. Code	EMCUMA313A		
3. Range	Use magnetic particle testing method, at servicing centres or locations with operating equipment, to analyze and examine surface or sub-surface cracks and weld defects on metal equipment or materials.		
4. Level	3		
5. Credits	3		
6. Competency	<u>Performance Requirements</u>		
	6.1	Techniques and principles of inspecting metal equipment or materials for cracks	<ul style="list-style-type: none"> ◆ Understand the principles of magnetic particle testing used to inspect metal equipment or materials for surface or sub-surface cracks ◆ Understand the relationship between current and magnetic field ◆ Know about magnetic conductivity for various types of ferromagnetic metals ◆ Understand the merits and limitations of magnetic particle testing, especially with reference to those of liquid penetrant testing, ultrasonic testing and x-ray testing
	6.2	Methods and procedures of analyzing and examining cracks on metal equipment or materials	<ul style="list-style-type: none"> ◆ Use magnetic particle testing effectively to examine and analyze surface or sub-surface cracks on metal equipment ◆ Choose suitable amount of current for magnetic particle testing according to different magnetic conductivity for various types of metals ◆ Base on the pros and cons of various types of NDTs to recommend on and conduct magnetic particle testing so as to confirm the positions and degree of work piece damages or structure defects ◆ Mark the positions with cracks effectively
	6.3	Professionalism in inspecting and examining metal equipment and materials for cracks	<ul style="list-style-type: none"> ◆ Have adequate hands-on practice in crack inspection according to professional qualification requirements, and record and analyze cracks ◆ Inspect and analyze surface or sub-surface cracks on metal equipment or materials safely according to guidelines on the use of materials and code of practice ◆ Understand international standards or in-house guidelines, and report the positions and size of surface or sub-surface cracks identified according to requirements

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to use magnetic particle testing to examine and analyze surface or sub-surface cracks on metal equipment; and (ii) Capable to point out the pros and cons of magnetic particle testing with reference to liquid penetrant testing, ultrasonic testing and x-ray testing.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMCUMA201A “Non-destructive test (NDT) - magnetic particle inspection”.

1. Title	Test diesel engines
2. Code	EMCUMA314A
3. Range	Use typical or tailor-made mechanical tools to test diesel engines at servicing workshops or locations with diesel engines according to testing instructions and standards.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Working principles of diesel engines ♦ Understand the structure and working principles of various component systems of diesel engine</p> <p>6.2 Methods and procedures of testing diesel engines ♦ Test various component systems and fittings of a diesel engine effectively according to testing instructions and standards ♦ Test the overall performance of a diesel engine ♦ Use common and tailor-made mechanical tools effectively ♦ Keep record of data effectively</p> <p>6.3 Professionalism in diesel engine test ♦ Perform general tests on diesel engines independently according to testing instructions and standards ♦ Use instruments to measure air and noise pollution caused by the diesel engine ♦ Understand the legal requirements on work safety and the code of practice when performing tests on diesel engines</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to test the core systems of a diesel engine effectively and correctly according to testing instructions and standards as well as the requirements on work safety and the code of practice, to keep record of data effectively and check the performance of the diesel engine.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of mechanical equipment servicing.

1. Title	Procure simple electrical and mechanical engineering equipment and materials
2. Code	EMCUOM301A
3. Range	Know how to procure simple electrical and mechanical engineering equipment and materials, and control the procurement cost for the electrical and mechanical operation management.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Procurement procedures for general and simple electrical and mechanical engineering equipment and materials</p> <ul style="list-style-type: none"> ◆ Understand the procurement procedures for general and simple electrical and mechanical engineering equipment and materials, such as liaising with suppliers, assessing the quality and prices of materials from the suppliers, general ordering and payment procedures, etc. <p>6.2 Procure simple electrical and mechanical engineering equipment and materials</p> <ul style="list-style-type: none"> ◆ List out correctly the details, specifications and standards of the equipment and materials to be procured ◆ Procure equipment and materials needed according to the specifications and requirements for procurement of general and simple electrical and mechanical engineering equipment and materials ◆ Bargain with the suppliers so as to control the procurement costs of the equipment and materials
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to list out the specifications and requirements for procurement of general electrical and mechanical engineering equipment and materials; and</p> <p>(ii) Capable to control the procurement costs of general electrical and mechanical engineering equipment and materials.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Handle and review customers' complaints about electrical and mechanical product or service quality
2. Code	EMCUQM302A
3. Range	With regard to electrical and mechanical service quality management, analyze, review and handle customers' complaints properly, in clearly-defined conditions, according to in-house instructions.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 In-house instructions on handling customers' complaints ♦ Understand in-house instructions on handling customers' complaints about electrical and mechanical product or service quality</p> <p>6.2 Analyze, handle and review customers' complaints about electrical and mechanical product quality ♦ Analyze and handle customers' complaints about electrical and mechanical product or service quality properly according to in-house instructions, including:</p> <ul style="list-style-type: none"> • Referring the complaints to departments concerned to follow up and review of causes of the issues • Analyzing causes of the complaints and solving the problems with departments concerned • Handling and responding to the customers' complaints about quality or service <p>♦ review customers' complaints about electrical and mechanical product quality or service</p> <ul style="list-style-type: none"> • analyze customers' satisfaction on the handling of complaints based on information from survey questionnaire on complaints • review the way of handling complaints • review the performance of handling complaints
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to analyze and handle customers' complaints about electrical and mechanical product quality, and make reviews.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of quality management.

1. Title	Implement quality control and quality assurance
2. Code	EMCUQM303A
3. Range	Implement quality control and quality assurance according to engineering procedures for electrical and mechanical services to achieve high quality engineering performance.
4. Level	3
5. Credits	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Engineering procedures and quality control points of electrical and mechanical services</p> <ul style="list-style-type: none"> ◆ Understand the engineering procedures for electrical and mechanical services ◆ Understand quality monitoring points of each engineering procedure, including the electrical and mechanical installation procedure, inspection procedure, debugging procedure, commissioning procedure and servicing procedure ◆ Understand the quality control system of the organization and ensure that the service quality meet the requirements, including: <ul style="list-style-type: none"> • Ensuring that the engineering procedures meet the quality requirements and performance indicators • Confirming and rectifying procedures not complying with regulations • Organize teams to formulate quality improvement plans <p>6.2 Implement quality control and quality assurance</p> <ul style="list-style-type: none"> ◆ Follow the quality management scheme, quality assurance procedures and verification specifications to implement quality assurance ◆ Strictly examine the major monitoring points of each engineering procedure to ensure the quality performance of procedures ◆ Record various engineering quality problems and report to the management through the communication mechanism
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to implement quality control and quality assurance system, master the verification specifications and examine the major monitoring points of each engineering procedure to ensure the quality performance.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of quality management.

1. Title	Formulate simple quality assurance plan and quality assurance reports
2. Code	EMCUQM304A
3. Range	With regard to electrical and mechanical engineering design, and in clearly-defined conditions, formulate simple quality assurance plan for all process for electrical and mechanical services and compile quality assurance reports on electrical and mechanical services.
4. Level	3
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Format, key points and relevant concerns of quality assurance reports ♦ Understand the format, key points and relevant concerns of quality assurance reports on electrical and mechanical services</p> <p>6.2 Compile quality assurance reports on electrical and mechanical services and formulate simple quality assurance plan ♦ Compile quality assurance reports on electrical and mechanical services with correct format ♦ Formulate simple quality assurance plan, including:</p> <ul style="list-style-type: none"> • Quality management standards and technical requirements • Quality management staff's responsibilities • Quality management resources arrangement • Quality management work instructions • Quality monitoring points of electrical and mechanical engineering process • Confirm the method and items of quality assurance and check • Measures to rectify quality deviations • Internal quality audit • File record management system
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to compile quality assurance reports on electrical and mechanical services and formulate simple quality assurance plan.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of quality management.

1. Title	Record quality issues on electrical and mechanical services
2. Code	EMCUQM306A
3. Range	With regard to quality management of electrical and mechanical services, record all the quality main points of each engineering process, quality issues and problems to provide information for the management to formulate quality assurance reports.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Format and key points of quality assurance report on electrical and mechanical services ♦ Understand format, key points and record required of quality assurance report on electrical and mechanical services</p> <p>6.2 Record all kinds of engineering quality issues and problems ♦ Strictly examine the major quality main points of each engineering process and record all kinds of engineering quality issues and problems</p> <ul style="list-style-type: none"> • Follow the quality plan in order to execute quality assurance system, master the verification specifications, strictly examine the major control points of each engineering process, record all quality related issues, such as quality level for each action, non-compliance with regulations, errors, defects, deviation, excesses or shortfalls, etc. <p>♦ Quantify issues and problems on quality management so as to provide sufficient data or information for the management to produce the quality assurance reports</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to examine each engineering process; quantify quality management issues and problems so as to provide sufficient data or information for the management to produce the quality assurance reports.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concepts of quality management.

1. Title	Investigate general industrial accidents
2. Code	EMCUSH305A
3. Range	Investigate industrial accidents related to electrical and mechanical services and propose solutions to improve occupational safety and health, and be capable to write accident investigation reports.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 General industrial accident investigation</p> <ul style="list-style-type: none"> ◆ Understand procedures for industrial accident investigation, including investigating by accident type, recording the happening of accident, collecting information and reporting the accident to relevant departments <p>6.2 Handle industrial accidents</p> <ul style="list-style-type: none"> ◆ Investigate industrial accidents related to electrical and mechanical services <ul style="list-style-type: none"> • Be capable to handle and investigate industrial accidents related to electrical and mechanical services according to the code of practice required for handling industrial accidents, including informing employers concerned, the Labour Department, the police and the families of the victims; filling in declaration form; investigating and recording the people, place, time and date, the machinery involved, the course of the accident, causes for it, etc. • Use objective methods and techniques to investigate and collect information. The investigation work includes on-the-spot investigation, interviewing the victims/witnesses in person or on the phone, using questionnaire, etc. ◆ Report the accident to relevant departments ◆ Assist relevant departments to investigate the accident ◆ Improvement plans <ul style="list-style-type: none"> • Make improvement plans to reduce similar industrial accidents • Understand the causes of industrial accidents and ways of prevention ◆ Write accident investigation reports <ul style="list-style-type: none"> • Understand the document format and wording required and write accident investigation reports
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to handle and investigate industrial accidents related to electrical and mechanical services according to the code of practice required for handling industrial accidents, to make improvement plans and write accident investigation reports.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety knowledge.

1. Title	Perform occupational safety and health supervision
2. Code	EMCUSH308A
3. Range	Master safety management techniques and occupational safety and health knowledge to perform occupational safety and health supervision in electrical and mechanical workplaces in order to comply with relevant safety legislations and the engineering contract requirements.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Concepts and techniques of occupational safety and health supervision</p> <ul style="list-style-type: none"> ◆ Understand the concepts and techniques of safety management in order to perform safety supervision, including: <ul style="list-style-type: none"> • Work safety requirements of the electrical and mechanical engineering contract • Safety inspection • Accident investigation • Safety audit and check • Work site tidiness and hygiene • Safety promotion • Risk assessment • Safety committee • Knowledge of latest safety legislations and their recent amendments <p>6.2 Occupational safety and health supervision</p> <ul style="list-style-type: none"> ◆ Apply knowledge and techniques of occupational safety and health supervision to perform occupational safety and health supervision for electrical and mechanical work in order to comply with relevant safety legislations and the engineering contract requirements
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply safety management techniques and occupational safety and health knowledge to perform occupational safety and health supervision for electrical and mechanical work according to relevant safety legislations and contract requirements.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic occupational safety and health knowledge.

1. Title	Apply sales and marketing techniques
2. Code	EMCUMS301A
3. Range	Apply sales and marketing techniques, in workplaces where electrical sales and marketing is involved, to perform sales and marketing related to engineering projects.
4. Level	3
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic concepts of sales and marketing</p> <ul style="list-style-type: none"> ◆ Understand basic concepts of sales and marketing ◆ Understand the relationship between sales and marketing and different process of an engineering project: <ul style="list-style-type: none"> • Quotation • Preparations for the project • Design and procurement • Electrical and mechanical equipment installation • Requirement details of the inspection, debugging and commissioning of electrical and mechanical equipment • Requirement details of the operation, maintenance and servicing of electrical and mechanical equipment <p>6.2 Sales and marketing techniques</p> <ul style="list-style-type: none"> ◆ Know the application of all types of sales and marketing methods such as: <ul style="list-style-type: none"> • Sales and marketing techniques for general electrical and mechanical installation products and engineering services, e.g. general newspaper advertisement and leaflets by post • Sales and marketing techniques for specific electrical and mechanical installation products and engineering services, e.g. professional advertisement for engineering and business-to-business direct sale • Sales and marketing manpower organizational chart • Authority and responsibilities of sales and marketing staff at different levels • Concepts and limitations of local sales and marketing network • Sales and marketing flowchart • Sales and marketing review
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply sales and marketing techniques to perform sales and marketing related to engineering projects.</p>
8. Remarks	This unit of competency is applicable to electrical and mechanical practitioners in general.

1. Title	Repair faults in generator and its accessories
2. Code	EMCUOR307A
3. Range	Repair the faults in generator and its accessories at servicing stations or external sites.
4. Level	3
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and working principles of generator and its accessories ♦ Understand the structure and working principles of generator and its accessories</p> <p>6.2 Find and repair faults in generator and its accessories ♦ Repair the fault in a generator</p> <ul style="list-style-type: none"> • Check the following generator components and accessories to find out the root of fault according to the signs of fault and based on the understanding of the working principles of generator: <ul style="list-style-type: none"> ▸ All magnetic coils in the generator ▸ Magnetic circuit and equipment ▸ Overspeed mechanical protector ▸ Auxiliary generator ▸ Battery unit • Repair the fault after finding out the fault equipment or component <p>6.3 Professionalism in repairing generator and its accessories ♦ Repair the generator and its accessories according to the safety regulations and code of practice</p> <p>♦ Write a simple repair report according to the damage of the generator and its accessories</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to find out the faults in generator and its accessories within a reasonable period of time according to the symptoms of fault;</p> <p>(ii) Capable to handle and eliminate the fault in generator and its accessories effectively; and</p> <p>(iii) Capable to write simple repair reports.</p>
8. Remarks	<p>This unit of competency is suitable for training electrical and mechanical engineering personnel involving in the work of generators. The credit value of this unit of competency is set on the presumption that the person already possesses basic competency of repairing generator and its accessories.</p>

1. Title	Repair faults in diesel engines
2. Code	EMCUOR308A
3. Range	Repair the faults in diesel engines at servicing stations or external sites.
4. Level	3
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and working principles of diesel engine ♦ Understand the structure and working principles of diesel engine</p> <p>6.2 Find and repair faults in diesel engines ♦ Repair the fault in diesel engine</p> <ul style="list-style-type: none"> • Check the diesel engine and its control equipment, including the following equipment and systems, to find out the root of fault according to the signs of fault by applying the working principles of diesel engine and its control equipment: <ul style="list-style-type: none"> › Engine cylinder and its mechanism › Fuel supply system › Fuel injector and filter › Governor › Supercharger and turbo-charger › Cooling system and equipment › Lubricating system and equipment › Initial acceleration mechanical protection • Repair the fault after finding out the fault equipment or component <p>6.3 Professionalism in repairing diesel engines ♦ Repair the diesel engine according to the safety regulations and code of practice</p> <p>♦ Write a simple repair report according to the damage of the diesel engine</p>
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to find out the fault in the diesel engine within a reasonable period of time according to the symptoms of fault;</p> <p>(ii) Capable to handle and eliminate effectively the fault in the diesel engine; and</p> <p>(iii) Capable to write simple repair reports.</p>
8. Remarks	This unit of competency is suitable for training electrical and mechanical engineering personnel involving in the work of diesel engine. The credit value of this unit of competency is set on the presumption that the person already possesses basic competency of repairing diesel engines.

1. Title	Repair faults in control and protection device of diesel engines and generators
2. Code	EMCUOR309A
3. Range	Repair faults in control and protection device of diesel engines and generators in servicing stations or external sites.
4. Level	3
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Composition and working principles of control and protection device of diesel engines and generators</p> <ul style="list-style-type: none"> ◆ Understand the composition and working principles of control and protection device of diesel engines and generators <p>6.2 Find and repair faults in control and protection device of diesel engines and generators</p> <ul style="list-style-type: none"> ◆ Repair faults in control equipment of diesel engines and generators <ul style="list-style-type: none"> • Check the control equipment of diesel engines and generators, including the following, to find out the root of fault according to the signs of fault by applying the working principles of control equipment of diesel engines and generators: <ul style="list-style-type: none"> ▸ Speed controller of the diesel engine ▸ Magnetic field control circuit and equipment of the generator ▸ Load regulator of the generator and its control circuit ▸ Control circuit of the auxiliary generator ▸ Control circuit of the battery unit ▸ Circuit breaker and relay • Repair the fault after finding out the faulty equipment or component ◆ Repair the fault in protection device of diesel engines and generators <ul style="list-style-type: none"> • Repair the protection device of diesel engines and generators, including: <ul style="list-style-type: none"> ▸ Engine and generator overspeed protection circuit ▸ Engine overheat alarm ▸ Water thermometer ▸ Generator overload protector • Measure data output of the generator • Repair the fault after finding out the faulty equipment or component

	<p>6.3 Professionalism in repairing control and protection device of diesel engines and generators</p> <ul style="list-style-type: none"> ◆ Repair the control and protection device of diesel engines and generators according to the safety regulations and code of practice ◆ Write a simple repair report according to the damage of the control and protection device of diesel engines and generators
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to find out the fault in the control and protection device of a diesel engine within a reasonable period of time according to the symptoms of fault; (ii) Capable to find out the fault in the control and protection device of a generator within a reasonable period of time according to the symptoms of fault; (iii) Capable to handle and eliminate effectively the fault in the control and protection device of diesel engines and generators; and (iv) Capable to write simple repair reports.
8. Remarks	<p>This unit of competency is suitable for training electrical and mechanical engineering personnel involving in the work of diesel generator. The credit value of this unit of competency is set on the presumption that the person already possesses basic competency of repairing control and protection device of diesel engines and generators.</p>

1. Title	Basic calculations for ship design	
2. Code	EMSRDE301A	
3. Range	Apply the basic knowledge of marine engineering, including geometry, calculations of ship area and volume, to daily tasks of calculations related to ship design.	
4. Level	3	
5. Credit	9	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of ship design</p> <ul style="list-style-type: none"> ◆ Know about the descriptive terms and definitions of ship appearances <ul style="list-style-type: none"> • Overall length, length between perpendiculars, designed waterline length, mould depth and mould width • Moulded draught, maximum draught and mean draught • Waterline bow-to-stern hull and parallel middle body • Internal volume of a ship • Gross tonnage and net tonnage • Relevant symbols and marks ◆ Know about the coefficients related to ships <ul style="list-style-type: none"> • Block coefficient • Prismatic coefficient • Midship cross section coefficient • Water plane area coefficient • Vertical prismatic coefficient ◆ Know about buoyancy and hydrodynamics, such as: <ul style="list-style-type: none"> • Archimedes principle • Factors affecting the absolute pressure of fluids, such as acceleration due to gravity and depth from water level • Knowledge and calculation of centroids, such as centre of buoyancy and centre of gravity <p>6.2 Methods of using calculations for ship design</p> <ul style="list-style-type: none"> ◆ Master ship calculations and data for analysis of design feasibility; calculations include: <ul style="list-style-type: none"> • Bonjean curve and its application • Application of displacement sheet • Calculation of the area, volume, centre of mass, torque and buoyancy of a ship <p>6.3 Professionalism in using calculations for ship design</p> <ul style="list-style-type: none"> ◆ Apply relevant knowledge (such as hydrostatics and change of centre of buoyancy at draught and displacement) to analysis of actual navigation in addition to the use of primary data of ships 	

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to calculate the area, volume, centre of mass, torque and buoyancy of a ship; and (ii) Capable to apply the above calculations to assist in ship design.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of calculations and physics.

1. Title	Assemble and install marine engineering system and mechanical equipment	
2. Code	EMSRIN301A	
3. Range	Install deck equipment of small boats (boat length less than 100m) according to the operation characteristics of the system.	
4. Level	3	
5. Credit	9	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Characteristics and operating principles of general marine engineering system and mechanical equipment</p> <ul style="list-style-type: none"> ◆ Understand the operating principles and assembly arrangement of the following marine engineering equipment system and mechanical equipment <ul style="list-style-type: none"> • main engine system and its mechanical equipment • auxiliary machinery system and its mechanical equipment • characteristics of gas supply system • marine boiler system and its mechanical equipment • marine steam turbine equipment system and its mechanical equipment • marine gas turbine equipment system and its mechanical equipment • rudder steering system and its mechanical equipment • pump suction and discharge system and its mechanical equipment • propelling system and its mechanical equipment • refrigeration system and its mechanical equipment • anti-corrosion and anti-fouling • marine fire system and its mechanical equipment • marine electric power system and its mechanical equipment <p>6.2 Methods and procedures of installing general marine engineering system and equipment</p> <ul style="list-style-type: none"> ◆ Use relevant tools to assemble and install typical marine engineering equipment and be able to: <ul style="list-style-type: none"> • Master the characteristics and limitations of craft skills used to assemble and install marine engineering system and mechanical equipment • consider the nature and parameters of the system and components in the course of assembly and installation 	

	<p>6.3 Professionalism in installing general marine engineering and system equipment</p> <ul style="list-style-type: none"> ◆ Properly follow important assembly instruction and parameters (e.g. installation manual, manufacturer’s guidelines, etc.) for typical marine engineering equipment system components ◆ Correctly select appropriate installation materials and assembly method to comply with the prescribed tolerance ◆ Use appropriate equipment and mechanical tools and comply with general safety practices
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to correctly install general marine engineering system and mechanical equipment according to installation procedures, use tools and instruments, record data and adjust the equipment to prescribed standard ; and</p> <p>(ii) Capable to follow the prescribed safety rules and procedures to implement the installation work.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of marine engineering equipment system and the ability to assemble equipment (such as: EMSRIN101A”Read main basic ship hull drawings” and EMSRIN201A”Basic layout and assembly of ship power units”).</p>

1. Title	Position and assemble ship-deck equipment
2. Code	EMSRIN302A
3. Range	Master and make use of the characteristics of various types of equipment to install ship deck equipment when performing related installation or repair works.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about main ship-deck equipment</p> <ul style="list-style-type: none"> ◆ Know about the functions of main ship structure ◆ Know about typical dimension construction of ship's centre part ◆ Know about the characteristics of the following deck equipment: <ul style="list-style-type: none"> • anchor and chain • windlass and winch system • chain pipe • hawser pipe • chain locker • chain stopper • marine machinery switching devices ◆ Know about the layout and assembly arrangement of cargo loading system <ul style="list-style-type: none"> • derricks • ship's cranes • conveyor • containers-ship-borne cranes • cargo lines and stripping line • cabin cover ◆ Know about the layout and assembly arrangement of lifeboat equipment <ul style="list-style-type: none"> • propeller • layout and installation of boat rack • arrangement of boat hanging rope • unhooking device ◆ Know about the loading and unloading arrangement for lifeboat ◆ Know about the layout and assembly arrangement of deck fire equipment ◆ Know about the application of different types of hatch closing gear

	<p>6.2 Methods of positioning and assembling main deck equipment of boats</p> <ul style="list-style-type: none"> ◆ Apply requirements on safe operation of relevant deck equipment to replace or install boat components or installations ◆ Use relevant tools to adjust and assemble ship cargo loading system equipment ◆ Follow prescribed procedures and legal requirements to plan and implement the positioning and assembly of life-saving equipment of boats <p>6.3 Professionalism in positioning and assembling main deck equipment of boats</p> <ul style="list-style-type: none"> ◆ Properly follow important assembly instruction parameters (e.g. installation manual, manufacturer’s guidelines, etc.) for typical deck equipment and cargo loading system components ◆ Correctly select appropriate installation materials and assembly method to comply with the prescribed tolerance ◆ Use appropriate equipment and mechanical tools and comply with general safety practices
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Know how to correctly implement installation procedures of modern boat’s deck equipment, use tools and instruments, record data and adjust the equipment to prescribed standard ; and</p> <p>(ii) Capable to follow the prescribed safety rules and procedures to implement the installation work.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of marine engineering equipment layout (such as: EMSRIN101A”Read main basic ship hull drawings” and EMSRIN201A”Basic layout and assembly of ship power units”).</p>

1. Title	Install and disassemble marine electronic instruments	
2. Code	EMSRIN303A	
3. Range	Master and make use of the characteristics of various types of equipment to install and disassemble marine electronic instruments when performing related installation or repair works.	
4. Level	3	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Characteristics and working principles of general marine electronic instruments</p> <ul style="list-style-type: none"> ◆ Know about marine electrical engineering and electronic engineering, and the basic working principles of instruments and equipment ◆ Know about the characteristics of actual operation and range of control for various types of marine electrical and electronic control equipment ◆ Be familiar with installation and disassembly guide for common marine electronic instruments <p>6.2 Methods and procedures of installing and disassembling general marine electronic instruments</p> <ul style="list-style-type: none"> ◆ Use appropriate tools to assemble, disassemble and install marine electronic instrument and: <ul style="list-style-type: none"> • Master the characteristics and limitations of craft skills used to assemble and install common marine electronic instruments • Follow requirements of relevant manuals to implement installation and disassembly procedure in order to meet the technical specifications <p>6.3 Professionalism in installing and disassembling general marine electronic instruments</p> <ul style="list-style-type: none"> ◆ Properly follow important assembly instruction parameters (e.g. installation manual, manufacturer's guidelines, etc.) for marine electronic instrument components ◆ Correctly use measure and calibrate instruments and take reasonable measures ◆ Use appropriate equipment and mechanical tools and comply with general safety practices 	

