

Qualification Pack



Forger

QP Code: CSC/Q1101

Version: 2.0

NSQF Level: 4

Capital Goods Skill Council || 1st Floor, L-29, Outer Circle, Connaught Place
New Delhi - 110001 || email:coo@cgsc.in



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CSC/Q1101: Forger

Brief Job Description

The incumbent on the job is involved in setting up of forging machines with dies and presses and performing heat treatment and forging operations so that the material forms the shape as per the requirement.

Personal Attributes

The job holder must have an eye for detail as well as the patience and discipline required to carry out detailed and repetitive tasks. The candidate should be able to read and understand technical manuals, instructions and warnings.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [CSC/N1335: Follow the health and safety practices at the workplace](#)
2. [CSC/N1336: Coordinate with co-workers to achieve work efficiency](#)
3. [CSC/N1001: Perform heat treatment operations on ferrous & non-ferrous metals and alloys](#)
4. [CSC/N1101: Perform forging techniques on ferrous & non-ferrous metals and alloys](#)

Qualification Pack (QP) Parameters

Sector	Capital Goods
Sub-Sector	Light Engineering Goods
Occupation	Forging
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/NIL
Minimum Educational Qualification & Experience	Ability to Read and Write with 5 years experience in the relevant field Or 5th Class Pass with 3 years experience in the relevant field Or

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	8th Class Pass with 1year experience in the relevant field Or 8th Class Pass + ITI (1year) Or Sheet metal worker NSQF - Level 2 with 1 year experience
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	
Next Review Date	
Deactivation Date	
NSQC Approval Date	
Version	2.0
Reference code on NQR	
NQR Version	2.0

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CSC/N1335: Follow the health and safety practices at work

Description

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

Scope

This unit/task 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 first-aid 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

Check the first aid box, firefighting and safety equipment

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

- PC10. check the first aid box to ensure it is updated with the relevant first aid supplies
- PC11. check and test the firefighting and various safety equipment to ensure they are in usable condition

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PC12. 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:

PC13. segregate waste into appropriate categories

PC14. recycle the recyclable waste appropriately

PC15. 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:

PC16. use the appropriate type of fire extinguisher to extinguish different types of fires safely

PC17. follow the recommended practices for a safe rescue during a fire emergency

PC18. 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:

PC19. follow the organisational health and safety guidelines during workplace emergencies to ensure own and co-workers' safety

PC20. follow the recommended practices to minimise loss to organisational property during an emergency

PC21. follow the recommended procedure to free a person from electrocution

PC22. administer appropriate first aid to the injured personnel

PC23. perform Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest

PC24. 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:

PC25. carry out appropriate documentation following a health and safety incident at work, including all the required information

PC26. coordinate with the relevant personnel to review health and safety conditions at work regularly or following an incident

PC27. 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

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- KU3. the importance and process of selecting and using the appropriate PPE relevant to the task and work conditions
- KU4. the recommended techniques to be followed while lifting and moving heavy objects to avoid injury
- KU5. the importance of following the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment
- KU6. the importance and process of identifying existing and potential hazards at work
- KU7. the process of assessing the potential risks and injuries associated with the various hazards
- KU8. how to prevent or minimise different types of hazards
- KU9. how to handle and store hazardous materials safely
- KU10. the importance of ensuring the first aid box is updated with the relevant first aid supplies
- KU11. the process of checking and testing the firefighting and various safety equipment to ensure they are in a usable condition
- KU12. the criteria for segregating waste into appropriate categories
- KU13. the appropriate methods for recycling the recyclable waste
- KU14. the process of disposing of the non-recyclable waste safely and the applicable regulations
- KU15. use of different types of fire extinguishers to extinguish different types of fires
- KU16. the recommended practices to be followed for a safe rescue during a fire emergency
- KU17. how to request assistance from the fire department to extinguish a serious fire
- KU18. the appropriate practices to be followed during workplace emergencies to ensure safety and minimise loss to organisational property
- KU19. common health and safety hazards present in a work environment, associated risks, and how to mitigate them
- KU20. safe working practices to be followed while working at various hazardous sites and using electrical equipment
- KU21. the importance of ensuring easy access to firefighting and safety equipment
- KU22. the appropriate preventative and remedial actions to be taken in the case of exposure to toxic materials, such as poisonous chemicals and gases
- KU23. various causes of fire in different work environments and the recommended precautions to be taken to prevent fire accidents
- KU24. different methods of extinguishing fire
- KU25. different materials used for extinguishing fire, such as sand, water, foam, CO₂, dry powder, etc.
- KU26. the applicable rescue techniques to be followed during a fire emergency
- KU27. the importance of placing safety signs and instructions at strategic locations in a workplace and following them
- KU28. different types of first aid treatment to be provided for different types of injuries
- KU29. potential injuries associated with incorrect manual handling
- KU30. how to move an injured person safely
- KU31. various hazards associated with the use of various machinery, tools, implements, equipment and materials

