QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR CAPITAL GOODS INDUSTRY

## Contents



### What are Occupational Standards(OS) ?

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


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## Introduction

### Qualifications Pack- Service Engineer - Breakdown Service

**SECTOR/S:** CAPITAL GOODS

**SUB-SECTOR:**

1. Machine Tools
2. Textile Manufacturing Machinery
3. Plastics Manufacturing Machinery
4. Process Plant Machinery
5. Electrical and Power Machinery

**OCCUPATION:** Service

**REFERENCE ID:** CSC/Q0503

**ALIGNED TO:** NCO-2004/NIL

**Brief Job Description:** Deliver breakdown service for a range of mechanical equipment. It also involves identifying customer requirements; decision making on the need for repair, replacement or modification; communication with the customer on the course of action required; applying maintenance engineering techniques to equipment or component modification or repair; planning for spares based on probability of failure/ wear & tear and criticality of the component/ machine for production and carrying out Root Cause Analysis for repeated/ long breakdowns to find out a permanent solution.

**Personal Attributes:** Basic communication, numerical and computational abilities. Openness to learning, ability to plan and organize own work and identify and solve problems in the course of working. Understanding the need to take initiative and manage self and work to improve efficiency and effectiveness.

Job Details

| | | | |
|---|---|---|---|
| **Qualifications Pack Code** | **CSC/Q0503** | | |
| **Job Role** | **Service Engineer - Breakdown Service**<br>**[Applicable for National Scenarios]** | | |
| **Credits** | **TBD** | **Version number** | **1.0** |
| **Sector** | **Capital Goods** | **Drafted on** | **24/04/2014** |
| **Sub-sector** | **1. Machine Tools**<br>**2. Plastics Manufacturing Machinery**<br>**3. Textile Manufacturing Machinery**<br>**4. Process Plant Machinery**<br>**5. Electrical and Power Machinery** | **Last reviewed on** | **24/11/2017** |
| **Occupation** | **Service** | **Next review date** | **24/11/2021** |
| **NSQC Clearance on** | **18/06/2015** | | |

| Job Role | Service Engineer - Breakdown Service |
|---|---|
| **Role Description** | Perform breakdown service for a range of mechanical equipment such as machine tools, process control equipment, rotating mechanical equipment, conveyors, equipment for lifting and handling, process plant equipment, in accordance with approved procedures. |
| **NSQF level** | 5 |
| **Minimum Educational Qualifications**<br>**Maximum Educational Qualifications** | Diploma - Mechanical Engineering<br>Not Applicable |
| **Prerequisite License or Training** | No Previous Training Required |
| **Minimum Job Entry Age** | 18 Years |
| **Experience** | Minimum 1 year as a Service Engineer Installation or Commisioning |
| **Applicable National Occupational Standards (NOS)** | **Compulsory:**<br>1. CSC/N0501 Install mechanical equipment at site<br>2. CSC/N0502 Commission mechanical equipment after installation at site<br>3. CSC/N0503 Deliver breakdown service on mechanical equipment installed and commissioned on site<br>4. CSC/N1335 Use basic health and safety practices at the workplace<br>5. CSC/N1336 Work effectively with others |
| **Performance Criteria** | As described in the relevant OS units |

Definitions

| Keywords /Terms | Description |
|---|---|
| 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 they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts. |
| Performance Criteria | Performance criteria are statements that together specify the standard of performance required when carrying out a task. |
| National Occupational Standards (NOS) | NOS are occupational standards which apply uniquely in the Indian context. |
| Qualifications Pack(QP) | QP comprises the set of OSs, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code. |
| 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. |
| Unit Code | Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N' |
| Unit Title | Unit title gives a clear overall statement about what the incumbent should be able to do. |
| Description | Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for. |
| Scope | Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required. |
| Knowledge and Understanding | Knowledge and understanding are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual need 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. |

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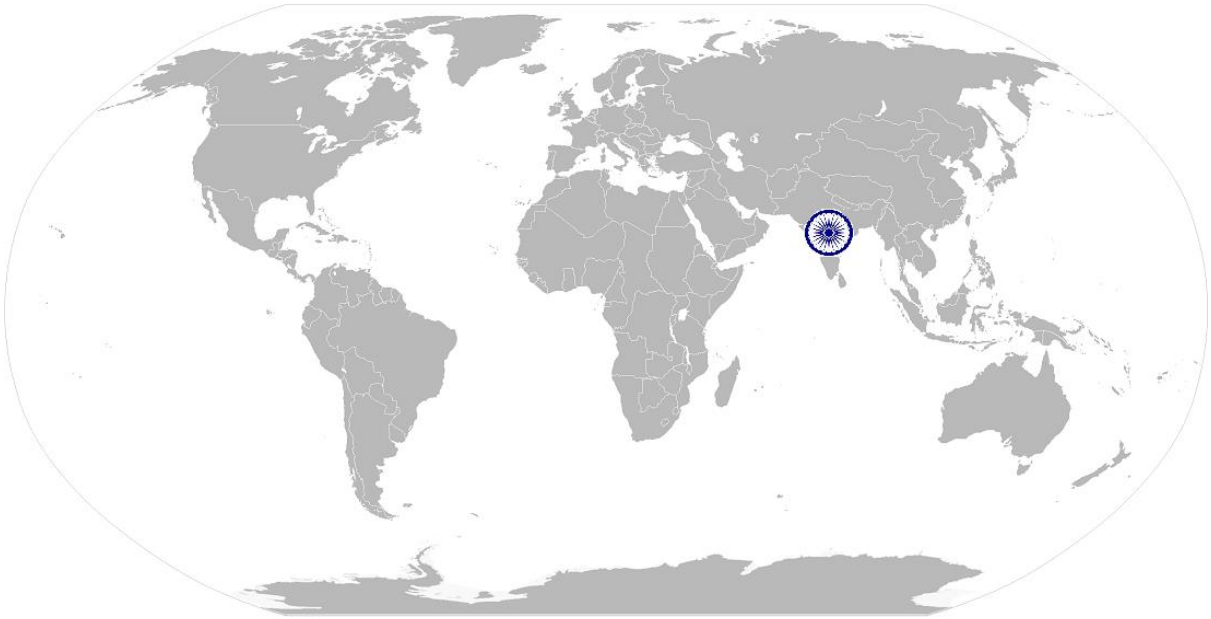
| Core Skills/ Generic Skills | Core skills or generic skills are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. In the context of the OS, these include communication related skills that are applicable to most job roles. |

## Acronyms

| Keywords /Terms | Description |
|---|---|
| NDT | Non Destructive Test |
| PLC/PC | Programmable Logic Controller / Programmable Controller |
| $CO_2$ | Carbon Dioxide |
| CPR | Cardiac Pulmonary Resuscitation |
| PPE | Personal Protective Equipment |

**CSC/N0501** **Install mechanical equipment at site**

# National Occupational Standard



## Overview

**This unit covers the installing of a range of mechanical equipment such as machine tools, process control equipment, rotating mechanical equipment, conveyors, equipment for lifting and handling, hydraulic press, furnaces, auto/ manual welding machines, shot blasting machines, process plant equipment, in accordance with approved procedures.**

**CSC/N0501** **Install mechanical equipment at site**

National Occupational Standard

| Unit Code | CSC/N0501 |
|---|---|
| **Unit Title (Task)** | **Install mechanical equipment at site** |
| **Description** | This unit covers the skills and knowledge required for installing a range of mechanical equipment such as machine tools, process control equipment, rotating mechanical equipment, conveyors, lifting and handling equipment hydraulic press, furnaces, auto / manual welding machines, shot blasting machines and processing plant machinery that have mechanical systems connected to them, in accordance with approved procedures. |
| **Scope** | This unit/task covers the following:<br>• Work safely<br>• Carry out a site check, prior to the installation<br>• Carry out a check on receiving the product for installation<br>• Prepare the product for installation<br>• Install the mechanical equipment |

| **Performance Criteria(PC) w.r.t. the Scope** | |
|---|---|
| **Element** | **Performance Criteria** |
| **Work safely** | To be competent, the user/individual on the job must be able to:<br>PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work<br>PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing installation operations<br>PC3. ensure work area is clean and safe from hazards<br>PC4. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition<br>PC5. obtain clearance to carry out the installation activities<br>PC6. provide safe access and working arrangements for the installation area<br>PC7. ensure safe isolation of services during the installation<br>PC8. dispose of waste items in a safe and environmentally acceptable manner<br>PC9. leave the work area in a safe condition and free from foreign object debris |
| **Carry out a site check prior to the installation** | To be competent, the user/individual on the job must be able to:<br>PC10. plan the installation activities in an efficient and appropriate manner<br>PC11. survey and inspect the site and foundation for the following<br>Inspect the following: ensure that the site is accessible; ensure that site is free from obstructions or hazards; conduct load test to test suitability of foundation where required; ensure the site is suitably prepared for the mechanical equipment installation to take place<br>PC12. ensure that appropriate utilities are available (eg. gas, water, air, electricity) |

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| | PC13. ensure that required installation consumables are available<br>PC14. ensure that safety and environmental conditions can be met<br>PC15. obtain necessary permits to carry out the required work<br>PC16. check the installation job specification documentation are available and correct<br>Job specification documents: e.g. assembly drawings; layout drawings; contractual specifications; manufacture's guidelines for installation; spares check and handover; manuals check and handover, etc.<br>PC17. instruct and supervise marking out of positioning and layouts |
| **Carry out a check on receiving the product for installation** | To be competent, the user/individual on the job must be able to:<br>PC18. check and record for any physical damages to the machine/equipment<br>PC19. compare received product and accessories with product order specifications<br>PC20. take appropriate action in lieu with manufacturer and customer, in case of any deviations |
| **Prepare the product for installation** | To be competent, the user/individual on the job must be able to:<br>PC21. instruct and supervise use of grouting and adhesives after conducting foundation/site inspection<br>PC22. instruct and supervise drilling holes for rig and anchor bolts<br>PC23. instruct and supervise the movement and positioning of equipment, using cranes or forklifts as per the layout<br>PC24. remove moisture absorbent bags, rust preventive, locking devices<br>PC25. fill oils for lubrication, hydraulic and other special oils<br>PC26. ensure the machine is clean |
| **Install the mechanical equipment** | To be competent, the user/individual on the job must be able to:<br>PC27. install the machine in accordance with manufacturers' and site specifications<br>PC28. perform routine modifications/alterations as per standard operating procedures or in consultation with manufacturer and customer, where required<br>PC29. use the various installation tools and equipment as required<br>Instruments: straight edges and feeler gauges; spirit levels with appropriate accuracy; mandrels; dial test indicators; measuring instruments (meter tape, vernier caliper, micrometers, depth gauges); plumb lines and taut wires; tension meters; customized gauges; multimeters; autocollimator; laser interferometer; right angle/square block<br>PC30. apply installation techniques like leveling, aligning, coupling and connecting in accordance with specifications<br>PC31. fill coolants, oil and other fluids as per specifications<br>PC32. ensure the site is cleaned and clear of all debris and left in safe state<br>PC33. check that all reports and documentation are completed correctly to required specifications |

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| | PC34. produce installations which comply with the equipment manufacturer's operation specification/range<br>PC35. deal promptly and effectively with problems within control, and seek help and guidance from the relevant people for problems that cannot be resolved<br>PC36. complete the relevant paperwork, and pass to the appropriate people<br>Paperwork: work instruction checklist along with non-conformance report; installation records; company specific documentation; service report to be signed by customer; maintain and hand-over log data sheet<br>PC37. give a brief to the customer staff on do's and don'ts of the operation and maintenance of the machine<br>PC38. switch on product equipment and carry out check for proper functioning without load<br>Checks: system turns on; input and output voltage levels are being arrived at; hydraulics are working; pressure is building as per requirement; working of fans, motors, ACs, etc. and functioning properly; various sub-parts of the machinery functions; check oils and coolant; testing that the equipment operates to the installation specification<br>PC39. make adjustments, appropriate to the equipment being installed |
| **Knowledge and Understanding (K)** | |
| **A. Organizational Context**(Knowledge of the company/organization andits processes) | The user/individual on the job needs to know and understand:<br>KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions<br>KA2. relevant health and safety requirements applicable in the work place<br>KA3. importance of working in clean and safe environment<br>KA4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities<br>KA5. reporting structure, inter-dependent functions, lines and procedures in the<br>KA6. work area<br>KA7. relevant people and their responsibilities within the work area<br>KA8. escalation matrix and procedures for reporting work and employment related issues<br>KA9. documentation and related procedures applicable in the context of employment and work<br>KA10. importance and purpose of documentation in context of employment and work |
| **B. Technical Knowledge** | The user/individual on the job needs to know and understand:<br>KB1. procedures to be carried out before starting work on the installation<br>KB2. specific safe working practices, installation procedures and environmental regulations that must be observed<br>KB3. hazards associated with carrying out the installation of machinery and plant |

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| | equipment and how can they be minimized<br>KB4. personal protective equipment to be used during the fabrication and fitting activities and where can it be obtained<br>KB5. types and sources of appropriate job specifications<br>Job specification documents: e.g. assembly drawings; layout drawings; contractual specifications; manufacture's guidelines for installation; spares check and handover; manuals check and handover<br>KB6. common terminology used in installation of machinery and plant equipment<br>KB7. interpretation of drawings, standards, quality control procedures and specifications used for the installation including testing procedures<br>KB8. equipment to be installed, its operating procedures and function<br>KB9. methods of marking out the site for positioning of the equipment, and the tools and equipment used for this<br>KB10. methods of drilling holes for rag and expanding bolts (including the use of grouting and adhesives)<br>KB11. various mechanical fasteners that will be used, and their method of installation (eg. threaded fasteners, special securing devices, masonry fixing devices)<br>KB12. torque loading requirements of the fasteners, and what to do if these loadings are exceeded or not achieved<br>KB13. correct tools, equipment, and fasteners for the installation activities<br>KB14. types of tools and instruments used to position, secure and align the equipment (eg. spanners, wrenches, crow bars, torque wrenches, engineer's levels, alignment telescopes and laser devices)<br>Instruments: straight edges and feeler gauges; spirit levels with appropriate accuracy; mandrels; dial test indicators; measuring instruments (meter tape, vernier caliper, micrometers, depth gauges); plumb lines and taut wires; tension meters; customized gauges; multimeters; autocollimator; laser interferometer; right angle/square block<br>KB15. techniques used to position, align, level and adjust the equipment<br>KB16. methods of lifting, handling and supporting the equipment during the installation activities<br>KB17. methods of connecting to mechanical power transmission devices (eg. belt and chain drives, couplings, clutches and brakes)<br>KB18. methods of connecting equipment to service supplies (eg. electrical, fluid power, compressed air oil and fuel supplies)<br>KB19. procedure for the safe disposal of waste materials<br>KB20. how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy, and quality of the installation<br>Checks: setting working clearance; tensioning; checking level and alignment; |