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Know how to correctly implement procedures of installing and disassembling general marine electronic instruments, use tools and instruments, record data and calibrate the instruments to the prescribed standard ; and (ii) Capable to accurately know the effect of the installation or disassembly process on the accessory installations and system, and correctly understand the drawings in order to implement the work.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic ship, equipment arrangement and electronic technology knowledge. (such as: EMSRIN201A “Basic layout and assembly of ship power units” and EMSRIN202A “Basic layout of marine electrical installations”) °</p>

1. Title	Inspect, repair and install general piping
2. Code	EMSRIN304A
3. Range	Inspect, repair and install general low or medium pressure pipes on board, at repair workshops or at related work sites of dockyards.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Characteristics of common piping materials and common tools for working on pipes, and working principles of pipe drawings</p> <ul style="list-style-type: none"> ◆ Understand the characteristics and materials commonly used for installation, inspection and repair of pipes, including: <ul style="list-style-type: none"> • Types of pipes • Types of flanges • Bends and tees • Hardware parts • Joint accessories • Filler materials • Bedding and coating materials • Heat insulation materials ◆ Know how to use piping tools and instruments including: <ul style="list-style-type: none"> • Pumps for water pressure test pump and pressure gauge • Grove machine • Pipe-bending machine • Grinding machine, cutting machine • Level gauge ◆ Know how to read and understand mechanical drawings of general equipment <ul style="list-style-type: none"> • Structural drawings • Sketches for machining parts • Piping layouts • Pipelines stereogram • System drawings • Common parts drawings • Assembly drawings • Know the meanings of symbols on the drawings, including tolerance match, surface finish and geometrical tolerance

	<p>6.2 Procedures and requirements for installing, inspecting and repairing low or medium pressure pipe system</p> <ul style="list-style-type: none"> ◆ Know how to inspect, repair and install low or medium pressure (below 30 bar) pipes, including: <ul style="list-style-type: none"> • Formulating procedures and requirements within the scope of work • Producing low pressure pipes including: straight pipes, winding pipes, straight tees, all kinds of pipe accessories and supporting and hanging units • Estimating the material requirements for laying low pressure pipes ◆ Know all aspects of pipe installation, inspection and repair within the scope of work, including the system's: <ul style="list-style-type: none"> • Hydraulic test • Flushing and dirt removal • Washing • Acid cleaning • Passivation <p>6.3 Professionalism in repairing low or medium pressure pipes</p> <ul style="list-style-type: none"> ◆ Follow the requirements of drawings to carry out piping installation, inspection and repair ◆ Follow the engineering requirements to control the installation progress, ensuring that the installation meets the engineering requirements and quality standard ◆ Understand safety guidelines as required by the law, code of practice and supplier's installation and repair guidelines to carry out pipe work installation, inspection and repair
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to install, inspect and repair low or medium pressure pipe systems; (ii) Capable to correctly arrange and install measuring instruments to correctly measure, record data and adjust various axial alignment to required standard; and (iii) Capable to compile installation and examination reports and clearly describe the operational status of various types of pipe systems.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic techniques of installing, disassembling and repairing pipes.</p>

1. Title	Examine the shapes and dimensions of prefabricated pieces according to standards
2. Code	EMSRIT301A
3. Range	In regular inspection, commissioning and testing of ship-repair works, apply the knowledge of welding and fabrication to examine welded, fabricated and rolled pieces to check whether the shape and dimension of prefabricated pieces /work pieces meet the engineering requirements, such as information on drawings or in standards of the survey company.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of examining welded, fabricated and rolled pieces according to standards</p> <ul style="list-style-type: none"> ◆ Master the effects of the technical limitations of welding, fabrication and rolling on the precision of work pieces to be produced ◆ Master the basic working principles and standards for the production of welded, fabricated or rolled work pieces , such as: <ul style="list-style-type: none"> • Relationship between the properties of materials, such as their types, thickness, distance and angle, and the welding method • Relationship between the shortest distance of the nodal rivets and the margin of the structural piece with the bolt and rivet • Procedures and requirements of post-weld heat treatment <p>6.2 Methods of examining welded, fabricated and rolled pieces according to standards</p> <ul style="list-style-type: none"> ◆ Effectively use appropriate examination tools or instruments to examine the shapes and dimensions of welded, fabricated and rolled pieces, such as: <ul style="list-style-type: none"> • Using curve model to check the shape of weld seams • Using profile model to check shell curvature and shapes of other elements • Accurately measure dimensions of work pieces
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to correctly examine the shapes and dimensions of welded, fabricated and rolled pieces according to standards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of inspection, commissioning and testing and know how to read relevant engineering drawings (such as: EMSRIN101A "Read main basic ship hull drawings" and EMSRIT201A "Test the physical strength of materials") °

1. Title	Test automatic installations	
2. Code	EMSRIT302A	
3. Range	Regarding regular inspection, commissioning and testing for ship repair and marine engineering works, assist in planning test arrangements and implementing the tests for automatic installations, and use the test results for analysis.	
4. Level	3	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of testing automatic installations</p> <ul style="list-style-type: none"> ◆ Master the indicators and cycle of testing automatic equipment, and procedures and performance criteria for testing automatic installations ◆ Be familiar with the sensing and transmission mode of signals of automatic systems ◆ Master the operating principles of pneumatic and electronic transmission systems ◆ Master basic regulation concept and the operating principles of open and closed loop regulation systems <p>6.2 Methods and procedures of testing automatic installations</p> <ul style="list-style-type: none"> ◆ Systematically implement tests on ship and marine automatic installations ◆ Know how to illustrate all processes of the operation of automatic installations with block diagrams ◆ Interpret display signals for the monitoring and alarm of the installation system, and process and integrate the messages ◆ Master the regulation techniques, and process and integrate the regulated data according to the inter-relationship of input and output items ◆ Appropriately coordinate the functional performance of automatic installations and its components after testing <p>6.3 Professionalism in testing automatic installations</p> <ul style="list-style-type: none"> ◆ Follow user manuals of ship or marine automatic installations and make use of the knowledge and experience of equipment test indicators to implement test procedures and analyze test data ◆ Record the setting point of each test item, and maintain effective monitoring and alarm required after regulation ◆ Assist in planning test arrangements 	

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to correctly implement test procedures for ship and marine automatic installations, use testing tools and equipment, record and process data, and use the data to clearly demonstrate the test results.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of inspection, commissioning and testing.

1. Title	Hull-stability examination and inclination test									
2. Code	EMSRT303A									
3. Range	Perform inspections or commissioning of ships at test sites for stability and inclination, and consolidate relevant data for test reference. The competency in this unit is applicable to inspections and commissioning related to regular ship repairs, such as assisting in planning test arrangements and implementing the tests.									
4. Level	3									
5. Credit	3									
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Basic knowledge of lateral , longitudinal stability technology</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Know about basic lateral movement, longitudinal and lateral change of drive centre, including: <ul style="list-style-type: none"> • centre of buoyancy • righting moment • effect of ship loading condition, hanging weight or free surface on lateral stability ◆ Understand the effect of changes in water density on draught </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Methods of hull stability examination and inclination test</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Use inclination test technology to perform ship stability-tests and consider the effect of ship in drydocking on its draught and stability </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in hull stability examination and inclination test</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ perform the test according to inclining experiment /steps, and use appropriate illustration to make a summary report on the ship stability test </td> </tr> </table>	6.1	Basic knowledge of lateral , longitudinal stability technology	<ul style="list-style-type: none"> ◆ Know about basic lateral movement, longitudinal and lateral change of drive centre, including: <ul style="list-style-type: none"> • centre of buoyancy • righting moment • effect of ship loading condition, hanging weight or free surface on lateral stability ◆ Understand the effect of changes in water density on draught 	6.2	Methods of hull stability examination and inclination test	<ul style="list-style-type: none"> ◆ Use inclination test technology to perform ship stability-tests and consider the effect of ship in drydocking on its draught and stability 	6.3	Professionalism in hull stability examination and inclination test	<ul style="list-style-type: none"> ◆ perform the test according to inclining experiment /steps, and use appropriate illustration to make a summary report on the ship stability test
6.1	Basic knowledge of lateral , longitudinal stability technology	<ul style="list-style-type: none"> ◆ Know about basic lateral movement, longitudinal and lateral change of drive centre, including: <ul style="list-style-type: none"> • centre of buoyancy • righting moment • effect of ship loading condition, hanging weight or free surface on lateral stability ◆ Understand the effect of changes in water density on draught 								
6.2	Methods of hull stability examination and inclination test	<ul style="list-style-type: none"> ◆ Use inclination test technology to perform ship stability-tests and consider the effect of ship in drydocking on its draught and stability 								
6.3	Professionalism in hull stability examination and inclination test	<ul style="list-style-type: none"> ◆ perform the test according to inclining experiment /steps, and use appropriate illustration to make a summary report on the ship stability test 								
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to systematically and efficiently finish hull-stability examination and inclination test, including correctly implementing relevant test procedures, using testing tools and equipment, recording and processing data, and using the data to clearly demonstrate the test results.</p>									
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of inspection and testing.									

1. Title	Test diesel engines
2. Code	EMSRRIT304A
3. Range	Use common or tailor-made mechanical tools to test low or medium speed diesel engines e.g. diesel engines below 1800kW (or 2400BHP), at repair workshops or locations with diesel engines according to test instructions and standards.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and basic principles of diesel engine</p> <ul style="list-style-type: none"> ◆ Understand the structure and basic working principles of various equipment systems of a diesel engine <p>6.2 Methods and procedures of testing diesel engines</p> <ul style="list-style-type: none"> ◆ Test various systems and components of a diesel engine according to test instructions and standards ◆ Test the overall performance of a diesel engine ◆ Use common and tailor-made mechanical tools and inspection instruments effectively <p>6.3 Professionalism in testing diesel engines</p> <ul style="list-style-type: none"> ◆ Perform general tests on diesel engines independently according to test instructions and standards ◆ Understand the legal requirements on work safety and the code of practice when performing tests on diesel engines
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to test the core systems of a diesel engine effectively and correctly according to test instruction standards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of repairing mechanical equipment (such as EMSRRM101A “Repairs of marine engineering equipment and machines” and EMSRRM208A “Repair diesel engines”).

1. Title	Test marine engineering equipment	
2. Code	EMSRLT305A	
3. Range	In work related to regular inspection, commissioning and testing for ship repair and marine engineering, assist in planning test arrangements and implementing the tests for marine engineering equipment, and use the test results for analysis.	
4. Level	3	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of testing marine engineering equipment</p> <ul style="list-style-type: none"> ◆ Master the indicators and cycle of testing general marine engineering equipment, and normal procedures and performance criteria for testing, such as: <ul style="list-style-type: none"> • Speed • Temperature • Pressure • Vibration • Power • Sounds ◆ Be familiar with the sensing and transmission mode of monitoring and alarm signals of marine engineering equipment system ◆ Master the operating principles of quantitative conversion instruments for speed, temperature, pressure, vibration, power and sounds and message transmission system ◆ Master basic regulation concept and the operating principles of open and closed loop regulation systems <p>6.2 Methods and procedures of testing marine engineering equipment</p> <ul style="list-style-type: none"> ◆ Systematically implement tests on general marine engineering equipment ◆ Know how to illustrate all processes of the system operation of marine engineering equipment with block diagrams ◆ Interpret display signals for the monitoring and alarm of marine engineering equipment system, and understand and integrate the messages ◆ Master the regulation techniques, and process and integrate the regulated data according to the inter-relationship of input and output items ◆ Appropriately coordinate the functions of individual marine engineering equipment and the performance of its associated system after testing 	

	<p>6.3 Professionalism in testing marine engineering equipment</p> <ul style="list-style-type: none"> ◆ Follow user manuals of general marine engineering equipment and make use of the knowledge and experience of equipment test indicators to implement test procedures and analyze test data ◆ Record the setting point of each test item, and maintain effective monitoring and alarm required after regulation ◆ Assist in planning test arrangements
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to correctly implement test procedures for general marine engineering equipment, use testing tools and equipment, record and process data, and use the data to clearly demonstrate the test results.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of inspection, commissioning and testing.</p>

1. Title	Test propulsion devices	
2. Code	EMSRIT306A	
3. Range	In repairs, inspection, commissioning and testing of general ship propulsion devices, assist in planning test arrangements and implementing stationary tests and sea trials (if applicable), and use the test results for analysis.	
4. Level	3	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of testing propulsion devices</p> <ul style="list-style-type: none"> ◆ Master the performance indicators and cycle of testing general ship propulsion devices, as well as normal procedures and performance criteria for testing, such as: <ul style="list-style-type: none"> • Physical parameters (including: speed/turning speed, temperature, pressure, vibration and power) • Other parameters (such as fuel consumption and emission levels) ◆ Be familiar with the sensing and transmission mode of monitoring and alarm signals of general propulsion devices system ◆ Master the operating principles of physical and chemical quantitative conversion instruments and message transmission system ◆ Master basic regulation concept and the operating principles of open and closed loop regulation systems <p>6.2 Methods and procedures of testing propulsion devices</p> <ul style="list-style-type: none"> ◆ Systematically implement tests on general propulsion devices e.g. fixed test and tolerance alignment ◆ Know how to illustrate all processes of the system operation of propulsion devices with block diagrams ◆ Interpret display signals for the monitoring and alarm of propulsion devices system, and understand and integrate the messages ◆ Master the regulation techniques, and process and integrate the regulated data according to the inter-relationship of input and output items ◆ Appropriately coordinate the functions of individual propulsion devices and the performance of its associated system after testing 	

	<p>6.3 Professionalism in testing propulsion devices</p> <ul style="list-style-type: none"> ◆ Follow user manuals of general propulsion devices and make use of the knowledge and experience of test indicators for the units to judge the fixed test or sea trial arrangements required ◆ Implement test or sea trial procedures and collect and analyze test data ◆ Record the setting point of each test or sea trial item, and maintain effective monitoring and alarm required after regulation ◆ Assist in planning test or sea trial arrangements
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to correctly implement test procedures for general propulsion devices, use testing tools and equipment, record and process data, and use the data to demonstrate the test results; and</p> <p>(ii) Capable to assist in analyzing the production capacity and overall functional performance of a propulsion unit based on data resulted from the fixed test or sea trial (if applicable) e.g. speed, fuel consumption, emission and other parameters of the ship as well as basic ship resistance data.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of inspection, commissioning and testing.</p>

1. Title	Supervise ship painting works	
2. Code	EMSRLT307A	
3. Range	Formulate work specifications for ship painting works according to relevant requirements and standards; follow ship painting inspection guidelines or quality requirements for general factory painting works to supervise ship painting works.	
4. Level	3	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Preparations and work specifications for ship painting works</p> <ul style="list-style-type: none"> ◆ Know about the appropriate working conditions before performing ship painting, such as ventilation system, restricted areas for pedestrians and isolation measures for protection ◆ Understand surface treatment before painting the ship and the methods and procedures of removing grease, iron filing, scales and dirt thoroughly ◆ Be familiar with the preparation standards for general painting surface in order to required cleanliness and surface treatment quality before painting, such as SA and ST ◆ Be familiar with the blending and amount of paint used, thickness and thinning of coating, and surface treatment techniques and specifications ◆ Know about the storage, thinning, blending, handling, usage, protection and other related specifications <p>6.2 Methods of and points to note in supervising and accepting ship painting works</p> <ul style="list-style-type: none"> ◆ Summarize the acceptance standards of inspection, clearly record the examination results and accurately state any key findings ◆ Perform inspections at any stage of ship painting works according to different specifications ◆ Demonstrate and lead the inspection tasks of painted surfaces <ul style="list-style-type: none"> • Thickness of coating • Percentage of paint cracking • Colour and glossiness • Cleanliness of coating • Appearance of coating • Coating cohesion ◆ Establish scope of responsibility so as to accurately report and seek help for conditions exceeding one's supervision area 	

	<p>6.3 Professionalism in supervising ship painting works</p> <ul style="list-style-type: none"> ◆ Supervise ship painting works according to corporate guidelines ◆ Judge what remedies to take when the painting procedures or the painting works do not follow the specifications
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to make preparations for painting and allocate the painting works; and (ii) Capable to perform painting works according to the approved practice and relevant standards, and know general techniques for testing coating.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of inspecting and commissioning painting works.</p>

1. Title	Repair hull structures of non-steel ships
2. Code	EMSRRM301A
3. Range	Apply the techniques and knowledge of non-steel ship production to the repairs of non-steel ships when handling ship maintenance and repair works.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Construction of different hull line shapes and principles of repair</p> <ul style="list-style-type: none"> ◆ Understand the characteristics, construction and layout of basic hull line shapes (flat bottom, V-bottom and round bottom) <ul style="list-style-type: none"> ◆ Backbone frame • Skeleton frame • bulwark and vertical beam • horizontal beam • middle hull ◆ Know about the damages usually occur in non-steel hull <ul style="list-style-type: none"> • Collapse and cracks • Mold and moth • Erosion and spalling ◆ Know about the basic principles of repairing non-steel hull, such as carving, plate laying, strip cutting, cold plastic and lapping hoop strips ◆ Know about the techniques of jointing various types of honeycomb plates ◆ Know about some less popular materials (such as titanium and carbon fibre) <p>6.2 Methods of repairing non-steel ship hull structure</p> <ul style="list-style-type: none"> ◆ Effectively use correct tools to perform various repair procedures such as drying, saw-cutting, planing, fastening, jointing (use of enhanced plastics) , softening, bonding, gap filling and laying ◆ Perform repairs for common damages occurred in single-layer hull, double-layer hull and compound hull ◆ Perform the procedures of jointing and repairing honeycomb plates

	<p>6.3 Professionalism in repairing non-steel ship hull structure</p> <ul style="list-style-type: none"> ◆ Makes following preparations systematically for repair works, and adopt appropriate measures according to the actual environment and condition <ul style="list-style-type: none"> • Select appropriate materials • Draft working drawing • Prioritize the repair items • Allocate repair works and arrange for implementation ◆ Cut, disassemble and assemble non-steel hulls and structures according to approved practice and procedures or instructions of repair manuals ◆ Select appropriate protection gear such as earplugs and goggles according to implementation needs ◆ Compile simple repair reports ◆ Perform work procedures according to guidelines or material usage guides
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to perform structural repairs on general non-steel ships and test the repair standard according to approved practice and procedures; and</p> <p>(ii) Capable to compile simple repair reports.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of ship repair.</p>

1. Title	Maintenance of and urgent repairs to vessels at port
2. Code	EMSRRM302A
3. Range	Apply the techniques and knowledge of repairs to ships and marine engines in provision of urgent overall repairs to and maintenance of ships at port so as to ensure the seaworthiness of ships.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Common wear and tear of deck units, and main and auxiliary engines</p> <ul style="list-style-type: none"> ◆ Know about the types of damages and their locations of the deck units and the main and auxiliary engines, such as oxidation, pitting, spalling, deformation, cracking, gapping, denting and bulging ◆ Know whether the fixed parts and moving sections of deck machinery and ship machine units, such as the jointing positions of the chassis, pedestal, foundation, shaft, main bearing, crankshaft neck and bushing, have developed defects of looseness, breakage, sinking, nipping and leaking ◆ Understand the concerns of general maintenance of and urgent repairs to the main and auxiliary sections, such as cylinders, sleeves, pistons, crosshead shafts and sliding bearing, of ship machine units, including: <ul style="list-style-type: none"> • Cracks, scratches, blowholes and grooves inside the cylinder • Appearance of pistons; and abnormal wear, strain and partial rubbing of crosshead shafts, crankshafts and main shaft neck • Spalling, denudating, elongating and cracking on the bush surface of sliding bearing <p>6.2 Methods of maintaining port vessels and providing urgent repairs at sea</p> <ul style="list-style-type: none"> ◆ Master the methods of protecting, repairing, reconditioning consumed or damaged fixed parts of deck units and the main and auxiliary engines ◆ Straighten or reshape damaged parts, such as frames and enhanced plates ◆ Conduct leakage tests after urgent repairs ◆ Perform the tasks of lubricating, washing, isolating, removing and assembling ship machine units according to approved practice and procedures and repair manual instructions

	<p>6.3 Professionalism in maintaining vessels at port and providing urgent repairs at sea</p>	<ul style="list-style-type: none"> ◆ Master the general failures of and repairs to fuel injectors, fuel pumps and boosters ◆ Adopt appropriate measures for performing the following tasks according to actual situations and conditions and manufacturer's maintenance instructions: <ul style="list-style-type: none"> • Examining and repairing the damage of the inner wall of the cylinder • Mending bearing bushing and grinding shaft • Non-destructive tests and adjustment of links • Repairing and replacing consumed parts • Adjusting crankshaft and rectifying crank arm deflection • Recasting or replacing the bush of the sliding bearing • Fault identification and troubleshooting of general ship machine units ◆ Master the methods of repairing and replacing general deck machinery, such as anchor winches and other winches ◆ Make the following preparations for site maintenance and urgent repairs and replacement of parts: <ul style="list-style-type: none"> • Organizing and allocating manpower • Selecting appropriate machines, materials and parts according to manufacturer's instructions and repair requirements • Referring to processing diagrams adopt reasonable maintenance layout • Assessing the urgency of repair items, such as the required time, technical difficulties and material supply, and coordinating the work for urgent repairs and maintenance • Allocating repair items and arranging implementation of works ◆ Examine the consumption of large parts, such as steel plates, castings and fixed parts and give advice on repairs if necessary ◆ Compile simple repair reports
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7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to select and use appropriate methods to inspect deck units and ship machinery and adopt appropriate measures to repair damaged sections; and (ii) Capable to select and use appropriate tools, materials and parts to perform general tasks of maintenance of port vessels and urgent repairs at sea.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of ship maintenance and main engine repairs and understands the application of ultrasonic thickness gauge.

1. Title	Maintenance and repairs of ships in dock (on slip)	
2. Code	EMSRRM303A	
3. Range	Apply the techniques and knowledge of ship repairs and marine-engine rehabilitation to regular or periodic maintenance of load-carrying ships when handling daily tasks related to maintenance and repairs of ships in dock, ensuring that the ships meet the requirements of respective surveying bodies and the conditions of seaworthiness; assist in planning shipyard work and general frontline management for urgent repairs of ships and marine engineering equipment.	
4. Level	3	
5. Credit	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Preparations before docking and undocking arrangements</p> <ul style="list-style-type: none"> ◆ Know about the types, sizes, weights of the ships to be docked; assist in preparing slipway, ship cradle, rising platform according to the drawings and information provided by the concerned ship ◆ Request the concerned ship to adjust to appropriate bow and stern draught difference, load distribution, hull balance, and working conditions of the anchor winch and gypsy winch according to the condition of the dock (slipway) ◆ Assist in preparations, arrangements and implementation after docking, including connection to onshore power; provision of fire services water, fresh water, compressed air, cooling water of cooling system, temporary sanitation utilities and treatment facilities for life wastes ◆ Understand the distribution of oil and water tanks on ship and their stock ◆ Assist in preparing for the ship the safety equipment (including safety measures during typhoons, fire prevention and control of oil spills) at worksites within the dockyard ◆ Maintain and repair equipment and facilities of docks(slipway) ◆ Know about the inspection items (including classification, annual inspection and special inspection) required by surveying bodies, and the conditions for seaworthiness <p>6.2 Methods of repairing ships docking (on slip)</p> <ul style="list-style-type: none"> ◆ Master the methods and arrangements of repairing and replacing hull plates ◆ Master the sequence of the processes of washing and painting hull plates ◆ Master the methods of inspecting, surveying, reversing and replacing anchor chains 	

	<ul style="list-style-type: none"> ◆ Master the methods of inspecting, repairing and surveying rudder blades and rudder bearings ◆ Master the methods of surveying tail-shaft subsidence and tail-shaft bearing, shaft centering and of inspecting, surveying, repairing and replacing shaft and shaft seal ◆ Master the methods of surveying, inspecting, repairing, polishing and removing/assembling propellers ◆ Master the methods of inspecting and repairing submarine valve boxes/grilles, submarine valves and sea valves ◆ Master the repairing of the grilles of the valves and suction inlets on the lateral side of a ship <p>6.3 Professionalism in maintaining docking ships and repairing ships docking (on slip)</p> <ul style="list-style-type: none"> ◆ Know about relevant docking diagrams, propeller drawings, shafting diagrams, layout plans of oil and water tanks and layout plans of fire services equipment ◆ Assess repair items and allocate resources appropriately ◆ Know about the details of and the requirements on the inspection items of the underwater sections specified by classification societies ◆ Examine underwater sections, tail-shafts, propellers, rudder blades, and rudder columns and advise on repairs according to needs ◆ Compile simple repair reports and records
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to arrange the docking of ships according to the noting points; (ii) Capable to select and use appropriate methods to identify the inadequacy and damage in hulls, main and auxiliary engines, stern frames, rudders and other safety equipment at shipyards and adopt appropriate measures to repair and replace damaged parts; and (iii) Capable to select and use appropriate tools and materials and operate large machinery so as to carry out maintenance and routine repairs (or urgent repairs) of large components of ships on slip in dock.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of repairing ship structure and main and auxiliary engines (such as EMSRRM101A “Repairs of marine engineering equipment and machines” and EMSRRM206A “Repair and maintain ship hull and its structural elements”) and is able to take precautions for working in confined spaces.</p>

1. Title	Ship woodwork and laying of insulation	
2. Code	EMSRRM304A	
3. Range	Apply the techniques and knowledge of woodwork and heat resistance materials to perform general frontline tasks of fabrication of and repair to ship woodwork and repair to insulation and cladding.	
4. Level	3	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of ship timber and heat-resistant materials</p> <ul style="list-style-type: none"> ◆ Understand the types, characteristics, quality and uses of the following materials, and the methods of handling, storing and repairing them: <ul style="list-style-type: none"> • Ship timber and plates • Glass-fibre-reinforced and chemical plastic materials • Insulation and fire-resistant materials ◆ Understand the principles of processing ship timber and heat-resistant materials, such as cleaning, drying, anti-corroding, sawing, planing, joining, enhancing, jointing, binding, covering and packaging ◆ Understand the following points related to general maintenance and repairs of woodwork and insulation <ul style="list-style-type: none"> • Range of working temperatures • Requirements on breaking stress • Properties of cold resistance, heat resistance or electrical insulation resistance • Anti-corrosion protection and heat conduction <p>6.2 Techniques and methods of processing ship woodwork and insulation layer packaging</p> <ul style="list-style-type: none"> ◆ Use correct tools for fabrication of and repair to ship woodwork and insulation ◆ Select appropriate materials for fabrication of and repair to woodwork and vessels ◆ Select appropriate insulation materials for application under different temperature and insulation conditions according to manuals and correct practice ◆ Cut, remove and assemble ship woodwork and insulation according to approved practice and procedures and processing requirements ◆ Adopt appropriate measures, according to circumstances and conditions, to repair or replace aged or damaged sections of woodwork like deck, bulkheads, guards, furniture and structures; and insulation materials of furnaces, kitchens (or pantries), toilets and pipes, etc. 	

