

QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR CAPITAL GOODS INDUSTRY

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: Senior Manual Metal Arc Welding/ Shielded Metal Arc Welding

SECTOR: CAPITAL GOODS

SUB-SECTOR:

Machine Tools,
Dies, Moulds and Press Tools, Plastics
Manufacturing Machinery, Textile
Manufacturing Machinery

Process Plant Machinery,
Electrical and Power Machinery,
Light Engineering Goods,

OCCUPATION: Welding and Cutting

REFERENCE ID: CSC/ Q 0208

ALIGNED TO: NCO-2004/NIL

MMAW/SAW Welder: Perform manual metal arc welding (MMAW) also known as shielded metal arc welding (SAW) for producing a range of joints on various forms of materials including carbon steels, low alloy steels and austenitic stainless steel in all positions, as per welding specification procedures (WPS).

Brief Job Description: Perform manual metal arc welding (MMAW) welding also known as Shielded Metal Arc Welding (SAW) for a range of standard welding job requirements. This is for a skilled welder who can weld different materials (carbon steel, low alloy steel and austenitic stainless steel) in all positions. The welder can prepare various joints including groove, corner, butt and fillet welds. The welder can set-up and prepare for operations interpreting the right information from the WPS.

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, manage self and work to improve efficiency and effectiveness.

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|--------------------|---------------------------------|---|-------------------------|-----------------|
| Job Details | Qualifications Pack Code | CSC/ Q 0208 | | |
| | Job Role | Senior Manual Metal Arc Welding/Shielded Metal Arc Welder | | |
| | Credits (NSQF) | TBD | Version number | 1.0 |
| | Sector | CAPITAL GOODS | Drafted on | 10/04/14 |
| | Sub-sector | <ol style="list-style-type: none"> 1. Machine Tools 2. Dies, Moulds and Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods | Last reviewed on | 18/03/15 |
| | Occupation | WELDING AND CUTTING | Next review date | 30/08/16 |
| | NSQC Clearance on | 22/04/2015 | | |

| Job Role | MMAW/SMAW Welder |
|--|---|
| Role Description | Perform manual metal arc welding (MMAW) also known as shielded metal arc welding (SMAW) for producing a range of joints on various forms of materials (carbon steels, low alloy steel and stainless steel as per welding specification procedures (WPS). |
| NSQF level | 4 |
| Minimum Educational Qualifications | 10 th standard |
| Maximum Educational Qualifications | N.A. |
| Training (Suggested but not) | No Previous Training Required |
| Minimum Job Entry Age | 18 Years Old |
| Experience | No Previous Experience Required |
| Applicable National Occupational Standards (NOS) | <p>Compulsory:</p> <ol style="list-style-type: none"> CSC/ N 0208 (Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding / Shielded Metal Arc Welding) CSC/ N 0207 (Manually cut metal materials using plasma arc) CSC/ N 0203 (Manually cut metal and metal alloys using oxy-fuel gas) CSC/ N 1335 (Use basic health and safety practices at the workplace) CSC/ N 1336 (Work effectively with others) <p>Optional: N.A.</p> |
| Performance Criteria | As described in the relevant OS units |

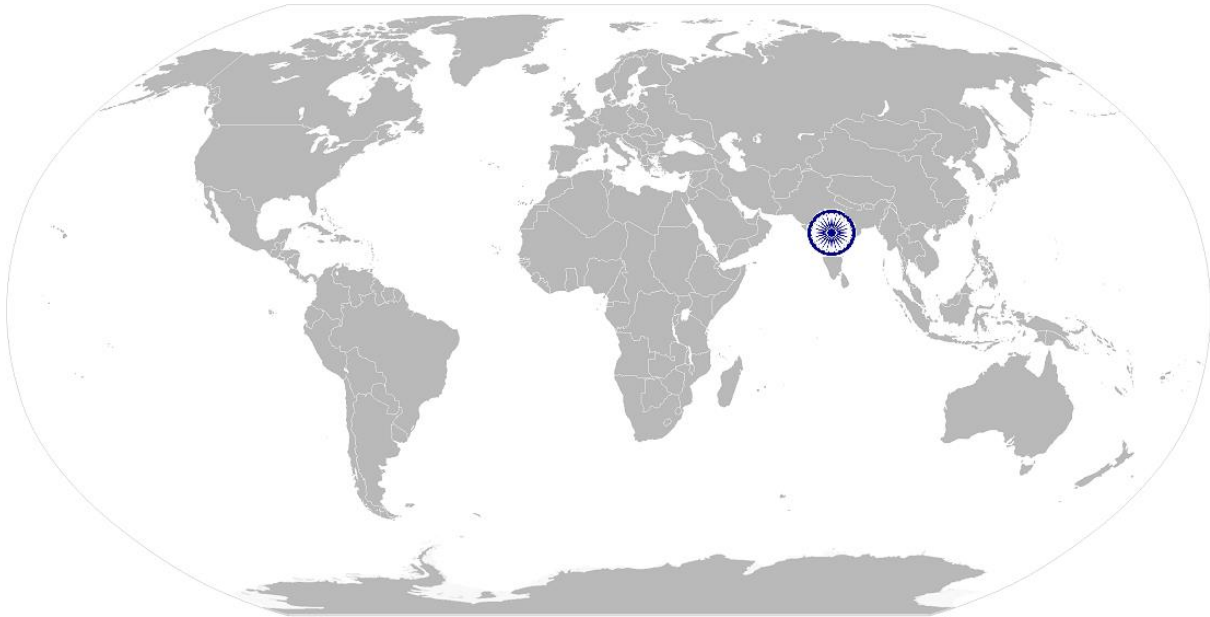
| Definitions | Keywords /Terms | Description |
|-------------|---------------------------------------|--|
| | Core Skills/Generic Skills | Core Skills or Generic Skills are a group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the NOS, these include communication related skills that are applicable to most job roles. |
| | Function | Function is an activity necessary for achieving the key purpose of the sector, occupation, or area of work, which can be carried out by a person or a group of persons. Functions are identified through functional analysis and form the basis of NOS. |
| | Job role | Job role defines a unique set of functions that together form a unique employment opportunity in an organization. |
| | Knowledge and Understanding | Knowledge and Understanding are statements which together specify the technical, generic, professional and organizational specific knowledge that an individual needs in order to perform to the required standard. |
| | National Occupational Standards (NOS) | NOS are Occupational Standards which apply uniquely in the Indian context |
| | Occupation | Occupation is a set of job roles, which perform similar/related set of functions in an industry. |
| | Organisational Context | Organisational Context includes the way the organization is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility. |
| | Performance Criteria | Performance Criteria are statements that together specify the standard of performance required when carrying out a task. |
| | Qualifications Pack(QP) | Qualifications Pack comprises the set of NOS, together with the educational, training and other criteria required to perform a job role. A Qualifications Pack is assigned a unique qualification pack code. |
| | Qualifications Pack Code | Qualifications Pack Code is a unique reference code that identifies a qualifications pack. |
| | Scope | Scope is the 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 the quality of performance required. |
| | Sector | Sector is a conglomeration of different business operations having similar businesses 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. |
| | Sub-functions | Sub-functions are sub-activities essential to fulfil the achieving the objectives of the function. |
| | Technical Knowledge | Technical Knowledge is the specific knowledge needed to accomplish specific designated responsibilities. |
| | Unit Code | Unit Code is a unique identifier for a NOS unit, which can be denoted with an 'N' |
| | Unit Title | Unit Title gives a clear overall statement about what the incumbent should be able to do. |
| | Vertical | Vertical may exist within a sub-sector representing different domain areas or the client industries served by the industry. |

Acronyms

| Keywords /Terms | Description |
|-----------------|--|
| MMAW | Manual Metal Arc Welding |
| SMAW | Shielded Metal Arc Welding |
| WPS | Welding Procedure Speciation |
| IS | Indian Standards |
| EN | European Standards |
| ASME | American Society of Mechanical Engineers |
| AC / DC | Alternating Current / Direct Current |
| VT | Visual Testing |
| NDT | Non-Destructive Testing |
| DT | Destructive Testing |
| RT | Radiographic Testing |
| UT | Ultrasonic Testing |
| DPT | Dye Penetrant Testing |
| MPT | Magnetic Particle Testing |
| FPT | Fluorescent Penetrant Testing |
| DP | Dye Penetration Test |
| CO2 | Carbon dioxide |
| CPR | Cardiac Pulmonary Resuscitation |
| IS | Indian Standards |
| EN | European Standards |
| ASME | American Society of Mechanical Engineers |
| ISO | International Organization for Standardization |
| PQR | Process Qualification Record |

CSC/ N 0208: Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

National Occupational Standard



Overview

This unit covers the performing of manual metal arc welding (MMAW) also known as shielded metal arc welding (SMAW) for producing a range of joints on various forms of metal and metal alloys including carbon steels, low alloy steels and austenitic stainless steel as per welding specification procedures (WPS).

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National Occupational Standard

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| Unit Code | CSC/ N 0208 |
| Unit Title (Task) | Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding / Shielded Metal Arc Welding |
| Description | <p>This OS unit is about performing manual metal arc welding (MMAW) welding also known as Shielded Metal Arc Welding (SMAW) for a range of standard welding job requirements. This is for a skilled welder who can weld different materials (carbon steel, low alloy steel and austenitic stainless steel) in 1G/1F, 2G/2F, 3G/3F, 4G/4F, 5G/5F and 6G positions. The welder can prepare various joints including various groove and fillet welds.</p> <p>The welder carries out these operations in a safe manner following practices that ensure safety for self, others and the work environment.</p> |
| Scope | <p>This unit/task covers the following:</p> <ul style="list-style-type: none"> • Working safely • Preparing for welding operations • Carrying out welding operations • Testing for quality • Post-welding activities • Dealing with contingencies |
| Performance Criteria(PC) w.r.t. the Scope | |
| Element | Performance Criteria |
| Working Safely | <p>The user/individual on the job should be able to:</p> <p>PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>PC2. adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations</p> <p>Safety precautions (general): general workshop safety; fire prevention; general hazards; manual lifting; overhead lifting; shopfloor housekeeping including surface conditions; waste disposal; stability of surrounding structures, furniture etc.</p> <p>PC3. check the condition of, and correctly connect, welding leads, earthing arrangements and electrode holder</p> <p>PC4. deal with any faults or differential as per laid procedures</p> <p>PC5. follow fume extraction safety procedures</p> |
| Preparing for welding operations | <p>The user/individual on the job should be able to:</p> <p>PC6. read and interpret routine information on written job instructions, welding procedure specifications (WPS) and standard operating procedures</p> <p>WPS: e.g. welding process (ISO codes); parent metal; consumables; pre welding joint preparation (edge preparation, assembly, pre-heat); welding parameters; welding positions (ISO 6947 – PA, PB, PC, PD, PE, PF, PG; ASME IX – I-6 G/1-6 F); number and arrangement of runs to fully fill/weld joints; electrode sizes for joint thicknesses; electrode and covering; electrical</p> |