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| | making visual checks for completeness and freedom from damage; making sensory checks (sight, sound, smell, touch); ensuring that moving parts are guarded and clear of obstruction; checking torque settings of fasteners fitted at the site; ensuring locking devices are fitted to fasteners (where appropriate); ensure fulfillment of specific instruction in manufactures' guidelines<br>KB21. how to recognize installation defects and how to address them appropriately Defects: leaks, poor seals, misalignment, ineffective fasteners, foreign object damage, contamination, vibration, etc.<br>KB22. importance of ensuring that the completed installation is free from dirt, and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected<br>KB23. calibration/care and control procedures for tools and equipment<br>KB24. problems that can occur with the installation operations, and how these can be overcome<br>KB25. fault-finding techniques to be used when the equipment fails to operate correctly<br>KB26. recording documentation and importance of completing it accurately and timely for the activities undertaken<br>KB27. extent of own responsibility, and whom to report to in case there is a problems that is not getting resolved<br>KB28. reading of various job related engineering drawings<br>KB29. knowledge of the mechanical equipment function and product<br>KB30. knowledge of component machining processes<br>KB31. relevant basic electrical installation theory (electrical connections of the equipment to be installed)<br>KB32. do's and don'ts of operating and maintaining the machine |
| **Skills (S)** | |
| **A. Core Skills/ Generic Skills** | **Reading Skills** |
| | The user/ individual on the job needs to know and understand how to:<br>SA1. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language |
| | **Writing Skills** |
| | The user/individual on the job needs to know and understand how to:<br>SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language<br>SA3. undertake numerical operations, geometry and calculations/ formulae arithmetic: addition, subtraction, multiplication, division, fractions and |

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| | decimals, percentages and proportions, simple ratios and averages<br>SA4. use appropriate measuring techniques<br>SA5. express numerical solutions to a degree of accuracy that is appropriate to the value being calculated<br>degree of accuracy: correct to three significant figures, correct to two decimal places, express a decimal fraction in standard form, express tolerance in terms of limits of size<br>SA6. use a calculator to raise a number to a power and determine square roots<br>SA7. use formulae to complete transpositions and solve problems<br>transpositions: involving addition, subtraction, multiplication and division in any combination using a maximum of three terms, for example Ohm's Law, substitution of known values<br>SA8. use algebraic expressions to solve linear equations<br>SA9. plot and interpret straight line graphs<br>SA10. apply pythagoras' theorem to perform calculations<br>SA11. explain how to use sine, cosine and tangent to solve typical engineering problems<br>sine, cosine and tangent: state their ratios for angles up to 90°, determine their values for given angles up to 90°, solve simple problems<br>SA12. define density and relative density and solve related problems using formula<br>SA13. define moments of a force and solve related problems using formula<br>moments of a force: define and apply the 'Principle of Moments', define the meanings of the terms 'torque' & 'couple'<br>SA14. define work, power and energy and solve related problems using formula<br>work, power and energy: explain what is meant by energy; state that the unit of energy is the joule (J), the unit of power is the watt (W) and the unit of work is the joule (J); define power in terms of voltage/current and work done per second, perform calculations for work, power and energy, levers and couples work, power and energy, define work done in terms of force and distance moved<br>SA15. define friction and solve related problems using formula<br>friction: definition, explain coefficient of friction, explain how friction can be educed, select materials that will rotate, or slide together with low frictional value, perform calculations for friction<br>SA16. describe the relationship between temperature changes and changes in length<br>temperature: define coefficient of expansion, solve numerical problems to determine the change in length due to temperature<br>SA17. define types of heat and solve related problems using formula<br>heat: define specific heat capacity, specific latent heat (fusion, evaporation) |

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| | solve numerical problems associated with specific heat capacity, specific latent heat of fusion, specific latent heat of evaporation<br>SA18. measure heights and angles at a site |
| | **Oral Communication (Listening and Speaking skills)** |
| | The user/individual on the job needs to know and understand how to:<br>SA19. convey and share technical information clearly using appropriate language<br>SA20. check and clarify task-related information<br>SA21. liaise with appropriate authorities using correct protocol<br>SA22. communicate with people in respectful form and manner in line with organizational protocol<br>SA23. listen to questions and concerns of the customer and provide resolution in a respectful manner as per organizational guidelines<br>SA24. be well dressed and groomed<br>SA25. put forward ones point of view in a convincing manner |
| **B. Professional Skills** | **Decision Making** |
| | NA |
| | **Plan and Organize** |
| | The user/individual on the job needs to know and understand how to:<br>SB1. plan, prioritize and sequence work operations as per job requirements<br>SB2. organize and analyze information relevant to work<br>SB3. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time |
| | **Customer Centricity** |
| | The user/individual on the job needs to know and understand how to:<br>SB4. exercise restraint while expressing dissent and during conflict situations<br>SB5. follow correct communication protocols with customers<br>SB6. work towards ensuring customer satisfaction and delight<br>SB7. contribute to customer satisfaction<br>SB8. meet customer needs for information and assistance<br>SB9. recognize and communicate limits of one's authority and ability in responding to customer expectations<br>SB10. collect and pass on accurate and timely customer feedback to appropriate company authorities<br>SB11. handle customer disgruntlement and dissatisfaction |
| | **Problem Solving** |
| | The user/individual on the job needs to know and understand how to:<br>SB12. identify problems with work planning, procedures, output and behavior and their implications |

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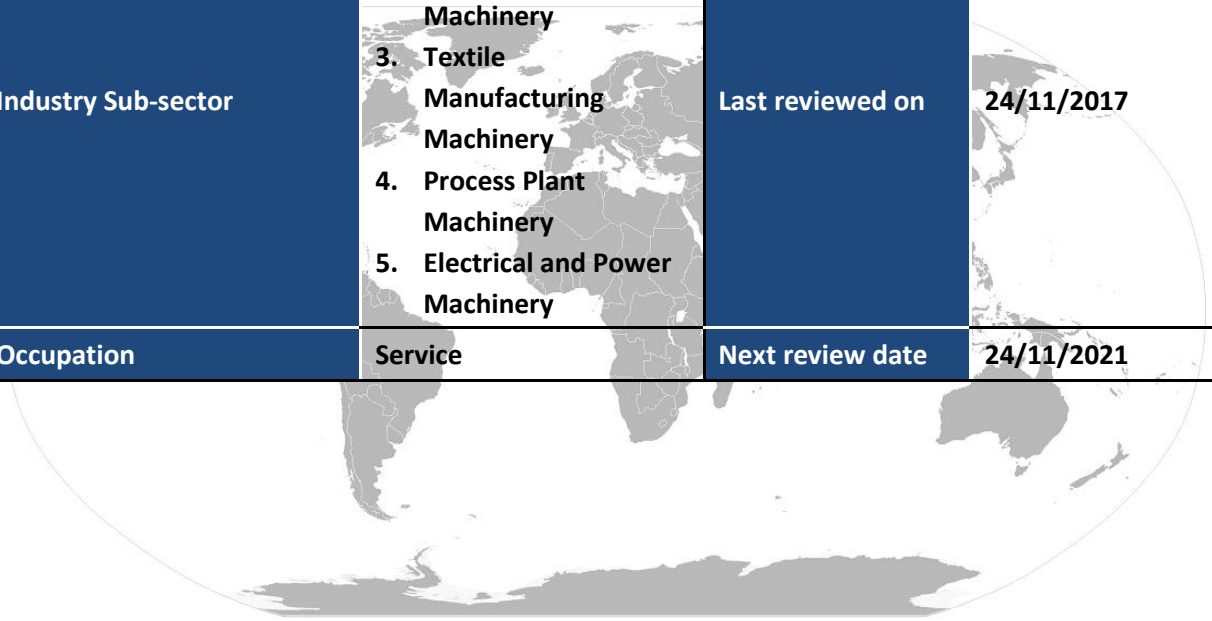
| | SB13. prioritize and plan for problem solving<br>SB14. communicate problems appropriately to others<br>SB15. identify sources of information and support for problem solving<br>SB16. seek assistance and support from other sources to solve problems<br>SB17. identify effective resolution techniques<br>SB18. select and apply resolution techniques<br>SB19. seek evidence for problem resolution |
| | **Analytical Thinking** |
| | The user/individual on the job needs to know and understand how to:<br>SB20. undertake and express new ideas and initiatives to others<br>SB21. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses<br>SB22. participate in improvement procedures including process, quality and internal/external customer/supplier relationships<br>SB23. enhance one's competencies in new and different situations and contexts to achieve more |
| | **Critical Thinking** |
| | The user/individual on the job needs to know and understand how to:<br>SB24. apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action<br>SB25. participate in on-the-job and other learning, training and development interventions and assessments<br>SB26. clarify task related information with appropriate personnel or technical adviser<br>SB27. seek to improve and modify own work practices<br>SB28. maintain current knowledge of application standards, legislation, codes of practice and product/process developments |

**CSC/N0501** **Install mechanical equipment at site**

# NOS Version Control

| NOS Code | CSC/N0501 | | |
|---|---|---|---|
| Credits | TBD | Version number | 1.0 |
| Industry | Capital Goods | Drafted on | 24/04/2014 |
| Industry Sub-sector | 1. Machine Tools<br>2. Plastics Manufacturing Machinery<br>3. Textile Manufacturing Machinery<br>4. Process Plant Machinery<br>5. Electrical and Power Machinery | Last reviewed on | 24/11/2017 |
| Occupation | Service | Next review date | 24/11/2021 |



**CSC/N0502 Commission mechanical equipment after installation at site**

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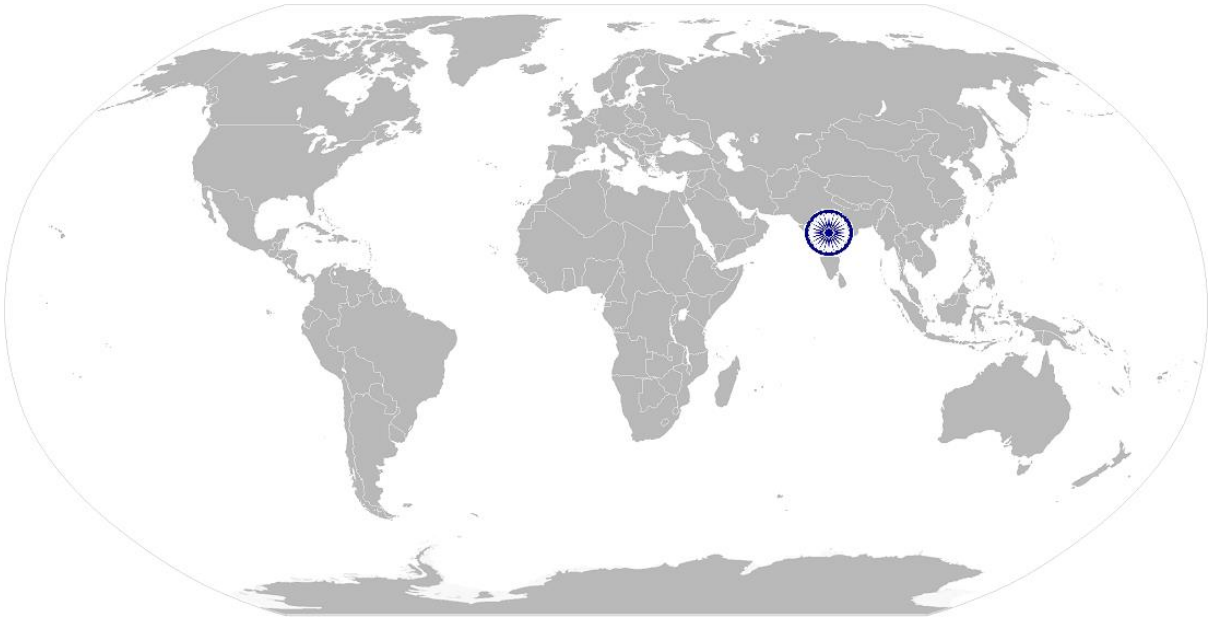
# National Occupational Standard



## Overview

**This unit covers the commissioning of a range of mechanical equipment such as machine tools, process control equipment, rotating mechanical equipment, conveyors, equipment for lifting and handling, hydraulic press, furnaces, auto / manual welding machines, shot blasting machines, process plant equipment, in accordance with approved procedures.**

## CSC/N0502 Commission mechanical equipment after installation at site

National Occupational Standard

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| **Unit Code** | **CSC/N0502** |
| **Unit Title (Task)** | **Commission mechanical equipment after installation at site** |
| **Description** | This unit covers the commissioning of a range of mechanical equipment such as machine tools, process control equipment, rotating mechanical equipment, equipment for lifting and handling, hydraulic press, furnaces, auto / manual welding machines, shot blasting machines, process plant equipment, after installation, in accordance with approved procedures. |
| **Scope** | This unit/task covers the following:<br>• Work safely<br>• Prepare to commission the mechanical equipment<br>• Commission the mechanical equipment |
| **Performance Criteria(PC) w.r.t. the Scope** | |
| **Element** | **Performance Criteria** |
| **Work safely** | To be competent, the user/individual on the job must be able to:<br>PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work<br>PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing installation operations ensure work area is clean and safe from hazards<br>PC3. work following laid down procedures and instructions<br>PC4. ensure work area is clean and safe from hazards<br>PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition<br>PC6. follow all relevant setting up and operating specifications for the products or mechanical equipment being commissioned<br>PC7. follow the defined procedures and set up the equipment correctly ensuring that all operating parameters are achieved |
| **Prepare to commission the mechanical equipment** | To be competent, the user/individual on the job must be able to:<br>PC8. plan the commissioning activities so as to minimize disruption to normal working<br>PC9. ensure that all tools and equipment used are within current calibration dates<br>PC10. obtain clearance to carry out the commissioning activities<br>PC11. isolate equipment from electricity, gas or fluids during commissioning<br>PC12. prepare the work area for the commissioning operations as per procedure or operational specification<br>PC13. ensure that the site is accessible, free from obstructions or hazards<br>PC14. obtain relevant information required to undertake the commissioning |

