

Qualification Pack



Service Engineer- Installation and Commissioning

QP Code: CSC/Q0502

Version: 2.0

NSQF Level: 4

Capital Goods Skill Council || 1st Floor, L-29, Outer Circle, Connaught Place
New Delhi - 110001



Qualification Pack

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CSC/Q0502: Service Engineer- Installation and Commissioning

Brief Job Description

A Service Engineer - installation and commissioning are responsible for installing, commissioning and maintaining a variety of mechanical equipment. The individual conducts a survey of the client premises to determine the installation requirements, prepares the equipment for installation, installs and commissions the equipment. The person also provides breakdown services for the equipment when it experiences a breakdown.

Personal Attributes

The individual must be physically fit to work for long durations. The person must have attention to detail, analytical and problem-solving skills. The individual must have basic verbal and written communication skills with the ability to work in coordination with others to achieve the work objectives.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [CSC/N1335: Follow the health and safety practices at work](#)
2. [CSC/N1336: Coordinate with co-workers to achieve work efficiency](#)
3. [CSC/N0501: Install the mechanical equipment](#)
4. [CSC/N0502: Commission the mechanical equipment](#)

Optional NOS:

1. [CSC/N0503: Provide the breakdown service for mechanical equipment](#)

Qualification Pack (QP) Parameters

Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery
Occupation	Service
Country	India

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NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/NIL
Minimum Educational Qualification & Experience	<p>8th Class Pass + ITI (2years) with 2 years of experience in the relevant field</p> <p>OR</p> <p>10th Class Pass with 2 years of experience in the relevant field</p> <p>OR</p> <p>10th Class Pass + ITI (1 year after Class 10th) with 1 year of experience in the relevant field</p> <p>OR</p> <p>10th Class Pass + ITI (2 years after Class 10th)</p> <p>OR</p> <p>12th Class Pass with 6 months of experience in the relevant field</p> <p>OR</p> <p>Certified in NSQF-L3 Operator Installation Services with 2 years of experience in the relevant field</p>
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	2015/CCM/GCSC/00251
NQR Version	1.0

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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
- PC12.** coordinate with the supervisor for the repair and replacement of firefighting and safety equipment

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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
- 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

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- 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
- 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:



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- 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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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	Machine Tools, Process Plant Machinery, Dies, Moulds and Press Tools, Electrical and Power Machinery, Plastics Manufacturing Machinery, Light Engineering Goods, Textile Manufacturing Machinery
Occupation	Machining
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)
- PC16.** adopt gender-neutral behaviour at work

Knowledge and Understanding (KU)

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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

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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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1336
NOS Name	Coordinate with co-workers to achieve work efficiency
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Machining
NSQF Level	3
Credits	TBD
Version	2.0
Last Reviewed Date	
Next Review Date	
Deactivation Date	
NSQC Clearance Date	

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CSC/N0501: Install the mechanical equipment

Description

This OS unit is about installing a range of mechanical equipment at the client premises, such as machine tools, process control equipment, conveyors, lifting and handling equipment, hydraulic press, etc. It also covers resource optimisation.

Scope

This unit/task covers the following:

- Plan and conduct the site survey
- Prepare for the installation of equipment
- Install and test the equipment
- Use resources optimally

Elements and Performance Criteria

Plan and conduct the site survey

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

- PC1.** plan the site survey and installation activities to ensure their efficient and timely completion
- PC2.** conduct a survey of the installation site and check the foundation for the installation of mechanical equipment
- PC3.** conduct a load test to test the suitability of the foundation at the installation site, as required
- PC4.** ensure the site is accessible and free from any obstructions or hazards
- PC5.** ensure the availability of relevant utilities such as electricity, gas, water at the site
- PC6.** check the site meets the applicable safety and environmental conditions

