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

Contact Us:
Capital Goods Skill Council, C/O Awfis, 1st Floor, L-29 Outer Circle Connaught Place
New Delhi – 110001
E-mail:
inder.gahlaut@cgsc.in

Introduction

Qualifications Pack- Metal Inert Gas/ Metal Active Gas/ Gas Metal Arc Welder (MIG/MAG/GMAW)

SECTOR/S: CAPITAL GOODS

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

OCCUPATION: Welding and Cutting

REFERENCE ID: CSC/Q0209

ALIGNED TO: NCO-2004/7212.2

Brief Job Description: Perform manual (semi-automatic) MIG/MAG (GMAW) welding for a range of standard welding job requirements and weld different materials (carbon steel, aluminum and stainless steel) in various 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/Q0209**		
Job Role	**Metal Inert Gas/ Metal Active Gas/ Gas Metal Arc Welder (MIG/ MAG/ GMAW)** **[Applicable for National Scenarios]**		
Credits	**TBD**	**Version number**	**1.0**
Sector	**Capital Goods**	**Drafted on**	**10/04/2014**
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**	**24/11/2017**
Occupation	**Welding and Cutting**	**Next review date**	**24/11/2021**
NSQC Clearance on	**26/03/2015**		

Job Role	MIG/ MAG/ GMAW Welder
Role Description	Perform manual (semi-automatic) operations for performing metal inert gas/metal active gas welding (MIG/MAG) also known as gas metal arc welding (GMAW) for welding joints in all positions 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/N0209 Manually (semi-automatic) welding joints using the MIG/MAG (GMAW) process 2. CSC/N0204 Manually weld carbon and low alloy steels in 1G/1F, 2G/2F and 3G/3F welding positions using Manual Metal Arc Welding/ Shielded Metal Arc Welding 3. CSC/N0203 Manually cut metal and metal alloys using oxyfuel gas 4. CSC/N0207 Manually cut metal materials using plasma arc 5. CSC/N1335 Use basic health and safety practices at the workplace 6. 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
MIG	Metal Inert Gas
MAG	Metal Active Gas
GMAW	Gas Metal Arc Welding
WPS	Welding Procedure Speciation
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
IS	Indian Standards
EN	European Standards
ASME	American Society of Mechanical Engineers
ISO	International Organization for Standardization
D.C.	Direct Current
STT	Surface Tension Transfer
PQR	Process Qualification Record
CO_2	Carbon dioxide
CPR	Cardiac Pulmonary Resuscitation
PPE	Personal Protective Equipment

CSC/N0209 Manually (semi-automatic) welding joints using the MIG/MAG (GMAW) process

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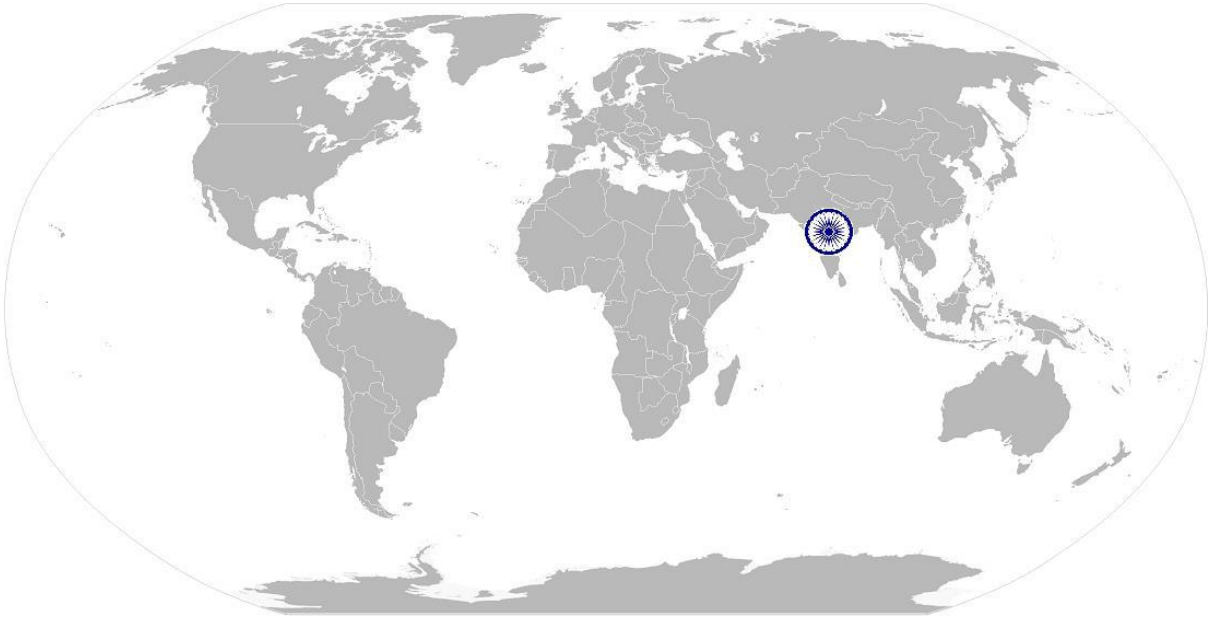
National Occupational Standard



Overview

This unit is about performing manual (semi-automatic) operations for metal inert gas welding (MIG)/metal active gas welding(MAG) also known as gas metal arc welding (GMAW) for welding joints in all positions as per welding procedure specification (WPS).

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National Occupational Standard

Unit Code	CSC/N0209
Unit Title (Task)	**Manually (semi-automatic) welding joints using the MIG/MAG (GMAW) process**
Description	This unit is about performing manual (semi-automatic) operations for metal inert gas welding (MIG)/ metal active gas welding (MAG) also known as gas metal arc welding (GMAW) for welding joints in all positions as per welding procedure specification (WPS).
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 for MIG/MAG welding operations Safety precautions: e.g. 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 welding leads, gas connection arrangements, earthing arrangements and electrode holder PC4. report any faults or potential hazards to appropriate authority
Prepare for welding operations	To be competent, the user/individual on the job must be able to: PC5. interpret weld procedure data sheets specifications, PQR and WPS Interpreting WPS: e.g. welding process (ISO codes); parent metal; consumables; pre welding joining preparation (cleaning, edge preparation, assembly, pre-heat); welding parameters; welding positions (EN 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/filler wire; electrical conditions required (direct [D.C..], electrode polarity (positive, negative), welding current and voltage ranges; methods of

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	arc ignition (scratch, high frequency, lift start); shielding gas (type, flow rate, pre-weld gas flow, post-weld gas flow); welding techniques; sequence of welding; control of heat input; interpass/run cleaning/back gouging methods; post welding activities (wiring brushing, removal of excess weld metal where required); post-weld heat treatment; etc. PC6. select welding machines such as inverters, rectifiers and generators, according to the task PC7. select electrodes according to classification and specifications PC8. 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 various machines and techniques for the above (eg. chamfering machine, gas and plasma cutting, grinding and stripping, 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 PC9. check the condition of, and correctly connect, welding leads/cables, hoses, shielding gas supply and wire feed mechanisms Welding concepts and mechanisms: rated output (duty cycle); measurement of electrical output and continuity; relationship between wire feed speed control and welding current; power source characteristics (volt/ampere graph, flat characteristic, constant voltage output); function of induction (principle, effect, fixed, stepped, variable control, return; earth; wire feed control (variable speed motor, direct control of wire feed rate); indirect control of welding current; relay for electrical power PC10. prepare the welding equipment for a range of given applications Welding equipment: rectifier (diode, thyristor/transistor), inverter, generator; wire feed system; measurement equipment for measuring electrical output and continuity (voltmeter/multi-meter, ammeter/shunts/coils, tong tester); welding cables - wire feed to torch (air cooled, harness construction); welding guns/torches (air cooled, construction, types [push, pull, reel-on-gun] swan neck design, pistol design); nozzles (dip, spray); return clamps (types, clamping mechanisms) and cables; solenoid valves (shielding gas); jog-feed control, gas purge control; ancillary equipment (angle grinders, wire brushes, linishers, hammer, power saw, angle, pedestal and straight grinders, chisel); other tools and equipment such as wrenches, wire cutters and MIG pliers PC11. select the welding shielding gases and equipment for a range of given applications