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- KU32. the importance of ensuring no obstruction and free access to fire exits
- KU33. how to free a person from electrocution safely
- KU34. how to administer appropriate first aid to an injured person
- KU35. how to perform Cardiopulmonary Resuscitation (CPR)
- KU36. the importance of coordinating with the emergency services to request urgent medical assistance for persons requiring professional medical attention or hospitalisation
- KU37. the appropriate documentation to be carried out following a health and safety incident at work, and the relevant information to be included
- KU38. the importance and process of reviewing the health and safety conditions at work regularly or following an incident
- KU39. 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

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Maintain personal health and safety</i>	7	12	-	-
PC1. follow the recommended practices to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask	2	3	-	-
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	2	-	-
PC4. follow the recommended techniques while lifting and moving heavy objects to avoid injury	1	3	-	-
PC5. follow the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment	2	2	-	-
<i>Assist in hazard management</i>	4	10	-	-
PC6. identify existing and potential hazards at work	1	1	-	-
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	1	3	-	-
PC9. handle hazardous materials safely and store them in the designated storage	1	3	-	-
<i>Check the first aid box, firefighting and safety equipment</i>	3	7	-	-
PC10. check the first aid box to ensure it is updated with the relevant first aid supplies	1	2	-	-
PC11. check and test the firefighting and various safety equipment to ensure they are in usable condition	1	3	-	-
PC12. coordinate with the supervisor for the repair and replacement of firefighting and safety equipment	1	2	-	-
<i>Assist in waste management</i>	3	8	-	-
PC13. segregate waste into appropriate categories	1	3	-	-

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PC14.recycle the recyclable waste appropriately	1	3	-	-
PC15.dispose of the non-recyclable waste in an environment-friendly manner, complying with the applicable regulations	1	2	-	-
<i>Follow the fire safety guidelines</i>	3	12	-	-
PC16.use the appropriate type of fire extinguisher to extinguish different types of fires safely	1	4	-	-
PC17.follow the recommended practices for a safe rescue during a fire emergency	1	4	-	-
PC18.coordinate with the fire department to request assistance to extinguish a serious fire	1	4	-	-
<i>Follow the emergency and first-aid procedures</i>	7	12	-	-
PC19.follow the organisational health and safety guidelines during workplace emergencies to ensure own and co-workers' safety	1	2	-	-
PC20.follow the recommended practices to minimise loss to organisational property during an emergency	1	3	-	-
PC21.follow the recommended procedure to free a person from electrocution	1	2	-	-
PC22.administer appropriate first aid to the injured personnel	1	2	-	-
PC23.perform Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest	1	2	-	-
PC24.coordinate with the emergency services to request medical assistance for seriously injured/ ill personnel requiring professional medical attention or hospitalisation	2	1	-	-
<i>Carry out relevant documentation and review</i>	3	9	-	-
PC25.carry out appropriate documentation following a health and safety incident at work, including all the required information	1	3	-	-
PC26.coordinate with the relevant personnel to review health and safety conditions at work regularly or following an incident	1	3	-	-
PC27.assist in implementing appropriate changes to improve the health and safety conditions at work	1	3	-	-
NOS Total	30	70	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1335
NOS Name	Follow the health and safety practices at the work
Sector	Capital Goods
Sub-Sector	Generic
Occupation	Generic
NSQF Level	3
Credits	TBD
Version	2.0
Last Reviewed Date	
Next Review Date	
Deactivation Date	
NSQC Clearance Date	

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CSC/N1336: Coordinate with co-workers to achieve work efficiency

Description

This OS unit is about working in coordination with co-workers to achieve the work objectives efficiently. It also covers practising inclusion at work.