**CSC/N0502 Commission mechanical equipment after installation at site**

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| | Information: client requirements; equipment specifications; manufacturers' manuals/settings; regulations and guidelines; environmental requirements; installation reports; commissioning procedures/work instructions; product/process specifications; resources necessary to carry out commissioning (such as manpower, supplies, time constraints); drawings of assembly and circuits |
| **Commission the mechanical equipment** | To be competent, the user/individual on the job must be able to:<br>PC15. carry out start-up procedures, and confirm that the functioning meets specifications<br>PC16. run equipment at the recommended initial settings (eg. reduced power / speed/ flow)<br>PC17. check for leaks during operations, make sensory checks (sight, sound, smell, touch)<br>PC18. run through the operating sequence, and check for correct functioning<br>PC19. load the system incrementally, and make any necessary adjustments to settings to achieve the specification parameters<br>Specification parameters: speeds, feeds, pressures, flow, timing, sequence<br>PC20. conduct a trial run of the equipment at full power/speed/flow<br>PC21. confirm that the final product/process outcomes meet specifications<br>PC22. monitor and record measurements and observations<br>PC23. shut down and/or isolate the installed equipment to a safe condition<br>PC24. deal with equipment malfunction and rectify faults during the commissioning process as appropriate<br>PC25. dismantle mechanical equipment in order to replace defective components (eg. release of pressures/force, proof-marking of components, removal of components by extraction or pressing)<br>PC26. re-assemble the removed components, and adjust them to meet the operating specification<br>PC27. ensure that the commissioned equipment complies with specified standards<br>PC28. complete the machine related documentation like backups, manuals, logs, etc. and hand over to the appropriate people<br>Documentation and paperwork: work instruction checklist along with non-conformance report; commissioning log/report (including checks and tests undertaken where the installation fails to meet the specification requirements, probable causes/sources of the defect and recommended actions to correct the fault); job sheet; customer specific documentation; handover report |
| **Knowledge and Understanding (K)** | |
| **A. Organizational** | The user/individual on the job needs to know and understand:<br>KA1. legislation, standards, policies, and procedures followed in the company |

**CSC/N0502 Commission mechanical equipment after installation at site**

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| **Context** (Knowledge of the company/ organization and its processes) | relevant to own employment and performance conditions<br>KA2. relevant health and safety requirements applicable in the work place<br>KA3. importance of working in clean and safe environment<br>KA4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities<br>KA5. reporting structure, inter-dependent functions, lines and procedures in the<br>KA6. work area<br>KA7. relevant people and their responsibilities within the work area<br>KA8. escalation matrix and procedures for reporting work and employment related issues<br>KA9. documentation and related procedures applicable in the context of employment and work<br>KA10. importance and purpose of documentation in context of employment and work |
| **B. Technical Knowledge** | The user/individual on the job needs to know and understand:<br>KB1. procedures to be carried out before starting work on the installation<br>KB2. specific safe working practices, installation procedures and environmental regulations that must be observed<br>KB3. hazards associated with carrying out the installation of machinery and plant equipment and how can they be minimized<br>KB4. personal protective equipment to be used during the fabrication and fitting activities and where can it be obtained<br>KB5. types and sources of appropriate job specifications<br>Job specification documents: e.g. assembly drawings; layout drawings; contractual specifications; manufacture's guidelines for installation; spares check and handover; manuals check and handover<br>KB6. common terminology used in installation of machinery and plant equipment<br>KB7. interpretation of drawings, standards, quality control procedures and specifications used for the installation including testing procedures<br>KB8. equipment to be installed, its operating procedures and function<br>KB9. methods of marking out the site for positioning of the equipment, and the tools and equipment used for this<br>KB10. methods of drilling holes for rag and expanding bolts (including the use of grouting and adhesives)<br>KB11. various mechanical fasteners that will be used, and their method of installation (eg. threaded fasteners, special securing devices, masonry fixing devices)<br>KB12. torque loading requirements of the fasteners, and what to do if these loadings are exceeded or not achieved<br>KB13. correct tools, equipment, and fasteners for the installation activities |

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| | KB14. types of tools and instruments used to position, secure and align the equipment (eg. spanners, wrenches, crow bars, torque wrenches, engineer's levels, alignment telescopes and laser devices)<br>Instruments: straight edges and feeler gauges; spirit levels with appropriate accuracy; mandrels; dial test indicators; measuring instruments (meter tape, vernier caliper, micrometers, depth gauges); plumb lines and taut wires; tension meters; customized gauges; multimeters; autocollimator; laser interferometer; right angle/square block<br>KB15. techniques used to position, align, level and adjust the equipment<br>KB16. methods of lifting, handling and supporting the equipment during the installation activities<br>KB17. methods of connecting to mechanical power transmission devices (eg. belt and chain drives, couplings, clutches and brakes)<br>KB18. methods of connecting equipment to service supplies (eg. electrical, fluid power, compressed air oil and fuel supplies)<br>KB19. procedure for the safe disposal of waste materials<br>KB20. how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy, and quality of the installation<br>Checks: setting working clearance; tensioning; checking level and alignment; making visual checks for completeness and freedom from damage; making sensory checks (sight, sound, smell, touch); ensuring that moving parts are guarded and clear of obstruction; checking torque settings of fasteners fitted at the site; ensuring locking devices are fitted to fasteners (where appropriate); ensure fulfillment of specific instruction in manufactures' guidelines<br>KB21. how to recognize installation defects and how to address them appropriately<br>Defects: leaks, poor seals, misalignment, ineffective fasteners, foreign object damage, contamination, vibration, etc.<br>KB22. importance of ensuring that the completed installation is free from dirt, and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected<br>KB23. calibration/care and control procedures for tools and equipment<br>KB24. problems that can occur with the installation operations, and how these can be overcome<br>KB25. fault-finding techniques to be used when the equipment fails to operate correctly<br>KB26. recording documentation and importance of completing it accurately and timely for the activities undertaken<br>KB27. extent of own responsibility, and whom to report to in case there is a problems that is not getting resolved |

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| | KB28. reading of various job related engineering drawings<br>KB29. knowledge of the mechanical equipment function and product<br>KB30. knowledge of component machining processes<br>KB31. relevant basic electrical installation theory (electrical connections of the equipment to be installed)<br>KB32. do's and don'ts of operating and maintaining the machine |
| **Skills (S)** | |
| **A. Core Skills/ Generic Skills** | **Reading Skills** |
| | The user/ individual on the job needs to know and understand how to:<br>SA1. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language |
| | **Writing Skills** |
| | The user/individual on the job needs to know and understand how to:<br>SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language<br>SA3. undertake numerical operations, geometry and calculations/ formulae arithmetic: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages<br>SA4. use appropriate measuring techniques<br>SA5. express numerical solutions to a degree of accuracy that is appropriate to the value being calculated<br>degree of accuracy: correct to three significant figures, correct to two decimal places, express a decimal fraction in standard form, express tolerance in terms of limits of size<br>SA6. use a calculator to raise a number to a power and determine square roots<br>SA7. use formulae to complete transpositions and solve problems<br>transpositions: involving addition, subtraction, multiplication and division in any combination using a maximum of three terms, for example Ohm's Law, substitution of known values<br>SA8. use algebraic expressions to solve linear equations<br>SA9. plot and interpret straight line graphs<br>SA10. apply pythagoras' theorem to perform calculations<br>SA11. explain how to use sine, cosine and tangent to solve typical engineering problems<br>Sine, cosine and tangent: state their ratios for angles up to 90°, determine their values for given angles up to 90°, solve simple problems<br>SA12. define density and relative density and solve related problems using formula<br>SA13. define moments of a force and solve related problems using formula |

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| | moments of a force: define and apply the 'Principle of Moments', define the meanings of the terms 'torque' & 'couple'<br>SA14. define work, power and energy and solve related problems using formula work, power and energy: explain what is meant by energy; state that the unit of energy is the joule (J), the unit of power is the watt (W) and the unit of work is the joule (J); define power in terms of voltage/current and work done per second, perform calculations for work, power and energy, levers and couples work, power and energy, define work done in terms of force and distance moved<br>SA15. define friction and solve related problems using formula<br>friction: definition, explain coefficient of friction, explain how friction can be educed, select materials that will rotate, or slide together with low frictional value, perform calculations for friction<br>SA16. describe the relationship between temperature changes and changes in length<br>temperature: define coefficient of expansion, solve numerical problems to determine the change in length due to temperature<br>SA17. define types of heat and solve related problems using formula<br>heat: define specific heat capacity, specific latent heat (fusion, evaporation) solve numerical problems associated with specific heat capacity, specific latent heat of fusion, specific latent heat of evaporation<br>SA18. measure heights and angles at a site |
| | **Oral Communication (Listening and Speaking skills)** |
| | The user/individual on the job needs to know and understand how to:<br>SA19. convey and share technical information clearly using appropriate language<br>SA20. check and clarify task-related information<br>SA21. liaise with appropriate authorities using correct protocol<br>SA22. communicate with people in respectful form and manner in line with organizational protocol<br>SA23. listen to questions and concerns of the customer and provide resolution in a respectful manner as per organizational guidelines<br>SA24. be well dressed and groomed<br>SA25. put forward ones point of view in a convincing manner |
| **B. Professional Skills** | **Decision Making** |
| | NA |
| | **Plan and Organize** |
| | The user/individual on the job needs to know and understand how to:<br>SB1. plan, prioritize and sequence work operations as per job requirements<br>SB2. organize and analyze information relevant to work |

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| | SB3. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time |
| | **Customer Centricity** |
| | The user/individual on the job needs to know and understand how to:<br>SB4. exercise restraint while expressing dissent and during conflict situations<br>SB5. follow correct communication protocols with customers<br>SB6. work towards ensuring customer satisfaction and delight<br>SB7. contribute to customer satisfaction<br>SB8. meet customer needs for information and assistance<br>SB9. recognize and communicate limits of one's authority and ability in responding to customer expectations<br>SB10. collect and pass on accurate and timely customer feedback to appropriate company authorities<br>SB11. handle customer disgruntlement and dissatisfaction |
| | **Problem Solving** |
| | The user/individual on the job needs to know and understand how to:<br>SB12. identify problems with work planning, procedures, output and behavior and their implications<br>SB13. prioritize and plan for problem solving<br>SB14. communicate problems appropriately to others<br>SB15. identify sources of information and support for problem solving<br>SB16. seek assistance and support from other sources to solve problems<br>SB17. identify effective resolution techniques<br>SB18. select and apply resolution techniques<br>SB19. seek evidence for problem resolution |
| | **Analytical Thinking** |
| | The user/individual on the job needs to know and understand how to:<br>SB20. undertake and express new ideas and initiatives to others<br>SB21. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses<br>SB22. participate in improvement procedures including process, quality and internal/external customer/supplier relationships<br>SB23. enhance one's competencies in new and different situations and contexts to achieve more |
| | **Critical Thinking** |
| | The user/individual on the job needs to know and understand how to:<br>SB24. apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action<br>SB25. participate in on-the-job and other learning, training and development |

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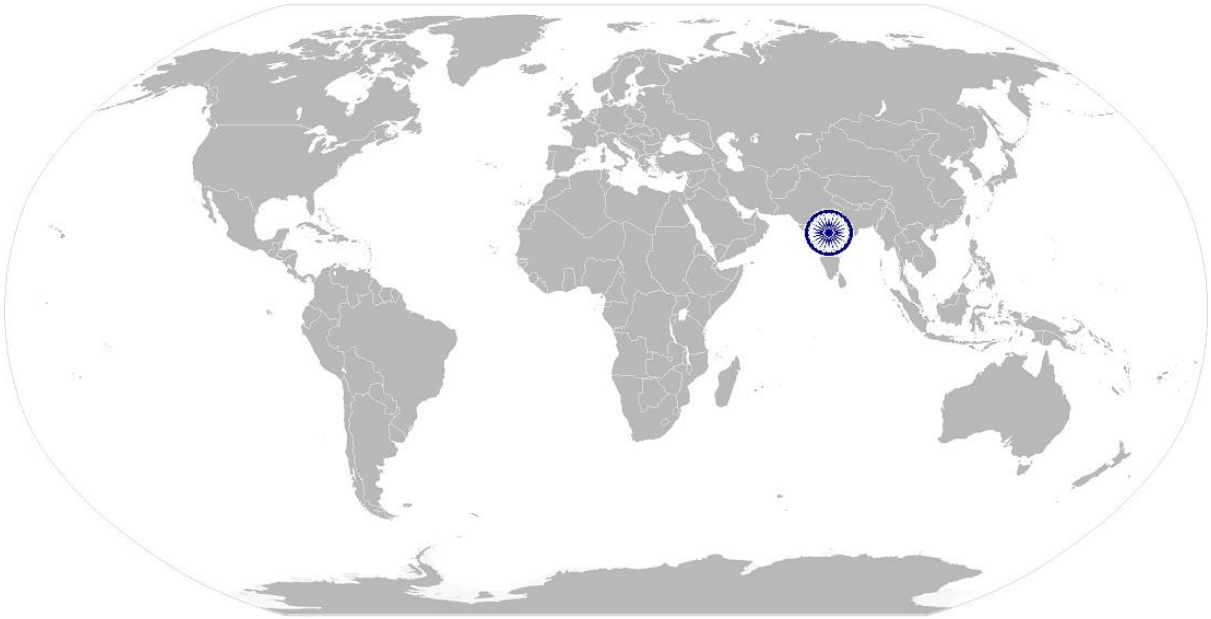
| | interventions and assessments<br>SB26. clarify task related information with appropriate personnel or technical adviser<br>SB27. seek to improve and modify own work practices<br>SB28. maintain current knowledge of application standards, legislation, codes of practice and product/process developments |



