Qualification Pack

Design Engineer - Marine Piping and Engineering

QP Code: CSC/Q0407

Version: 1.0

NSQF Level: 7

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Contents

CSC/Q0407: Design Engineer - Marine Piping and Engineering

Brief Job Description

Design Engineer - Marine piping and engineering is responsible for design of various engineering system(s) of ship which includes, but not limited to, formulation of technical requirements, sizing and selection of major equipment, equipment installation and design of pipe networks to achieve the intended function of the system(s).

Personal Attributes

The person should be able to work effectively within a design team environment. The person should have excellent communication and interpersonal skills, strong attention to detail and accuracy, good logical, mathematical and presentation skills. Besides, they require to understand the need to take initiative and manage self and work to improve efficiency and effectiveness.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. CSC/N1338: Work effectively in a collaborative environment (SM)
2. CSC/N1337: Follow the health and safety practices at shipbuilding work
3. SGJ/N1703: Adopt sustainable practices at the workplace
4. CSC/N0414: Prepare for designing marine systems for naval ships
5. CSC/N0413: Design marine systems
6. CSC/N0412: Perform post-designing activities for ships and marine systems

Qualification Pack (QP) Parameters

Sector	Capital Goods
Sub-Sector	Ship Building & Repair
Occupation	Design
Country	India
NSQF Level	7
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7123.9900

Minimum Educational Qualification & Experience	B.E./B.Tech (Degree in Marine Engineering / Mechanical Engineering) with 5 years of experience in marine systems design
Minimum Level of Education for Training in School	Not Applicable
Pre-Requisite License or Training	NA
Minimum Job Entry Age	23 Years
Last Reviewed On	NA
Next Review Date	NA
NSQC Approval Date	
Version	1.0

CSC/N1338: Work effectively in a collaborative environment (SM)

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

The scope covers the following :

- Work effectively in a team
- Demonstrate communication etiquette and good behaviour at the workplace
- Respect diversity

Elements and Performance Criteria

Work effectively in a team

To be competent, the user/individual on the job must be able to:

PC1. clarify individual, team and organisational goals and responsibilities

PC2. take initiative to identify and solve team and work related problems in a positive manner

PC3. consult with and assist others to maximise effectiveness and efficiency in carrying out tasks and solving problems

PC4. apply initiatives to develop understanding, goodwill and trust with team members

PC5. resolve individual disagreements with the concerned person

PC6. recognize when a conflict situation exists and try to resolve amicably

PC7. follow the organisations policies and procedures to resolve conflicts

Demonstrate communication etiquette and good behaviour at the workplace

To be competent, the user/individual on the job must be able to:

PC8. give feedback of work done and report problems identified in the field

PC9. communicate with other people clearly and effectively

PC10. use digital and virtual tools for collaboration and communication

PC11. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism

PC12. display workplace etiquettes such as using appropriate titles, terms of respect, polite language and avoiding casual expressions

PC13. display active listening skills while interacting with others at work

PC14. demonstrate responsible and disciplined behavior

Respect diversity

To be competent, the user/individual on the job must be able to:

PC15. manage discussions to keep verbal, non-verbal and written communication gender, disability, age and culturally sensitive and respectful

PC16. ensure all group processes follow inclusive practices

PC17. transact with all people without any personal bias based on gender, disability, caste, religion, colour, sexual orientation or culture and in accordance with their legal rights

PC18. recognize indicators of harassment and discrimination based on gender, disability, caste, religion, colour, sexual orientation or culture at workplace and follow organisational policy for reporting the same.

PC19. improve workplace design and accessibility to make it friendly for persons with disabilities (PwD)

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation's policies and procedures for working with colleagues and dealing with conflict

KU2. ndividual, team and organisational goals and responsibilities

KU3. various categories of people that one is required to communicate and coordinate with in the organisation

KU4. importance of effective communication in the workplace

KU5. importance of teamwork in organisational and individual success

KU6. various components of effective communication

KU7. key elements of active listening

KU8. value and importance of active listening and assertive communication

KU9. barriers to effective communication

KU10. importance of tone and pitch in effective communication

KU11. importance of avoiding casual expletives and unpleasant terms while communicating professional circles

KU12. how poor communication practices can disturb people, environment and cause problems for the employee, the employer and the customer

KU13. importance of ethics for professional success

KU14. importance of discipline for professional success

KU15. what constitutes disciplined behavior for a working professional

KU16. common reasons for interpersonal conflict

KU17. importance of developing effective working relationships for professional success

KU18. expressing and addressing grievances appropriately and effectively

KU19. common reasons for interpersonal conflict and ways of managing it effectively

KU20. benefits of developing productive working relationships with colleagues

KU21. importance of disciplined and responsible behaviour

KU22. different types of disabilities and the challenges faced by persons with disability (PwD)

KU23. laws, acts and provisions defined for PwD by the statutory bodies

KU24. government and private schemes and benefits available for PwD

KU25. importance of gender sensitivity and equality.