Scope

This unit/task covers the following:

- Work effectively with co-workers
- Communicate effectively with co-workers
- Practice inclusion at work

Elements and Performance Criteria

Work effectively with co-workers

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

- PC1. plan daily tasks at work to ensure their timely completion and efficient use of time
- PC2. carry out work responsibilities adhering to the limits of authority
- PC3. follow the supervisor's instructions to ensure adherence to the applicable quality standards and timescales
- PC4. coordinate with the co-workers to achieve the work objectives efficiently
- PC5. prepare the relevant documents and reports as per the supervisor's instructions, providing appropriate information clearly and systematically
- PC6. coordinate with the supervisor or relevant personnel to deal with out of authority tasks and concerns
- PC7. mentor and assist subordinates in the execution of their work responsibilities
- PC8. identify possible disruptions to work through coordination with the relevant stakeholders and take appropriate preventive measures
- PC9. use various resources efficiently to ensure maximum utilisation and minimum wastage
- PC10. follow the recommended practices to avoid and resolve conflicts at work
- PC11. follow the relevant organisational policies to ensure disciplined behaviour with maximum productivity at work

Communicate effectively with co-workers

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

- PC12. follow the organisational policy for the efficient and timely dissemination of information to the authorised personnel
- PC13. communicate clearly and politely to ensure effective communication with co-workers
- PC14. follow the appropriate techniques for active listening during interactions

Practice inclusion at work

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

- PC15. empathise with Persons with Disabilities (PwD)

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PC16. adopt gender-neutral behaviour at work

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. the importance and process of effective communication in the workplace
- KU2. the barriers to effective communication and how to overcome them
- KU3. the importance of teamwork in an organisation's and individual's success
- KU4. the importance of active listening in the work environment
- KU5. the appropriate techniques to be followed for active listening
- KU6. importance of tone and pitch in effective communication
- KU7. importance of avoiding casual expletives and unpleasant terms while communicating professional circles
- KU8. the importance of maintaining discipline and ethical behaviour at work
- KU9. the common reasons for interpersonal conflict and how to resolve them
- KU10. the importance of developing effective working relationships for professional success
- KU11. how expressing and addressing grievances appropriately and effectively
- KU12. the importance and process of planning daily tasks to ensure their timely completion and efficient use of time
- KU13. the importance of adhering to the limits of authority at work
- KU14. the importance of following the applicable quality standards and timescales at work
- KU15. the importance of coordinating with the co-workers to achieve the work objectives efficiently
- KU16. the relevant documentation requirements
- KU17. the importance of providing appropriate information clearly and systematically in work documents
- KU18. the escalation matrix to be followed to deal with out of authority tasks and concerns
- KU19. the importance and process of mentoring and assisting subordinates in the execution of their work responsibilities
- KU20. how to identify possible disruptions to work prevent them
- KU21. how to use various resources efficiently to ensure maximum utilisation and minimum wastage
- KU22. the recommended practices to be followed at work to avoid and resolve conflicts at work
- KU23. the importance and process of efficient and timely dissemination of information to the authorised personnel
- KU24. how to communicate clearly and politely to ensure effective communication
- KU25. the importance of following the recommended practices to ensure an inclusive environment for PwD and all genders at work



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Generic Skills (GS)

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

- GS1. maintain work-related notes and records
- GS2. read work-related and other relevant literature
- GS3. communicate politely and -professionally
- GS4. listen attentively to understand the information or instructions being shared
- GS5. plan and prioritise tasks to ensure timely completion
- GS6. take prompt decisions to deal with workplace emergencies and accidents
- GS7. evaluate all possible solutions to a problem to select the best one

