



QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR STRATEGIC MANUFACTURING INDUSTRY

What are Occupational Standards (OS)?

- OS describe what individuals need to do, know and understand in order to carry out a particular job role or function
- OS are performance standards that individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding

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Introduction

Qualifications Pack- Design Engineer – Marine Piping and Engineering

SECTOR/S: STRATEGIC MANUFACTURING

SUB-SECTOR: Ship Building & Ship Repair

OCCUPATION: Ship Building

REFERENCE ID: SMC/Q 3801

ALIGNED TO: NCO-2015/ NIL, ISCO - NIL

Brief Job Description: Design Engineer – marine piping & engineering is responsible for designing the piping structures of ship including development of diagrams for layout and formulation of system design for piping network in a ship.

Personal Attributes: He should be able to work effectively within a design team environment. He should have excellent communication and interpersonal skills, strong attention to detail and accuracy, good logical, mathematical and presentation skills. Also, understanding the need to take initiative and manage self and work to improve efficiency and effectiveness.



Qualifications Pack- Design Engineer – Marine Piping and Engineering

Job Details

Qualifications Pack Code	SMC/Q 3801		
Job Role	Design Engineer – Marine Piping and Engineering		
Credits (NSQF)	TBD	Version number	1.0
Sector	Strategic Manufacturing	Drafted on	05/11/2016
Sub-sector	Ship Building and Ship Repair	Last reviewed on	13/09/2017
Occupation	Ship Building	Next review date	12/09/2020
NSQC Clearance on	NA		

Job Role	Design Engineer – Marine Piping and Engineering
Role Description	Design Engineer – marine piping & engineering is responsible for designing the piping structures of ship including development of diagrams for layout and formulation of system design for piping network in a ship.
NSQF level	7
Minimum Educational Qualifications	Engineering Graduate in marine engineering
Maximum Educational Qualifications	N/A
Prerequisite License or Training	Training in engineering design software of ship building
Minimum Job Entry Age	23 years
Experience	2 year experience in engineering design
Applicable National Occupational Standards (NOS)	<p>Compulsory NOS:</p> <ol style="list-style-type: none"> 1. SMC/N 3801 Plan marine piping and engineering designs 2. SMC/N 3802 Develop marine piping and engineering designs 3. SMC/N 9103 Work effectively in a collaborative environment 4. SMC/N 9104 Maintain safe, hygiene and secure environment
Performance Criteria	As described in the relevant OS units



Qualifications Pack- Design Engineer – Marine Piping and Engineering

Definitions

Keywords /Terms	Description
Sector	Sector is a conglomeration of different business operations having similar businesses and interest. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/related set of In an industry.
Function	Function is an activity necessary for achieving the key purpose of the sector, occupation, or area of work, which can be carried out by a person or a group of persons. Functions are identified through analysis and form the basis of OS.
Job Role	Job role defines a unique set of functions that together form a unique Employment opportunity in an organization.
OS	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the knowledge and understanding they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria	Performance Criteria are statements that together specify the standard of performance required when carrying out a task.
NOS	NOS are Occupational Standards which apply uniquely in the Indian context.
Qualifications Pack Code	Qualifications Pack Code is a unique reference code that identifies a qualifications pack.
Qualifications Pack	Qualifications Pack comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A Qualifications Pack is assigned a unique qualification pack code.
Unit Code	Unit Code is a unique identifier for an Occupational Standard , which is denoted by an 'N'
Unit Title	Unit Title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for
Knowledge and Understanding	Knowledge and Understanding are statements which together specify the technical, generic, professional and organizational specific knowledge that an individual needs in order to perform to the required standard.
Organizational Context	Organizational Context includes the way the organization is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.



Qualifications Pack- Design Engineer – Marine Piping and Engineering

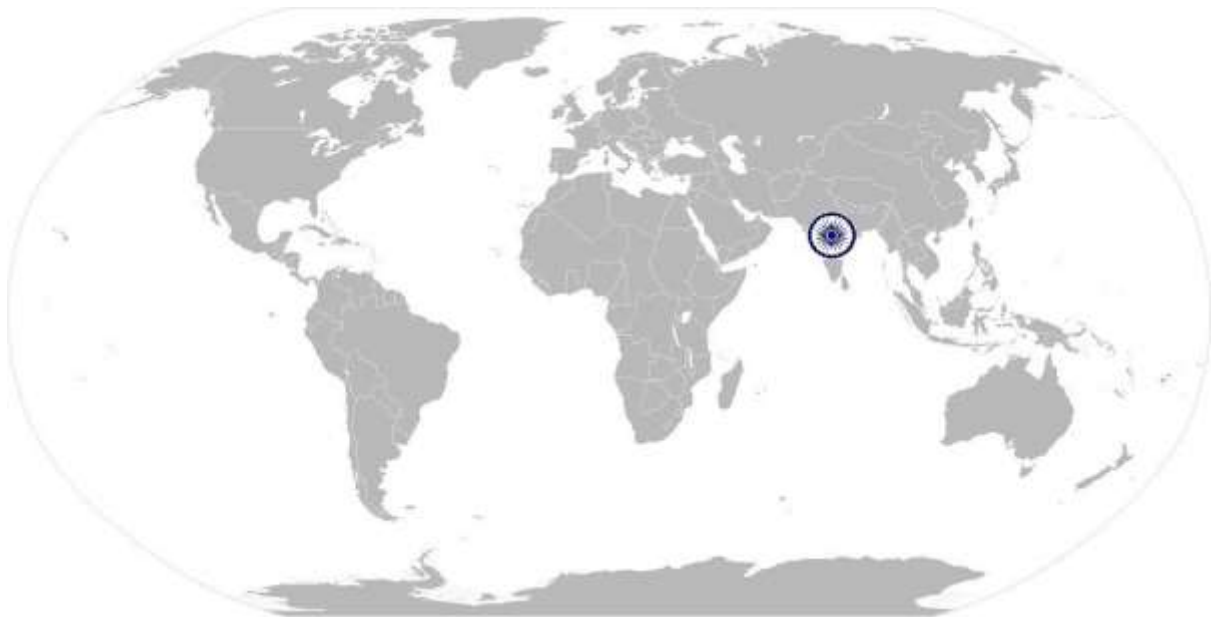
Technical Knowledge	Technical Knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills or Generic Skills	Core Skills or Generic Skills are a group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.

