QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR CAPITAL GOODS INDUSTRY

Contents

What are Occupational Standards(OS) ?

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

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Introduction

Qualifications Pack- Submerged Arc Welder (SAW)

SECTOR/S: CAPITAL GOODS

SUB-SECTOR:

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

OCCUPATION: Welding and Cutting

REFERENCE ID: CSC/Q0211

ALIGNED TO: NCO-2004/NIL

Brief Job Description: Perform mechanized submerged arc welding (SAW) operations for a range of standard welding job requirements and weld different materials (carbon steel, aluminum and stainless steel) in 1G & 2G positions. The welder can prepare various joints including corner, butt, fillet and tee. 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 and manage self and work to improve efficiency and effectiveness.

Job Details

Qualifications Pack Code	**CSC/Q0211**		
Job Role	**Submerged Arc Welder (SAW)** **(Applicable for National Scenarios)**		
Credits	**TBD**	**Version number**	**1.0**
Sector	**Capital Goods**	**Drafted on**	**24/04/2014**
Sub-sector	**1. Machine Tools** **2. Textile Manufacturing Machinery** **3. Process Plant Machinery** **4. Electrical and Power Machinery** **5. Light Engineering Goods**	**Last reviewed on**	**24/11/2017**
Occupation	**Welding and Cutting**	**Next review date**	**24/11/2021**
NSQC Clearance on	**20/07/2015**		

Job Role	Submerged Arc Welder (SAW)
Role Description	Perform operations for mechanized Submerged Arc Welding (SAW) and independently carry out SAW weld operations for welding joints as per welding procedure specification (WPS).
NSQF level	4
Minimum Educational Qualifications **Maximum Educational Qualifications**	10th Standard pass, preferably Not Applicable
Prerequisite License or Training	Manual/ Shielded Metal Arc Welding
Minimum Job Entry Age	18 Years
Experience	3 months Manual/Shielded Metal Arc Welding
Applicable National Occupational Standards (NOS)	**Compulsory:** 1. CSC/N0211 Weld joints of fabricated metal products using the submerged arc welding (SAW) machine 2. CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding / Shielded Metal Arc Welding 3. CSC/N1335 Use basic health and safety practices at the workplace 4. CSC/N1336 Work effectively with others
Performance Criteria	As described in the relevant OS units

Definitions

Keywords /Terms	Description
Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Jobrole	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the knowledge and understanding they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria	Performance criteria are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack(QP)	QP comprises the set of OSs, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
Knowledge and Understanding	Knowledge and understanding are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual need to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish

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

Acronyms

Keywords /Terms	Description
SAW	Submerged Arc Welding
WPS	Welding Procedure Speciation
NDT	Non-Destructive Testing
DT	Destructive Testing
RT	Radiographic Testing
UT	Ultrasonic Testing
CO_2	Carbon Dioxide
CPR	Cardiac Pulmonary Resuscitation
HAZ	Heat Affected Zone
VT	Visual Testing
AC/ DC	Alternating Current/ Direct Current

CSC/N0211 Weld joints of fabricated metal products using the submerged arc welding (SAW) machine

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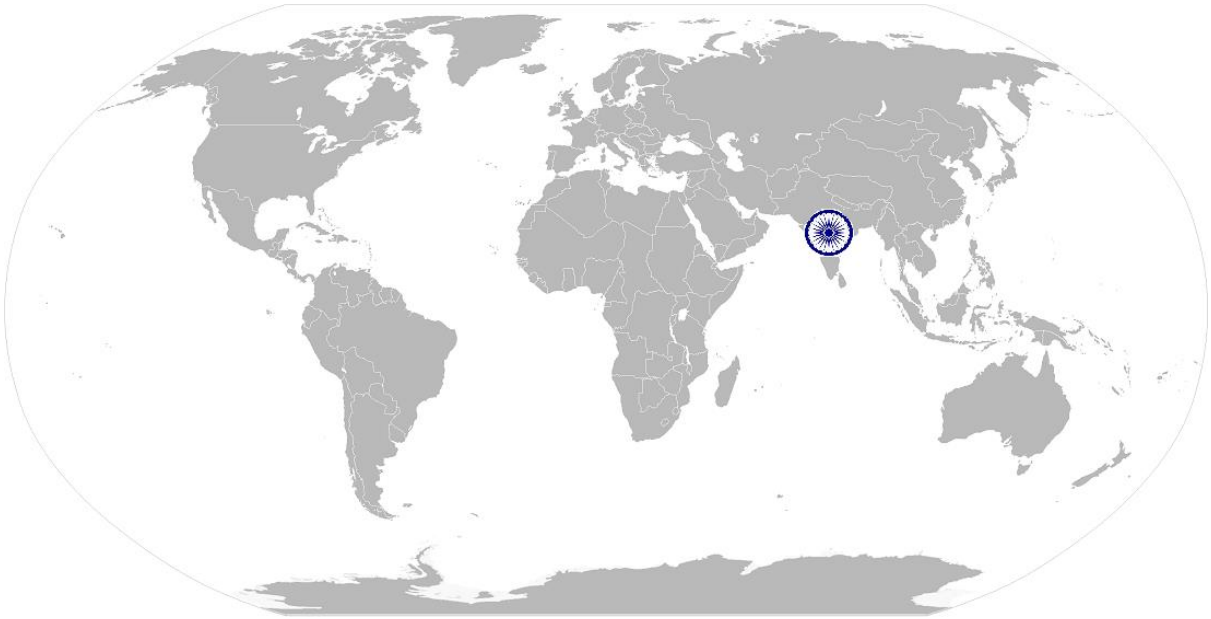
National Occupational Standard



Overview

This unit covers welding of joints of fabricated metal products using the submerged arc welding (SAW) machine. It includes setting up and operating SAW machine as per welding procedure specification (WPS).

CSC/N0211 Weld joints of fabricated metal products using the submerged arc welding (SAW) machine

National Occupational Standard

Unit Code	CSC/N0211
Unit Title (Task)	**Weld joints of fabricated metal products using the submerged arc welding (SAW) machine**
Description	This unit covers welding of joints of fabricated metal products using the submerged arc welding (SAW) machine. It includes setting up and operating SAW machine as per welding procedure specification (WPS). This involves setting-up and preparing for operations, interpreting the right information from the WPS, obtaining the right consumables and raw materials, etc.
Scope	This unit/task covers the following: • Work safely • Prepare for welding operations • Carry out welding operations • Test of output • Deal with contingencies

Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Work safely	To be competent, the user/individual on the job must be able to: PC1. work safely at all times, complying with health and safety and other relevant regulations and guidelines PC2. stop machine in case of emergencies and start when safe using correct procedure PC3. operate machine safety devices in line with set procedures PC4. stop the machine in a timely and safe manner during an emergency
Prepare for welding operations	To be competent, the user/individual on the job must be able to: PC5. interpret weld procedure data sheets specifications PC6. confirm that the machine is set up and operating correctly, ready for the joining operations to be carried out PC7. check the installation has been approved for production PC8. check supplies of components and consumables are adequate and correctly prepared Components: AC or DC current supply; wire straightener; wire feed rolls; flux supply and hopper; indicators; wire reel; heads (torch) PC9. ensure all materials are clean, free from contaminants and ready for use PC10. select suitable wire/flux combination as per manufacturer's guidelines PC11. re-dry flux at the suitable temperature as per manufacturer's guidelines PC12. select and use tools and equipment such as fillet gauges, calculators, measuring tapes, squares and straight edges