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work effectively with co-workers</i>	20	24	-	-
PC1. plan daily tasks at work to ensure their timely completion and efficient use of time	2	4	-	-
PC2. carry out work responsibilities adhering to the limits of authority	2	4	-	-
PC3. follow the supervisor's instructions to ensure adherence to the applicable quality standards and timescales	2	4	-	-
PC4. coordinate with the co-workers to achieve the work objectives efficiently	2	4	-	-
PC5. prepare the relevant documents and reports as per the supervisor's instructions, providing appropriate information clearly and systematically	2	4	-	-
PC6. coordinate with the supervisor or relevant personnel to deal with out of authority tasks and concerns	2	4	-	-
PC7. mentor and assist subordinates in the execution of their work responsibilities	2	4	-	-
PC8. identify possible disruptions to work through coordination with the relevant stakeholders and take appropriate preventive measures	2	4	-	-
PC9. use various resources efficiently to ensure maximum utilisation and minimum wastage	2	4	-	-
PC10. follow the recommended practices to avoid and resolve conflicts at work	1	4	-	-
PC11. follow the relevant organisational policies to ensure disciplined behaviour with maximum productivity at work	1	3	-	-
<i>Communicate effectively with co-workers</i>	6	15	-	-
PC12. follow the organisational policy for the efficient and timely dissemination of information to the authorised personnel	2	5	-	-
PC13. communicate clearly and politely to ensure effective communication with co-workers	2	5	-	-
PC14. follow the appropriate techniques for active listening during interactions	2	5	-	-
<i>Practice inclusion at work</i>	4	12	-	-



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PC15. empathise with Persons with Disabilities (PWD)	2	6	-	-
PC16. adopt gender-neutral behaviour at work	2	6	-	-
NOS Total	30	70	-	-



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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1336
NOS Name	Coordinate with co-workers to achieve work efficiency
Sector	Capital Goods
Sub-Sector	Generic
Occupation	Generic
NSQF Level	3
Credits	TBD
Version	2.0
Last Reviewed Date	
Next Review Date	
Deactivation Date	
NSQC Clearance Date	

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CSC/N1001: Perform heat treatment operations on ferrous & non-ferrous metals and alloys

Description

This unit is about performing heat treatment operations on ferrous, non-ferrous metals and alloys in line with the required specifications and industry standards.

Scope

This unit/task covers the following:

- Prepare for heat treatment operations
- Perform heat treatment operations
- Perform post-heat treatment operations

Elements and Performance Criteria

Prepare for heat treatment operations

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

- PC1. identify work requirements by interpreting engineering drawings; planning documentation; quality control documents; operation sheets; process specifications etc. and instructions received from supervisor
- PC2. identify the tools, heat treatment apparatus and input materials required for the job
- PC3. select and arrange the right material (like metal bars), tools, heat treatment apparatus, lifting equipment and consumables as per the SOP and job requirements
- PC4. check the tools and equipment for any defects before use
- PC5. check that all measuring equipment are within calibration date
- PC6. prepare the work area as per procedure or operation specification
- PC7. prepare the material by performing various preparatory activities such as cleaning the surface (e.g.. removing scale, oil and dirt); degreasing; drying at the correct temperature; masking the materials to contain the case hardening or carburising deposits; polishing the material surface; packing or coating the components with a carbon enriched material; pre-heating before immersion into a salt bath; pickling and sand blasting.
- PC8. set the tools, equipment and heat treatment apparatus as per the job requirements and SOP
- PC9. use appropriate Personal Protective Equipment (PPE) for safe working in workshop

Perform heat treatment operations

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

- PC10. set the parameters of induction heaters/ furnace at a desired temperature range for preheating, heating as well as post heating zones
- PC11. load the components in the furnace by using manual techniques or hoists, cranes, magnetic lifters etc.
- PC12. ensure that each thermal/ heating zone reaches the desired temperature levels when the components are passing through the furnace
- PC13. perform various heat treatment processes e.g. tempering heat treatment process, annealing

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heat treatment process, normalizing/stress relieving heat treatment process, carburising heat treatment process

- PC14. observe the uniform heating of metal as per the desired specifications
- PC15. cool the treated object using appropriate amounts of cooling medium so that it will not overheat or reach flash point
- PC16. remove the components safely and correctly from the heat source/solution
- PC17. perform quenching/cooling process on the components by using the appropriate medium and technique

Perform post-heat treatment operations

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

- PC18. inspect the heat treated output for required quality standards and measure the workpiece for geometry, material & dimensional parameters
- PC19. shut down the heat treatment equipment to a safe condition on completion of the activities
- PC20. remove the bad quality components from the main production line and allow the accepted components to cool down for forging process
- PC21. report any emergencies/deviations from the Work Instructions/ SOP to the supervisor immediately