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| | <p>conditions required (type of current, alternating [A.C.] direct [D.C.], electrode polarity (positive or negative), welding current ranges); welding techniques; sequence of welding; control of heat input; preheat/post heat; interpass/run cleaning/back gouging methods; post welding activities (wire brushing and grinding, removal of excess weld metal where required); post-weld heat treatment (normalising, stress relief), etc.</p> <p>PC7. select welding machines (e.g. transformers, rectifiers, inverters and generators, etc.) according to the task</p> <p>PC8. select type and size of electrodes according to classification and specifications</p> <p>PC9. re-dry electrodes as per electrode classification requirement</p> <p>PC10. prepare the work area for the welding activities</p> <p>PC11. perform measurements for joint preparation and routine MMAW</p> <p>PC12. prepare the various forms of materials and the joint in readiness for welding</p> <p>Materials: Carbon steel, low alloy steel and stainless steels Forms: plate, sheet (1.5mm), structural section, other forms (hollow tubes, sections, shapes, etc.) Joint preparation: made rust free; cleaned – free from scaling, paint, oil/ grease; made dry and free from moisture; edges to be welded prepared as per job requirement - such as flat, square or bevelled; use various machines and techniques for the above (eg. chamfering machine, grinding and stripping, gas or plasma cutting, etc.); correctly positioned- positioning: devices and techniques; jigs and fixtures; restraining devices such as clamps and weights/blocks; setting up the joint in the correct position and alignment</p> <p>PC13. use manual metal-arc welding and related equipment to include a. alternating current (AC) equipment b. direct current (DC) equipment MMAW equipment: e.g. transformers; rectifiers; generators; invertors; consumables – electrodes, dyes; welding accessories - holders, cables and accessories; ancillary equipment - (power saw, angle, pedestal and straight grinders, tong tester, etc.); electrode drying oven, etc.</p> <p>PC14. connect equipment to power source</p> <p>PC15. connect cables, electrode holders, return leads and ground clamps to appropriate terminal</p> <p>PC16. set, read and adjust amperage controls</p> <p>PC17. verify setup by running test and appropriately handle weld specimen/scrap-plate</p> <p>PC18. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding</p> |
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| <p>Carrying out welding operations</p> | <p>The user/individual on the job should be able to:</p> <p>PC19. strike and maintain a stable arc</p> <p>PC20. stop and properly re-start arc to avoid welding defects (scratch start, tapping techniques)</p> <p>PC21. manipulate electrode angle using various methods as per WPS</p> <p>PC22. maintain constant puddle by using appropriate travel speed</p> <p>PC23. remove slag in an appropriate manner (eg. wire brush, hammer, etc.)</p> <p>PC24. weld the joint to the specified quality, dimensions and profile applicable to range of material</p> <p>PC25. produce range of welded joints to within the mentioned standard using single or multi-run welds (as appropriate)</p> <p>Joints: fillet and groove</p> <p>PC26. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817</p> <p>Weld quality standards: required parameters for dimensional accuracy; weld finishes are built up to the full section of the weld; joins at stop/start positions merge smoothly; weld surface is: free from cracks, substantially free from porosity, free from any pronounced hump or crater, substantially free from shrinkage cavities, substantially free from trapped slag, substantially free from arcing or chipping marks; fillet welds are: equal in leg length, slightly convex in profile (where applicable), size of the fillet equivalent to the thickness of the material welded: weld contour is: of linear and of uniform profile; smooth and free from excessive undulations; regular and has an even ripple formation; welds are adequately fused, and there is minimal undercut, overlap and surface inclusions; tack welds are blended in to form part of the finished weld, without excessive hump; corner joints have minimal burn through to the underside of the joint or, where appropriate</p> <p>PC27. produce range of welded joints in various positions as per the WPS specified</p> <p>Positions: flat (PA) 1G/1F, horizontal vertical (PB) 2F, horizontal (PC) 2G, vertical upwards (PF) 3F / 3G, vertical downwards (PG) 3F / 3G, 4G Plate (overhead) Plate to Pipe (Fixed) 5F, pipe welding 5G/5F and 6G</p> <p>PC28. shut down and make safe the welding equipment on completion of the welding activities</p> |
| <p>Testing for quality</p> | <p>The user/individual on the job should be able to:</p> <p>PC29. identify various weld defects, use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification</p> <p>Weld defects: lack of continuity of the weld; uneven and irregular ripple formation; excessive spatter; incorrect weld size or profile; burn through; undercutting; overlap; inclusions; distortion; porosity; internal cracks; surface cracks; lack of fusion or incomplete fusion; lack of penetration; excessive</p> |

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| | <p>penetration; gouges; stray arc strikes; sharp edges; excessive convexity</p> <p>PC30. check that the welded joint conforms to the specification, by checking various quality parameters by visual inspection Quality parameters: dimensional accuracy; alignment/squareness; size and profile of weld; visual defects; NDT/DT tested defects Visual inspections: e.g. use of visual techniques, distance from workpiece, angle of observation, adequate lighting, low powered magnification, fillet weld gauges, etc.</p> <p>PC31. detect surface imperfections and deal with them appropriately</p> <p>PC32. carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT)</p> |
| <p>Post-welding activities</p> | <p>The user/individual on the job should be able to:</p> <p>PC33. assist in preparation for non-destructive testing of the welds, for a range of tests Non-destructive tests (NDT): Penetrant testing- dye penetrant (DPT), fluorescent penetrant (FPT); magnetic particle (MPT); radiographic (RT); ultrasonic (UT)</p> <p>PC34. prepare for destructive tests on weld specimens for fillet, butt and corner Destructive tests (DT): macro examination; fractured test- nick break test; bend tests (such as face, root or side as appropriate); mechanical (tensile and shear, impact); chemical</p> |
| <p>Dealing with contingencies</p> | <p>The user/individual on the job should be able to:</p> <p>PC35. 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</p> |
| <p>Knowledge and Understanding (K)</p> | |
| <p>A. Organizational Context (Knowledge of the company / organization and its processes)</p> | <p>The user/individual on the job needs to know and understand:</p> <p>KA1. relevant legislation, standards, policies, and procedures followed in the company</p> <p>KA2. key purpose of the organization</p> <p>KA3. department structure and hierarchy protocols</p> <p>KA4. work flow and own role in the workflow</p> <p>KA5. dependencies and interdependencies in the workflow</p> <p>KA6. support functions and types of support available for incumbents in this role</p> |

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| B. Technical Knowledge | <p>The user/individual on the job needs to know and understand:</p> <p>KB1. health and safety, hazards and precautions associated with MMAW/SMAW welding Safety precautions (MMAW/SMAW Welding): protection from live and other electrical components, including insulation, proper earthing, etc.; proper handling and placement of hot metal; taking account of spatter and related safe distance; adequate lighting; appropriate personal protective equipment- suitable aprons, welding gloves, respirators, safety boots, correctly fitting overalls, suitable eye shields/goggles, hard hat/helmet; protection of self and others from the effects of the welding arc; fume extraction/control measures; safety measures for elevated and trench workings (eg. harness, etc.)</p> <p>KB2. applications of manual metal arc welding</p> <p>KB3. effects of exposure to the electric arc</p> <p>KB4. types of fire extinguishers and their suitable uses</p> <p>KB5. effects of exposure to welding fume</p> <p>KB6. methods of managing welding fume hazards</p> <p>KB7. personal protective equipment (PPE) and clothing to be worn during MMAW/SMAW welding Personal protective equipment (PPE): (suitable aprons, welding gloves, respirators, safety boots, correctly fitting overalls, suitable eye shields/goggles, hard hat/helmet</p> <p>KB8. welding specific equipment requirements for MMAW/SMAW welding MMAW equipment: e.g. transformers; rectifiers; generators; invertors; consumables – electrodes, dyes; welding accessories - holders, cables and accessories; ancillary equipment - (power saw, angle, pedestal and straight grinders, tong tester, etc.); electrode drying oven, etc.</p> <p>KB9. main components and controls of welding equipment</p> <p>KB10. how to connect electrical components correctly</p> <p>KB11. type of current used and implication</p> <p>KB12. welding symbols used and their correct interpretation</p> <p>KB13. consumables used for MMAW/SMAW welding</p> <p>KB14. various types of electrodes (classification) based on covering Electrodes: rutile, basic, cellulosic, acid</p> <p>KB15. function of covering</p> <p>KB16. various defects associated with the MMAW/SMAW welding process Weld defects: lack of continuity of the weld; uneven and irregular ripple formation; excessive spatter; incorrect weld size or profile; burn through; undercutting; overlap; inclusions; distortion; porosity; internal cracks; surface cracks; lack of fusion or incomplete fusion; lack of penetration; excessive penetration; gouges; stray arc strikes; sharp edges; excessive convexity</p> <p>KB17. types of joint configurations Joints: fillet and groove (lap joints, tee fillet joints, corner joints, butt joints- square, single vee, double vee)</p> <p>KB18. factors that determine weld bead shape Factors: electrode angles and welding technique (push, perpendicular, drag); arc length; thickness of base metal; travel speed (slow, normal, fast)</p> <p>KB19. types of beads, their characteristics and uses (stringer, weave, weave</p> |
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| | <p>patterns) Bead characteristics: spatter deposits, roughness, evenness, fill, crater, overlap</p> <p>KB20. factors that affect weld quality Quality standards: required parameters for dimensional accuracy; weld finishes are built up to the full section of the weld; joins at stop/start positions merge smoothly; weld surface is (free from cracks; substantially free from porosity; free from any pronounced hump or crater; substantially free from shrinkage cavities; substantially free from trapped slag; substantially free from arcing or chipping marks); fillet welds are (equal in leg length, slightly convex in profile (where applicable), size of the fillet equivalent to the thickness of the material welded); weld contour is (of linear and of uniform profile; smooth and free from excessive undulations; regular and has an even ripple formations); welds are adequately fused, and there is minimal undercut, overlap and surface inclusions; tack welds are blended in to form part of the finished weld, without excessive hump; corner joints have minimal burn through to the underside of the joint or, where appropriate</p> <p>KB21. weld positions such as flat, horizontal, vertical and overhead</p> <p>KB22. types of equipment components such as electrode holders, work leads cables and ground clamps</p> <p>KB23. awareness and importance of cable size and length</p> <p>KB24. types of polarity such as AC and DC electrode negative and DC electrode positive for welding purposes</p> <p>KB25. various types of base metals used in welding and their implications</p> <p>KB26. type and thickness of base metals to be welded Base metals: e.g. mild or low carbon steel, austenitic stainless steel, etc.</p> <p>KB27. distortion and how to control distortion Distortion (causes and control methods): Causes: improper sequence of weld runs; direction of weld runs; heat input errors; lack of inaccuracy of jigs and fixture; Control Methods: sequence of welding as materials; proper direction; tacking and its frequency (where applicable; use clamping and jigs and fixtures (where applicable)</p> <p>KB28. magnetic arc blow or arc deflection, causes and methods to avoid or compensate</p> <p>KB29. storage requirements for consumable electrodes</p> <p>KB30. electrode classifications such as tensile strength, position and composition</p> <p>KB31. electrode types based on covering, their characteristics and uses</p> <p>KB32. purpose of re-drying and procedure for different classification of electrode</p> <p>KB33. welding process and method specification sheet, process qualification record (PQR) and related essential variables</p> <p>KB34. travel speed and heat inputs</p> <p>KB35. amperage requirements for different classification of electrodes and positions</p> <p>KB36. importance and implications of various diameters of electrodes</p> <p>KB37. gouging and back gouging principles, methods and procedures</p> <p>KB38. purpose and importance of pre-heating requirements for base metals</p> <p>KB39. purpose and importance of post-heating in welding</p> <p>KB40. methods to achieve pre-heat and post heat requirements</p> |
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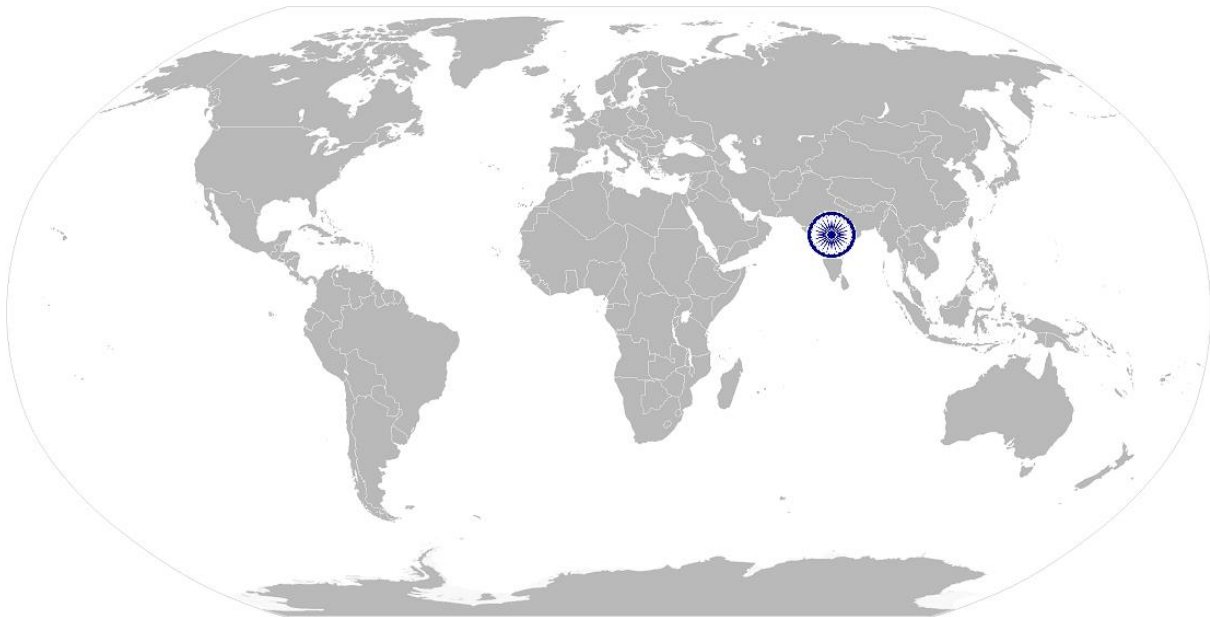
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| | <p>KB41. tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc.</p> <p>KB42. significance of diffusible hydrogen for welds</p> <p>KB43. importance of maintaining welding standards specified for the job</p> <p>KB44. impact of a welding job done right, acceptable or non-acceptable</p> <p>KB45. types of visual inspection indicators and methods Visual inspections: e.g. use of visual techniques, distance from workpiece, angle of observation, adequate lighting, low powered magnification, fillet weld gauges, etc.</p> <p>KB46. types of NDT and DT inspection methods</p> <p>KB47. procedure to conduct DP testing</p> <p>KB48. common welder testing codes and their purpose Testing codes: ASME section IX, EN 287, ISO 9606, IS 731</p> |
| Skills (S) [Optional] | |
| A. Core Skills/ Generic Skills | Communication |
| | <p>The user/ individual on the job needs to know and understand how to:</p> <p>SA1. read and interpret information correctly from various job specification documents, manuals, health and safety instructions, memos, etc. applicable to the job in English and/or local language</p> <p>SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language</p> <p>SA3. convey and share technical information clearly using appropriate language</p> <p>SA4. check and clarify task-related information</p> <p>SA5. liaise with appropriate authorities using correct protocol</p> <p>SA6. communicate with people in respectful form and manner in line with organizational protocol</p> |
| | Numerical and computational skills |
| <p>The user/individual on the job needs to know and understand how to:</p> <p>SA7. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)</p> <p>SA8. use appropriate measuring techniques</p> <p>SA9. use and convert imperial and metric systems of measurements</p> <p>SA10. apply appropriate degree of accuracy to express numbers</p> <p>SA11. calculate tolerance in terms of limits of size</p> <p>SA12. check measurements, angles, orientation and slopes</p> <p>SA13. types of reference lines such as tangent lines, datum lines, centre lines and work points</p> <p>SA14. check square of material using corner-to-corner dimensions and triangulation (3-4-5) method</p> <p>SA15. select and use tools and equipment such as measuring tapes, levels, squares, protractors and dividers</p> <p>SA16. ability to check dimensions of components</p> <p>SA17. calculate the value of angles in a triangle</p> | |