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	PC13. ensure machine settings comply with instructions and the welding procedure specification PC14. check all machine functions operate correctly PC15. ensure all safety equipment is in place and functioning correctly PC16. check that the parent material, components, consumables and joint preparation comply with specifications PC17. select and use tools and equipment such as temperature sticks, pyrometer, thermometers and pre-heat monitoring equipment PC18. identify material required according to drawings and specifications PC19. select required amount of materials PC20. verify that appropriate heat treatments have been applied as per requirement
Carry out welding operations	To be competent, the user/individual on the job must be able to: PC21. layout, fit, and tack the workpieces together using manual welding equipment PC22. position weld line parallel to carriage PC23. turn the control levers or pushes buttons to align theelectrode and the welding head over the weld joint for linear joints PC24. adjust length of radial arm to position electrode over weld joint for radial joints PC25. clamp cylindrical workpieces onto turning rolls understationary headfor circular joints PC26. put specified electrode wire from reel through feed rolls and welding head PC27. adjust welding head to set specified angle of electrode PC28. fill specified flux PC29. direct nozzle or gravity feed over weld line PC30. adjust shielding gas or gas mixture flow rate PC31. turns knobs to set current, voltage, and slope, and synchronize feed of wire and flux with speed of welding action PC32. set travel speed as per requirement PC33. adjust wire stick-out PC34. adjust machine setup to vary size, location, and penetration of bead PC35. monitor meters, gauges and welding action for correct functioning as per procedure PC36. inspect welds visually for adherence to specifications PC37. re-weld defective joints, using manual welding equipment PC38. remove surplus slag, flux, and spatter, using brush, portable grinder, and handscraper PC39. operate mechanised submerged arc welding processes in the specified

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	materials, forms and positions PC40. verify set up by running test welds specimen PC41. produce welded components covering different joint configurations PC42. carry out and monitor the machine operations in accordance with specifications and job instructions PC43. use tools and equipment such as bolt cutters, overhead cranes, tracks and vessel rolls PC44. monitor the process operation and machine functions, and make adjustments as required to welding parameters and mechanisms within their permitted authority and tolerance Welding parameters and mechanisms: electrical parameters (type, amperage, voltage); welding speed; flux dispensing and recovery mechanisms; safety devices; wire feed rate; electrode stick-out; single pass or multi-pass; mechanical functions (handling, loading, work holding, transfer) PC45. place and secure weldments as per requirement PC46. connect cables and ground clamps to power source correctly and safely PC47. change components according to task PC48. transfer information from parent piece to off-cuts and crop pieces accurately
Test of output	To be competent, the user/individual on the job must be able to: PC49. achieve joints of the required quality and specified PC50. meet the required dimensional accuracy within specified tolerances PC51. achieve the rate of output as specified
Deal with contingencies	To be competent, the user/individual on the job must be able to: PC52. detect equipment malfunctions and deal with them appropriately PC53. deal promptly and effectively with problems within own control and seek appropriate and timely help from relevant personnel where required PC54. shut down the equipment to a safe condition on conclusion of the joiningactivities PC55. interpret weld procedure data sheets specification
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. relevant legislation, standards, policies, and procedures followed in the company KA2. key purpose of the organization KA3. department structure and hierarchy protocols KA4. work flow and own role in the workflow KA5. dependencies and interdependencies in the workflow KA6. support functions and types of support available for incumbents in this role

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B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. safe working practices, precautions and procedures to be observed when operating mechanized submerged arc welding installations Safety precautions (SAW): protection from live and other electrical components, including insulation, proper earthing, proper loading, etc.; proper handling and placement of hot metal; using machine guards and safety devices; connect ground to base metal for conductivity; adequate lighting; appropriate personal protective equipment (suitable aprons, welding gloves, safety boots, correctly fitting overalls); fume extraction/control measures; safety measures for elevated and trench working KB2. hazards associated with arc welding machines and how they can be minimized KB3. basic principles of mechanized and automated welding Principles: type of installations: tractor and boom equipment; machine functions; control systems; safety features KB4. effect of heat due to welding on based metals and job KB5. effects of dilution on fully fused joints in dissimilar metals KB6. key components and features of the equipment used in SAW Key components and features: power source; electrical parameters such as arc voltage, current, wire dispensing and feed mechanisms; flux dispensing and recovery; control and storage of consumables; how variations in the parameters influence weld features, quality and output KB7. various weld features and appropriate related terminology Features: face, root, HAZ (heat affected zone), convex fillet profile, concave fillet profile, mitred fillet profile, root face, root gap, root radius ('U' butt profile), land ('U' butt profile), bevel angle, included angle, weld width, leg length(s), fusion zone (depth of fusion), excess weld metal, penetration, throat thickness, fusion line (boundary) KB8. fundamentals of SAW processes KB9. characteristics of an electric arc used for welding purposes Electric arc: voltage distribution across the arc; heat generation of the weld joint; arc characteristics (alternating current [A.C.], direct current [D.C.]); effects and influence of magnetic fields; factors that influence metal transfer (surface tension, gravity, electromagnet [Lorentz] force KB10. type of fluxes and role of fluxes in shielding the weld metal KB11. effects of fluxes and electrode coverings/cores upon welding processes Effects: facilitates arc striking; stabilizes the arc; protects filler metal from atmospheric contamination during transfer; protects deposited metal from contamination; provides appropriate weld contour; prevents rapid cooling of

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	weld metal (thermal blanket effect); provides a flux for the molten pool to remove oxides and impurities KB12. importance of speed, voltage and amperage on weld parameters (depth, deposition rate, width, KB13. type and thickness of base metals and its impact on welding operations Base metals: carbon steel and stainless steel KB14. uses, classification and considerations for usage of consumables such as fluxes and wires KB15. basicity and characteristics of the flux, and its importance for welding KB16. flux preparation methods (eg. fused, agglomerated) and its importance Flux characteristics: basic, acid, neutral KB17. diffusible hydrogen content of the weld metal and its importance KB18. where to source or clarify information on uses, classification and consideration of consumables such as wires and fluxes KB19. pre-weld heat, inter-pass and post weld-heat treatment requirements KB20. knowledge of heat treatment methods such as annealing and tempering KB21. cooling processes such as quenching and controlled cooling KB22. appropriate usage of equipment supports such as booms and tracks KB23. use and features of SAW equipment such as drive rolls, contact tips and barrels KB24. effects of dilution on fully fused joints in dissimilar metals KB25. functions and impact of sub-arc tractors KB26. flux recovery systems, function and use KB27. different welding cable sizes, use and impact KB28. uses of cables and ground clamps KB29. use, features and impact of power sources such as AC and DC KB30. use, layout, importance and operations of control panels KB31. duty cycle and importance of adhering to guidance on it KB32. how to extract the necessary information from drawings and welding procedure specifications; welding symbols and abbreviations used KB33. operation of the machine controls and their function; care of equipment KB34. how to set up and align the workpiece, and the equipment to be used KB35. how to monitor the installation during the welding process; how to recognize problems and action to be taken KB36. problems that can occur with the welding activities (distortion, material and weld defects) KB37. methods of distortion control and rectification KB38. residual stress and its effect on welding KB39. organizational quality systems (standards to be achieved; production records