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. relevant legislation, standards, policies, and procedures followed in the organization
- KU2. common terminology used in heat treatment procedures
- KU3. different types of material used for heat treatment and forging process
 - Ferrous metals:** carbon steels, stainless steels, cast iron, tool steel, hard metals
 - Non-ferrous metals:** bronze, bronze alloys, copper and copper alloys)
- KU4. specific health and safety precautions need to be taken when carrying out heat treatment processes
- KU5. importance of ensuring that fume extraction equipment is operating effectively
- KU6. material preparation methods and techniques to be undertaken, prior to applying the heat treatments
- KU7. heat treatment processes to be carried out, and the types of application and metals for which they are best suited
- KU8. SOP recommended by manufacturer for using tools and heat treatment apparatus
 - Equipment and tools:** furnaces (gas, electric, oil fired, vacuum, hearth, pit type, muffle); induction heating; kilns; tempering ovens; heated baths; salt baths; gas torches; specialised tongs/tools
- KU9. methods to prepare the tools and equipment
 - Preparation activities:** setting furnace or salt bath controls to give the correct temperature; the procedure for lighting and extinguishing the blacksmiths forge; setting up gas torches; ensuring that suitable tongs/handling/lifting devices
- KU10. methods used to hold/secure components in a heat treatment solution such as wires, hooks,

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jigs, etc.

- KU11. importance of monitoring equipment settings and process solutions during the heat treatment process
- KU12. temperature ranges used for various metals and their impact on the properties of output
- KU13. correct temperature for heating of components as per the process being carried out and its importance
- KU14. process of quenching and cooling methods
- KU15. need to maintain quenching oil at a temperature below its flash point
- KU16. problems that can occur with the heat treatment operations, and how these can be overcome
- KU17. ways to check quality of the shaped components against required quality standards
- KU18. methods for repairing pieces with minor defects

Generic Skills (GS)

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

- GS1. note the information related to work and processes
- GS2. write reports and observations related to work in English/regional language
- GS3. read and interpret and process flowchart for all operations
- GS4. read manuals and operation documents to understand the Equipment used into operation
- GS5. discuss task lists, schedules and activities with the seniors and team members
- GS6. follow organization rule-based decision making process
- GS7. take decisions with systematic course of actions and/or response
- GS8. plan and organize tasks to meet deadlines
- GS9. find ways of modifying difficult operating stages to make it operation friendly
- GS10. apply domain information to set and define operation parameters that ensures economy and quality of the product
- GS11. analyse the complexity of work to determine if it can be successfully carried out or needs to be referred to a superior/specialist
- GS12. recognise a workplace problem and take suitable action to resolve it

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare for heat treatment operations</i>	14	23	-	9
PC1. identify work requirements by interpreting engineering drawings; planning documentation; quality control documents; operation sheets; process specifications etc. and instructions received from supervisor	1	2	-	-
PC2. identify the tools, heat treatment apparatus and input materials required for the job	4	2	-	2
PC3. select and arrange the right material (like metal bars), tools, heat treatment apparatus, lifting equipment and consumables as per the SOP and job requirements	2	4	-	1
PC4. check the tools and equipment for any defects before use	2	3	-	1
PC5. check that all measuring equipment are within calibration date	1	2	-	1
PC6. prepare the work area as per procedure or operation specification	1	2	-	1
PC7. prepare the material by performing various preparatory activities such as cleaning the surface (e.g.. removing scale, oil and dirt); degreasing; drying at the correct temperature; masking the materials to contain the case hardening or carburising deposits; polishing the material surface; packing or coating the components with a carbon enriched material; pre-heating before immersion into a salt bath; pickling and sand blasting	2	5	-	2
PC8. set the tools, equipment and heat treatment apparatus as per the job requirements and SOP	1	2	-	1
PC9. use appropriate Personal Protective Equipment (PPE) for safe working in workshop	-	1	-	-
<i>Perform heat treatment operations</i>	11	20	-	7
PC10. set the parameters of induction heaters/ furnace at a desired temperature range for preheating, heating as well as post heating	1	2	-	1