	<p>6.3 Professionalism in processing ship woodwork and outer insulation layer packaging</p> <ul style="list-style-type: none"> ◆ Make preparations for the following repair items: <ul style="list-style-type: none"> • Allocating the required materials according to actual situations (such as environmental factors) • Preparing drawings for processing • Assessing the urgency of repairs • Allocating items for processing and making work arrangements ◆ Examine the sections of woodwork and insulation materials which are frequently damaged, such as wooden deck, wooden facilities, anti-corrosion layer, protective layer and decorative layer, and give repair advice on the following aspects if necessary: <ul style="list-style-type: none"> • Appearance • Structure • Sealing • Water resistance • Fire protection • Protection, such as heat resistance, insulation and explosion resistance • Chemical properties, such as insulation and heat conduction ◆ Compile simple repair reports
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to perform general repairs of ship woodwork and insulation layers and test the quality of fabrication and repair according to approved practice and procedures; and</p> <p>(ii) Capable to select and use appropriate methods to assess the working conditions of woodwork and insulation layers and adopt appropriate measures to repair ageing and damaged sections.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of insulation materials and the competency of making woodwork and glass-reinforced plastic (such as EMSRIN103A “Woodwork and production of glassfibre-reinforced plastic” and EMSRDE203A “Lofting and modelling according to hull-line diagrams”).</p>

1. Title	Repair and maintain paint coatings of ships	
2. Code	EMSRRM305A	
3. Range	Apply the knowledge of paint repairs and maintenance to assist in planning and implementing frontline supervision of general hull painting projects or coating repairs and maintenance of ocean-going or coastal-sailing ships.	
4. Level	3	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge and range of application of ship paints</p> <ul style="list-style-type: none"> ◆ Understand the components of paints such as synthetic resins, plasticizers and dry oil ◆ Understand the properties and range of application of ship paints ◆ Understand the steps, techniques and principles of applying and spraying paint <p>6.2 Work procedures and techniques of ship paint repairs and maintenance</p> <ul style="list-style-type: none"> ◆ Master work procedures and repair methods of various types of paints such as brushing, rolling and spraying paint ◆ Perform paint spraying according to approved procedures or instructions of painting manual so as to <ul style="list-style-type: none"> • Have correct thickness of coating • Have a smooth surface • Focus on one spot to spray the paint • Correctly blend the paint ◆ Select and use appropriate paints according to different parts of hull (e.g. ship bottom, waterline section, upper hull, hull deck, cabin, fuel tank, pressure tank, cargo cabin, drinking water tank) ◆ Adopt appropriate measures to repair degraded coating according to the actual environment and condition <p>6.3 Professionalism in ship paint repairs and maintenance</p> <ul style="list-style-type: none"> ◆ Ensure work procedures meet safety requirements and engineering rules such as providing appropriate protection gear for work ◆ Know how to identify the causes of paint peeling and look for solutions ◆ Inspect the performance, characteristics and painted surface quality of various types of ship paint, and give advice on reconditioning of coating if necessary ◆ Compile simple reports to record the progress of painting work 	

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to correctly implement general ship painting repairs, and complete work details according to approved practice and procedures; and (ii) Capable to select and use appropriate methods to identify the causes of paint peeling, and adopt appropriate measures to repair degraded coating.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic ship painting knowledge and techniques, and the competency of EMSRRM209A “Ship-painting works”.

1. Title	Repair and maintain marine electrical equipment and systems	
2. Code	EMSRRM306A	
3. Range	Apply the techniques and knowledge of repairing marine electrical equipment to tasks of inspecting and replacing electrical system on ships so as to ensure reliability and smooth functioning of electrical installations under different situations.	
4. Level	3	
5. Credit	8	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Protection for and layout of marine electrical equipment and systems</p> <ul style="list-style-type: none"> ◆ Know about the marine power distribution systems ◆ Know about the required insulation features of electrical appliances on ships ◆ Know about the importance of the protective and explosion-proof features of installations ◆ Master emergency lighting and the continuity of remote control circuits and power disconnection and alarm devices ◆ Know about the cooling and ventilation for electrical installations and the effects of mechanical interlock, such as normal operating temperature, stability and protection ◆ Interpret the instruments and light signals on switchboards related to control of generators and operation of motors ◆ Know about the features of power distribution installations, such as: <ul style="list-style-type: none"> • Prevention trip • Differential protection • Overload protection • Earthing system • Flame-proof devices • Generators and battery charging • Parallel synchronization system <p>6.2 Methods of repairing and maintaining marine electrical equipment and systems</p> <ul style="list-style-type: none"> ◆ Understand the electrical system by reading the overall wiring diagram of the ship and the wiring diagrams of different electrical installations (such as basic wiring, power network and control circuit) <ul style="list-style-type: none"> • Identifying the impact of the failures on the auxiliary electrical installations and electrical system ◆ Analyze the data of the main instruments and the light signals on the switchboard and identify the sections where failures usually occur, and preventive measures against damage 	

	<p>6.3 Professionalism in repairing and maintaining electrical equipment and system on ships</p> <ul style="list-style-type: none"> ◆ Adopt reasonable measures and procedures or follow repair manual instructions to perform the tasks of surveying, calibrating and maintaining electrical units on ships ◆ Adopt appropriate measures for performing the following tasks according to actual situations and conditions and manufacturer's repair instructions <ul style="list-style-type: none"> • Removing, replacing and connecting electrical installations on ships • Control of asynchronous AC electrical units and protection equipment • Maintaining and repairing generators and power restriction device circuits • Rewinding AC and DC generator coils • Balancing of rotors ◆ Implement the work processes of maintaining, removing, replacing and connecting batteries, including the use of electrohydraulic densimeter to assess the degree of discharging ◆ Master the screen configuration, operation and programming procedures of programmable controllers on ships ◆ Make the following preparations for maintaining, repairing and replacing the parts of the electrical system on ships: <ul style="list-style-type: none"> • Selecting appropriate instruments, materials and parts according to manufacturer's instructions and repair requirements • Referring to electrical wiring diagrams and implementing appropriate activities for maintenance and repairs • Assessing the urgency of repair items • Allocating repair items and making work arrangements ◆ Examine the consumption of the components of the electrical installations, equipment, units and switches on ships and give advice on repairs if necessary ◆ Compile simple repair reports
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7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to select and use appropriate methods to identify the consumption of the components of different electrical installations and units on ships and adopt appropriate measures to survey, calibrate and repair damaged components; (ii) Capable to interpret the data of the main instruments and the light signals on the switchboards, and use appropriate programmable controllers to identify the causes of the failure of the electrical system; and (iii) Capable to select and use appropriate instruments, materials and parts to perform general tasks of maintaining/repairing marine electrical equipment and of rewinding coils for motors.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge and techniques of electrical appliances and of applying general electrical materials and common instruments/electrical equipment.</p>

1. Title	Repair ship piping system	
2. Code	EMSRRM307A	
3. Range	Regarding ship maintenance/repairs and construction works in dockyards, use the techniques and knowledge of pipeline repair to assist in planning new assembly projects for piping systems or relaying pipelines and overhauls of general pipes and accessories.	
4. Level	3	
5. Credit	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of ship pipelines and valves and causes of their failures</p> <ul style="list-style-type: none"> ◆ Know about the functions of all kinds of ship piping systems and their requirements according to the nature of different fluids they transmit (such as sea water, fresh water, oils, gases and liquids with different pressures or temperatures) ◆ Know about different types of ship valves and their working principles, such as stop valve, check valve, throttle valve, pressure control valve ◆ Know about colour classification and coding of ship piping systems ◆ Know about concerns for general repair and maintenance or assembly of pipelines and valves, such as: <ul style="list-style-type: none"> • leakage • sticking • blockage • loosing • breaking <p>6.2 Techniques of and methods of repairing ship pipelines</p> <ul style="list-style-type: none"> ◆ Master the methods of measuring the thicknesses and testing pressure of general pipes and valves ◆ Use correct tools for the procedures of assembling pipelines and valves, such as cutting, bending, threading, disassembling and jointing ◆ Master the method of jointing special copper-nickel alloy pipes ◆ Isolate, disassemble and assemble ship piping systems according to approved practice and procedures or repair manual instructions ◆ Adopt appropriate measures to repair or relay pipelines and valves according to the actual environment and condition 	

	<p>6.3 Professionalism in repairing ship pipelines</p> <ul style="list-style-type: none"> ◆ Make the following preparations for the repair or new assembly project <ul style="list-style-type: none"> • Select appropriate materials • Draft working drawing • Prioritize the repair items • Allocate repair works and arrange for implementation ◆ Examine the temperature and pressure that the joints of various types of pipelines and valves can withstand, and give advice on repair or assembly if necessary ◆ Compile simple repair reports
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to repair and relay the pipelines for general ship piping systems, and test the standard of work according to approved practice and procedures; and</p> <p>(ii) Capable to correctly select and use appropriate methods to identify causes of failures in pipelines and valves, and adopt appropriate measures to repair or replace the damaged parts.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses practical knowledge of ship pipeline repair and maintenance and masters the application techniques of installation and repair.</p>

1. Title	Repair protection and indication devices of diesel engines
2. Code	EMSRRM308A
3. Range	Use common repairing and inspection instruments and tools to repair, maintain and set protection and indication devices of diesel engines e.g. low or medium speed engines below 1800kW (or 2400BHP), at repair workshops or locations with diesel engines according to repair instructions and standards.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Working principles of protection and indication devices of diesel engines</p> <ul style="list-style-type: none"> ◆ Understand the uses and working principles of various types of protection and indication devices of diesel engines, including: <ul style="list-style-type: none"> • Engine speed indication and protection devices • Engine temperature indication and protection devices • Engine lubrication system protection devices • Fuel filter system protection devices <p>6.2 Methods and procedures of repairing protection and indication devices of diesel engines</p> <ul style="list-style-type: none"> ◆ Repair protection and indication devices of diesel engines effectively, including checking, cleaning, measurement, maintenance and testing, according to repair instructions and standards ◆ Handle and eliminate faults in repair protection and indication devices of diesel engines effectively ◆ Test and set various types of protection and indication devices of diesel engines according to standards ◆ Use common repairing and inspection instruments and tools effectively <p>6.3 Professionalism in repairing and maintaining protection and indication devices of diesel engines</p> <ul style="list-style-type: none"> ◆ Perform general repair and maintenance of protection and indication devices of diesel engines independently according to repair instructions and standards ◆ Understand the code of practice when performing repair and maintenance of protection and indication devices of diesel engines
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to check and maintain the core protection and indication devices of diesel engines effectively and correctly according to repair standards; and</p> <p>(ii) Capable to commission and set various protection and indication devices effectively.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of repairing electrical and mechanical equipment.

1. Title	Repair faults with diesel engines, generators and their control equipment
2. Code	EMSRRM309A
3. Range	Repair faults in low or medium speed diesel engines below 1800 kW (or 2400 BHP), generators and their control equipment on board, at repair workshops or related worksites at dockyard.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and working principles of diesel engines, generators and their control equipment ♦ Understand the structure and working principles of diesel engines, generators and their control equipment</p> <p>6.2 Find and repair faults in diesel engines, generators and their control equipment ♦ Repair faults in a diesel engine</p> <ul style="list-style-type: none"> • Check the diesel engine and its control equipment, including the following equipment and systems, to find out the fault according to symptoms by applying knowledge on the working principles of diesel engine and its control equipment: engine cylinder and its mechanism, fuel supply system, fuel injector and filter, governor, cooling system and equipment, lubricating system and equipment and auxiliary generator and battery unit • Repair the fault after finding out the fault equipment or component <p>♦ Repair faults in a generator</p> <ul style="list-style-type: none"> • Check the following generator components and control equipment to find out the root cause of fault according to the symptoms and based on knowledge on the working principles of generator: such as all magnetic coils in the generator, magnetic circuit and equipment, load regulator, auxiliary generator, battery unit, circuit breaker and relay • Repair the fault after finding out the faulty equipment or component <p>♦ Inspect protective devices of diesel engines and generators</p> <ul style="list-style-type: none"> • Inspect protective devices of diesel engines and generators, including: engine overheat alarm, water thermometer, and generator overload protector • Measure data output of the generator

	<p>6.3 Professionalism in repairing diesel engines, generators and their control equipment</p> <p>◆ Repair diesel engines, generators and their control equipment according to the safety instructions and code of practice</p>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to find out faults in diesel engine control equipment within a reasonable period of time according to the symptoms;</p> <p>(ii) Capable to find out the fault in generator control equipment within a reasonable period of time according to the symptoms.</p>
8. Remarks	<p>This unit of competency is suitable for training electrical and mechanical engineering personnel involving in the work of diesel generators. The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electrical installations (such as: EMCUIN201A” Perform general electrical assembly and fitting”and EMSRRM208A “Repair diesel engines”).</p>

1. Title	Machining of heavy and large work pieces	
2. Code	EMSRRM310A	
3. Range	Carry out repair works for common worn-out work pieces, such as large, heavy and slender transmission shafts or motor rotors, large gear shafts, slender steel plates and cable quills, at servicing workshops; perform tasks of machining accurately, safely and effectively according to drawings.	
4. Level	3	
5. Credit	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the professional requirements on machining of heavy and large work pieces</p> <ul style="list-style-type: none"> ◆ Know about the basic principles and proper operation of machining equipment ◆ Know about the functions, uses and operation procedures of large, specific machine tools and special fixtures, lifting appliances and cutting tools <p>6.2 Process of machining and proper practice</p> <ul style="list-style-type: none"> ◆ Operate large lathes and heavy presses for processing components and parts of various dimensions (such as parts of 3 metric tons with an axis length of no less than 3m and an axis diameter of as large as 75cm) ◆ Work out properly the safe way of placing a work piece on or lifting it from the machine tool in order not to cause damage ◆ Adjust accurately the stability, straightness, equilibrium and concentricity of a work piece on the machine tool ◆ Select appropriate speeds of machining and reciprocating a work piece and turning speeds of cutting tools ◆ Select proper feeds for cutting tools so as to increase surface precision and finish of work pieces ◆ Supervise and perform the following tasks according to actual circumstances and conditions: <ul style="list-style-type: none"> • Machining large and heavy components, such as motor rotors, large gear shafts and cable drums • Boring large circumference to make cavity components such as bearing holes and hub bores • Forging heavy components for ships, such as slender steel plates 	

	<p>6.3 Professionalism in machining heavy and large work pieces</p> <ul style="list-style-type: none"> ◆ Align large, heavy and slender transmission shafts and motor rotors, and large gear shafts accurately ◆ Adjust the equilibrium of the rotors of large and heavy shafts effectively ◆ Examine the consumption and utilization of large and heavy components and advise on machining repairs and modification if necessary ◆ Compile simple repair reports
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to instruct co-workers to carry out the processes of laying, lifting and machining large work pieces; and</p> <p>(ii) Capable to handle the work pieces for large marine engine equipment and carry out repairs and modifications of accessories safely and accurately according to instructions.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of machining for repairs.</p>

1. Title	Repair high power diesel engines (about 3000 kW (or 4000 BHP) or above)
2. Code	EMSRRM311A
3. Range	Use appropriate or tailor-made repairing tools to repair, adjust and assemble high power diesel engines according to repair instructions and standards at repair workshops or locations with diesel engines.
4. Level	3
5. Credit	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure and working principles of high power diesel engine</p> <ul style="list-style-type: none"> ◆ Working principles of internal combustion engine- suction, compression, power and exhaust ◆ Crank shaft, bearing, cylinder head, piston, cam/shaft, transmission gear/chain and shock absorber ◆ Fuel system such as high pressure oil pump, injector ◆ Air intake and exhaust system including supercharger, air cooling device and exhaust valve unit ◆ Air start system ◆ Governor control system including related pneumatic, electric and hydraulic devices and governor ◆ Cooling system and related devices ◆ Lubrication system and related devices <p>6.2 Procedures of repairing and working on diesel engines</p> <ul style="list-style-type: none"> ◆ Disassemble and assemble the basic mechanical elements and devices of a diesel engine ◆ Disassemble, inspect and repair the mechanical elements and devices or replace tailor-made components effectively according to instructions and standards of repair manual or information ◆ Adjust diesel engine devices for effective operation according to instructions and standards of repair manual or information ◆ Use common or tailor-made tools and inspection instruments effectively to facilitate the work <p>6.3 Professionalism in diesel engine repair</p> <ul style="list-style-type: none"> ◆ Read and understand the instructions and standards of repair manual or information, and perform general repair of diesel engines independently ◆ Understand the legal requirements on work safety and the code of practice for performing diesel engine repairs ◆ Examine the wear and tear condition of the fixed and moving parts of diesel engines, and give advice on repair if necessary ◆ Compile simple repair reports

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none">(i) Capable to check and repair the core systems of a diesel engine effectively according to relevant repair standards; and(ii) Capable to adjust and control the normal working parameters of various component systems of a diesel engine effectively for an effective operation of the engine.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMSRRM208A "Repair diesel engines" and EMSRRM202A "Repair and maintain ship's main engine equipment".</p>

1. Title	Aluminium alloy ship painting works									
2. Code	EMSRRM312A									
3. Range	Apply the knowledge of aluminium alloy hull surface treatment to implement aluminium alloy ship surface treatment procedures before painting the ship; coordinate with other teams to work on the aluminium alloy surface treatment projects and be responsible for the work quality of aluminium alloy surface treatment.									
4. Level	3									
5. Credit	3									
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Aluminum alloy surface treatment preparation before painting the ship</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Remove oil stains on the aluminium alloy surface according to guidelines ◆ Thoroughly clean the aluminium alloy surface with water </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Aluminum alloy surface treatment procedures before painting the ship</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Perform aluminium alloy surface treatment by using acid to wash and erode the paints above waterline ◆ Perform aluminium alloy surface treatment procedures below waterline with ultra high pressure water-jet </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in aluminum alloy surface treatment before painting the ship</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Know about the quality standards for aluminium alloy surface treatment such as: <ul style="list-style-type: none"> • Paint supplier’s requirements • ISO or BS ◆ Perform inspection according to the quality standards for aluminium alloy surface treatment </td> </tr> </table>	6.1	Aluminum alloy surface treatment preparation before painting the ship	<ul style="list-style-type: none"> ◆ Remove oil stains on the aluminium alloy surface according to guidelines ◆ Thoroughly clean the aluminium alloy surface with water 	6.2	Aluminum alloy surface treatment procedures before painting the ship	<ul style="list-style-type: none"> ◆ Perform aluminium alloy surface treatment by using acid to wash and erode the paints above waterline ◆ Perform aluminium alloy surface treatment procedures below waterline with ultra high pressure water-jet 	6.3	Professionalism in aluminum alloy surface treatment before painting the ship	<ul style="list-style-type: none"> ◆ Know about the quality standards for aluminium alloy surface treatment such as: <ul style="list-style-type: none"> • Paint supplier’s requirements • ISO or BS ◆ Perform inspection according to the quality standards for aluminium alloy surface treatment
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7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to perform aluminum alloy surface treatment according to approved practice for painting work and relevant standards; and</p> <p>(ii) Capable to understand the quality standards and required techniques for aluminum alloy surface treatment.</p>									
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of ship painting works (such as EMSRRM209A “Ship-painting works”).									

1. Title	Heat treatment operations of steel
2. Code	EMSRRM313A
3. Range	Implement procedures of heat treatment of steel in daily tasks of ship repair.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic theory of heating and its application to steel</p> <ul style="list-style-type: none"> ◆ Understand the physical effect of heating on steel and its range of application based on the knowledge of the relation diagram of iron and carbon <ul style="list-style-type: none"> • Toughening effect • Normalization effect • Hardening effect • Heat treatment (such as soldering) <p>6.2 Heat treatment method and procedures for steel</p> <ul style="list-style-type: none"> ◆ Heat treatment of steel (such as quenching, normalizing, tempering, annealing) ◆ Implement bathing or blowing working procedures systematically in the hardening process of heat treatment <p>6.3 Professional knowledge of heat treatment</p> <ul style="list-style-type: none"> ◆ Know about the basics and range of application of steel materials ◆ Assist in and make preparations for the welding procedure ◆ Be familiar with the heating process and necessary procedures
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to implement heat treatment procedures for steel; and</p> <p>(ii) Capable to apply the professional knowledge of heat treatment.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of physics.

1. Title	Repair hull plates and hull structures	
2. Code	EMSRRM314A	
3. Range	Apply the techniques and knowledge of hull structures to repairs of hull and metal structures, to repairs or replacements of common hull plates of 16-20mm in thickness at dockyards, maintenance shipyards or relevant locations.	
4. Level	3	
5. Credit	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of hulls and their structures</p> <ul style="list-style-type: none"> ◆ Know about the general safety practice for pressing and jointing 16-20mm thick metal plates for ships ◆ Know about the methods of full position bonding, rolling and dynamic pressing and their application to ship structure repairs ◆ Know about the main functions of common hull plates and metal structures, such as upper deck, hull plates and bilge motherboard, under-waterline plate, reinforced deck, hull frame, bow-to-stern frame, bulkhead plates and fabricated plates inside oil and water tank ◆ Know about the grades (such as AH) of hull plates and the standards and supervision of hull structure repairs <p>6.2 Methods and procedures of repairing hull plates and hull structures</p> <ul style="list-style-type: none"> ◆ Perform tasks of pressing, forming and repairing hull metal plates according to work standards ◆ Use tools and common forming, bending and rolling machines effectively and carry out the processes of toughening metal plates and pressing metal plates ◆ Master the work processes of jointing hull metal plates of 16-20mm in thickness, such as preparing joints, treating carbon elements, back gouging and fitting ◆ Carry out MIG and TIG welding at different positions so as to repair hull plates and hull structures <p>6.3 Professionalism in repairing hull plates and hull structures</p> <ul style="list-style-type: none"> ◆ Inspect the positions of the hull plates and hull structures which are frequently flushed, water-soaked, abraded and corroded, and set working schedules for repair or replacement under instruction or after assessment ◆ Identify the hull sections which are usually worn out and their jointing conditions and adopt measures to stop deterioration ◆ Describe the details of works clearly and compile relevant repair reports 	

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to perform tasks of repairing and replacing common hull metal plates (16-20mm thick) and of repairing hull structures so as to pass the examinations and tests set by regulatory bodies; and (ii) Capable to select and use appropriate tools and perform tasks of repairing hull plates and hull structures according to repair instructions.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses the competency of EMSRRM206A “Repair and maintain ship hull and its structural elements”.</p>

1. Title	Repair high-speed engines and water-jet propellers of ships
2. Code	EMSRRM315A
3. Range	Apply the knowledge of repairing high-speed engines and water-jet propelling equipment to repairs of high-speed propelling system of ships and to repairs and replacements of relevant parts of these engines and equipment so as to ensure their normal operation.
4. Level	3
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Operating principles of high-speed engines and water-jet propellers of ships</p> <ul style="list-style-type: none"> ◆ Know the followings about high-speed engines of ships <ul style="list-style-type: none"> • Definition of high-speed engines of ships and their basic structure • Overall layout of high-speed engines and required operation • Structural characteristics and operating principles of the main components of high-speed engines of ships, such as base, shaft, crank, bearing, camshaft and axle drive ◆ Know about water-jet propellers <ul style="list-style-type: none"> • Working principles and technical data • Overall layout and names and functions of main components • Types of control systems and their specifications <p>6.2 General repair items related to high-speed engines and water-jet propellers for ships</p> <ul style="list-style-type: none"> ◆ Interpret and understand the technical instructions of operation manuals and repair manuals ◆ Record repair data properly, such as operation hours and working conditions of main components and identification of general failure of sections according to instructions and preventives against damage ◆ Relate possible impact of the accessory devices of a high-speed engine to the failure of the main machine in operation ◆ Survey, align, maintain and repair the high-speed engine units of ships, including pedestal, main components and operating systems, according to repair instructions ◆ Master the drive arrangements of ship engines and water-jet propellers, such as the maintenance data and normal positions relating to alignment of slave axis and axial line , and speed relay ◆ Master the proper procedures of removing, repairing, replacing, aligning and assembling the main components of water-jet propellers for ships

	<p>6.3 Professionalism in repairing high-speed engines and water-jet propellers for ships</p> <ul style="list-style-type: none"> ◆ Make the following preparations for maintaining, repairing and replacing the parts of high-speed engines and water-jet propellers for ships: <ul style="list-style-type: none"> • Selecting appropriate instruments, materials and parts according to manufacturer’s instructions and repair requirements • Referring to installation and repair guidelines and implementing appropriate activities for maintenance and repairs • Implementing the work according to the urgency of repair items • Coordinating with other repair teams when carrying out repairs ◆ Examine the consumption of general components, machinery, devices, equipment and control modules and give advice on repairs if necessary ◆ Compile simple repair reports
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to select and use appropriate methods to examine the damaged components of high-speed engines and water-jet propellers for ships and adopt appropriate measures to survey, align, repair and replace the damaged parts; (ii) Capable to understand the instructions of the installation and repair manuals and follow light signals and use appropriate testing instruments to identify the sections where failures usually occur and adopt preventives against damage; and (iii) Capable to select and use appropriate instruments, materials and parts to implement regular maintenance and preventive repairs for high-speed engines and water-jet propellers for ships in general according to instructions.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of machinery and repairs of internal combustion engines.</p>

1. Title	Basic operational requirements for material management
2. Code	EMSROM301A
3. Range	Implement materials management and logistic control during operation management routines related to ship repairs.
4. Level	3
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of material management</p> <ul style="list-style-type: none"> ◆ Know about basic ship materials, including the characteristics of material management (such as storage requirements on space, environment, etc.) ◆ Know about the considerations for assessment of material demand, such as: <ul style="list-style-type: none"> • Average utilization rate • Storage period • Characteristics of producer's supplies (such as the relationship between order quantities and discount) <p>6.2 Methods of managing materials</p> <ul style="list-style-type: none"> ◆ Know how to set the material demand according to the operation status of the company ◆ Effectively control the logistics and make good use of resources to ensure greatest effectiveness <p>6.3 Professionalism in managing materials</p> <ul style="list-style-type: none"> ◆ Assess the inventory level of materials and the supply limit of the producer, always keeping enough inventory without being excessive
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to implement material management during regular work according to basic operation requirements; and</p> <p>(ii) Capable to maintain appropriate level of supply of materials.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of management.