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	to be kept) KB40. personal approval tests and their applicability to their work KB41. reasons for marking material and parts eg. traceability and identification KB42. purpose and importance of pre-heating requirements for base metals KB43. purpose and importance of post-heating in welding KB44. methods to achieve pre-heat and post heat requirements for welding KB45. tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc. KB46. significance of diffusible hydrogen for welds and how it is measured KB47. importance of personalized weld identification methods such as initials and stamps KB48. how to prepare the welds for examination KB49. how to check the welded joints for uniformity, alignment, position, weld size and profile KB50. various procedures for visual examination of the welds for cracks KB51. types and requirements for non-destructive and destructive tests Non-destructive tests (NDT): visual inspection, radiographic (RT), ultrasonic (UT) Destructive tests (DT): sample preparations to perform DT, metallographic, mechanical (tensile, guided bend, charpy v, impact), chemical KB52. methods of removing a test piece of weld from a suitable position in the joint KB53. safe working practices and procedures to be adopted when preparing the welds for examination KB54. how to examine the welds after the tests and how to check for such things as the degree of penetration and fusion, inclusions, porosity, cracks, undercut and overlap, uneven and irregular ripple formation KB55. extent of their own authority and explain whom they should report to if they have problems that they cannot resolve KB56. reporting lines and procedures, line supervision and technical experts KB57. types of fire extinguishers and their suitable uses in case of welding related fires
Skills (S)	
A. Core Skills/ Generic Skills	**Reading Skills**
	The user/ individual on the job needs to know and understand how to: 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
	Writing Skills

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	The user/individual on the job needs to know and understand how to: SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language SA3. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages) SA4. use appropriate measuring techniques SA5. use and convert British and metric systems of measurements SA6. apply appropriate degree of accuracy to express numbers SA7. calculate tolerance in terms of limits of size SA8. check measurements, angles, orientation and slopes SA9. types of reference lines such as tangent lines, datum lines, centre lines and work points SA10. check square of material using corner-to-corner dimensions and triangulation (3-4-5) method SA11. select and use tools and equipment such as measuring tapes, levels, squares, protractors and dividers SA12. ability to check dimensions of components SA13. calculate the value of angles in a triangle SA14. apply Pythagoras' Theorem to right-angled triangle problems SA15. interpret straight line graphs using given data
	Oral Communication (Listening and Speaking Skills)
	The user/individual on the job needs to know and understand how to: SA16. convey and share technical information clearly using appropriate language SA17. check and clarify task-related information SA18. liaise with appropriate authorities using correct protocol SA19. communicate with people in respectful form and manner in line with organizational protocol
B. Professional Skills	**Decision Making**
	NA
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB1. plan, prioritize and sequence work operations as per job requirements SB2. organize and analyze information relevant to work SB3. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	CustomerCentricity

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	The user/individual on the job needs to know and understand how to: SB4. exercise restraint while expressing dissent and during conflict situations SB5. avoid and manage distractions to be disciplined at work SB6. manage own time for achieving better results SB7. work in a team in order to achieve better results SB8. identify and clarify work roles within a team SB9. communicate and cooperate with others in the team for better results SB10. seek assistance from fellow team members
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB11. identify problems with work planning, procedures, output and behavior and their implications SB12. prioritize and plan for problem solving SB13. communicate problems appropriately to others SB14. identify sources of information and support for problem solving SB15. seek assistance and support from other sources to solve problems SB16. identify effective resolution techniques SB17. select and apply resolution techniques SB18. seek evidence for problem resolution
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB19. undertake and express new ideas and initiatives to others SB20. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB21. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB22. enhance one's competencies in new and different situations and contexts to achieve more
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB23. participate in on-the-job and other learning, training and development interventions and assessments SB24. clarify task related information with appropriate personnel or technical adviser SB25. seek to improve and modify own work practices SB26. maintain current knowledge of application standards, legislation, codes of practice and product/process developments

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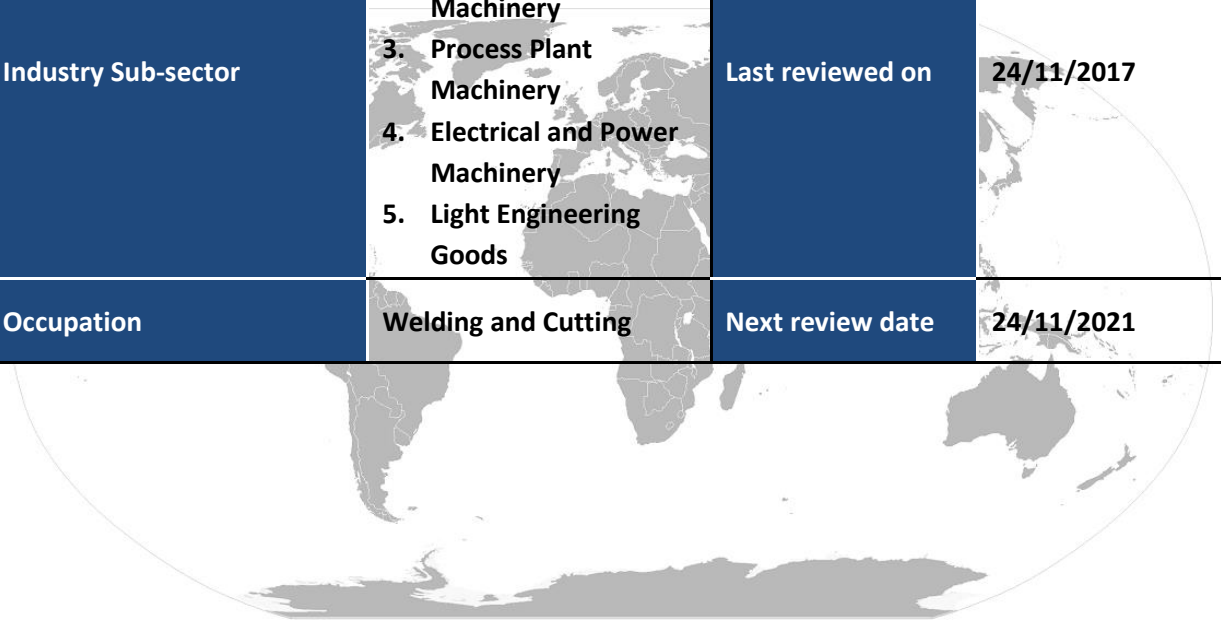
NOS Version Control

NOS Code	CSC/N0211		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	24/04/2014
Industry Sub-sector	1. Machine Tools 2. Textile Manufacturing Machinery 3. Process Plant Machinery 4. Electrical and Power Machinery 5. Light Engineering Goods	Last reviewed on	24/11/2017
Occupation	Welding and Cutting	Next review date	24/11/2021



CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding/ Shielded Metal Arc Welding