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zones				
PC11. load the components in the furnace by using manual techniques or hoists, cranes, magnetic lifters etc.	1	2	-	-
PC12. ensure that each thermal/ heating zone reaches the desired temperature levels when the components are passing through the furnace	1	1	-	1
PC13. perform various heat treatment processes e.g. tempering heat treatment process, annealing heat treatment process, normalizing/stress relieving heat treatment process, carburising heat treatment process	3	6	-	2
PC14. observe the uniform heating of metal as per the desired specifications	1	2	-	1
PC15. cool the treated object using appropriate amounts of cooling medium so that it will not overheat or reach flash point	1	2	-	1
PC16. remove the components safely and correctly from the heat source/solution	1	2	-	-
PC17. perform quenching/cooling process on the components by using the appropriate medium and technique	2	3	-	1
<i>Perform post-heat treatment operations</i>	5	7	-	4
PC18. inspect the heat treated output for required quality standards and measure the workpiece for geometry, material & dimensional parameters	2	3	-	2
PC19. shut down the heat treatment equipment to a safe condition on completion of the activities	1	1	-	-
PC20. remove the bad quality components from the main production line and allow the accepted components to cool down for forging process	1	2	-	1
PC21. report any emergencies/deviations from the Work Instructions/ SOP to the supervisor immediately	1	1	-	1
NOS Total	30	50	-	20



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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1001
NOS Name	Perform heat treatment operations on ferrous & non-ferrous metals and alloy
Sector	Capital Goods
Sub-Sector	Light Engineering Goods
Occupation	Forging
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	
Next Review Date	
NSQC Clearance Date	

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CSC/N1101: Perform forging techniques on ferrous & non-ferrous metals and alloys

Description

This unit is about performing range of forging techniques for producing complex solid forged shapes on ferrous & non-ferrous metals and alloys in line with the required specifications and industry standards.

Scope

This unit/task covers the following:

- Prepare for forging activities
- Perform forging operations
- Perform post-forging operations

Elements and Performance Criteria

Prepare for forging activities

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

- PC1. read and interpret job requirements from the job specification document accurately
- PC2. identify the tools, equipment, dies and forging apparatus required for the job
- PC3. select and arrange the tools, equipment, dies, forging apparatus, lifting equipment and consumables as per the SOP and job requirements
- PC4. check the tools and equipment for any defects before use
- PC5. prepare the work area for the forging operations as per SOP
- PC6. ensure availability of heat treated work-pieces /raw materials for forging as per job requirements
- PC7. ensure that dies and forging apparatus are cleaned properly and free from oil, grease and dust particles
- PC8. set the forging machine and its parameters as per the job requirements and SOP
- PC9. select the appropriate die as per the required output and fit it into the machine
- PC10. measure and mark the specified features for bending and forming operations on the workpieces as per job specification by using appropriate measuring and marking out tools and equipment
- PC11. use appropriate Personal Protective Equipment (PPE) for safe working in workshop

Perform forging operations

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

- PC12. place and position the material to be forged safely and correctly on the forging equipment as per specification
- PC13. attach hammer tools and fixtures to power hammer correctly
- PC14. select the right program in the forging machine and make changes/modifications in the program as per the work instructions and production requirements

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- PC15. select and combine common forge work techniques to produce forged products and tools that are fit for purpose
- PC16. adjust temperature of the die to ensure uniform heating of the workpiece
- PC17. adjust various parameters of main press machine including blocker, finisher and trimmer (like pressure, cycle time, etc.) as per the output requirement
- PC18. monitor the process parameters by reading the various gauges and correct them if not within standards
- PC19. carry out common heat treatments of normalising and annealing on forged steel and minimise the effects of oxidation and overheating
- PC20. remove the forged workpiece from machine and allow it to cool for sometime
- PC21. perform finishing operations such as twisting, straightening etc. on workpiece to get the desired specifications
- PC22. measure the first workpiece for geometry, material & dimensional parameters and compare it with the specifications prescribed in the work order and engineering drawing
- PC23. adjust the parameters of the corresponding presses for the finishing operations i.e. twisting, straightening etc. if required to get the desired specifications
- PC24. report any emergencies/deviations from the Work Instructions/ Control Panel/SOP to the supervisor immediately

