Skills for Employment Investment Program (SEIP)

COMPETENCY STANDARD

FOR

SHIP PIPING

(SHIPBUILDING SECTOR)

Finance Division, Ministry of Finance
Government of the People's Republic of Bangladesh

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Introduction

The Skills for Employment Investment Program (SEIP) Project of the Finance Division of the Ministry of Finance has embarked on a project which aims to qualitatively and quantitatively expand the skilling capacity of identified public and private training providers by establishing and operationalizing a responsive skill ecosystem and delivery mechanism through a combination of well-defined set of funding triggers and targeted capacity support.

Among the many components of the project, one is to promote a Market Responsive Inclusive Skills Training Delivery programme. Key priority economic growth sectors identified by the government have been targeted by the project to improve current job skills along with up-skilling of the existing workforce to ensure 'required skills to industry standards'. Training providers are encouraged and supported to work with industry to address identified skills and knowledge to enable industry growth and increased employment through the provision of market responsive inclusive skills training programmes. Priority sectors were identified to adopt a demand driven approach to training with effective inputs from Industry Skills Councils (ISC's), employer associations and employers.

This document is developed to improve skills and knowledge in accordance with the job roles, duties and tasks of the occupation and ensure that the required skills and knowledge are aligned to industry requirements.

The document also details the format, sequencing, wording and layout of the Competency Standard for an occupation which is comprised of Units of Competence and its corresponding Elements.

Overview

A **competency standard** is a written specification of the knowledge, skills and attitudes required for the performance of an occupation, trade or job corresponding to the industry standard of performance required in the workplace.

The purpose of competency standards is to:

- provide a consistent and reliable set of components for training, recognising and assessing people's skills, and may also have optional support materials
- enable industry recognised qualifications to be awarded through direct assessment of workplace competencies
- encourage the development and delivery of flexible training which suits individual and industry requirements
- encourage learning and assessment in a work-related environment which leads to verifiable workplace outcomes

Competency standards are developed by a working group comprised of national and international subject-matter experts, SEIP, BTEB, ISC, and industry experts to identify the competencies required of an occupation in a particular sector.

Competency standards describe the skills, knowledge and attitude needed to perform effectively in the workplace. Competency standards acknowledge that people can achieve technical and vocational competency in many ways by emphasising what the learner can do, not how or where they learned to do it.

With competency standards, training and assessment may be conducted at the workplace or at training institute or any combination of these.

Competency standards consist of a number of units of competency. A unit of competency describes a distinct work activity that would normally be undertaken by one person in accordance with industry standards.

Units of competency are documented in a standard format that comprises of:

- unit title
- nominal duration
- unit code
- unit descriptor
- elements and performance criteria
- variables and range statement
- curricular content guide
- assessment evidence guide

Together, all the parts of a unit of competency:

- describe a work activity
- guide the assessor to determine whether the candidate is competent or not yet competent

Identification and validation of units of competency and elements for this occupation were made by experts within this sector. A series of meetings were held to accurately capture industry and employer needs and expectations, and develop the competency framework that would help to enhance the employability of the

youth trained. This process started on 1 February 2018 and concluded with a validation workshop with working group on 9 May 2018.

Experts Involved

Industry and subject-matter experts who provided their valuable inputs to develop this competency standard [February 2018 – May 2018]:

Name	Organisation	Designation
Md. Arifur Rahman Khan	Western Marine Shipyard Limited (WMSL)	Director
Md. Shahadat HossainTalukder	AEOSIB-SEIP	Coordinator - Monitoring & Evaluation
Md. Anwar Hossain	Western Marine Shipyard Limited (WMSL)	General Manager - Technical & Project Management
Md. Gias Uddin Ahmed Chowdhury	Highspeed Shipbuilding & Engineering Company Limited	Chief Engineer and Shipyard In-Charge
Mr.Niranjan Kumar Podder	Karnafuly Ship Builders Limited	Executive Technical Director
Mohd. Abul Hasnat	Karnafuly Ship Builders Limited	General Manager
Cdr. Kaosar Rashid	Military Institute of Science and Technology (MIST)	Commander/Associate Professor
Maj. Osman Md. Amin	MIST	Assistant Professor
Md. Rabiul Hasan	Bangladesh Marine Academy	Engineer Instructor
Mr. Uttam Kumar Das	BKTTC Chattogram	Instructor (Mech.)
Md. Jahangir alam	Bangladesh Institute of Marine Technology (BIMT)	Instructor (Mech.)
Md. Jahidul Alam	Western Marine Shipyard Limited	Manager - Ship Piping
Mr. Dilip Kumar Paul	Karnafuly Ship Builders Limited	Assistant Engineer (Mech.)
Md. Masum Ahmed	Western Marine Shipyard Limited	Senior Foreman
Md Rafiqul Islam	Western Marine Shipyard Limited	Senior Fitter

Name	Organisation	Designation
Mr. Saleh Ahmed	Highspeed Shipbuilding & Engineering Company Limited	Senior Fitter
Md. Kamruzzaman	BIMT	Welder
Md. Suman	BIMT	Fitter
Tozammel Hossain Khan	British Council - SD03	National Subject Matter Consultant - Shipbuilding

Development Workshop

Working group formation and competency standard development workshop participants [10 April 2018]:

Name	Organisation	Designation
Md. Arifur Rahman Khan	Western Marine Shipyard Limited (WMSL)	Director
Md. Saifur Rahman	Highspeed Shipbuilding & Engineering Company Limited	General Manager
Md. Azaher Ali	Western Marine Shipyard Limited (WMSL)	Assistant General Manager - Ship Piping
Mr. Rupak Kanti Biswas	Bangladesh Technical Education Board (BTEB)	Quality Assurance Officer
Mr. Syed Nasir Ershad	SEIP	AEPD (Public 1)
Mr. Md. Ahsan Habib	SEIP	TVET Specialist
David King	British Council - SD03	Team Leader
Tozammel Hossain Khan	British Council - SD03	National Subject Matter Consultant - Shipbuilding

Validation Workshop

Competency standard validation workshop participants [9 May 2018]:

Name	Organisation	Designation
Md. Arifur Rahman Khan	Western Marine Shipyard Limited(WMSL)	Director/ISC Representative
Md. Azaher Ali	Western Marine Shipyard Limited (WMSL)	Assistant General Manager - Ship Piping
Mr. Uttam Kumar Das	BKTTC Chattogram	Instructor (Mech.)
Mr. Rupak Kanti Biswas	Bangladesh Technical Education Board (BTEB)	Quality Assurance Officer