Acronyms

Keywords /Terms	Description
SMSSC	Strategic Manufacturing Sector Skill Council
NOS	National Occupational Standards
NSQF	National Skills Qualification Framework
NVEQF	National Vocational Educational Qualification Framework
NVQF	National Vocational Qualification Framework
OS	Occupational Standards
PC	Performance Criteria
QP	Qualification Pack
SSC	Sector Skills Council



National Occupational Standard



Overview

This unit is about planning marine piping and engineering designs



SMC/N 3801

Plan marine piping and engineering designs

National Occupational Standard

Unit Code	SMC/N 3801
Unit Title (Task)	Plan marine piping and engineering designs
Description	This unit is about planning marine piping and engineering designs
Scope	This unit/task covers the following: <ul style="list-style-type: none"> Plan for marine piping designs Plan for engineering designs
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Plan for marine piping designs	To be competent, the user/ individual must be able to: <ul style="list-style-type: none"> PC1. prepare basic layout of concept design of marine piping PC2. plan designing of piping support structures for all types of fluid and drain systems and wave guides PC3. plan ship utility design for electrical, sewage and water for integration of marine piping PC4. provide piping design analysis to shipyard for approval PC5. plan integration of propulsion package with shafts and propellers
Plan for engineering designs	To be competent, the user/ individual must be able to: <ul style="list-style-type: none"> PC6. plan layout of engineering spaces PC7. plan design of exhaust ventilation from engineering spaces PC8. formulate plan based on shipyard design capabilities and module-lifting schemes to assist production, material handling, and outfitting departments
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the organization and its processes)	The user/individual on the job needs to know and understand: <ul style="list-style-type: none"> KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA2. all types of ships such as cargo ships, tankers, passengers ships, cruise ships, ferries, war ships, frigate, crew ships KA3. type of fishing vessels - small, medium and large KA4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities KA5. reporting structure, inter-dependent functions, lines and procedures in the work area KA6. relevant people and their responsibilities within the work area KA7. escalation matrix and procedures for reporting work and employment related issues KA8. documentation and related procedures applicable in the context of employment and work KA9. importance and purpose of documentation in context of employment and work KA10. company systems for recording design information
B. Technical Knowledge	The user/individual on the job needs to know and understand: <ul style="list-style-type: none"> KB1. how to extract and use information from engineering drawings and related



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Plan marine piping and engineering designs

	<p>specifications in relation to work undertaken</p> <p>KB2. how to interpret isometric drawings, imperial and metric systems of measurement, work-piece reference points and system of tolerance</p> <p>KB3. how to prepare the pipes/metal sheets/deck fittings in readiness for the marking out activities</p> <p>KB4. preparation of pipes/metal sheets/deck fittings : e.g. visually checking for defects, cleaning the materials, removing burrs and sharp edges, etc.</p> <p>KB5. standard specification of pipes/metal sheets/deck fittings, fittings and flanges</p> <p>KB6. functioning of various pumps like positive displacement pump, dynamic pressure pump, reciprocating pump, centrifugal pump, gear pump, screw pump, rotary pump, submersible pump etc.</p> <p>KB7. type of welding to be used based on the kind of pipes/metal sheets/deck fittings</p> <p>KB8. tools and equipment used in the cutting and preparing the pipes/metal sheets/deck fittings</p> <p>KB9. the key elements and be able to understand the integration of the numerous systems of a naval ship during the design process</p> <p>KB10. how to operate computer-aided design (CAD) to make 2D/3D layout of piping and engineering</p> <p>KB11. marine design, practices in marine design and ship building process</p> <p>KB12. structural calculation, structural analysis and design</p> <p>KB13. purpose of design brief and its importance</p> <p>KB14. how to measure internal and external dimensions, measuring geometric features</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	The user/ individual on the job needs to know and understand how to: SA1. prepare and maintain documentation SA2. fill up appropriate technical forms, process charts and activity logs
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA3. read vernacular/english language SA4. read and understand manuals, health and safety instructions, memos, other company documents SA5. read from different sources- books, screens in machines and signage SA6. read various colour codes, as per standard electrical, mechanical and civil nomenclature
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA7. express statements or information clearly so that others can hear and understand SA8. participate in and understand the main points of simple discussions SA9. respond appropriately to any queries SA10. communicate with peers, superiors and sub-ordinates



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Plan marine piping and engineering designs

	SA11. convey and share technical information clearly using appropriate language SA12. communicate with people in respectful form and manner in line with organizational protocol SA13. put forward one's point of view in a convincing manner
B. Professional Skills	Decision making
	The user/individual on the job needs to know and understand how to: SB1. follow organisation rule- based decision making process SB2. take decision with systematic course of actions and/or response SB3. follow organization code of conduct SB4. work towards achieving better results for self, others and organization
	Plan and organize
	The user/individual on the job needs to know and understand how to: SB5. plan and organize work schedule to meet deadlines SB6. work constructively and collaboratively with others SB7. seek to improve and modify own work practices SB8. undertake and express new ideas and initiative to others
	Analytical thinking
	The user/individual on the job needs to know and understand how to: SB9. apply domain knowledge, observations and data to select course of action to perform tasks SB10. analyse information according to enterprise and work requirements SB11. provide suggestions to further streamline process
	Critical thinking
SB12. select and apply resolution techniques SB13. use reasoning skills to identify and resolve basic problems SB14. use acquired knowledge of the process and apply the information gathered from observation, experience, reasoning, or communication to act efficiently SB15. apply balanced judgements to different situations	