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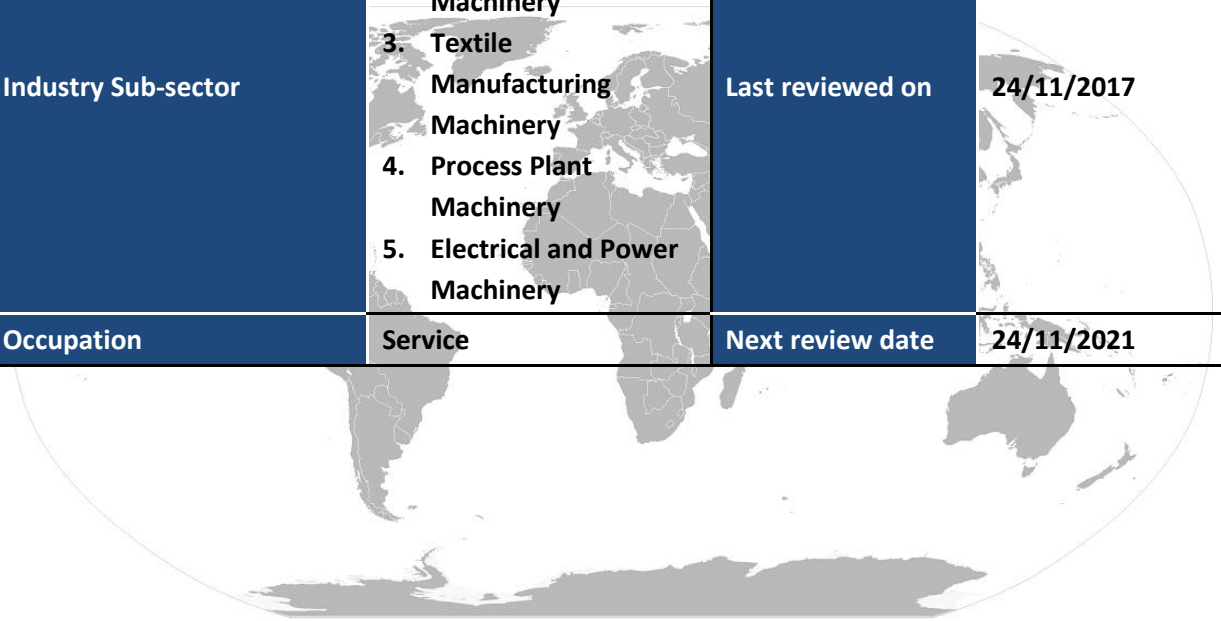
## NOS Version Control

| NOS Code | CSC/N0502 | | |
|---|---|---|---|
| Credits | TBD | Version number | 1.0 |
| Industry | Capital Goods | Drafted on | 24/04/2014 |
| Industry Sub-sector | 1. Machine Tools<br>2. Plastics Manufacturing Machinery<br>3. Textile Manufacturing Machinery<br>4. Process Plant Machinery<br>5. Electrical and Power Machinery | Last reviewed on | 24/11/2017 |
| Occupation | Service | Next review date | 24/11/2021 |



**CSC/N0503 Deliver breakdown service on mechanical equipment installed and commissioned on site**

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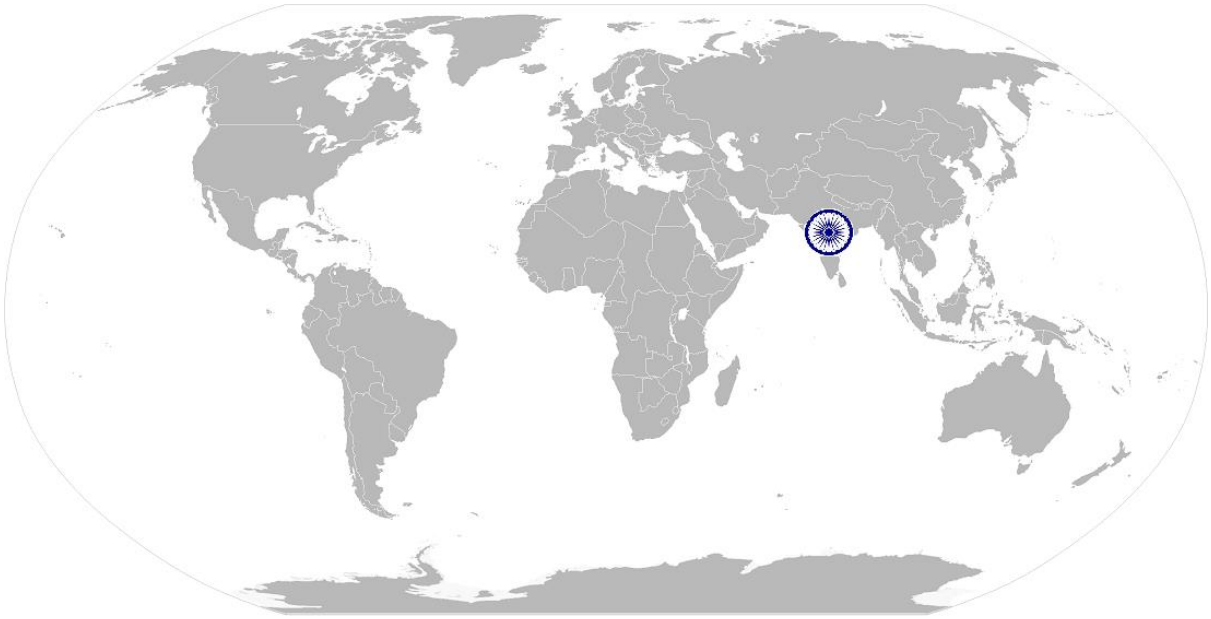
# National Occupational Standard



## Overview

**This unit covers the delivering of breakdown service for a range of mechanical equipment installed and commissioned at site such as machine tools, process control equipment, rotating mechanical equipment, conveyors, equipment for lifting and handling, hydraulic press, furnaces, auto / manual welding machines, shot blasting machines, process plant equipment, in accordance with approved procedures.**

## CSC/N0503 Deliver breakdown service on mechanical equipment installed and commissioned on site

National Occupational Standard

| Unit Code | CSC/N0503 |
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| **Unit Title (Task)** | **Deliver breakdown service on mechanical equipment installed and commissioned on site** |
| **Description** | This unit covers the skills and knowledge required for delivering breakdown service for a range of mechanical equipment installed and commissioned on site such as machine tools, process control equipment, rotating mechanical equipment, conveyors, equipment for lifting and handling, hydraulic press, furnaces, auto / manual welding machines, shot blasting machines, process plant equipment, in accordance with approved procedures. |
| **Scope** | This unit/task covers the following:<br>• Work safely<br>• Identify fault<br>• Suggest corrective action<br>• Ensure rectification of fault and hand over to customer |

| **Performance Criteria(PC) w.r.t. the Scope** | |
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| **Element** | **Performance Criteria** |
| **Work safely** | To be competent, the user/individual on the job must be able to:<br>PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work<br>PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing breakdown servicing operations<br>PC3. work following laid down procedures and instructions<br>PC4. ensure work area is clean and safe from hazards<br>PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition<br>PC6. follow all relevant setting up and operating specifications for the products or mechanical equipment being commissioned<br>PC7. follow the defined procedures and set up the equipment correctly ensuring that all operating parameters are achieved<br>Parameters: speeds, feeds, pressures, flow, timing, sequence |
| **Identify fault** | To be competent, the user/individual on the job must be able to:<br>PC8. identify customer requirements from verbal or written communication<br>PC9. check and clarify understanding about the fault from the customer or customer representative<br>PC10. collect evidence regarding the fault from the sources<br>Sources: person or operator who reported the fault; sensory input (sight, sound, smell, touch); monitoring equipment or gauges; plant/machinery |

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| | records; recording devices; condition of end product<br>PC11. use a range of fault diagnostic equipment to investigate the problem<br>Diagnostic equipment: manufacturer's manual, physical layout diagrams, algorithms, flow charts, probability charts/reports, fault analysis charts (eg. fault trees), equipment self-diagnostics, troubleshooting guides<br>PC12. apply monitoring or testing procedures to help in the fault diagnosis<br>Monitoring or testing procedures: level and alignment checks; force/pressure checks (eg. spring pressure, hydraulic or pneumatic pressures); leakage; vibration; thermal checks (eg. bearings, friction surfaces); movement checks (eg. travel, clearance, levers, links); setting travel; setting backlash in gears; setting working clearance; testing that the equipment operates to the installation specification; tensioning; topping up fluid/oil reservoirs; making 'off-load' checks; switching and checking all electricals and interlocks; making visual checks for completeness and freedom from damage; making sensory checks (sight, sound, smell, touch); validate torque settings of fasteners fitted at site; ensuring locking devices are fitted to fasteners (where appropriate<br>PC13. use various testing equipment to carry out relevant tests |
| **Suggest corrective action** | To be competent, the user/individual on the job must be able to:<br>PC14. evaluate various types of information available for fault diagnosis<br>PC15. evaluate sensory information to assess faults<br>PC16. evaluate preventative maintenance system requirements<br>PC17. review equipment or component condition analysis reports, including the results of any required NDT<br>PC18. review life cycle of the mechanical equipment<br>Mechanical equipment: gearboxes; machine tools; lifting and handling equipment; processing plant; production plant; engines; pumps; process control valves; compressors; transfer equipment; mechanical structures; work-holding devices<br>PC19. decide if repair, replacement or modification is appropriate<br>PC20. seek any necessary approvals<br>PC21. assess the need for technical and professional assistance<br>PC22. determine materials, components, maintenance processes, equipment and tools required to implement corrective action<br>PC23. create adequate and accurate calculations, preliminary graphics and maintain process records, including use of software, as appropriate<br>PC24. communicate to the customer the degree to which requirements can be met including details such as cost, delivery date, quantity or quality<br>PC25. propose alternatives for any inability to completely satisfy customer requirements |

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| **Ensure rectification of fault and hand over to customer** | To be competent, the user/individual on the job must be able to:<br>PC26. plan, schedule and coordinate the repair or modification task ensure that the service or maintenance activities are carried in the specified sequence and in an agreed timescale<br>PC27. communicate the service or maintenance activities to the team<br>PC28. allocate specific activities to each team member<br>PC29. monitor and support the repair or modification activities within the limits of their personal authority<br>PC30. dismantle mechanical equipment in order to replace defective components (eg. release of pressures/force, proof marking of components, removal of components by extraction or pressing)<br>PC31. re-assemble the removed components, and adjust them to meet the operating specification<br>PC32. carry out servicing and maintenance techniques as applicable<br>Servicing and maintenance techniques: dismantling equipment to unit/subassembly level; dismantling units to component level; proof marking/labelling of components; checking components for serviceability; replacing all lifed items (eg. seals, bearings, gaskets); replacing damaged/defective components; setting, aligning and adjusting replaced components; tightening fastenings to the required torque; making 'off-load' checks before starting up; replenishing oils and greases; safety system checks; functionally testing the completed system<br>PC33. conduct a trial run of the equipment at full power/speed/flow<br>PC34. confirm that the final product/process outcomes meet specifications<br>PC35. monitor and record measurements and observations<br>PC36. deal with equipment malfunction and rectify faults during the breakdown servicing process as appropriate<br>Categories of fault: any part not functioning; setting related problems; no availability of appropriate raw materials or consumables; defects of installation & commissioning; shortcoming in end product (load testing); shortcomings against specifications of the machine<br>Breakdown categories: intermittent problem; partial failure/out-of specificationoutput; complete breakdowns<br>PC37. ensure that the commissioned equipment complies with specified standards<br>PC38. complete the relevant paperwork, and pass to the appropriate people<br>PC39. deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve |

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| Knowledge and Understanding (K) | |
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| **A. Organizational Context** (Knowledge of the company/ organization and its processes) | The user/individual on the job needs to know and understand:<br>KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions<br>KA2. relevant health and safety requirements applicable in the work place<br>KA3. importance of working in clean and safe environment<br>KA4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities<br>KA5. reporting structure, inter-dependent functions, lines and procedures in the<br>KA6. work area<br>KA7. relevant people and their responsibilities within the work area<br>KA8. escalation matrix and procedures for reporting work and employment related issues<br>KA9. documentation and related procedures applicable in the context of employment and work<br>KA10. importance and purpose of documentation in context of employment and work |
| **B. Technical Knowledge** | The user/individual on the job needs to know and understand:<br>KB1. specific safe working practices, breakdown servicing procedures and environmental regulations that must be observed<br>KB2. hazards associated with carrying out breakdown servicing and how can theybe minimized<br>Hazards: handling oils; greases; stored pressure/force; misuse of tools; using damaged or badly maintained tools and equipment; not following laid-down maintenance procedures<br>KB3. personal protective equipment to be used during the servicing and maintenance activities and where can it be obtained<br>KB4. organizational process for receiving information and communicating customer requests for breakdown servicing<br>Information: client requirements; equipment specifications; manufacturers' manuals/settings; regulations and guidelines; environmental requirements; installation and commissioning reports; drawings of assembly and circuits<br>KB5. the importance of ensuring that teams have the required skills, knowledge and understanding in order to maintain equipment to the required standards<br>KB6. the isolation and lock-off procedures or permit-to-work procedure that applies<br>KB7. the procedures to be followed for investigating the faults, and how to deal with intermittent faults<br>KB8. how to analyse and evaluate possible characteristics and causes of specific |