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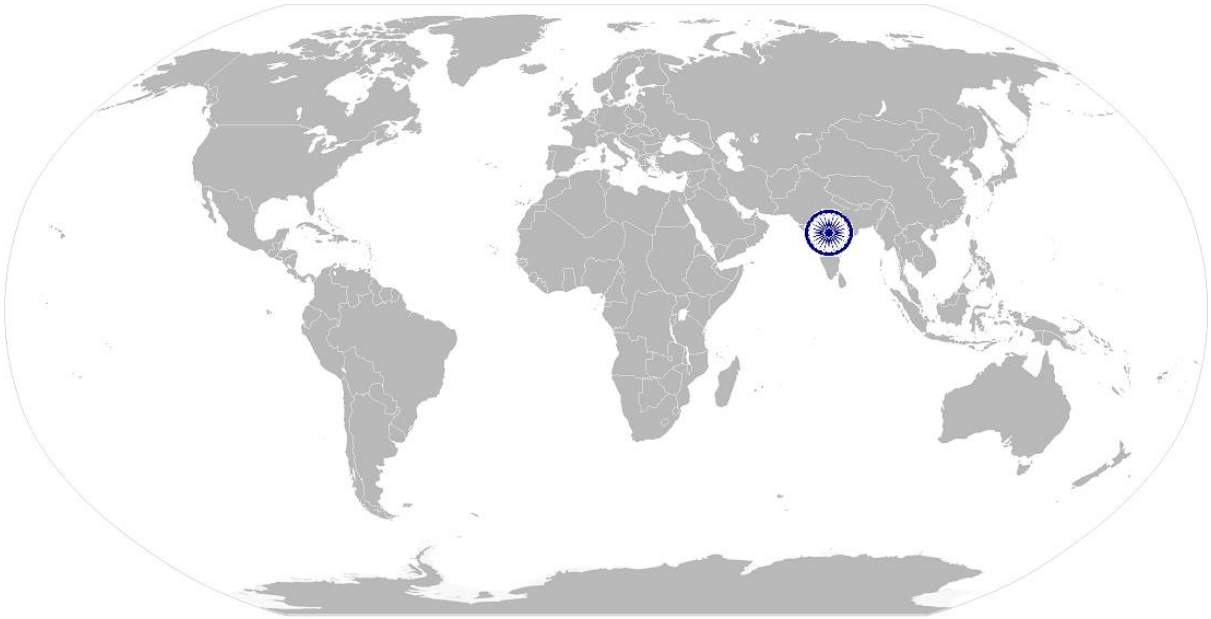
National Occupational Standard



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 mild or low carbon steels and austenitic stainless steel as per welding specification procedures (WPS).

CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding / Shielded Metal Arc Welding

National Occupational Standard

Unit Code	CSC/N0208
Unit Title (Task)	Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding / Shielded Metal Arc Welding
Description	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 (mild or low carbon steel and austenitic stainless steel) in 1G/1F, 2G/2F, 3G/3F, 4G/4F, 5G/5F and 6G positions.
Scope	This unit/task covers the following: • Work safely • Prepare for welding operations • Carry out welding operations • Test for quality • Post-welding activities • Deal with contingencies
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Work safely	To be competent, the user/individual on the job must be able to: PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines PC2. adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations 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. PC3. check the condition of, and correctly connect, welding leads, earthing arrangements and electrode holder PC4. deal with any faults or differential as per laid procedures PC5. follow fume extraction safety procedures
Prepare for welding operations	To be competent, the user/individual on the job must be able to: PC6. read and interpret routine information on written job instructions, welding procedure specifications (WPS) and standard operating procedures 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;

CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding / Shielded Metal Arc Welding

	electrode sizes for joint thicknesses; electrode and covering; electrical 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; 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. PC7. select welding machines (e.g. transformers, rectifiers, inverters and generators, etc.) according to the task PC8. select type and size of electrodes according to classification and specifications PC9. re-dry electrodes as per electrode classification requirement PC10. prepare the work area for the welding activities PC11. perform measurements for joint preparation and routine MMAW PC12. prepare the materials and joint in readiness for welding Material and 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 variousmachines 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 PC13. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding PC14. 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. PC15. connect equipment to power source PC16. connect cables, electrode holders, return leads and ground clamps to appropriate terminal PC17. set, read and adjust amperage controls PC18. verify set up by running test and appropriately handle weld specimen (scrap plate) Handling specimens: handling hot materials; using chemicals for cleaning and etching; using equipment to fracture welds

CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding / Shielded Metal Arc Welding

Carry out welding operations	To be competent, the user/individual on the job must be able to: PC19. strike and maintain a stable arc PC20. stop and properly re-start arc to avoid welding defects (scratch start, tapping techniques) PC21. manipulate electrode angle using various methods as per WPS PC22. maintain constant puddle by using appropriate travel speed PC23. remove slag in an appropriate manner (eg. wire brush, hammer, etc.) PC24. weld the joint to the specified quality, dimensions and profile applicable to range of material from 1.5 mm – 24 mm Materials: mild or low carbon steel, austenitic stainless, low alloy steel, Forms: plate, sheet (1.5mm), structural section, other forms (hollow tubes, sections, shapes, etc.) PC25. produce range of welded joints to within the mentioned standard using single or multi-run welds (as appropriate) Joints: fillet and groove PC26. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817 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 PC27. produce range of welded joints in various positions as per the WPS specified Positions: flat (PA) IG/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 PC28. shut down and make safe the welding equipment on completion of the welding activities
Test for quality	To be competent, the user/individual on the job must be able to: PC29. identify various weld defects, use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the

CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding / Shielded Metal Arc Welding

	weld are to the specification 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 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. PC31. detect surface imperfections and deal with them appropriately PC32. carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT)
Post-welding activities	To be competent, the user/individual on the job must be able to: 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) 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
Deal with contingencies	To be competent, the user/individual on the job must be able to: PC35. deal promptly and effectively with problems within their control, and seekhelp and guidance from the relevant people if they have problems that they cannot resolve
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. job relevant legislation, standards, policies, and procedures followed in the company KA2. key purpose of the organization KA3. department structure and hierarchy protocols KA4. work flow and own role in the workflow KA5. dependencies and interdependencies in the workflow KA6. support functions and types of support available for incumbents in this role

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B. Technical Knowledge	The user/individual on the job needs to know and understand: 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 equipmentsuitableaprons, 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.) KB2. applications of manual metal arc welding KB3. effects of exposure to the electric arc KB4. types of fire extinguishers and their suitable uses KB5. effects of exposure to welding fume KB6. methods of managing welding fume hazards 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 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. KB9. main components and controls of welding equipment KB10. how to connect electrical components correctly KB11. type of current used and implication KB12. welding symbols used and their correct interpretation KB13. consumables used for MMAW/SMAW welding KB14. various types of electrodes (classification) based on covering Electrodes: rutile, basic, cellulosic, acid KB15. function of covering 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