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Plan marine piping and engineering designs

NOS Version Control

NOS Code	SMC/N 3801		
Credits (NSQF)	TBD	Version number	1.0
Industry	Strategic Manufacturing	Drafted on	05/11/2016
Industry Sub-sector	Ship Building and Ship Repair	Last reviewed on	13/09/2017
Occupation	Ship Building	Next review date	12/09/2020



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National Occupational Standard



Overview

This unit is about developing marine piping and engineering designs



SMC/N 3802

Develop marine piping and engineering designs

National Occupational Standard

Unit Code	SMC/N 3802
Unit Title (Task)	Develop marine piping and engineering designs
Description	This unit is about developing marine piping and engineering designs
Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Develop Marine Piping design • Develop engineering designs
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Develop marine piping designs	To be competent, the user/ individual must be able to: PC1. formulate 2D/3D modelling for piping, machinery and associated systems PC2. formulate design of piping for machinery spaces PC3. formulate design of upper deck piping PC4. formulate design for lower deck piping develop piping design so that it technically meets the safety rules and standards laid down by shipyard PC5. prepare hull form fairing and curved plate expansion calculations PC6. prepare output of marine design for propulsion power and steering efficiency PC7. prepare overboard discharge of bilge and ballast system
Develop engineering designs	PC8. formulate vessel basic design plan including general engineering arrangement, lines including stability analysis PC9. formulate design of steering gear PC10. formulate design for control hydraulics of the ship and their integration with rest of the system PC11. perform system design for marine engineering machinery which includes powering calculation, machinery modelling plan, hvac ducts PC12. formulate basic design of all engineering spaces, including propulsion package PC13. formulate basic design of exhaust ventilation from engineering spaces PC14. prepare 2D/3D models and assembly drawings formulated PC15. prepare fitment design plan of superstructure, navigation, weapons and sensors propulsion and dovetail into own design PC16. integrate steering gear design with overall engineering package PC17. prepare documents for design references PC18. prepare shipbuilder and yard documents
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the organization and its processes)	The user/individual on the job needs to know and understand: KA1. company systems for recording design information KA2. importance of using the company information systems KA3. limits of learner’s own authority, and to whom should they report if they have problems that they cannot resolve KA4. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA5. own job role and responsibilities and sources for information pertaining to



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Develop marine piping and engineering designs

	<p>employment terms, entitlements, job role and responsibilities</p> <p>KA6. relevant people and their responsibilities within the work area</p> <p>KA7. importance of working in different shifts</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. naval ship design piping & engineering</p> <p>KB2. structural statics, naval architectural calculation</p> <p>KB3. fundamentals of fluid mechanics, structural dynamics, marine hydrodynamics, ship resistance and propulsion, marine mechanics of materials and theory of vibration</p> <p>KB4. the key elements and be able to understand the integration of the numerous systems of a naval ship during the design process</p> <p>KB5. the engineering requirements and standards which are applicable to the design of naval ships</p> <p>KB6. how to operate computer-aided design (CAD) to make 2D layout of piping structure</p> <p>KB7. marine design, practices in marine design, ship building process</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The user/ individual on the job needs to know and understand how to:</p> <p>SA1. prepare and maintain documentation</p> <p>SA2. complete accurate well written work with attention to detail</p>
	Reading Skills
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA3. read vernacular/english language</p> <p>SA4. read and understand manuals, health and safety instructions, memos, other company documents</p> <p>SA5. read from different sources- books, screens in machines and signage</p> <p>SA6. read various colour codes, as per standard electrical, mechanical and civil nomenclature</p>
B. Professional Skills	Oral Communication (Listening and Speaking skills)
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA7. express statements or information clearly so that others can hear and understand</p> <p>SA8. participate in and understand the main points of simple discussions</p> <p>SA9. respond appropriately to any queries</p> <p>SA10. communicate with peers, superiors and sub-ordinates</p> <p>SA11. put forward one's point of view in a convincing manner</p>
B. Professional Skills	Decision making
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. follow organisation rule- based decision making process</p> <p>SB2. take decision with systematic course of actions and/or response</p> <p>SB3. follow organization code of conduct</p> <p>SB4. take decisions within own jurisdiction or take approval for case outside own jurisdiction</p>



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Develop marine piping and engineering designs

	Plan and organize
	The user/individual on the job needs to know and understand how to: SB5. plan and organize work schedule to meet deadlines SB6. work constructively and collaboratively with others SB7. store and retrieve information SB8. keep up to date with changes, procedures and practices in your field of expertise SB9. seek to improve and modify own work practices
	Analytical thinking
	The user/individual on the job needs to know and understand how to: SB10. apply domain knowledge, observations and data to select course of action to perform tasks SB11. analyse information according to enterprise and work requirements SB12. undertake and express new ideas and initiative to others
	Critical thinking
	SB12. apply balanced judgements to different situations SB13. provide opinions on work in a detailed and constructive way SB14. achieve more by applying one's competencies in new and different situations and contexts





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Develop marine piping and engineering designs

NOS Version Control

NOS Code	SMC/N 3802		
Credits (NSQF)	TBD	Version number	1.0
Industry	Strategic Manufacturing	Drafted on	05/11/2016
Industry Sub-sector	Ship Building & Ship Repair	Last reviewed on	13/09/2017
Occupation	Ship Building	Next review date	12/09/2020



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National Occupational Standard



Overview

This unit covers basic practices for working effectively with others in a collaborative environment, such as team work and cooperation, awareness of team and organisational goals, sharing of information, communicating effectively using appropriate etiquettes and behaviours, and interpersonal relations.