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| | SA18. interpret straight line graphs using given data |
| | Learning |
| | The user/individual on the job needs to know and understand how to: SA19. participate in on-the-job and other learning, training and development interventions and assessments SA20. clarify task related information with appropriate personnel or technical adviser SA21. seek to improve and modify own work practices SA22. maintain current knowledge of application standards, legislation, codes of practice and product/process developments |
| B. Professional Skills | Problem Solving |
| | The user/individual on the job needs to know and understand how to: SB1. identify problems with work planning, procedures, output and behavior and their implications SB2. prioritize and plan for problem solving SB3. communicate problems appropriately to others SB4. identify sources of information and support for problem solving SB5. seek assistance and support from other sources to solve problems SB6. identify effective resolution techniques SB7. select and apply resolution techniques SB8. seek evidence for problem resolution |
| | Plan and Organize |
| | The user/individual on the job needs to know and understand how to: SB9. plan, prioritize and sequence work operations as per job requirements SB10. organize and analyze information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time |
| | Initiative and Enterprise |
| | The user/individual on the job needs to know and understand how to: SB12. undertake and express new ideas and initiatives to others SB13. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB14. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB15. one's competencies in new and different situations and contexts to achieve more |
| | Self-Management |
| | The user/individual on the job needs to know and understand how to: SB16. exercise restraint while expressing dissent and during conflict situations SB17. avoid and manage distractions to be disciplined at work SB18. manage own time for achieving better results |
| | Teamwork |

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| | <p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none">SB19. work in a team in order to achieve better resultsSB20. identify and clarify work roles within a teamSB21. communicate and cooperate with others in the team for better resultsSB22. seek assistance from fellow team members |
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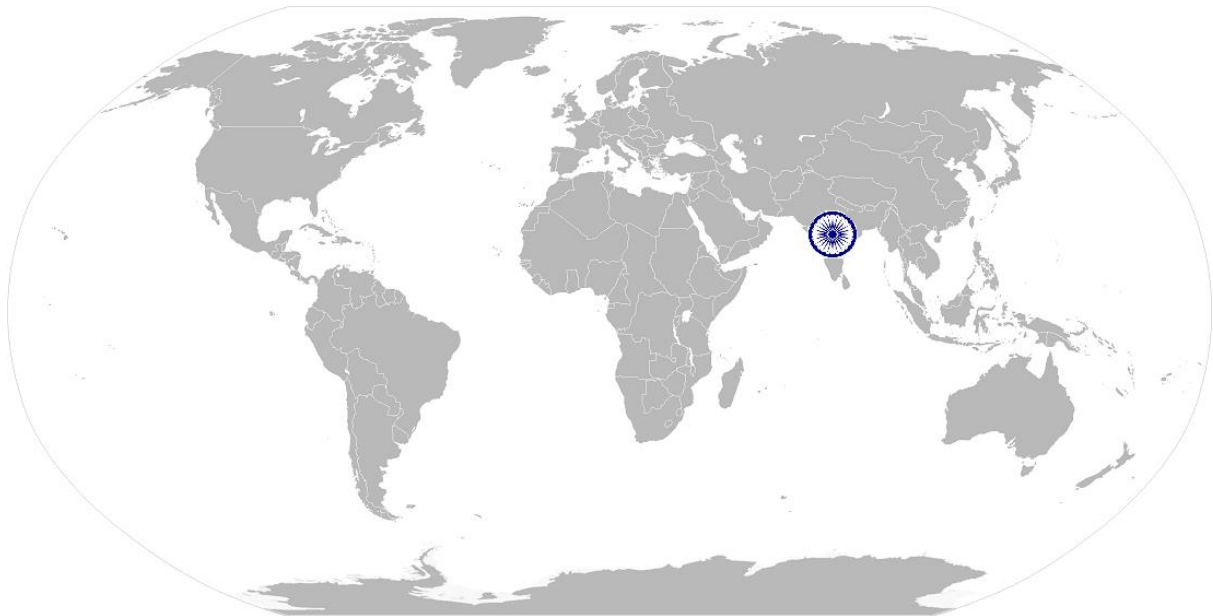
CSC/ N 0208: Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding / Shielded Metal Arc Welding

NOS Version Control

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|----------------------------|---|-------------------------|-----------------|
| NOS Code | CSC / N 0208 | | |
| Credits(NSQF) | TBD | Version number | 1.0 |
| Industry | Capital Goods | Drafted on | 10/04/14 |
| Industry Sub-sector | <ol style="list-style-type: none"> 1. Machine Tools 2. Dies, Moulds and Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods | Last reviewed on | 18/03/15 |
| Occupation | Welding and Cutting | Next review date | 30/08/16 |

CSC/ N 0207: Manually cut metal materials using plasma arc

National Occupational Standard



Overview

This unit covers manual cutting operations using plasma arc cutting process. The person would be able to independently carry out plasma arc cutting operations for as per welding procedure specification (WPS).

CSC/ N 0207: Manually cut metal materials using plasma arc

National Occupational Standard

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| Unit Code | CSC / N 0207 |
| Unit Title (Task) | Manually cut metal materials using plasma arc |
| Description | <p>This unit is about competencies required for manual cutting operations using plasma arc. The candidate will be able to cut different materials (mild carbon steel, stainless steel, aluminum, high tensile and special steels, and other materials) in various profiles pertaining to the gas cutting process.</p> <p>The candidate will be expected to work with a minimum of supervision, taking personal responsibility for own actions, quality and accuracy of the work.</p> |
| Scope | <p>This unit/task covers the following:</p> <ul style="list-style-type: none"> • Working safely • Prepare for cutting operations • Carry out cutting operations • Test for quality • Dealing with contingencies |
| Performance Criteria(PC) w.r.t. the Scope | |
| Element | Performance Criteria |
| Working safely | <p>The user/individual on the job should be able to:</p> <p>PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>Safety precautions (general): general workshop safety; fire prevention; general hazards; manual lifting; overhead lifting; surface conditions; stability of surrounding structures, furniture, etc.</p> <p>PC2. take necessary safety precautions for plasma cutting operations including equipment, processes and checks</p> |
| Prepare for cutting operations | <p>The user/individual on the job should be able to:</p> <p>PC3. interpret cutting procedure data sheets specifications</p> <p>PC4. check regulators, hoses and check that valves are securely connected and free from leaks and damage</p> <p>PC5. check equipment is calibrated and approved for use</p> <p>PC6. check/fit the correct nozzle to the torch</p> <p>PC7. match correct tips and cups to the torch as per requirement and manufacturer's equipment instructions</p> <p>PC8. set the amperage and gas pressure as per metal thickness, metal type, and type of gas</p> <p>Materials type: mild steel; high alloy steel; stainless steel; aluminium and its alloys; other appropriate metal</p> <p>Types of gases: Primary Plasma Gas – used to create the plasma arc (Nitrogen, Argon, Hydrogen, Compressed air); Secondary Shielding Gas – used to protect the cut metals from oxidation (CO₂, Compressed Air)</p> <p>PC9. use the correct procedure for lighting, adjusting and extinguishing the arc</p> |

CSC/ N 0207: Manually cut metal materials using plasma arc

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| | <p>PC10. use appropriate and safe procedures for handling and storing of gas cylinders</p> <p>PC11. prepare the work area for the cutting activities</p> <p>PC12. obtain the appropriate tools and equipment for the plasma arc cutting operations, and check that they are in a safe and usable condition Equipment: plasma power source ; pilot arc ignition system; torch; portable straight line cutters; profile cutting machines; air filter with regulator; burner electrode; compressor; nozzle; electrode holder; contact tube; front cap; gas supply system with gauges; cooling system; earthing clamp; connecting leads and cables</p> <p>PC13. check that the plasma arc cutting equipment is correctly set up for the operations to be performed</p> <p>PC14. carry out correct measurements required using appropriate equipment and methods for planning the cut</p> <p>PC15. where appropriate, mark out the components for the required operations, using appropriate tools and techniques</p> <p>PC16. perform trial cut to check for cut defect</p> |
| <p>Carry out cutting operations</p> | <p>The user/individual on the job should be able to:</p> <p>PC17. operate the plasma cutting equipment to produce items/cut shapes to the dimensions and profiles as specified</p> <p>PC18. use the correct angles to cut and the right speed</p> <p>PC19. use various types of plasma arc cutting methods/techniques Cutting techniques: stand-off, circle cutting, profile cutting, edge, stenting hole, piercing technique</p> <p>PC20. perform various cutting operations correctly Cutting operations: down-hand straight cuts (freehand), making straight cuts (track guided), cutting regular shapes, cutting irregular shapes, making angled cuts, cutting chamfers, making radial cuts, gouging/flushing, bevelled edge – weld preparations, cutting out holes</p> <p>PC21. produce thermal cuts in various forms of material Forms: plate, rolled section, pipe/tube, solid bars</p> <p>PC22. produce cut profiles for various type of materials Materials type: mild steel; high alloy steel; stainless steel; aluminium and its alloys; other appropriate metal</p> <p>PC23. produce thermally-cut components which meet specified quality criteria Quality criteria: dimensional accuracy is within the tolerances specified on the drawing/specification, or within +/- 1mm; angled/radial cuts are within specification requirements; cuts are clean and smooth and free from flutes; no drags</p> <p>PC24. detect and correct defects in cut</p> <p>PC25. leave the work area in a safe and tidy condition on completion of the cutting activities</p> |

CSC/ N 0207: Manually cut metal materials using plasma arc

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| <p>Test for quality</p> | <p>The user/individual on the job should be able to:</p> <p>PC26. check that the finished components meet the required standard</p> <p>PC27. use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the cut material are to the specification</p> <p>PC28. identify various cutting defects Defects: grooved, fluted or ragged cuts, poor draglines, rounded edges, tightly adhering slag, dross, burr, distortion</p> |
| <p>Dealing with contingencies</p> | <p>The user/individual on the job should be able to:</p> <p>PC29. report any difficulties or problems that may arise with the cutting activities, and carry out any agreed actions</p> <p>PC30. detect equipment malfunctions and deal with them appropriately</p> <p>PC31. 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</p> <p>PC32. shut down and make safe the cutting equipment on completion of the cutting activities or during an emergency</p> <p>PC33. in case of emergencies follow standard emergency procedures</p> |
| <p>Knowledge and Understanding (K)</p> | |
| <p>A. Organizational Context (Knowledge of the company / organization and its processes)</p> | <p>The user/individual on the job needs to know and understand:</p> <p>KA1. job relevant legislation, standards, policies, and procedures followed in the company</p> <p>KA2. key purpose of the organization</p> <p>KA3. department structure and hierarchy protocols</p> <p>KA4. work flow and own role in the workflow</p> <p>KA5. dependencies and interdependencies in the workflow</p> <p>KA6. support functions and types of support available for incumbents in this role</p> |
| <p>B. Technical Knowledge</p> | <p>The user/individual on the job needs to know and understand:</p> <p>KB1. types of fire extinguishers and their suitable uses in case of gas cutting related fires</p> <p>KB2. specific safety precautions to be taken when working with plasma arc cutting equipment in a fabrication environment Safety precautions: safety from trailing hoses; safety from arc; appropriate fume and gases extraction/control measures; safety from spatter and hot metal (distance, PPE, proper handling and placement); protection from live and other electrical components, including insulation, proper earthing, proper loading, etc.; adequate lighting; appropriate personal protective equipment; protection of self and others from the effects of the arc; cylinder safety; safety measures including nozzles, valves, flowmeter, flashback arrestors, etc.; safety measures for elevated and trench working</p> <p>KB3. personal protective clothing and equipment (PPE) to be worn when working with plasma cutting equipment Personal protective equipment: suitable aprons, gloves, safety boots, correctly fitting overalls, suitable eye shields/goggles, ear plugs or covering hazards associated with carrying out plasma arc cutting activities and how</p> <p>KB4.</p> |