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	Shielding gases: applications for shielding gases/gas mixtures (argon, mixture, helium, argon/helium mixtures, helium/argon mixtures, argon/hydrogen mixtures, nitrogen argon/nitrogen mixtures, CO_2 and CO_2 mixtures); flow rates for applications; identify percentage of purity and mixture with respect to WPS (Welding Procedure Specification)/PQR (Process Qualification Record) Shielding gas equipment: cylinders; manifold systems; regulators (fixed, single stage, two-stage); gas flow meters; gas tubes and connectors; use of solenoid valves PC12. plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS PC13. clean wire feeder and torch tip PC14. connect torches and components PC15. connect and adjust regulators and flow meters to cylinders PC16. adjust wire feed rate and read and set current as required PC17. set other welding parameters (eg. voltage, slope of current versus voltage curve where required) Parameters: correct set-up of the joint; proper condition of electrical connections; welding return and earthing arrangements; operating parameters PC18. choose appropriate mode of metal transfer PC19. set pre-purge with shielding gas as required PC20. set and verify gas flow rates PC21. prepare and support the joint, using the appropriate methods PC22. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding
Carry out welding operations	To be competent, the user/individual on the job must be able to: PC23. use manual welding and related equipment, to carry out MIG/MAG welding processes PC24. perform MIG/MAG welding operations using various welding techniques to meet welding procedure specification requirements Welding techniques: e.g. fine adjustment of parameters, correct manipulation of the torch, blending in stops/starts, tack welds, angle of the torch, setting of individual parameters like wire feed speed, voltage, gas flow rate, stick-out, etc. PC25. adjust wire stick-out as per requirement PC26. use welding consumables appropriate to the material and application to DC current types Welding consumables: wire electrodes, wires and rods for arc welding; shielding gases; welding spools and drum packs; anti-spatter compound

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	PC27. 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 PC28. produce joints from various materials in different forms Types of ferrous metals/materials: carbon steel, stainless steel Types of forms: sheet (less than 1.5 mm), plate, structural section, pipe/tube, other forms PC29. weld joints in good access situations, in select positions Welding positions: flat (PA) IG/1F, horizontal vertical (PB) 2F, horizontal (PC) 2G, vertical upwards (PF) 3F / 3G, vertical downwards (PG) 3F / 3G, plate to pipe (fixed) 5F PC30. make sure that the work area is maintained and left in a safe and tidy condition
Test for quality	To be competent, the user/individual on the job must be able to: PC31. 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 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 PC32. 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: use of visual techniques, distance of observation, angel of

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	observation, adequate lighting, low powered magnification, fillet weld gauges PC33. detect surface imperfections and deal with them appropriately PC34. 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: PC35. assist in preparation for non-destructive testing of the welds, for a range of tests Non-destructive tests (NDT): dye penetrant (DPT), fluorescent penetrant (FPT), magnetic particle (MPT) PC36. prepare for destructive tests on weld specimens for fillet, butt and corner Destructive tests (DT): macro examination, nick break test, bend tests (such as face, root or side, as appropriate), mechanical (peel, tensile and shear, fatigue, impact tests), chemical PC37. shut down and make safe the welding equipment on completion of the welding activities PC38. follow the established organisational process for dealing with the welded pieces including handover, storage, safety and security, record keeping, etc.
Deal with contingencies	To be competent, the user/individual on the job must be able to: PC39. detect equipment malfunctions and deal with them safely and as per organisation procedures PC40. deal promptly and effectively with problems within own control, and seek timely and appropriate help and guidance from relevant personnel where required
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
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. types of fire extinguishers and their suitable uses in case of welding related fires KB2. effects of exposure to welding fume and related safety practices KB3. range of welding equipment available for GMAW welding Welding equipment: rectifier (diode, thyristor/transistor), inverter, generator; wire feed system; measurement equipment for measuring

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	electrical output and continuity (voltmeter/multi-meter, ammeter/shunts/coils, tong tester); welding cables - wire feed to torch (air cooled, harness construction); welding guns/torches (air cooled, construction, types [push, pull, reel-on-gun] swan neck design, pistol design); nozzles (dip, spray); return clamps (types, clamping mechanisms) and cables; solenoid valves (shielding gas); jog-feed control, gas purge control; ancillary equipment (angle grinders, wire brushes, linishers, hammer, power saw, angle, pedestal and straight grinders, chisel); other tools and equipment such as wrenches, wire cutters and MIG pliers KB4. functions of welding equipment KB5. principles and techniques of MIG/MAG welding Welding technique: e.g. fine adjustment of parameters, correct manipulation of the torch, blending in stops/starts, tack welds, angle of the torch, setting of individual parameters like wire feed speed, voltage, gas flow rate, stick-out, etc. KB6. relationship between wire feed, speed control and welding current KB7. how to compare welding consumables for suitability for a range of given applications Welding consumables: wire electrodes, wires and rods for arc welding; shielding gases; welding spools and drum packs; anti-spatter compound KB8. welding consumables classification as applicable to GMAW KB9. safe working practices and procedures to be followed when preparing and using MIG/MAG welding equipment KB10. hazards associated with MIG/MAG welding and safety precautions to minimize risk Safety precautions (MIG/MAG 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 (higher grade of glasses DIN 13); protection of self and others from the effects of the welding arc; fume extraction/control measures; safety measures for working in enclosed spaces KB11. personal protective equipment to be worn for the welding activities KB12. correct handling and storage of gas cylinders for welding purposes KB13. manual MIG/MAG welding process KB14. type and thickness of base metals for welding purposes KB15. types (availability, typical sizes), storage (storage, identification, segregation (classification, size) of ferrous metals

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	KB16. current and polarity required for GMAW KB17. types, selection and application of filler wires and welding electrodes KB18. reasons for using shielding gases, and the types and application of the various gases Shielding gases: applications for shielding gases/gas mixtures (argon, mixture, helium, argon/helium mixtures, helium/argon mixtures, argon/hydrogen mixtures, nitrogen argon/nitrogen mixtures, CO_2 and CO_2 mixtures); flow rates for applications; identify percentage of purity and mixture with respect to WPS/PQR KB19. use, impact and importance of gas pressures and flow rates (in relationship to the type of material being welded) Types of ferrous metals/materials: carbon steel, stainless steel KB20. methods/modes of metal transfer and their uses Methods: globular, short circuit transfer, spray arc, pulse, surface tension transfer (STT) KB21. types of welded joints to be produced Types of joints: fillet lap joints, tee fillet joints, corner joints, butt joints: square, single vee, double vee KB22. terminology used for the appropriate welding positions Welding positions: flat (PA) IG/1F, horizontal vertical (PB) 2F, horizontal (PC) 2G, vertical upwards (PF) 3F / 3G, vertical downwards (PG) 3F / 3G, plate to pipe (fixed) 5F KB23. type, components and features of a manual gas shielded arc welding torch Components of torch: handle; neck; trigger; hose package; shielding gas nozzle; contact tip and tip fixture; insulator; wire guide tube (liner); shielding gas supply lead; welding current supply lead KB24. how to prepare the materials in readiness for the welding activity KB25. purpose and correct use of anti-spatter compound KB26. importance and procedure to clean torch tip and liner KB27. how to set up and restrain the joint, and the tools and techniques to be used KB28. appropriate tack welding size and spacing (in relationship to material thickness) KB29. checks to be made prior to welding KB30. factors that determine weld bead shape Factors: gun angles and weld bead profiles (push, perpendicular, drag); electrode extensions stick out (short, normal, long); fillet weld electrode extension stick out (short, normal, long); gun travel speed (slow, normal, fast); current and voltage KB31. types of weld beads and uses (stringer, weave, weave patterns)