Name	Organisation	Designation
Mr. Syed Nasir Ershad	SEIP	AEPD (Public 1)
Mr. Mohiuzzaman	SEIP	Course Specialist
Silvia Parveen	SEIP	Project Officer
David King	British Council - SD03	Team Leader
Tozammel Hossain Khan	British Council - SD03	National Subject Matter Consultant - Shipbuilding

The ensuing sections of this document comprise of a description of the relevant occupation, trade or job with all the key components of a unit of competency, including:

- a chart with an overview of all Units of Competency for the relevant occupation, trade or job including the Unit Codes and the Unit of Competency titles and corresponding Elements
- the Competency Standard that includes the Unit of Competency, Unit Descriptor, Elements and Performance Criteria, Range of Variables, Curricular Content Guide and Assessment Evidence Guide

Competency Chart

Units of Competency	Elements		
A. Generic (basic) Competencies (70 hours)			
Use basic mathematical concepts SEIP-SBD-SPF-01-G	Identify calculation requirements in the workplace	Select appropriate mathematical methods/concepts for the calculation	Use tools and instruments to perform calculations
Apply occupational health and safety (OHS) practice in the workplace SEIP-SBD-SPF-02-G	Identify OHS policies and procedures	Apply personal health and safety practices	Report hazards and risks
	Respond to emergencies		
Carry out workplace interaction SEIP-SBD-SPF-03-G	Interpret workplace communication and etiquette	Read and understand workplace documents	Participate in workplace meetings and discussions
	Practice professional ethics at work		
Operate in a team environment SEIP-SBD-SPF-04-G	Identify team goals and work processes	Identify own role and responsibilities within team	Communicate and co-operate with team members
	Practice problem solving within the team		
B. Sector-specific (common) Competencies (30 hours)			
Work effectively in the shipbuilding sector SEIP-SBD-SPF-01-S	Understand basics of shipbuilding	Obtain information about the industry	Identify key machines installed on a ship
Use hand and power tools SEIP-SBD-SPF-02-S	Identify and inspect hand and power tools	Use hand tools properly and safely	Operate power tools properly and safely
	Clean and maintain hand and power tools		

C. Occupation-specific (core) Competencies (260 hours)

Identify basic ship piping work SEIP-SBD-SPF-01-O	Identify key tasks of ship pipe fitter	Interpret piping system	Understand drawings, symbols and specifications
	Identify colour codes and standards		
Identify pipe and pipe fittings components SEIP-SBD-SPF-02-O	Identify different types of pipes	Identify different types of valves	Identify different types of fittings
	Identify different types of pumps	Identify different types of supports and fasteners	
Perform welding works SEIP-SBD-SPF-03-O	Identify types of welding and welding terminology	Identify different types of welding technique	Perform arc welding
	Perform tack welding		
Perform pipe fabrication works SEIP-SBD-SPF-04-O	Cut, thread and bevel pipes	Perform bend pipe with different angle	Secure supports, hangers and guides
	Clean and test piping		
Perform installation of piping system SEIP-SBD-SPF-05-O	Install fresh water piping system	Fix bilge water piping system	Install fuel oil piping system
	Install fire protection piping system	Install ballast piping system	Assemble hydraulic piping system
	Assemble refrigeration and air-conditioning piping system		

Units and Elements Table

A. Generic (basic) Competencies

Code	Unit of Competency	Elements of Competency	Duration (hours)
SEIP-SBD-SPF-01-G	Use basic mathematical concepts	**1.** Identify calculation requirements in the workplace. **2.** Select appropriate mathematical methods/concepts for the calculation. **3.** Use tools and instruments to perform calculations.	25
SEIP-SBD-SPF-02-G	Apply occupational health and safety (OHS) practice in the workplace	**1.** Identify OHS policies and procedures. **2.** Apply personal health and safety practices. **3.** Report hazards and risks. **4.** Respond to emergencies.	15
SEIP-SBD-SPF-03-G	Carry out workplace interaction	**1.** Interpret workplace communication and etiquette. **2.** Read and understand workplace documents. **3.** Participate in workplace meetings and discussions. **4.** Practice professional ethics at work.	15
SEIP-SBD-SPF-04-G	Operate in a team environment	**1.** Identify team goals and work processes. **2.** Identify own role and responsibilities within team. **3.** Communicate and co-operate with team members. **4.** Practice problem solving within the team.	15
Total Hours			**70**

B. Sector-specific (common) Competencies

Code	Unit of Competency	Elements of Competency	Duration (hours)
SEIP-SBD-SPF-01-S	Work effectively in the shipbuilding sector	1. Understand basics of shipbuilding. 2. Obtain information about the industry. 3. Identify key machines installed on a ship.	15
SEIP-SBD-SPF-02-S	Use hand and power tools	1. Identify and inspect hand and power tools. 2. Use hand tools properly and safety. 3. Operate power tools properly and safely. 4. Clean and maintain hand and power tools.	15
Total Hours			**30**

C. Occupation-specific (core) Competencies

Code	Unit of Competency	Elements of Competency	Duration (hours)
SEIP-SBD-SPF-01-O	Identify basic ship piping work	1. Identify key tasks of a ship pipe fitter. 2. Interpret piping system. 3. Understand drawings, symbols and specifications. 4. Identify colour codes and standards.	30
SEIP-SBD-SPF-02-O	Identify pipe and pipe fittings components	1. Identify the different types of pipes. 2. Identify different types of valves 3. Identify different types of fittings 4. Identify different types of pumps. 5. Identify different types of supports and fasteners.	30
SEIP-SBD-SPF-03-O	Perform welding works	1. Identify types of welding and welding terminology. 2. Identify different types of welding technique. 3. Perform arc welding. 4. Perform tack welding.	40
SEIP-SBD-SPF-04-O	Perform pipe fabricationn works	1. Cut, thread and bevel pipes. 2. Perform bend pipe with different angle. 3. Secure supports, hangers and guides. 4. Clean and test piping.	120
SEIP-SBD-SPF-05-O	Perform installation of piping system	1. Install fresh water piping system. 2. Install sea water piping system. 3. Install fuel piping system. 4. Install hydraulic piping system.	40
Total Hours			**260**