KU26. gender, disability and cultural biases, stereotypes and impact on others

KU27. gender and its concepts such as gender roles, gender spectrum, gender as an identity

KU28. common inclusive practices and policies following in gender neutral and PwD sensitive organisations

KU29. legislations, grievance redressal mechanisms, and penalties against harassment in the workplace

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. write clear and legible notes, keep records, prepare to-do lists and take down instructions

GS2. write basic numbers, quantities and basic work-related terminology for operational requirements in the local language and English

GS3. read basic terminologies to accurately interpret labels, supervisor's instructions in the local language and English

GS4. read and interpret accurate information from work-related documents and various relevant work instructions and records in local language or English

GS5. interact with the concerned personnel appropriately (correct protocol and manner of speaking etc.)

GS6. display active listening skills while interacting with co-workers and others in the workplace

GS7. deliver consistent and reliable service to internal and external customers

GS8. work with co-workers and stakeholders to resolve any issues that threaten work quality as per the planned schedule

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Work effectively in a team	11	26	-	-
PC1. clarify individual, team and organisational goals and responsibilities	1	3	-	-
PC2. take initiative to identify and solve team and work related problems in a positive manner	2	5	-	-
PC3. consult with and assist others to maximise effectiveness and efficiency in carrying out tasks and solving problems	1	4	-	-
PC4. apply initiatives to develop understanding, goodwill and trust with team members	2	5	-	-
PC5. resolve individual disagreements with the concerned person	1	4	-	-
PC6. recognize when a conflict situation exists and try to resolve amicably	2	3	-	-
PC7. follow the organisations policies and procedures to resolve conflicts	2	2	-	-
Demonstrate communication etiquette and good behaviour at the workplace	11	26	-	-
PC8. give feedback of work done and report problems identified in the field	2	3	-	-
PC9. communicate with other people clearly and effectively	1	4	-	-
PC10. use digital and virtual tools for collaboration and communication	2	3	-	-
PC11. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism	2	4	-	-
PC12. display workplace etiquettes such as using appropriate titles, terms of respect, polite language and avoiding casual expressions	2	4	-	-
PC13. display active listening skills while interacting with others at work	1	4	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. demonstrate responsible and disciplined behavior	1	4	-	-
Respect diversity	8	18	-	-
PC15. manage discussions to keep verbal, non-verbal and written communication gender, disability, age and culturally sensitive and respectful	2	4	-	-
PC16. ensure all group processes follow inclusive practices	1	3	-	-
PC17. transact with all people without any personal bias based on gender, disability, caste, religion, colour, sexual orientation or culture and in accordance with their legal rights	2	4	-	-
PC18. recognize indicators of harassment and discrimination based on gender, disability, caste, religion, colour, sexual orientation or culture at workplace and follow organisational policy for reporting the same.	2	4	-	-
PC19. improve workplace design and accessibility to make it friendly for persons with disabilities (PwD)	1	3	-	-
NOS Total	**30**	**70**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1338
NOS Name	Work effectively in a collaborative environment (SM)
Sector	Capital Goods
Sub-Sector	Generic
Occupation	Generic
NSQF Level	7
Credits	TBD
Version	1.0
Next Review Date	NA

CSC/N1337: Follow the health and safety practices at shipbuilding work

Description

This OS unit is about following the appropriate health and safety practices at work during ship building. It covers responsibilities towards self and others to ensure a safe work environment.

Scope

The scope covers the following :

- Maintain personal health and safety
- Assist in hazard management
- Check the first aid box firefighting and safety equipment
- Assist in waste management
- Follow the fire safety guidelines
- Follow the emergency and firstaid procedures
- Carry out relevant documentation and review

Elements and Performance Criteria

Maintain personal health and safety

To be competent, the user/individual on the job must be able to:

PC1. follow the recommended practices to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask

PC2. check the work conditions, assess the potential health and safety risks, and take appropriate measures to mitigate them

PC3. select and use the appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions

PC4. follow the recommended techniques while lifting and moving heavy objects to avoid injury

PC5. follow the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment

Assist in hazard management

To be competent, the user/individual on the job must be able to:

PC6. identify existing and potential hazards at work

PC7. assess the potential risks and injuries associated with the identified hazards

PC8. coordinate with the supervisor or other relevant personnel to prevent or minimise the identified hazards

PC9. handle hazardous materials safely and store them in the designated storage

PC10. identify common health hazards and symptoms for self and other crew members related to exposure of confined spaces, radiant energy during welding and cutting, anti fouling and anti – rust additives

PC11. • ensure marine accommodation related safety aspects
• Marine accomodation related safety aspects: All emergency lights operational, color coded and marked with "E"; escape routes unobstructed; exits clearly marked; safety signs and placards posted and clearly readable; life jackets, immersion suits and EEBDs correctly stowed and marked; internal communications equipment tested and operating correctly; muster list signed and properly displayed at appropriate locations