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| | faults/problems<br>Causes or defects: leaks due poor seals, misaligned guarding, patch holes, unplugged fasteners, etc.; misalignment; improper fasteners or connections; transit damage; not meeting the geometrical alignments; product not meeting specifications; improper floor or grouting; fault in various settings(flow, pressure, speeds, etc.); unwanted vibrations; foreign object damage; contamination, rusting, etc.<br>KB9. procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities<br>KB10. sequence to be adopted for the dismantling/re-assembly of various types of assemblies<br>KB11. methods and techniques used to dismantle/assemble mechanical equipment<br>Methods and techniques: release of pressures/force, proof marking, extraction, pressing, alignment<br>KB12. methods of checking components are fit for purpose, and how to identify defects and wear characteristics<br>KB13. basic principles of how the equipment functions, operation sequence, the working purpose of individual units/components and how they interact<br>KB14. methods of checking that removed components are fit for purpose, and the need to replace `lifed' items<br>KB15. uses of measuring, testing and fault diagnosis equipment<br>Diagnostic equipment: manufacturer's manual, physical layout diagrams, algorithms, flow charts, probability charts/reports, fault analysis charts (eg. fault trees), equipment self-diagnostics, troubleshooting guides<br>Test equipment: measuring instruments/devices, thermal indicators, dial test indicators, audio test devices, torque measuring devices, self-diagnostic equipment, other specific test equipment<br>KB16. how to make adjustments to components/assemblies to ensure they function correctly<br>KB17. the importance of making `off-load' checks before running the equipment under power<br>KB18. how to check tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purposethe<br>KB19. importance of documentation and/or reports following the breakdown servicing activity, and how to generate them<br>Documentation and paperwork: work instruction checklist along with nonconformance<br>report; breakdown servicing log/report (including checks and |

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| | tests undertaken where the installation fails to meet the specification requirements, probable causes/sources of the defect and recommended actions to correct the fault); job sheet ; customer specific documentation; handover report<br>KB20. the equipment operating and control procedures to be applied during the breakdown servicing activity<br>KB21. how to use lifting and handling equipment in the maintenance activity<br>KB22. the problems associated with breakdown of the mechanical equipment, and how they can be overcome<br>Mechanical equipment: gearboxes; machine tools; lifting and handling equipment; processing plant; production plant; engines; pumps; process control valves; compressors; transfer equipment; mechanical structures; work-holding devices<br>KB23. how to conduct a systematic plan, do, check, act approach to problem solving<br>KB24. how to evaluate corrective action ideas in order to select those that are to be pursued<br>KB25. how improvements to the process are achieved by engaging the knowledge and experience of the people working on the process<br>KB26. the extent of their own authority and to whom they should report if they have a problem that they cannot resolve<br>KB27. how to extract and use information from engineering drawings and related specifications in relation to work undertaken<br>KB28. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing the<br>KB29. interpretation of drawings, standards, quality control procedures and specifications used for the breakdown servicing<br>KB30. the procedure for obtaining replacement parts, materials and other consumables necessary for the breakdown servicing<br>KB31. the importance of running the equipment at reduced power and/or in incremental stages to ensure satisfactory performance before applying full load checks<br>KB32. how to make adjustments to components/assemblies to ensure that they function<br>KB33. the fault diagnostic techniques that can be used to help identify problems with the equipment<br>Fault diagnostic techniques: half-split technique; emergent sequence; unit substitution; input/output; function/performance testing; six point technique; injection and sampling; equipment self-diagnostics |

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| | KB34. the calibration/care and control procedures for the instruments, devices and equipment used during breakdown servicing<br>Instruments and devices: straight edges and feeler gauges; spirit levels with appropriate accuracy; mandrels; dial test indicators; measuring instruments (meter tape, vernier caliper, micrometers, depth gauges); plumb lines and taut wires; tension meters; customized gauges; speed measuring devices; multimeter; continuity tester; pressure testing devices; flow testing devices; specific diagnostic aids; PLC/PC equipment<br>KB35. the methods and techniques used to dismantle mechanical equipment in order to replace defective components (eg. release of pressures/force, proof marking of components, removal of components by extraction or pressing)<br>KB36. how to re-assemble the removed components, and how to adjust them to meet the operating specification<br>KB37. the recording and/or reporting documentation to be completed for the activities undertaken<br>KB38. the types of problem associated with the breakdown servicing activity, and how they can be overcome<br>KB39. the organisational procedures to be adopted for the safe disposal of waste of all types of materials<br>KB40. the extent of one's own responsibility, and whom to report to if there is a problem that cannot be resolved<br>KB41. knowledge of the mechanical equipment function and product<br>KB42. end product manufacturing process and various applications<br>KB43. basic knowledge of electrical connections of the equipment to be commissioned<br>KB44. basic knowledge of electronic components used in the equipment being commissioned and their applications<br>KB45. knowledge of component machining processes<br>KB46. do's and don'ts of operating and maintaining the machine |
| **Skills (S)** | |
| **A. Core Skills/ Generic Skills** | **Reading Skills** |
| | The user/ individual on the job needs to know and understand how to:<br>SA1. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language |
| | **Writing Skills** |

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| | The user/individual on the job needs to know and understand how to:<br>SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language<br>SA3. undertake numerical computations and calculations<br>Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages, basic algebra and trigonometry<br>SA4. identify and draw various basic, compound and solid shapes as per dimensions given<br>Basic shapes: square, rectangle, triangle, circle, quadrilaterals<br>Compound shapes: involving squares, rectangles, triangles, circles, semicircles, quadrants of a circle<br>Solid shapes: cube, rectangular prism, cylinder<br>SA5. use appropriate measuring techniques and units of measurement<br>SA6. use appropriate units and number systems to express degree of accuracy<br>Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity<br>SA7. interpret and express tolerance in terms of limits on dimensions<br>calculate of the value of angles in a triangle<br>Angles in a triangle: right-angled, isosceles, equilateral, scalene<br>SA8. measure heights and angles at a site<br>SA9. write a small program which consists of all the machine functions |
| | **Oral Communication (Listening and Speaking skills)** |
| | The user/individual on the job needs to know and understand how to:<br>SA10. convey and share technical information clearly using appropriate language<br>SA11. check and clarify task-related information<br>SA12. liaise with appropriate authorities using correct protocol<br>SA13. communicate with people in respectful form and manner in line with<br>SA14. organizational protocol<br>SA15. listen to questions and concerns of the customer and provide resolution in a<br>SA16. respectful manner as per organizational guidelines<br>SA17. be well dressed and groomed<br>SA18. put forward ones point of view in a convincing manner |
| **B. Professional Skills** | **Decision Making** |
| | NA |
| | **Plan and Organize** |
| | The user/individual on the job needs to know and understand how to:<br>SB1. plan, prioritize and sequence work operations as per job requirements |

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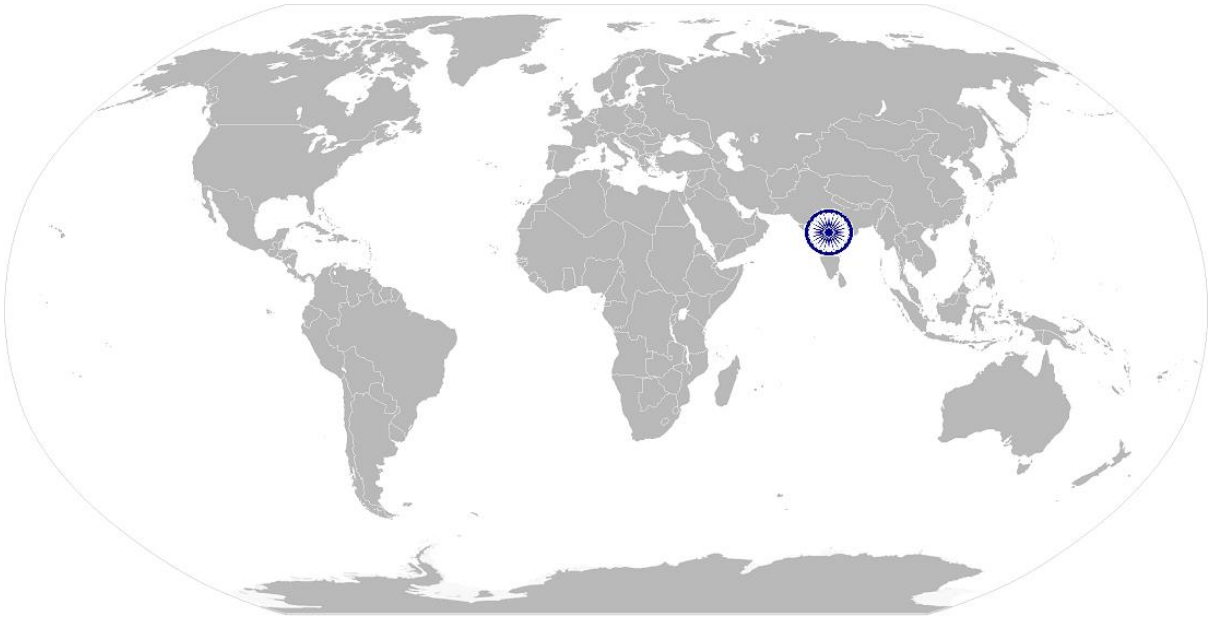
| | SB2. organize and analyze information relevant to work<br>SB3. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time |
| | **Customer Centricity** |
| | The user/individual on the job needs to know and understand how to:<br>SB4. exercise restraint while expressing dissent and during conflict situations<br>SB5. avoid and manage distractions to be disciplined at work<br>SB6. manage own time for achieving better results<br>SB7. collect and pass on accurate and timely customer feedback to appropriate company authorities<br>SB8. handle customer disgruntlement and dissatisfaction<br>SB9. work in a team in order to achieve better results<br>SB10. identify and clarify work roles within a team<br>SB11. communicate and cooperate with others in the team for better results<br>SB12. seek assistance from fellow team members |
| | **Problem Solving** |
| | The user/individual on the job needs to know and understand how to:<br>SB13. identify problems with work planning, procedures, output and behavior and their implications<br>SB14. prioritize and plan for problem solving<br>SB15. communicate problems appropriately to others<br>SB16. identify sources of information and support for problem solving<br>SB17. seek assistance and support from other sources to solve problems<br>SB18. identify effective resolution techniques<br>SB19. select and apply resolution techniques<br>SB20. seek evidence for problem resolution |
| | **Analytical Thinking** |
| | The user/individual on the job needs to know and understand how to:<br>SB21. undertake and express new ideas and initiatives to others<br>SB22. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses<br>SB23. participate in improvement procedures including process, quality and internal/external customer/supplier relationships<br>SB24. enhance one's competencies in new and different situations and contexts to achieve more |
| | **Critical Thinking** |
| | The user/individual on the job needs to know and understand how to:<br>SB25. apply, analyze, and evaluate the information gathered from observation, |

**CSC/N0503 Deliver breakdown service on mechanical equipment installed and commissioned on site**

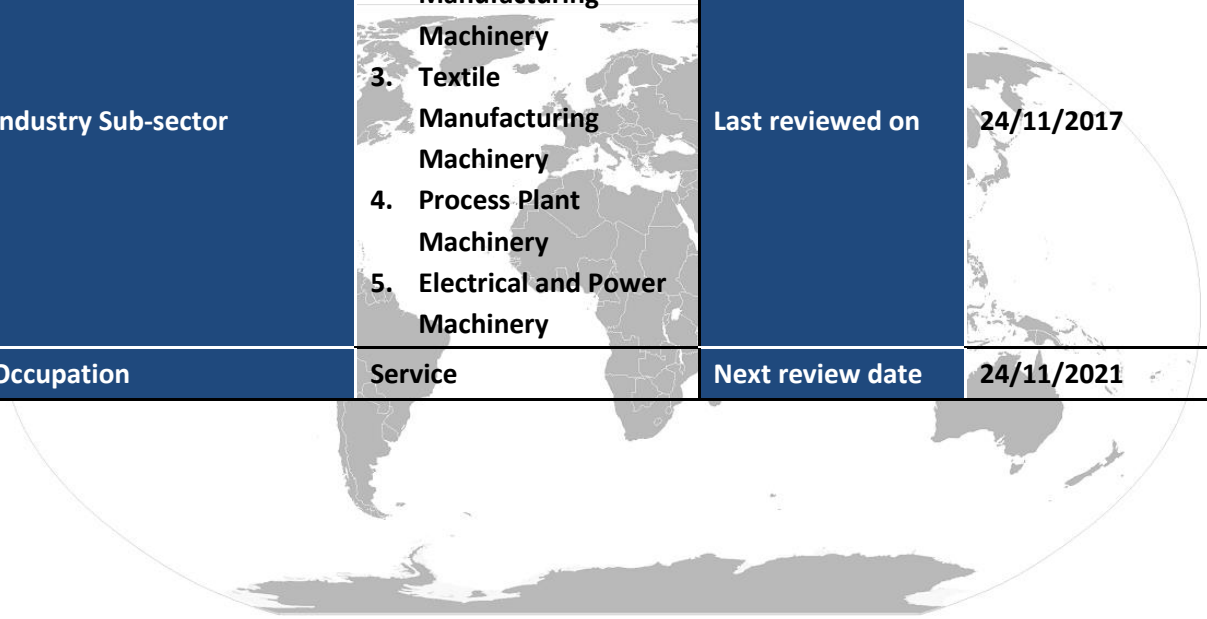
| | |
|---|---|
| | experience, reasoning, or communication, as a guide to thought and action<br>SB26. participate in on-the-job and other learning, training and development interventions and assessments<br>SB27. clarify task related information with appropriate personnel or technical adviser<br>SB28. seek to improve and modify own work practices<br>SB29. maintain current knowledge of application standards, legislation, codes of practice and product/process developments |