SMC/N 9103

Work effectively in a collaborative environment

National Occupational Standard

Unit Code	SMC/N 9103
Unit Title (Task)	Work effectively in a collaborative environment
Description	This unit covers basic practices for working effectively with others in a collaborative environment, such as team work and cooperation, awareness of team and organisational goals, sharing of information, communicating effectively using appropriate etiquettes and behaviours, and interpersonal relations.
Scope	<p>This unit/task covers the following:</p> <p>Activities covered:</p> <ul style="list-style-type: none"> • Working effectively in a team • Etiquettes and behaviors for: <ul style="list-style-type: none"> • understanding & sharing information with others to enable efficient delivery of work • communicating with other members and people internal or external to the organization • Interpersonal relations
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Working effectively in a team	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. define own work and responsibilities</p> <p>PC2. understand organisational, individual and team goals</p> <p>PC3. understand work requirements and assigned targets</p> <p>PC4. identify team members and other persons responsible for preceding and successive activities</p> <p>PC5. identify any problems with team members and take initiative to solve problems in a positive manner</p> <p>PC6. discuss with the appropriate authority or person, any problems that arise, which may affect the work and remain unresolved</p> <p>PC7. carry out any commitments made to others</p> <p>PC8. ensure proper care is given to a fellow worker in case of an accident</p>



SMC/N 9103

Work effectively in a collaborative environment

Etiquettes and behaviors for sharing information and communicating effectively	To be competent, the user/individual on the job must be able to: PC9. give feedback of work done and report problems identified in the field PC10. pass on accurate information to authorized persons who require it and within agreed timescale and confirm its receipt PC11. make sure that information being provided is within the purview of own authority and responsibility PC12. communicate with other people clearly and effectively PC13. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism PC14. etiquettes may include: <ul style="list-style-type: none">• use appropriate titles and terms of respect• use polite language• avoid casual expressions PC15. display active listening skills while interacting with others at work PC16. communicate with other employees to ensure that work is organized to protect workers against risks and accidents PC17. demonstrate responsible and disciplined behavior
Interpersonal relations	To be competent, the user/individual on the job must be able to: PC18. develop understanding, goodwill and trust with team members PC19. resolve individual disagreements with the concerned person PC20. recognize when a conflict situation exists and try to resolve amicably PC21. follow the organisation's policies and procedures to resolve conflicts PC22. escalate unresolved grievances to appropriate authority
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the organization and its processes)	The user/individual on the job needs to know and understand: KA1. organisational chart and project schedules KA2. work flow in the organization, relevant people and their responsibilities within the work area KA3. procedures in the organization to deal with conflicts KA4. organization's policies and procedures for working with colleagues KA5. relevant people and their responsibilities within the work area KA6. benefits of developing productive working relationships with colleagues
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. organizational goals and objectives, individual and team performance KB2. formation and characteristics of teams, stages in team development KB3. importance of team work in organizational and individual success KB4. importance of developing effective working relationships KB5. importance of building rapport through collaboration and mutual support KB6. importance of knowledge sharing for effective working KB7. importance of effective communication in the workplace KB8. importance of tone and pitch in effective communication KB9. key elements of active listening KB10. importance of communicating clearly and effectively with people face-to-face,



SMC/N 9103

Work effectively in a collaborative environment

	<p>by telephone and in writing KB11. importance of discipline for professional success KB12. process of resolving interpersonal conflicts KB13. importance and ways of managing interpersonal conflict effectively</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	The user/ individual on the job needs to know and understand how to: SA1. prepare and maintain documentation
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA2. read vernacular/English language SA3. read and understand manuals, health and safety instructions SA4. read from different sources- books, screens in machines and signage SA5. read various colour codes, as per standard electrical, mechanical and civil nomenclature
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA6. express statements or information clearly so that others can hear and understand SA7. participate in and understand the main points of simple discussions SA8. respond appropriately to any queries SA9. communicate with employees
B. Professional Skills	Decision making
	The user/individual on the job needs to know and understand how to: SB1. follow organization rule- based decision making process SB2. take decision with systematic course of actions and/or response
	Plan and organize
	The user/individual on the job needs to know and understand how to: SB3. plan and organize work schedule to meet deadlines SB4. how to improve the work process
	Team Working Skills
	The user/individual on the job needs to know and understand how to: SB5. work constructively and collaboratively with others SB6. build rapport and cooperative relationships with internal team members and other departments for effective completion of work SB7. resolve conflicts within teams
	Analytical thinking
	The user/individual on the job needs to know and understand how to: SB8. apply domain knowledge, observations and data to select course of action to perform tasks



SMC/N 9103

Work effectively in a collaborative environment

NOS Version Control

NOS Code	SMC/N 9103		
Credits (NSQF)	TBD	Version number	1.0
Industry	Strategic Manufacturing	Drafted on	05/11/2016
Industry Sub-sector	Common	Last reviewed on	13/09/2017
Occupation	Common	Next review date	12/09/2020