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	KB32. weld bead quality characteristics Bead characteristics: spatter deposits, roughness, evenness, fill, crater, overlap, contour – convex, concave, mitre KB33. techniques of operating the welding equipment to produce a range of joints in the various joint positions KB34. effects of the electrical characteristics of the MIG/MAG welding arc KB35. how to control distortion (such as welding sequence; deposition technique) 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) KB36. problems that can occur with the welding activities and how to address them KB37. how to close down the welding equipment safely and correctly KB38. own responsibility to assist in preparation of the welds and weld pieces for examination KB39. how to check the welded joints for uniformity, alignment, position, weld size and profile KB40. gouging and back gouging, its importance, principles, methods and procedures in welding KB41. purpose and importance of pre-heating requirements for base metals in preparation for welding KB42. purpose and importance of post-heating in welding KB43. methods to achieve pre-heat and post heat requirements for welding purposes KB44. tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc. KB45. significance of diffusible hydrogen for welds and how it is measured KB46. procedure to conduct dye penetrant test to assess weld quality KB47. various procedures for visual examination of the welds for cracks Visual inspections: use of visual techniques, distance of observation, angel of observation, adequate lighting, low powered magnification, fillet weld gauges KB48. types of non-destructive and destructive tests for assessing weld quality Non-destructive tests (NDT): dye penetrant (DPT), fluorescent penetrant (FPT), magnetic particle (MPT) Destructive tests (DT): macro examination, nick break test, bend tests (such as face, root or side, as appropriate), mechanical (peel, tensile and shear, fatigue, impact tests), chemical KB49. methods of removing a test piece of weld from a suitable position in the joint

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	KB50. safe working practices, handling and procedures to be adopted when preparing the welds for examination Handling specimens for tests: handling hot materials; using chemicals for cleaning and etching; using equipment to fracture welds KB51. importance of leaving the work area and equipment in a safe condition on completion of the welding activities
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, 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: 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 Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity SA7. use and understand tolerance in terms of limits of size SA8. check measurements, angles, orientation and slopes SA9. types of reference lines such as tangent lines, datam 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
	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

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	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
	Customer Centricity
	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

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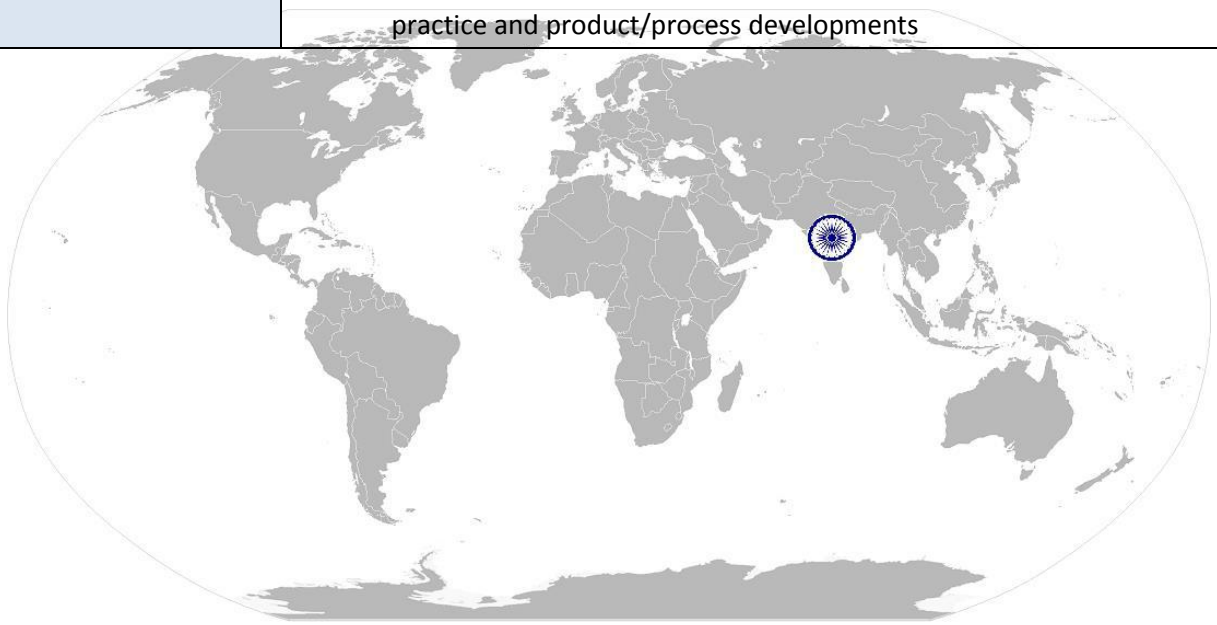
	SB21. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB22. enhance one's competencies in new and different situations and contexts to achieve more
	Critical Thinking
	The user/individual on the job needs to know and understand how 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/N0209		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	10/04/2014
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	24/11/2017
Occupation	Welding and Cutting	Next review date	24/11/2021

CSC/N0204 Manually weld carbon and low alloy steels in 1G/1F, 2G/2F and 3G/3F welding positions using Manual Metal Arc Welding/ Shielded Metal Arc Welding

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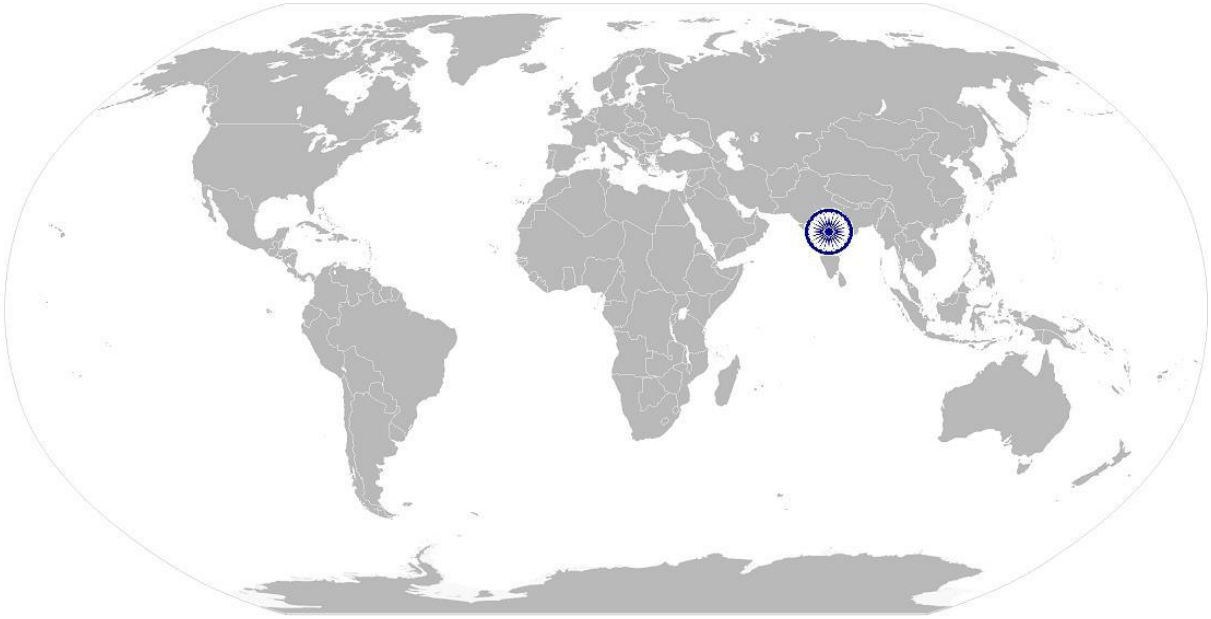
National Occupational Standard



Overview

This unit covers the performing of manual metal arc welding (MMAW) also known as shielded metal arc welding (SMAW) for producing various types of joints on low carbon and low alloy steels in a range of welding positions as per specific instructions given.