Perform post-forging operations

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

- PC25. check the forged work pieces for product quality as per the work instructions
- PC26. conduct destructive and non-destructive tests on the work pieces
- PC27. compare the texture, color, surface properties, hardness and strength with the given product specifications
- PC28. rectify minor defects like shape deformation, sharp edges, rough surfaces, extra material from grooves, holes, parting line area etc. from the workpieces
- PC29. segregate, tag and store the completed pieces in to Ok pieces, defective pieces which can be repaired/reworked and pieces which are beyond repair and maintain records of each category
- PC30. check the machine operations for any malfunctions/ defects in the component and inform the supervisor/maintenance team for correction
- PC31. clean and store the tools and forging apparatus after completion of all activities as per SOP

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. relevant legislation, standards, policies, and procedures followed in the organization
- KU2. various activities carried out during forging activities are: upsetting, drawing down, spreading, sets, transitions, swaging, fullering
- KU3. hazards associated with forging furnaces, equipment and processes and how to minimize the same
- KU4. different types of forging techniques like hammer or drop forging, press forging, open-die forging, closed-die forging and their respective operating parameters
- KU5. different types of dies to be used for forging operations and their setting up mechanism

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- KU6. types of presses used in forging activities i.e. hydraulic presses, mechanical presses, screw presses, hammers (gravity drop; power drop; counter blow (two rams)), high pressure gas
- KU7. different parameters pertinent to pressing process like cycle time, force applied, gear and pinion movements, friction, torque etc.
- KU8. Standard Operating Procedures (SOP) recommended by OEM for using forging presses and dies
- KU9. adjustment made to equipment settings to heat/prepare material for forging
- KU10. importance of monitoring the equipment settings and function during the forging process
- KU11. possible effects of heating and cooling on the structure of ferrous metals
- KU12. possible effects of oxidation/burning, carburization, on ferrous metals
- KU13. possible effects of forging on the structure of ferrous metals
- KU14. correct techniques used to heat heavy and complex forgings
- KU15. how to secure the work-piece/raw material correctly using appropriate devices
- KU16. basic process followed for inspection of the forged work pieces
- KU17. how to use measurement instruments like rulers, Vernier calipers, micrometer, weighing scale, gauges and other inspection equipment
- KU18. methods and techniques to check for common forging imperfections/defects and conformance to specifications
- KU19. various type of defects in forged products
- KU20. procedures for handling components with forging imperfections/defects that cannot be removed/repared and how can they be minimized
- KU21. methods of storage and tagging of final product
- KU22. about the various testing techniques like visual, destructive and non-destructive

Generic Skills (GS)

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

- GS1. note the information related to work and processes
- GS2. write reports and observations related to work in English/regional language
- GS3. read and interpret and process flowchart for all operations
- GS4. read manuals and operation documents to understand the Equipment used into operation
- GS5. discuss task lists, schedules and activities with the seniors and team members
- GS6. follow organization rule-based decision making process
- GS7. take decisions with systematic course of actions and/or response
- GS8. plan and organize tasks to meet deadlines
- GS9. find ways of modifying difficult operating stages to make it operation friendly
- GS10. apply domain information to set and define operation parameters that ensures economy and quality of the product
- GS11. analyse the complexity of work to determine if it can be successfully carried out or needs to be referred to a superior/specialist
- GS12. recognise a workplace problem and take suitable action to resolve it

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare for forging activities</i>	9	18	-	6
PC1. read and interpret job requirements from the job specification document accurately	-	1	-	-
PC2. identify the tools, equipment, dies and forging apparatus required for the job	3	1	-	2
PC3. select and arrange the tools, equipment, dies, forging apparatus, lifting equipment and consumables as per the SOP and job requirements	2	3	-	1
PC4. check the tools and equipment for any defects before use	1	2	-	1
PC5. prepare the work area for the forging operations as per SOP	-	2	-	-
PC6. ensure availability of heat treated work-pieces /raw materials for forging as per job requirements	-	1	-	-
PC7. ensure that dies and forging apparatus are cleaned properly and free from oil, grease and dust particles	-	1	-	-
PC8. set the forging machine and its parameters as per the job requirements and SOP	1	2	-	1
PC9. select the appropriate die as per the required output and fit it into the machine	1	2	-	-
PC10. measure and mark the specified features for bending and forming operations on the workpieces as per job specification by using appropriate measuring and marking out tools and equipment	1	2	-	1
PC11. use appropriate Personal Protective Equipment (PPE) for safe working in workshop	-	1	-	-
<i>Perform forging operations</i>	12	20	-	9
PC12. place and position the material to be forged safely and correctly on the forging equipment as per specification	1	1	-	-
PC13. attach hammer tools and fixtures to power hammer correctly	1	1	-	1