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| | <p>they can be minimized</p> <p>KB5. safe working practices and procedures for using plasma equipment</p> <p>KB6. principles of plasma arc cutting Principles: plasma an ionized gas that conducts electricity; plasma is created by adding energy to an electrically neutral gas; gas is compressed air, energy is electricity; more electrical energy added, the hotter the plasma; plasma cutting machines constrict the arc and force it through a concentrated area (the nozzle); pilot arc, cutting arc; increasing air pressure and intensifying the arc with higher amperage, the arc becomes hotter and more capable of blasting through thicker metals and blowing away the cuttings and it does not require a pre-heat cycle; using an inert gas for pressure prevents the cut areas from oxidizing; for most ferrous metals, compressed air is used; for non-ferrous metals the inert gas is essential to prevent oxidation; different plasma tip diameters are used for different cutting thickness; has smaller heat affected zone (HAZ) preventing the area around the cut from warping and minimizes paint damage; provides gouging and piercing capabilities; minimal cleanup required, small and more precise kerf (width of the cut); cuts any type of electrically conductive metals including aluminum, copper, brass and stainless steel</p> <p>KB7. common terminology used in plasma cutting</p> <p>KB8. procedure for obtaining the required drawings, job instructions and other related specifications</p> <p>KB9. how to use and extract information from engineering drawings and related specifications, workpiece reference points and system of tolerances</p> <p>KB10. various types of plasma arc cutting equipment available Types: transferred, non-transferred (welding)</p> <p>KB11. various components of the cutting equipment and types of consumables used Consumables: electrode, gases, tips, cups</p> <p>KB12. construction of the cutting torch</p> <p>KB13. types of plasma arc gases used Types of gases: Primary Plasma Gas – used to create the plasma arc (Nitrogen, Argon, Hydrogen, Compressed air); Secondary Shielding Gas – used to protect the cut metals from oxidation (CO₂, Compressed Air)</p> <p>KB14. accessories that can be used with handheld gas cutting equipment to aid cutting operations (such as cutting guides, templates)</p> <p>KB15. types of regulators such as low- and high-pressure, and single- and two-stage</p> <p>KB16. nozzle type as per type and thickness of base materials</p> <p>KB17. preparations prior to cutting (including checking connections for leaks, setting gas pressures, setting up the material/workpiece, and checking the cleanliness of materials used)</p> <p>KB18. holding methods that are used to aid plasma cutting, and the equipment that can be used</p> <p>KB19. correct procedure for lighting, cutting and extinguishing the arc</p> <p>KB20. importance of following the correct procedure for lighting, cutting and extinguishing an arc</p> <p>KB21. importance of torch to arc distance in relation to thickness of materials, types of torches and gases</p> |
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CSC/ N 0207: Manually cut metal materials using plasma arc

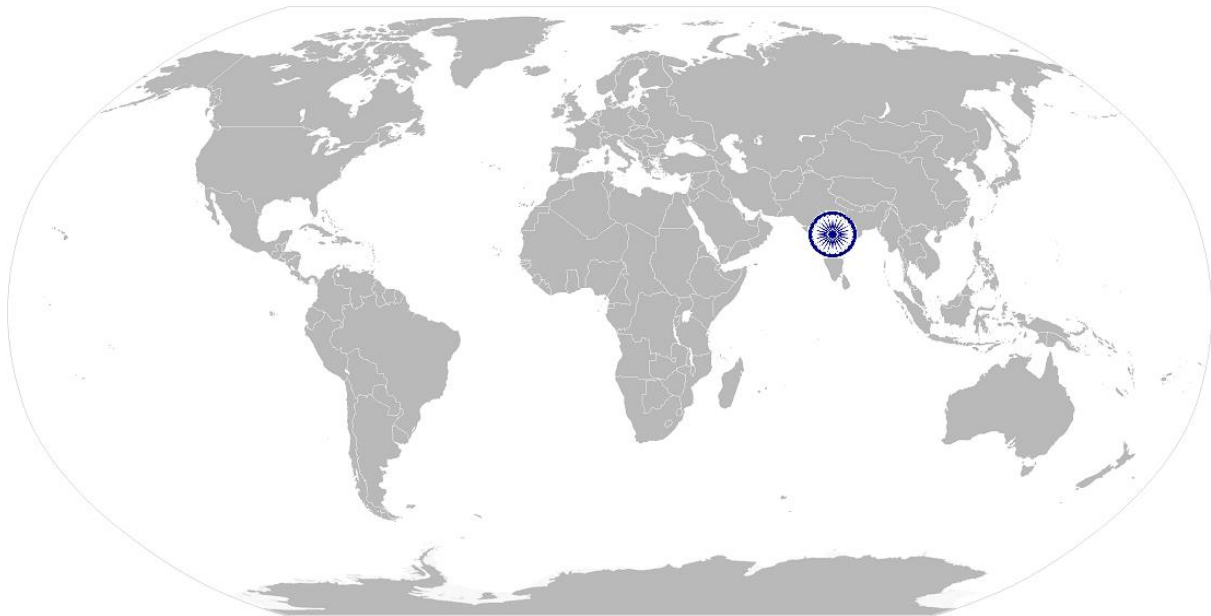
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| | <p>Torches: air plasma, oxygen injected, duel gas</p> <p>KB22. factors that impact nozzle life</p> <p>KB23. double arcing and its impact</p> <p>KB24. problems that can occur with plasma cutting, and how they can be avoided (including causes of distortion during plasma cutting and methods of controlling distortion)</p> <p>KB25. effects of oil, grease, scale or dirt on the cutting process</p> <p>KB26. quality parameters for plasma cut materials</p> <p>Quality parameters: shape and length of the draglines; squareness; angle deviation; smoothness of the sides; sharpness of the top edges; amount of slag adhering to the metal</p> <p>KB27. causes of cutting defects, how to recognize them, and methods of correction and prevention</p> <p>KB28. gouging and back gouging principles, methods and procedures</p> <p>KB29. importance of leaving the work area in a safe and clean condition on completion of activities</p> <p>KB30. emergency procedures for electrical and other fires</p> <p>KB31. how to close down the cutting equipment safely and correctly</p> <p>KB32. purging tools and their function</p> |
| Skills (S) [Optional] | |
| A. Core Skills/ Generic Skills | Communication |
| | <p>The user/ individual on the job needs to know and understand how to:</p> <p>SA1. read and interpret information correctly from various job specification documents, manuals, health and safety instructions, memos, etc. applicable to the job in English and/or local language</p> <p>SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language</p> <p>SA3. convey and share technical information clearly using appropriate language</p> <p>SA4. check and clarify task-related information</p> <p>SA5. liaise with appropriate authorities using correct protocol</p> <p>SA6. communicate with people in respectful form and manner in line with organizational protocol</p> |
| | Numerical and computational skills |
| | <p>The user/individual on the job needs to know and understand how to:</p> <p>SA7. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)</p> <p>SA8. use appropriate measuring techniques</p> <p>SA9. use and convert imperial and metric systems of measurements</p> <p>SA10. apply appropriate degree of accuracy to express numbers</p> <p>SA11. use tolerance in terms of limits of size</p> <p>SA12. check measurements, angles, orientation and slopes</p> <p>SA13. types of reference lines such as tangent lines, datum lines, center lines and work points</p> <p>SA14. check square of material using corner-to-corner dimensions and triangulation (3-4-5) method</p> |

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| | <p>SA15. select and use tools and equipment such as measuring tapes, levels, squares, protractors and dividers</p> <p>SA16. ability to check dimensions of components</p> <p>SA17. calculate the value of angles in a triangle</p> |
| | <p>Learning</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA18. participate in on-the-job and other learning, training and development interventions and assessments</p> <p>SA19. clarify task related information with appropriate personnel or technical adviser</p> <p>SA20. seek to improve and modify own work practices</p> <p>SA21. maintain current knowledge of application standards, legislation, codes of practice and product/process developments</p> |
| B. Professional Skills | <p>Problem Solving</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. identify problems with work planning, procedures, output and behavior and their implications</p> <p>SB2. prioritize and plan for problem solving</p> <p>SB3. communicate problems appropriately to others</p> <p>SB4. identify sources of information and support for problem solving</p> <p>SB5. seek assistance and support from other sources to solve problems</p> <p>SB6. identify effective resolution techniques</p> <p>SB7. select and apply resolution techniques</p> <p>SB8. seek evidence for problem resolution</p> |
| | <p>Plan and Organize</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB9. plan, prioritize and sequence work operations as per job requirements</p> <p>SB10. organize and analyze information relevant to work</p> <p>SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time</p> |
| | <p>Initiative and Enterprise</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB12. undertake and express new ideas and initiatives to others</p> <p>SB13. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses</p> <p>SB14. participate in improvement procedures including process, quality and internal/external customer/supplier relationships</p> <p>SB15. one's competencies in new and different situations and contexts to achieve more</p> |
| | <p>Self-Management</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB16. exercise restraint while expressing dissent and during conflict situations</p> <p>SB17. avoid and manage distractions to be disciplined at work</p> <p>SB18. manage own time for achieving better results</p> |

CSC/ N 0207: Manually cut metal materials using plasma arc

| | Teamwork |
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| | The user/individual on the job needs to know and understand how to: SB19. work in a team in order to achieve better results SB20. identify and clarify work roles within a team SB21. communicate and cooperate with others in the team for better results SB22. seek assistance from fellow team members |



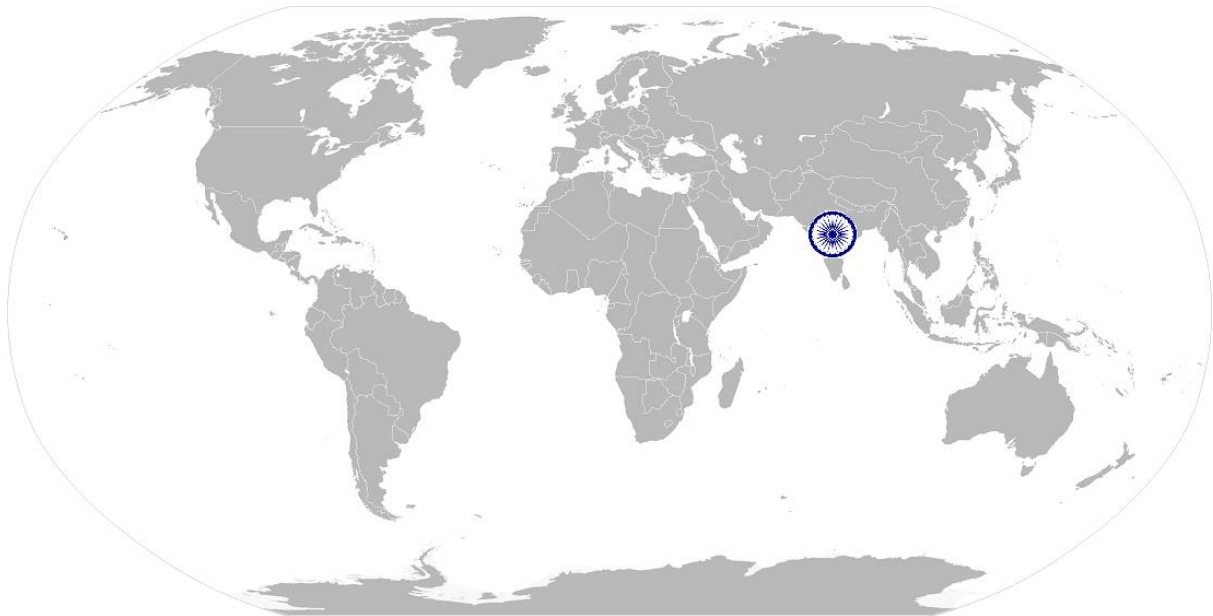
CSC/ N 0207: Manually cut metal materials using plasma arc

NOS Version Control

| NOS Code | CSC / N 0207 | | |
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| Credits(NSQF) | TBD | Version number | 1.0 |
| Industry | Capital Goods | Drafted on | 10/04/14 |
| Industry Sub-sector | <ol style="list-style-type: none"> 1. Machine Tools 2. Dies, Moulds And Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods | Last reviewed on | 18/03/15 |
| Occupation | Welding and Cutting | Next review date | 30/08/16 |

CSC/ N 0203: Manually cut metal and metal alloys using oxy-fuel gas

National Occupational Standard



Overview

This unit is about competencies required for manual cutting operations using oxy-fuel gas. The person would be able to independently carry out oxy-fuel gas cutting operations as per welding procedure specification (WPS).