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National Occupational Standard

Unit Code	CSC/N0204
Unit Title (Task)	**Manually weld carbon and low alloy steels in 1G/1F, 2G/2F, 3G/3F welding positions 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 producing various types of joints on carbon and low alloy steels in 1G/1F, 2G/2F and 3G/3F welding positions as per specific instructions given.
Scope	This unit/task covers the following: • Work safely • Prepare for welding operations • Carry out welding operations • Test for quality

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, welding leads, earthing arrangements and electrode holder PC4. report any faults or potential hazards to appropriate authority 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 and drawings, welding procedure specifications and standard operating procedures Interpreting the WPS: e.g. welding process (ISO codes); parent metal; consumables; pre welding joint preparation (edge preparation, assembly, preheat); welding parameters; welding positions (ISO 6947 – PA, PB, PC, PD, PE, PF, PG; ASME IX–I-6 G/1-6 F); number & arrangement of runs to fully fill /weld joints; electrode sizes for joint thicknesses; electrode & covering; electrical conditions required (type of current, alternating [A.C.] direct [D.C.],

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	electrode polarity (positive or negative), welding current ranges); welding techniques (string/weave);welding sequence; heat input control; bead length/travel speed 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. PC7. identify welding machines eg. transformers, rectifiers, inverters and generators, according to the task PC8. prepare the work area for the welding activities PC9. perform measurements for joint preparation and routine MMAW PC10. prepare the materials and joint in readiness for welding Materials: carbon, low alloy steel, Form: plate (1.5 - 24mm)/ sheet (1.5mm) 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; setting up joint in correct position & alignment) PC11. use manual metal-arc welding and related equipment to include a. alternating current (AC) equipment b. direct current (DC) equipment MMAW equipment: 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.) PC12. connect equipment to power source PC13. connect cables, electrode holders, return leads and ground clamps to appropriate terminal PC14. re-dry electrodes as per electrode classification requirement PC15. set, read and adjust amperage controls PC16. verify set up by running test weld specimen (scrap plate) PC17. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding PC18. report any faults or problem to appropriate authority
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)

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	PC21. maintain constant puddle by using appropriate travel speed PC22. maintain proper bead sequence with respect to groove/fillet configurations and positions PC23. remove slag in an appropriate manner (eg. wire brush, hammer, etc.) PC24. produce welded joints to the specified quality, dimensions and profile applicable to carbon and low alloy steel sheets and plates from 1.5 – 24 mm 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, 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 Joints: fillet lap joints, tee fillet joints, corner joints, butt joints (square, single, vee, double vee) PC25. produce fillet and grove joints in 1F/1G, 2F/2G and 3F/ 3G welding positions as per the WPS specified using single or multi-run welds Positions: flat (PA) IG/1F, horizontal vertical (PB)2F, horizontal (PC)2G, vertical upwards (PF) 3F / 3G, vertical downwards (PG) 3F / 3G, Plate to Pipe (Fixed) 5F PC26. 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 PC27. produce joints on carbon and low alloy steel materials using various methods Methods: drag, weave, whip PC28. shut down and make safe the welding equipment on completion of the welding activities 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.
Test for quality	To be competent, the user/individual on the job must be able to: PC29. measure and check that all dimensional and geometrical aspects of the weld

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	are as per instructions PC30. check that the welded joint conforms to the instructions given, by checking various quality parameters by visual inspection Quality parameters: dimensional accuracy; alignment/squareness; size and profile of weld; visual defects PC31. identify various weld defects using visual inspection 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 Visual inspections: e.g. use of visual techniques, distance from workpiece, angle of observation, adequate lighting, low powered magnification, fillet weld gauges, etc. PC32. detect and report surface imperfections to appropriate authority PC33. deal with defects in welding as per instructions given
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. department structure and hierarchy protocols KA3. work flow and own role in the workflow KA4. dependencies and interdependencies in the workflow KA5. support functions and types of support available for incumbents in this role
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. health and safety hazards 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); 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. effects of exposure to the electric arc KB3. types of fire extinguishers and their suitable uses KB4. effects of exposure to welding fume KB5. methods of managing welding fume hazards KB6. personal protective equipment (PPE) and clothing to be worn during MMAW/SMAW welding

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	Personal protective equipment (PPE): (suitable aprons, welding gloves, respirators, safety boots, correctly fitting overalls, suitable eye shields/goggles, hard hat/helmet KB7. 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. KB8. main components and controls of welding equipment KB9. how to connect electrical components correctly KB10. type of current used and implication KB11. welding symbols used and their correct interpretation KB12. types of consumables used for MMAW/SMAW welding KB13. 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 KB14. types of joint configurations for welding Types: groove and fillet KB15. 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) KB16. types of beads, characteristics and uses (stringer, weave, weave patterns) Bead characteristics: spatter deposits, roughness, evenness, fill, crater, overlap KB17. factors that affect weld quality standards 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

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	part of the finished weld, without excessive hump; corner joints have minimal burn through to the underside of the joint or, where appropriate KB18. weld positions such as flat, horizontal, vertical and overhead Positions: flat (PA) IG/1F, horizontal vertical (PB) 2F, horizontal (PC) 2G and 3G/3F vertical downwards and upwards KB19. types of equipment components such as electrode holders, work leads cables and ground clamps KB20. awareness and importance of cable size and length KB21. types of polarity such as DC electrode negative and DC electrode positive for welding purposes KB22. various types of base metals used in welding and their implications KB23. 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) KB24. magnetic arc blow or arc deflection, causes and methods to avoid or compensate KB25. significance of diffusible hydrogen for welds KB26. storage requirements for consumable electrodes KB27. welding process specification sheet, process qualification record (PQR) and related essential variables KB28. travel speed and heat inputs KB29. amperage requirements for different classification of electrodes and positions KB30. importance and implications of various diameters of electrodes KB31. gouging and back gouging principles, methods and procedures KB32. purpose and importance of pre-heating requirements for base metals KB33. tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc. KB34. purpose and importance of post-heating in welding KB35. 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. KB36. awareness of common welder testing codes and their purpose Welder testing codes: ASME section IX, EN 287, ISO 9606, IS 7310
Skills (S)	

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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, 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: 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. apply appropriate degree of accuracy to express numbers SA6. calculate tolerance in terms of limits of size SA7. check measurements, angles, orientation and slopes SA8. types of reference lines such as tangent lines, datum lines, centre lines and work points SA9. select and use tools and equipment such as measuring tapes, levels, squares, protractors and dividers SA10. ability to check dimensions of components SA11. 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: SA12. convey and share technical information clearly using appropriate language SA13. check and clarify task-related information SA14. liaise with appropriate authorities using correct protocol SA15. 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