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	cracks; lack of fusion or incomplete fusion; lack of penetration; excessive penetration; gouges; stray arc strikes; sharp edges; excessive convexity KB17. types of joint configurations Joints: fillet and groove (lap joints, tee fillet joints, corner joints, butt joints square,single vee, double vee) 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) KB19. types of beads, their characteristics and uses (stringer, weave, weave patterns) Bead characteristics:spatter deposits, roughness, evenness, fill, crater, overlap 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 KB21. weld positions such as flat, horizontal, vertical and overhead KB22. types of equipment components such as electrode holders, work leads cables and ground clamps KB23. awareness and importance of cable size and length KB24. types of polarity such as AC and DC electrode negative and DC electrode positive for welding purposes KB25. various types of base metals used in welding and their implications KB26. type and thickness of base metals to be welded Base metals: e.g. mild or low carbon steel, austenitic stainless steel, etc. 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;

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	tacking and its frequency (where applicable; use clamping and jigs and fixtures (where applicable) KB28. magnetic arc blow or arc deflection, causes and methods to avoid or compensate KB29. storage requirements for consumable electrodes KB30. electrode classifications such as tensile strength, position and composition KB31. electrode types based on covering, their characteristics and uses KB32. purpose of re-drying and procedure for different classification of electrode KB33. welding process and method specification sheet, process qualification record (PQR) and related essential variables KB34. travel speed and heat inputs KB35. amperage requirements for different classification of electrodes and positions KB36. importance and implications of various diameters of electrodes KB37. gouging and back gouging principles, methods and procedures KB38. purpose and importance of pre-heating requirements for base metals KB39. purpose and importance of post-heating in welding KB40. methods to achieve pre-heat and post heat requirements KB41. tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc. KB42. significance of diffusible hydrogen for welds KB43. importance of maintaining welding standards specified for the job KB44. impact of a welding job done right, acceptable or non-acceptable 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. KB46. types of NDT and DT inspection methods KB47. procedure to conduct DP testing KB48. common welder testing codes and their purpose Testing codes: ASME section IX, EN 287, ISO 9606, IS 731
Skills (S)	
A. Core Skills/ GenericSkills	**Reading Skills**
	The user/ individual on the job needs to know and understand how to: SA1. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language
	Writing Skills
	The user/individual on the job needs to know and understand how to:

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	SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language SA3. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages) SA4. use appropriate measuring techniques SA5. use and convert imperial and metric systems of measurements SA6. apply appropriate degree of accuracy to express numbers SA7. use tolerance in terms of limits of size SA8. check measurements, angles, orientation and slopes SA9. types of reference lines such as tangent lines, datum lines, center lines and work points SA10. check square of material using corner-to-corner dimensions and triangulation (3-4-5) method SA11. select and use tools and equipment such as measuring tapes, levels, squares, protractors and dividers SA12. ability to check dimensions of components SA13. calculate the value of angles in a triangle
	Oral Communication (Listening and Speaking Skills)
	The user/individual on the job needs to know and understand how to: SA14. convey and share technical information clearly using appropriate language SA15. check and clarify task-related information SA16. liaise with appropriate authorities using correct protocol SA17. communicate with people in respectful form and manner in line with organizational protocol
B. Professional Skills	**Decision Making**
	NA
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB1. plan, prioritize and sequence work operations as per job requirements SB2. organize and analyze information relevant to work SB3. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	CustomerCentricity
	The user/individual on the job needs to know and understand how to: SB4. exercise restraint while expressing dissent and during conflict situations SB5. avoid and manage distractions to be disciplined at work

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	SB6. manage own time for achieving better results SB7. work in a team in order to achieve better results SB8. identify and clarify work roles within a team SB9. communicate and cooperate with others in the team for better results SB10. seek assistance from fellow team members
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB11. identify problems with work planning, procedures, output and behavior and their implications SB12. prioritize and plan for problem solving SB13. communicate problems appropriately to others SB14. identify sources of information and support for problem solving SB15. seek assistance and support from other sources to solve problems SB16. identify effective resolution techniques SB17. select and apply resolution techniques SB18. seek evidence for problem resolution
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB19. undertake and express new ideas and initiatives to others SB20. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB21. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB22. enhance one's competencies in new and different situations and contexts to achieve more
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB23. participate in on-the-job and other learning, training and development interventions and assessments SB24. clarify task related information with appropriate personnel or technical adviser SB25. seek to improve and modify own work practices SB26. maintain current knowledge of application standards, legislation, codes of practice and product/process developments

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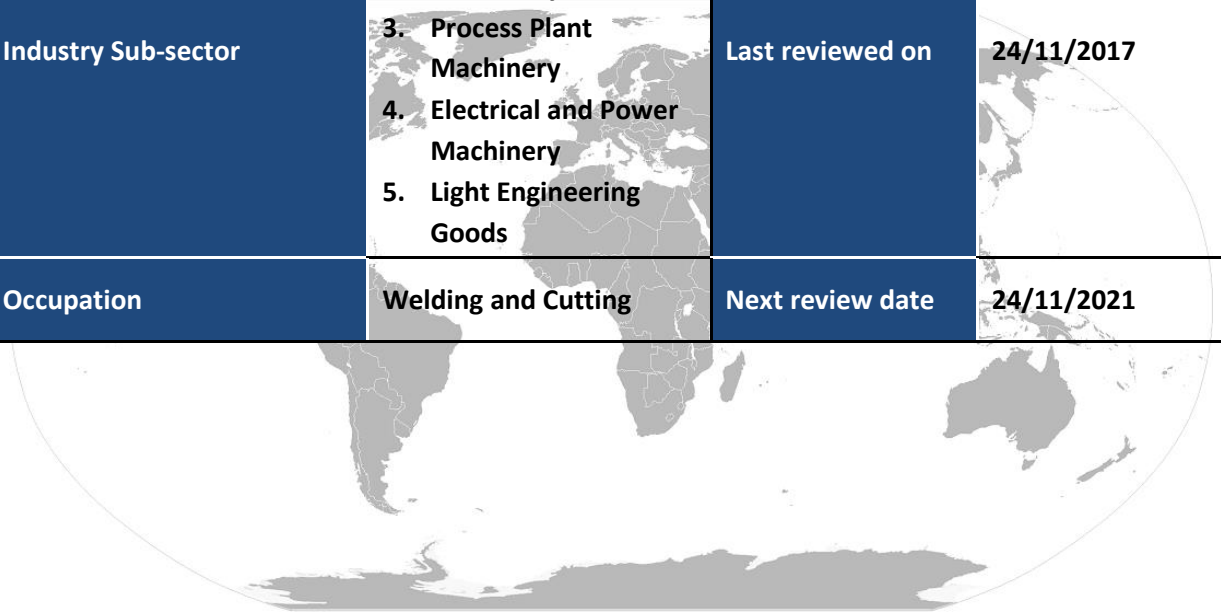
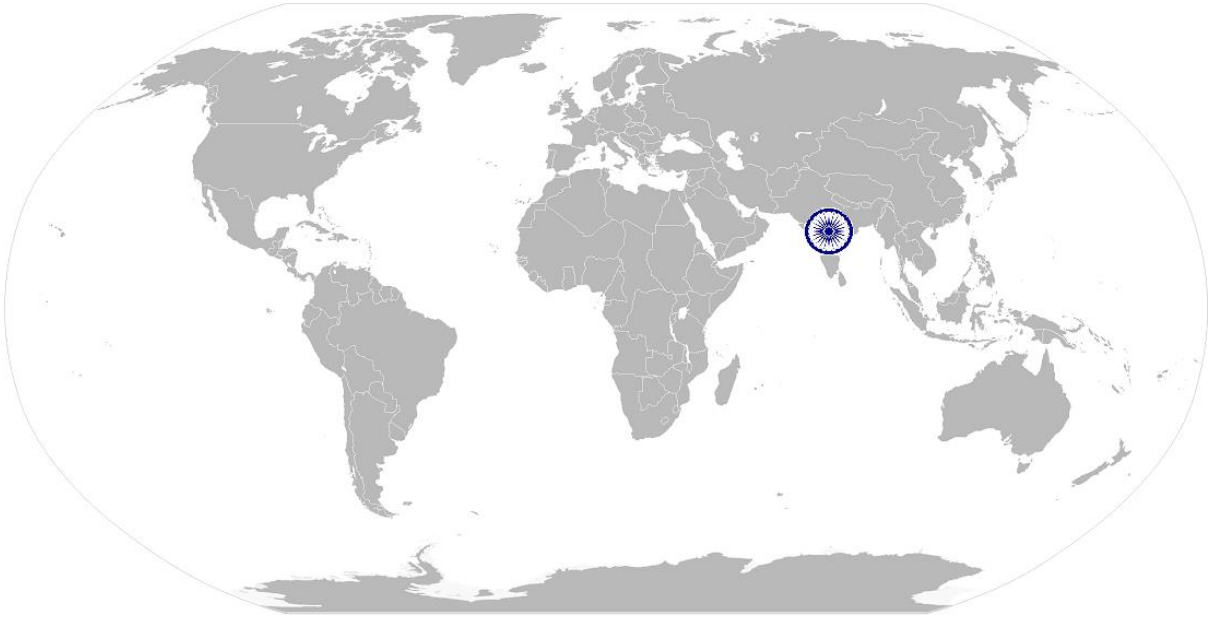
NOS Version Control