**CSC/N0503 Deliver breakdown service on mechanical equipment installed and commissioned on site**

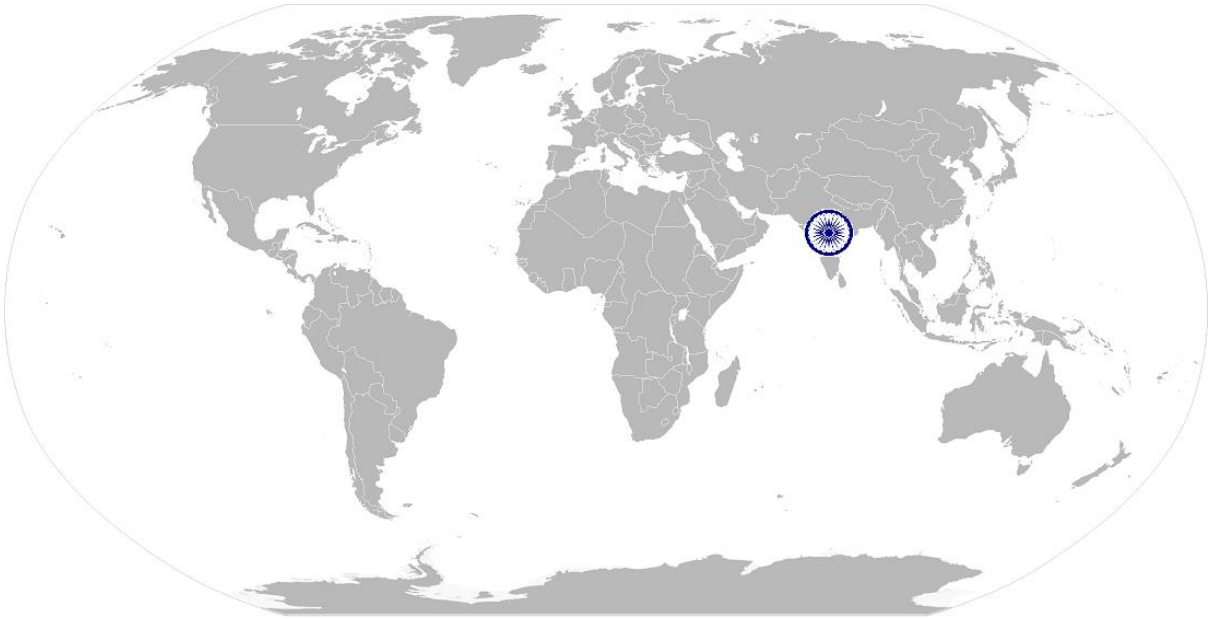
# NOS Version Control

| NOS Code | CSC/N0503 | | |
|---|---|---|---|
| Credits | TBD | Version number | 1.0 |
| Industry | Capital Goods | Drafted on | 24/04/2014 |
| Industry Sub-sector | 1. Machine Tools<br>2. Plastics Manufacturing Machinery<br>3. Textile Manufacturing Machinery<br>4. Process Plant Machinery<br>5. Electrical and Power Machinery | Last reviewed on | 24/11/2017 |
| Occupation | Service | Next review date | 24/11/2021 |



**CSC/N1335 Use basic health and safety practices at the workplace**

# National Occupational Standard



## Overview

**This unit covers health, safety and security at the workplace. This includes procedures and practices that candidates need to follow to help maintain a healthy, safe and secure work environment.**

## CSC/N1335 Use basic health and safety practices at the workplace

National Occupational Standard

| Unit Code | CSC/N1335 |
|---|---|
| Unit Title (Task) | Use basic health and safety practices at the workplace |
| Description | This OS unit is about knowledge and practices relating to health, safety and security that candidates need to use in the workplace. It covers responsibilities towards self, others, assets and the environment. |
| Scope | This unit/task covers the following:<br>• Health and safety<br>• Fire safety<br>• Emergencies, rescue and first-aid procedure |

| Performance Criteria(PC) w.r.t. the Scope | |
|---|---|
| **Element** | **Performance Criteria** |
| **Health and safety** | To be competent, the user/individual on the job must be able to:<br>PC1. use protective clothing/equipment for specific tasks and work conditions<br>Protective clothing: leather or asbestos gloves, flame proof aprons, flame proof overalls buttoned to neck, cuffless (without folds), trousers, reinforced footwear, helmets/hard hats, cap and shoulder covers, ear defenders/plugs, safety boots, knee pads, particle masks, glasses/goggles/visors<br>Equipment: hand shields, machine guards, residual current devices, shields, dust sheets, respirator<br>PC2. state the name and location of people responsible for health and safety in the workplace<br>PC3. state the names and location of documents that refer to health and safety in the workplace<br>PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace<br>Hazards: sharp edged and heavy tools; heated metals; oxyfuel and gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, oxy-fuel, fumes, dust, etc.); physical hazards(working at heights, large and heavy objects and machines, sharp and piercing objects, tolls and machines, intense light, load noise, obstructions in corridors, by doors, blind turns, noise, over stacked shelves and packages, etc.) electrical hazards (power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.)<br>Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as |

**CSC/N1335 Use basic health and safety practices at the workplace**

| | |
|---|---|
| | drunkenness); health hazards (such as untreated injuries and contagious illness)<br>PC5. carry out safe working practices while dealing with hazards to ensure the safety of self and others<br>Safe working practices: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and store and maintain them properly; keep work area clear of clutter, spillage and unsafe object lying casually; while working with electricity take all electrical precautions like insulated clothing, adequate equipment insulation, use of control equipment, dry work area, switch off the power supply when not required, etc.; safe lifting and carrying practices; use equipment that is working properly and is well maintained; take due measures for safety while working in confined places, trenches or at heights, etc. including safety harness, fall arrestors, etc.<br>PC6. state methods of accident prevention in the work environment of the job role<br>Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors<br>PC7. state location of general health and safety equipment in the workplace<br>General health and safety equipment: fire extinguishers; first aid equipment; safety instruments and clothing; safety installations(eg fire exits, exhaust fans)<br>PC8. inspect for faults, set up and safely use steps and ladders in general use<br>Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/ unfixed nuts or bolts, etc.<br>Ladders set up: firm/level base, clip/lash down, leaning at the correct angle, etc.<br>PC9. work safely in and around trenches, elevated places and confined areas<br>PC10. lift heavy objects safely using correct procedures<br>PC11. apply good housekeeping practices at all times<br>Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces<br>PC12. identify common hazard signs displayed in various areas<br>Various areas: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc.<br>PC13. retrieve and/or point out documents that refer to health and safety in the workplace<br>Documents: fire notices, accident reports, safety instructions for equipment |

**CSC/N1335 Use basic health and safety practices at the workplace**

| | |
|---|---|
| | and procedures, company notices and documents, legal documents (eg government notices) |
| **Fire safety** | To be competent, the user/individual on the job must be able to:<br>PC14. use the various appropriate fire extinguishers on different types of fires correctly<br>Types of fires: Class A: eg. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: eg. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no longer receiving electricity); Class D: combustible metals such as magnesium, titanium, and sodium (These fires burn at extremely high temperatures and require special suppression agents)<br>PC15. demonstrate rescue techniques applied during fire hazard<br>PC16. demonstrate good housekeeping in order to prevent fire hazards<br>PC17. demonstrate the correct use of a fire extinguisher |
| **Emergencies, rescue and first-aid procedures** | To be competent, the user/individual on the job must be able to:<br>PC18. demonstrate how to free a person from electrocution<br>PC19. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.<br>PC20. demonstrate basic techniques of bandaging<br>PC21. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments<br>PC22. perform and organize loss minimization or rescue activity during an accident in real or simulated environments<br>PC23. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases<br>PC24. demonstrate the artificial respiration and the CPR Process<br>PC25. participate in emergency procedures<br>Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work<br>PC26. complete a written accident/incident report or dictate a report to another person, and send report to person responsible<br>Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified<br>PC27. demonstrate correct method to move injured people and others during an emergency |

## CSC/N1335 Use basic health and safety practices at the workplace

| Knowledge and Understanding (K) | |
|---|---|
| **A. Organizational Context** (Knowledge of the company / organization and its processes) | The user/individual on the job needs to know and understand:<br>KA1. names (and job titles if applicable), and where to find, all the people responsible for health and safety in a workplace<br>KA2. names and location of documents that refer to health and safety in the workplace |
| **B. Technical Knowledge** | The user/individual on the job needs to know and understand:<br>KB1. meaning of "hazards" and "risks"<br>KB2. health and safety hazards commonly present in the work environment and related precautions<br>KB3. possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible<br>KB4. possible causes of risk and accident<br>Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness)<br>KB5. methods of accident prevention<br>Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors<br>KB6. safe working practices when working with tools and machines<br>KB7. safe working practices while working at various hazardous sites<br>KB8. where to find all the general health and safety equipment in the workplace<br>KB9. various dangers associated with the use of electrical equipment<br>KB10. preventative and remedial actions to be taken in the case of exposure to toxic materials<br>Exposure: ingested, contact with skin, inhaled<br>Preventative action: ventilation, masks, protective clothing/ equipment);<br>Remedial action: immediate first aid, report to supervisor<br>Toxic materials: solvents, flux, lead<br>KB11. importance of using protective clothing/equipment while working<br>KB12. precautionary activities to prevent the fire accident<br>KB13. various causes of fire<br>Causes of fires: heating of metal; spontaneous ignition; sparking; electrical heating; loose fires (smoking, welding, etc.); chemical fires; etc.<br>KB14. techniques of using the different fire extinguishers<br>KB15. different methods of extinguishing fire |

**CSC/N1335 Use basic health and safety practices at the workplace**

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|---|---|
| | KB16. different materials used for extinguishing fire<br>Materials: sand, water, foam, $CO_2$, dry powder<br>KB17. rescue techniques applied during a fire hazard<br>KB18. various types of safety signs and what they mean<br>KB19. appropriate basic first aid treatment relevant to the condition eg. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries<br>KB20. content of written accident report<br>KB21. potential injuries and ill health associated with incorrect manual handing<br>KB22. safe lifting and carrying practices<br>KB23. personal safety, health and dignity issues relating to the movement of a person by others<br>KB24. potential impact to a person who is moved incorrectly |
| **Skills (S)** | |
| **C. Core Skills/ Generic Skills** | **Reading Skills** |
| | The user/ individual on the job needs to know and understand how to:<br>SA1. read and comprehend basic content to read labels, charts, signages<br>SA2. read and comprehend basic English to read manuals of operations<br>SA3. read an accident/incident report in local language or English |
| | **Writing Skills** |
| | The user/individual on the job needs to know and understand how to:<br>SA4. write an accident/incident report in local language or English |
| | **Oral Communication (Listening and Speaking skills)** |
| | The user/individual on the job needs to know and understand how to:<br>SA5. question coworkers appropriately in order to clarify instructions and other issues<br>SA6. give clear instructions to coworkers, subordinates others |
| **D. Professional Skills** | **Decision Making** |
| | The user/individual on the job needs to know and understand how to:<br>SB1. make appropriate decisions pertaining to the concerned area of work with respect to intended work objective, span of authority, responsibility, laid down procedure and guidelines |
| | **Plan and Organize** |
| | The user/individual on the job needs to know and understand how to:<br>SB2. plan and organize their own work schedule, work area, tools, equipment and materials to maintain decorum and for improved productivity |
| | **Customer Centricity** |
| | The user/individual on the job needs to know and understand how to: |

**CSC/N1335 Use basic health and safety practices at the workplace**

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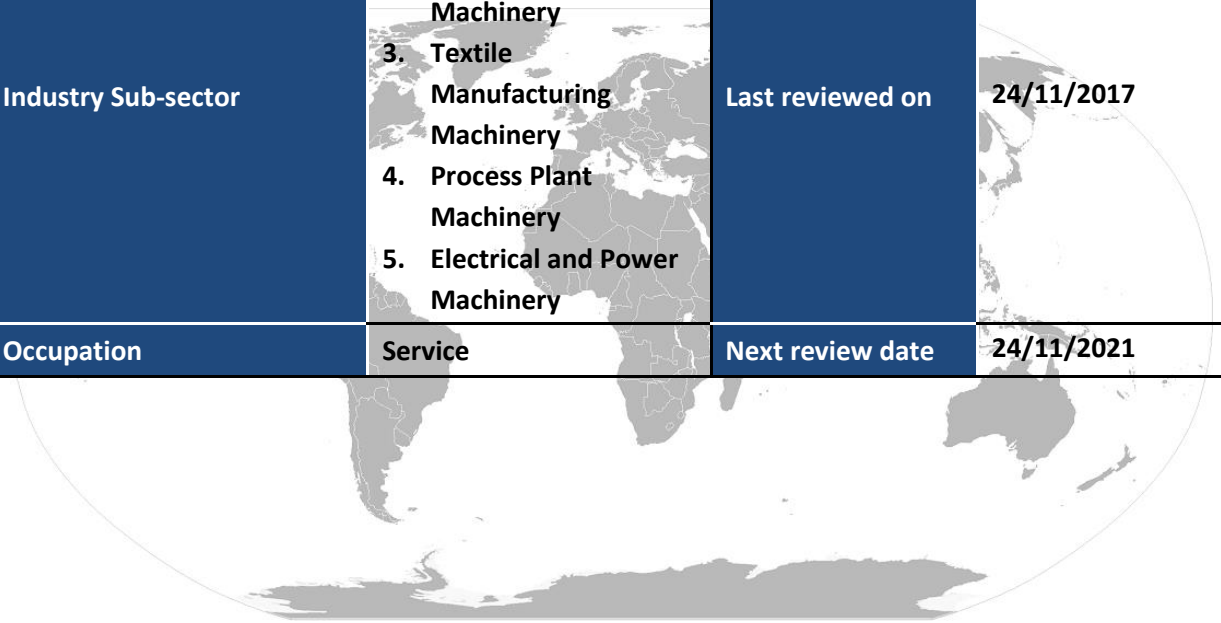
|---|---|
| | SB3. remain congenial while discussing and debating issues with co-workers<br>SB4. follow appropriate protocols for communication based on situation, hierarchy, organizational culture and practice<br>SB5. ask for, provide and receive required assistance where possible to ensure achievement of work related objectives<br>SB6. thank coworkers for any assistance received<br>SB7. offer appropriate respect based on mutuality and respect for fellow workmanship and authority |
| | **Problem Solving** |
| | The user/individual on the job needs to know and understand how to:<br>SB8. think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s)<br>SB9. identify immediate or temporary solutions to resolve delays<br>SB10. identify sources of support that can be availed of for problem solving for various kind of problems<br>SB11. seek appropriate assistance from other sources to resolve problems<br>SB12. report problems that you cannot resolve to appropriate authority |
| | **Analytical Thinking** |
| | The user/individual on the job needs to know and understand how to:<br>SB13. identify cause and effect relations in their area of work<br>SB14. use cause and effect relations to anticipate potential problems and their solution |
| | **Critical Thinking** |
| | NA |