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	Customer Centricity
	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/N0204**		
Credits	**TBD**	**Version number**	**1.0**
Industry	**Capital Goods**	**Drafted on**	**10/04/2014**
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**	**24/11/2017**
Occupation	**Welding and Cutting**	**Next review date**	**24/11/2021**

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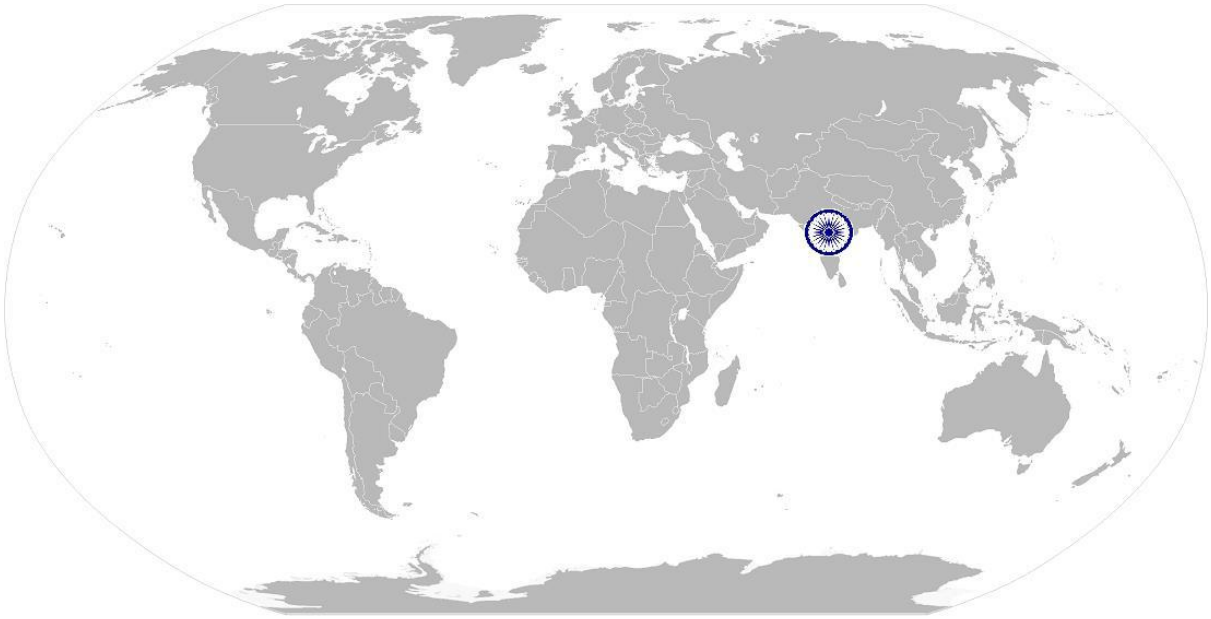
National Occupational Standard



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).

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Unit Code	CSC/N0203
Unit Title (Task)	Manually cut metal and metal alloys using oxyfuel gas
Description	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 oxyfuel cutting operations for as per welding procedure specification (WPS).
Scope	This unit/task covers the following: • Work safely • Prepare for cutting operations • Carry out cutting operations • Test for accuracy • 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 Safety precautions: general workshop safety, fire prevention, general hazards, manual lifting, overhead lifting, surface conditions, stability of surrounding structures, furniture, etc. PC2. take necessary safety precautions for gas cutting operations including equipment, processes and checks
Prepare for cutting operations	To be competent, the user/individual on the job must be able to: 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 PC11. adjust torch valve for type of flame such as neutral, carburizing and oxidizing

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	PC12. follow sequence of operations such as pre-heating material and initiating cut PC13. mark out the locations for cutting accurately and as per requirement PC14. use appropriate and safe procedures for handling and storing of gas cylinders PC15. prepare the work area for the cutting activities 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 PC17. check that the oxy-fuel gas cutting equipment is set up for the operations to be performed PC18. adjust cylinder valves and adjust regulator for operating pressure to achieve specifications for required operations PC19. where appropriate, mark out the components for the required operations, using appropriate tools and techniques PC20. perform trial cut to check for cut defects
Carry out cutting operations	To be competent, the user/individual on the job must be able to: PC21. operate the oxy-fuel gas cutting equipment to produce items/cut shapes to the dimensions and profiles specified PC22. use various types of oxy-fuel gas cutting methods 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 PC24. produce thermal cuts in various forms of material (metal of 3mm and above) 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 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 PC27. recognize and correct burnback and flashback PC28. detect and correct defects in cut PC29. ensure the work area is left in a safe and tidy condition on completion of the cutting activities
Test for accuracy	To be competent, the user/individual on the job must be able to: PC30. check that the finished components meet the standard required

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	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 PC32. identify various cutting defects and follow organisation recommended procedures to address them Defects: distortion; grooved, fluted or ragged cuts; poor draglines; rounded edges; tightly adhering slag
Deal with contingencies	To be competent, the user/individual on the job must be able to: PC33. report any difficulties or problems that may arise with the cutting activities, and carry out any agreed actions PC34. detect equipment malfunctions and deal with them appropriately 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 PC36. shut down and make safe the cutting equipment on completion of the cutting activities PC37. follow standard emergency procedures in case of emergencies 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
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and	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

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its processes)	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
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. types of fire extinguishers and their suitable uses in case of gas cutting related fires 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 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 KB4. hazards associated with carrying out gas cutting activities and how they can be minimized KB5. safe working practices and procedures for using thermal equipment 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 KB7. procedure for obtaining the required drawings, job instructions and other related specifications

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	KB8. how to use and extract information from engineering drawings and related specifications, workpiece reference points and system of tolerances 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 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) KB11. construction of the heating and cutting torch KB12. types of oxy-fuel gases such as acetylene, natural gas and propane KB13. accessories that can be used with handheld gas cutting equipment to aid cutting operations (such as cutting guides, trammels, templates) KB14. importance of correct marking procedure before a cut (eg. allowances for post-cut operations, punch marks, etc.) KB15. types of regulators such as low- and high-pressure, and single- and two-stage KB16. how to identify the gases used in the cutting process, and the color coding of gas cylinders KB17. type and thickness of base metals related to nozzle type 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) KB19. holding methods that are used to aid thermal cutting, and the equipment that can be used 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 KB21. types of flames and their implication for cutting KB22. importance of following the correct procedure for lighting, cutting and extinguishing a flame 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) KB24. effects of oil, grease, scale or dirt on the cutting process KB25. gas mixture ratio required to get various flames KB26. quality parameters for gas cut materials

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	Quality parameters: shape and length of the draglines; smoothness of the sides; sharpness of the top edges; amount of slag adhering to the metal KB27. special grade materials used in industry and their behavior with oxy fuel gas 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 KB29. importance of leaving the work area in a safe and clean condition on completion of activities KB30. correct handling and storage of gas cylinders 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; 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 KB32. how to close down the cutting equipment safely and correctly KB33. purging tools and their function
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, 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) SA4. use appropriate measuring techniques SA5. use and convert imperial and metric systems of measurements SA6. apply appropriate degree of accuracy to express numbers Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity SA7. calculate the value of angles in a triangle Angles in a triangle: right-angled, isosceles, equilateral
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA8. convey and share technical information clearly using appropriate language SA9. check and clarify task-related information SA10. liaise with appropriate authorities using correct protocol SA11. 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
	Customer Centricity
	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