CSC/ N 0203: Manually cut metal and metal alloys using oxy-fuel gas

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| National Occupational Standard | Unit Code | CSC/ N 0203 |
| | Unit Title (Task) | Manually cut metal and metal alloys using oxy-fuel gas |
| | Description | <p>This unit is about competencies required for manual cutting operations using oxy-fuel gas such as oxy-acetylene. The person would be able to independently carry out oxy-fuel cutting operations for as per welding procedure specification (WPS). The candidate will be able to cut different materials (mild carbon steel, high tensile and special steels, other materials) in various positions.</p> <p>The candidate will be expected to work with a minimum of supervision, taking personal responsibility for own actions, quality and accuracy of the work.</p> |
| | Scope | <p>This unit/task covers the following:</p> <ul style="list-style-type: none"> • Working safely • Prepare for cutting operations • Carry out cutting operations • Test for accuracy • Dealing with contingencies |
| Performance Criteria(PC) w.r.t. the Scope | | |
| Element | Performance Criteria | |
| Working safely | <p>The user/individual on the job should be able to:</p> <p>PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines Safety precautions: general workshop safety, fire prevention, general hazards, manual lifting, overhead lifting, surface conditions, stability of surrounding structures, furniture, etc.</p> <p>PC2. take necessary safety precautions for gas cutting operations including equipment, processes and checks</p> | |
| Prepare for cutting operations | <p>The user/individual on the job should be able to:</p> <p>PC3. interpret cutting procedure data sheets specifications PC4. check regulators, hoses and check that valves are securely connected and free from leaks and damage PC5. check equipment is calibrated and approved for use PC6. check/fit the correct size gas nozzle to the torch PC7. ensure preheat and oxygen holes on the tips are clean PC8. check that a flashback arrestor is fitted PC9. set appropriate gas pressures PC10. use the correct procedure for lighting, adjusting and extinguishing the flame Lighting and cutting procedures: lighting the cutting torch; adjusting gas controls to produce a neutral flame; methods of starting the cut and controlling the cutting speed; direction and angle of cut; procedure for extinguishing the flame</p> <p>PC11. adjust torch valve for type of flame such as neutral, carburizing and oxidizing PC12. follow sequence of operations such as pre-heating material and initiating cut</p> | |

CSC/ N 0203: Manually cut metal and metal alloys using oxy-fuel gas

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| | <p>PC13. mark out the locations for cutting accurately and as per requirement</p> <p>PC14. use appropriate and safe procedures for handling and storing of gas cylinders</p> <p>PC15. prepare the work area for the cutting activities</p> <p>PC16. obtain the appropriate tools and equipment for the oxy-fuel gas cutting operations, and check that they are in a safe and usable condition Equipment: hand-held oxy-fuel gas cutting equipment, simple, portable, track-driven cutting equipment (electrical or mechanical), fixed bench gas cutting equipment</p> <p>PC17. check that the oxy-fuel gas cutting equipment is set up for the operations to be performed</p> <p>PC18. adjust cylinder valves and adjust regulator for operating pressure to achieve specifications for required operations</p> <p>PC19. where appropriate, mark out the components for the required operations, using appropriate tools and techniques</p> <p>PC20. perform trial cut to check for cut defects</p> |
| <p>Carry out cutting operations</p> | <p>The user/individual on the job should be able to:</p> <p>PC21. operate the oxy-fuel gas cutting equipment to produce items/cut shapes to the dimensions and profiles specified</p> <p>PC22. use various types of oxy-fuel gas cutting methods</p> <p>PC23. perform various cutting operations correctly Cutting operations: down-hand straight cuts (freehand), making straight cuts (track guided), cutting regular shapes, cutting irregular shapes, making angled cuts, cutting chamfers, making radial cuts, gouging/flushing, beveled edge – weld preparations, cutting out holes</p> <p>PC24. produce thermal cuts in various forms of material (metal of 3mm and above)</p> <p>PC25. produce cut profiles for various type of materials and forms Materials: mild carbon steel, high tensile and special steels, other materials Forms: plate, rolled section, pipe/tube, solid bars</p> <p>PC26. produce thermally-cut components which meet specified quality criteria Quality criteria: dimensional accuracy is within the tolerances specified on the drawing/specification, or within +/- 2mm; angled/radial cuts are within specification requirements; cuts are clean and smooth and free from flutes; no drags</p> <p>PC27. recognize and correct burnback and flashback</p> <p>PC28. detect and correct defects in cut</p> <p>PC29. ensure the work area is left in a safe and tidy condition on completion of the cutting activities</p> |
| <p>Test for accuracy</p> | <p>The user/individual on the job should be able to:</p> <p>PC30. check that the finished components meet the standard required</p> <p>PC31. use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the cut material are to the specification</p> <p>PC32. identify various cutting defects and follow organisation recommended procedures to address them Defects: distortion; grooved, fluted or ragged cuts; poor draglines; rounded</p> |

CSC/ N 0203: Manually cut metal and metal alloys using oxy-fuel gas

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| | edges; tightly adhering slag |
| <p>Dealing with contingencies</p> | <p>The user/individual on the job should be able to:</p> <p>PC33. report any difficulties or problems that may arise with the cutting activities, and carry out any agreed actions</p> <p>PC34. detect equipment malfunctions and deal with them appropriately</p> <p>PC35. 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</p> <p>PC36. shut down and make safe the cutting equipment on completion of the cutting activities</p> <p>PC37. in case of emergencies follow standard emergency procedures</p> <p>Emergencies (safety procedures): sustained backfire in a blowpipe; close the oxygen valve of the blowpipe; followed by the fuel valve and then close both cylinder valves; investigate the cause and rectify the fault; re-light the blowpipe only after it is completely cooled down; flashback into the hose and equipment, or a hose fire or explosion, or a fire at the gas regulator connections; isolate the fuel gas and oxygen supplies by closing the cylinder valves only when this can be done safely; may attempt to control the fire by fire-fighting equipment only when there is no undue risk of personal injury; activate the fire alarm and call for the Fire Services Department as per organizational procedures; fires involving acetylene cylinders; always best dealt with by firemen from the Fire Services Department. However, the following initial response may be appropriate: cool the cylinder by spraying with water only if it is safe to do so; close the cylinder valve to control the fire only if it is safe to do so; evacuate the building by activating the fire alarm or by any other means; to avoid explosion never move an acetylene cylinder involved in a fire or which has been affected by heat from a nearby fire even if it seems cooled down</p> |
| <p>Knowledge and Understanding (K)</p> | |
| <p>A. Organizational Context (Knowledge of the company / organization and its processes)</p> | <p>The user/individual on the job needs to know and understand:</p> <p>KA1. job relevant legislation, standards, policies, and procedures followed in the company</p> <p>KA2. key purpose of the organization</p> <p>KA3. department structure and hierarchy protocols</p> <p>KA4. work flow and own role in the workflow</p> <p>KA5. dependencies and interdependencies in the workflow</p> <p>KA6. support functions and types of support available for incumbents in this role</p> |

CSC/ N 0203: Manually cut metal and metal alloys using oxy-fuel gas

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| <p>B. Technical Knowledge</p> | <p>The user/individual on the job needs to know and understand:</p> <p>KB1. types of fire extinguishers and their suitable uses in case of gas cutting related fires</p> <p>KB2. specific safety precautions to be taken when working with oxy-fuel gas cutting equipment in a fabrication environment Safety precautions: safety from trailing hoses; safety from naked flames; appropriate fume and gases extraction/control measures; safety from explosive gas mixtures and oxygen enrichment; safety from spatter and hot metal (distance, PPE, proper handling and placement); protection from live and other electrical components, including insulation, proper earthing, proper loading, etc.; adequate lighting; appropriate personal protective equipment; protection of self and others from the effects of the flame; safety measures for elevated and trench working; gas cylinder safety: right color code; correctly labelled; no leakage; away from heat or ignition source; never use hose other than that designed for the specified gas; use ferrules or clamps designed for the hose (not ordinary wire or other substitute) to connect hoses to fittings; upright position (fuel gas); physical care to avoid damage and falls, throws and bumps; move on trolleys, cap closed and without regulators; valves closed on empty cylinders</p> <p>KB3. personal protective clothing and equipment (PPE) to be worn when working with gas cutting equipment Personal protective equipment: suitable aprons, gloves, safety boots, correctly fitting overalls, suitable eye shields/goggles, respirators</p> <p>KB4. hazards associated with carrying out gas cutting activities and how they can be minimized</p> <p>KB5. safe working practices and procedures for using thermal equipment</p> <p>KB6. principles of oxy-fuel gas cutting Principles: oxygen cutting for materials which readily get oxidized; oxides have lower melting points than the metals; widely used for ferrous materials; oxygen cutting is not used for materials like aluminum, bronze, mild steels which resist oxidation; cutting of high carbon steels and cast irons require special attention due to formation of heat affected zone (HAZ) where structural transformation occurs; substitute hydrocarbon gases (propane, butane and natural gas) not suitable for cutting ferrous materials due to their oxidizing characteristics</p> <p>KB7. procedure for obtaining the required drawings, job instructions and other related specifications</p> <p>KB8. how to use and extract information from engineering drawings and related specifications, workpiece reference points and system of tolerances</p> <p>KB9. various types of gas cutting equipment available Equipment: hand-held oxy-fuel gas cutting equipment, simple, portable, track-driven cutting equipment (electrical or mechanical), fixed bench gas cutting equipment</p> <p>KB10. various components of the gas cutting equipment Components: color coded cylinder oxygen; color coded cylinder acetylene; cylinder valve; flashback arrestor; set of nozzles; gas lighter nozzle; cutting tips; pressure regulator; pressure gauge; non-return valves; color coded flexible hose; trolleys; torches (rose-bud heating, cutting, others)</p> |
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CSC/ N 0203: Manually cut metal and metal alloys using oxy-fuel gas

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| | <p>KB11. construction of the heating and cutting torch</p> <p>KB12. types of oxy-fuel gases such as acetylene, natural gas and propane</p> <p>KB13. accessories that can be used with handheld gas cutting equipment to aid cutting operations (such as cutting guides, trammels, templates)</p> <p>KB14. importance of correct marking procedure before a cut (eg. allowances for post-cut operations, punch marks, etc.)</p> <p>KB15. types of regulators such as low- and high-pressure, and single- and two-stage</p> <p>KB16. how to identify the gases used in the cutting process, and the color coding of gas cylinders</p> <p>KB17. type and thickness of base metals related to nozzle type</p> <p>KB18. preparations prior to cutting (including checking connections for leaks, setting gas pressures, setting up the material/workpiece, and checking the cleanliness of materials used)</p> <p>KB19. holding methods that are used to aid thermal cutting, and the equipment that can be used</p> <p>KB20. correct procedure for lighting, cutting and extinguishing the flame Lighting and cutting procedures: lighting the cutting torch; adjusting gas controls to produce a neutral flame; methods of starting the cut and controlling the cutting speed; direction and angle of cut; procedure for extinguishing the flame</p> <p>KB21. types of flames and their implication for cutting</p> <p>KB22. importance of following the correct procedure for lighting, cutting and extinguishing a flame</p> <p>KB23. problems that can occur with thermal cutting, and how they can be avoided (including causes of distortion during thermal cutting and methods of controlling distortion)</p> <p>KB24. effects of oil, grease, scale or dirt on the cutting process</p> <p>KB25. gas mixture ratio required to get various flames</p> <p>KB26. quality parameters for gas cut materials Quality parameters: shape and length of the draglines; smoothness of the sides; sharpness of the top edges; amount of slag adhering to the metal</p> <p>KB27. special grade materials used in industry and their behavior with oxy fuel gas</p> <p>KB28. causes of cutting defects, how to recognize them, and methods of correction and prevention Defects: distortion; grooved, fluted or ragged cuts; poor draglines; rounded edges; tightly adhering slag</p> <p>KB29. importance of leaving the work area in a safe and clean condition on completion of activities</p> <p>KB30. correct handling and storage of gas cylinders</p> <p>KB31. emergency procedures for backfires, flashback and other fires Emergencies (safety procedures): sustained backfire in a blowpipe; close the oxygen valve of the blowpipe; followed by the fuel valve and then close both cylinder valves; investigate the cause and rectify the fault; re-light the blowpipe only after it is completely cooled down; flashback into the hose and equipment, or a hose fire or explosion, or a fire at the gas regulator connections; isolate the fuel gas and oxygen supplies by closing the cylinder valves only when this can be done safely; may attempt to control the fire by fire-fighting equipment only when there is no undue risk of personal injury;</p> |
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CSC/ N 0203: Manually cut metal and metal alloys using oxy-fuel gas