**CSC/N1335 Use basic health and safety practices at the workplace**

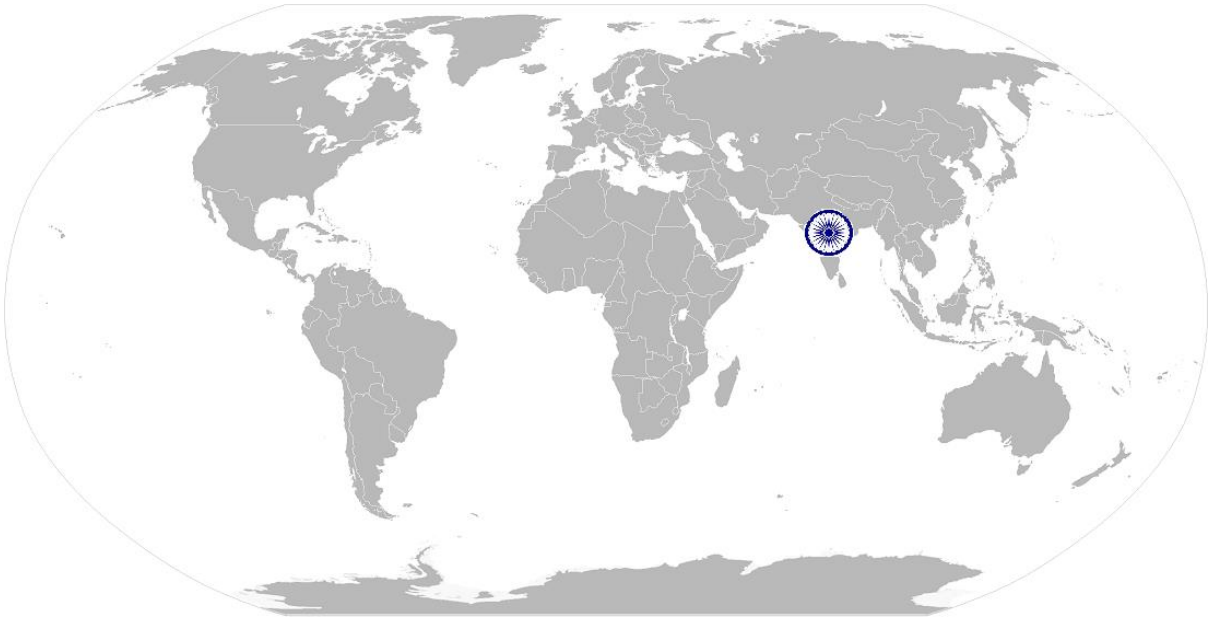
# NOS Version Control

| NOS Code | CSC/N1335 | | |
|---|---|---|---|
| Credits | TBD | Version number | 1.0 |
| Industry | Capital Goods | Drafted on | 24/04/2014 |
| Industry Sub-sector | 1. Machine Tools<br>2. Plastics Manufacturing Machinery<br>3. Textile Manufacturing Machinery<br>4. Process Plant Machinery<br>5. Electrical and Power Machinery | Last reviewed on | 24/11/2017 |
| Occupation | Service | Next review date | 24/11/2021 |



**CSC/N1336** **Work effectively with others**

# National Occupational Standard



## Overview

**This unit covers basic practices that improve effectiveness of working with others in an organizational set-up.**

**CSC/N1336** **Work effectively with others**

National Occupational Standard

| | |
|---|---|
| **Unit Code** | **CSC/N1336** |
| **Unit Title (Task)** | **Work effectively with others** |
| **Description** | This unit covers basic etiquette and competencies that a candidate is required to possess and demonstrate in their behavior and interactions with others at the workplace. These cover areas such as communication etiquette, discipline, listening etc. |
| **Scope** | This unit/task covers the following:<br>• Work effectively with others |

| **Performance Criteria(PC) w.r.t. the Scope** | |
|---|---|
| **Element** | **Performance Criteria** |
| **Work effectively with others** | To be competent, the user/individual on the job must be able to:<br>PC1. receive information accurately and instructions from the supervisor and fellow workers, getting clarification where required<br>PC2. pass information accurately to authorized persons who require it and within agreed timescale and confirm its receipt<br>PC3. give information to others clearly, at a pace and in a manner that helps them to understand<br>PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible<br>PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks<br>PC6. display appropriate communication etiquette while working<br>Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa)etc.<br>PC7. display active listening skills while interacting with others at work<br>PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism<br>PC9. demonstrate responsible and disciplined behaviors at the workplace<br>Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc.<br>PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict |

| **Knowledge and Understanding (K)** | |
|---|---|
| **A. Organizational Context** (Knowledge of the company / organization and | The user/individual on the job needs to know and understand:<br>KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions<br>KA2. reporting structure, inter-dependent functions, lines and procedures in the work area |

**CSC/N1336** **Work effectively with others**

| | |
|---|---|
| its processes) | KA3. relevant people and their responsibilities within the work area<br>KA4. escalation matrix and procedures for reporting work and employment related issues |
| **B. Technical Knowledge** | The user/individual on the job needs to know and understand:<br>KB1. various categories of people that one is required to communicate and co-ordinate with in the organization<br>KB2. importance of effective communication in the workplace<br>KB3. importance of teamwork in organizational and individual success<br>KB4. various components of effective communication<br>KB5. key elements of active listening<br>KB6. value and importance of active listening and assertive communication<br>KB7. barriers to effective communication<br>KB8. importance of tone and pitch in effective communication<br>KB9. importance of avoiding casual expletives and unpleasant terms while communicating professional circles<br>KB10. how poor communication practices can disturb people, environment and cause problems for the employee, the employer and the customer<br>KB11. importance of ethics for professional success<br>KB12. importance of discipline for professional success<br>KB13. what constitutes disciplined behavior for a working professional<br>KB14. common reasons for interpersonal conflict<br>KB15. importance of developing effective working relationships for professional success<br>KB16. expressing and addressing grievances appropriately and effectively<br>KB17. importance and ways of managing interpersonal conflict effectively |
| **Skills (S)** | |
| **A. Core Skills/ Generic Skills** | **Reading Skills** |
| | The user/ individual on the job needs to know and understand how to:<br>SA1. read basic terms and terminologies to accurately interpret work related documents, labels, supervisor instructions in the local language<br>SA2. read and interpret accurate information from various relevant work instructions and records |
| | **Writing Skills** |
| | The user/ individual on the job needs to know and understand how to:<br>SA3. write clear and legible notes to self, colleagues and seniors to pass messages, keep records, prepare to-do lists, take down instructions<br>SA4. write basic numbers, quantities and work related terminology for operational requirements in the local language |
| | **Oral Communication (Listening and Speaking skills)** |

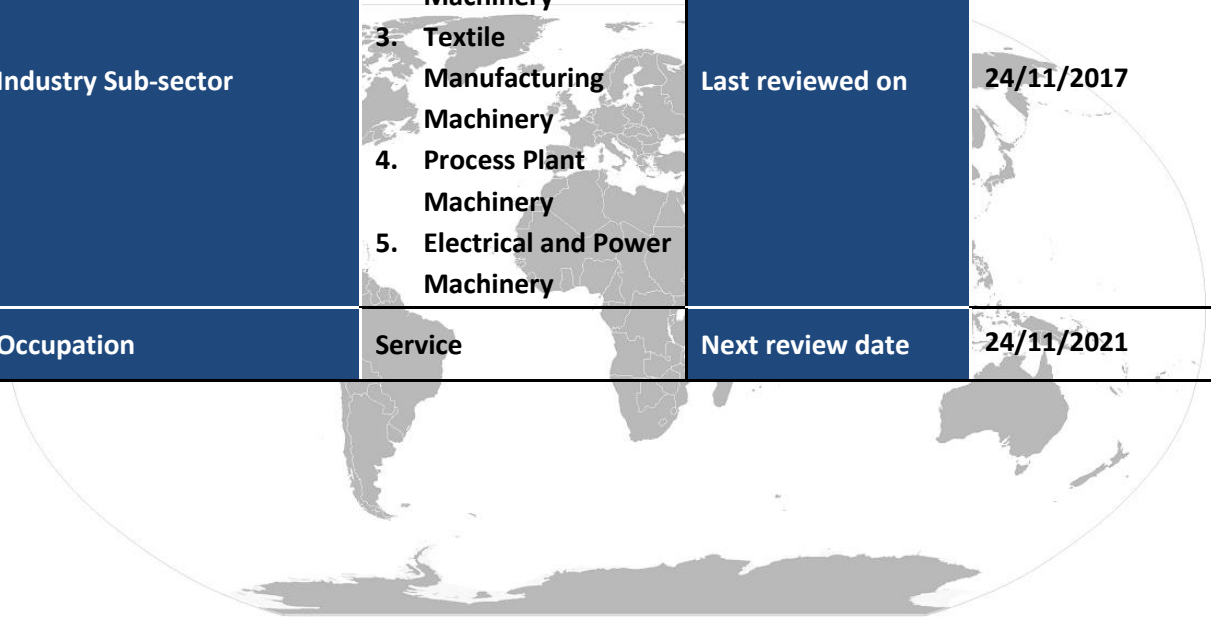
**CSC/N1336** **Work effectively with others**

| | |
|---|---|
| | The user/individual on the job needs to know and understand how to:<br>SA5. interact with the supervisor appropriately (correct protocol and manner of speaking) in order to understand the basic requirements of the product, production plans and other associated requirements<br>SA6. give clear instructions to co-workers about the type of output required and answer queries<br>SA7. display active listening skills while interacting with co-workers and other in the workplace |
| **B. Professional Skills** | **Decision Making** |
| | NA |
| | **Plan and organize** |
| | The user/individual on the job needs to know and understand how to:<br>SB1. use appropriate planning to maintain a smooth relationship with fellow team members<br>SB2. take steps within one's limits of authority to initiate modification in plan if the circumstances require it |
| | **Customer Centricity** |
| | The user/individual on the job needs to know and understand how to:<br>SB3. check that work meets customer requirements<br>SB4. deliver consistent and reliable service to internal and external customers |
| | **Problem Solving** |
| | The user/individual on the job needs to know and understand how to:<br>SB5. work with co-workers and supervisor to resolve any issues that threaten disruption, increase risk, cause delays or under-achievement of quality and targets as per the planned schedule |
| | **Analytical Thinking** |
| | NA |
| | **Critical Thinking** |
| | NA |

**CSC/N1336** **Work effectively with others**

# NOS Version Control

| NOS Code | CSC/N1336 | | |
|---|---|---|---|
| Credits | TBD | Version number | 1.0 |
| Industry | Capital Goods | Drafted on | 24/04/2014 |
| Industry Sub-sector | 1. Machine Tools<br>2. Plastics Manufacturing Machinery<br>3. Textile Manufacturing Machinery<br>4. Process Plant Machinery<br>5. Electrical and Power Machinery | Last reviewed on | 24/11/2017 |
| Occupation | Service | Next review date | 24/11/2021 |



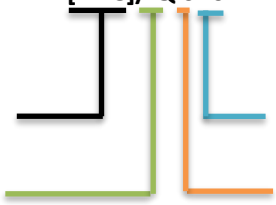
# Annexure

## Nomenclature for QP and NOS

### Qualifications Pack

*9 characters*

**[ABC]/ Q 0101**



[Insert 3 letter codes for SSC]

Q denoting Qualifications Pack

QP number (2 numbers)

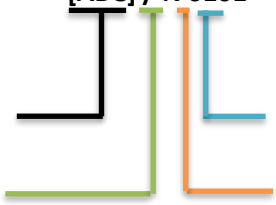
Occupation (2 numbers)

### Occupational Standard

**An example of NOS with 'N'**

*9 characters*

**[ABC] / N 0101**



[Insert 3 letter codes for SSC]

N denoting National Occupational Standard

OS number (2 numbers)

Occupation (2 numbers)

Back to top…

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

| Sub-sector | Range of Occupation numbers |
|---|---|
| **Machine Tools** | 01-13 |
| **Dies, Moulds and Press Tools** | 01-13 |
| **Plastic Manufacturing Machinery** | 01-13 |
| **Textile Manufacturing Machinery** | 01-13 |
| **Process Plant Machinery** | 01-13 |
| **Electrical and Power Machinery** | 01-13 |
| **Light Engineering Goods** | 01-13 |

| Sequence | Description | Example |
|---|---|---|
| **Three letters** | Capital Goods | CSC |
| **Slash** | / | / |
| **Next letter** | Whether **Q**P or **N**OS | N |
| **Next two numbers** | Occupation code | 01 |
| **Next two numbers** | OS number | 01 |