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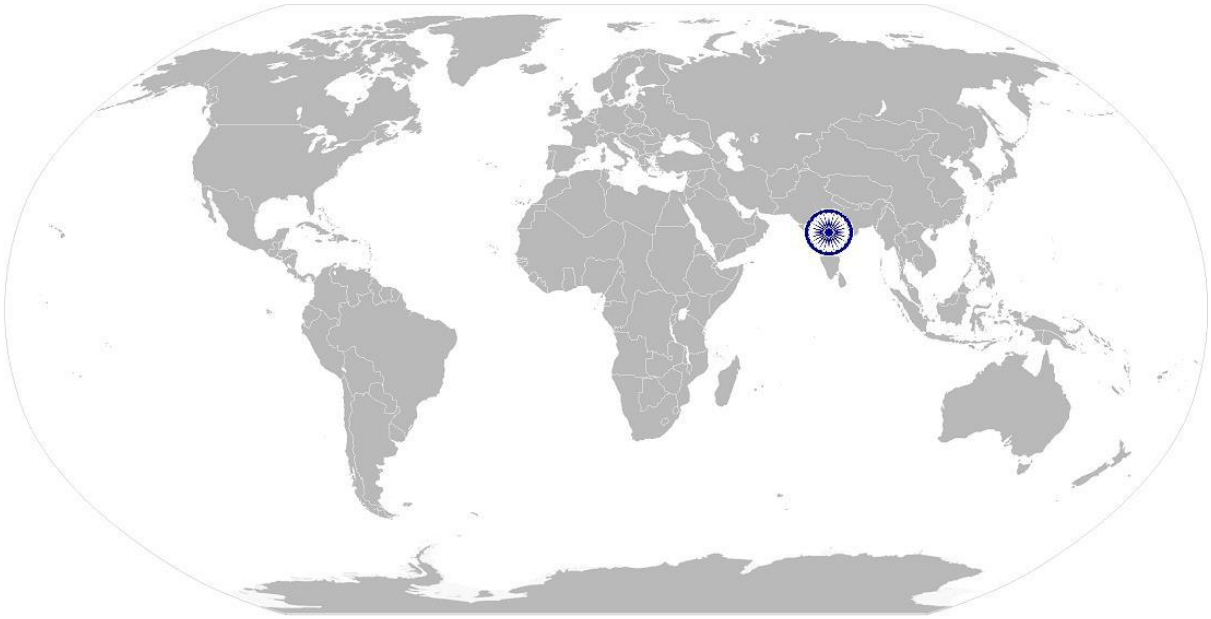
	The user/individual on the job needs to know and understand how to: SB11. identify problems with work planning, procedures, output and behavior and their implications SB12. prioritize and plan for problem solving SB13. communicate problems appropriately to others SB14. identify sources of information 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

CSC/N0203 Manually cut metal and metal alloys using oxyfuel gas

NOS Version Control

NOS Code	CSC/N0203		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	10/04/2014
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	24/11/2017
Occupation	Welding and Cutting	Next review date	24/11/2021

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/N0207 Manually cut metal materials using plasma arc

National Occupational Standard

Unit Code	**CSC/N0207**
Unit Title (Task)	**Manually cut metal materials using plasma arc**
Description	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.
Scope	This unit/task covers the following: • Work safely • Prepare for cutting operations • Carry out cutting operations • Test for quality • 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 Safety precautions (general): general workshop safety; fire prevention; general hazards; manual lifting; overhead lifting; surface conditions; stability of surrounding structures, furniture, etc. PC2. take necessary safety precautions for plasma cutting operations including equipment, processes and checks
Prepare for cutting operations	To be competent, the user/individual on the job must be able to: 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 nozzle to the torch PC7. match correct tips and cups to the torch as per requirement and manufacturer's equipment instructions PC8. set the amperage and gas pressure as per metal thickness, metal type, and type of gas Materials type: mild steel; high alloy steel; stainless steel; aluminium and its alloys; other appropriate metal Types of gases: Primary Plasma Gas – used to create the plasma arc (Nitrogen, Argon, Hydrogen, Compressed air); Secondary Shielding Gas – used

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	to protect the cut metals from oxidation (CO_2, Compressed Air) PC9. use the correct procedure for lighting, adjusting and extinguishing the arc PC10. use appropriate and safe procedures for handling and storing of gas cylinders PC11. prepare the work area for the cutting activities 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 PC13. check that the plasma arc cutting equipment is correctly set up for the operations to be performed PC14. carry out correct measurements required using appropriate equipment and methods for planning the cut PC15. where appropriate, mark out the components for the required operations, using appropriate tools and techniques PC16. perform trial cut to check for cut defect
Carry out cutting operations	To be competent, the user/individual on the job must be able to: PC17. operate the plasma cutting equipment to produce items/cut shapes to the dimensions and profiles as specified PC18. use the correct angles to cut and the right speed PC19. use various types of plasma arc cutting methods/techniques Cutting techniques: stand-off, circle cutting, profile cutting, edge, stenting hole, piercing technique 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 PC21. produce thermal cuts in various forms of material Forms: plate, rolled section, pipe/tube, solid bars 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 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

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	PC24. detect and correct defects in cut PC25. leave the work area in a safe and tidy condition on completion of the cutting activities
Test for quality	To be competent, the user/individual on the job must be able to: PC26. check that the finished components meet the required standard 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 PC28. identify various cutting defects Defects: grooved, fluted or ragged cuts, poor draglines, rounded edges, tightly adhering slag, dross, burr, distortion
Deal with contingencies	To be competent, the user/individual on the job must be able to: PC29. report any difficulties or problems that may arise with the cutting activities, and carry out any agreed actions PC30. detect equipment malfunctions and deal with them appropriately 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 PC32. shut down and make safe the cutting equipment on completion of the cutting activities or during an emergency PC33. follow standard emergency procedures in case of emergencies
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
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. types of fire extinguishers and their suitable uses in case of gas cutting related fires 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

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	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
	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
	KB4. hazards associated with carrying out plasma arc cutting activities and how they can be minimized
	KB5. safe working practices and procedures for using plasma equipment
	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 nonferrous 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
	KB7. common terminology used in plasma cutting
	KB8. procedure for obtaining the required drawings, job instructions and other related specifications
	KB9. how to use and extract information from engineering drawings and related specifications, workpiece reference points and system of tolerances
	KB10. various types of plasma arc cutting equipment Types: transferred, non-transferred (welding)
	KB11. various components of the cutting equipment and types of consumables used Consumables: electrode, gases, tips, cups
	KB12. construction of the cutting torch
	KB13. types of plasma arc gases used Types of gases: Primary Plasma Gas – used to create the plasma arc

CSC/N0207 Manually cut metal materials using plasma arc

	(Nitrogen, Argon, Hydrogen, Compressed air); Secondary Shielding Gas – used to protect the cut metals from oxidation (CO_2, Compressed Air) KB14. accessories that can be used with handheld gas cutting equipment to aid cutting operations (such as cutting guides, templates) KB15. types of regulators such as low- and high-pressure, and single- and two-stage KB16. nozzle type as per type and thickness of base materials 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) KB18. holding methods that are used to aid plasma cutting, and the equipment that can be used KB19. correct procedure for lighting, cutting and extinguishing the arc KB20. importance of following the correct procedure for lighting, cutting and extinguishing an arc KB21. importance of torch to arc distance in relation to thickness of materials, types of torches and gases Torches: air plasma, oxygen injected, duel gas KB22. factors that impact nozzle life KB23. double arcing and its impact 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) KB25. effects of oil, grease, scale or dirt on the cutting process KB26. quality parameters for plasma cut materials 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 KB27. causes of cutting defects, how to recognize them, and methods of correction and prevention KB28. gouging and back gouging principles, methods and procedures KB29. importance of leaving the work area in a safe and clean condition on completion of activities KB30. emergency procedures for electrical and other fires KB31. how to close down the cutting equipment safely and correctly KB32. purging tools and their function
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