Competency Standard

A: Generic (basic) Competencies

Unit of Competency:	Nominal Duration:	Unit Code:
Use basic mathematical concepts	25 hours	SEIP-SBD-SPF-01-G

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to perform computations using basic mathematical concepts in the workplace. It specifically includes identifying general calculation requirements, selecting appropriate mathematical method/concept, and forming and solving mathematical problems in the workplace using appropriate tools and instruments.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Identify calculation requirements in the workplace	**1.1.** **Calculation requirements** are identified from **workplace information.** **1.2.** Mathematical problems are constructed from workplace information.
2. Select appropriate mathematical methods/concepts for the calculation	**2.1** **Appropriate method** is selected to carry out calculation requirements. **2.2** Constructed mathematical problems are solved with appropriate method.
3. Use tools and instruments to perform calculations	**3.1** Tools and instruments required for computation are identified. **3.2** Calculation is performed using appropriate tools and instruments accurately.

Range of Variables

Variable	Range*(may include but not limited to)*
1. Calculation requirements	**1.1.** Unit **1.2.** Area **1.3.** Height/ length/ breadth/ thickness **1.4.** Diameter **1.5.** Weight **1.6.** Percentage **1.7.** Capacity **1.8.** Time **1.9.** Temperature **1.10.** Material/data usage **1.11.** Speed **1.12.** Costing

Variable	Range*(may include but not limited to)*
2. Workplace information	**2.1** Floor environment **2.2** Design sheet **2.3** Specification sheet **2.4** Working chart/drawing **2.5** Standard operating procedure (SOP) **2.6** Job order
3. Appropriate method	**3.1** Addition **3.2** Subtraction **3.3** Division **3.4** Multiplication **3.5** Conversion **3.6** Percentage and ratio calculation **3.7** Simple equation
4. Tools and instruments	**4.1.** Calculator **4.2.** Cell phone **4.3.** Computer **4.4.** Ruler

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Numerical concepts **1.2.** Basic mathematical methods such as addition, subtraction, multiplication, division and percentage **1.3.** Mathematical language, symbols and terminology **1.4.** Measuring units
2. Underpinning skills	**2.1** Constructing simple problems from workplace information **2.3** Solving problems using appropriate method, tools and instruments **2.4** Using appropriate tools and instruments
3. Underpinning attitudes	**3.1** Prompt in carrying out activities **3.2** Tidy and punctual **3.3** Respectful of peers, subordinates and seniors in the workplace **3.4** Safely use tools and equipment **3.5** Sincere and honest concerning duties

Curricula Content Guide	
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Calculator **4.3.** Cell phone **4.4.** Computer/laptop/notebook **4.5.** Measuring tape **4.6.** Ruler **4.7.** Projector **4.8.** Stationary **4.9.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** identified calculation requirements from workplace information **1.2.** selected appropriate method to carry out the calculation requirements **1.3.** completed calculations using appropriate tools and instruments
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.

Unit of Competency:	Nominal Duration:	Unit Code:
Apply occupational health and safety (OHS) practice in the workplace	15 hours	SEIP-SBD-SPF-02-G

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to apply occupational health and safety (OHS) practice in the workplace. It specifically includes identifying OHS policies and procedures, applying personal health and safety practices, reporting hazards and risks, and responding to emergencies.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Identify OHS policies and procedures	**1.1.** **OHS policies** and safe operating procedures are interpreted. **1.2.** Safety signs and symbols are identified and followed. **1.3.** Response, evacuation procedures and other contingency measures are interpreted correctly.
2. Apply personal health and safety practices	**2.1.** OHS policies and procedures are applied in the workplace including personal protective equipment (PPE). **2.2.** Common health issues are recognised. **2.3.** Common safety issues are identified.
3. Report hazards and risks	**3.1.** Hazards and risks are identified. **3.2.** Hazards and risks assessment and controls are interpreted.
4. Respond to emergencies	**4.1.** Responded to alarms and warning devices. **4.2.** **Emergency response plans and procedures** are responded to. **4.3.** **First aid procedures** during emergency situations are identified.

Range of Variables

Variable	Range*(may include but not limited to)*
1. OHS policies	**1.1.** Organisational OHS polices **1.2.** International OHS requirements **1.3.** Fire safety rules and regulations
2. Emergency response plans and procedures	**2.1.** Firefighting procedures **2.2.** Earthquake response procedures **2.3.** Emergency response procedures **2.4.** Medical and first aid

Variable	Range*(may include but not limited to)*
3. First aid procedure	**3.1.** Washing of open wound **3.2.** Washing chemically infected area **3.3.** Applying bandage **3.4.** Taking appropriate medicine
4. Personal protective equipment	**4.1.** Safety glasses **4.2.** Ear plugs **4.3.** Gloves **4.4.** Apron **4.5.** Helmet **4.6.** Mask **4.7.** Safety shoes

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Workplace OHS policies and procedures **1.2.** Work safety procedures **1.3.** Emergency response procedures: **1.3.1.** Fire fighting **1.3.2.** Earthquake response **1.3.3.** Accident response **1.4.** Types of hazards (biological, chemical and physical) and their effects **1.5.** OHS awareness **1.6.** Personal protective equipment (PPE)
2. Underpinning skills	**2.1.** Identifying OHS policies and procedures **2.2.** Applying personal health and safety practices **2.3.** Reporting hazards and risks **2.4.** Responding to emergencies
3. Underpinning attitudes	**3.1.** Committed to occupational health and safety practices **3.2.** Communicates well with peers, subordinates and seniors in workplace **3.3.** Prompt in carrying out activities **3.4.** Tidy and punctual **3.5.** Sincere and honest concerning duties **3.6.** Responsible during emergencies

Curricula Content Guide	
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Personal protective equipment (PPE) **4.3.** Firefighting equipment **4.4.** Emergency response manual **4.5.** First aid kits **4.6.** Stationary **4.7.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** identified OHS policies and procedures **1.2.** applied personal health and safety practices (including PPE) **1.3.** reported hazards and risks **1.4.** responded to emergencies
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.