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| | <p>activate the fire alarm and call for the Fire Services Department as per organizational procedures; fires involving acetylene cylinders; always best dealt with by firemen from the Fire Services Department. However, the following initial response may be appropriate: cool the cylinder by spraying with water only if it is safe to do so; close the cylinder valve to control the fire only if it is safe to do so; evacuate the building by activating the fire alarm or by any other means; to avoid explosion never move an acetylene cylinder involved in a fire or which has been affected by heat from a nearby fire even if it seems cooled down</p> <p>KB32. how to close down the cutting equipment safely and correctly KB33. purging tools and their function</p> |
| Skills (S) [Optional] | |
| A. Core Skills/ Generic Skills | <p>Communication</p> <p>The user/ individual on the job needs to know and understand how to:</p> <p>SA1. read and interpret information correctly from various job specification documents, manuals, health and safety instructions, memos, etc. applicable to the job in English and/or local language SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language SA3. convey and share technical information clearly using appropriate language SA4. check and clarify task-related information SA5. liaise with appropriate authorities using correct protocol communicate with people in respectful form and manner in line with organizational protocol</p> <p>Numerical and computational skills</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA6. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages) SA7. use appropriate measuring techniques SA8. apply appropriate degree of accuracy to express numbers Units and number systems representing degree of accuracy: decimals places, fractions as a decimal quantity</p> <p>Learning</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA9. participate in on-the-job and other learning, training and development interventions and assessments SA10. clarify task related information with appropriate personnel or technical adviser SA11. seek to improve and modify own work practices SA12. maintain current knowledge of application standards, legislation, codes of practice and product/process developments</p> |
| B. Professional Skills | <p>Problem Solving</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. identify problems with work planning, procedures, output and behavior and</p> |

CSC/ N 0203: Manually cut metal and metal alloys using oxy-fuel gas

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| | <p>their implications</p> <p>SB2. prioritize and plan for problem solving</p> <p>SB3. communicate problems appropriately to others</p> <p>SB4. identify sources of information and support for problem solving</p> <p>SB5. seek assistance and support from other sources to solve problems</p> <p>SB6. identify effective resolution techniques</p> <p>SB7. select and apply resolution techniques</p> <p>SB8. seek evidence for problem resolution</p> |
| | Plan and Organize |
| | <p>The user/individual on the job needs to know and understand how to:</p> <p>SB9. plan, prioritize and sequence work operations as per job requirements</p> <p>SB10. organize and analyze information relevant to work</p> <p>SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time</p> |
| | Initiative and Enterprise |
| | <p>The user/individual on the job needs to know and understand how to:</p> <p>SB12. undertake and express new ideas and initiatives to others</p> <p>SB13. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses</p> <p>SB14. participate in improvement procedures including process, quality and internal/external customer/supplier relationships</p> <p>SB15. one's competencies in new and different situations and contexts to achieve more</p> |
| | Self-Management |
| | <p>The user/individual on the job needs to know and understand how to:</p> <p>SB16. exercise restraint while expressing dissent and during conflict situations</p> <p>SB17. avoid and manage distractions to be disciplined at work</p> <p>SB18. manage own time for achieving better results</p> |
| | Teamwork |
| <p>The user/individual on the job needs to know and understand how to:</p> <p>SB19. work in a team in order to achieve better results</p> <p>SB20. identify and clarify work roles within a team</p> <p>SB21. communicate and cooperate with others in the team for better results</p> <p>SB22. seek assistance from fellow team members</p> | |

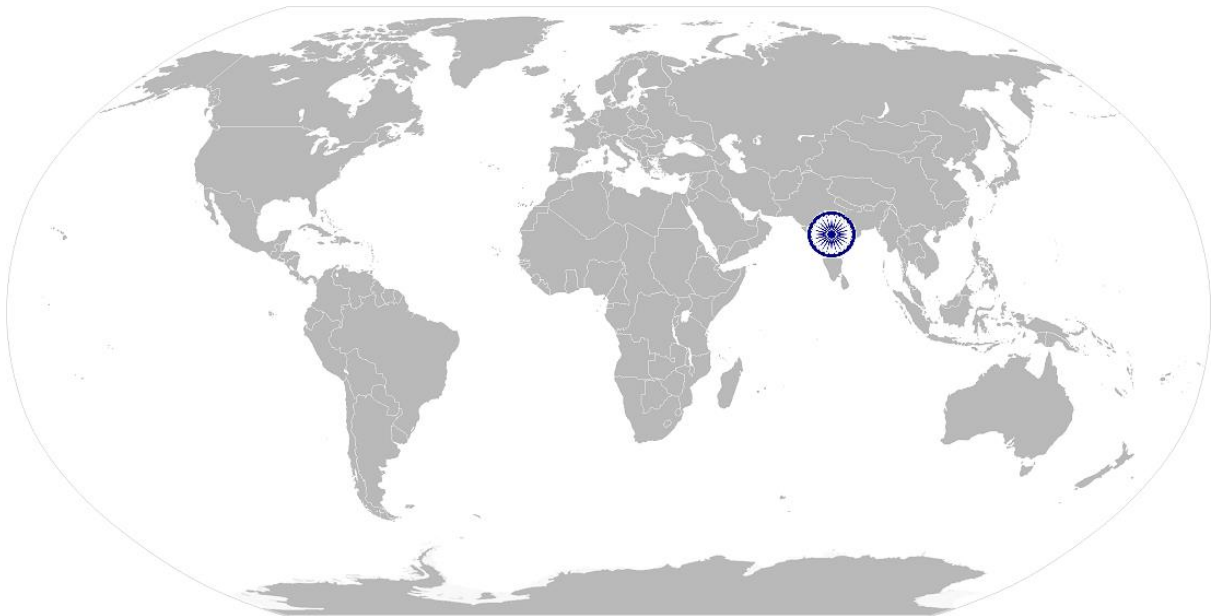
CSC/ N 0203: Manually cut metal and metal alloys using oxy-fuel gas

NOS Version Control

| NOS Code | CSC/ N 0203 | | |
|---------------------|---|------------------|----------|
| Credits(NSQF) | TBD | Version number | 1.0 |
| Industry | Capital Goods | Drafted on | 10/04/14 |
| Industry Sub-sector | <ol style="list-style-type: none"> 1. Machine Tools 2. Dies, Moulds and Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods | Last reviewed on | 18/03/15 |
| Occupation | Welding and Cutting | Next review date | 30/08/16 |

CSC/ N 1335: 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/ N 1335: Use basic health and safety practices at the workplace

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| National Occupational Standard | Unit Code | CSC / N 1335 |
| | Unit Title (Task) | Use basic health and safety practices at the workplace |
| | Description | <p>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.</p> <p>It includes understanding of risks and hazards in the workplace, along with common techniques to minimize risk, deal with accidents, emergencies, etc.</p> <p>It covers knowledge of fire safety, common first aid applications, safe practices and emergency procedures.</p> |
| | Scope | <p>This unit/task covers the following:</p> <ul style="list-style-type: none"> • Health and safety • Fire safety • Emergencies, rescue and first-aid procedures |
| Performance Criteria(PC) w.r.t. the Scope | | |
| Element | Performance Criteria | |
| Health and safety | <p>The user/individual on the job should be able to:</p> <p>PC1. use protective clothing/equipment for specific tasks and work conditions</p> <p>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</p> <p>Equipment: hand shields, machine guards, residual current devices, shields, dust sheets, respirator</p> <p>PC2. state the name and location of people responsible for health and safety in the workplace</p> <p>PC3. state the names and location of documents that refer to health and safety in the workplace</p> <p>PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace</p> <p>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.)</p> | |

CSC/ N 1335: Use basic health and safety practices at the workplace

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| | <p>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)</p> <p>PC5. carry out safe working practices while dealing with hazards to ensure the safety of self and others</p> <p>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.</p> <p>PC6. state methods of accident prevention in the work environment of the job role</p> <p>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</p> <p>PC7. state location of general health and safety equipment in the workplace</p> <p>General health and safety equipment: fire extinguishers; first aid equipment; safety instruments and clothing; safety installations(eg fire exits, exhaust fans)</p> <p>PC8. inspect for faults, set up and safely use steps and ladders in general use</p> <p>Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/unfixed nuts or bolts, etc.</p> <p>Ladders set up: firm/level base, clip/lash down, leaning at the correct angle, etc.</p> <p>PC9. work safely in and around trenches, elevated places and confined areas</p> <p>PC10. lift heavy objects safely using correct procedures</p> <p>PC11. apply good housekeeping practices at all times</p> <p>Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces</p> <p>PC12. identify common hazard signs displayed in various areas</p> <p>Various areas: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc.</p> <p>PC13. retrieve and/or point out documents that refer to health and safety in the workplace</p> |
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CSC/ N 1335: Use basic health and safety practices at the workplace

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| | <p>Documents: fire notices, accident reports, safety instructions for equipment and procedures, company notices and documents, legal documents (eg government notices)</p> |
| Fire safety | <p>The user/individual on the job should be able to:</p> <p>PC14. use the various appropriate fire extinguishers on different types of fires correctly</p> <p>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)</p> <p>PC15. demonstrate rescue techniques applied during fire hazard</p> <p>PC16. demonstrate good housekeeping in order to prevent fire hazards</p> <p>PC17. demonstrate the correct use of a fire extinguisher</p> |
| Emergencies, rescue and first-aid procedures | <p>The user/individual on the job should be able to:</p> <p>PC18. demonstrate how to free a person from electrocution</p> <p>PC19. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.</p> <p>PC20. demonstrate basic techniques of bandaging</p> <p>PC21. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments</p> <p>PC22. perform and organize loss minimization or rescue activity during an accident in real or simulated environments</p> <p>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</p> <p>PC24. demonstrate the artificial respiration and the CPR Process</p> <p>PC25. participate in emergency procedures</p> <p>Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work</p> <p>PC26. complete a written accident/incident report or dictate a report to another person, and send report to person responsible</p> <p>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</p> <p>PC27. demonstrate correct method to move injured people and others during an emergency</p> |
| Knowledge and Understanding (K) | |

CSC/ N 1335: Use basic health and safety practices at the workplace

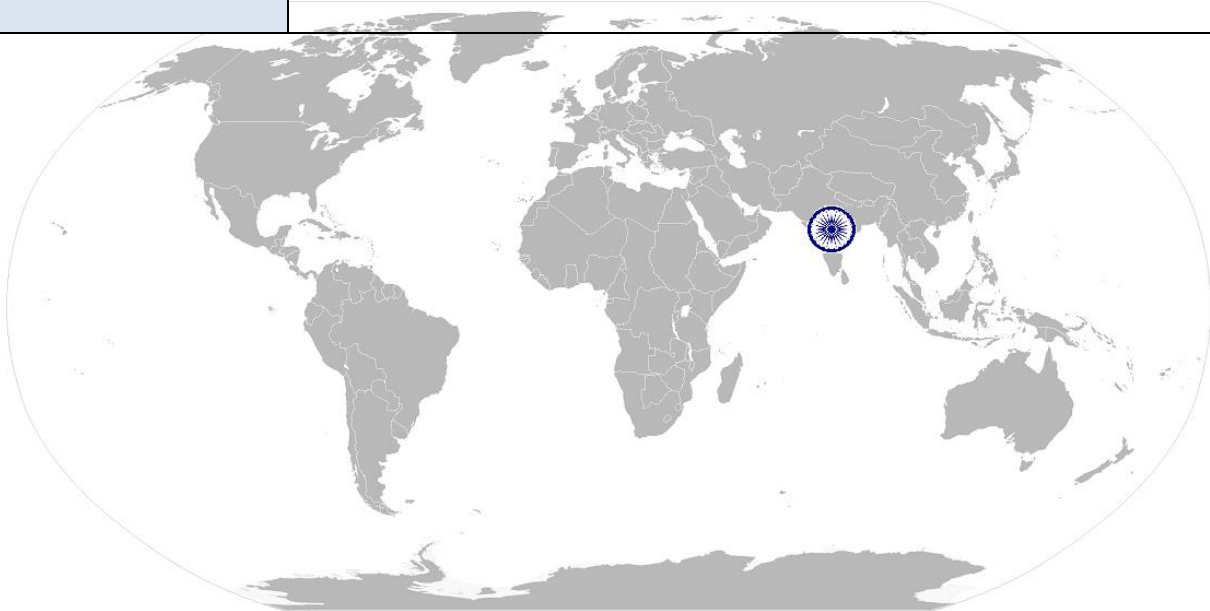
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| <p>A. Organizational Context (Knowledge of the company / organization and its processes)</p> | <p>The user/individual on the job needs to know and understand:</p> <p>KA1. names (and job titles if applicable), and where to find, all the people responsible for health and safety in a workplace.</p> <p>KA2. names and location of documents that refer to health and safety in the workplace.</p> |
| <p>B. Technical Knowledge</p> | <p>The user/individual on the job needs to know and understand:</p> <p>KB1. meaning of “hazards” and “risks”</p> <p>KB2. health and safety hazards commonly present in the work environment and related precautions</p> <p>KB3. possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible</p> <p>KB4. possible causes of risk and accident 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)</p> <p>KB5. methods of accident prevention 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</p> <p>KB6. safe working practices when working with tools and machines</p> <p>KB7. safe working practices while working at various hazardous sites</p> <p>KB8. where to find all the general health and safety equipment in the workplace</p> <p>KB9. various dangers associated with the use of electrical equipment</p> <p>KB10. preventative and remedial actions to be taken in the case of exposure to toxic materials Exposure: ingested, contact with skin, inhaled Preventative action: ventilation, masks, protective clothing/ equipment); Remedial action: immediate first aid, report to supervisor Toxic materials: solvents, flux, lead</p> <p>KB11. importance of using protective clothing/equipment while working</p> <p>KB12. precautionary activities to prevent the fire accident</p> <p>KB13. various causes of fire Causes of fires: heating of metal; spontaneous ignition; sparking; electrical heating; loose fires (smoking, welding, etc.); chemical fires; etc.</p> <p>KB14. techniques of using the different fire extinguishers</p> <p>KB15. different methods of extinguishing fire</p> <p>KB16. different materials used for extinguishing fire Materials: sand, water, foam, CO₂, dry powder</p> <p>KB17. rescue techniques applied during a fire hazard</p> <p>KB18. various types of safety signs and what they mean</p> |