NOS Code	**CSC/N0208**		
Credits	**TBD**	**Version number**	**1.0**
Industry	**Capital Goods**	**Drafted on**	**24/04/2014**
Industry Sub-sector	**1. Machine Tools 2. Textile Manufacturing Machinery 3. Process Plant Machinery 4. Electrical and Power Machinery 5. Light Engineering Goods**	**Last reviewed on**	**24/11/2017**
Occupation	**Welding and Cutting**	**Next review date**	**24/11/2021**



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

National Occupational Standard



Overview

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

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

National Occupational Standard

Unit Code	CSC/N1335
Unit Title (Task)	Use basic health and safety practices at the workplace
Description	This OS unit is about knowledge and practices relating to health, safety and security that candidates need to use in the workplace. It covers responsibilities towards self, others, assets and the environment.
Scope	This unit/task covers the following: • Health and safety • Fire safety • Emergencies, rescue and first-aid procedure
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Health and safety	To be competent, the user/individual on the job must be able to: PC1. use protective clothing/equipment for specific tasks and work conditions 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 Equipment: hand shields, machine guards, residual current devices, shields, dust sheets, respirator PC2. state the name and location of people responsible for health and safety in the workplace PC3. state the names and location of documents that refer to health and safety in the workplace PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace 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.) 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

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

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

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

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Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. names (and job titles if applicable), and where to find, all the people responsible for health and safety in a workplace KA2. names and location of documents that refer to health and safety in the workplace
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. meaning of "hazards" and "risks" KB2. health and safety hazards commonly present in the work environment and related precautions KB3. possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible 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) 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 KB6. safe working practices when working with tools and machines KB7. safe working practices while working at various hazardous sites KB8. where to find all the general health and safety equipment in the workplace KB9. various dangers associated with the use of electrical equipment 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 KB11. importance of using protective clothing/equipment while working KB12. precautionary activities to prevent the fire accident KB13. various causes of fire Causes of fires: heating of metal; spontaneous ignition; sparking; electrical heating; loose fires (smoking, welding, etc.); chemical fires; etc. KB14. techniques of using the different fire extinguishers

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	KB15. different methods of extinguishing fire KB16. different materials used for extinguishing fire Materials: sand, water, foam, CO_2, dry powder KB17. rescue techniques applied during a fire hazard KB18. various types of safety signs and what they mean KB19. appropriate basic first aid treatment relevant to the condition eg. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries KB20. content of written accident report KB21. potential injuries and ill health associated with incorrect manual handing KB22. safe lifting and carrying practices KB23. personal safety, health and dignity issues relating to the movement of a person by others KB24. potential impact to a person who is moved incorrectly
Skills (S)	
A. Core Skills/ GenericSkills	**Reading 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 an accident/incident report in local language or English
	Writing Skills
	The user/individual on the job needs to know and understand how to: SA4. write an accident/incident report in local language or English
	Oral Communication (Listening and Speaking Skills)
	The user/individual on the job needs to know and understand how to: SA5. question coworkers appropriately in order to clarify instructions and other issues SA6. give clear instructions to coworkers, subordinates others
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1. make appropriate decisions pertaining to the concerned area of work with respect to intended work objective, span of authority, responsibility, laid down procedure and guidelines
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB2. plan and organize their own work schedule, work area, tools, equipment and materials to maintain decorum and for improved productivity
	Customer Centricity