Unit of Competency:	Nominal Duration:	Unit Code:
Carry out workplace interaction	15 hours	SEIP-SBD-SPF-03-G

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to carry out workplace interaction. It specifically includes workplace communication, etiquette, understanding workplace documents, workplace meetings and discussions, and professional ethics at work.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Interpret workplace communication and etiquette	**1.1.** Workplace codes of conduct are interpreted as per organisational guidelines. **1.2.** Appropriate lines of communication are maintained with supervisors and colleagues. **1.3.** Workplace interactions are conducted in a **courteous manner** to gather and convey information. **1.4.** **Workplace procedures and matters** are comprehended.
2. Read and understand workplace documents	**2.1.** Workplace documents are interpreted correctly. **2.2.** Visual information/symbols/signage are understood correctly and followed. **2.3.** Specific and relevant information are accessed from **appropriate sources.** **2.4.** Appropriate medium is used to transfer information and ideas.
3. Participate in workplace meetings and discussions	**3.1.** Team meetings are attended on time. **3.2.** Meeting procedures and etiquette are followed. **3.3.** Active participation is ensured, opinions are expressed and heard. **3.4.** Inputs are provided and interpreted in line with the meeting purpose.
4. Practice professional ethics at work	**4.1.** Responsibilities as a team member are performed. **4.2.** Tasks are performed in accordance with workplace procedures. **4.3.** Confidentiality is maintained. **4.4.** Inappropriate and conflicting situations are avoided.

Range of Variables

Variable	Range*(may include but not limited to)*
1. Courteous manner	**1.1.** Effective questioning **1.2.** Active listening **1.3.** Speaking skills **1.4.** Writing skill **1.5.** Email etiquette

Variable	Range*(may include but not limited to)*
2. Workplace procedures and matters	**2.1.** Notes **2.2.** Arranging a meeting **2.3.** Agenda **2.4.** Simple reports such as progress and incident reports **2.5.** Job sheets **2.6.** Operational manuals **2.7.** Brochures and promotional material **2.8.** Visual and graphic materials **2.9.** Standards **2.10.** OHS information **2.11.** Signs
3. Appropriate sources	**3.1.** Human Resources (HR) Department **3.2.** Managers **3.3.** Supervisors **3.4.** Management Information System (MIS)

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Workplace communication and etiquette **1.2.** Workplace documents, signs and symbols **1.3.** Meeting procedure and etiquette **1.4.** Professional ethics
2. Underpinning skills	**2.1.** Demonstrating workplace communication and etiquette **2.2.** Interpreting workplace instructions and symbols **2.3.** Demonstrating active participation on workplace meeting **2.4.** Applying professional ethics at work
3. Underpinning attitudes	**3.1.** Prompt in carrying out activities **3.2.** Tidy and punctual **3.3.** Respectful of peers, subordinates and seniors in the workplace **3.4.** Concerned about the work environment **3.5.** Sincere and honest concerning duties

Curricula Content Guide	
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Workplace procedures **4.3.** Standard operating procedure **4.4.** Workplace documents, signs and symbols **4.5.** Codes of conduct **4.6.** Projector **4.7.** Relevant specifications or work instructions stationary **4.8.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** interpreted workplace communication and etiquette **1.2.** interpreted workplace instructions and symbols **1.3.** performed active participation in workplace meetings
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.

Unit of Competency:	Nominal Duration:	Unit Code:
Operate in a team environment	15 hours	SEIP-SBD-SPF-04-G

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to operate in a team environment. It specifically includes team goals and work processes, roles and responsibilities, team communication and problem solving within the team.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Identify team goals and work processes	**1.1.** Roles and objectives of the team are identified and interpreted. **1.2.** Roles and responsibilities of team members are identified and interpreted.
2. Identify own role and responsibilities within team	**2.1.** Personal role and responsibilities are identified within the team environment. **2.2.** Reporting relationships are interpreted within team and external to team.
3. Communicate and co-operate with team members	**3.1.** Other teammates' tasks are identified and support provided when requested. **3.2.** The team is encouraged through **sharing information** or expertise, working together to solve problems, and putting team success first. **3.3.** Views and opinions of other team members are interpreted and respected.
4. Practice problem solving within the team	**4.1.** Problems faced at the individual and team level are identified and showed insight into the root-causes of the problems. **4.2.** A range of solutions and courses of action are identified together with benefits, costs, and risks associated with each. **4.3.** The good ideas of others to help develop solutions are recognised and advice sought from those who have solved similar problems. **4.4.** It is looked beyond the obvious and not stopped at the first answers.

Range of Variables

Variable	Range*(may include but not limited to)*
1. Sharing information	**1.1.** Agenda **1.2.** Minutes **1.3.** progress and incident reports **1.4.** Operational manuals **1.5.** Visual and graphic materials **1.6.** Emails and SMS **1.7.** Phone directory **1.8.** Policy, procedure and standards **1.9.** OHS information

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Team goals and work processes **1.2.** Roles and responsibilities **1.3.** Finding problems and solving them
2. Underpinning skills	**2.1.** Identifying own role and responsibilities within team **2.2.** Communicating and co-operating with team members **2.3.** Demonstrating problem solving within the team
3. Underpinning attitudes	**3.1.** Active on teamwork **3.2.** Prompt in carrying out activities **3.3.** Tidy and punctual **3.4.** Respectful of peers, subordinates and seniors in the workplace **3.5.** Sincere and honest concerning duties
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Projector **4.3.** Stationary **4.4.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** identified own role and responsibilities within team **1.2.** communicated and co-operated with team members **1.3.** demonstrated problem solving within the team

Assessment Evidence Guide	
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.

B: Sector-specific (common) Competencies

Unit of Competency: Work effectively in the shipbuilding sector	**Nominal Duration:** 15 hours	**Unit Code:** SEIP-SBD-SPF-01-S

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to work effectively in the shipbuilding sector. It specifically includes an overview of the shipbuilding, obtaining information about the industry, and identifying key machines installed on a ship.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Understand basics of shipbuilding	**1.1.** Electrical devices, components and equipment of a ship are identified and described. **1.2.** Ship construction terminology and GA plan of a ship is interpreted. **1.3.** **Key areas of a ship** are identified from general drawing or model ship. **1.4.** Classification of society and ISO rules are explained.
2. Obtain information about the industry	**2.1.** Sources of information about industry are identified. **2.2.** **Industry information** is collected from multiple sources. **2.3.** Information is interpreted and applied to day-to-day work activities.
3. Identify key machines installed on a ship	**3.1.** Key **machines** installed on a ship are identified. **3.2.** Identified machines are located on ship.