Competency Level 4

1. Title	Formulate effective storage and updating system for drawings
2. Code	EMCUDE405A
3. Range	Formulate effective storage and updating systems for drawings to support electrical and mechanical services for electrical and mechanical organization.
4. Level	4
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Storage system for electrical and mechanical engineering documents</p> <ul style="list-style-type: none"> ◆ Understand the entire storage system for electrical and mechanical engineering documents, including the correlational series and classification of typical drawings, and document storage system <p>6.2 Processing of electrical and mechanical engineering documents</p> <ul style="list-style-type: none"> ◆ Arrange drawings and classification of information <ul style="list-style-type: none"> • With engineering senses, classify the correlational series of typical drawings and information effectively for easy management ◆ Formulate system for the issuance of drawings and information, including: <ul style="list-style-type: none"> • Record of drawings and information issued • Marking of versions and dates issued ◆ Formulate retrieval mechanism for old drawings and information <ul style="list-style-type: none"> • Trace the locations of old drawings and information according to the issuance record, and be able to issue the most updated versions of drawings and information • Establish effective communication channels with users of the drawings and information ◆ Make use of information technology to enhance the efficiency of the storage and updating system for drawings and information <ul style="list-style-type: none"> • Use information technology and techniques to formulate systems to enhance the efficiency of storing, issuing, tracing and updating drawings and information
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate an effective storage and updating system for drawings and information to effectively support the electrical and mechanical services.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electrical and mechanical drawing plans.

1. Title	Implement quality management in electrical and mechanical engineering services
2. Code	EMCUQM402A
3. Range	Plan, organize and control effectively the working procedures prior to and during the project so as to achieve the result of minimal cost and high quality for electrical and mechanical project.
4. Level	4
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Division of procedure for electrical and mechanical installation project</p> <ul style="list-style-type: none"> ◆ Understand and analyze the division of process for electrical and mechanical installation project; set the following for quality control before the project starts: <ul style="list-style-type: none"> • Check points for different stages of the project • Quality management goals such as completion dates for different stages of the project, alert level for the number of items not conforming to the plan, accident rate, productivity, etc. <p>6.2 Implement the quality management plan and organized working procedure of the quality control system effectively</p> <ul style="list-style-type: none"> ◆ Confirm and analyze items not conforming to the rules at different stages of the project, and formulate improvement plans with working teams concerned ◆ Performance indicators for different stages of the project should be set with reference to level of performance specified by the contract, code of practice, and international standards, etc. ◆ Formulate quality management plan, including the following, to control procedure costs and quality in an organized and effective way: <ul style="list-style-type: none"> • Division of procedure for the project • Check points of 'planning-implementation-commissioning-rectification' for quality management at different stages of the project • Performance indicators at different stages of the project • Ways to handle items not conforming to the rules • Quality management goals • Mechanism to communicate with relevant teams and formulation of timetables for improvement plans, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate quality management plans effectively, monitor project quality, control costs and improve process not conforming to the rules.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concept of quality management.

1. Title	Promote quality management culture at working level
2. Code	EMCUQM403A
3. Range	Master the knowledge of quality management, lead the quality management working group to promote and foster basic level quality management culture for the electrical and mechanical services.
4. Level	4
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of quality management</p> <ul style="list-style-type: none"> ◆ Understand the concept of quality management ◆ Understand the goals of organizational quality management culture <p>6.2 Promote and foster basic level quality management culture</p> <ul style="list-style-type: none"> ◆ Promote basic level quality management culture, including: <ul style="list-style-type: none"> • Implement on-the-job training on quality knowhow for frontline staff • Set up frontline staff quality monitoring group to foster quality management culture at working level • Organize quality management culture promotional activities, such as quiz competitions, quality circle, visits, seminars, etc.
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to master the knowledge of quality management, and lead the quality management working group to promote and foster quality management culture at working level.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concept of quality management.

1. Title	Conduct site survey and quality control
2. Code	EMCUQM404A
3. Range	Investigate the characteristics and limitations of the work site and conduct quality control and monitoring of engineering projects.
4. Level	4
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Quality control and monitoring requirements on work site environment</p> <ul style="list-style-type: none"> ◆ Master the progress of design, installation, operation, maintenance and repair, inspection, commissioning and testing necessary for the engineering projects, and understand the quality control and monitoring requirements on work site environment <p>6.2 Conduct site survey and clear obstacles so as to implement quality control of electrical and mechanical installation project</p> <ul style="list-style-type: none"> ◆ Investigate and analyze the characteristics and limitations of the work site, and point out potential problems in and obstacles to the electrical and mechanical design, installation, operation, maintenance and repair, inspection, commissioning and testing of the projects there so as to ensure: <ul style="list-style-type: none"> • The effective implementation of all engineering projects • The effective implementation of quality control scheme • The effective operation of the flow chart of quality control procedures ◆ Suggest solutions to clear the obstacles so as to implement quality control of the electrical and mechanical installation projects
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to demonstrate how to conduct site survey and clear obstacles in order to assist in quality control of the electrical and mechanical installation projects.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of quality management.

1. Title	Supervise non-destructive test (NDT) inspection
2. Code	EMCUMA402A
3. Range	Supervise non-destructive test (NDT) inspection (e.g. ultrasonic testing, x-ray testing) at industrial plants, power plants. The testing part may range from a single piece of material to a whole large structure (e.g. pipework, ship shell, plant machinery) or any part of it.
4. Level	4
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Technical requirements and concerns for NDT</p> <ul style="list-style-type: none"> ◆ Have general understanding in the technical requirements for supervising NDT inspection ◆ Be familiar with concerns and tools required for carrying out the inspection ◆ Be familiar with the advantages and limitations of different NDTs <p>6.2 Methods and procedures of supervising NDT inspection</p> <ul style="list-style-type: none"> ◆ Supervise NDT inspection and correct mistakes made by workers who implement the process when necessary ◆ Select the most suitable testing method for different kinds of jobs with regard to the degree and size of damage of the testing part ◆ Write a supervision report on the inspection. <p>6.3 Professionalism in supervising NDT inspection</p> <ul style="list-style-type: none"> ◆ Follow international specifications and in-house guidelines to ensure that NDT inspection be conducted safely and properly
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to ensure that NDT inspection be conducted safely and properly;</p> <p>(ii) Capable to explain clearly the task of NDT inspection and safety concerns; and</p> <p>(iii) Capable to write a supervision report on the inspection.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person is familiar with NDT inspection.

1. Title	Calculation of ship buoyancy
2. Code	EMSRDE401A
3. Range	Master ship buoyancy calculations to design tasks or buoyancy calculations in daily routines related to ship engineering.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of ship building</p> <ul style="list-style-type: none"> ◆ Master the basic knowledge of ship building, such as: <ul style="list-style-type: none"> • waterline rules and tonnage measurement • specifications and characteristics of freeboard and ship dimensions • hull linear and form coefficient • basic industry terms and meanings , e.g. wet surface area, horizontal area, the first and second torque <p>6.2 Application of ship buoyancy calculations</p> <ul style="list-style-type: none"> ◆ Use data information and formula (e.g. Simpson Rules) to perform calculations of ship buoyancy including: <ul style="list-style-type: none"> • volume and centre of mass, displacement, centre of buoyancy, immerse (ton/cm) • make full use of the above calculation results in ship design or hull analysis <p>6.3 Professionalism in ship buoyancy calculations</p> <ul style="list-style-type: none"> ◆ Consider issues like water pressure resistance strength of components in the process of analysis
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to briefly point out the basic knowledge of ship building; and</p> <p>(ii) Capable to calculate ship's centre of buoyancy LCF.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of calculation and the competency of EMSRDE301A "Basic calculations for ship design".

1. Title	Calculation of ship stability
2. Code	EMSRDE402A
3. Range	Apply the basic knowledge of ship stability to design tasks or stability calculations in daily routines related to ship engineering.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Concept of ship stability</p> <ul style="list-style-type: none"> ◆ Master the concepts of lateral stability and longitudinal stability of ships ◆ Master the procedures of conducting inclining experiments and the implications of the results ◆ Master the impact of load change and free surface on stability <p>6.2 Methods of calculating ship stability</p> <ul style="list-style-type: none"> ◆ Identify the lateral stability and longitudinal stability of ships by conducting experiments, calculations and data analysis <ul style="list-style-type: none"> • Lateral stability, such as lateral metacentre and metacentric height, inclining experiment, shift of centre of gravity due to load change, weight and lateral torque of suspension weight and stability of inclining at large/small angle • Longitudinal stability, such as the impact of change in height of longitudinal metacentre, longitudinal gradient and torque of longitudinal gradient and change of load on longitudinal gradient, change of longitudinal gradient and stability at times of docking and stranding and change of longitudinal gradient due to change of water density <p>6.3 Professionalism in calculating ship stability</p> <ul style="list-style-type: none"> ◆ Analyze the results of inclining experiments ◆ Assess ship stability according to in-house requirements or supervisor's instructions
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to calculate and analyze the lateral and longitudinal stability of ships;</p> <p>(ii) Capable to assess the impact of free surface change on ship stability; and</p> <p>(iii) Capable to list the procedures for conducting inclining experiments and analyze experiment results.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of physics and the competency of EMSRDE301A “Basic calculations for ship design”.

1. Title	Marine engineering equipment power calculations
2. Code	EMSRDE403A
3. Range	Apply the principles of marine engineering equipment design and calculations to ship design tasks.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic principles for the construction and design of marine engineering equipment</p> <ul style="list-style-type: none"> ◆ Be familiar with the basic principles for the construction and design of marine engineering equipment including: <ul style="list-style-type: none"> • main propulsion devices for low/medium/high-speed diesel engine, steam turbine, gas turbine and power drives, propeller and other types of propulsion systems • boiler • auxiliary equipment • ancillary equipment • ship pumping and piping system • fire services installations <p>6.2 Techniques of calculating marine engineering equipment power</p> <ul style="list-style-type: none"> ◆ Apply the knowledge of marine engineering equipment design to marine engineering equipment power calculations for implementation of ship design, including: <ul style="list-style-type: none"> • Reading propulsion device layout plan to obtain information on the arrangement of structures • Analyzing the functions of different gas turbines and correctly select appropriate components or designs <p>6.3 Professionalism in calculating marine engineering equipment power</p> <ul style="list-style-type: none"> ◆ Follow approved specifications of marine engineering equipment and apply the knowledge of marine engineering equipment power to design marine engineering equipment
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use the principles of marine engineering equipment design and general structural arrangement, and calculate the power of marine engineering equipment in order to implement relevant design tasks.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic mechanical and calculation knowledge and the competency of EMSRDE301A “Basic calculations for ship design”.

1. Title	Design marine electrical equipment
2. Code	EMSRDE404A
3. Range	Apply design principles of marine electrical equipment to performing general tasks in design studio and making design drawings.
4. Level	4
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Specifications, basic construction and range of application of marine electrical installations</p> <ul style="list-style-type: none"> ◆ Be familiar with general marine electrical installations, including transformers, DC/AC motor, AC generators and lighting ◆ Be familiar with marine power supply and distribution system ◆ Be familiar with electrical specifications and cable requirements <p>6.2 Techniques of designing marine electrical installations</p> <ul style="list-style-type: none"> ◆ Apply design principles and specifications for marine electrical installations to designing general marine electrical installations and accessories ◆ Draw drafts of marine electrical installations <p>6.3 Professionalism in designing marine electrical installations</p> <ul style="list-style-type: none"> ◆ Follow in-house guidelines and legislations related to marine electrical installations, ensuring that the installation design meets safety standard
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to design general marine electrical installations and accessories ; and</p> <p>(ii) Capable to draw drafts of marine electrical installations.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electrical equipment (such as: EMCUDE109A “Identify general properties of different types of typical electrical and mechanical engineering materials” and EMSRIN202A “Basic layout of marine electrical installations”).

1. Title	Use computer software to assist in ship-design projects									
2. Code	EMSRDE405A									
3. Range	In routine ship-design projects, use computer to perform general tasks in design office and to produce design drawings.									
4. Level	4									
5. Credit	3									
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Scope of application of computer aided ship design</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Master the scope of application of computer aided ship design, including: <ul style="list-style-type: none"> • 2D and geometric model production • graphic operation and wireframe techniques • conversion system and rendering ◆ Master the scope of application of computer aided ship design software </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Methods of using computer-aided ship design</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Know how to use the techniques of engineering design simulation, analysis and optimization in computer aided ship design ◆ Consider the interaction, processing and design characteristics of materials in the design process </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in using computer aided ship design</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Include basic concepts of quality and reliability in the design process ◆ Use professional ship design software </td> </tr> </table>	6.1	Scope of application of computer aided ship design	<ul style="list-style-type: none"> ◆ Master the scope of application of computer aided ship design, including: <ul style="list-style-type: none"> • 2D and geometric model production • graphic operation and wireframe techniques • conversion system and rendering ◆ Master the scope of application of computer aided ship design software 	6.2	Methods of using computer-aided ship design	<ul style="list-style-type: none"> ◆ Know how to use the techniques of engineering design simulation, analysis and optimization in computer aided ship design ◆ Consider the interaction, processing and design characteristics of materials in the design process 	6.3	Professionalism in using computer aided ship design	<ul style="list-style-type: none"> ◆ Include basic concepts of quality and reliability in the design process ◆ Use professional ship design software
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6.3	Professionalism in using computer aided ship design	<ul style="list-style-type: none"> ◆ Include basic concepts of quality and reliability in the design process ◆ Use professional ship design software 								
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to make geometric models and perform ship design with the aid of computer software; and</p> <p>(ii) Capable to perform engineering design according to design principles.</p>									
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic computer knowledge.									

1. Title	Organize and arrange ships' outfitting works
2. Code	EMSRIN401A
3. Range	Study hull structure and its principles of mechanics and formulate assembly processes, supervise works execution and perform general tasks of frontline works management at shipyards when handling daily routines related to outfitting works.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Methods of assessing ship strength and hull resistance</p> <ul style="list-style-type: none"> ◆ Master the following methods of assessing ship strength: <ul style="list-style-type: none"> • Calculating longitudinal stress, transverse stress and local stress • Working out the load and shear and bending moment diagrams • Calculating the longitudinal stress of ships in calm water and regular waves • Understanding the tilt parameters of hulls ◆ Master the following methods of assessing hull resistance and understand the importance of friction on sea navigation <ul style="list-style-type: none"> • Practical skills of analyzing resistance and boundary layer • Analyzing the flow resistance parameters and the measurements of approximate total resistance of ships • Applying the formulae related to displacement, momentum, energy and ship mechanics in calculations <p>6.2 Supervise ship outfitting works</p> <ul style="list-style-type: none"> ◆ Apply fully the above methods to formulation of ship outfitting works ◆ Adopt the most appropriate assembly measures to enhance the features of ship structure based on ship strength and hull resistance <p>6.3 Professionalism in supervising ship outfitting works</p> <ul style="list-style-type: none"> ◆ Meet the requirements laid down in approved drawings of outfitting works for hulls, including in-house guidelines, customer needs and manufacturer's manuals ◆ Make arrangements for hull dismantling, modifications or assembly and assist in preparing drawings ◆ Arrange assembly processes and coordinate the efforts according to actual situation

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: <ul style="list-style-type: none">(i) Capable to estimate the stress exerted on ships accurately under static conditions;(ii) Capable to apply the data of resistance on ships to preliminary estimation; and(iii) Capable to carry out relevant processes for outfitting works on ships, apply tools and instruments, record data and adjust to assembly standards properly.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of physics.

1. Title	Organize and arrange installation of ships' propulsion devices											
2. Code	EMSRIN402A											
3. Range	Assist in formulating installation procedures of propulsion devices when handling daily tasks related to ship installation or repairs, lead the work and implement frontline works management at shipyards											
4. Level	4											
5. Credit	3											
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Know about technical data of propulsion devices and requirements for marine power</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Master the meanings of the technical data for propulsion devices, including propulsion power, shaft power, transmission performance and hull performance ◆ Master different parameters of propulsion devices, including: <ul style="list-style-type: none"> • Knowledge of propeller • Thrust and torque coefficient ◆ Know about the requirements for marine power </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Methods of propulsion devices assembly supervision</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Estimate ship resistance and effective power by using data chart/manual ◆ Evaluate the mutual effect of the ship and propeller ◆ Make preparations for the disassembly, modification or assembly of propulsion device; assist in formulating working drawings ◆ Supervise the works according to performance requirements </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in propulsion devices assembly supervision</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Verify the requirements of propulsion device drawings, including in-house guidelines, client requirements and manufacturer manuals ◆ Make decisions on assembly according to approved procedures, or standards and limitations recommended by installation manuals ◆ Organize installation procedures and coordinate the efforts according to actual situations </td> </tr> </table>			6.1	Know about technical data of propulsion devices and requirements for marine power	<ul style="list-style-type: none"> ◆ Master the meanings of the technical data for propulsion devices, including propulsion power, shaft power, transmission performance and hull performance ◆ Master different parameters of propulsion devices, including: <ul style="list-style-type: none"> • Knowledge of propeller • Thrust and torque coefficient ◆ Know about the requirements for marine power 	6.2	Methods of propulsion devices assembly supervision	<ul style="list-style-type: none"> ◆ Estimate ship resistance and effective power by using data chart/manual ◆ Evaluate the mutual effect of the ship and propeller ◆ Make preparations for the disassembly, modification or assembly of propulsion device; assist in formulating working drawings ◆ Supervise the works according to performance requirements 	6.3	Professionalism in propulsion devices assembly supervision	<ul style="list-style-type: none"> ◆ Verify the requirements of propulsion device drawings, including in-house guidelines, client requirements and manufacturer manuals ◆ Make decisions on assembly according to approved procedures, or standards and limitations recommended by installation manuals ◆ Organize installation procedures and coordinate the efforts according to actual situations
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7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to supervise the progress of work, including correctly implementing assembly procedures, applying tools and instruments, recording data and working to the prescribed standards for assembly; and (ii) Capable to assess whether the ship assembly equipment meet the power requirements for propulsion devices.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of marine power and the competency of project supervision (such as: EMCUOM102A “Basic knowledge of electrical and mechanical services management” and EMSRDE301A “Basic calculations for ship design”).</p>

1. Title	Organize and arrange assembly of ship hulls	
2. Code	EMSRIN403A	
3. Range	Apply the assembly techniques to formulation of hull repair and assembly procedures (including aluminium alloy and GRP ships) when handling daily tasks related to installation or repairs of hulls; lead groups to work and perform general tasks of frontline works management at shipyards.	
4. Level	4	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure of and work requirements on hulls</p> <ul style="list-style-type: none"> ◆ Understand the structure of hulls, such as: <ul style="list-style-type: none"> • Technical terms and definition of main components • Structural arrangements of different ship cabins and thicknesses of plate materials for assembly ◆ Be familiar with the assembly work requirements such as relevant constitution and regulations on assembling hulls and criteria on allowed wear of hull parts established by general regulatory bodies or classification societies <p>6.2 Methods and procedures of leading hull assembly works</p> <ul style="list-style-type: none"> ◆ Arrange for the assembly works to ensure proper plans, technical specifications, materials and equipment for execution of works. For example <ul style="list-style-type: none"> • preparing for different types of jointing edges according to thickness requirement to prevent shrinkage and deformation ◆ Adopt strict surveillance measures for important work processes, such as: <ul style="list-style-type: none"> • Make strength analysis on joint weld and fillet weld with thickness of 35 mm or below <p>6.3 Professionalism in arranging hull assembly works</p> <ul style="list-style-type: none"> ◆ Monitor the procedures of assembling hulls according to technical guidelines of regulatory bodies and classification societies, in-house guidelines, customer needs and instructions on working drawings, and ensure that the procedures are in compliance with approved practice ◆ Make decisions on assembly according to approved procedures, and standards and limitations recommended by regulatory bodies or classification societies ◆ Organize work procedures and coordinate the efforts according to actual situations 	

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to compare the merits and demerits and concerns of various types of technologies in the course of formulating procedures for assembling hulls; and (ii) Capable to lead groups to carry out assembly procedures, to apply tools and instruments, to record data and to work to the prescribed standards for assembly.
8. Remarks	<p>This unit of competency is applicable to frontline managers of ship repair and hull assembly. The credit value of this unit of competency is set on the presumption that the person already the use of installation tools, techniques of oxyacetylene cutting, welding, copper welding and machining, and skills of mathematical analysis of stress and strain.</p>

1. Title	Organize and arrange installation of marine automatic equipment	
2. Code	EMSRIN404A	
3. Range	Supervise the installation and assembly of electronic and control equipment for propulsion system, assist in formulating disassembly and installation procedures, lead groups to work and perform general tasks of frontline works management at shipyards when handling daily tasks related to installation and assembly of marine propulsion and control systems as well as electronic and automatic installations.	
	4	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Marine electrical engineering, electronics, control principles and electrical equipment</p> <ul style="list-style-type: none"> ◆ Know about control engineering, instruments and principles of propulsion system ◆ Understand the operation requirements for electronic and automatic control of propulsion system ◆ Know about the technical standards of the performance of electronic and automatic control equipment <p>6.2 Methods and procedures of supervising the installation and disassembly of electronic and automatic control equipment</p> <ul style="list-style-type: none"> ◆ Ensure in the arrangement of works that thorough consideration is given to the integration of electronic and control equipment for propulsion system, including circuit protection, wiring, feedback signal and normal working condition during works execution ◆ Ensure that the activities of disassembly and installation are done according to plans meeting technical, conventional, safety and procedural standards ◆ Identify the impact of the installation or disassembly on auxiliary devices and the system, and use surveying and calibration instruments for conducting the disassembly or installation properly <p>6.3 Professionalism in supervising the installation and disassembly of electronic and automatic control equipment</p> <ul style="list-style-type: none"> ◆ Compare the working conditions of electronic and automatic control equipment for propulsion system and ensure that their performance meets manufacturer's indicators and installation manual requirements ◆ Take actions according to approved procedures and the standards and limitations stated in manuals and make decisions on installation and disassembly ◆ Organize installation and disassembly procedures and coordinate the efforts according to actual situations 	

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to master the noting points for the disassembly, installation and works of electronic and automatic control equipment for propulsion system; and (ii) Capable to finish work arrangements, including leading groups to carry out assembly procedures correctly, applying tools and instruments, recording data and working to the prescribed standards for assembly.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses the basic knowledge of electrical, electronic and control installations (such as EMSRIN303A “Install and disassemble marine electronic instruments”).</p>

1. Title	Organize and arrange installation of communication equipment on ships		
2. Code	EMSRIN405A		
3. Range	Formulate installation procedures, supervise works execution and perform general tasks of frontline works management at shipyards when handling daily tasks related to installation of marine electronic navigating equipment and radio communication system.		
	4		
5. Credit	3		
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p>		
	6.1	Basic electronics and radio communication technology	<ul style="list-style-type: none"> ◆ Know about electronic engineering, navigation instruments and principles of radio communication ◆ Understand the operation requirements for marine electronic navigating and radio communication devices ◆ Know about the technical standards of the performance of electronic navigating and radio communication equipment
	6.2	Methods and procedures of supervising the installation and removal of electronic navigating equipment and radio communication devices	<ul style="list-style-type: none"> ◆ Ensure in the process of works supervision that thorough consideration is given to the integration of marine electronic navigating and radio communication equipment, including circuit protection, wiring, feedback signal and normal working condition during works execution ◆ Ensure that the activities of removal and installation are done according to plans meeting technical, conventional, safety and procedural standards ◆ Identify the impact of the installation or removal on auxiliary devices and the system, and use surveying and calibration instruments for conducting the removal or installation properly
	6.3	Professionalism in supervising the installation and removal of electronic navigating equipment and radio communication devices	<ul style="list-style-type: none"> ◆ Compare the working conditions of electronic navigating system and radio communication equipment and ensure that their performance meets manufacturer's indicators and installation manual requirements ◆ Take actions according to approved procedures or the standards and limitations stated in installation manuals and make decisions on installation and removal ◆ Organize installation and removal procedures and coordinate the efforts according to actual situations

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to explain the operating principles of marine electronic navigating and radio communication system properly; (ii) Capable to supervise the removal and installation of marine electronic navigating devices and radio communication equipment; and (iii) Capable to ensure that installation procedures, application of tools and instruments, and data recording and adjusting procedures meet the specified standards of assembly.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses the basic knowledge of a ship electrician and of electronic communication (such as EMSRIN202A “Basic layout of marine electrical installations” and EMSRIN303A “Install and disassemble marine electronic instruments”).</p>

1. Title	Plan lifting work
2. Code	EMSRIN406A
3. Range	Plan to erect jibs and riggings for ship repairs, or direct cranes to lift and move objects to the positions specified.
4. Level	2
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Application and operation of lifting appliances ♦ Understand application and operation of general lifting appliances, such as offshore cranes, winches, lifeboats hangers and anchor windlasses</p> <p>6.2 Plan to use ship riggings and cranes for lifting ♦ Correctly plan the operation procedures of ship lifting appliances, including:</p> <ul style="list-style-type: none"> • Pre-operation safety inspection items (equipment and machinery) • Give appropriate commands when necessary (such as weather or wind and tide change, equipment failures) • Supervise the storage and safe stacking of heavy cargo <p>6.3 Professionalism in planning to use ship riggings and cranes for lifting ♦ Instruct others to follow relevant codes (such as the code of marine safety) to work</p> <ul style="list-style-type: none"> ♦ Assess the cargo weight and verify the safe load of machines and tools ♦ Judge the included angle and the safe load of multi-leg slings
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to plan the lifting procedures for ship repairs, including correctly erecting gin poles and laying out riggings, using signals and controlling the lifting operation; and</p> <p>(ii) Capable to use safety inspection lists.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the knowledge of using general personal safety gear.