CSC/ N 1335: Use basic health and safety practices at the workplace

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| | <p>KB19. appropriate basic first aid treatment relevant to the condition eg. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries</p> <p>KB20. content of written accident report</p> <p>KB21. potential injuries and ill health associated with incorrect manual handling</p> <p>KB22. safe lifting and carrying practices</p> <p>KB23. personal safety, health and dignity issues relating to the movement of a person by others</p> <p>KB24. potential impact to a person who is moved incorrectly</p> |
| Skills (S) [Optional] | |
| A. Core Skills/ Generic Skills | Reading and Writing Skills |
| | The user/individual on the job needs to know and understand how to: |
| | SA1. read and comprehend basic content to read labels, charts, signages |
| | SA2. read and comprehend basic English to read manuals of operations |
| | SA3. read and 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: | |
| SA4. question coworkers appropriately in order to clarify instructions and other issues | |
| SA5. give clear instructions to coworkers, subordinates others | |
| Decision Making | |
| The user/individual on the job needs to know and understand how to: | |
| SA6. 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 | |
| B. Professional Skills | Plan and Organize |
| | The user/individual on the job needs to know and understand how to: |
| | SB1. plan and organize their own work schedule, work area, tools, equipment and materials to maintain decorum and for improved productivity |
| | Working with others |
| The user/individual on the job needs to know and understand how to: | |
| SB2. remain congenial while discussing and debating issues with co-workers | |
| SB3. follow appropriate protocols for communication based on situation, hierarchy, organizational culture and practice | |
| SB4. ask for, provide and receive required assistance where possible to ensure achievement of work related objectives | |
| SB5. thank coworkers for any assistance received | |
| SB6. offer appropriate respect based on mutuality and respect for fellow workmanship and authority | |

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| | Problem Solving |
| | The user/individual on the job needs to know and understand how to: SB7. think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB8. identify immediate or temporary solutions to resolve delays SB9. identify sources of support that can be availed of for problem solving for various kind of problems SB10. seek appropriate assistance from other sources to resolve problems SB11. report problems that you cannot resolve to appropriate authority |
| | Analytical Thinking |
| | The user/individual on the job needs to know and understand how to: SB12. identify cause and effect relations in their area of work SB13. use cause and effect relations to anticipate potential problems and their solution |



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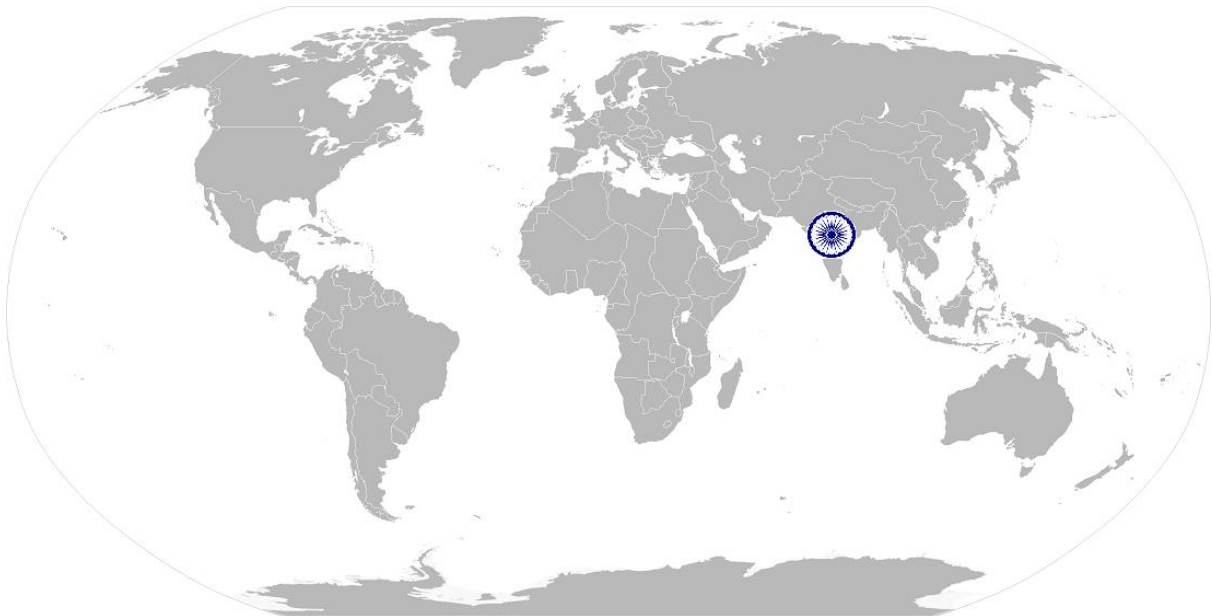
NOS Version Control

| NOS Code | CSC / N 1335 | | |
|---------------------|--|------------------|----------|
| Credits (NSQF) | TBD | Version number | 1.0 |
| Industry | Capital Goods | Drafted on | 10/04/14 |
| Industry Sub-sector | <ol style="list-style-type: none"> 1. Machine Tools 2. Dies, Moulds And Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Generation Machinery 7. Light Engineering Goods | Last reviewed on | 18/03/15 |
| Occupation | DD/MM/YYYY | Next review date | 30/08/16 |

CSC/ N 1336:

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/ N 1336:

Work effectively with others

National Occupational Standard

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| Unit Code | CSC / N 1336 |
| Unit Title (Task) | Work effectively with others |
| Description | <p>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.</p> <p>These cover areas such as communication etiquette, discipline, listening, handling conflict and grievances.</p> |
| Scope | <p>This unit/task covers the following:</p> <ul style="list-style-type: none"> Working with others |
| Performance Criteria (PC) w.r.t. the Scope | |
| Element | Performance Criteria |
| Working with others | <p>The user/individual on the job should be able to:</p> <p>PC1. accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required</p> <p>PC2. accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt</p> <p>PC3. give information to others clearly, at a pace and in a manner that helps them to understand</p> <p>PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible</p> <p>PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks</p> <p>PC6. display appropriate communication etiquette while working</p> <p>Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa)etc.</p> <p>PC7. display active listening skills while interacting with others at work</p> <p>PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism</p> <p>PC9. demonstrate responsible and disciplined behaviors at the workplace</p> <p>Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc.</p> <p>PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict</p> |
| Knowledge and Understanding (K) | |
| A. Organizational Context (Knowledge of the company / organization and its processes) | <p>The user/individual on the job needs to know and understand:</p> <p>KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions</p> <p>KA2. reporting structure, inter-dependent functions, lines and procedures in the work area</p> <p>KA3. relevant people and their responsibilities within the work area</p> <p>KA4. escalation matrix and procedures for reporting work and employment related issues</p> |

CSC/ N 1336:

Work effectively with others

B. Technical Knowledge

The user/individual on the job needs to know and understand:

- KB1. various categories of people that one is required to communicate and co-ordinate with in the organization
- KB2. importance of effective communication in the workplace
- KB3. importance of teamwork in organizational and individual success
- KB4. various components of effective communication
- KB5. key elements of active listening
- KB6. value and importance of active listening and assertive communication
- KB7. barriers to effective communication
- KB8. importance of tone and pitch in effective communication
- KB9. importance of avoiding casual expletives and unpleasant terms while communicating professional circles
- KB10. how poor communication practices can disturb people, environment and cause problems for the employee, the employer and the customer
- KB11. importance of ethics for professional success
- KB12. importance of discipline for professional success
- KB13. what constitutes disciplined behavior for a working professional
- KB14. common reasons for interpersonal conflict
- KB15. importance of developing effective working relationships for professional success
- KB16. expressing and addressing grievances appropriately and effectively
- KB17. importance and ways of managing interpersonal conflict effectively

Skills (S) [Optional]



CSC/ N 1336:

Work effectively with others

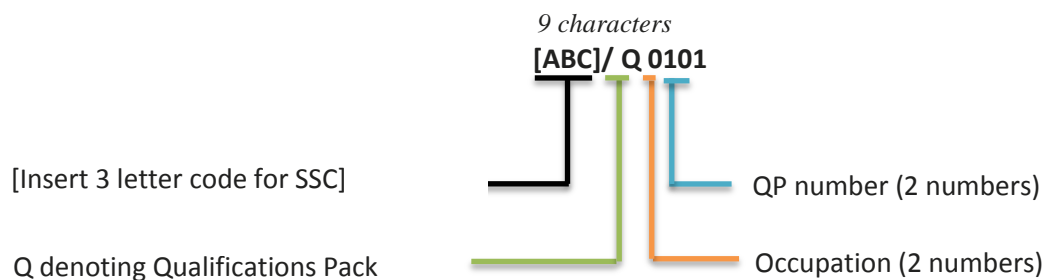
NOS Version Control

| NOS Code | CSC / N 1336 | | |
|---------------------|---|------------------|----------|
| Credits(NSQF) | TBD | Version number | 1.0 |
| Industry | Capital Goods | Drafted on | 10/04/14 |
| Industry Sub-sector | 1. Machine Tools 2. Dies, Moulds And Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods | Last reviewed on | 18/03/15 |
| Occupation | Welding and Cutting | Next review date | 30/08/16 |

Annexure

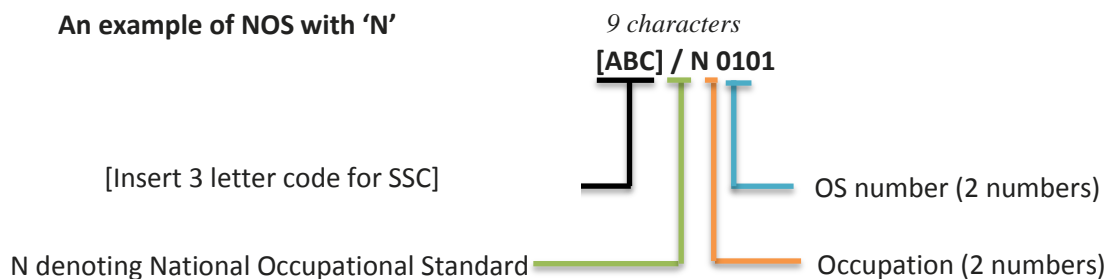
Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard

An example of NOS with 'N'



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 QP or NOS | N |
| Next two numbers | Occupation code | 01 |
| Next two numbers | OS number | 01 |

CRITERIA FOR ASSESSMENT OF TRAINEES

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|-----------------------------|--|
| Job Role | MMAW/SMAW Welder Level 4 |
| Qualification Pack | CSC/ Q 0208 |
| Sector Skill Council | Capital Goods Sector Skills 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. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below)
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria
5. To pass the Qualification Pack , every trainee should score a minimum of 70% in every NOS
6. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

| Assessable outcomes | Assessment Criteria | Total Mark | Out of | Theory | Practical Skill |
|--|---|------------|--------|--------|-----------------|
| CSC/ N 0208: Manually weld carbon steel/ low alloy steel and austenitic stainless steel in all positions using Metal Arc Welding / Shielded Metal Arc Welding | PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines | 100 | 3 | 1 | 2 |
| | PC2. adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations | | 4 | 1 | 3 |
| | PC3. check the condition of, and correctly connect, welding leads, earthing arrangements and electrode holder | | 2 | 0 | 2 |
| | PC4. deal with any faults or differential as per laid procedures | | 2 | 0 | 2 |
| | PC5. follow fume extraction safety procedures | | 3 | 1 | 2 |
| | PC6. read and interpret routine information on written job instructions, welding procedure specifications (WPS) and standard operating procedures | | 3 | 1 | 2 |