CSC/N0207 Manually cut metal materials using plasma arc

	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: 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
	Customer Centricity

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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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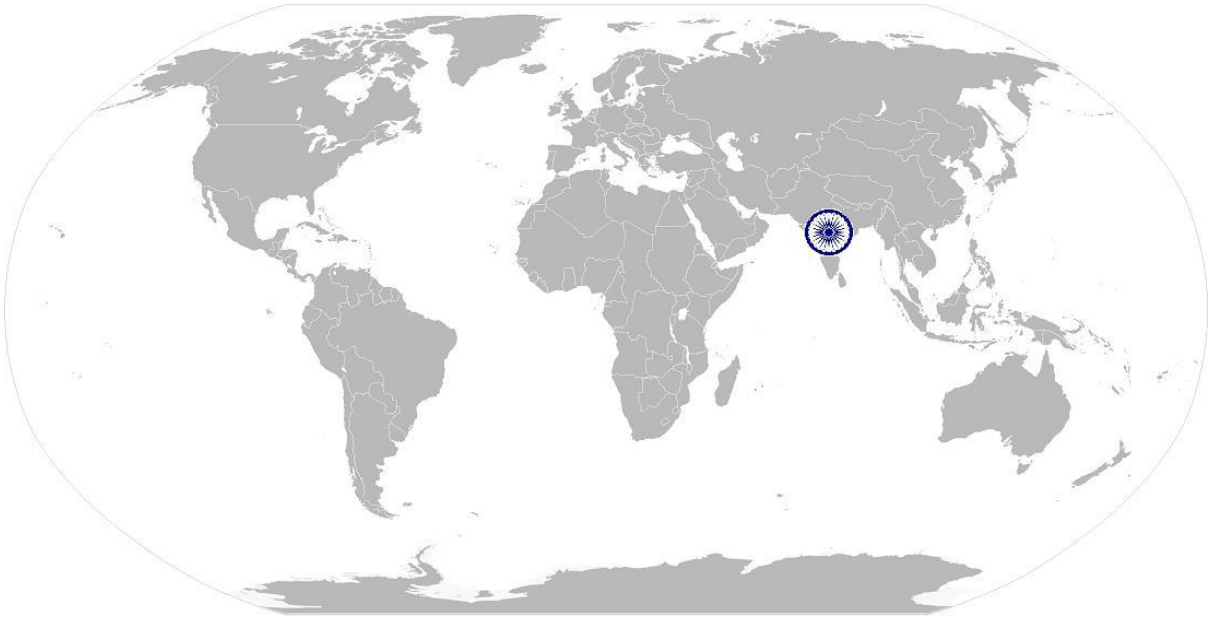
NOS Version Control

NOS Code	CSC/N0207		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	10/04/2014
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	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; oxy fuel 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

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

	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
Knowledge and Understanding (K)	

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

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 KB15. different methods of extinguishing fire KB16. different materials used for extinguishing fire

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

	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/ Generic Skills	**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
	The user/individual on the job needs to know and understand how to: SB3. remain congenial while discussing and debating issues with co-workers

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	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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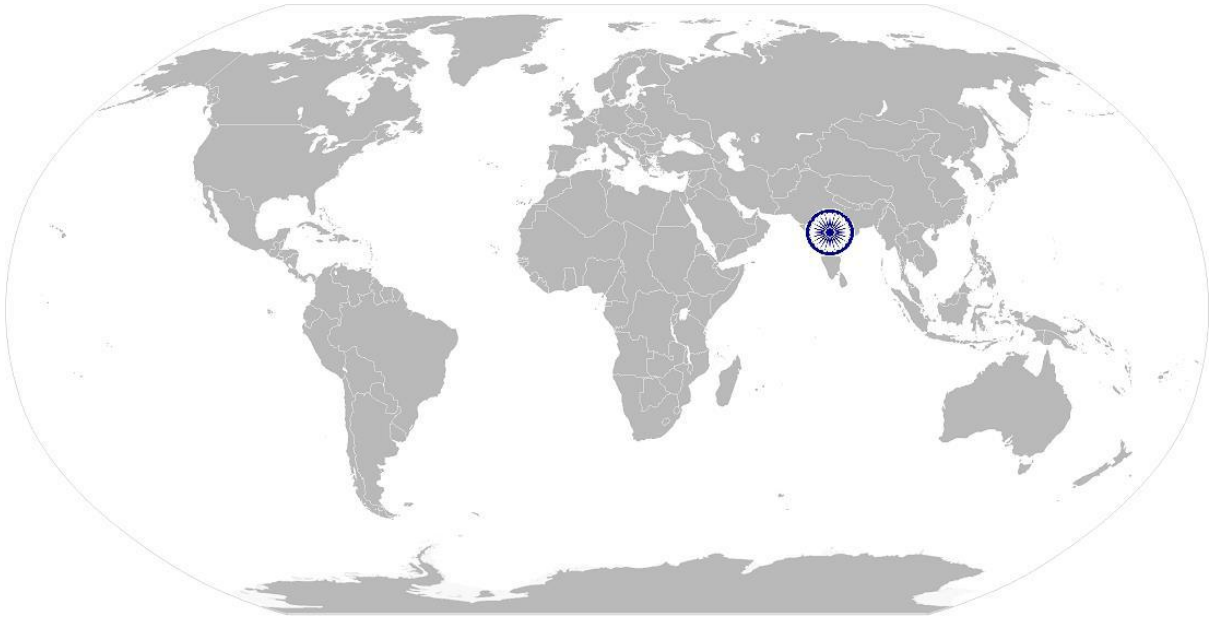
NOS Version Control

NOS Code	CSC/N1335		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	10/04/2014
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	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 / organization and	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 work area

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its processes)	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
	Oral Communication (Listening and Speaking skills)

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	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

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NOS Version Control

NOS Code	CSC/N1336		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	10/04/2014
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	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)

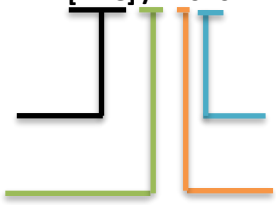
Occupation (2 numbers)

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 **N**OS	N
Next two numbers	Occupation code	01
Next two numbers	OS number	01

Criteria For Assessment Of Trainees

Job Role: Metal Inert Gas/ Metal Active Gas/ Gas Metal Arc Welder (MIG/MAG/GMAW)

Qualification Pack: CSC/Q0209

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.

Total Marks: 600	**Compulsory NOS**			**Marks Allocation**	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out of**	**Theory**	**Skills Practical**
CSC/N0209 Manually (semi-automatic) welding joints using the MIG/MAG (GMAW) process	PC1.work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines protective equipment (PPE) and other relevant safety regulations for MIG/MAG welding operations	100	3	1	2
	PC3. check the condition of welding leads, gas connection arrangements, earthing arrangements and electrode holder		2	0	2
	PC4.report any faults or potential hazards to appropriate authority		2	0	2
	PC5.interpret weld procedure data sheets specifications, PQR and WPS		3	1	2
	PC6.select welding machines such as inverters, rectifiers and generators,according to the task		2	0	2
	PC7.select electrodes according to classification and specifications		3	1	2