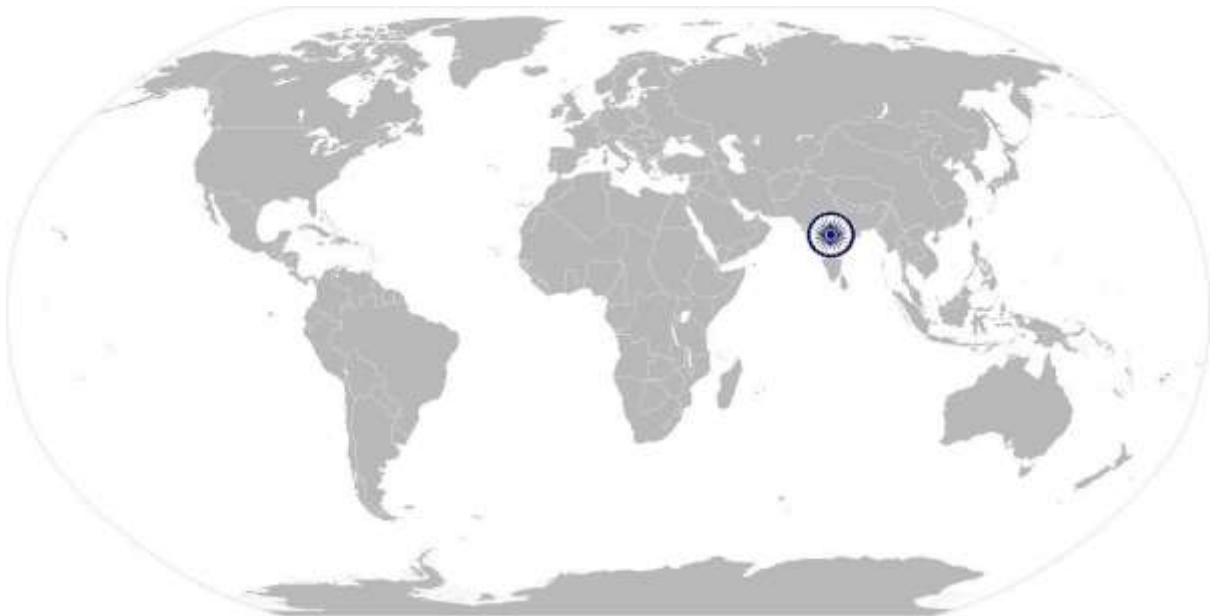


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SMC/N 9104 Maintain a healthy, safe and secure working environment

National Occupational Standard



Overview

This unit covers procedures and practices to be followed to maintain a healthy, safe and secure work environment.



SMC/N 9104 Maintain a healthy, safe and secure working environment

National Occupational Standard

Unit Code	SMC/N 9104
Unit Title (Task)	Maintain a healthy, safe and secure working environment
Description	This unit is about maintaining a healthy, safe and secure work environment. It covers responsibilities towards self, others, assets and the environment.
Scope	<p>This unit/task covers the following:</p> <p>Activities covered:</p> <ul style="list-style-type: none"> • maintain healthy workplace environment • maintain safe and secure environment • fire safety • emergencies, rescue and first-aid procedures
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Maintain healthy workplace	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. maintain cleanliness and hygiene</p> <p>PC2. wear clean and appropriate clothing, footwear and headgear</p> <p>PC3. follow health and hygiene procedures in all the work at all times</p> <p>PC4. identify common health hazards and symptoms for self and other crew members related to exposure of H2S, solvents, asbestos fibres, etc</p>
Maintain safe and secure environment	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC5. keep a look out for hazards in the workplace related to equipment and personal clothing</p> <p>PC6. use protective clothing/equipment for specific tasks & work conditions</p> <p>PC7. keep a lookout for following Accommodation related safety aspects</p> <ul style="list-style-type: none"> • all emergency lights operational, color coded and marked with "E" • escape routes unobstructed; exits clearly marked • life jackets, immersion suits & EEBDs correctly stowed & marked • internal communications equipment tested and operating correctly • muster list signed and properly displayed at appropriate locations <p>PC8. keep a lookout for the following Machinery Spaces related safety aspects</p> <ul style="list-style-type: none"> • escape routes, ladders and emergency exits unobstructed and clearly marked • all handrails, guard-rails and safety guards correctly fitted and secured to protect against fall • spare life-jackets marked and in good order, emergency equipment accessible and operational • all lights operational, stairways and work areas adequately lit, emergency lighting in E/R checked • switchboard area clear and free of obstructions and rubber mats in



SMC/N 9104 Maintain a healthy, safe and secure working environment

	<p>position</p> <ul style="list-style-type: none">• all portable fire extinguishers correctly stowed, accessible and inspection dated• all fixed fire-fighting equipment unobstructed and in good condition• high voltage areas clearly marked• muster lists displayed• protective guards for rotating machinery properly secured in place• shielding of high pressure fuel pipes in place, steam pipes properly insulated• self-closing device on sounding pipes and glass level gauges functional & not tied in open position• low clearance limits stripe marked• oil soaked rags and other flammable materials kept in covered non-combustible bins• supplies and materials properly stored• chemicals properly labelled and stored, acids & alkalis segregated, MSDS & PPE available at site• approved First Aid supplies readily available, accessible and clearly marked• is the engine room workshop tidy with equipment protected as required & safety instructions posted <p>PC9. keep a lookout for the following Deck Area related safety aspects</p> <ul style="list-style-type: none">• escape routes and embarking areas marked, unobstructed and no slipping and tripping hazards• “Danger-Enclosed Space” marked outside all such spaces having access other than via manholes• all deck lights operational and in sound enclosures• all hand-rails and guard-rails correctly fitted and secure, all ladderways guarded by railings• all safety & hazard zone identification signs posted & readable, fire plan wallets updated• all lifebuoys correctly stowed, life buoy lights and smoke markers valid & in good condition• piping systems on deck are properly clamped• watertight doors closing properly with packing in good condition• all weather tight hatches closing properly with packing in good condition• good health of oil pollution clean-up equipment and their storage locations clearly marked• supplies and materials are properly stored• all cans in paint store are closed, cargo & bunker samples on tankers are stowed in paint store• provision and easy accessibility of Material Safety Data Sheet (MSDS)
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SMC/N 9104 Maintain a healthy, safe and secure working environment