Prepare for the installation of equipment

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

- PC7.** check the availability of the necessary permits, job specification documents, required installation material and machine consumables
- PC8.** check the installation material and machine consumables to ensure they meet the required specifications and don't have any faults or physical damage
- PC9.** coordinate with the supplier or the relevant personnel for the replacement of faulty or damaged installation material and machine consumables
- PC10.** supervise the process of marking the positions as per the layout
- PC11.** ensure grouting is done appropriately at the foundation
- PC12.** check that holes of the recommended dimensions are drilled for rig and anchor bolts
- PC13.** supervise the movement and positioning of equipment as per the layout, using cranes or forklifts, as appropriate
- PC14.** follow the recommended practices to prevent moisture and rusting at the installation site
- PC15.** ensure appropriate maintenance of the equipment is carried out before the installation

Install and test the equipment

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

- PC16.** install the equipment as per the manufacturer's instructions and client's requirements

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- PC17. follow the applicable regulations, and health and safety requirements during the installation process
- PC18. use various installation tools and equipment such as plumb lines and taut wires, tension meters, customised gauges, multimeter, as required
- PC19. use the relevant installation techniques such as levelling, aligning, coupling and connecting as per the requirement
- PC20. use the relevant Industry 4.0 manufacturing technologies to ensure interconnectivity, automation, machine learning, and real-time data collection and analysis
- PC21. ensure the equipment has the recommended levels of lubricant, hydraulic and other types of oils
- PC22. carry out appropriate modifications/ adjustments to the equipment to ensure its optimum performance
- PC23. ensure all waste materials and debris are cleared from the site, and it is left in a safe state after the installation
- PC24. carry out appropriate documentation with respect to the installation of equipment, including all the relevant information

Use resources optimally

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

- PC25. optimise the usage of electricity and other resources in various tasks and processes
- PC26. connect the electrical tools and equipment safely, and turn them off when not in use

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. use of the relevant terminology
- KU2. the applicable documentation requirements in the job role
- KU3. the relevant precautions to be taken before and during the installation activities
- KU4. the concepts and benefits of Industry 4.0 and Industrial Internet of Things (IIoT)
- KU5. the installation procedures and environmental regulations
- KU6. how to minimise various hazards associated with carrying out the installation of machinery and plant equipment
- KU7. the importance of using the relevant PPE during the equipment installation
- KU8. the relevant job specification documents to be referred to such as assembly drawings; layout drawings; etc.
- KU9. how to interpret various drawings such as assembly, engineering, and component drawings
- KU10. applicable standards and quality control procedures
- KU11. the operating procedures and functions of various mechanical equipment
- KU12. the process of marking the site for positioning of the equipment, and the use of relevant tools and equipment for the purpose
- KU13. the process of drilling holes for rag and expanding bolts
- KU14. the use of grouting, adhesives, special securing devices, and masonry fixing devices
- KU15. use of various mechanical fasteners such as threaded fasteners
- KU16. torque loading requirements of fasteners, and the appropriate action to be taken when the loadings are exceeded or not achieved
- KU17. use of various relevant instruments, such as feeler gauges; spirit levels, mandrels, dial test indicators, measuring instruments, autocollimator; laser interferometer; right angle/square block, etc.
- KU18. the tools and instruments used to position, secure and align the equipment such as spanners, wrenches, crowbars, torque wrenches, engineers levels, alignment telescopes and laser

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devices, straight edges, etc.

- KU19.** how to position, align, level and adjust mechanical equipment
- KU20.** the process of connecting mechanical power transmission devices such as belt and chain drives, couplings, clutches and brakes, etc.
- KU21.** how to connect mechanical equipment to electrical, fluid power, compressed air oil and fuel supplies
- KU22.** how to conduct the necessary checks to ensure the equipment integrity, functionality, accuracy, and quality of the installation
- KU23.** how to identify installation defects such as leaks, misalignment, ineffective fasteners, foreign object damage, contamination, vibration and how to address them appropriately
- KU24.** the importance of ensuring the completed installation is free from dirt, foreign objects and damage
- KU25.** the importance of covering/ protecting the relevant exposed cables, components, and pipes
- KU26.** common problems encountered during the installation of mechanical equipment and how to overcome them
- KU27.** the functions of various the mechanical equipment
- KU28.** how to perform relevant electrical installations and connections
- KU29.** the importance of ensuring that moving parts are guarded and clear of obstruction
- KU30.** how to check the torque settings of fasteners
- KU31.** the benefits and methods of resource optimisation