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| PC7. select welding machines (e.g. transformers, rectifiers, inverters and generators, etc.) according to the task | 2 | 0 | 2 |
| PC8. select type and size of electrodes according to classification and specifications | 3 | 1 | 2 |
| PC9. re-dry electrodes as per electrode classification requirement | 3 | 1 | 2 |
| PC10. prepare the work area for the welding activities | 2 | 0 | 2 |
| PC11. perform measurements for joint preparation and routine MMAW | 3 | 0 | 3 |
| PC12. prepare the various forms of materials and the joint in readiness for welding | 2 | 0 | 2 |
| PC13. use manual metal-arc welding and related equipment to include a. alternating current (AC) equipment b. direct current (DC) equipment | 3 | 0 | 3 |
| PC14. connect equipment to power source | 3 | 0 | 3 |
| PC15. connect cables, electrode holders, return leads and ground clamps to appropriate terminal | 2 | 0 | 2 |
| PC16. set, read and adjust amperage controls | 3 | 1 | 2 |
| PC17. verify setup by running test and appropriately handle weld specimen/scrap-plate | 3 | 1 | 2 |
| PC18. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding | 3 | 0 | 3 |
| PC19. strike and maintain a stable arc | 2 | 0 | 2 |
| PC20. stop and properly re-start arc to avoid welding defects (scratch start, tapping techniques) | 2 | 0 | 2 |
| PC21. manipulate electrode angle using various methods as per WPS | 3 | 1 | 2 |
| PC22. maintain constant puddle by using appropriate travel speed | 2 | 0 | 2 |

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| PC23. remove slag in an appropriate manner (eg. wire brush, hammer, etc.) | 2 | 0 | 2 |
| PC24. weld the joint to the specified quality, dimensions and profile applicable to range of material | 5 | 1 | 4 |
| PC25. produce range of welded joints to within the mentioned standard using single or multi-run welds (as appropriate) | 5 | 1 | 4 |
| PC26. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817 | 4 | 1 | 3 |
| PC27. produce range of welded joints in various positions as per the WPS specified | 3 | 0 | 3 |
| PC28. shut down and make safe the welding equipment on completion of the welding activities | 2 | 0 | 2 |
| PC29. identify various weld defects, use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification | 4 | 1 | 3 |
| PC30. check that the welded joint conforms to the specification, by checking various quality parameters by visual inspection | 4 | 1 | 3 |
| PC31. detect surface imperfections and deal with them appropriately | 2 | 0 | 2 |
| PC32. carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT) | 3 | 1 | 2 |
| PC33. assist in preparation for non-destructive testing of the welds, for a range of tests | 3 | 1 | 2 |
| PC34. prepare for destructive tests on weld specimens for fillet, butt and corner | 2 | 0 | 2 |
| PC35. deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have | 3 | 0 | 3 |

| | problems that they cannot resolve | | | | |
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| | | | 100 | 16 | 84 |
| CSC/ N 0207: Manually cut metal materials using plasma arc | PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines | | 3 | 1 | 2 |
| | PC2. take necessary safety precautions for plasma cutting operations including equipment, processes and checks | | 2 | 0 | 2 |
| | PC3. interpret cutting procedure data sheets specifications | | 3 | 1 | 2 |
| | PC4. check regulators, hoses and check that valves are securely connected and free from leaks and damage | | 2 | 0 | 2 |
| | PC5. check equipment is calibrated and approved for use | | 2 | 0 | 2 |
| | PC6. check/fit the correct nozzle to the torch | | 2 | 0 | 2 |
| | PC7. match correct tips and cups to the torch as per requirement and manufacturer's equipment instructions | | 3 | 1 | 2 |
| | PC8. set the amperage and gas pressure as per metal thickness, metal type, and type of gas | | 2 | 0 | 2 |
| | PC9. use the correct procedure for lighting, adjusting and extinguishing the arc | | 4 | 1 | 3 |
| | PC10. use appropriate and safe procedures for handling and storing of gas cylinders | | 3 | 1 | 2 |
| | PC11. prepare the work area for the cutting activities | | 2 | 0 | 2 |
| | PC12. obtain the appropriate tools and equipment for the plasma arc cutting operations, and check that they are in a safe and usable condition | | 2 | 0 | 2 |
| | PC13. check that the plasma arc cutting equipment is correctly set up for the operations to be performed | | 2 | 0 | 2 |

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| PC14. carry out correct measurements required using appropriate equipment and methods for planning the cut | | 3 | 1 | 2 |
| PC15. where appropriate, mark out the components for the required operations, using appropriate tools and techniques | | 4 | 1 | 3 |
| PC16. perform trial cut to check for cut defects | | 2 | 0 | 2 |
| PC17. operate the plasma cutting equipment to produce items/cut shapes to the dimensions and profiles as specified | | 5 | 1 | 4 |
| PC18. use the correct angles to cut and the right speed | | 3 | 0 | 3 |
| PC19. use various types of plasma arc cutting methods/techniques | | 4 | 0 | 4 |
| PC20. perform various cutting operations correctly | | 4 | 0 | 4 |
| PC21. produce thermal cuts in various forms of material | | 4 | 0 | 4 |
| PC22. produce cut profiles for various type of materials | | 4 | 0 | 4 |
| PC23. produce thermally-cut components which meet specified quality criteria | | 5 | 1 | 4 |
| PC24. detect and correct defects in cut | | 3 | 0 | 3 |
| PC25. leave the work area in a safe and tidy condition on completion of the cutting activities | | 2 | 0 | 2 |
| PC26. check that the finished components meet the required standard | | 4 | 1 | 3 |
| PC27. use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the cut material are to the specification | | 6 | 2 | 4 |
| PC28. identify various cutting defects | | 3 | 0 | 3 |
| PC29. report any difficulties or problems that may arise with the cutting activities, and carry out any agreed actions | | 2 | 0 | 2 |

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| | PC30. detect equipment malfunctions and deal with them appropriately | | 2 | 0 | 2 |
| | PC31. 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 | | 3 | 0 | 3 |
| | PC32. shut down and make safe the cutting equipment on completion of the cutting activities or during an emergency | | 2 | 0 | 2 |
| | PC33. in case of emergencies follow standard emergency procedures | | 3 | 1 | 2 |
| | | | 100 | 13 | 87 |
| CSC/ N 0203: Manually cut metal and metal alloys using oxy-fuel gas | PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines | | 3 | 1 | 2 |
| | PC2. take necessary safety precautions for gas cutting operations including equipment, processes and checks | | 2 | 0 | 2 |
| | PC3. interpret cutting procedure data sheets specifications | | 3 | 1 | 2 |
| | PC4. check regulators, hoses and check that valves are securely connected and free from leaks and damage | | 2 | 0 | 2 |
| | PC5. check equipment is calibrated and approved for use | | 2 | 0 | 2 |
| | PC6. check/fit the correct size gas nozzle to the torch | | 2 | 0 | 2 |
| | PC7. ensure preheat and oxygen holes on the tips are clean | | 2 | 0 | 2 |
| | PC8. check that a flashback arrestor is fitted | | 2 | 0 | 2 |
| | PC9. set appropriate gas pressures | | 2 | 0 | 2 |
| | PC10. use the correct procedure for lighting, adjusting and extinguishing the flame | | 3 | 1 | 2 |
| | PC11. adjust torch valve for type of flame such as neutral, carburizing and oxidizing | | 2 | 0 | 2 |

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| PC12. follow sequence of operations such as pre-heating material and initiating cut | 3 | 1 | 2 |
| PC13. mark out the locations for cutting accurately and as per requirement | 3 | 1 | 2 |
| PC14. use appropriate and safe procedures for handling and storing of gas cylinders | 3 | 1 | 2 |
| PC15. prepare the work area for the cutting activities | 2 | 0 | 2 |
| PC16. obtain the appropriate tools and equipment for the oxy-fuel gas cutting operations, and check that they are in a safe and usable condition | 2 | 0 | 2 |
| PC17. check that the oxy-fuel gas cutting equipment is set up for the operations to be performed | 2 | 0 | 2 |
| PC18. adjust cylinder valves and adjust regulator for operating pressure to achieve specifications for required operations | 3 | 1 | 2 |
| PC19. where appropriate, mark out the components for the required operations, using appropriate tools and techniques | 2 | 0 | 2 |
| PC20. perform trial cut to check for cut defects | 3 | 0 | 3 |
| PC21. operate the oxy-fuel gas cutting equipment to produce items/cut shapes to the dimensions and profiles specified | 5 | 1 | 4 |
| PC22. use various types of oxy-fuel gas cutting methods | 4 | 0 | 4 |
| PC23. perform various cutting operations correctly | 4 | 0 | 4 |
| PC24. produce thermal cuts in various forms of material (metal of 3mm and above) | 4 | 0 | 4 |
| PC25. produce cut profiles for various type of materials | 3 | 0 | 3 |
| PC26. produce thermally-cut components which meet specified quality criteria leave | 4 | 1 | 3 |
| PC27. recognize and correct | 3 | 1 | 2 |

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| | burnback and flashback | | | | |
| | PC28. detect and correct defects in cut | | 2 | 0 | 2 |
| | PC29. ensure the work area is left in a safe and tidy condition on completion of the cutting activities | | 2 | 0 | 2 |
| | PC30. check that the finished components meet the standard required | | 3 | 1 | 2 |
| | PC31. use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the cut material are to the specification | | 4 | 1 | 3 |
| | PC32. identify various cutting defects and follow organisation recommended procedures to address them | | 3 | 1 | 2 |
| | PC33. report any difficulties or problems that may arise with the cutting activities, and carry out any agreed actions | | 2 | 0 | 2 |
| | PC34. detect equipment malfunctions and deal with them appropriately | | 2 | 0 | 2 |
| | PC35. 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 |
| | PC36. shut down and make safe the cutting equipment on completion of the cutting activities | | 2 | 0 | 2 |
| | PC37. in case of emergencies follow standard emergency procedures | | 3 | 1 | 2 |
| | | | 100 | 14 | 86 |
| CSC/ N 1335 (Use basic health and safety practices at the workplace) | PC1. use protective clothing/equipment for specific tasks and work conditions | 100 | 5 | 2 | 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 |

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| 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 state methods of accident prevention in the work environment of the job role | 4 | 2 | 2 |
| PC6. state location of general health and safety equipment in the workplace | 3 | 2 | 1 |
| PC7. inspect for faults, set up and safely use steps and ladders in general use | 5 | 2 | 3 |
| PC8. work safely in and around trenches, elevated places and confined areas | 5 | 2 | 3 |
| PC9. lift heavy objects safely using correct procedures | 5 | 2 | 3 |
| PC10. apply good housekeeping practices at all times | 4 | 2 | 2 |
| PC11. identify common hazard signs displayed in various areas | 5 | 2 | 3 |
| PC12. retrieve and/or point out documents that refer to health and safety in the workplace | 3 | 1 | 2 |
| PC13. use the various appropriate fire extinguishers on different types of fires correctly | 4 | 1 | 3 |
| PC14. demonstrate rescue techniques applied during fire hazard | 4 | 1 | 3 |
| PC15. demonstrate good housekeeping in order to prevent fire hazards | 3 | 1 | 2 |
| PC16. demonstrate the correct use of a fire extinguisher | 4 | 1 | 3 |
| PC17. demonstrate how to free a person from electrocution | 4 | 1 | 3 |
| PC18. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc. | 4 | 1 | 3 |
| PC19. demonstrate basic techniques of bandaging | 3 | 1 | 2 |

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| | PC20. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments | | 4 | 1 | 3 |
| | PC21. perform and organize loss minimization or rescue activity during an accident in real or simulated environments | | 3 | 1 | 2 |
| | PC22. 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 |
| | PC23. demonstrate the artificial respiration and the CPR Process | | 3 | 1 | 2 |
| | PC24. participate in emergency procedures | | 3 | 2 | 1 |
| | PC25. complete a written accident/incident report or dictate a report to another person, and send report to person responsible | | 4 | 1 | 3 |
| | PC26. demonstrate correct method to move injured people and others during an emergency | | 4 | 1 | 3 |
| | | Total | 100 | 36 | 64 |
| CSC/ N 1336 (Work effectively with others) | PC1. accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required | 100 | 10 | 3 | 7 |
| | PC2. accurately pass on information 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 |
| | 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 |

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| | 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 |