PC12. • ensure machinery spaces related safety aspects
• Machinery spaces related safety aspects: 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; safety signs and placards posted

PC13. • ensure deck area related safety aspects
• Deck area related safety aspects: 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 safety and hazard zone identification signs posted and readable, fire plan wallets updated; all lifebuoys correctly stowed, life buoy lights and smoke markers valid

Check the first aid box, firefighting and safety equipment

To be competent, the user/individual on the job must be able to:

PC14. check the first aid box to ensure it is updated with the relevant first aid supplies

PC15. check and test the firefighting and various safety equipment to ensure they are in usable condition

PC16. ensure all portable fire extinguishers and stowage locations numbered in place and inspection dated for safety reasons

PC17. ensure that the fire station is not locked but only sealed

PC18. coordinate with the supervisor for the repair and replacement of firefighting and safety equipment

Assist in waste management

To be competent, the user/individual on the job must be able to:

PC19. segregate waste into appropriate categories

PC20. recycle the recyclable waste appropriately

PC21. dispose of the non-recyclable waste in an environment-friendly manner, complying with the applicable regulations

Follow the fire safety guidelines

To be competent, the user/individual on the job must be able to:

PC22. use the appropriate type of fire extinguisher to extinguish different types of fires safely

PC23. follow the recommended practices for a safe rescue during a fire emergency

PC24. coordinate with the fire department to request assistance to extinguish a serious fire

Follow the emergency and first-aid procedures

To be competent, the user/individual on the job must be able to:

PC25. follow the organisational health and safety guidelines during workplace emergencies to ensure own and co-workers' safety

PC26. follow the recommended practices to minimise loss to organisational property during an emergency

PC27. follow the recommended procedure to free a person from electrocution

PC28. administer appropriate first aid to the injured personnel

PC29. perform Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest

PC30. coordinate with the emergency services to request medical assistance for seriously injured/ ill personnel requiring professional medical attention or hospitalisation

Carry out relevant documentation and review

To be competent, the user/individual on the job must be able to:

PC31. carry out appropriate documentation following a health and safety incident at work, including all the required information

PC32. coordinate with the relevant personnel to review health and safety conditions at work regularly or following an incident

PC33. assist in implementing appropriate changes to improve the health and safety conditions at work

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the recommended practices to be followed to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask

KU2. the importance and process of checking the work conditions, assessing the potential health and safety risks, and take appropriate measures to mitigate them

KU3. precautions to be taken to be taken while working in heights like safety nets, length of rope and other safety practices in marine industry

KU4. the importance and process of selecting and using the appropriate PPE relevant to the task and work conditions

KU5. the recommended techniques to be followed while lifting and moving heavy objects to avoid injury

KU6. the importance of following the manufacturer instructions and workplace safety guidelines while working on heavy machinery, tools and equipment

KU7. the importance and process of identifying existing and potential hazards at work

KU8. the process of assessing the potential risks and injuries associated with the various hazards

KU9. how to prevent or minimise different types of hazards

KU10. safety aspects related to marine accommodation, machine spaces and deck area

KU11. how to handle and store hazardous materials safely

KU12. the importance of ensuring the first aid box is updated with the relevant first aid supplies

KU13. the process of checking and testing the firefighting and various safety equipment to ensure they are in a usable condition

KU14. the criteria for segregating waste into appropriate categories

KU15. the appropriate methods for recycling the recyclable waste

KU16. the process of disposing of the non-recyclable waste safely and the applicable regulations

KU17. use of different types of fire extinguishers to extinguish different types of fires

KU18. the recommended practices to be followed for a safe rescue during a fire emergency

KU19. how to request assistance from the fire department to extinguish a serious fire

KU20. the appropriate practices to be followed during workplace emergencies to ensure safety and minimise loss to organisational property

KU21. entry and exit of vessel and evacuation procedures in case of an emergency

KU22. 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

KU23. common health and safety hazards present in a work environment, associated risks, and how to mitigate them

KU24. safe working practices to be followed while working at various hazardous sites and using electrical equipment

KU25. ratings of motors and precautions to taken while dealing with electrical equipment

KU26. the importance of ensuring easy access to firefighting and safety equipment

KU27. the appropriate preventative and remedial actions to be taken in the case of exposure to toxic materials, such as poisonous chemicals and gases

KU28. various causes of fire in different work environments and the recommended precautions to be taken to prevent fire accidents

KU29. different methods of extinguishing fire

KU30. different materials used for extinguishing fire, such as sand, water, foam, CO2, dry powder, etc.