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PC14. select the right program in the forging machine and make changes/modifications in the program as per the work instructions and production requirements	1	1	-	1
PC15. select and combine common forge work techniques to produce forged products and tools that are fit for purpose	2	3	-	2
PC16. adjust temperature of the die to ensure uniform heating of the workpiece	-	1	-	-
PC17. adjust various parameters of main press machine including blocker, finisher and trimmer (like pressure, cycle time, etc.) as per the output requirement	1	2	-	1
PC18. monitor the process parameters by reading the various gauges and correct them if not within standards	1	1	-	-
PC19. carry out common heat treatments of normalising and annealing on forged steel and minimise the effects of oxidation and overheating	2	3	-	1
PC20. remove the forged workpiece from machine and allow it to cool for sometime	-	1	-	-
PC21. perform finishing operations such as twisting, straightening etc. on workpiece to get the desired specifications	2	2	-	2
PC22. measure the first workpiece for geometry, material & dimensional parameters and compare it with the specifications prescribed in the work order and engineering drawing	1	2	-	1
PC23. adjust the parameters of the corresponding presses for the finishing operations i.e. twisting, straightening etc. if required to get the desired specifications	-	1	-	-
PC24. report any emergencies/deviations from the Work Instructions/ Control Panel/SOP to the supervisor immediately	-	1	-	-
<i>Perform post-forging operations</i>	9	12	-	5
PC25. check the forged work pieces for product quality as per the work instructions	1	2	-	1
PC26. conduct destructive and non-destructive tests on the work pieces	2	3	-	1
PC27. compare the texture, color, surface properties, hardness and strength with the given product	1	1	-	-

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specifications				
PC28. rectify minor defects like shape deformation, sharp edges, rough surfaces, extra material from grooves, holes, parting line area etc. from the workpieces	2	2	-	1
PC29. segregate, tag and store the completed pieces in to Ok pieces, defective pieces which can be repaired/reworked and pieces which are beyond repair and maintain records of each category	1	2	-	1
PC30. check the machine operations for any malfunctions/ defects in the component and inform the supervisor/maintenance team for correction	1	1	-	1
PC31. clean and store the tools and forging apparatus after completion of all activities as per SOP	1	1	-	-
NOS Total	30	50	-	20



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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1101
NOS Name	Perform forging techniques on ferrous & non-ferrous metals and alloys
Sector	Capital Goods
Sub-Sector	Light Engineering Goods
Occupation	Forging
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	
Next Review Date	
NSQC Clearance Date	

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Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for the Qualification Pack will be created by CGSC.
2. Performance Criteria (PC) have been assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
3. The assessment for the theory part will/may be based on knowledge bank of questions approved CGSC.
4. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
5. Assessment Agencies will create Assessor Guides comprising of Theory and Practical Assessment Set and Guidelines for each examination/training centre (as per assessment criteria below). The same will be approved by CGSC for adequacy.
6. To successfully attain Certification on the Qualification Pack, the trainee must score a minimum of 70% in each Core NOS and minimum of 50% in all non-core NOS. In addition, a candidate needs to attain a minimum overall pass percentage of 70% for certification.
7. 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.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CSC/N1335. Use basic health and safety practices at the workplace	30	70	-	-	100	15
CSC/N1336. Coordinate with co-workers to achieve work efficiency	30	70	-	-	100	15
CSC/N1001. Perform heat treatment operations on ferrous & non-ferrous metals and alloys	30	50	-	20	100	35



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CSC/N1101.Perform forging techniques on ferrous & non-ferrous metals and alloy	30	50	-	20	100	35
Total	120	240	-	40	400	100

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
CO ₂	Carbon Dioxide
CPR	Cardiac Pulmonary Resuscitation
PPE	Personal Protective Equipment

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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.

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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.