	<p>PC10. report any accidents or near accidents quickly and accurately to the proper person</p> <p>PC11. practice emergency procedures correctly</p>
Fire safety	<p>To be competent ,the user/individual on the job must be able to:</p> <p>PC12. use appropriate fire extinguishers on different types of fires correctly</p> <p>PC13. ensure all portable fire extinguishers & stowage locations numbered, in place & inspection dated and for safety reasons, fire station not locked but only sealed</p> <p>PC14. demonstrate rescue techniques applied during fire hazard</p> <p>PC15. demonstrate good housekeeping in order to prevent fire hazards</p> <p>PC16. demonstrate the correct use of a fire extinguisher</p>
Emergencies, rescue and first-aid procedures	<p>To be competent ,the user/individual on the job must be able to:</p> <p>PC17. demonstrate how to free a person from electrocution, as per laid down procedure</p> <p>PC18. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.</p> <p>PC19. demonstrate basic techniques of bandaging</p> <p>PC20. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments</p> <p>PC21. perform and organize loss minimization or rescue activity during an accident in real or simulated environments administer basic first aid to victims</p> <p>PC22. participate in emergency procedures and move injured people and others during an emergency</p> <p>PC23. demonstrate correct method to move injured people and others during an emergency</p>
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the organization and its processes)	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. responsibilities under the organization’s health, safety and security standards</p> <p>KA2. why it is important to work in a healthy, safe and hygienic way</p> <p>KA3. where one can get information about health, hygiene and safety at the workplace</p> <p>KA4. names of all the people responsible for health and safety in a workplace</p> <p>KA5. names and location of documents that refer to health and safety in the workplace.</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. general rules on hygiene that one must follow</p> <p>KB2. the adverse health effects that may be caused by the exposure to a hazard</p> <p>KB3. the physical signs and reactions related to exposures to such hazards</p> <p>KB4. proper use of barriers that may be needed to protect an entrant from hazards</p> <p>KB5. entry and exit of vessel and evacuation procedures in case of an emergency</p> <p>KB6. what personal protective equipment is needed for safe entry into and exit from the space</p> <p>KB7. emergency indicators like sirens and what it indicates</p>



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	<p>KB8. precautions to be taken in confined spaces</p> <p>KB9. precautions to be taken while working with working machine tools</p> <p>KB10. how to use various firefighting systems in ship like fire extinguishers, fire hose etc</p> <p>KB11. methods of prevention of fires like proper and safe disposal of inflammable material, maintenance of proper ventilation in enclosed spaces, temperature control in working areas</p> <p>KB12. knowledge of precautions to be taken to be taken while working in heights like safety nets, length of rope and other safety practices in marine industry</p> <p>KB13. knowledge of ratings of motors and precautions to taken while dealing with electrical equipment</p> <p>KB14. awareness of work going on in surrounding areas</p> <p>KB15. awareness of gasses generated on board of ship</p> <p>KB16. awareness of toxic gases in confined spaces</p> <p>KB17. precautions to be taken while sand blasting & painting</p> <p>KB18. health and safety hazards commonly present in the work environment and related precautions</p> <p>KB19. possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible</p> <p>KB20. methods of accident prevention</p> <p>KB21. types of emergencies that may happen at the workplace and how to deal with these</p> <p>KB22. where to find first aid equipment and who the registered first-aider is in the workplace</p> <p>KB23. safe lifting and handling techniques to be followed</p> <p>KB24. techniques of using the different fire extinguishers</p> <p>KB25. rescue techniques applied during a fire hazard</p> <p>KB26. where to find fire alarms and how to set them off</p> <p>KB27. various dangers associated with the use of electrical equipment</p> <p>KB28. preventive and remedial actions to be taken in the case of exposure to toxic materials</p> <p>KB29. various types of safety signs and what they mean</p> <p>KB30. appropriate basic first aid treatment relevant to the condition</p> <p>KB31. the correct procedures for dealing with customers in case of emergencies</p> <p>KB32. content of written accident report</p>
Skills (S)	
C. Core Skills/ Generic Skills	Writing Skills
	The user/ individual on the job needs to know and understand how to: SA1. prepare and maintain documentation
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA2. read vernacular/english language SA3. read and understand manuals, health and safety instructions



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	SA4. read various colour codes, as per standard electrical, mechanical and civil nomenclature
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA5. express statements or information clearly so that others can hear and understand SA6. participate in and understand the main points of simple discussions SA7. respond appropriately to any queries SA8. communicate with employees
D. Professional Skills	Decision making
	The user/individual on the job needs to know and understand how to: SB1. follow organisation rule- based decision making process SB2. take decision with systematic course of actions and/or response
	Plan and organize
	The user/individual on the job needs to know and understand how to: SB3. plan and organize work schedule to meet deadlines SB4. work constructively and collaboratively with others
	Analytical thinking
	The user/individual on the job needs to know and understand how to: SB5. apply domain knowledge, observations and data to select course of action to perform tasks related to solar photovoltaic power plant