KU31. the applicable rescue techniques to be followed during a fire emergency

KU32. the importance of placing safety signs and instructions at strategic locations in a workplace and following them

KU33. different types of first aid treatment to be provided for different types of injuries

KU34. potential injuries associated with incorrect manual handling

KU35. how to move an injured person safely

KU36. various hazards associated with the use of various machinery, tools, implements, equipment and materials

KU37. the importance of ensuring no obstruction and free access to fire exits

KU38. how to free a person from electrocution safely

KU39. how to administer appropriate first aid to an injured person

KU40. how to perform Cardiopulmonary Resuscitation (CPR)

KU41. the importance of coordinating with the emergency services to request urgent medical assistance for persons requiring professional medical attention or hospitalisation

KU42. the appropriate documentation to be carried out following a health and safety incident at work, and the relevant information to be included

KU43. the importance and process of reviewing the health and safety conditions at work regularly or following an incident

KU44. the importance and process of implementing appropriate changes to improve the health and safety conditions at work

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain work-related notes and records

GS2. communicate clearly and politely with co-workers and clients

GS3. read the relevant literature to get the latest updates about the field of work
GS4. listen attentively to understand the information being shared
GS5. plan and prioritise tasks to ensure timely completion
GS6. take quick decisions to deal with workplace emergencies and accidents
GS7. identify possible disruptions to work and take appropriate preventive measures
GS8. coordinate with the co-workers to achieve the work objectives
GS9. evaluate all possible solutions to a problem to select the best one

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Maintain personal health and safety	4	11	-	-
PC1. follow the recommended practices to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask	1	2	-	-
PC2. check the work conditions, assess the potential health and safety risks, and take appropriate measures to mitigate them	1	2	-	-
PC3. select and use the appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions	1	3	-	-
PC4. follow the recommended techniques while lifting and moving heavy objects to avoid injury	0.5	2	-	-
PC5. follow the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment	0.5	2	-	-
Assist in hazard management	13	30	-	-
PC6. identify existing and potential hazards at work	1	3	-	-
PC7. assess the potential risks and injuries associated with the identified hazards	1	3	-	-
PC8. coordinate with the supervisor or other relevant personnel to prevent or minimise the identified hazards	0.5	3	-	-
PC9. handle hazardous materials safely and store them in the designated storage	1	3	-	-
PC10. identify common health hazards and symptoms for self and other crew members related to exposure of confined spaces, radiant energy during welding and cutting, anti fouling and anti - rust additives	0.5	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. • ensure marine accommodation related safety aspects • Marine accomodation related safety aspects: All emergency lights operational, color coded and marked with "E"; escape routes unobstructed; exits clearly marked; safety signs and placards posted and clearly readable; life jackets, immersion suits and EEBDs correctly stowed and marked; internal communications equipment tested and operating correctly; muster list signed and properly displayed at appropriate locations	3	5	-	-
PC12. • ensure machinery spaces related safety aspects • Machinery spaces related safety aspects: 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; safety signs and placards posted	3	5	-	-
PC13. • ensure deck area related safety aspects • Deck area related safety aspects: 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 safety and hazard zone identification signs posted and readable, fire plan wallets updated; all lifebuoys correctly stowed, life buoy lights and smoke markers valid	3	5	-	-
Check the first aid box, firefighting and safety equipment	1.5	4	-	-
PC14. check the first aid box to ensure it is updated with the relevant first aid supplies	0.5	1	-	-
PC15. check and test the firefighting and various safety equipment to ensure they are in usable condition	0.25	1	-	-
PC16. ensure all portable fire extinguishers and stowage locations numbered in place and inspection dated for safety reasons	0.25	1	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC17. ensure that the fire station is not locked but only sealed	0.25	0.5	-	-
PC18. coordinate with the supervisor for the repair and replacement of firefighting and safety equipment	0.25	0.5	-	-
Assist in waste management	1.5	3	-	-
PC19. segregate waste into appropriate categories	0.5	1	-	-
PC20. recycle the recyclable waste appropriately	0.5	1	-	-
PC21. dispose of the non-recyclable waste in an environment-friendly manner, complying with the applicable regulations	0.5	1	-	-
Follow the fire safety guidelines	3.5	8	-	-
PC22. use the appropriate type of fire extinguisher to extinguish different types of fires safely	2	4	-	-
PC23. follow the recommended practices for a safe rescue during a fire emergency	1	2	-	-
PC24. coordinate with the fire department to request assistance to extinguish a serious fire	0.5	2	-	-
Follow the emergency and first-aid procedures	4.5	10	-	-
PC25. follow the organisational health and safety guidelines during workplace emergencies to ensure own and co-workers' safety	1	1	-	-
PC26. follow the recommended practices to minimise loss to organisational property during an emergency	1	1	-	-
PC27. follow the recommended procedure to free a person from electrocution	0.5	2	-	-
PC28. administer appropriate first aid to the injured personnel	1	3	-	-
PC29. perform Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest	0.5	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC30. coordinate with the emergency services to request medical assistance for seriously injured/ ill personnel requiring professional medical attention or hospitalisation	0.5	1	-	-
Carry out relevant documentation and review	2	4	-	-
PC31. carry out appropriate documentation following a health and safety incident at work, including all the required information	1	2	-	-
PC32. coordinate with the relevant personnel to review health and safety conditions at work regularly or following an incident	0.5	1	-	-
PC33. assist in implementing appropriate changes to improve the health and safety conditions at work	0.5	1	-	-
NOS Total	**30**	**70**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1337
NOS Name	Follow the health and safety practices at shipbuilding work
Sector	Capital Goods
Sub-Sector	Generic
Occupation	Generic
NSQF Level	7
Credits	TBD
Version	1.0
Next Review Date	NA

SGJ/N1703: Adopt sustainable practices at the workplace

Description

This unit describes the skills and knowledge required to improve material and energy efficiency in business operations. It describes effective waste management techniques at workplace and suggests ways to make the workplace environmentally sustainable.