Range of Variables

Variable	Range*(may include but not limited to)*
1. Key areas of ship	**1.1.** Bridge **1.2.** Main hull **1.3.** Engine room **1.4.** Cargo holds **1.5.** Deep Tank **1.6.** Double Bottom (DB) tank **1.7.** Bulbous bow **1.8.** Forecastle **1.9.** Poop **1.10.** Weather deck **1.11.** Tween deck **1.12.** Bulkhead **1.13.** Collision bulkhead

Variable	Range*(may include but not limited to)*
2. Machines	**2.1.** Marine engine **2.2.** Panel board **2.3.** Generator **2.4.** Transformer **2.5.** Air compressor **2.6.** Life boat engine **2.7.** Heat exchanger **2.8.** Motor **2.9.** Radar **2.10.** Echo sounder **2.11.** Gyro-compass **2.12.** Magnetic compass **2.13.** Steam boiler **2.14.** Pumps **2.15.** Winch and windlass **2.16.** Crane **2.17.** Propeller unit **2.18.** Air conditioner **2.19.** Refrigeration plant **2.20.** Purifier/centrifuged **2.21.** Laundry unit

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Electrical devices, components and equipment **1.2.** Key areas of a ship **1.3.** Key ship machinery **1.4.** Shipbuilding terminology
2. Underpinning skills	**2.1.** Identifying key areas of a ship **2.2.** Interpreting terminology and plans **2.3.** Locating key machinery
3. Underpinning attitudes	**3.1.** Cleanliness and tidiness **3.2.** Commitment to occupational health and safety **3.3.** Environmental concerns **3.4.** Eagerness to learn **3.5.** Timeliness and orderliness **3.6.** Respect for rights of peers and seniors in workplace

Curricula Content Guide	
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Sketches **4.3.** Drawings **4.4.** Layouts **4.5.** Plans **4.6.** Machinery and equipment **4.7.** Projector **4.8.** Stationary **4.9.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** identified key areas of a ship **1.2.** interpreted terminology and plans **1.3.** located key machinery
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.

Unit of Competency:	Nominal Duration:	Unit Code:
Use hand and power tools	15 hours	SEIP-SBD-SPF-02-S

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to use hand and power tools in the workplace. It specifically includes identifying and inspecting hand and power tools for usability, using and operating tools properly and safely, and cleaning and maintaining hand and power tools after use.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Identify and inspect hand and power tools	**1.1.** Appropriate hand and power tools are identified. **1.2.** Application of hand and power tools is recognised. **1.3.** Usability of hand and power tools is checked and verified.
2. Use hand tools properly and safely	**2.1.** Appropriate **hand tools** are selected. **2.2.** Safety precautions are ensured before using hand tools. **2.3.** Unsafe or faulty hand tools are identified and marked for repair. **2.4.** **Measuring tools** are checked and calibrated before use. **2.5.** Use hand tools properly and safely to perform work activity.
3. Operate power tools properly and safely	**3.1.** Appropriate **power tools** are selected. **3.2.** Power supply outlet and electrical cord are inspected and confirmed safe for use in accordance with established workplace safety requirements. **3.3.** Safety precautions are ensured before using power tools in accordance with manufacturer's operating specification. **3.4.** Proper sequence of operation applied for using power tools. **3.5.** Unsafe or faulty power tools are identified and marked for repair. **3.6.** Operate power tools properly and safely to perform work activity.
4. Clean and maintain hand and power tools	**4.1.** Dust and foreign matters removed from hand and power tools in accordance to workplace standards. **4.2.** Condition of hand and power tools is checked after use and reported. **4.3.** Appropriate lubricant is applied after use and prior to storage. **4.4.** Measuring tools are checked and calibrated after use. **4.5.** Defective hand and power tools are inspected and repaired or replaced. **4.6.** Hand and power tools are stored and secured in accordance with workplace requirements.

Range of Variables

Variable	Range*(may include but not limited to)*
1. Hand tools	**1.1.** Hammer **1.2.** Bench vice **1.3.** Files **1.4.** Punches **1.5.** Chisels **1.6.** Wrenches **1.7.** Pliers **1.8.** Scriber **1.9.** Screwdrivers **1.10.** Hacksaw **1.11.** Socket spanners **1.12.** Spanners **1.13.** Vice grip **1.14.** Wire cutters **1.15.** Drill **1.16.** Grinder **1.17.** Clamps **1.18.** Jacks
2. Power tools	**2.1.** Drills **2.2.** Grinders **2.3.** Cutting **2.4.** Saws **2.5.** Soldering iron **2.6.** Welding machines
3. Measuring tools	**3.1.** Meters **3.2.** Testers **3.3.** Megger **3.4.** Measuring tape **3.5.** Hose level **3.6.** Water level **3.7.** Calliper **3.8.** Steel rule **3.9.** Protractor **3.10.** Tri-square

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Information on types of hand and power tools, their functions and use **1.2.** Procedures for safely using hand and power tools
2. Underpinning skills	**2.1.** Identifying hand and power tools, and measuring tools **2.2.** Following safety precautions when using hand, power tools and measuring tools **2.3.** Operating power tools correctly and safely in accordance to manufacturer's operating specification **2.4.** Cleaning and maintaining hand and power tools after use **2.5.** Applying appropriate lubricant on hand and power tools after using and prior to storing
3. Underpinning attitudes	**3.1.** Commitment to occupational health and safety **3.2.** Promptness in carrying out activities **3.3.** Sincere and honest to duties **3.4.** Environmental concerns **3.5.** Tidiness and timeliness **3.6.** Concerned for proper use of tools
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Hand tools **4.3.** Power tools **4.4.** Measuring tools **4.5.** Projector **4.6.** Stationary **4.7.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** identified and selected appropriate hand and power tools for work to be performed **1.2.** identified and used measuring and testing tools appropriate to work activity **1.3.** followed safety precautions when using hand and power tools **1.4.** operated power tools safely and pursuant to manufacturer's operating specification **1.5.** performed cleaning and maintenance of hand and power tools after use and prior to storing

Assessment Evidence Guide	
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.