# Criteria For Assessment Of Trainees

**Job Role:** Service Engineer - Breakdown Service

**Qualification Pack:** CSC/Q0503

**Sector Skill Council:** Capital Goods Skill Council

## Guidelines for Assessment

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

| **Compulsory NOS**<br>**Total Marks: 500** | | | | **Marks Allocation** | |
|---|---|---|---|---|---|
| **Assessment outcomes** | **Assessment Criteria for outcomes** | **Total Marks** | **Out of** | **Theory** | **Skills Practical** |
| CSC/N0501 Install mechanical equipment at site | PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work | 100 | 3 | 1 | 2 |
| | PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing installation operations | | 4 | 1 | 3 |
| | PC3.ensure work area is clean and safe from hazards | | 2 | 0 | 2 |
| | PC4.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition | | 2 | 0 | 2 |
| | PC5.obtain clearance to carry out the installation activities | | 2 | 0 | 2 |
| | PC6.provide safe access and working arrangements for the installation area | | 3 | 0 | 3 |
| | PC7.ensure safe isolation of services during the installation | | 2 | 0 | 2 |
| | PC8.dispose of waste items in a safe and environmentally acceptable manner | | 2 | 1 | 1 |
| | PC9.leave the work area in a safe condition and free from foreign object debris | | 2 | 0 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| | PC10.plan the installation activities in an efficient and appropriate manner | | 3 | 1 | 2 |
| | PC11. survey and inspect the site and foundation for the following | | 3 | 0 | 3 |
| | PC12.ensure that appropriate utilities are available (eg. gas, water, air, electricity) | | 2 | 0 | 2 |
| | PC13.ensure that required installation consumables are available | | 2 | 0 | 2 |
| | PC14.ensure that safety and environmental conditions can be met | | 3 | 1 | 2 |
| | PC15.obtain necessary permits to carry out the required work | | 2 | 0 | 2 |
| | PC16.check the installation job specification documentation are available and correct | | 2 | 0 | 2 |
| | PC17.instruct and supervise marking out of positioning and layouts | | 2 | 0 | 2 |
| | PC18.check and record for any physical damages to the machine/equipment | | 2 | 0 | 2 |
| | PC19.compare received product and accessories with product order specifications | | 3 | 1 | 2 |
| | PC20.take appropriate action in lieu with manufacturer and customer, in case of any deviations | | 3 | 0 | 3 |
| | PC21.instruct and supervise use of grouting and adhesives after conducting foundation/site inspection | | 3 | 0 | 3 |
| | PC22.instruct and supervise drilling holes for rig and anchor bolts | | 3 | 0 | 3 |
| | PC23.instruct and supervise the movement and positioning of equipment, using cranes or forklifts as per the layout | | 3 | 1 | 2 |
| | PC24.remove moisture absorbent bags, rust preventive, locking devices | | 2 | 0 | 2 |
| | PC25.fill oils for lubrication, hydraulic and other special oils | | 2 | 0 | 2 |
| | PC26.ensure the machine is clean | | 1 | 0 | 1 |
| | PC27.install the machine in accordance with manufacturers' and site specifications | | 4 | 1 | 3 |
| | PC28.perform routine modifications/alterations as per standard operating procedures or in consultation with manufacturer and customer, where required | | 5 | 2 | 3 |
| | PC29.use the various installation tools and equipment as required | | 2 | 0 | 2 |
| | PC30.apply installation techniques like leveling, aligning, coupling and connecting in accordance with specifications | | 4 | 1 | 3 |
| | PC31.fill coolants, oil and other fluids as per specifications | | 3 | 1 | 2 |
| | PC32.ensure the site is cleaned and clear of all debris and left in safe state | | 1 | 0 | 1 |

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| | PC33.check that all reports and documentation are completed correctly to required specifications | | 3 | 1 | 2 |
| | PC34.produce installations which comply with the equipment manufacturer's operation specification/range | | 4 | 1 | 3 |
| | PC35.deal promptly and effectively with problems within control, and seek help and guidance from the relevant people for problems that cannot be resolved | | 2 | 0 | 2 |
| | PC36.complete the relevant paperwork, and pass to the appropriate people | | 2 | 0 | 2 |
| | PC37.give a brief to the customer staff on do's and don'ts of the operation and maintenance of the machine | | 2 | 0 | 2 |
| | PC38.switch on product equipment and carry out check for proper functioning without load | | 2 | 0 | 2 |
| | PC39.make adjustments, appropriate to the equipment being installed | | 3 | 0 | 3 |
| | | **Total** | **100** | **14** | **86** |
| CSC/N0502 Commission mechanical equipment after installation at site | PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work | 100 | 3 | 1 | 2 |
| | PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing installation operations ensure work area is clean and safe from hazards | | 4 | 1 | 3 |
| | PC3.work following laid down procedures and instructions | | 3 | 1 | 2 |
| | PC4.ensure work area is clean and safe from hazards | | 2 | 0 | 2 |
| | PC5.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition | | 2 | 0 | 2 |
| | PC6.follow all relevant setting up and operating specifications for the products or mechanical equipment being commissioned | | 3 | 1 | 2 |
| | PC7.follow the defined procedures and set up the equipment correctly ensuring that all operating parameters are achieved | | 3 | 1 | 2 |
| | PC8.plan the commissioning activities so as to minimize disruption to normal working | | 4 | 1 | 3 |
| | PC9.ensure that all tools and equipment used are within current calibration dates | | 2 | 0 | 2 |
| | PC10.obtain clearance to carry out the commissioning activities | | 2 | 0 | 2 |
| | PC11.isolate equipment from electricity, gas or fluids during commissioning | | 3 | 0 | 3 |
| | PC12.prepare the work area for the commissioning operations as per procedure or operational specification | | 4 | 1 | 3 |
| | PC13.ensure that the site is accessible, free from obstructions or hazards | | 2 | 0 | 2 |

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| | PC14.obtain relevant information required to undertake the commissioning | | 2 | 0 | 2 |
| | PC15.carry out start-up procedures, and confirm that the functioning meets specifications | | 4 | 1 | 3 |
| | PC16.run equipment at the recommended initial settings (eg. reduced power / speed/ flow) | | 4 | 1 | 3 |
| | PC17.check for leaks during operations, make sensory checks (sight, sound, smell, touch) | | 4 | 0 | 4 |
| | PC18.run through the operating sequence, and check for correct functioning | | 6 | 2 | 4 |
| | PC19.load the system incrementally, and make any necessary adjustments to settings to achieve the specification parameters | | 6 | 2 | 4 |
| | PC20.conduct a trial run of the equipment at full power/speed/flow | | 4 | 0 | 4 |
| | PC21.confirm that the final product/process outcomes meet specifications | | 6 | 2 | 4 |
| | PC22.monitor and record measurements and observations | | 4 | 1 | 3 |
| | PC23.shut down and/or isolate the installed equipment to a safe condition | | 2 | 0 | 2 |
| | PC24.deal with equipment malfunction and rectify faults during the commissioning process as appropriate | | 4 | 1 | 3 |
| | PC25.dismantle mechanical equipment in order to replace defective components (eg. release of pressures/force, proof-marking of components, removal of components by extraction or pressing) | | 4 | 0 | 4 |
| | PC26.re-assemble the removed components, and adjust them to meet the operating specification | | 6 | 2 | 4 |
| | PC27.ensure that the commissioned equipment complies with specified standards | | 4 | 2 | 2 |
| | PC28.complete the machine related documentation like backups, manuals, logs, etc. and hand over to the appropriate people | | 3 | 0 | 3 |
| | | **Total** | **100** | **21** | **79** |
| CSC/N0503 Deliver breakdown service on mechanical equipment installed and commissioned on site | PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work | 100 | 3 | 1 | 2 |
| | PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing breakdown servicing operations | | 3 | 1 | 2 |
| | PC3.work following laid down procedures and instructions | | 2 | 1 | 1 |

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| | PC4.ensure work area is clean and safe from hazards | | 2 | 0 | 2 |
| | PC5.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition | | 2 | 0 | 2 |
| | PC6.follow all relevant setting up and operating specifications for the products or mechanical equipment being commissioned | | 2 | 1 | 1 |
| | PC7.follow the defined procedures and set up the equipment correctly ensuring that all operating parameters are achieved | | 3 | 1 | 2 |
| | PC8.identify customer requirements from verbal or written communication | | 2 | 0 | 2 |
| | PC9.check and clarify understanding about the fault from the customer orcustomer representative | | 2 | 0 | 2 |
| | PC10.collect evidence regarding the fault from the sources | | 2 | 0 | 2 |
| | PC11.use a range of fault diagnostic equipment to investigate the problem | | 3 | 0 | 3 |
| | PC12.apply monitoring or testing procedures to help in the fault diagnosis | | 5 | 2 | 3 |
| | PC13.use various testing equipment to carry out relevant tests | | 2 | 0 | 2 |
| | PC14.evaluate various types of information available for fault diagnosis | | 3 | 0 | 3 |
| | PC15.evaluate sensory information to assess faults | | 3 | 0 | 3 |
| | PC16.evaluate preventative maintenance system requirements | | 3 | 0 | 3 |
| | PC17.review equipment or component condition analysis reports, including the results of any required NDT | | 2 | 0 | 2 |
| | PC18.review life cycle of the mechanical equipment | | 2 | 0 | 2 |
| | PC19.decide if repair, replacement or modification is appropriate | | 2 | 0 | 2 |
| | PC20.seek any necessary approvals | | 2 | 0 | 2 |
| | PC21.assess the need for technical and professional assistance | | 3 | 0 | 3 |
| | PC22.determine materials, components, maintenance processes, equipment and tools required to implement corrective action | | 3 | 0 | 3 |
| | PC23.create adequate and accurate calculations, preliminary graphics and maintain process records, including use of software, as appropriate | | 4 | 1 | 3 |
| | PC24.communicate to the customer the degree to which requirements can be met including details such as cost, delivery date, quantity or quality | | 2 | 0 | 2 |
| | PC25.propose alternatives for any inability to completely satisfy customer requirements | | 3 | 0 | 3 |

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| | PC26.plan, schedule and coordinate the repair or modification task ensure that the service or maintenance activities are carried in the specified sequence and in an agreed timescale | | 3 | 1 | 2 |
| | PC27.communicate the service or maintenance activities to the team | | 1 | 0 | 1 |
| | PC28.allocate specific activities to each team member | | 2 | 0 | 2 |
| | PC29.monitor and support the repair or modification activities within the limits of their personal authority | | 2 | 0 | 2 |
| | PC30.dismantle mechanical equipment in order to replace defective components (eg. release of pressures/force, proof marking of components, removal of components by extraction or pressing) | | 3 | 0 | 3 |
| | PC31.re-assemble the removed components, and adjust them to meet the operating specification | | 4 | 1 | 3 |
| | PC32.carry out servicing and maintenance techniques as applicable | | 4 | 1 | 3 |
| | PC33.conduct a trial run of the equipment at full power/speed/flow | | 2 | 0 | 2 |
| | PC34.confirm that the final product/process outcomes meet specifications | | 3 | 1 | 2 |
| | PC35.monitor and record measurements and observations | | 2 | 0 | 2 |
| | PC36.deal with equipment malfunction and rectify faults during the breakdown servicing process as appropriate | | 3 | 0 | 3 |
| | PC37.ensure that the commissioned equipment complies with specified standards | | 3 | 1 | 2 |
| | PC38.complete the relevant paperwork, and pass to the appropriate people | | 1 | 0 | 1 |
| | PC39.deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve | | 2 | 0 | 2 |
| | | **Total** | **100** | **13** | **87** |
| CSC/N1335 Use basic health and safety practices at the workplace | PC1.use protective clothing/equipment for specific tasks and work conditions | 100 | 4 | 1 | 3 |
| | PC2.state the name and location of people responsible for health and safety in the workplace | | 3 | 1 | 2 |
| | PC3.state the names and location of documents that refer to health and safety in the workplace | | 3 | 1 | 2 |
| | PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace | | 5 | 2 | 3 |
| | PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others | | 4 | 2 | 2 |
| | PC6.state methods of accident prevention in the work environment of the job role | | 3 | 2 | 1 |
| | PC7.state location of general health and safety equipment in the workplace | | 5 | 2 | 3 |

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| | PC8.inspect for faults, set up and safely use steps and ladders in general use | | 5 | 2 | 3 |
| | PC9.work safely in and around trenches, elevated places and confined areas | | 5 | 2 | 3 |
| | PC10.lift heavy objects safely using correct procedures | | 4 | 2 | 2 |
| | PC11.apply good housekeeping practices at all times | | 5 | 2 | 3 |
| | PC12.identify common hazard signs displayed in various areas | | 3 | 1 | 2 |
| | PC13.retrieve and/or point out documents that refer to health and safety in the workplace | | 4 | 1 | 3 |
| | PC14.use the various appropriate fire extinguishers on different types of fires correctly | | 3 | 1 | 2 |
| | PC15.demonstrate rescue techniques applied during fire hazard | | 3 | 1 | 2 |
| | PC16.demonstrate good housekeeping in order to prevent fire hazards | | 4 | 1 | 3 |
| | PC17.demonstrate the correct use of a fire extinguisher | | 4 | 1 | 3 |
| | PC18.demonstrate how to free a person from electrocution | | 4 | 1 | 3 |
| | PC19.administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc. | | 3 | 1 | 2 |
| | PC20.demonstrate basic techniques of bandaging | | 3 | 1 | 2 |
| | PC21.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments | | 3 | 1 | 2 |
| | PC22.perform and organize loss minimization or rescue activity during an accident in real or simulated environments | | 3 | 1 | 2 |
| | PC23.administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases | | 3 | 1 | 2 |
| | PC24.demonstrate the artificial respiration and the CPR Process | | 3 | 1 | 2 |
| | PC25.participate in emergency procedures | | 4 | 1 | 3 |
| | PC26.complete a written accident/incident report or dictate a report to another person, and send report to person responsible | | 3 | 1 | 2 |
| | PC27.demonstrate correct method to move injured people and others during an emergency | | 4 | 2 | 2 |
| | | **Total** | **100** | **36** | **64** |
| CSC/N1336 Work effectively with others | PC1.receive information accurately and instructions from the supervisor and fellow workers, getting clarification where required | 100 | 10 | 3 | 7 |
| | PC2.pass information accurately to authorized persons who require it and within agreed timescale and confirm its receipt | | 10 | 3 | 7 |
| | PC3.give information to others clearly, at a pace and in a manner that helps them to understand | | 10 | 3 | 7 |

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| | PC4.display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible | | 10 | 3 | 7 |
| | PC5.consult with and assist others to maximize effectiveness and efficiency in carrying out tasks | | 10 | 3 | 7 |
| | PC6.display appropriate communication etiquette while working | | 10 | 3 | 7 |
| | PC7.display active listening skills while interacting with others at work | | 10 | 3 | 7 |
| | PC8.use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism | | 10 | 3 | 7 |
| | PC9.demonstrate responsible and disciplined behaviors at the workplace | | 10 | 3 | 7 |
| | PC10.escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict | | 10 | 3 | 7 |
| | | **Total** | **100** | **30** | **70** |