Scope

The scope covers the following :

- Material and energy audit of workplace
- Material conservation and use of environment friendly materials
- Energy/electricity conservation practices and use of energy efficient systems
- Effective waste management/recycling practices at workplace

Elements and Performance Criteria

Material and energy audit of workplace

To be competent, the user/individual on the job must be able to:

PC1. check for compliance with applicable environmental, waste management and disposal regulations

PC2. collect information about usage of different materials including water

PC3. collect information on the pattern of electricity and fuel consumption

PC4. prepare material and energy audit reports

Material conservation and use of environment friendly materials

To be competent, the user/individual on the job must be able to:

PC5. analyze material audit report to decipher excessive consumption of material and water

PC6. identify materials which can be replaced by environment friendly substitutes

PC7. identify processes where material utilization can be optimized

PC8. plan the introduction of revised processes and environment friendly materials in a phased manner

PC9. plan and implement ways to conserve and re-use water

PC10. monitor material and water conservation processes

Energy/electricity conservation practices

To be competent, the user/individual on the job must be able to:

PC11. analyze energy/electricity audit report to identify high energy/electricity consumption areas

PC12. identify processes where energy/electricity utilization can be optimized

PC13. identify possibilities of using renewable energy and environment friendly fuels

PC14. plan the implementation of energy efficient systems in a phased manner

PC15. ensure electrical equipment and appliances are switched off when not in use

Effective waste management/recycling practices

To be competent, the user/individual on the job must be able to:

PC16. identify recyclable, non-recyclable and hazardous waste
PC17. ensure recyclable, non-recyclable and hazardous waste are segregated as per SOP
PC18. ensure proper mechanism is followed while collecting and disposing recyclable and non-recyclable waste
PC19. ensure proper mechanism is followed while collecting and disposing hazardous waste as per SOP
PC20. ensure reuse and recycling of waste wherever applicable
PC21. ensure proper mechanism is followed for treatment of wastewater in the unit

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. legislative requirements and organizations procedures for waste management and disposal
KU2. organizational procedures for safe handling of equipment and machine operations
KU3. reporting protocol and documentation required
KU4. parameters and data required for material and energy audit
KU5. latest methods of energy and material conservation
KU6. environment friendly materials available to replace conventional materials
KU7. methods of reducing electrical consumptions
KU8. renewable energy sources which can be deployed at the workplace
KU9. methods of optimum utilization of waste and best practices for waste disposal
KU10. methods of treating wastewater and recycling of water

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. record data relevant to waste disposal at workplace
GS2. complete statutory documents relevant to safety and hygiene
GS3. communicate with team members and colleagues on the significance of greening of jobs
GS4. communicate with industries and customers to understand and analyze various strategies, demands, and limitations in the market
GS5. make timely decisions for efficient utilization of resources
GS6. take decisions with systematic course of actions and/or response
GS7. work constructively and collaboratively with others
GS8. delegate tasks to improve efficiencies
GS9. identify cause and effect of greening of jobs
GS10. evaluate information obtained from other departments and stakeholders

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Material and energy audit of workplace	4	8	-	-
PC1. check for compliance with applicable environmental, waste management and disposal regulations	1	2	-	-
PC2. collect information about usage of different materials including water	1	2	-	-
PC3. collect information on the pattern of electricity and fuel consumption	1	2	-	-
PC4. prepare material and energy audit reports	1	2	-	-
Material conservation and use of environment friendly materials	6	12	-	-
PC5. analyze material audit report to decipher excessive consumption of material and water	1	2	-	-
PC6. identify materials which can be replaced by environment friendly substitutes	1	2	-	-
PC7. identify processes where material utilization can be optimized	1	2	-	-
PC8. plan the introduction of revised processes and environment friendly materials in a phased manner	1	2	-	-
PC9. plan and implement ways to conserve and re-use water	1	2	-	-
PC10. monitor material and water conservation processes	1	2	-	-
Energy/electricity conservation practices	5	10	-	-
PC11. analyze energy/electricity audit report to identify high energy/electricity consumption areas	1	2	-	-
PC12. identify processes where energy/electricity utilization can be optimized	1	2	-	-
PC13. identify possibilities of using renewable energy and environment friendly fuels	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. plan the implementation of energy efficient systems in a phased manner	1	2	-	-
PC15. ensure electrical equipment and appliances are switched off when not in use	1	2	-	-
Effective waste management/recycling practices	6	12	-	-
PC16. identify recyclable, non-recyclable and hazardous waste	1	2	-	-
PC17. ensure recyclable, non-recyclable and hazardous waste are segregated as per SOP	1	2	-	-
PC18. ensure proper mechanism is followed while collecting and disposing recyclable and non-recyclable waste	1	2	-	-
PC19. ensure proper mechanism is followed while collecting and disposing hazardous waste as per SOP	1	2	-	-
PC20. ensure reuse and recycling of waste wherever applicable	1	2	-	-
PC21. ensure proper mechanism is followed for treatment of wastewater in the unit	1	2	-	-
NOS Total	**21**	**42**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	SGJ/N1703
NOS Name	Adopt sustainable practices at the workplace
Sector	Green Jobs
Sub-Sector	Other Green Jobs
Occupation	Resource Optimization
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	16/12/2019
Next Review Date	27/04/2022