1. Title	Organize and arrange assembly of aluminium-alloy ships	
2. Code	EMSRIN407A	
3. Range	Apply corresponding assembly techniques for different types of materials (such as aluminium alloys, honeycomb panels and some less popular materials) to formulation of installation procedures when handling daily tasks related to installation of aluminium alloy hulls; lead groups to work and manage general frontline tasks at shipyards.	
4. Level	4	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Structure of and work requirements on aluminium alloy hulls</p> <ul style="list-style-type: none"> ◆ Understand the structure of aluminium alloy hulls, such as: <ul style="list-style-type: none"> • Fabrication and stress positions of main components • Installation standards, such as angle, border, stern cover, jointing and finishing • Structural arrangements of different bulkheads and thicknesses, weight and strength requirements for corresponding assembly different types of materials (such as aluminium alloys, honeycomb panels and some less popular materials) ◆ Understand the general standards for assembling aluminium alloy hulls established by regulatory bodies and classification societies, such as relevant constitution and regulations and criteria on allowed wear of hull parts <p>6.2 Methods and procedures of assembling aluminium alloy hulls</p> <ul style="list-style-type: none"> ◆ Make preparations for assembling aluminium alloy hulls so as to ensure proper plans, technical specifications, materials and equipment for execution of works; for example, prepare for different types of jointing edges (of different thicknesses) to prevent the following phenomena: <ul style="list-style-type: none"> • Shrinkage • Distortion • Deformation • Corrosion • Material fatigue ◆ Adopt strict surveillance measures for important work processes, such as: <ul style="list-style-type: none"> • Cutting • Drilling • Welding • Binding • Folding • Bending 	

	<p>6.3 Professionalism in assembling aluminium alloy hulls</p> <ul style="list-style-type: none"> ◆ Monitor the procedures of assembling hulls according to technical guidelines of regulatory bodies, classification societies and materials manufacturers, in-house guidelines, customer needs and instructions on working drawings, and ensure that the procedures are in compliance with approved practice ◆ Make decisions on assembly according to approved procedures, and standards and limitations recommended by regulatory bodies or classification societies ◆ Organize work procedures and coordinate the efforts according to actual situations
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to compare the merits and demerits and concerns of various types of technologies in the course of formulating procedures for assembling aluminium alloy hulls; and (ii) Capable to lead groups to carry out assembly procedures, to apply tools and equipment, to record data and to work to the standards of regulatory bodies.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of assembling hulls (such as EMSRRM301A “Repair hull structures of non-steel ships”).</p>

1. Title	Arrange for ship inspection according to class registration / certification
2. Code	EMSRIT401A
3. Range	In daily tasks of ship repairs and marine inspection, commissioning and testing, apply legal knowledge related to ship industry to supervise the arrangement of ship inspection for class registration / certification, and formulate related work specifications.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Standards required for ship inspection</p> <ul style="list-style-type: none"> ◆ Be familiar with the requirements of maritime departments, classification bodies and class registration / certification on the standards for ship inspection, including: <ul style="list-style-type: none"> • Inspection procedures and items for classification • Meanings of classification symbols • Ship classification by work procedures <p>6.2 Methods of ship inspection arrangements</p> <ul style="list-style-type: none"> ◆ Systematically prepare the procedures for ship inspection and tests, including: <ul style="list-style-type: none"> • Sea trial • Annual inspection • Periodic inspection ◆ Clearly point out failed items and give advice on remedy for ships not passing the requirements <p>6.3 Professionalism in ship inspection arrangements</p> <ul style="list-style-type: none"> ◆ Follow rules and regulations of maritime departments, classification bodies and class registration / certification to arrange and supervise all the preparations for ship inspection ◆ Assist in writing survey reports and recommendations
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to correctly prepare the work procedures for ship class registration / certification, accurately record and analyze data, and judge the accuracy of the test results; and</p> <p>(ii) Capable to correct state in detail the requirements for ship classification.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic project supervision techniques and maritime knowledge.

1. Title	Supervise ship works to meet seaworthiness standards	
2. Code	EMSRIT402A	
3. Range	In daily tasks of ship repairs and marine inspection, commissioning and testing, supervise ship works to meet seaworthiness standards, and formulate work specifications for inspection and testing.	
4. Level	4	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Marine ordinance and bylaws, knowledge of the policies</p> <ul style="list-style-type: none"> ◆ Be familiar with marine ordinance and ship registration requirements, including: <ul style="list-style-type: none"> • Scope, procedures and certification requirements of maritime departments • Relevant terms of international maritime conventions ◆ Be familiar with Marine Insurance Act, including: <ul style="list-style-type: none"> • Importance of hull and machinery insurance and policy content • Basic area of work for P & I Club ◆ Understand maritime political systems, including: <ul style="list-style-type: none"> • Effect of the flag of convenience on ship registration requirements • requirements of maritime departments on port control enforcement <p>6.2 Methods of supervising ship works to meet seaworthiness standards</p> <ul style="list-style-type: none"> ◆ Supervise ship works to ensure that the work standards meet the requirements for ship registration ◆ Formulate work specifications for ship inspection such as the following inspection standards: <ul style="list-style-type: none"> • tail shaft, hull and all the machines • pressure containers and other lifting appliances <p>6.3 Professionalism in supervising ship works to meet seaworthiness standards</p> <ul style="list-style-type: none"> ◆ supervise ship works, ensuring that they are performed according to relevant marine ordinance and bylaws 	
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to correctly supervise ship works to meet seaworthiness standards and formulate work specifications for ship inspection ; and</p> <p>(ii) Capable to correctly point out relevant terms of international maritime conventions and legislations.</p>	
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic project supervision techniques and maritime knowledge.	

1. Title	Marine inspection and ship survey	
2. Code	EMSRIT403A	
3. Range	Apply relevant marine ordinance and requirements to ship inspection when handling daily tasks for ship repairs and marine inspection and ship survey.	
4. Level	4	
5. Credit	5	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Specifications of periodic inspection required for ship classification</p> <ul style="list-style-type: none"> ◆ Be familiar with the scope and items of ship inspection ◆ Master ship survey procedures ◆ Master general ship survey principles and ship survey items for special conditions <p>6.2 Methods of marine inspection and ship survey</p> <ul style="list-style-type: none"> ◆ Perform ship survey for different reasons, such as: <ul style="list-style-type: none"> • Classification renewal inspection (hull and machinery) • Annual inspection (hull and machinery) • Mid-term inspection (hull and machinery) • Ship bottom inspection (condition of dryness and in the water) • Tail shaft inspection (intact and modified) • Thorough inspection of boiler • Damage and repair inspection • Port control inspection • Inspection prior to change of ownership • Commissioning of idle and reassembled ships <p>6.3 Professionalism in marine inspection and ship survey</p> <ul style="list-style-type: none"> ◆ Verify the quality system with approved ship inspection methods ◆ Finish ship survey according to the requirements of local classification societies or social practice, and assist in compiling survey reports and recommendations 	
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to perform ship survey and judge whether the ship meets relevant requirements; and</p> <p>(ii) Capable to assist in compiling survey reports and recommendations.</p>	
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic maritime knowledge (such as: EMSRIT303A “Hull-stability examination and inclination test”).	

1. Title	Inspect and test high power diesel engines	
2. Code	EMSRT404A	
3. Range	Inspect and test high power (3000 kW/4000 BHP or above) diesel engines in daily tasks related to ship repairs and marine engineering; use the test results to analyze the performance of diesel engines and assess whether there are faults or defects.	
4. Level	4	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of testing high power diesel engines</p> <ul style="list-style-type: none"> ◆ Master the test indicators and cycles, regular testing procedures and performance criteria of large diesel engines, such as: <ul style="list-style-type: none"> • Preparations for restarting engine after overhaul • Adjustments before starting • Starting engine • Running in full speed • Normal operation • Cruising mode • Stopping operation ◆ Understand the system monitor and alarm modes of large diesel engines, such as signal detection and transmission ◆ Master unusual working conditions and alerting signals ◆ Master the operation parameters of diesel engines and compare them with manufacturer values ◆ Master the conditions and data of empty running and running with different loadings and conduct situation analysis and assessment <p>6.2 Methods and procedures of testing high power diesel engines</p> <ul style="list-style-type: none"> ◆ Perform general tasks of inspecting and testing large diesel engines systematically, such as analyzing and setting crank-arm deflection, regular checking and adjustment of fuel injection, adjustment of speed functions, setting the parameters for the working temperature and pressure, and setting the parameters for the power and gas control ◆ Use block diagrams to illustrate the system operation of large diesel engines at different phases ◆ Interpret the system monitor and alarm signals of large diesel engines and understand and integrate the messages 	

	<ul style="list-style-type: none"> ◆ Master tuning techniques and handle and integrate the data of tuning according to the relationship of the input and output items ◆ Fault diagnosis and troubleshooting of large diesel engines ◆ Have proper coordination of the functions of large diesel engines and the performance of their related systems after inspection <p>6.3 Professionalism in testing large diesel engines</p> <ul style="list-style-type: none"> ◆ Perform relevant testing procedures, analyze test results and assess the performance of diesel engines and see whether there are faults or defects according to the repair manuals of large diesel engines, in addition to the worker's knowledge and experience of the test indicators of diesel engines ◆ Record the set points of every test item and maintain effective monitoring and alarm after adjustment ◆ Plan the details for inspection and performing tests
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to implement general procedures of inspecting large diesel engines, apply testing tools and equipment, record and compile data and use the data to illustrate the test results; and</p> <p>(ii) Capable to organize inspection work and coordinate the normal operation parameters of different systems so as to facilitate effective power transmission of large diesel engines.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of testing marine engineering equipment.</p>

1. Title	Inspection and testing of ship lifting appliances	
2. Code	EMSRIT405A	
3. Range	Master the performance of lifting appliances and the procedures for inspecting them and formulate relevant work processes for inspection of ship lifting appliances when handling daily tasks related to inspection, commissioning and testing ship lifting appliances.	
4. Level	4	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Regulations and legal requirements on lifting appliances for ship repairs</p> <ul style="list-style-type: none"> ◆ Understand ordinances related to lifting for ship repairs: <ul style="list-style-type: none"> • Code of marine safety • Occupational safety and health ordinance • Factories and Industrial Undertakings Ordinance • Factories and Industrial Undertakings Regulations ◆ Understand the requirements and rules for testing lifting appliances, such as statutory regulations for inspection of ships and marine facilities, ship safety standards, other relevant international standards and codes of practice ◆ Understand the operation and performance of lifting appliances for ship repairs, including: <ul style="list-style-type: none"> • Types and uses of lifting appliances • Combinations of units of lifting appliances and their limitations • Safe working load of lifting appliances • Safety devices of lifting appliances ◆ Understand the work allocation and safety procedures of the mechanical, electrical and control systems of lifting appliances <p>6.2 Methods of inspecting and testing the mechanical, electrical and control systems of lifting appliances</p> <ul style="list-style-type: none"> ◆ Interpret correctly the information used in inspections and tests, such as mechanical drawings, wiring diagrams, overall layout plans, load charts, specifications, manufacturer's manuals, past maintenance records and written symbols ◆ Master the calibration of testing instruments and connect them to the lifting appliances to be inspected, commissioned and tested ◆ Master the procedures of inspecting and testing general mechanical handling equipment and carry out different inspection items and procedures according to the requirements of approved regulations 	

	<p>6.3 Professionalism in inspecting and testing lifting appliances</p> <ul style="list-style-type: none"> ◆ Understand the inspection requirements on electrical lifting gear and implement the control system according to relevant requirements, including inspection and testing of alarms and safety devices ◆ Describe the results of routine tests correctly and if necessary, provide relevant information for further analysis and inspection ◆ Meet the legal requirements stated in the certificate for general lifting appliances, such as initial test and inspection, annual overhaul, renewal test and inspection; supervise frontline works and inspection on lifting appliances and tests on lifting by claims adjusters ◆ Use visual (eye) observation and other alternatives during on-site inspection, such as hammer test on components and parts, and ultrasonic inspection and magnetic particle test ◆ Confirm whether there is any deformation and defect of the components of the lifting appliance, such as cracks, excessive wear and rusting, because its safety and normal lifting operation will be affected by such conditions in future ◆ State the work responsibility and report accurately and seek assistance if matters are beyond personal purview
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to supervise the inspection of the operation of various types of lifting appliances properly; and</p> <p>(ii) Capable to implement relevant inspection procedures, apply testing tools and instruments and record and analyze data properly; certify the inspection and test results.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already knows about general loading equipment and lifting appliances and possesses basic knowledge of works supervision (such as EMCUOM102A “Basic knowledge of electrical and mechanical services management” and EMSRIN204A “Use ship’s lifting appliances”).</p>

1. Title	Plan and analyze hull stability and inclination tests									
2. Code	EMSRLT406A									
3. Range	Regarding ship stability assessment, use calculation and relevant inclining test technology and arrange hull stability and inclining tests so as to analyze and report on hull stability performance.									
4. Level	4									
5. Credit	3									
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Concerns for arrangement of hull stability and inclining tests</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Be familiar with basic content and calculation of lateral, longitudinal stability technology ◆ Master the concerns for the arrangement of hull stability and inclining tests, such as: <ul style="list-style-type: none"> • Items for work arrangement, such as preparation of tools, manpower and venue • Record and analysis of test results </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Methods of in planning and analyzing hull stability and inclining tests</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Master the steps and key points of testing, and arrange hull stability and inclining tests ◆ Accurately analyze test records and extract information from test results in order to write the report </td> </tr> <tr> <td style="vertical-align: top;">6.3</td> <td style="vertical-align: top;">Professionalism in planning and analyzing hull stability and inclining tests</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Make good use of stability calculations and past experience, and use appropriate data in the test report ◆ Make reference of stability information of relevant ship types </td> </tr> </table>	6.1	Concerns for arrangement of hull stability and inclining tests	<ul style="list-style-type: none"> ◆ Be familiar with basic content and calculation of lateral, longitudinal stability technology ◆ Master the concerns for the arrangement of hull stability and inclining tests, such as: <ul style="list-style-type: none"> • Items for work arrangement, such as preparation of tools, manpower and venue • Record and analysis of test results 	6.2	Methods of in planning and analyzing hull stability and inclining tests	<ul style="list-style-type: none"> ◆ Master the steps and key points of testing, and arrange hull stability and inclining tests ◆ Accurately analyze test records and extract information from test results in order to write the report 	6.3	Professionalism in planning and analyzing hull stability and inclining tests	<ul style="list-style-type: none"> ◆ Make good use of stability calculations and past experience, and use appropriate data in the test report ◆ Make reference of stability information of relevant ship types
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6.3	Professionalism in planning and analyzing hull stability and inclining tests	<ul style="list-style-type: none"> ◆ Make good use of stability calculations and past experience, and use appropriate data in the test report ◆ Make reference of stability information of relevant ship types 								
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to plan hull stability and inclining test procedures, ensuring that correct tools and equipment are used in the procedures; clearly record and process data; and</p> <p>(ii) Capable to use data collected for analysis and write test reports.</p>									
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of calculation and hull stability and inclining tests (such as: EMSRLT303A “Hull-stability examination and inclination test”).									

1. Title	Test marine glass-fibre-reinforced plastic (GRP)
2. Code	EMSRLT407A
3. Range	Use different methods to judge whether the structure of glass-fibre-reinforced plastic equipment has any problem or defect when performing hull installation test.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Common defects in glass-fibre-reinforced plastic and test methods</p> <ul style="list-style-type: none"> ◆ Be familiar with the common defects in fibre glass enhanced plastic such as: <ul style="list-style-type: none"> • Delamination • Blisters • Distortion • Incomplete curing ◆ Be familiar with different test methods such as NDT methods and measurement <ul style="list-style-type: none"> • Range of applications and limitations • Accuracy <p>6.2 Techniques and procedures of testing marine glass-fibre-reinforced plastic</p> <ul style="list-style-type: none"> ◆ Master the uniqueness of different marine engineering equipment and effectively use appropriate test methods to identify the condition of plastic structure, such as: <ul style="list-style-type: none"> • Research relevant information (e.g. equipment being hit previously) to assist in planning the test procedures • Whether the position of equipment is suitable for using a certain test method <p>6.3 Professionalism in testing marine glass-fibre-reinforced plastic</p> <ul style="list-style-type: none"> ◆ Base on accurate test analysis to decide whether the plastic is suitable for further use or needs replacement
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to correctly test glass-fibre-reinforced plastic for problems and defects.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of testing (such as: EMSRLT201A “Test the physical strength of materials” and EMCULN306A “Perform electrical and mechanical installation and testing according to the drawings and specifications of electrical devices and wiring”).

1. Title	Examine welded, fabricated and rolled pieces
2. Code	EMSRLT408A
3. Range	Regarding regular inspection, commissioning and testing for ship repair and mechanical works, apply the knowledge of welding and fabrication to examine welded, fabricated and rolled pieces, and inspect and appraise the quality of the work pieces.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of examining welded, fabricated and rolled pieces</p> <ul style="list-style-type: none"> ◆ Be familiar with welding standard and specification standards for different components, such as: <ul style="list-style-type: none"> • Deviations for low pressure and high pressure structures • Consider whether the weld seams cause buffeting ◆ Be familiar with the craft skill requirements for component fabrication <p>6.2 Methods of examining craftsmanship of welded, fabricated and rolled pieces</p> <ul style="list-style-type: none"> ◆ Effectively use appropriate examination tools or instruments to examine the craftsmanship standard of welded, fabricated and rolled pieces, including: <ul style="list-style-type: none"> • Using all kinds of examination methods such as visual observation or NDT technology • Adjusting the examination standard according to the importance of component functions <p>6.3 Professionalism in examining craftsmanship of welded, fabricated and rolled pieces</p> <ul style="list-style-type: none"> ◆ assess with professional experience whether the quality of welded, fabricated and rolled pieces are up to standard
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to correctly examine the quality of welded, fabricated and rolled pieces.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses the knowledge of inspection, commissioning and testing, including all kinds of testing techniques (such as EMCUIN306A “Perform electrical and mechanical installation and testing according to the drawings and specifications of electrical devices and wiring” and EMSRLT301A “Examine the shapes and dimensions of prefabricated pieces according to standards”) .</p>

1. Title	Lead workgroups to maintain and repair main power units of ships
2. Code	EMSRRM401A
3. Range	In daily tasks related to maintenance of ships and marine engineering equipment , lead workgroups to maintain and repair main power units of ships, supervise the progress of work, formulate work specifications and supervise the work.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Working principles and repair of main power units of ships</p> <ul style="list-style-type: none"> ◆ Master the operation characteristics of internal combustion engine for marine diesel engines with different power output /turning speed ◆ Understand the operation characteristics of steam turbine ◆ Understand characteristics and work cycles of steam boiler ◆ Understand the basic working principles of gas turbine and jet system <p>6.2 Leading workgroups to maintain and repair main marine engineering equipment</p> <ul style="list-style-type: none"> ◆ Plan and supervise maintenance/repairs of ships' power units, ensure that the work procedures are carried out according to technical, statutory, safety and procedural requirements <ul style="list-style-type: none"> • Use appropriate materials and equipment for repairs • Select the most appropriate measures for maintenance and repairs <p>6.3 Professionalism in leading the groups to maintain and repair main marine engineering equipment</p> <ul style="list-style-type: none"> ◆ Check the actual status of operation of the marine engineering equipment to see if the performance of equipment tallies with manufacturer's guidelines or requirements in the maintenance manuals ◆ Perform repairs according to approved practice or the specifications and limitations recommended in repair manuals, and make decisions on repair methods ◆ Prepare repair procedures and coordinate the repairs

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to lead workgroups to carry out maintenance and repairs of main power units of ships; (ii) Capable to identify causes of failures of machines and methods to eliminate the failures according to approved procedures or repair manual instructions; and (iii) Capable to effectively supervise the repairs of main marine engineering equipment.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic mechanical principles and the knowledge of repairing main power units of ships (such as: EMSRRM102A “Repair and maintain general marine devices” and EMSRIN301A “Assemble and install marine engineering system and mechanical equipment”) and know about the basic management and planning techniques.</p>

1. Title	Lead workgroups to maintain and repair auxiliary units of ships	
2. Code	EMSRRM402A	
3. Range	In daily tasks related to maintenance of ships and marine auxiliary units, apply the knowledge on these areas to lead workgroups to maintain and repair auxiliary units of ships, formulate work specifications, and supervise repairs.	
4. Level	4	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Working principles and repair items of auxiliary units of ships</p> <ul style="list-style-type: none"> ◆ Understand the operation and maintenance items of marine auxiliary machinery, including pumping system , heat energy exchanger, fresh water machine, refrigeration machine, air compressor, blower, oil purifier and auxiliary boiler, and the steering gear system ◆ Understand the operation and maintenance items of control system, cargo handling equipment and deck machinery ◆ Master the repair standards for fire fighting facilities onboard, ballast pump suction, fuel supply, waste water and piping systems <p>6.2 Leading workgroups to maintain and repair auxiliary units of ships</p> <ul style="list-style-type: none"> ◆ Plan and supervise the maintenance/repairs of auxiliary units of ships, ensure that the work procedures are carried out according to approved practice, and the performance of the units meets the technical specification in manufacturer's maintenance manual ◆ Ensure that the safe and high-performance operation and status of marine auxiliary equipment is applicable to different modes of operation <p>6.3 Professionalism in leading the groups to maintain and repair auxiliary units of ships</p> <ul style="list-style-type: none"> ◆ Check the actual status of operation of the auxiliary units of ships to see if the performance of units tallies with manufacturer's guidelines or the requirements in the maintenance manual ◆ Take action according to approved practice or the specifications and limitations recommended in repair manuals, and make decisions on repair methods ◆ Prepare repair procedures and coordinate the repairs 	

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to lead the workgroups to carry out maintenance and repairs of auxiliary units of ships; identify causes of failures of machines and methods to eliminate the failures according to approved procedures or repair manual instructions; and (ii) Capable to effectively supervise the repairs of auxiliary units of ships, and adopt the most appropriate repair measures to restore the functions of the units.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic mechanical principles and the knowledge of repairing auxiliary components and equipment of ships (such as: EMSRRM204A “Repair and maintain ship auxiliary equipment” and EMSRIN301A “Assemble and install marine engineering system and mechanical equipment”) and know about the basic management and planning techniques.</p>

1. Title	Supervise hull and ship structure repairs	
2. Code	EMSRRM403A	
3. Range	Apply the knowledge of metal fabrication technology and hull structure to supervision of hull and ship structure repairs, and formulate work standards, supervise repair work and manage general frontline tasks at shipyards.	
4. Level	4	
5. Credit	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Types of ships and methods of constructing and building main structural framework</p> <ul style="list-style-type: none"> ◆ Understand naval architecture and ship structure, including knowledge of damage control and techniques of hull repairs ◆ Understand the basic construction of different types of ships <ul style="list-style-type: none"> • Traditional types • High-speed types ◆ Understand the key functions of main structural parts <ul style="list-style-type: none"> • Definitions of hog and sagging • Common load • Typical load (characteristics) graph • Construction of amidship • Cabinet framework and outer hull plates • Double-bottom • Bulbous bow • Bow construction • Stern frame • Bulkhead <p>6.2 Methods and procedures of supervising hull and ship structure repairs</p> <ul style="list-style-type: none"> ◆ Plan and supervise the maintenance of the hull and internal structure and ensure the work processes meet technical, legal, safety and procedural standards <ul style="list-style-type: none"> • Using appropriate materials and equipment for repairs • Selecting the most appropriate measures for repairs ◆ Master the key points to ship repairing, technology updating and water-tightness testing, and lead working groups to perform the following tasks: <ul style="list-style-type: none"> • Repairing the coating of hulls and working on damaged ship plates • Repairing and reconditioning the parts of different materials and perform water-tightness tests after repairing 	