Generic Skills (GS)

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

- GS1.** maintain work-related notes and records
- GS2.** read the relevant literature to learn about the latest developments in the field of work
- GS3.** communicate politely and professionally
- GS4.** listen attentively to understand the information or instructions being shared
- GS5.** plan and schedule tasks to ensure timely completion
- GS6.** identify possible disruptions to work and take appropriate preventive measures
- GS7.** take quick decisions to deal with workplace emergencies/ accidents
- GS8.** evaluate all possible solutions to a problem to select the best one



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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0501
NOS Name	Install the mechanical equipment
Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery
Occupation	Service
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	
Next Review Date	
Deactivation Date	
NSQC Clearance Date	

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CSC/N0502: Commission the mechanical equipment

Description

This OS unit is about commissioning a range of mechanical equipment after their installation at the client premises. It covers the preparation for commissioning the equipment and commissioning it as per the approved procedures.

Scope

This unit/task covers the following:

- Prepare to commission the mechanical equipment
- Commission the mechanical equipment

Elements and Performance Criteria

Prepare to commission the mechanical equipment

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

- PC1.** plan efficient commissioning of the equipment to ensure timely completion
- PC2.** ensure all the tools and equipment being used are within their calibration dates
- PC3.** coordinate with the relevant authority or personnel to get the required permissions for carrying out the commissioning activities
- PC4.** prepare the work area for the commissioning activities as per operational specification, ensuring the safety of all the personnel involved
- PC5.** ensure the commissioning site is accessible and free from any obstructions and hazards

Commission the mechanical equipment

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

- PC6.** carry out start-up procedures as per the manufacturer's instructions, and test the functioning meets the required specifications
- PC7.** operate the equipment at the recommended initial settings, such as power and speed
- PC8.** check for leakage, abnormal sounds and excessive vibrations during the equipment operations
- PC9.** follow the recommended operating sequence and check for the correct functioning of the equipment
- PC10.** undertake necessary adjustments in the settings to achieve the required performance parameters such as speed, pressure, flow, timing, etc.
- PC11.** ensure the equipment is able to work at its maximum capacity without any issue and the final product/process outcomes meet specifications
- PC12.** monitor and record measurements and observations
- PC13.** follow the manufacturer's instructions to shut down and/or isolate the installed equipment to a safe condition
- PC14.** carry out troubleshooting to rectify any faults identified with equipment performance during the commissioning process or coordinate with the manufacturer for any manufacturing faults
- PC15.** replace any faults components and adjust them to meet the operational specifications, following the relevant safety precautions
- PC16.** ensure that the commissioned equipment complies with the specified standards
- PC17.** carry out appropriate documentation with respect to the commissioning of the equipment
- PC18.** conduct a session with the client to complete handover and guide them regarding the use and



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general maintenance of the equipment

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the relevant documentation requirement such as conformance and commissioning report
- KU2.** the calibration and control procedures for various tools and equipment
- KU3.** the process of commissioning various mechanical equipment
- KU4.** use of the relevant tools and equipment
- KU5.** the applicable environmental, health and safety regulations
- KU6.** how to deal with various hazards associated with carrying out the installation of machinery and plant equipment
- KU7.** how to conduct the necessary checks to ensure the equipment integrity, functionality, accuracy, and quality of the installation
- KU8.** the importance of using the appropriate PPE while commissioning various equipment
- KU9.** the sources for obtaining appropriate job specifications such as assembly drawings, layout drawings, engineering drawings
- KU10.** the necessary checks to be performed before handing over the equipment to the client
- KU11.** the applicable quality control and testing procedures
- KU12.** applicable standards and quality control procedures
- KU13.** how to lift, handle and support the equipment
- KU14.** the importance and process of positioning, aligning and levelling the equipment before commissioning it
- KU15.** methods of connecting the mechanical power transmission devices
- KU16.** how to dispose of the industrial waste safely