CSC/N0414: Prepare for designing marine systems for naval ships

Description

This unit describes the requirements for planning marine piping and engineering designs

Scope

The scope covers the following :

- ~~This unit/task covers the following:~~
- Gather information
- Prepare the plan
- Organise the resources

Elements and Performance Criteria

Gather information

To be competent, the user/individual on the job must be able to:

PC1. identify the marine systems to be designed, their purpose and performance requirements from the statement of qualitative requirements, which is laid by the customer.
• types of Marine systems: Propulsion systems, pneumatic and hydraulic systems, habitability and life support systems, rescue and safety systems, ship's gears and devices, weapon engineering systems, etc.

PC2. identify design constraints

PC3. extract relevant information on the latest technologies, standards and guidance for compliances and improvements in design from authorised sources

PC4. identify resources required at various stages of designing

Prepare the plan

To be competent, the user/individual on the job must be able to:

PC5. prepare a design brief with all information required for commencement of designing

PC6. prepare a list of specific tasks required for designing requirements across various marine systems design phases

PC7. produce work measurement records, progress reports and output PERT charts

Organise the resources

To be competent, the user/individual on the job must be able to:

PC8. prepare the software and drafting workstations for various design activities such as 2D/3D drafting, flow analysis, FE analysis, etc.

PC9. organise for the availability of equipment, materials and human resources at various stages of the designing process

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions

KU2. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities

KU3. relevant people and their responsibilities within the work area

KU4. reporting structure, inter-dependent functions, lines and procedures in the work area

KU5. company systems for recording design information

KU6. international system (SI) of measurement

KU7. various types of naval ships and their layout.

KU8. various types of marine systems used in Naval ships and their purposes and common performance requirements

KU9. naval ships and marine systems designing process

KU10. information and level of detail to be included in a design brief of marine systems and their sources

KU11. how to extract and use information from engineering drawings and related specifications in relation to work undertaken

KU12. how to interpret isometric drawings, imperial and metric systems of measurement, work-piece reference points and system of tolerance

KU13. how to measure internal and external dimensions, measuring geometric features

KU14. basic naval architecture concepts

KU15. authorised sources of information on latest technologies, standards and guidance for compliances and improvements in naval marine systems design

KU16. rules and guidelines specified in standards applicable to naval marine systems

KU17. project management tools and concepts

KU18. importance of identifying design constraints

KU19. information and level of detail to be included in a design brief.

KU20. ~~a~~ 2D/3D software and drafting workstations applicable to naval marine systems design activities

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. prepare and maintain documentation

GS2. read and correctly interpret manuals, health and safety instructions, memos, standards, compliance and company-related documents in English

GS3. convey and share technical information clearly using appropriate language

GS4. communicate with clients, peers, superiors and subordinates in respectful form and manner in line with organisational protocol

GS5. follow organisation rule- based decision-making process

GS6. work towards achieving better results for self, others and the organisation

GS7. plan and organise work schedule to meet deadlines

GS8. organise and analyse information relevant to work

GS9. work constructively and collaboratively with others

GS10. seek to improve and modify own work practices

GS11. apply domain knowledge, observations and data to select a course of action to perform tasks

GS12. apply balanced judgements to different situations

GS13. use reasoning skills to identify and resolve basic problems

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Gather information	17	26	-	-
PC1. • identify the marine systems to be designed, their purpose and performance requirements from the statement of qualitative requirements, which is laid by the customer. • types of Marine systems: Propulsion systems, pneumatic and hydraulic systems, habitability and life support systems, rescue and safety systems, ship's gears and devices, weapon engineering systems, etc.	5	7	-	-
PC2. identify design constraints	4	7	-	-
PC3. extract relevant information on the latest technologies, standards and guidance for compliances and improvements in design from authorised sources	4	6	-	-
PC4. identify resources required at various stages of designing	4	6	-	-
Prepare the plan	15	22	-	-
PC5. prepare a design brief with all information required for commencement of designing	6	9	-	-
PC6. prepare a list of specific tasks required for designing requirements across various marine systems design phases	4	6	-	-
PC7. produce work measurement records, progress reports and output PERT charts	5	7	-	-
Organise the resources	8	12	-	-
PC8. prepare the software and drafting workstations for various design activities such as 2D/3D drafting, flow analysis, FE analysis, etc.	4	6	-	-
PC9. organise for the availability of equipment, materials and human resources at various stages of the designing process	4	6	-	-
NOS Total	40	60	-	-