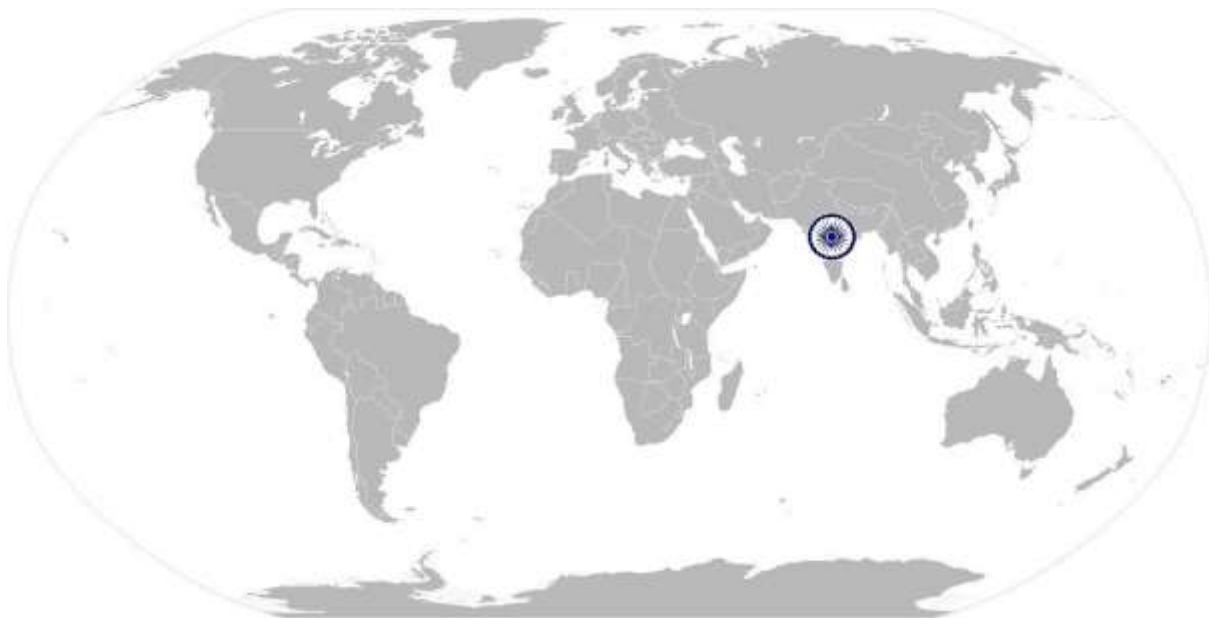




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NOS Version Control

NOS Code	SMC/N 9104		
Credits (NSQF)	TBD	Version number	1.0
Industry	Strategic Manufacturing	Drafted on	05/11/2016
Industry Sub-sector	Common	Last reviewed on	13/09/2017
Occupation	Common	Next review date	12/09/2020



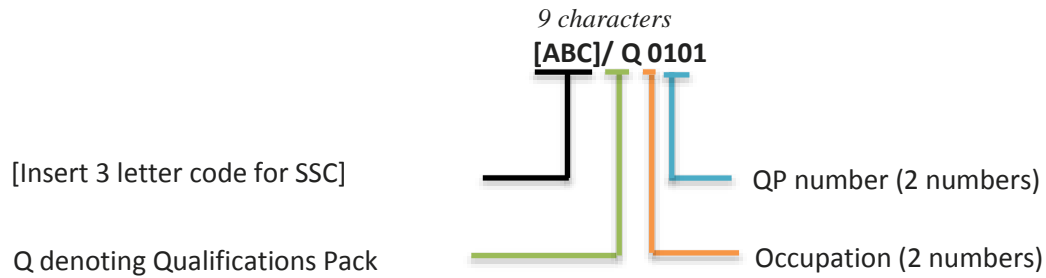
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Annexure

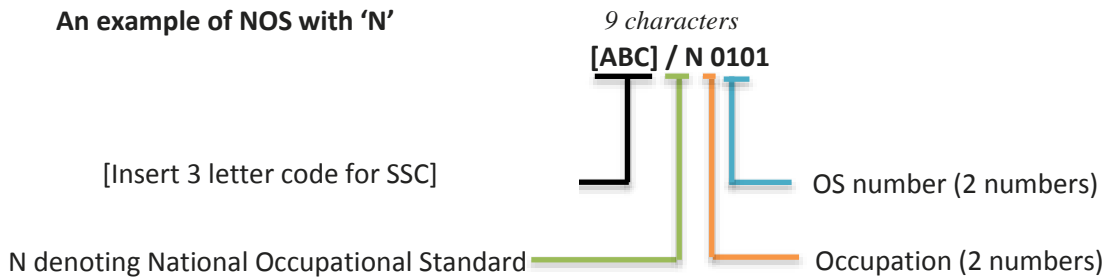
Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard

An example of NOS with 'N'



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The following acronyms/codes have been used in the nomenclature above:

Sub sectors	Range of occupation numbers
Defence Equipment - Land & Naval Systems	01-30
Ship building & Ship breaking	31-60
Electronic Security Equipment Manufacturing	61-75
Safety & Fire Fighting Equipment	76-90
Common	91-94

Sequence	Description	Example
Three letters	Industry name	SMC
Slash	/	/
Next letter	Whether QP or NOS	Q or N
Next two numbers	Occupation code	1
Next two numbers	OS number	1

Note :

- The range of occupation numbers have been decided based on the number of existing and future occupations in a segment



CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role: Design Engineer – Marine Piping and Engineering

Qualification Pack: SMC/Q 3801

Sector Skill Council: Strategic Manufacturing Sector Skill Council

Guidelines for Assessment

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criterion.
6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
7. In case of *unsuccessful completion*, the trainee may seek reassessment on the Qualification Pack.



Compulsory NOS Total Marks: 400				Marks Allocation	
Assessment outcomes	Assessment criteria for outcomes	Total Marks	Out of	Theory	Skills/ Practical
SMC/N 3801 Plan & develop marine piping and engineering designs	PC1. prepare basic layout of concept design of marine piping	100	13	4	9
	PC2. plan designing of piping support structures for all types of fluid and drain systems and wave guides		13	4	9
	PC3. plan ship utility design for electrical, sewage and water for integration of marine piping		13	4	9
	PC4. provide piping design analysis to shipyard for approval		13	4	9
	PC5. plan integration of propulsion package with shafts and propellers		13	4	9
	PC6. plan layout of engineering spaces		13	4	9
	PC7. plan design of exhaust ventilation from engineering spaces		12	4	8
	PC8. formulate plan based on shipyard design capabilities and module-lifting schemes to assist production, material handling, and outfitting departments		12	4	8
	Total	100	32	68	
SMC/N 3802 Develop marine piping and engineering designs	PC1. formulate 2D/3D modelling for piping, machinery and associated systems	100	4	2	2
	PC2. formulate design of piping for machinery spaces		4	2	2
	PC3. formulate design of upper deck piping		4	2	2
	PC4. formulate design for lower deck piping develop piping design so that it technically meets the safety rules and standards laid down by shipyar		4	2	2