C: Occupation-specific (core) Competencies

Unit of Competency: Identify basic ship piping work	**Nominal Duration:** 30 hours	**Unit Code:** SEIP-SBD-SPF-01-O

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to identify basic ship piping work. It specifically includes identifying key tasks of a pipe fitter, interpreting ship piping systems, understanding drawings, symbols and specifications, and identifying color codes and standards in a ship.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Identify key tasks of a ship pipe fitter	**1.1.** Key tasks of a ship pipe fitter are identified. **1.2.** Roles and responsibilities of a pipe fitter are explained.
2. Interpret piping system	**2.1.** **Ship piping system** is accurately identified and explained. **2.2.** **Components** of ship piping system are identified and described.
3. Understand drawings, symbols and specifications	**3.1.** Types of **piping drawings** are explained as per job requirement. **3.2.** Components of spool sheet drawing are identified. **3.3.** Pipe fitting symbols are identified and defined. **3.4.** Information contained in **specifications** of piping work is explained.
4. Identify colour codes and standards	**4.1.** **Colour codes** are identified and described as per job requirement. **4.2.** Colour standard for different systems of ship piping are identified and described. **4.3.** Supplier documentation is identified and described.

Range of Variables

Variable	Range *(may include but not limited to)*
1. Ship piping system	**1.1** Fresh water **1.2** Sea water **1.3** Fuel **1.4** Hydraulic **1.5** Firefighting **1.6** Bilge **1.7** Ballast **1.8** Cooling **1.9** Tank sounding **1.10** Exhaust

Variable	Range *(may include but not limited to)*
2. Components	**2.1.** Flange **2.2.** Elbow **2.3.** Nipple **2.4.** Reducer **2.5.** Valves
3. Piping drawings	**3.1.** Piping (2D) **3.2.** Pipe cutting template **3.3.** Pipe bend **3.4.** Working sheet/spool sheet
4. Specifications	**4.1.** Material **4.2.** Piping code **4.3.** Item code number **4.4.** Size **4.5.** Bill of materials
5. Colour Codes	**5.1.** Sea water line - green **5.2.** Fresh water line - blue **5.3.** Bilge Water line - yellow **5.4.** Sludge water line - black **5.5.** Heavy oil line - maroon **5.6.** Diesel oil line - brown **5.7.** Steam line - grey **5.8.** Airline - white **5.9.** Fire line - red

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Key tasks of a ship pipe fitter **1.2.** Ship piping system **1.3.** Types of pipe drawing **1.4.** Color codes and standards
2. Underpinning skills	**2.1.** Drawing pipe cutting template **2.2.** Identifying and interpreting different types of ship piping systems **2.3.** Identifying components of spool sheet **2.4.** Applying types of piping drawings as per job requirement **2.5.** Complying with colour codes and standards as per job requirement

Curricula Content Guide	
3. Underpinning attitudes	**3.1.** Eagerness to learn and acquire skills **3.2.** Commitment to occupational health and safety practices **3.3.** Tidiness, timeliness, and orderliness **3.4.** Accept the job is shift based
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Drawings and specifications **4.3.** Colour codes and standards **4.4.** Supplier documentation **4.5.** Projector **4.6.** Stationary **4.7.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** identified and interpreted ship piping systems **1.2.** applied spool sheet drawings as per job requirement
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.

Unit of Competency:	Nominal Duration:	Unit Code:
Identify pipe and pipe fitting components	30 hours	SEIP-SBD-SPF-02-O

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to identify pipe and pipe fitting components. It specifically includes identifying the different types of pipes, different types of valves, different types of fittings and types of pumps, different types of hangers, supports, guides and fasteners.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Identify different types of pipes	**1.1.** **Different types of pipes** are identified. **1.2.** Pipes are selected as per job requirement.
2. Identify different types of valves	**2.1.** **Different types of valves** are identified **2.2.** Installing methods of valves are explained. **2.3.** Valves are selected as per job requirement.
3. Identify different types of fittings	**3.1.** **Different types of fittings** are identified. **3.2.** Connection methods of fittings are explained. **3.3.** Fittings are selected as per job requirement.
4. Identify different types of pumps	**4.1.** **Different types of pumps** are identified. **4.2.** Pump components are identified and their functions are described. **4.3.** Pump is selected as per job requirement.
5. Identify different types of supports and fasteners	**5.1.** **Different types of hangers, supports, guides and fasteners** are identified. **5.2.** Pipe supporting and fastening process is explained. **5.3.** Supports and fasteners are selected as per job requirement.

Range of Variables

Variable	Range*(may include but not limited to)*
1. Different types of pipes	**1.1.** Galvanized iron (G.I) **1.2.** Mild steel (M.S) **1.3.** Stainless steel (S.S) **1.4.** Copper **1.5.** Alloy steel **1.6.** Carbon steel **1.7.** Aluminium

Variable	Range*(may include but not limited to)*
2. Different types of valves	**2.1.** Globe **2.2.** Gate **2.3.** Non-return **2.4.** Butterfly **2.5.** Relief/safety **2.6.** Ball **2.7.** Swing check **2.8.** Main steam stop **2.9.** Feed check **2.10.** Remote control
3. Different types fittings	**3.1.** Elbow **3.2.** Union **3.3.** Nipple **3.4.** Reducer **3.5.** Double tapped bushing **3.6.** Tee **3.7.** Diverter tee **3.8.** Cross cap **3.9.** Plug **3.10.** Combo tee **3.11.** Sanitary tee **3.12.** Baffle tee **3.13.** Y-fitting
4. Different types of pumps	**4.1.** Gear **4.2.** Centrifugal **4.3.** Dosing **4.4.** Submersible **4.5.** Hydraulic

Variable	Range*(may include but not limited to)*
5. Different types of hangers, supports, guides and fasteners	**Hangers:** **5.1.1** Pipe **5.1.2** Clevis **5.1.3** Ring **5.1.4** Roller **5.1.5** Saddles and stanchions **5.1.6** Roller support **5.1.7** Thrust blocks **5.1.8** Pipe clams and guides **Fasteners:** **5.2.1** Hanger bolts **5.2.2** Beam clamps **5.2.3** Concrete fasteners **5.2.4** Metal fasteners

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Types of pipes, valves and fittings **1.2.** Types of pumps **1.3.** Types of supports and hangers
2. Underpinning skills	**2.1.** Identifying different pipes, valves and fittings **2.2.** Identifying different pumps **2.3.** Identifying different supports and hangers
3. Underpinning attitudes	**3.1.** Eagerness to learn and acquire skills **3.2.** Commitment to occupational health and safety practices **3.3.** Accept the job is shift based **3.4.** Prompt in carrying out activities **3.5.** Tidy and punctual **3.6.** Concerned about the work environment **3.7.** Sincere and honest concerning duties
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Drawings and sketches **4.3.** Valves, fittings and pumps **4.4.** Hand and power tools **4.5.** Welding equipment **4.6.** PPE **4.7.** Stationary **4.8.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** identified different pipes, valves and fittings and explained their function **1.2.** identified different pumps and explained their function **1.3.** identified different supports and hangers and explained their function **1.4.** selected appropriate pipes, valves, fittings, pumps, supports and hangers as per job specification
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.