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

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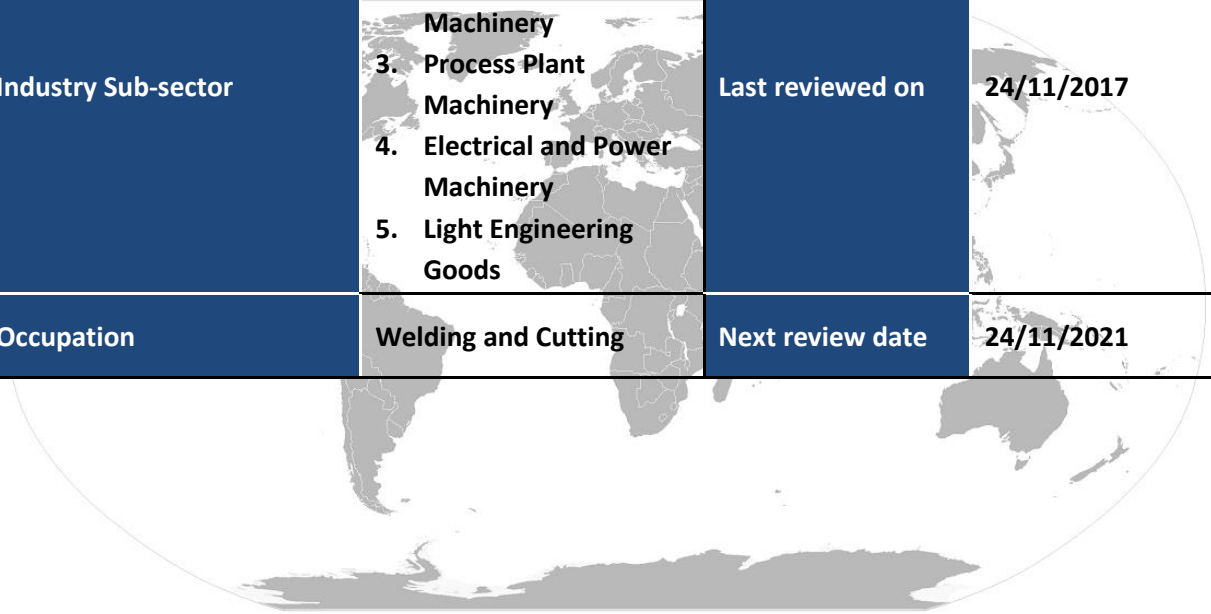
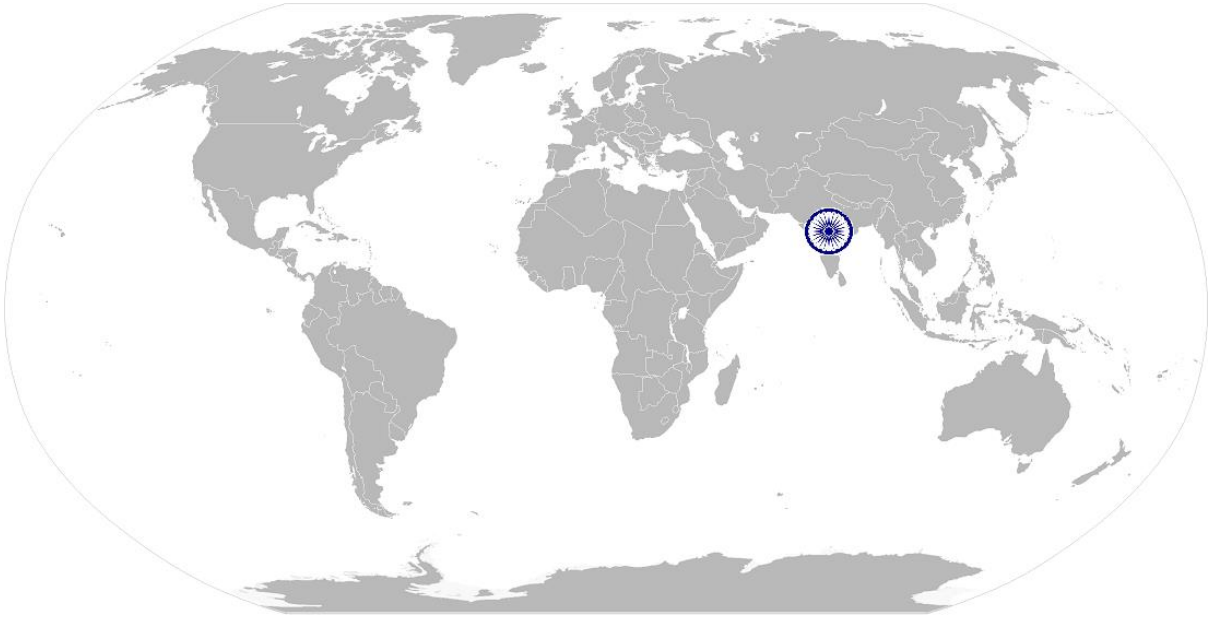
NOS Version Control

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



CSC/N1336 **Work effectively with others**

National Occupational Standard



Overview

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

CSC/N1336 **Work effectively with others**

National Occupational Standard

Unit Code	**CSC/N1336**
Unit Title (Task)	**Work effectively with others**
Description	This unit covers basic etiquette and competencies that a candidate is required to possess and demonstrate in their behavior and interactions with others at the workplace. These cover areas such as communication etiquette, discipline, listening etc.
Scope	This unit/task covers the following: • Work effectively with others
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Work effectively with others	To be competent, the user/individual on the job must be able to: PC1. accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required PC2. accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt PC3. give information to others clearly, at a pace and in a manner that helps them to understand PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks PC6. display appropriate communication etiquette while working Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa)etc. PC7. display active listening skills while interacting with others at work PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism PC9. demonstrate responsible and disciplined behaviors at the workplace Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc. PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company /	The user/individual on the job needs to know and understand: KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA2. reporting structure, inter-dependent functions, lines and procedures in the

CSC/N1336 **Work effectively with others**

organization and its processes)	work area KA3. relevant people and their responsibilities within the work area KA4. escalation matrix and procedures for reporting work and employment related issues
B. Technical Knowledge	The user/individual on the job needs to know and understand: 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)	
A. Core Skills/ Generic Skills	**Reading Skills**
	The user/ individual on the job needs to know and understand how to: SA1. read basic terms and terminologies to accurately interpret work related documents, labels, supervisor instructions in the local language SA2. read and interpret accurate information from various relevant work instructions and records
	Writing Skills
	The user/ individual on the job needs to know and understand how to: SA3. write clear and legible notes to self, colleagues and seniors to pass messages, keep records, prepare to-do lists, take down instructions SA4. write basic numbers, quantities and work related terminology for operational requirements in the local language

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

CSC/N1336 **Work effectively with others**

NOS Version Control

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

Annexure

Nomenclature for QP and NOS

Qualifications Pack

9 characters

[ABC]/ Q 0101

[Insert 3 letter codes for SSC]

Q denoting Qualifications Pack

QP number (2 numbers)

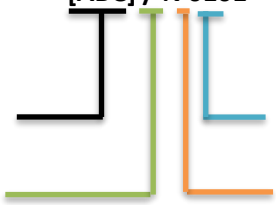
Occupation (2 numbers)

Occupational Standard

An example of NOS with 'N'

9 characters

[ABC] / N 0101



[Insert 3 letter codes for SSC]

N denoting National Occupational Standard

OS number (2 numbers)

Occupation (2 numbers)

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

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

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

Criteria For Assessment Of Trainees

Job Role: Submerged Arc Welder (SAW)

Qualification Pack: CSC/Q0211

Sector Skill Council: Capital Goods Skill Council

Guidelines for Assessment

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

Compulsory NOS **Total Marks: 400**				**Marks Allocation**	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out of**	**Theory**	**Skills Practical**
CSC/N0211 Weld joints of fabricated metal products using the submerged arcwelding (SAW) machine	PC1.work safely at all times, complying with health and safety and other relevant regulations and guidelines	100	2	1	1
	PC2.stop machine in case of emergencies and start when safe using correct procedure		1	0	1
	PC3.operate machine safety devices in line with set procedures		2	1	1
	PC4.stop the machine in a timely and safe manner during an emergency		1	0	1
	PC5.interpret weld procedure data sheets specifications		2	1	1
	PC6.confirm that the machine is set up and operating correctly, ready for the joining operations to be carried out		1	0	1
	PC7.check the installation has been approved for production		1	0	1