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.** perform work-related calculations
- GS5.** listen attentively to understand the information or instructions being shared
- GS6.** plan and prioritise tasks to ensure timely completion
- GS7.** identify potential disruptions to work and take appropriate preventive measures
- GS8.** take prompt decisions to deal with workplace emergencies and accidents
- GS9.** evaluate all possible solutions to a problem to select the best one



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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0502
NOS Name	Commission the mechanical equipment
Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery
Occupation	Service
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	
Next Review Date	
Deactivation Date	
NSQC Clearance Date	

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CSC/N0503: Provide the breakdown service for mechanical equipment

Description

This OS unit is about providing breakdown service at the client premises for the mechanical equipment that experiences a breakdown. It involves inspecting the equipment to identify the fault and carrying out repair and maintenance using the appropriate tools and equipment.

Scope

This unit/task covers the following:

- Identify the fault
- Prepare for carrying out repair and maintenance
- Carry out repair and maintenance

Elements and Performance Criteria

Identify the fault

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

- PC1.** isolate the equipment from electricity/ gas/ fluid supply before checking it
- PC2.** determine the issue with the equipment by probing the client and using the relevant fault diagnostic tools and equipment
- PC3.** analyse the equipment maintenance records including the results of any tests conducted on it
- PC4.** follow the manufacturer's instructions while dismantling the equipment for fault diagnosis and troubleshooting
- PC5.** conduct relevant checks on the equipment to test its performance and determine the cause of the issue being experienced, such as level and alignment check; force/pressure check; thermal check, etc.
- PC6.** determine whether the repair of equipment or replacement of relevant components is required

Prepare for carrying out repair and maintenance

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

- PC7.** determine the requirement of relevant materials, components, manpower, and assistance from the manufacturer for carrying out repair and maintenance activities
- PC8.** determine the applicable costs and timescales for the completion of repair and maintenance activities
- PC9.** select the appropriate tools and equipment for carrying for repair and maintenance activities
- PC10.** prepare the tools and equipment for use, as required, such as their calibration and lubrication
- PC11.** arrange the necessary materials, components, and manpower as per the requirement
- PC12.** plan the repair and maintenance activities to ensure their timely completion with minimum impact on productivity
- PC13.** allocate tasks to the personnel involved in the repair and maintenance activities, according to their expertise

Carry out repair and maintenance

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

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- PC14. carry out the repair and maintenance of the equipment according to the manufacturer's instructions
- PC15. replace the faulty components appropriately and secure them appropriately
- PC16. reassemble the equipment after carrying out repair and maintenance activities
- PC17. test the performance of the equipment after reassembling it and carry out troubleshooting for any issues identified
- PC18. coordinate with an expert or the manufacturer to resolve the complex issues
- PC19. check the final product/process outcomes to ensure they meet the required specifications
- PC20. follow the applicable safety instructions to protect against exposure to electricity, gas, fluids, air pressure, etc.
- PC21. ensure all the personnel involved use the recommended PPE during the repair and maintenance activities
- PC22. maintain the relevant records with respect to the repair and maintenance of the equipment