Unit of Competency: Perform welding works	Nominal Duration: 40 hours	Unit Code: SEIP-SBD-SPF-03-O

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to perform welding works on a ship It specifically includes identifying different types of welding and welding terminology, welding techniques and procedures, performing arc and tack welding on ship piping.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Identify types of welding and welding terminology	**1.1.** **Tools and equipment** required for welding are identified. **1.2.** Different **types of welding** are identified and described. **1.3.** Welding terminology is listed and defined.
2. Identify different types of welding technique	**2.1.** Pipe welding **positional techniques** are identified and explained. **2.2.** **Arc welding** techniques are identified and explained. **2.3.** **Welding faults and tests** are identified and explained.
3. Perform arc welding	**3.1.** Materials and electrode for arc welding are selected. **3.2.** Tools and equipment for arc welding are selected and set up. **3.3.** Edge prepared and job set-up maintaining proper gap. **3.4.** Arc welding performed following correct welding procedure. **3.5.** Clean work area upon completion of welding.
4. Perform tack welding	**4.1.** Materials and electrode for tack welding are selected. **4.2.** Tools and equipment for tack welding are selected and set up. **4.3.** Edge prepared and job set-up maintaining proper gap. **4.4.** Tack welding performed following correct welding procedure. **4.5.** Clean work area upon completion of welding.

Range of Variables

Variable	Range *(may include but not limited to)*
1. Tools and equipment	**1.1.** Arc welding machine **1.2.** Electrode holder **1.3.** Earth clamp **1.4.** Chipping hammer **1.5.** Steel wire brush **1.6.** Hand shield
2. Types of welding	**2.1.** Arc **2.2.** Gas

Variable	Range *(may include but not limited to)*
3. Welding terminology	**3.1.** Work piece **3.2.** Electrode **3.3.** Slag **3.4.** Root **3.5.** Root gap **3.6.** Toe **3.7.** Leg length **3.8.** Throat thickness **3.9.** Weld bead **3.10.** Welding faults **3.11.** Penetration **3.12.** Oxy acetylene flame **3.13.** Welding torch **3.14.** Electrode Code **3.15.** Electrode holder **3.16.** Edge preparation **3.17.** Welding unit/transformer **3.18.** Polarity **3.19.** Alternating current **3.20.** Direct current **3.21.** Oxygen/acetylene cylinder
4. Positional techniques	**4.1.** Flat position **4.2.** Horizontal **4.3.** Vertical **4.4.** Overhead **4.5.** Rolled /wrap around position (for different angles)
5. Arc welding techniques	**5.1.** Fillet **5.2.** Butt **5.3.** Lap **5.4.** Tack **5.5.** Groove

Variable	Range *(may include but not limited to)*
6. Welding faults and tests	**6.1.** Welding faults: **6.1.1.** Porosity **6.1.2.** Undercut **6.1.3.** Slag inclusion **6.1.4.** Blow hole **6.1.5.** Lack in penetration **6.1.6.** Weld crack **6.2.** Tests: **6.2.1.** Destructive **6.2.2.** Non-destructive

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Types of welding, and welding tools and equipment **1.2.** Types of selection of materials, electrodes and plates **1.3.** Setting of SMAW/Arc weld **1.4.** Types of welding joints and positioning **1.5.** General welding practice and techniques **1.6.** Weld faults and tests
2. Underpinning skills	**2.1.** Performing arc welding **2.2.** Performing tack welding **2.3.** Demonstrating different positional techniques **2.4.** Identifying welding faults
3. Underpinning attitudes	**3.1.** Eagerness to learn and acquire skills **3.2.** Commitment to occupational health and safety practices **3.3.** Accept the job is shift based **3.4.** Prompt in carrying out activities **3.5.** Tidy and punctual **3.6.** Concerned about the work environment **3.7.** Sincere and honest concerning duties
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Work pieces **4.3.** Welding materials **4.4.** Welding tools and equipment **4.5.** PPE **4.6.** Projector **4.7.** Stationary **4.8.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** performed tack welding **1.2.** identified welding faults
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.

Unit of Competency:	Nominal Duration:	Unit Code:
Perform pipe fabrication works	120 hours	SEIP-SBD-SPF-04-O

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to perform pipe fabrication works. It specifically includes cutting, threading and bevelling pipe, bending pipe with different angle, securing supports, hangers and guides, and cleaning, inspecting and testing piping assembly.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Cut, thread and bevel pipes	**1.1.** **Materials** are identified and selected as per job requirement. **1.2.** **Tools and equipment** are identified and selected as per job requirement. **1.3.** **Cutting techniques** are identified and appropriate technique selected as per job requirement. **1.4.** Cutting is performed as per specification and job requirement. **1.5.** Threading of pipe, bevelling and grinding is performed as per specification.
2. Perform pipe bending with different angle	**2.1.** Pipe bending terms are identified and defined. **2.2.** Pipes are bent with different angle using bending machine.
3. Secure supports, hangers and guides	**3.1.** Pipe supporting and fastening process is identified and explained. **3.2.** Pipe support and fastening process is carried out as per job requirement.
4. Clean and test piping	**4.1.** **Cleaning and inspection** of piping assembly is carried out. **4.2.** **Testing methods** for piping system and assembly are applied. **4.3.** Work area is cleaned upon completion of fabrication.