	PC8.check supplies of components and consumables are adequate and correctly prepared		2	1	1
	PC9.ensure all materials are clean, free from contaminants and ready for use		1	0	1
	PC10select suitable wire/flux combination as per manufacturer's guidelines		2	1	1
	PC11.re-dry flux at the suitable temperature as per manufacturer's guidelines		2	1	1
	PC12.select and use tools and equipment such as fillet gauges, calculators, measuring tapes, squares and straight edges		2	1	1
	PC13.ensure machine settings comply with instructions and the welding procedure specification		1	0	1
	PC14.check all machine functions operate correctly		2	1	1
	PC15.ensure all safety equipment is in place and functioning correctly		1	0	1
	PC16.check that the parent material, components, consumables and joint preparation comply with specifications		2	1	1
	PC17. select and use tools and equipment such as temperature sticks, pyrometer, thermometers and pre-heat monitoring equipment		2	1	1
	PC18.identify material required according to drawings and specifications		2	1	1
	PC19.select required amount of materials		1	0	1
	PC20.verify that appropriate heat treatments have been applied as per requirement		1	0	1
	PC21.layout, fit, and tack the workpieces together using manual welding equipment		3	1	2
	PC22.position weld line parallel to carriage		1	0	1
	PC23.turn the control levers or pushes buttons to align theelectrode and the welding head over the weld joint for linear joints		2	1	1
	PC24.adjust length of radial arm to position electrode over weld joint for radial joints		2	1	1
	PC25.clamp cylindrical workpieces onto turning rolls understationary headfor circular joints		2	1	1
	PC26.put specified electrode wire from reel through feed rolls and welding head		2	1	1
	PC27.adjust welding head to set specified angle of electrode		1	0	1
	PC28.fill specified flux		2	1	1
	PC29.direct nozzle or gravity feed over weld line		2	0	2
	PC30.adjust shielding gas or gas mixture flow rate		2	1	1

	PC31.turns knobs to set current, voltage, and slope, and synchronize feed of wire and flux with speed of welding action		3	1	2
	PC32.set travel speed as per requirement		2	1	1
	PC33.adjust wire stick-out		1	0	1
	PC34.adjust machine setup to vary size, location, and penetration of bead		3	1	2
	PC35.monitor meters, gauges and welding action for correct functioning as per procedure		3	1	2
	PC36.inspect welds visually for adherence to specifications		3	1	2
	PC37.re-weld defective joints, using manual welding equipment		1	0	1
	PC38.remove surplus slag, flux, and spatter, using brush, portable grinder and hand scraper		1	0	1
	PC39.operate mechanised submerged arc welding processes in the specified\ materials, forms and positions		2	0	2
	PC40.verify set up by running test welds specimen		2	1	1
	PC41.produce welded components covering different joint configurations		3	1	2
	PC42.carry out and monitor the machine operations in accordance with specifications and job instructions		2	1	1
	PC43.use tools and equipment such as bolt cutters, overhead cranes, tracks and vessel rolls		2	0	2
	PC44.monitor the process operation and machine functions, and make adjustments as required to welding parameters and mechanisms within their permitted authority and tolerance		4	2	2
	PC45.place and secure weldments as per requirement		1	0	1
	PC46.connect cables and ground clamps to power source correctly and safely		1	0	1
	PC47.change components according to task		1	0	1
	PC48.transfer information from parent piece to off-cuts and crop pieces accurately		2	1	1
	PC49.achieve joints of the required quality and specified		2	1	1
	PC50.meet the required dimensional accuracy within specified tolerances		2	1	1
	PC51.achieve the rate of output as specified		2	1	1
	PC52.detect equipment malfunctions and deal with them appropriately		2	1	1
	PC53.deal promptly and effectively with problems within own control and seek appropriate and timely help from relevant personnel where required		2	0	2

	PC54.shut down the equipment to a safe condition on conclusion of the joining activities		1	0	1
	PC55.interpret weld procedure data sheets specification		2	1	1
		Total	**100**	**34**	**66**
CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel 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		3	1	2
	PC3.check the condition of, and correctly connect, welding leads, earthing arrangements and electrode holder		3	1	2
	PC4.deal with any faults or differential as per laid procedures		3	1	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		4	1	3
	PC7.select welding machines (e.g. transformers, rectifiers, inverters and generators, etc.) according to the task		2	1	1
	PC8.select type and size of electrodes according to classification and specifications		2	1	1
	PC9.re-dry electrodes as per electrode classification requirement		3	1	2
	PC10.prepare the work area for the welding activities		1	0	1
	PC11.perform measurements for joint preparation and routine MMAW		3	1	2
	PC12.prepare the materials and joint in readiness for welding		3	1	2
	PC13.tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding		2	0	2
	PC14.use manual metal-arc welding and related equipment to include a. alternating current (AC) equipment b. direct current (DC) equipment		3	1	2
	PC15.connect equipment to power source		2	0	2
	PC16.connect cables, electrode holders, return leads and ground clamps to appropriate terminal		2	0	2
	PC17.set, read and adjust amperage controls		3	1	2
	PC18.verify set up by running test and appropriately handle weld specimen (scrap plate)		4	1	3
	PC19.strike and maintain a stable arc		4	1	3
	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		4	1	3

	PC22.maintain constant puddle by using appropriate travel speed		2	0	2
	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 from 1.5 mm – 24 mm		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	1	2
	PC28.shut down and make safe the welding equipment on completion of the welding activities		1	0	1
	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		3	1	2
	PC30.check that the welded joint conforms to the specification, by checking various quality parameters by visual inspection		3	1	2
	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 Non-destructive tests		3	1	2
	PC34.prepare for destructive tests on weld specimens for fillet, butt and corner		3	1	2
	PC35.deal promptly and effectively with problems within their control, and seekhelp and guidance from the relevant people if they have problems that they cannot resolve		2	0	2
		Total	**100**	**25**	**75**
CSC/N1335 Use basic health and safety practices at the workplace	PC1.use protective clothing/equipment for specific tasks and work conditions	100	4	1	3
	PC2.state the name and location of people responsible for health and safety in the workplace		3	1	2
	PC3.state the names and location of documents that refer to health and safety in the workplace		3	1	2
	PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace		5	2	3
	PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others		4	2	2

	PC6.state methods of accident prevention in the work environment of the job role		3	2	1
	PC7.state location of general health and safety equipment in the workplace		5	2	3
	PC8.inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC9.work safely in and around trenches, elevated places and confined areas		5	2	3
	PC10.lift heavy objects safely using correct procedures		4	2	2
	PC11.apply good housekeeping practices at all times		5	2	3
	PC12.identify common hazard signs displayed in various areas		3	1	2
	PC13.retrieve and/or point out documents that refer to health and safety in the workplace		4	1	3
	PC14.use the various appropriate fire extinguishers on different types of fires correctly		3	1	2
	PC15.demonstrate rescue techniques applied during fire hazard		3	1	2
	PC16.demonstrate good housekeeping in order to prevent fire hazards		4	1	3
	PC17.demonstrate the correct use of a fire extinguisher		4	1	3
	PC18.demonstrate how to free a person from electrocution		4	1	3
	PC19.administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		3	1	2
	PC20.demonstrate basic techniques of bandaging		3	1	2
	PC21.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		3	1	2
	PC22.perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC23.administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	PC24.demonstrate the artificial respiration and the CPR Process		3	1	2
	PC25.participate in emergency procedures		4	1	3
	PC26.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		3	1	2
	PC27.demonstrate correct method to move injured people and others during an emergency		4	2	2
		Total	**100**	**36**	**64**

CSC/N1336 Work effectively with others	PC1.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
	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**