	PC8.prepare the materials and joint in readiness for welding		2	1	1
	PC9.check the condition of, and correctly connect, welding leads/cables, hoses, shielding gas supply and wire feed mechanisms		2	0	2
	PC10.prepare the welding equipment for a range of given applications		2	0	2
	PC11.select the welding shielding gases and equipment for a range of givenapplications		2	1	1
	PC12.plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS		2	0	2
	PC13.clean wire feeder and torch tip		2	0	2
	PC14.connect torches and components		2	0	2
	PC15.connect and adjust regulators and flow meters to cylinders		3	1	2
	PC16.adjust wire feed rate and read and set current as required		2	1	1
	PC17.set other welding parameters (eg. voltage, slope of current versus voltage curve where required)		3	1	2
	PC18.choose appropriate mode of metal transfer		3	1	2
	PC19.set pre-purge with shielding gas as required		2	0	2
	PC20.set and verify gas flow rates		3	1	2
	PC21.prepare and support the joint, using the appropriate methods		2	0	2
	PC22.tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding		4	1	3
	PC23.use manual welding and related equipment, to carry out MIG/MAG weldingprocesses		2	0	2
	PC24.perform MIG/MAG welding operations using various welding techniques to meet welding procedure specification requirements		3	1	2
	PC25.adjust wire stick-out as per requirement		2	0	2
	PC26.use welding consumables appropriate to the material and application to DC current types		3	0	3
	PC27.produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817		3	1	2

	PC28.produce joints from various materials in different forms		2	0	2
	PC29.weld joints in good access situations, in select positions		2	0	2
	PC30.make sure that the work area is maintained and left in a safe and tidy condition		3	1	2
	PC31.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
	PC32.check that the welded joint conforms to the specification, by checking various quality parameters by visual inspection		3	1	2
	PC33.detect surface imperfections and deal with them appropriately		3	1	2
	PC34.carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT)		3	1	2
	PC35.assist in preparation for non-destructive testing of the welds, for a range of tests		2	0	2
	PC36.prepare for destructive tests on weld specimens for fillet, butt and corner		3	1	2
	PC37.shut down and make safe the welding equipment on completion of thewelding activities		2	1	1
	PC38.follow the established organisational process for dealing with the weldedpieces including handover, storage, safety and security, record keeping, etc.		2	1	1
	PC39.detect equipment malfunctions and deal with them safely and as peorganisation procedures		3	1	2
	PC40.deal promptly and effectively with problems where required		3	1	2
		Total	**100**	**23**	**77**
CSC/N0204 Manually weld carbon and low alloy steels in 1G/1F, 2G/2F and 3G/3F welding positions using Manual Metal Arc	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, welding leads, earthing arrangements and electrode holder		2	0	2

Welding/ Shielded Metal Arc Welding	PC4.report any faults or potential hazards to appropriate authority		3	1	2
	PC5.follow fume extraction safety procedures		3	1	2
	PC6.read and interpret routine information on written job instructions and drawings, welding procedure specifications and standard operating procedures		5	2	3
	PC7.identify welding machines eg. transformers, rectifiers, inverters and generators, according to the task		2	0	2
	PC8.prepare the work area for the welding activities		2	0	2
	PC9.perform measurements for joint preparation and routine MMAW		4	1	3
	PC10.prepare the materials and joint in readiness for welding		4	1	3
	PC11.use manual metal-arc welding and related equipment to include a. alternating current (AC) equipment b. direct current (DC) equipment		2	0	2
	PC12.connect equipment to power source		2	0	2
	PC13.connect cables, electrode holders, return leads and ground clamps to appropriate terminal		3	1	2
	PC14.re-dry electrodes as per electrode classification requirement		3	1	2
	PC15.set, read and adjust amperage controls		4	2	2
	PC16.verify set up by running test weld specimen (scrap plate)		2	1	1
	PC17.tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding		3	1	2
	PC18.report any faults or problem to appropriate authority		3	1	2
	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.maintain constant puddle by using appropriate travel speed		3	1	2
	PC22.maintain proper bead sequence with respect to groove/fillet configurations and positions		3	1	2
	PC23.remove slag in an appropriate manner (eg. wire brush, hammer, etc.)		3	1	2

	PC24.produce welded joints to the specified quality, dimensions and profile applicable to carbon and low alloy steel sheets and plates from 1.5 – 24 mm		4	1	3
	PC25.produce fillet and grove joints in 1F/1G, 2F/2G and 3F/ 3G welding position as per the WPS specified using single or multi-run welds		4	1	3
	PC26.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		4	1	3
	PC27.produce joints on carbon and low alloy steel materials using various methods Methods: drag, weave, whip		4	1	3
	PC28.shut down and make safe the welding equipment on completion of the welding activities		3	1	2
	PC29.measure and check that all dimensional and geometrical aspects of the weld are as per instructions		4	2	2
	PC30.check that the welded joint conforms to the instructions given, by checking various quality parameters by visual inspection		3	1	2
	PC31.identify various weld defects using visual inspection		2	0	2
	PC32.detect and report surface imperfections to appropriate authority		3	1	2
	PC33.deal with defects in welding as per instructions given		3	1	2
		Total	**100**	**28**	**72**
CSC/N0203 Manually cut metal and metal alloys using oxyfuel gas	PC1.work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	100	3	1	2
	PC2.take necessary safety precautions for gas cutting operations including equipment, processes and checks		3	1	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 asneutral, carburizing and oxidizing		3	1	2
	PC12.follow sequence of operations such as preheating 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 cuttingequipment is set up for the operations to be performed		2	0	2
	PC18.adjust cylinder valves and adjust regulator for operating pressure to achieve specificationsfor 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		2	0	2
	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	1	3
	PC23.perform various cutting operations correctly		4	1	3
	PC25.produce cut profiles for various type of materials		4	1	3
	PC26.produce thermally-cut components which meet specified quality criteria leave		4	1	3
	PC27.recognize and correct burnback and flashback		3	1	2
	PC28.detect and correct defects in cut		3	1	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		3	1	2
	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 outany agreed actions		3	1	2
	PC34.detect equipment malfunctions and deal with them appropriately		3	1	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		3	1	2
	PC37.follow standard emergency procedures incase of emergencies		2	0	2
		Total	**100**	**22**	**78**
CSC/N0207 Manually cut metal materials using plasma arc	PC1.work safely at all times, complying with health	100	3	1	2
	PC2.take necessary safety precautions for plasma cutting operations including equipment, processes and checks		3	1	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		3	1	2
	PC5.check equipment is calibrated and approved for use		2	0	2
	PC6.check/fit the correct nozzle to the torch		3	1	2
	PC7.match correct tips and cups to the torch as per requirement and manufacturer's equipment instructions		2	0	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		3	1	2
	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		3	1	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		3	1	2
	PC13.check that the plasma arc cutting equipment is correctly set up for the operations to be performed		2	0	2
	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		3	1	2
	PC16.perform trial cut to check for cut defects		3	1	2
	PC17.operate the plasma cutting equipment to produce items/cut shapes to the dimensions and profiles as specified		4	1	3
	PC18.use the correct angles to cut and the right speed		4	1	3
	PC19.use various types of plasma arc cutting methods/techniques		4	1	3
	PC20.perform various cutting operations correctly		4	1	3
	PC21.produce thermal cuts in various forms of material		4	1	3
	PC22.produce cut profiles for various type of materials		4	1	3
	PC23.produce thermally-cut components which meet specified quality criteria		4	1	3
	PC24.detect and correct defects in cut		3	1	2
	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		3	1	2
	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		4	2	2
	PC28.identify various cutting defects		3	1	2
	PC29.report any difficulties or problems that may arise with the cutting activities, and carry out any agreed actions		3	1	2
	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		4	1	3
	PC32.shut down and make safe the cutting equipment on completion of the cutting activities or during an emergency		2	0	2
	PC33.follow standard emergency procedures incase of emergencies		2	0	2
		Total	**100**	**26**	**74**
CSC/N1335 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
	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		4	1	3
	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		4	1	3
	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	2	1
	PC25.participate in emergency procedures		2	1	1
	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		3	1	2
		Total	**100**	**37**	**63**
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**