Range of Variables

Variable	Range*(may include but not limited to)*
1. Materials	**1.1.** Metal pipes **1.2.** Fittings **1.3.** Flange **1.4.** Bolts and nuts **1.5.** Gaskets **1.6.** Valves
2. Tools and equipment	**2.1.** Cutting sets **2.2.** Grinding machine **2.3.** Centre punch **2.4.** Level bar **2.5.** Ball hammer **2.6.** Spirit level **2.7.** Soft stone **2.8.** Measuring tape **2.9.** Files **2.10.** Power brush **2.11.** Steel brush **2.12.** Adjustable wrench **2.13.** Tip cleaner **2.14.** Contour marker **2.15.** Plumb bob **2.16.** Spark lighter
3. Cutting techniques	**3.1.** Straight **3.2.** Single, double and three cut **3.3.** Template (90/60/45 degree) **3.4.** Manual **3.5.** Gas
4. Cleaning and inspection	**4.1.** Pickling solution **4.2.** Caustic solution **4.3.** Water flushing **4.4.** Air flushing
5. Testing methods	**5.1.** Hydrostatic testing **5.2.** Pneumatic testing **5.3.** Non-destructive testing

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Materials, tools and equipment **1.2.** Cutting techniques **1.3.** Pipe bending terminology **1.4.** Commissioning requirements for piping **1.5.** Inspection and testing methods
2. Underpinning skills	**2.1.** Performing cutting as per job specification **2.2.** Performing bevelling and grinding following specification **2.3.** Carrying out hot and cold bending **2.4.** Bending pipes with different angle using bending machine
3. Underpinning attitudes	**3.1.** Eagerness to learn and acquire skills **3.2.** Commitment to occupational health and safety practices **3.3.** Accept the job is shift based **3.4.** Prompt in carrying out activities **3.5.** Tidy and punctual **3.6.** Concerned about the work environment **3.7.** Sincere and honest concerning duties
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Tools and equipment **4.3.** Bending machine **4.4.** Materials **4.5.** PPE **4.6.** Stationary **4.7.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** performed cutting as per job requirement **1.2.** performed bevelling and grinding following specification **1.3.** bent pipes with different angle using bending machine **1.4.** cleaned and inspected piping
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio

Assessment Evidence Guide	
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.

Unit of Competency: Perform installation of piping system	Nominal Duration: 40 hours	Unit Code: SEIP-SBD-SPF-05-O

Unit Descriptor:

This unit covers the skills, knowledge and attitudes required to perform installation of piping. system. It specifically includes installation of fresh water, sea water, fuel and hydraulic piping systems in a ship.

Elements and Performance Criteria

Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables.

Elements of Competency	Performance Criteria
1. Install fresh water piping system	**1.1.** Drawings, tools and equipment are identified and selected. **1.2.** Pipes are cut within tolerance. **1.3.** Thread of pipes is cut using threading machine or dice, as required. **1.4.** **Different types of fittings** are fixed on fresh water piping. **1.5.** Fresh water piping system is installed as per job requirement. **1.6.** Fresh water piping assembly is checked to ensure it is contaminate free.
2. Install sea water piping system	**2.1.** Drawings, tools and equipment are identified and selected. **2.2.** Pipes are cut within tolerance. **2.3.** Thread of pipes is cut using threading machine or dice, as required. **2.4.** Different types of fittings are fixed on sea water piping. **2.5.** Sea water piping system is installed as per job requirement. **2.6.** Sea water piping assembly is checked to ensure it is contaminate free.
3. Install fuel piping system	**3.1.** Drawings, tools and equipment are identified and selected. **3.2.** Pipes are cut within tolerance. **3.3.** Thread of pipes is cut using threading machine or dice, as required. **3.4.** Pressure testing of piping spool to be carried out. **3.5.** Pickling and cleaning of piping spools is carried out. **3.6.** Different types of fittings are fixed on fuel piping. **3.7.** Fuel piping system is installed as per job requirement. **3.8.** Fuel piping assembly is checked to ensure it is contaminate free.

Elements of Competency	Performance Criteria
4. Install hydraulic piping system	**4.1.** **Components of hydraulic piping system** are identified. **4.2.** Drawings, tools, equipment and fittings are identified and selected. **4.3.** Pickling and cleaning of piping spools is carried out. **4.4.** Hydraulic piping system is assembled as per specification. **4.5.** Different types of fittings are fixed on hydraulic piping. **4.6.** Hydraulic piping system is installed as per job requirement. **4.7.** Pressure testing of piping spool is carried out. **4.8.** Flushing of hydraulic piping is carried out.

Range of Variables

Variable	Range *(may include but not limited to)*
1. Different types of fittings	**1.1.** Treaded flange **1.2.** Treaded elbow **1.3.** Hexagon cap **1.4.** Treaded cap **1.5.** Treaded key **1.6.** Treaded nipple **1.7.** Threaded hex reducer
2. Components of hydraulic piping system	**2.1.** Reservoir/hydraulic cylinder **2.2.** Strainers and filters **2.3.** Accumulators **2.4.** Pumps **2.5.** Directional control valves

Curricula Content Guide	
1. Underpinning knowledge	**1.1.** Different types of piping systems **1.2.** Different types of fittings **1.3.** Installation process
2. Underpinning skills	**2.1.** Cutting pipes within tolerance **2.2.** Cutting thread of pipes using threading machine **2.3.** Fixing different types of fittings **2.4.** Installing piping system **2.5.** Checking piping assembly

Curricula Content Guide	
3. Underpinning attitudes	**3.1.** Eagerness to learn and acquire skills **3.2.** Commitment to occupational health and safety practices **3.3.** Accept the job is shift based **3.4.** Prompt in carrying out activities **3.5.** Tidy and punctual **3.6.** Concerned about the work environment **3.7.** Sincere and honest concerning duties
4. Resource implications	The following resources must be provided: **4.1.** Workplace (simulated or actual) **4.2.** Tools and equipment **4.3.** Materials **4.4.** Fittings **4.5.** Stationary **4.6.** Learning manual

Assessment Evidence Guide	
1. Critical aspects of competency	Assessment must evidence that the candidate: **1.1.** fixed different types fittings **1.2.** installed piping spool **1.3.** clean and pressure test **1.4.** checked piping assembly for contaminants
2. Methods of assessment	Methods of assessment may include but is not limited to: **2.1.** written test **2.2.** oral test **2.3.** observation **2.4.** demonstration **2.5.** portfolio
3. Context of assessment	**3.1.** Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. **3.2.** Assessment must be done by a suitably qualified/certified assessor.