	<p>6.3 Professionalism in supervising hull and ship structure repairs</p> <ul style="list-style-type: none"> ◆ Make a comparison of the actual state of the hull and ship structure with their pre-service conditions, and verify whether their performance meet the indicators of regulatory bodies and the requirements stated in the constitution of classification societies ◆ Take actions according to approved procedures, and standards and limitations recommended by classification societies and make decisions on repair procedures ◆ Organize repair procedures and coordinate the efforts
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to identify various types of ships and structural framework; (ii) Capable to lead working groups to perform the tasks of hull repairs and ship structure replacements; (iii) Capable to identify the damage of hulls and major structural parts and relevant remedies according to approved procedures and the instructions stated in the constitution of regulatory bodies and classification societies; and (iv) Capable to supervise hull and ship structure repairs effectively.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of hull structure and the competency of application of metal fabrication technology (such as EMSRIN102A “Checking of and working on ironwork materials” and EMSRRM201A “Apply metal fabrication skills to ship repairs and maintenance”) and understands basic management and planning skills.</p>

1. Title	Supervise difficult welding, duct overhaul and hull outfitting	
2. Code	EMSRRM404A	
3. Range	Supervise tasks of difficult welding, duct overhaul and hull lofting when handling daily tasks of ship repairs, formulate repair plans, direct work execution and perform general tasks of frontline works management at shipyards.	
4. Level	4	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of supervising difficult welding, ductwork and hull lofting</p> <ul style="list-style-type: none"> ◆ Understand various types of basic welding methods and the characteristics and work processes of difficult welding, such as: <ul style="list-style-type: none"> • Gas welding • Electric arc welding • Plasma arc welding ◆ Understand the structural composition and inspection procedures of ductwork, such as; <ul style="list-style-type: none"> • Methods of jointing different components (such as gates, pumps, pipe elbows/rings/joints) • Characteristics of ductwork of different materials or for different functions, and general items for inspection, such as duct blowing and washing and leakage testing ◆ Understand the procedures, requirements and aims of hull lofting, such as: <ul style="list-style-type: none"> • Unfolding components • Forming cradle <p>6.2 Techniques and procedures of supervising difficult welding, duct overhaul and hull lofting</p> <ul style="list-style-type: none"> ◆ Supervise difficult welding tasks, including: <ul style="list-style-type: none"> • Demonstrating relevant work processes • Illustrating and assessing the occurrence of different weld defects and relevant preventives • Planning the implementation procedures of welding work ◆ Supervise duct overhaul, including: <ul style="list-style-type: none"> • Demonstrating relevant work processes • Identifying the work requirements for ductwork of different materials or for different functions • Plan the implementation procedures for duct overhaul, including turning off gas supply, and treating the residues of the materials transported in the pipeline 	

	<ul style="list-style-type: none"> ◆ Supervise the tasks of hull lofting, including: <ul style="list-style-type: none"> • Demonstrating relevant work processes, such as linear lofting and structure lofting • Using computer software to help perform lofting tasks • Planning the implementation procedures of hull lofting <p>6.3 Professionalism in supervising difficult welding, duct overhaul and hull lofting</p> <ul style="list-style-type: none"> ◆ Make a comparison of the structures which require difficult welding and the actual state of duct overhaul with their pre-service conditions, and verify whether their performance meet the indicators of regulatory bodies and the requirements of the constitution of classification societies ◆ Take actions according to approved procedures, and standards and limitations recommended by classification societies, and make decisions on selection of proper work processes ◆ Organize repair procedures and coordinate the efforts
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to lead working groups to perform activities of difficult welding, duct overhaul and hull lofting; (ii) Capable to handle tasks of difficult welding, duct overhaul and hull outfitting according to approved procedures, and indicators stated in the constitution of regulatory bodies and classification societies; and (iii) Capable to use computer-aided hull lofting to implement technical instructions.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of hull structure and the competency of advanced welding techniques, and understands the requirements (such as EMCUMA201A “Non-destructive test (NDT) - magnetic particle inspection”, EMCUMA202A “Non-destructive test (NDT) - ultrasonic testing” and EMSRRM307A “Repair ship piping system”) on the work processes of compliance inspection (such as stress test and NDT test).</p>

1. Title	Supervise ship painting works for repairs and maintenance		
2. Code	EMSRRM405A		
3. Range	Apply the professional knowledge of hull treating, anti-rusting, anti-corrosion, protection and paints to formulation of work processes and lead workgroups to perform painting tasks, direct and supervise the work to its completion.		
4. Level	4		
5. Credit	3		
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Approved and international standards for ship painting works</p> <ul style="list-style-type: none"> ◆ Understand ordinances related to regulations of ship painting works, such as those on work conditions and environmental protection ◆ Understand relevant standards for implementation of painting works ◆ Understand the conditions for anti-corrosion and anti-growth of marine epiphytes on hulls ◆ Understand the specifications of ship paints and the legal content of chemicals stipulated in the legislations on prevention of pollution to marine environment <p>6.2 Methods of supervising and commissioning ship painting works</p> <ul style="list-style-type: none"> ◆ Perform visual observation and monitor relevant ship painting works independently ◆ Use various types of inspection tools to perform relevant tasks ◆ Master common defects in ship painting and assess whether they are acceptable ◆ Correctly understand the difficulties in appropriate execution of work and provide solutions if necessary ◆ Record the surveillance work systematically and prepare for further analysis and supervision <p>6.3 Professionalism in supervising ship painting</p> <ul style="list-style-type: none"> ◆ Supervise general ship painting works and test the quality according to approved practice and processes ◆ Supervise the implementation of painting work according to approved practice and processes and paint manufacturer's instructions ◆ Plan escape routes when working in confined spaces and locations with hazards ◆ Handle the paints left and the containers of paints properly and adopt the following measures: <ul style="list-style-type: none"> • Fire precautions • Maintaining good ventilation • Other relevant preparations 		

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to perform to approved practice and standards for painting works and understand general techniques for coat tests and painting methods; and (ii) Capable to apply the knowledge and techniques of ship painting works effectively and direct and supervise the implementation of works.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of ship painting works (such as EMSRRM305A “Repair and maintain paint coatings of ships” and EMSRRM312A “Aluminium alloy ship painting works”) and understands relevant work processes.</p>

1. Title	Supervise the repairs of high-speed engines and water-jet propellers for ships	
2. Code	EMSRRM406A	
3. Range	Apply the knowledge of repairing high-speed engines and water-jet propelling equipment to formulation of inspection procedures, and lead working groups to perform tasks of inspection and carry out frontline management duties so as to ensure normal operation of engine units.	
4. Level	4	
5. Credit	9	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about the structure of high-speed engines and water-jet propellers for ships</p> <p style="text-align: center;"><u>High-speed engines (1500RPM or above)</u></p> <ul style="list-style-type: none"> ◆ Understand the basic design concept and structural characteristics of high-speed engines for ships, such as assembly structure and drive mode ◆ Understand the overall layout of high-speed engines and operation of high-speed ships, such as engine positions and channel connection of different systems ◆ Master the processing characteristics and operating principles of the main components of high-speed engines for ships, such as bases, shafts, cranks, bearing, camshafts and axle drive <p style="text-align: center;"><u>Water-jet propellers, such as water-jet and turbine</u></p> <ul style="list-style-type: none"> ◆ Understand the working principles and technical specifications of water-jet propellers, such as sizes and output of impeller blades ◆ Master the overall layout of water-jet propellers and the names and functions of main components, including rudder control handle, stern frame seal, backflow device, sucking sheath, steering nozzle ◆ Understand the specifications of the control system of water-jet propellers, such as steering adjustment, hydraulic operation, reverse control, electronic module operation and position adjustment <p>6.2 Inspection items and methods for high-speed engines and water-jet propellers</p> <ul style="list-style-type: none"> ◆ Interpret and follow the technical instructions of operation and repair manuals, such as layout plans, technical data, specification sheets, control circuits, light signals and instrument information ◆ Record repair data properly, such as the operation hours and working conditions of main components, and identify the sections which usually fail according to instructions and preventive measures against damage 	

	<p>6.3 Professionalism in repairing high-speed engines and water-jet propellers for ships</p> <ul style="list-style-type: none"> ◆ Identify the impact of the accessory devices of the high-speed engine, such as turbocharger, air filtration, fresh water circulation, sea water circulation, fuel oil supply, oil filtration, dipstick and centre cooling systems, on the failure of the main machine ◆ Survey, calibrate, maintain and repair the high-speed engine units of ships according to appropriate measures and procedures and repair manual instructions, including: <ul style="list-style-type: none"> • Removing and reassembling the foundation and chassis • Repairing and replacing cylinder heads, cylinder sleeves, pistons, pressure rings, oil rings, shaft dowel pin, links, valve gear, speed governors, auxiliary drives, collection cavities, supercharged coolers and turbochargers • Maintaining and inspecting the systems related to discharging, lubrication, cooling, starting , fuel and instruments ◆ Understand the drive arrangements of the engines and water-jet propellers for ships, such as the normal positions relating to alignment of slave axis and axial line and speed relay ◆ Master the proper procedures of removing, repairing, replacing, calibrating and assembling the main components of water-jet propellers for ships ◆ Make the following preparations for maintaining, repairing and replacing the parts of high-speed engines and water-jet propellers for ships <ul style="list-style-type: none"> • Selecting appropriate instruments, materials and parts according to manufacturer’s instructions and repair requirements • Referring to installation and maintenance guidelines and implementing appropriate activities for maintenance and repairs • Assessing the urgency of repair items • Arranging repair procedures and coordinating the efforts ◆ Examine the consumption of general components, machinery, devices, equipment and control modules and give advice on repairs if necessary ◆ Compile simple repair reports
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7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to select and use appropriate methods to examine the worn-out components of high-speed engines and water-jet propellers for ships and adopt appropriate measures to survey, calibrate, and repair the damaged sections; (ii) Capable to interpret the instructions of the installation and repair manuals and follow light signals and use appropriate instruments to identify the failures of high-speed engines and water-jet propellers; and (iii) Capable to select and use appropriate instruments, materials and parts to implement regular maintenance and preventive repairs for high-speed engines and water-jet propellers for ships according to instructions.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge and techniques of mechanics and repairing internal combustion engines, and medium and high-speed diesel engines (such as EMSRRM208A “Repair diesel engines” and EMSRRM308A “Repair protection and indication devices of diesel engines”).</p>

1. Title	Manage ship systems' operations	
2. Code	EMSROM401A	
3. Range	Apply the knowledge of ship systems' operations to the formulation of work specifications and in-house guidelines to meet the standard for operation when handling management tasks.	
4. Level	4	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of ship system operation management</p> <ul style="list-style-type: none"> ◆ Master the guidelines for ship systems' maintenance management <ul style="list-style-type: none"> • Importance and methods of matching the maintenance policy with corporate goal of operation • Maintenance requirements for all kinds of ship facilities ◆ Master the key points for materials management <ul style="list-style-type: none"> • Special arrangement for storage of materials e.g. moisture proof and antiseptic protection • Procurement program • Communication among ship fleets e.g. inter-change or loan of accessories <p>6.2 Methods of managing ship systems' operations</p> <ul style="list-style-type: none"> ◆ Know how to formulate work specifications and in-house guidelines to enhance operation performance, such as: <ul style="list-style-type: none"> • Designing or selecting appropriate data access system e.g. spare work piece index and checklist control ◆ Be familiar with system operation mode, make good use of resources, and maintain smooth operation in the most economical and effective way <p>6.3 Professionalism in managing ship systems' operations</p> <ul style="list-style-type: none"> ◆ Follow in-house guidelines and factors of actual operation to manage ship system operations ◆ Improve existing operational performance, conduct reviews from time to time and adopt measures accordingly, or explore alternative way of management 	

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: <ul style="list-style-type: none">(i) Capable to manage, plan and control ship system operations;(ii) Capable to set clear goal for operation and formulate work specifications and in-house guidelines for implementation; and(iii) Capable to review operational performance and implement improvement measures if necessary.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic management knowledge.

1. Title	Organization and arrangement of dockyard work	
2. Code	EMSROM402A	
3. Range	Apply the knowledge and experience of ship repairs to human resources management for division, organization and arrangement of dockyard work and assist in formulating work standards.	
4. Level	4	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Concerns for organizing dockyard work</p> <ul style="list-style-type: none"> ◆ Understand the concerns for ship repairs, such as: <ul style="list-style-type: none"> • Control of sinking and floating and coordination of ships docking and undocking • Sinking and rising of float docks • Potential hazards of entering special work locations, such as narrow spaces, liquid tanks, engine rooms and dangerous goods stores ◆ Understand the human resources (such as specified professionals) required by different work processes ◆ Understand the arrangements for ships entering and leaving a dockyard, including: <ul style="list-style-type: none"> • Interpretation of docking diagram • Preparations made by a dockyard and for the use of slipway • Requirements for obtaining work permits • Erecting lifting appliances <p>6.2 Methods of organizing and arranging dockyard work</p> <ul style="list-style-type: none"> ◆ Assist in formulating work standards according to the work flow and management structure of repair workshops ◆ Manage the repair workforce effectively and control the division of work in dockyards properly and implement the organization and arrangements of work <p>6.3 Professionalism in organizing and arranging dockyard work</p> <ul style="list-style-type: none"> ◆ Perform ship repairs properly and organize and arrange dockyard work according to relevant ordinances on operation and the understanding of the operation of a major dockyard operators 	

7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to master the operation safety of dockyard repairs; (ii) Capable to arrange the work processes and manage the human resources for work division at dockyards; and (iii) Capable to identify ordinances related to regulation of operation.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of human resources management (such as EMCUOM102A “Basic knowledge of electrical and mechanical services management” and EMSROM301A “Basic operational requirements for material management”).</p>

1. Title	Supervise projects according to legislations and regulations related to ship operations
2. Code	EMSROM403A
3. Range	Apply the knowledge of legislations and rules on ship operations to formulate work specifications and internal guidelines, and supervise implementation of projects according to legislations so as to achieve an effective operation.
4. Level	4
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Content of legislations and rules on ship operation</p> <ul style="list-style-type: none"> ◆ Be familiar with the impact of government organizations, International Maritime Organization and international conventions on supervision of ship repair industry ◆ Be familiar with the rules and requirements of Marine Law on operation (such as fulfilling the engineering contracts) <p>6.2 Methods of supervising projects according to legislations</p> <ul style="list-style-type: none"> ◆ Implement project supervision according to legislations and rules on ship operation, including: <ul style="list-style-type: none"> • Formulating specifications of processing of work and ensuring compliance of the regulations, such as rigging skills, handling of cargo and dangerous goods on board • Monitoring project progress so as to complete the project according to contract requirements <p>6.3 Professionalism in supervising projects according to legislations</p> <ul style="list-style-type: none"> ◆ Follow operation ordinances to manage the ship projects properly ◆ Formulate work specifications and internal guidelines with reference to related legislations (such as “Blue card”)
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to correctly apply local legislations and rules on ship operation to the implementation of engineering operation management; and</p> <p>(ii) Capable to formulate work specifications and internal guidelines according to legislations.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the knowledge of local labour ordinances, basic engineering operation and the understanding of contract terms.

1. Title	Supervise ship repairs and demolition works	
2. Code	EMSRSH401A	
3. Range	Supervise and manage the safe undertaking of ship repairs and demolition works (including marine construction) by workers and adopt appropriate contingency measures and issue relevant guidelines to frontline workers.	
4. Level	4	
5. Credit	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand the concerns for ship management and relevant safety legislations</p> <ul style="list-style-type: none"> ◆ Understand the characteristics of ship repairs and demolition works ◆ Understand the causes of accidents and their precautions ◆ Understand the basic principles of risk assessment ◆ Understand the concerns related to shipboard safety and safety in working environment, including: <ul style="list-style-type: none"> • Boarding facilities and cabin passage • Safety concerns related to position shift of ships • Safety concerns related to work at height, near water level and under water level ◆ Understand the hazards in open waters ◆ Maintain the stability of ships at work ◆ Understand legislations related to safety for ship repairs and demolition works <ul style="list-style-type: none"> • Chapter 548 - Merchant Shipping (Local Vessels) Ordinance and Regulations • Chapter 13 - Shipping and Port Control Ordinance and Regulations • Offences and penalties • General duties of employers, subject officers and employees • Code of practice and other relevant codes and guidelines issued by marine department <p>6.2 Supervise the safe operation of routine works</p> <ul style="list-style-type: none"> ◆ Supervise the safe handling of materials and equipment, including: <ul style="list-style-type: none"> • Safe handling of dangerous goods and harmful materials • Manual lifting and handling • Safe operation of slings • Giving signals • Stowing and stacking 	

	<ul style="list-style-type: none"> ◆ Supervise the safe use of mechanical equipment and devices, including: <ul style="list-style-type: none"> • Safe use of electrical equipment, power tools, hand tools and pressure equipment • Basic operation and principles of lifting appliances • Limitations and hazards associated with lifting appliances • Inspection and maintenance of lifting appliances • Relevant legal requirements on lifting appliances and gear, and duties of qualified persons ◆ Supervise the safe operation of ship repairs and demolition works, including: <ul style="list-style-type: none"> • Safe operation on deck, in cabins, engine compartments and confined spaces • Concerns related to welding, flame cutting and other hot work • Fire prevention and extinguishing equipment • Concerns related to spray painting, sand blasting, water-jetting and pressure equipment <p>6.3 Analyze emergencies and adopt contingency measures</p> <ul style="list-style-type: none"> ◆ Take contingency measures according to actual situations, including: <ul style="list-style-type: none"> • Emergency procedures • Reporting accidents • First aid facilities ◆ Issue safety guidelines to workers, including: <ul style="list-style-type: none"> • Operation of fire extinguishers • Use of safety belts and arresters • Operation of cranes and use of signals • Use of life-jackets and life-buoys ◆ Compile analytical reports of emergencies
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to supervise and manage the undertaking of routine ship repairs, demolition and marine construction works by frontline workers in safe conditions; and</p> <p>(ii) Capable to assess risks and make analysis and adopt contingency measures in case of emergency.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of ship safety legislations (such as EMSRSH101A “Follow relevant codes of practice at workplaces, on environmental protection, and on occupational safety and health”), ship management and report writing, and experience of general ship repairs.</p>

Competency Level 5

1. Title	Write all kinds of electrical and mechanical engineering reports in Chinese
2. Code	EMCUDE506A
3. Range	For electrical and mechanical engineering design and operation, use correct report format to write all kinds of electrical and mechanical engineering reports in Chinese, including project management progress report, operation management report, engineering progress report, equipment fault report, accident investigation report, etc.
4. Level	5
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Key points of all kinds of electrical and mechanical engineering reports and their presentation</p> <ul style="list-style-type: none"> ◆ Understand the key points and purposes of all kinds of electrical and mechanical engineering reports, including: <ul style="list-style-type: none"> • Equipment fault report • Equipment inspection report • Accident investigation report • Operation management report <ul style="list-style-type: none"> ▸ Financial status of the company ▸ Balance of account ▸ Engineering budget • Engineering project management progress report <ul style="list-style-type: none"> ▸ Progress of crucial procedures ▸ Status of implementation of work plan, delay and causes, monitoring indicators and solutions ◆ Understand formats the above-mentioned electrical and mechanical engineering reports and common technical terms of electrical and mechanical services <p>6.2 Write all kinds of electrical and mechanical engineering reports in Chinese</p> <ul style="list-style-type: none"> ◆ Use correct report format to write all kinds of the above-mentioned electrical and mechanical engineering reports in Chinese ◆ Use drawings to strengthen and enrich the contents of the reports, including bar chart, square chart, pie chart, circular chart and flow chart, etc ◆ Write in fluent Chinese
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to write all kinds of electrical and mechanical engineering reports in fluent Chinese with graphs which conform to official document standards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic Chinese level.

1. Title	Write all kinds of electrical and mechanical engineering reports in English
2. Code	EMCUDE507A
3. Range	For electrical and mechanical engineering design and operation, use correct report format to write all kinds of electrical and mechanical engineering reports in English, including project management progress report, operation management report, engineering progress report, equipment fault report, accident investigation report, etc.
4. Level	5
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Key points of all kinds of electrical and mechanical engineering reports and their presentation</p> <ul style="list-style-type: none"> ◆ Understand the key points and purposes of all kinds of electrical and mechanical engineering reports, including: <ul style="list-style-type: none"> • Equipment fault report • Equipment inspection report • Accident investigation report • Operation management report <ul style="list-style-type: none"> ▸ Financial status of the company ▸ Balance of account ▸ Engineering budget • Engineering project management progress report <ul style="list-style-type: none"> ▸ Progress of crucial procedures ▸ Status of implementation of work plan, delay and causes, monitoring indicators and solutions ◆ Understand formats the above-mentioned electrical and mechanical engineering reports and common technical terms of electrical and mechanical services <p>6.2 Write all kinds of electrical and mechanical engineering reports in English</p> <ul style="list-style-type: none"> ◆ Use correct report format to write all kinds of the above-mentioned electrical and mechanical engineering reports in English ◆ Use drawings to strengthen and enrich the contents of the reports, including bar chart, square chart, pie chart, circular chart and flow chart, etc ◆ Write in fluent English
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to write all kinds of electrical and mechanical engineering reports in fluent English with graphs which conform to official document standards.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic English level.

1. Title	Manage general lifting machinery and lifting equipment operation
2. Code	EMCUIN502A
3. Range	Manage general lifting machinery and lifting equipment operation effectively in general industrial plants or electrical and mechanical workplaces where lifting and handling work is involved, and supervise, plan and implement properly the operation, inspection and maintenance of all kinds of equipment so as to avoid industrial accidents.
4. Level	5
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Use of general lifting machinery and lifting equipment</p> <ul style="list-style-type: none"> ◆ Understand the operating principles and limitations of general lifting machinery and lifting equipment, including their loading capacity and safety devices, etc. ◆ Understand the inspection and maintenance procedures for general lifting equipment as well as relevant legal requirements, including regular check and repair, testing, etc. <p>6.2 Management of general lifting machinery and lifting equipment</p> <ul style="list-style-type: none"> ◆ Perform the management work of general lifting machinery and lifting equipment, including: <ul style="list-style-type: none"> • Using all kinds of machinery safely • Conduct regular check and repair systematically according to relevant legislations • Perform loading test • Perform related maintenance procedures • Implement training on machinery operation
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to manage general lifting machinery and lifting equipment operation effectively, and supervise the safe operation, inspection and maintenance of all kinds of equipment according to relevant legislations and working instructions.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of performing general lifting machinery and lifting equipment inspection.

1. Title	Implement engineering operation and supervisory management
2. Code	EMCUOM502A
3. Range	Coordinate engineering operation, supervisory management and human resources management for electrical and mechanical services.
4. Level	5
5. Credits	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Understand engineering operation and supervisory areas and techniques ♦ Understand engineering operation management including:</p> <ul style="list-style-type: none"> • Supervisory management techniques for projects • Management techniques for work site environment • Workflow of electrical works project <p>6.2 Implement engineering operation and supervisory management ♦ Implement engineering operation management to ensure that all engineering procedures be carried out properly. The engineering operation management targets include zero breach of contract, zero accident rate, zero delay, timely delivery of material, balance of income and expenditure, etc.</p> <ul style="list-style-type: none"> ♦ Implement engineering supervisory management such as analyzing and arranging works so that the project can complete in time ♦ Understand the tendering strategy and assist the company in project quotation and bidding tenders
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to implement engineering operation, supervisory and management in different technical areas of work in order to achieve the targets.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of electrical and mechanical operation.

1. Title	Formulate project procedures and schedule
2. Code	EMCUPM501A
3. Range	Formulate project procedures and schedule for electrical and mechanical services according to the specifications, scope and targets of the project.
4. Level	5
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Principles and techniques of electrical and mechanical project management</p> <ul style="list-style-type: none"> ◆ Understand the principles and techniques of electrical and mechanical engineering project management, including the formulation of project procedures, schedule, contingency plan and review mechanism <p>6.2 Formulate procedures, schedule, contingency plans and review mechanism for electrical and mechanical projects</p> <ul style="list-style-type: none"> ◆ Draft project procedures <ul style="list-style-type: none"> • Confirm the project specifications, scope and targets according to the contract and related information • Analyze the work breakdown structure and organisational breakdown structure • Pay attention to safety, health and environmental protection ordinances and codes, the protection of intellectual property and quality management system of the organization when drafting project procedures ◆ Formulate project schedule <ul style="list-style-type: none"> • Apply project management techniques to formulate project schedule according to the contract and related information as well as project procedures drafted and the following arrangements: <ul style="list-style-type: none"> ▸ Critical path and flow chart ▸ Arrangements of equipment, materials and parts ▸ Arrangements of human resources ◆ Formulate contingency mechanism and review mechanisms <ul style="list-style-type: none"> • Conduct risk assessment for the projects and formulate contingency mechanism ◆ Formulate review mechanism for the project to ensure that targets of the project be achieved
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to formulate project procedures and schedules for electrical and mechanical projects according to the project specifications and targets; and</p> <p>(ii) Capable to formulate effective review check points and review mechanism for the projects.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of operation management.