Compulsory NOS Total Marks: 400				Marks Allocation	
Assessment outcomes	Assessment criteria for outcomes	Total Marks	Out of	Theory	Skills/ Practical
	PC5. prepare hull form fairing and curved plate expansion calculations		4	2	2
	PC6. prepare output of marine design for propulsion power and steering efficiency		4	2	2
	PC7. prepare overboard discharge of bilge and ballast system		4	2	2
	PC8. formulate vessel basic design plan including general engineering arrangement, lines including stability analysis		4	2	2
	PC9. formulate design of steering gear		4	1	3
	PC10. formulate design for control hydraulics of the ship and their integration with rest of the system		4	1	3
	PC11. perform system design for marine engineering machinery which includes powering calculation, machinery modelling plan, hvac ducts		4	1	3
	PC12. formulate basic design of all engineering spaces, including propulsion package		4	1	3
	PC13. formulate basic design of exhaust ventilation from engineering spaces		4	1	3
	PC14. prepare 2D/3D models and assembly drawings formulated		4	1	3
	PC19. prepare fitment design plan of superstructure, navigation, weapons and sensors propulsion and dovetail into own design		4	1	3
	PC20. integrate steering gear design with overall engineering package		4	1	3



Compulsory NOS Total Marks: 400				Marks Allocation	
Assessment outcomes	Assessment criteria for outcomes	Total Marks	Out of	Theory	Skills/ Practical
	PC21. prepare documents for design references		4	1	3
	PC22. prepare shipbuilder and yard documents		4	1	3
		Total	100	30	70
SMC/N 9103 Work effectively in a collaborative environment	PC1. define own work and responsibilities	100	3	1	2
	PC2. understand organisational, individual and team goals		3	1	2
	PC3. understand work requirements and assigned targets		3	1	2
	PC4. identify team members and other persons responsible for preceding and successive activities		3	1	2
	PC5. collaborate and integrate own work with other people's work		3	1	2
	PC6. consult with others to achieve smooth workflow and help in maximising effectiveness and efficiency in carrying out tasks		3	1	2
	PC7. identify any problems with team members and take initiative to solve problems in a positive manner		3	1	2
	PC8. discuss with the appropriate authority or person, any problems that arise, which may affect the work and remain unresolved		3	1	2
	PC9. work in a way that shows respect for others		3	1	2
	PC10. carry out any commitments made to others		3	1	2
	PC11. seek ways of improvement of work		3	1	2



Compulsory NOS Total Marks: 400				Marks Allocation	
Assessment outcomes	Assessment criteria for outcomes	Total Marks	Out of	Theory	Skills/ Practical
	PC12. learn skills from others that help in performing the work efficiently and share own skills with them, which may benefit their work		3	1	2
	PC13. work together as a single unit to ensure efficiency in work		3	1	2
	PC14. ensure proper care is given to a fellow worker in case of an accident		3	1	2
	PC15. receive information and instructions accurately from the supervisor and colleagues		3	1	2
	PC16. seek clarifications where required without disruption of own or others work		3	1	2
	PC17. give feedback of work done and report problems identified in the field		3	1	2
	PC18. pass on accurate information to authorized persons who require it and within agreed timescale and confirm its receipt		3	1	2
	PC19. make sure that information being provided is within the purview of own authority and responsibility		3	1	2
	PC20. communicate with other people clearly and effectively		3	1	2
	PC21. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		4	1	3
	PC22. exhibit proper work etiquettes		4	1	3
	PC23. display active listening skills while interacting with others at work and receiving feedback		4	1	3
	PC24. communicate with other employees to ensure that work is organized to protect workers against risks and accidents		4	1	3



Compulsory NOS Total Marks: 400				Marks Allocation	
Assessment outcomes	Assessment criteria for outcomes	Total Marks	Out of	Theory	Skills/ Practical
	PC25. demonstrate responsible and disciplined behaviour		4	1	3
	PC26. develop understanding, goodwill and trust with team members		4	1	3
	PC27. resolve individual disagreements with the concerned person		4	1	3
	PC28. recognize when a conflict situation exists and try to resolve amicably		4	1	3
	PC29. follow the organisation’s policies and procedures to resolve conflicts		4	1	3
	PC30. escalate unresolved grievances to appropriate authority		4	1	3
	Total		100	30	70
SMC/N 9104 Maintain a healthy, safe and secure working environment	PC1. maintain cleanliness and hygiene	100	3	1	2
	PC2. wear clean clothing		3	1	2
	PC3. follow health procedures		5	2	3
	PC4. identify common health hazards		5	2	3
	PC5. keep a look out for hazards		3	1	2
	PC6. use protective clothing/equipment		3	1	2
	PC7. keep a lookout for accommodation for safety		5	2	3
	PC8. keep a lookout for the Machinery		5	2	3
	PC9. keep a lookout for the Deck		5	2	3
	PC10. report any accidents or near accidents quickly and accurately to the proper person		4	2	2
	PC11. practice emergency procedures		5	2	3
	PC12. retrieve and/or point out documents that refer to		3	1	2



	safety at workplace				
	PC13. use appropriate fire extinguishers on different types of fires correctly causes of fires		5	2	3
	PC14. ensure all portable fire extinguishers & stowage locations numbered, in place & inspection dated and for safety reasons, fire station not locked but only sealed		5	2	3
	PC15. demonstrate rescue techniques applied during fire hazard		5	2	3
	PC16. demonstrate the correct use of a fire extinguisher		5	2	3
	PC17. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		4	1	3
	PC18. participate in emergency procedures and move injured people and others in correct method during an emergency		5	2	3
	PC19. perform emergency procedures		5	2	3
	PC20. perform and organize loss minimization or rescue activity during an accident in real or simulated environments administer basic first aid to victims		4	1	3
	PC21. demonstrate how to free a person from electrocution, as per laid down procedure		5	1	4
	PC22. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		5	1	4
	PC23. demonstrate basic techniques of bandaging		3	1	2
	Total		100	30	70