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. applicable documentation requirements regarding the service and repair of mechanical equipment
- KU2. the applicable safe working practices to be followed during the repair and maintenance activities
- KU3. how to minimise the hazards associated with carrying out repair and maintenance services, such as dealing with stored pressure/force; use of power tools and equipment; repair and replacement of sharp components, etc.
- KU4. the importance of ensuring that only trained personnel carry out or assist in the repair and maintenance of equipment
- KU5. the applicable quality and safety standards
- KU6. the importance of carrying out the repair and maintenance activities within the agreed timescales
- KU7. how various mechanical equipment function, along with the purpose of various units/components in the equipment and how they interact
- KU8. the applicable isolation and lock-off procedures for different mechanical equipment
- KU9. the procedures to be followed for investigating the faults, and how to deal with intermittent faults
- KU10. the possible causes for various faults, such as leaks, misaligned guarding, patch holes, unplugged fasteners, excessive vibration, contamination, foreign objects, improper fasteners or connections, transit damage; incorrect geometrical alignment, improper floor or grouting; improper flow, pressure, speeds, etc.
- KU11. the relevant components, materials and consumables required for the repair and maintenance of mechanical equipment
- KU12. the recommended sequence to be followed for dismantling/reassembling different types of mechanical equipment
- KU13. how to identify wear and tear or damage in various mechanical equipment components and ensure they are fit for purpose
- KU14. how to determine if the removed components are fit for purpose, and the need to replace them
- KU15. use of various aids for equipment testing and fault diagnosis such as manufacturer's manual, layout diagram, flow charts, fault analysis charts, etc.
- KU16. use of relevant testing devices such as thermal indicator, dial test indicator, torque measuring devices, self-diagnostic, and relevant testing devices
- KU17. how to make relevant adjustments to components/assemblies to ensure their smooth

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functioning

- KU18.** the importance of making 'off-load' checks before running the equipment under power
- KU19.** the importance of carrying out appropriate documentation and/ the respect to repair and maintenance such as breakdown report, service report, conformance report
- KU20.** the equipment operating and control procedures to be applied during the repair and maintenance activities
- KU21.** various problems associated with mechanical equipment components, such as pumps, process control valves, compressor, etc.
- KU22.** the importance of carrying out repair and maintenance activities in a systematic manner for efficient completion of tasks
- KU23.** how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points
- KU24.** various components, materials and machine consumables required for the repair and maintenance of mechanical equipment
- KU25.** the importance of running the equipment at reduced power and/or in incremental stages to ensure satisfactory performance before conducting full load checks
- KU26.** appropriate adjustments required to be made to various components and assemblies to ensure their correct functioning
- KU27.** the fault diagnostic techniques that can be used to help identify problems with the equipment such as half-split technique, emergent sequence, unit substitution, six-point technique, etc.
- KU28.** use of the relevant tools and equipment such as multimeter, continuity tester, pressure testing device, flow testing devices, diagnostic aids, etc.
- KU29.** the relevant techniques used to dismantle mechanical equipment in order to replace defective components
- KU30.** how to reassemble and adjust the dismantled components after repair
- KU31.** the common issues encountered with electrical connections in mechanical equipment and how to resolve them
- KU32.** how to repair various electronic components used in the mechanical equipment

Generic Skills (GS)

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

- GS1.** maintain work-related notes and records
- GS2.** undertake work-related numerical computations
- GS3.** use the appropriate units of measurement and measuring techniques
- GS4.** read the relevant literature to learn about the latest developments in the field of work
- GS5.** listen attentively to understand the information or instructions being shared
- GS6.** communicate politely and professionally
- GS7.** plan and prioritise tasks to ensure timely completion
- GS8.** coordinate with co-workers to achieve the work objectives
- GS9.** evaluate all possible solutions to a problem to select the best one
- GS10.** take prompt decisions to deal with workplace emergencies and accidents

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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0503
NOS Name	Provide the breakdown service for mechanical equipment
Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery
Occupation	Service
NSQF Level	5
Credits	TBD
Version	2.0
Last Reviewed Date	
Next Review Date	
Deactivation Date	
NSQC Clearance Date	



Qualification Pack

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 their importance in NOS. SSC will also lay down the proportion of marks for Theory and Skills Practical for each PC.
3. The assessment for the theory part will/may be based on a knowledge bank of questions approved by 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 a 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
Total						

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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
CNC	Computer Numerically Controlled
CAD	Computer Aided Design
2D	2 Dimensional
3D	3 Dimensional
CO ₂	Carbon Dioxide
CPR	Cardiac Pulmonary Resuscitation
ISO	International Organization For Standardization
PPE	Personal Protective Equipment
CD	Compact Disc
DVD	Digital Video Disc Or Digital Versatile Disc

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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 a 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 that 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 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.