1. Title	Implement risk management for electrical and mechanical services
2. Code	EMCUSH502A
3. Range	Apply risk assessment and management techniques to formulate and implement risk management plans.
4. Level	5
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Know about different kinds of electrical and mechanical engineering risks and their management methods</p> <ul style="list-style-type: none"> ◆ Understand different kinds of electrical and mechanical engineering risks such as: <ul style="list-style-type: none"> • Different kinds of potential hazards and risks caused by them • Risk analysis modes such as HAZOP(Hazard and Operability Studies), QRA(Quality Risk Assessment), FMEA(Failure Modes and Effects Analysis) and FTA(Fault Tree Analysis), etc. • Other risk related factors such as occupational safety and health, management systems, Factories and Industrial Undertakings Ordinance, etc. • Risk control and risk management plans <p>6.2 Implement risk management for electrical and mechanical services</p> <ul style="list-style-type: none"> ◆ Identify potential hazards and their kinds (e.g. chemical hazards, electrical hazards, etc.), the chance of happening and the consequences ◆ Conduct risk assessment and analysis <ul style="list-style-type: none"> • Conduct risk assessment for the working procedure, work type, machinery and organization according to the chance of happening and the consequences of the hazard • Analyze the price for the accident and the advantages of safe operation • Consider comprehensively the aspects of occupational safety and health as well as environmental protection when conducting risk assessment ◆ Control and management risks <ul style="list-style-type: none"> • Formulate risk control levels based on risk assessment data • Formulate the risk control and management plan according to risk control levels and by taking into consideration of the OHSAS18000 Occupational Health and Safety Assessment Series and Factories and Industrial Undertakings Ordinance and regulations ◆ Implement risk management for electrical and mechanical services according to the risk control and management plan

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to identify hazards and assess risks according to the activities and nature of the electrical and mechanical services; and (ii) Capable to devise a risk control and management plan according to the hazards identified, risk assessment and other considerations.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of occupational safety management.

1. Title	Formulate occupational safety and health management system
2. Code	EMCUSH504A
3. Range	Master the knowledge of occupational safety and health so as to formulate a basic occupational safety and health management system.
4. Level	5
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of occupational safety and health</p> <ul style="list-style-type: none"> ◆ Understand the operation of the occupational safety and health management system, including: <ul style="list-style-type: none"> • Goals of the management system • Monitoring mechanism • Training methods • Contingency measures • Review measures <p>6.2 Formulation of basic occupational safety and health management system</p> <ul style="list-style-type: none"> ◆ Formulate occupational safety and health management system according to the requirements of the occupational safety and health ordinances as well as the operation of the company. The tasks include: <ul style="list-style-type: none"> • Setting goals for the management system • Organizing management committee and setting its terms of reference • Establishing management system mechanism • Designing monitoring mechanism • Formulating training plans • Establishing work site contingency measures • Formulating review measures
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate an effective and basic occupational safety and health management system according to the requirements of the occupational safety and health ordinances as well as the operation of the company.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of occupational safety management.

1. Title	Formulate occupational safety and health and environmental protection schemes	
2. Code	EMCUSH505A	
3. Range	Analyze areas that have to be enhanced regarding staff's awareness of occupational safety and health and environmental protection, and to formulate schemes to enhance staff's awareness of occupational safety and health and environmental protection.	
4. Level	5	
5. Credits	6	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Occupational safety and health and environmental protection scheme</p> <ul style="list-style-type: none"> ◆ Understand the importance of occupational safety and health and environmental protection to staff; and draft a scheme relevant to occupational safety and health and environmental protection including the following: <ul style="list-style-type: none"> • Scheme targets • Schedule • Effectiveness review • Manpower arrangement • Budget, etc. <p>6.2 Formulation of occupational safety and health and environmental protection scheme</p> <ul style="list-style-type: none"> ◆ Identify the difference between the company's targets and staff awareness of occupational safety and health and environmental protection <ul style="list-style-type: none"> • Collect opinions of staff on occupational safety and health and environmental protection management • Set the company's targets on occupational safety and health and environmental protection management • Identify the difference between the company's targets and staff awareness of occupational safety and health and environmental protection management ◆ Formulate plans to enhance staff's awareness of occupational safety and health and environmental protection management <ul style="list-style-type: none"> • Analyze company's occupational safety and health and environmental protection management culture, and draft proposals for the enhancement scheme such as training courses, seminars and quiz competitions, etc. • Collect staff's opinions on safety, health and environmental improvement • Collect staff's opinions on the enhancement scheme • Use other organizations' successful experience in organizing activities to enhance staff's awareness of occupational safety and health and environmental protection 	

	<ul style="list-style-type: none"> • Formulate a scheme to enhance staff's awareness of occupational safety, health environmental protection, including the formulation of scheme targets, implementation methods and schedule, expected performance, budget, measuring methods, etc. • Manpower arrangement for the implementation of the scheme ◆ Review the effectiveness of the scheme <ul style="list-style-type: none"> • Ensure good communication during the implementation of the scheme • Measure and review the effectiveness of the scheme after implementation
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate and implement schemes to enhance staff's awareness of occupational safety and health and environmental protection; and to review their effectiveness.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of occupational safety management.</p>

1. Title	Perform risk assessment for electrical and mechanical work
2. Code	EMCUSH506A
3. Range	Apply the knowledge and skills of risk assessment with the understanding of the electrical and mechanical work to perform risk assessment. The competency of this unit is applicable to safety management of the electrical and mechanical services.
4. Level	5
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Engineering work and environment</p> <ul style="list-style-type: none"> ◆ Understand the engineering work and environment according to engineering working guidelines and on-site observation ◆ Understand the potential risks and hazards according to the accident reports <p>6.2 Perform risk assessment</p> <ul style="list-style-type: none"> ◆ Apply risk assessment skills to perform risk assessment for electrical and mechanical procedures, such as HAZOP (Hazard and Operability), FTA (Fault Tree Analysis), fault-finding analysis, status analysis, and the use of tools under different circumstances and handling of dangerous goods and scope of application ◆ Compile risk assessment reports for engineering procedures, including <ul style="list-style-type: none"> • Hazards and their identification • Risk assessment methods • Calculation and assessment of risks • Methods to reduce or eliminate risks • Conclusions and recommendations
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to perform effectively risk assessment and to write proposals for electrical and mechanical work and environment, and come up with conclusions and recommendations.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the competency of using basic risk assessment methods.

1. Title	Formulate environmental protection management system	
2. Code	EMCUSH507A	
3. Range	Master the legal requirements on environmental protection so as to formulate a basic environmental protection management system.	
4. Level	5	
5. Credits	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Basic knowledge of environmental protection</p> <ul style="list-style-type: none"> ◆ Understand the legal requirements on environmental protection, including the areas of emissions, waste water, noise, solid waste, chemical waste, etc. ◆ Understand the operation of a basic environmental protection management system, including: <ul style="list-style-type: none"> • Goals of the management system • Monitoring mechanism • Contingency measures • Review measures • ISO 14001, etc. <p>6.2 Formulation of basic environmental protection management system</p> <ul style="list-style-type: none"> ◆ Formulate a basic environmental protection management system according to the legal requirements on environmental protection, including the following: <ul style="list-style-type: none"> • Goals of the management system • Management system mechanism • Monitoring mechanism • Contingency measures • Review measures 	
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate an effective basic environmental protection management system for the electrical and mechanical services according to the legal requirements on environmental protection, and review its effectiveness.</p>	
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of environmental protection.	

1. Title	Implement occupational safety and health and environmental protection courses and training programmes
2. Code	EMCUSH508A
3. Range	Implement occupational safety and health and environmental protection courses and training programmes, and enhance safety awareness of staff.
4. Level	5
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Contents of general occupational safety and health and environmental protection courses and training</p> <ul style="list-style-type: none"> ◆ Understand the objectives and contents of general occupational safety and health and environmental protection courses and training ◆ Understand the characteristics and needs of training targets <p>6.2 Implementation of general occupational safety and health and environmental protection courses and training</p> <ul style="list-style-type: none"> ◆ Investigate the needs of training targets within the organization <ul style="list-style-type: none"> • Use different methods to help investigate the needs of training targets within the organization for occupational safety and health and environmental protection training, such as questionnaire, staff appraisal report, company policy, etc ◆ Implement occupational safety and health and environmental protection courses and training projects <ul style="list-style-type: none"> • Make relevant arrangements for enrolment and admission procedures, venue and duration for the course, teaching materials and aids, etc ◆ Enhance staff's safety awareness <ul style="list-style-type: none"> • Encourage the staff to participate actively in occupational safety and health and environmental protection courses and training programmes through continuous staff training, merit assessment, performance incentives, extracurricular activities
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to use different methods to investigate and analyze effectively the needs of training targets on occupational safety and health and environmental protection within the organization;</p> <p>(ii) Capable to organize training courses and programmes, and implement relevant activities effectively according to the internal needs of the organization; and</p> <p>(iii) Capable to formulate and implement encouragement measures to enhance staff's safety awareness.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses the knowledge of occupational safety management.

1. Title	Formulate and implement quality management courses and training programmes
2. Code	EMCUQM503A
3. Range	Formulate and implement quality management courses and training programmes by targeting the weaknesses in electrical and mechanical engineering quality management so as to enhance the staff's awareness of quality management.
4. Level	5
5. Credits	4
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Electrical and mechanical engineering quality management concept and culture</p> <ul style="list-style-type: none"> ◆ Understand the electrical and mechanical engineering quality management concept and culture, including the 'Plan-Do-Check-Act' Quality Management Cycle <p>6.2 Formulate and implement quality management courses and training programmes</p> <ul style="list-style-type: none"> ◆ Formulate and implement quality management courses and training programmes by targeting the weaknesses in electrical and mechanical engineering quality management such as the basic quality management in various procedures, including installation, checking, debugging, commissioning and repair, etc. ◆ Formulate the basic course on 'Plan-Do-Check-Act' Quality Management Cycle ◆ Formulate basic level quality management courses or training programmes ◆ Implement quality management courses or training programmes to enhance the staff's awareness of quality management, including: <ul style="list-style-type: none"> • Basic requirements and application of ISO 9000 quality management and quality assurance standards • Promoting quality management culture • Urging the staff to constantly review and improve the engineering process performance ◆ Review and improve the quality management courses regularly to enhance the effectiveness of staff training
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate and implement quality management courses and training programmes effectively by targeting the weaknesses in electrical and mechanical engineering quality management, and review and improve the quality management courses effectively.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concepts of quality management.

1. Title	Formulate and analyze quality assurance reports
2. Code	EMCUQM504A
3. Range	With regard to quality management of electrical and mechanical services, analyze information generated from quality monitoring points of each engineering procedure, quality issues and problems, and formulate quality assurance reports.
4. Level	5
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Format and key points of quality assurance report on electrical and mechanical services</p> <ul style="list-style-type: none"> ◆ Understand the format and key points of quality assurance report on electrical and mechanical services <p>6.2 Formulate and analyze quality assurance reports</p> <ul style="list-style-type: none"> ◆ Base on records of the major monitoring points of each service procedure and all quality related issues, such as quality level for each action, non-compliance with regulations, errors, defects, deviation, excesses or shortfalls and other causes, etc., to quantify quality management issues and problems so as to provide sufficient data or information to produce the quality assurance reports <ul style="list-style-type: none"> • Analyze all quality management issues and problems, formulate quality assurance reports and report to the management
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to effectively monitor each service procedure, quantify quality management issues and problems, analyze data and information, and formulate quality assurance reports.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concepts of quality management.

1. Title	Formulate schemes to enhance staff's awareness of quality management
2. Code	EMCUQM505A
3. Range	Analyze what areas in quality management of electrical and mechanical services that the staff should improve, and formulate schemes to enhance staff's awareness of quality management.
4. Level	5
5. Credits	5
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Culture and targets of organization in quality management</p> <ul style="list-style-type: none"> ◆ Understand the culture and targets of the organization in quality management <p>6.2 Plan to enhance staff's awareness of quality management and review the effectiveness of scheme</p> <ul style="list-style-type: none"> ◆ Collect staff's understanding and opinions on quality management ◆ Identify the deviation between targets of the organization and staff's performance on quality management ◆ Analyze the quality management culture of the organization, and draft forms of enhancement measures, such as training courses, quiz competitions and seminars, etc. ◆ Collect staff's opinions on the enhancement scheme ◆ Implement Quality Circle activities ◆ Formulate suitable schemes to enhance staff's awareness of quality management, including the formulation of schemes' targets, implementation methods and schedule, expected performance, budget and means for measuring the effectiveness, etc. ◆ Measure and review the effectiveness of the scheme after implementation
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to analyze the quality management culture of the organization, draft a proposal to enhance staff's awareness of quality management, and review the effectiveness of the enhancement scheme after implementation.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses a fair basis of quality management.

1. Title	Implement quality management training courses
2. Code	EMCUQM506A
3. Range	Master knowledge and skills in quality management of electrical and mechanical services to implement quality management courses.
4. Level	5
5. Credits	9
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Quality management system</p> <ul style="list-style-type: none"> ◆ Understand quality management system, such as: <ul style="list-style-type: none"> • ISO 9000 • Total quality management • Quality circle • Business Process Re-engineering <p>6.2 Implement quality management courses</p> <ul style="list-style-type: none"> ◆ Set targets for the courses <ul style="list-style-type: none"> • Identify staff's training needs and formulate a training plan accordingly • Set targets for each course according to the training plan ◆ Apply the knowledge of quality management system and the pre-set quality standard and system of the organization when formulating courses, including: <ul style="list-style-type: none"> • Working procedure system • Working instruction system • Document control system ◆ Set the teaching mode of the quality management courses, including: <ul style="list-style-type: none"> • Lesson mode • Interactive mode • Workshop mode • Assessment mode ◆ Review the effectiveness of courses <ul style="list-style-type: none"> • Use questionnaires to collect opinions of the staff concerned • Check with the department-in-charge the progress of the staff concerned after receiving the training
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply the knowledge of quality management system and the quality management policy of the organization to formulate effective quality management courses, and review the courses effectively after implementation.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses a fair basis of quality management.

1. Title	Implement quality management standards of International Organization for Standardization (ISO)
2. Code	EMCUQM507A
3. Range	Apply ISO quality management standards in quality management work of electrical and mechanical services.
4. Level	5
5. Credits	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 ISO quality management standards ♦ Understand ISO 9000 Quality Management and Quality Assurance Standard Series, including the quality assurance system and management mechanism</p> <p>6.2 Implement ISO quality management standards ♦ Implement ISO 9000 Quality Management and Quality Assurance Standard Series, including:</p> <ul style="list-style-type: none"> • Quality management responsibilities of staff at different levels • Quality assurance system • Inspection mechanism • Document and information management mechanism • Procurement management mechanism • Work process audit mechanism • Improper works control and correction system • Quality record control system • Internal quality audit system
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to implement effectively ISO 9000 Quality Management and Quality Assurance Standard Series and review its effectiveness.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic concepts of quality management.

1. Title	Strength calculation of ships
2. Code	EMSRDE501A
3. Range	Apply methods of strength calculation to tasks in design studio and preparations for engineering calculations related to ship design.
4. Level	5
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Methods of calculating ship design loads</p> <ul style="list-style-type: none"> ◆ Be familiar with various methods of calculating ships' still water loads <ul style="list-style-type: none"> • wave loads • local loads • hull girder loads <p>6.2 Methods and techniques of simulating, analyzing and optimizing the design of ship strength</p> <ul style="list-style-type: none"> ◆ set the conditions for ships' structural loads, including: deck structure, double bottom, yardstick for minimum materials for ship base, bulkhead dimensions and steel plate and pillar ◆ Analyze and calculate to see if the ship system or model meets the strength requirement <p>6.3 Professionalism in calculating ship strength</p> <ul style="list-style-type: none"> ◆ Follow requirements of the design code and in-house guidelines to ensure that the ship strength meets the standard
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to apply different loading conditions to analyzing and calculating hull strength required; and</p> <p>(ii) Capable to calculate total amount of ship materials required.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of physics, and be familiar with the related codes of ship design (such as: EMSRDE301A “Basic calculations for ship design” and EMSRDE401A “Calculation of ship buoyancy”).

1. Title	Ship's stability design
2. Code	EMSRDE502A
3. Range	Apply calculations for ship stability design and other methods of analyzing stability to tasks of ship design so as to assess whether the ship stability meets the requirements of International Maritime Organization.
4. Level	5
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Knowledge of ships' stability design</p> <ul style="list-style-type: none"> ◆ Master the knowledge of ships' stability design, including: <ul style="list-style-type: none"> • Free surface effect • Weight transfer effect ◆ Concept of stability design, such as lateral inclination difference • Wind effect • Importance of damage stability <p>6.2 Methods and procedures of designing ship stability</p> <ul style="list-style-type: none"> ◆ Set loading conditions for ships and simulate, analyze and assess ship stability, including: <ul style="list-style-type: none"> • Deducing the static water curve and cross curve • Estimating the longitudinal inclination difference of ships according to load change ◆ Apply relevant knowledge to stability assessment <ul style="list-style-type: none"> • Lateral stability design for ships under the special condition of longitudinal inclination difference • Impact of ballast water or liquid cargoes on stability <p>6.3 Professionalism in ships' stability design</p> <ul style="list-style-type: none"> ◆ Assess ship stability according to the requirements of International Maritime Organization
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to analyze the information on ship stability and perform relevant design tasks; and</p> <p>(ii) Capable to assess whether the ship stability meets the requirements of International Maritime Organization.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of calculation and physics, and understands the international requirements on ship stability (such as EMSRDE301A "Basic calculations for ship design" and EMSRDE402A "Calculation of ship stability").

1. Title	Sea-trial inspection and seaworthiness tests	
2. Code	EMSRIT501A	
3. Range	Perform tasks related to ship inspection and seaworthiness tests according to the requirements of relevant ordinances.	
4. Level	5	
5. Credit	3	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Standards of sea-trials ♦ Understand the details of and exemption criteria for sea -trials, such as:</p> <ul style="list-style-type: none"> • Scope of tests • Items for sea trials and seaworthiness tests <p>6.2 Methods and procedures of conducting sea-trial inspection and seaworthiness tests ♦ Understand the methods and procedures of conducting sea-trial inspection and seaworthiness tests, including:</p> <ul style="list-style-type: none"> • Arranging the tests to be conducted under the surveillance of a surveyor • Submitting required documents, such as information on the scope of tests and records of parameters • Performing all the required items, such as adjustment and control of the conditions for testing and demonstration of the normal functioning of the main and auxiliary machinery, according to ship classes and test requirements • Testing whether the service speed meets the requirement, and checking the propulsion in the case of failure of major auxiliary units • Conducting navigation and steering tests, such as astern trials and zigzag movements • Testing boilers, diesel engines (of different power/speed) and turbines • Performing inspection of machinery after sea trials, including all the propulsion machinery and the components that do not meet the test requirements <p>6.3 Professionalism in conducting sea trail inspection and seaworthiness tests ♦ Conduct checks and tests for ships as required by dockyards, ship owners and contracts</p> <p>♦ Compile detailed reports on results of ship inspection and make recommendations</p>	

7. Assessment Criteria	The integrated outcome requirements of this unit of competency are: (i) Capable to carry out sea-trial inspection and seaworthiness tests properly and assess whether the performance of ships meets relevant requirements; and (ii) Capable to compile inspection reports and make recommendations.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic marine knowledge (such as EMSRIT303A “Hull-stability examination and inclination test” and EMSRIT403A “Marine inspection and ship survey”).

Competency Level 6

1. Title	Apply project management skills and professional knowledge to handle unfulfilled or unperformed contracts effectively
2. Code	EMCUPM601A
3. Range	Use professional knowledge to analyze the reasons and impact of non-fulfillment or non-performance of project contracts, as far as electrical and mechanical project management is concerned, and apply project management knowledge and skills to handle these contracts effectively.
4. Level	6
5. Credits	20
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Reasons for non-fulfillment or non-performance of contract</p> <ul style="list-style-type: none"> ◆ Use professional knowledge and knowledge of engineering environment to analyze the reasons of non-fulfilment or non-performance of project contracts by considering the following factors: <ul style="list-style-type: none"> • Technical concerns • Cost effectiveness • Change in project environment • Political, social and legal concerns • Contractor-related concerns <p>6.2 Handle unfulfilled or unperformed project contracts</p> <ul style="list-style-type: none"> ◆ Consider all solutions according to the above concerns, and calculate the costs and price for each solution ◆ Identify the most beneficiary solution to both sides and draft details of the solution ◆ Base on the drafted solution to negotiate with the contractor in order to come up with a solution accepted by both sides ◆ Know which part of the contract is unfulfilled or unperformed, and arrange to call for tender for that part again ◆ Be capable to provide sufficient and clear information should legal actions are required to solve the contract issues
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to apply project management skills and professional knowledge to handle unfulfilled or unperformed project contracts, draft solutions effectively and calculate costs and prices for the solutions.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of engineering business management.

1. Title	Formulate overall safety, health and environmental protection policy
2. Code	EMCUSH601A
3. Range	Master comprehensive knowledge and techniques of safety, health and environmental protection; review comprehensively the organization's safety, health and environmental protection management system; and formulate a forward-looking, overall safety, health and environmental protection policy and management system.
4. Level	6
5. Credits	20
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Overall safety, health and environmental protection policy and management system of the organization</p> <ul style="list-style-type: none"> ◆ Understand the safety, health and environmental protection management system and policy goals of the organization, including: <ul style="list-style-type: none"> • Long-term and short-term goals • Measurement of performance • Management system • Review mechanism <p>6.2 Overall safety, health and environmental protection policy of the organization</p> <ul style="list-style-type: none"> ◆ Formulate long-term and short-term goals for the overall safety, health and environmental protection policy <ul style="list-style-type: none"> • Draw the experience of other organizations that have won safety, health and environmental protection awards, and formulate forward-looking, long-term and short-term goals for the overall safety, health and environmental protection management ◆ Identify the deviations between safety, health and environmental protection management goals and current performance <ul style="list-style-type: none"> • Identify and confirm the deviations between safety, health and environmental protection management goals and current performance of the organizational management system, including the items and operating mode ◆ Formulate and implement safety, health and environmental protection management policy <ul style="list-style-type: none"> • Analyze deviations between safety, health and environmental protection goals and current system performance, staff's awareness of safety, health and environmental protection, and formulate an overall safety, health and environmental protection management policy, including: <ul style="list-style-type: none"> ▸ Safety, health and environmental protection policy ▸ Long-term and short-term goals for safety, health and environmental protection

	<ul style="list-style-type: none"> › Resources arrangement for implementation of the safety, health and environmental protection policy and performance review › Operating mode of the management system for the safety, health and environmental protection policy › Measurement of performance of the safety, health and environmental protection management system › Review mechanism › Improvement mechanism › Communication channels
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to identify the deviations between safety, health and environmental protection goals and current performance of the organization according to activities and nature of the organization; and</p> <p>(ii) Capable to formulate a forward-looking safety, health and environmental protection management policy and system according to deviations identified and other factors of consideration, and review its performance and make modifications after implementation.</p>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of occupational safety management.</p>

1. Title	Formulate improvement plans for occupational safety and health	
2. Code	EMCUSH602A	
3. Range	Formulate improvement plans for working procedures and mechanical protection and systems that do not comply with the safety and health management standards, and to do so continuously according to views and recommendations generated after the reviews on safety and health policy and management system.	
4. Level	6	
5. Credits	20	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Occupational safety and health policy and management system</p> <ul style="list-style-type: none"> ◆ Understand the occupational safety and health policy and management system of the enterprise, such as: <ul style="list-style-type: none"> • Work safety and health pledge made by the enterprise and its safety policy • Framework for the implementation of the work safety and health pledge • Staff trained with the knowledge of working safely in conditions not hazardous to their health • Internal safety regulations to attain the goal of safety management • Identify dangers and conduct remedial inspection schemes accordingly on a regular basis or as deemed necessary • Identify potential dangers to workers and work out plans to deal with these dangers • Safety committee • Enhance, develop and maintain the awareness of safety and health at work site <p>6.2 Improvement plans for occupational safety and health</p> <ul style="list-style-type: none"> ◆ Formulate improvement plans for working procedures and mechanical protection and systems that do not comply with the safety and health management standards <ul style="list-style-type: none"> • Formulate improvement plans which include the goals, operating modes, training, implementation and monitoring, according to the investigation as well as the safety and health audit results; and formulate improvement plans for system management with respect to the overall system, financial estimates, performance measurement and review, workflow and schedule of implementation 	

	<ul style="list-style-type: none"> ◆ Formulate improvement plans according to views and recommendations generated after the reviews on safety and health policy and management system <ul style="list-style-type: none"> • Identify and confirm items or operating mode of the system that need to be improved according to views and recommendations generated after the reviews on safety and health policy and management system • Formulate an overall management system improvement plan for items or operating mode of the system that need to be improved ◆ Formulate improvement plans for the occupational safety and health management system for benchmarking enhancement <ul style="list-style-type: none"> • Identify and confirm items or operating mode of the system that need to be improved for benchmarking enhancement • Formulate an overall management system improvement plan for items or operating mode of the system that need to be improved ◆ Consult and communicate sufficiently when formulating improvement plans <ul style="list-style-type: none"> • Consult the staff and stakeholders extensively and establish good communication channels with them during the formulation of the improvement plans
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to formulate effective improvement plans for working procedures and mechanical protection and systems that do not comply with the safety and health management standards; and (ii) Capable to formulate effective improvement plans for benchmarking enhancement of the organization.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of occupational safety management.</p>

1. Title	Formulate environmental protection improvement plans	
2. Code	EMCUSH603A	
3. Range	Formulate improvement plans for working procedures and mechanical protection that do not comply with the environmental protection management standards, and to do so continuously according to views and recommendations generated after the reviews on environmental protection policy and management system.	
4. Level	6	
5. Credits	20	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Environmental protection policy and management system</p> <ul style="list-style-type: none"> ◆ Understand the environmental protection policy and management system of the organization, including: <ul style="list-style-type: none"> • Policy goals • Operating mode of the management system • Monitoring procedures • Measurement of performance <p>6.2 Environmental protection improvement plans</p> <ul style="list-style-type: none"> ◆ Formulate improvement plans for areas of emissions, waste water, light pollution, noise, solid waste, chemical waste, ecological environment, etc. that do not comply with the environmental protection management standards: <ul style="list-style-type: none"> • Operating mode • Implementation and monitoring • System management • budgeting • Measurement of performance • Review, workflow and schedule for implementation ◆ Formulate improvement plans according to views and recommendations generated after the reviews on environmental protection policy and management system <ul style="list-style-type: none"> • Identify and confirm items or operating mode of the system that need to be improved • Formulate an overall management system improvement plan for items or operating mode of the system that need to be improved ◆ Consult and communicate sufficiently when formulating improvement plans <ul style="list-style-type: none"> • Consult the staff and stakeholders extensively and establish good communication channels with them during the formulation of the improvement plans 	

7. Assessment Criteria	The integrated outcome requirement of this unit of competency is: (i) Capable to formulate improvement plans for the organization for areas that do not comply with the environmental protection management standards.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of environmental protection.