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0414
NOS Name	Prepare for designing marine systems for naval ships
Sector	Capital Goods
Sub-Sector	Ship Building & Repair
Occupation	Design
NSQF Level	7
Credits	TBD
Version	1.0
Next Review Date	NA

CSC/N0413: Design marine systems

Description

This unit deals with design of marine systems such as propulsion systems, pneumatic and hydraulic systems, habitability and life support systems, rescue and safety systems, ship's gears and devices, weapon engineering systems, etc.

Scope

The scope covers the following :

- ~~This unit/task covers the following:~~
- Prepare the preliminary design
- Review the design using 3D Modelling output
- Analyse and modify the system design using software

Elements and Performance Criteria

Prepare the preliminary design

To be competent, the user/individual on the job must be able to:

PC1. prepare a concept design

PC2. Identify the major equipment required for system operation

PC3. review the layout or general arrangement of the platform/vessel for system design

PC4. prepare a preliminary schematic diagram of the system, keeping in mind the layout

PC5. identify secondary equipment required for the system, its proper functioning and integration

PC6. perform calculations to finalise the specifications of the primary and secondary equipment
- Specifications: capacity, size, materials, etc.

PC7. finalise the piping design; diameter, thickness and materials of the pipes and pipe fittings

Review the design using 3D Modelling output

To be competent, the user/individual on the job must be able to:

PC8. provide inputs in the form of updated schematics to the 3D Modelling team

PC9. identify changes to be made in the design and equipment specifications based on 3D modelling output

Analyse and modify the system design using software

To be competent, the user/individual on the job must be able to:

PC10. run simulations to check whether results match with the requirement

PC11. perform finite element and/or computational fluids dynamics (CFD) and/or flow/kinematic analysis for the systems as required

PC12. modify design and equipment specifications based on the results of analysis after taking necessary approvals

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company systems for recording design information
KU2. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
KU3. marine systems preliminary designing process
KU4. design verification and modification process
KU5. fundamentals of fluid mechanics and structural dynamics in relation to marine systems design
KU6. marine mechanics of materials and theory of vibration
KU7. design principles for marine propulsion systems, pneumatic and hydraulic systems, habitability and life support systems, rescue and safety systems, ship's gears and devices, weapon engineering systems, etc.
KU8. machinery and equipment used in marine propulsion systems, pneumatic and hydraulic systems, habitability and life support systems, rescue and safety systems, ship's gears and devices, weapon engineering systems, etc.
KU9. the key elements and be able to understand the integration of the numerous systems of a naval ship during the design process
KU10. computer-aided design (CAD) software to make 2D schematics for marine systems and their operation
KU11. purpose, input and output of 3D Modelling
KU12. review of 3D Model of marine systems
KU13. simulation software used for the analysis of marine systems design
KU14. applications of FE analysis for marine systems
KU15. applications of CFD flow analysis for marine systems
KU16. process of conducting FE and flow analysis using software

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. prepare and maintain documentation
GS2. read and correctly interpret manuals, health and safety instructions, memos, standards, compliance and company-related documents in English
GS3. convey and share technical information clearly using appropriate language
GS4. communicate with clients, peers, superiors and subordinates in respectful form and manner in line with organisational protocol
GS5. follow organisation rule- based decision-making process
GS6. work towards achieving better results for self, others and the organisation
GS7. plan and organise work schedule to meet deadlines
GS8. organise and analyse information relevant to work
GS9. work constructively and collaboratively with others
GS10. seek to improve and modify own work practices
GS11. apply domain knowledge, observations and data to select a course of action to perform tasks
GS12. apply balanced judgements to different situations
GS13. use reasoning skills to identify and resolve basic problems

GS14. apply trans-disciplinary thinking at work

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare the preliminary design	22	35	-	-
PC1. prepare a concept design	3	5	-	-
PC2. Identify the major equipment required for system operation	3	5	-	-
PC3. review the layout or general arrangement of the platform/vessel for system design	3	5	-	-
PC4. prepare a preliminary schematic diagram of the system, keeping in mind the layout	3	5	-	-
PC5. identify secondary equipment required for the system, its proper functioning and integration	3	5	-	-
PC6. • perform calculations to finalise the specifications of the primary and secondary equipment • Specifications: capacity, size, materials, etc.	3	5	-	-
PC7. finalise the piping design; diameter, thickness and materials of the pipes and pipe fittings	4	5	-	-
Review the design using 3D Modelling output	6	9	-	-
PC8. provide inputs in the form of updated schematics to the 3D Modelling team	3	4	-	-
PC9. identify changes to be made in the design and equipment specifications based on 3D modelling output	3	5	-	-
Analyse and modify the system design using software	12	16	-	-
PC10. run simulations to check whether results match with the requirement	4	5	-	-
PC11. perform finite element and/or computational fluids dynamics (CFD) and/or flow/kinematic analysis for the systems as required	5	6	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. modify design and equipment specifications based on the results of analysis after taking necessary approvals	3	5	-	-
NOS Total	**40**	**60**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0413
NOS Name	Design marine systems
Sector	Capital Goods
Sub-Sector	Ship Building & Repair
Occupation	Design
NSQF Level	7
Credits	TBD
Version	1.0
Next Review Date	NA

CSC/N0412: Perform post-designing activities for ships and marine systems

Description

This unit deals in detail with the various activities performed after designing a ship or marine systems.

Scope

The scope covers the following :

- This unit/task covers the following:
- Perform post-designing activities

Elements and Performance Criteria

Perform post-designing activities

To be competent, the user/individual on the job must be able to:

PC1. correspond with customer and classification society for approval of the designs

PC2. produce technical reports and procedures, final schematics, statement of technical requirements, logistics documentation, performance requirements and bill of materials for the production team

PC3. interact with vendors to approve machinery

PC4. prepare the protocol for pre-dispatch inspection, installation and commissioning trials

PC5. review and analyse records of quality team tests, inspections and performance feedback

PC6. perform design iterations for further improvement

PC7. maintain all design and analysis related records for easy retrieval and reference in future

PC8. prepare the operating manuals and checklists required by the users or crew of the ship

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. various post-design activities that a ship and marine design engineer undertakes

KU2. information included in technical and logistics documentation related to recommended design and performance requirements

KU3. various tests performed by the quality team on a ship that could lead to design modifications

KU4. importance of proper maintenance of all design and analysis related records for easy retrieval in future

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. prepare and maintain documentation

GS2. read and correctly interpret manuals, health and safety instructions, memos, standards, compliance and company-related documents in English

GS3. convey and share technical information clearly using appropriate language

GS4. communicate with clients, peers, superiors and subordinates in respectful form and manner in line with organisational protocol

GS5. follow organisation rule- based decision-making process

GS6. work towards achieving better results for self, others and the organisation

GS7. plan and organise work schedule to meet deadlines

GS8. organise and analyse information relevant to work

GS9. work constructively and collaboratively with others

GS10. seek to improve and modify own work practices

GS11. apply domain knowledge, observations and data to select a course of action to perform tasks

GS12. apply balanced judgements to different situations

GS13. use reasoning skills to identify and resolve basic problems

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Perform post-designing activities	40	60	-	-
PC1. correspond with customer and classification society for approval of the designs	4	8	-	-
PC2. produce technical reports and procedures, final schematics, statement of technical requirements, logistics documentation, performance requirements and bill of materials for the production team	6	8	-	-
PC3. interact with vendors to approve machinery	4	8	-	-
PC4. prepare the protocol for pre-dispatch inspection, installation and commissioning trials	6	8	-	-
PC5. review and analyse records of quality team tests, inspections and performance feedback	6	8	-	-
PC6. perform design iterations for further improvement	6	8	-	-
PC7. maintain all design and analysis related records for easy retrieval and reference in future	5	8	-	-
PC8. prepare the operating manuals and checklists required by the users or crew of the ship	3	4	-	-
NOS Total	40	60	-	-

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0412
NOS Name	Perform post-designing activities for ships and marine systems
Sector	Capital Goods
Sub-Sector	Ship Building & Repair
Occupation	Design
NSQF Level	7
Credits	TBD
Version	1.0
Next Review Date	NA

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) (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. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).

4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.

5. In case of successfully passing only certain number of NOSs, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack. Qualification Pack Capital Goods Skill Council 47

6. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack

Minimum Aggregate Passing % at QP Level : 70

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to

successfully clear the Qualification Pack assessment.)

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CSC/N1338.Work effectively in a collaborative environment (SM)	30	70	-			
CSC/N1337.Follow the health and safety practices at shipbuilding work	30	70	-			
SGJ/N1703.Adopt sustainable practices at the workplace	21	42	-			
CSC/N0414.Prepare for designing marine systems for naval ships	40	60	-			
CSC/N0413.Design marine systems	40	60	-			
CSC/N0412.Perform post-designing activities for ships and marine systems	40	60	-			
Total	**201**	**362**	**-**			

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Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
NOS	National Occupational Standard(s)
NSQF	National Skill Qualification Framework
QP	Qualification Pack
TVET	Technical and Vocational Education and Training

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. 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 functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (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 (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications 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.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.

Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment 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.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.
Sector	Sector is a conglomeration of different business operations having similar business and interests. 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 functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (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 (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standard	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications 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.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Knowledge and Understanding (K	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in todays world. These skills are typically needed in any work environment in todays 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.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.