1. Title	Formulate quality management strategy
2. Code	EMCUQM601A
3. Range	Fully master the knowledge and techniques of quality management as well as business strategy and quality management culture of the organization and be able to formulate a forward-looking quality management strategy applicable to electrical and mechanical workplaces.
4. Level	6
5. Credits	20
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Quality management goals</p> <ul style="list-style-type: none"> ◆ Understand the concept of excellent quality management awards such as: <ul style="list-style-type: none"> • Deming Prize • Baldrige Quality Award • European Quality Award • Hong Kong Award for Industry <p>6.2 Formulation of quality management strategy</p> <ul style="list-style-type: none"> ◆ Identify the deviations between quality management goals and the current quality management system ◆ Identify the deviations between quality management goals and the performance of current quality management system ◆ Formulate quality management strategy <ul style="list-style-type: none"> • Analyze the deviations between quality management goals and the current quality management system, and quality management culture and quality costs of the organization in order to formulate the quality management strategy including: <ul style="list-style-type: none"> ▸ Quality management policy ▸ Quality management goals ▸ Operating mode of the quality management system under the quality management policy ▸ Measurement of the quality management system performance ▸ Review mechanism ▸ Improvement mechanism ▸ Communication channels
7. Assessment Criteria	<p>The integrated outcome requirement of this unit of competency is:</p> <p>(i) Capable to formulate an effective quality management strategy according to the deviations between quality management goals and the current quality management system as well as other factors of consideration.</p>
8. Remarks	This unit of competency is suitable for quality management staff enhancement. The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of quality management.

1. Title	Implement total quality management plan
2. Code	EMCUQM602A
3. Range	Master the knowledge and techniques of total quality management as well as business strategy and quality management culture of the organization so as to implement the total quality management plan properly for electrical and mechanical works.
4. Level	6
5. Credits	20
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Total quality management theory</p> <ul style="list-style-type: none"> ◆ Understand total quality management (TQM) methods and techniques such as: <ul style="list-style-type: none"> • Quality Function Deployment • Business Process Reengineering • Process Improvement • Strategic Outsourcing • Rapid Product Development ◆ Understand the concepts of quality economics, including: <ul style="list-style-type: none"> • Quality costs • Quality costs calculation system of quality economics <p>6.2 Implementation of total quality management</p> <ul style="list-style-type: none"> ◆ Implement total quality management <ul style="list-style-type: none"> • Apply the following TQM methods to assist the implementation of total quality management strategy <ul style="list-style-type: none"> ▸ Quality Function Deployment ▸ Business Process Reengineering ▸ Process Improvement ▸ Strategic Outsourcing ▸ Rapid Product Development ◆ Build up the concept of catering customers' needs in a correct way <ul style="list-style-type: none"> • implement the concept of catering customers' needs in a correct way, including: <ul style="list-style-type: none"> ▸ Internal and external customers ▸ Customers' voices ▸ Customers' level of satisfaction ▸ Customers' loyalty ▸ The importance of customers to the organization ◆ Apply the concept of quality economics to analyze quality costs <ul style="list-style-type: none"> • Apply the concept of quality economics to analyze quality costs and implement quality costs system calculated by quality economics, in which the economic value of customers' loyalty is also included

	<ul style="list-style-type: none"> ◆ Improve the quality management system continuously through learning and growth <ul style="list-style-type: none"> • Improve the quality management system continuously through quality management learning and upgrade provided by the organization • Improve the quality management system continuously through improvement of management method and employee empowerment
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to use TQM methods to formulate and implement effective quality management plans for the organization; (ii) Capable to apply the concept of quality economics to analyze quality costs for a specific organization; and (iii) Capable to formulate a mechanism to continuously improve the quality management system of the organization.
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of quality management.

1. Title	Lead and supervise management of large engineering projects
2. Code	EMSRPM601A
3. Range	Critically review, analyze, evaluate and judge in the course of management and supervision of projects related to maintenance of large ships and formulate schedules for the projects; lead and supervise large engineering projects.
4. Level	6
5. Credit	6
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Project management issues related to leading large-scale engineering projects</p> <ul style="list-style-type: none"> ◆ Be familiar with the management requirements for engineering projects of maintenance of large ships and related installations <p>6.2 Methods of supervising large engineering projects</p> <ul style="list-style-type: none"> ◆ Master techniques of supervising large engineering projects, and facilitate, coordinate and supervise the projects according to project schedules ◆ Lead the management of large ship-repair projects, including organizing project management of working groups, formulating project management plan and schedule, formulating project monitoring system, formulating delivery list and schedule for related materials and equipment, logistic management system for materials and equipment, handover arrangement upon completion of project <p>6.3 Professionalism in supervising large engineering projects</p> <ul style="list-style-type: none"> ◆ Critically review, analyze, evaluate and judge in the course of management and supervision of projects and formulate schedules for the projects
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <p>(i) Capable to demonstrate how to lead the management of large ship-repair projects; and</p> <p>(ii) Capable to demonstrate how to facilitate, coordinate and supervise the successful completion of engineering projects.</p>
8. Remarks	The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of project supervision (such as: EMSROM403A” Supervise projects according to legislations and regulations related to ship operations” and EMCUOM502A “Implement engineering operation and supervisory management”).

Competency Level 7

1. Title	Formulate overall operation development direction and strategy								
2. Code	EMCUOM701A								
3. Range	With regard to electrical and mechanical engineering operation management, understand the social conditions, fully master the development trend of the industry as well as the goals and present situation of the organization so as to formulate an overall operation development direction and strategy for the organization; handle very complex / new issues in the absence of complete/consistent data/information, and develop creative response.								
4. Level	7								
5. Credits	20								
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <table border="0"> <tr> <td style="vertical-align: top;">6.1</td> <td style="vertical-align: top;">Knowledge of social, electrical and mechanical industry's environment</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Understand the development trends of society and the electrical and mechanical trade ◆ Understand clearly the influence of legislations, especially ordinances related to safety, health and environmental protection, on the industry ◆ Master social and economic information </td> </tr> <tr> <td style="vertical-align: top;">6.2</td> <td style="vertical-align: top;">Formulate overall operation development direction and strategy</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ◆ Analyze strengths of the organization <ul style="list-style-type: none"> • Use analytical tools to analyze strengths of the organization in operation management, occupational safety and health and environmental protection, quality management, human resources management, financial management, product development management and risk management • Use internal questionnaire survey for analysis and reference • Use the comparison with industrial benchmarking for analysis and reference ◆ Formulate development goals for the organization according to the analysis of the its strengths, the social and industrial environment and trend, and stakeholders' needs ◆ Use operation management techniques to formulate an overall operation development direction and strategy according to development goals, including: <ul style="list-style-type: none"> • Business development strategy • Business operation strategy • Human resources management strategy • Financial strategy • Product development strategy • Risk management strategy • Communication channels </td> </tr> </table>			6.1	Knowledge of social, electrical and mechanical industry's environment	<ul style="list-style-type: none"> ◆ Understand the development trends of society and the electrical and mechanical trade ◆ Understand clearly the influence of legislations, especially ordinances related to safety, health and environmental protection, on the industry ◆ Master social and economic information 	6.2	Formulate overall operation development direction and strategy	<ul style="list-style-type: none"> ◆ Analyze strengths of the organization <ul style="list-style-type: none"> • Use analytical tools to analyze strengths of the organization in operation management, occupational safety and health and environmental protection, quality management, human resources management, financial management, product development management and risk management • Use internal questionnaire survey for analysis and reference • Use the comparison with industrial benchmarking for analysis and reference ◆ Formulate development goals for the organization according to the analysis of the its strengths, the social and industrial environment and trend, and stakeholders' needs ◆ Use operation management techniques to formulate an overall operation development direction and strategy according to development goals, including: <ul style="list-style-type: none"> • Business development strategy • Business operation strategy • Human resources management strategy • Financial strategy • Product development strategy • Risk management strategy • Communication channels
6.1	Knowledge of social, electrical and mechanical industry's environment	<ul style="list-style-type: none"> ◆ Understand the development trends of society and the electrical and mechanical trade ◆ Understand clearly the influence of legislations, especially ordinances related to safety, health and environmental protection, on the industry ◆ Master social and economic information 							
6.2	Formulate overall operation development direction and strategy	<ul style="list-style-type: none"> ◆ Analyze strengths of the organization <ul style="list-style-type: none"> • Use analytical tools to analyze strengths of the organization in operation management, occupational safety and health and environmental protection, quality management, human resources management, financial management, product development management and risk management • Use internal questionnaire survey for analysis and reference • Use the comparison with industrial benchmarking for analysis and reference ◆ Formulate development goals for the organization according to the analysis of the its strengths, the social and industrial environment and trend, and stakeholders' needs ◆ Use operation management techniques to formulate an overall operation development direction and strategy according to development goals, including: <ul style="list-style-type: none"> • Business development strategy • Business operation strategy • Human resources management strategy • Financial strategy • Product development strategy • Risk management strategy • Communication channels 							

	<ul style="list-style-type: none"> ◆ Formulate mechanisms to measure, review and improve the operation development direction and strategy ◆ Lead the organization for a forward-looking development according to the following social and industrial changes <ul style="list-style-type: none"> • Product or service requirements • Technological development • Human resources and all kinds of costs in comparison with competitors or the region
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> (i) Capable to formulate an overall operation development direction and strategy according to the situation of an electrical and mechanical organization; (ii) Capable to formulate for the organization mechanisms to measure, review and improve the operation development direction and strategy; and (iii) Capable to lead the organization for a forward-looking development according to social and industrial changes.
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses knowledge of engineering operation management.</p>

Appendix I

Generic Level Descriptors

Generic Level Descriptors				
Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
1	<ul style="list-style-type: none"> – Employ recall and demonstrate elementary comprehension in a narrow range of areas with dependency on ideas of others – Exercise basic skills – Receive and pass on information – Use, under supervision or prompting, basic tools and materials. – Apply learnt responses to solve problems – Operate in familiar, personal and/or everyday contexts – Take some account, with prompting, of identified consequences of actions. 	<ul style="list-style-type: none"> – Operate mainly in closely defined and highly structured contexts – Carry out processes that are repetitive and predictable – Undertake the performance of clearly defined tasks – Assume a strictly limited range of roles. 	<ul style="list-style-type: none"> – The ability to perform tasks of routine and repetitive nature given clear direction – Carry out directed activity under close supervision – Rely entirely on external monitoring of output and quality 	<ul style="list-style-type: none"> – Use very simple skills with assistance — for example: – Take some part in discussions about straightforward subjects – Read and identify the main points and ideas from documents about straightforward subjects – Produce and respond to a limited range of simple, written and oral communications, in familiar/routine contexts – Carry out a limited range of simple tasks to process data and access information – Use a limited range of very simple and familiar numerical and pictorial data – Carry out calculations, using whole numbers and simple decimals to given levels of accuracy.

Generic Level Descriptors				
Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
2	<ul style="list-style-type: none"> – Apply knowledge based on an underpinning comprehension in a selected number of areas – Make comparisons with some valuation and interpret available information – Apply basic tools and materials and use rehearsed stages for solving problems. – Operate in familiar, personal and/or everyday contexts – Take account the identified consequences of actions. 	<ul style="list-style-type: none"> – Choose from a range of procedures performed in a number of contexts, a few of which may be non-routine – Co-ordinate with others to achieve common goals. 	<ul style="list-style-type: none"> – The ability to perform a range of tasks in predictable and structured contexts – Undertake directed activity with a degree of autonomy – Achieve outcomes within time constraints – Accept defined responsibility for quantity and quality of output subject to external quality checking. 	<ul style="list-style-type: none"> – Use skills with some assistance — for example: <ul style="list-style-type: none"> – Take active part in discussions about identified subjects – Identify the main points and ideas from documents and reproduce them in other contexts – Produce and respond to a specified range of written and oral communications, in familiar/routine contexts – Carry out a defined range of tasks to process data and access information – Use a limited range of Familiar numerical and graphical data in everyday contexts – Carry out calculations, using percentages and graphical data to given levels of accuracy.

Generic Level Descriptors

Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
3	<ul style="list-style-type: none"> – Apply knowledge and skills in a range of activities, demonstrating comprehension of relevant theories – Access, organize and evaluate information independently and make reasoned judgements in relation to a subject or discipline – Employ a range of responses to well defined, but sometimes unfamiliar or unpredictable, problems – Make generalizations and predictions in familiar contexts. 	<ul style="list-style-type: none"> – Operate in a variety of familiar and some unfamiliar contexts, using a known range of technical or learning skills – Select from a considerable choice of predetermined procedures – Give presentations to an audience 	<ul style="list-style-type: none"> – The ability to perform tasks in a broad range of predictable and structured contexts which may also involve some non-routine activities requiring a degree of individual responsibility – Engage in self-directed activity with guidance/evaluation – Accept responsibility for quantity and quality of output – Accept well defined but limited responsibility for the quantity and quality of the output of others 	<ul style="list-style-type: none"> – Use a wide range of largely routine and well practiced skills — for example: <ul style="list-style-type: none"> – Produce and respond to detailed and complex written and oral communication in familiar contexts, and use a suitable structure and style when writing extended documents. – Select and use standard applications to obtain, process and combine information – Use a wide range of numerical and graphical data in routine contexts, which may have some non-routine elements.

Generic Level Descriptors

Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
4	<ul style="list-style-type: none"> – Develop a rigorous approach to the acquisition of a broad knowledge base, with some specialist knowledge in selected areas – Present and evaluate information, using it to plan and develop investigative strategies – Deal with well defined issues within largely familiar contexts, but extend this to some unfamiliar problems – Employ a range of specialised skills and approaches to generate a range of responses. 	<ul style="list-style-type: none"> – Operate in a range of varied and specific contexts involving some creative and non-routine activities – Exercise appropriate judgement in planning, selecting or presenting information, methods or resources – Carry out routine lines of enquiry, development of professional level issues and problems. 	<ul style="list-style-type: none"> – The ability to perform skilled tasks requiring some discretion and judgement, and undertake a supervisory role – Undertake self-directed and a some directive activity – Operate within broad general guidelines or functions – Take responsibility for the nature and quantity of own outputs – Meet specified quality standards – Accept some responsibility for the quantity and quality of the output of others. 	<ul style="list-style-type: none"> – Use a wide range of routine skills and some advanced skills associated with the subject/discipline — for example: – Present using a range of techniques to engage the audience in both familiar and some new contexts – Read and synthesize extended information from subject documents; organize information coherently, convey complex ideas in well-structured form – Use a range of IT applications to support and enhance work – Plan approaches to obtaining and using information, choose appropriate methods and data to justify results & choices – Carry out multi-stage calculations.

Generic Level Descriptors

Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
5	<ul style="list-style-type: none"> – Generate ideas through the analysis of abstract information and concepts – Command wide ranging, specialized technical, creative and/or conceptual skills – Identify and analyse both routine and abstract professional problems and issues, and formulate evidence-based responses – Analyse, reformat and evaluate a wide range of information – Critically analyse, evaluate and/or synthesize ideas, concepts, information and issues – Draw on a range of sources in making judgments. 	<ul style="list-style-type: none"> – Utilise diagnostic and creative skills in a range of technical, professional or management functions – Exercise appropriate judgement in planning, design, technical and/or supervisory functions related to products, services, operations or processes. 	<ul style="list-style-type: none"> – Perform tasks involving planning, design, and technical skills, and involving some management functions – Accept responsibility and accountability within broad parameters for determining and achieving personal and/or group outcomes – Work under the mentoring of senior qualified practitioners – Deal with ethical issues, seeking guidance of others where appropriate. 	<ul style="list-style-type: none"> – Use a range of routine skills and some advanced and specialized skills in support of established practices in a subject/discipline, for example: <ul style="list-style-type: none"> – Make formal and informal presentations on standard/mainstream topics in the subject/discipline to a range of audiences – Participate in group discussions about complex subjects; create opportunities for others to contribute – Use a range of IT applications to support and enhance work – Interpret, use and evaluate numerical and graphical data to achieve goals/targets.

Generic Level Descriptors

Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
6	<ul style="list-style-type: none"> – Critically review, consolidate, and extend a systematic, coherent body of knowledge – Utilise highly specialised technical research or scholastic skills across an area of study – Critically evaluate new information, concepts and evidence from a range of sources and develop creative responses – Critically review, consolidate and extend knowledge, skills practices and thinking in a subject/discipline – Deal with complex issues and make informed judgements in the absence of complete or consistent data/information. 	<ul style="list-style-type: none"> – Transfer and apply diagnostic and creative skills in a range of situations – Exercise appropriate judgement in complex planning, design, technical and/or management functions related to products, services operations or processes, including resourcing and evaluation – Conduct research, and/or advanced technical or professional activity – Design and apply appropriate research methodologies. 	<ul style="list-style-type: none"> – Apply knowledge and skills in a broad range of professional work activities – Practice significant autonomy in determining and achieving personal and/or group outcomes – Accept accountability in related decision making including use of supervision – Demonstrate leadership and /or make an identifiable contribution to change and development. 	<ul style="list-style-type: none"> – Communicate, using appropriate methods, to a range of audiences including peers, senior colleagues, specialists – Use a wide range of software to support and enhance work; identify refinements to existing software to increase effectiveness or specify new software – Undertake critical evaluations of a wide range of numerical and graphical data, and use calculations at various stages of the work.

Generic Level Descriptors

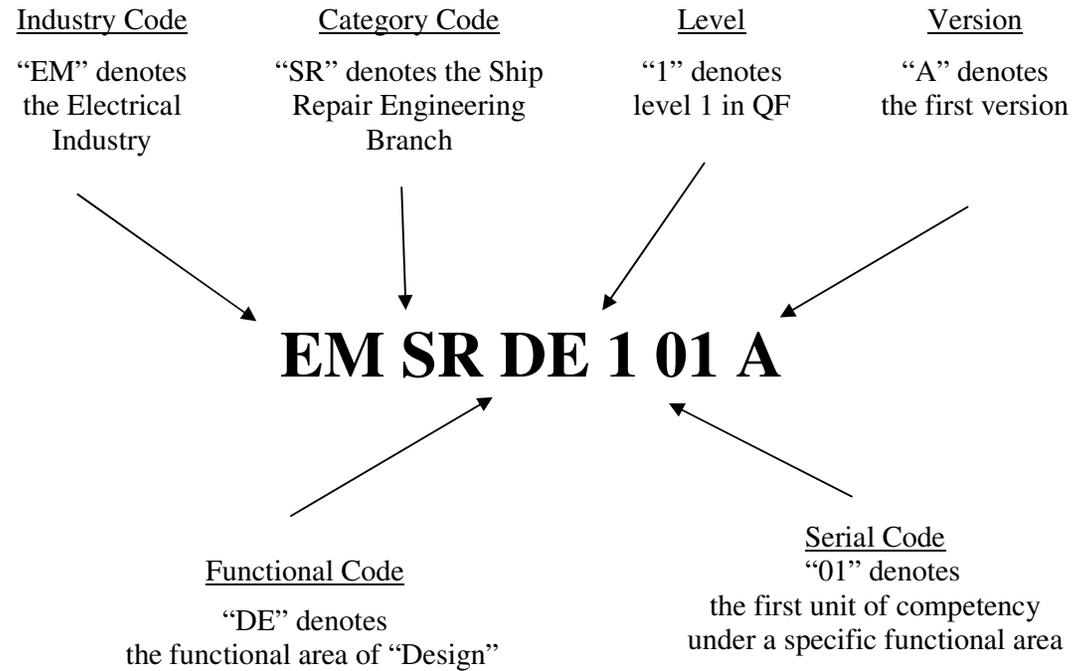
Level	Knowledge & Intellectual Skills	Processes	Application, Autonomy & Accountability	Communications, IT & Numeracy
7	<ul style="list-style-type: none"> – Demonstrate and work with a critical overview of a subject or discipline, including an evaluative understanding of principal theories and concepts, and of its broad relationships with other disciplines – Identify, conceptualise and offer original and creative insights into new, complex and abstract ideas and information – Deal with very complex and/or new issues and make informed judgements in the absence of complete or consistent data/information – Make a significant and original contribution to a specialised field of inquiry, or to broader interdisciplinary relationships. 	<ul style="list-style-type: none"> – Demonstrate command of research and methodological issues and engage in critical dialogue – Develop creative and original responses to problems and issues in the context of new circumstances. 	<ul style="list-style-type: none"> – Apply knowledge and skills in a broad range of complex and professional work activities, including new and unforeseen circumstances – Demonstrate leadership and originality in tackling and solving problems – Accept accountability in related decision making – High degree of autonomy, with full responsibility for own work, and significant responsibility for others – Deal with complex ethical and professional issues. 	<ul style="list-style-type: none"> – Strategically use communication skills, adapting context and purpose to a range of audiences – Communicate at the standard of published academic work and/or critical dialogue – Monitor, review and reflect on own work and skill development, and change and adapt in the light of new demands – Use a range of software and specify software requirements to enhance work, anticipating future requirements – Critically evaluate numerical and graphical data, and employ such data extensively.

Appendix II

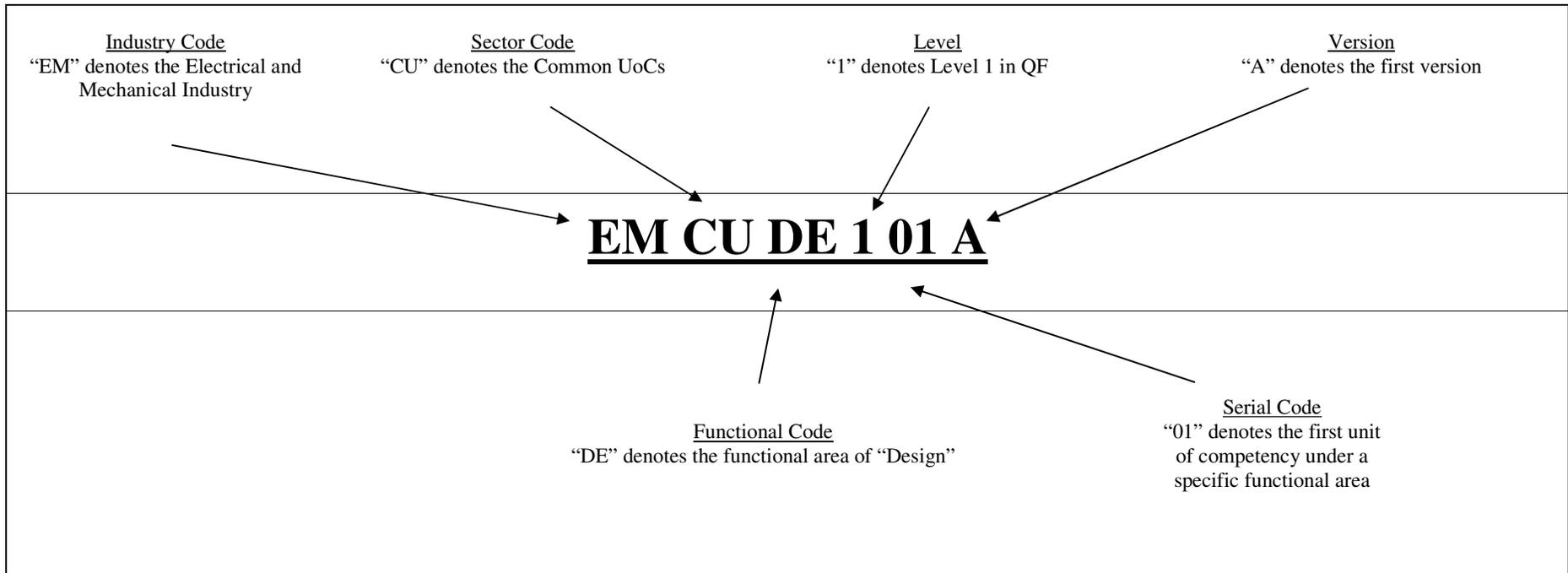
Coding Criteria

Coding Criteria

	Major Functional Areas	Code
(i)	Design	DE
(ii)	Installation	IN
(iii)	Inspection, Testing and Commissioning	IT
(iv)	Repair and Maintenance	RM
(v)	Project Management	PM
(vi)	Operation Management	OM
(vii)	Safety, Health and Environmental	SH
(viii)	Quality Management	QM
(ix)	Marketing and Sales	MS



Common UoCs Coding Criteria (The Common UoCs are applicable to other branches)



Remarks: 1) There is not space in the code.
2) The code must be underlined.

Common UoCs Coding Criteria (The Common UoCs are in the individual branch)

Use italic type, for example: *EMSRIN101A*