QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR CAPITAL GOODS INDUSTRY

Contents

What are Occupational Standards(OS)?

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

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Introduction

Qualifications Pack: Tungsten Inert Gas Welder (GTAW)

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OCCUPATION: Welding and Cutting

REFERENCE ID: CSC/ Q 0213

ALIGNED TO: NCO-2004/7212.2

Tungsten Inert Gas Welder (GTAW): Perform manual operations for performing tungsten inert arc welding (GTAW) also known as gas tungsten arc welding (GTAW) and independently carry out TIG (GTAW) weld operations for welding joints in all positions as per welding procedure specification (WPS).

Brief Job Description: Perform manual TIG (GTAW) welding for a range of standard welding job requirements. This is for a skilled welder who can weld different materials (carbon steel, aluminum, nickel, titanium, copper and stainless steel) in various positions and 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/ Q 0213**		
Job Role	**Tungsten Inert Gas Welder (GTAW) Level 5**		
Credits NSQF	**TBD**	**Version number**	**1.0**
Sector	**CAPITAL GOODS**	**Drafted on**	**10/04/14**
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**	**30/12/14**
Occupation	**WELDING AND CUTTING**	**Next review date**	**30/08/16**
NSQC Clearance on	**22/04/2015**		

Job Role	Tungsten Inert Gas Welder (GTAW) Level 5
Role Description	Perform manual operations for performing Tungsten Inert Arc Welding (GTAW) also known as Gas Tungsten Arc Welding (GTAW) and independently carry out TIG (GTAW) weld operations for welding joints in all positions as per Welding Procedure Specification.
NSQF level	5
Minimum Educational Qualifications	10^{th} standard
Maximum Educational Qualifications	N.A.
Training (Suggested but not mandatory)	Manual/Shielded Metal Arc Welding
Minimum Job Entry Age	18 Years Old
Experience	3 months Manual/Shielded Metal Arc Welding required
Applicable National Occupational Standards (NOS)	**Compulsory:** 1. CSC/ N 0213 (Perform Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW) Welding) 2. CSC/ N 1335 (Use basic health and safety practices at the workplace) 3. CSC/ N 1336 (Work effectively with others) **Optional:** N.A.
Performance Criteria	As described in the relevant OS units

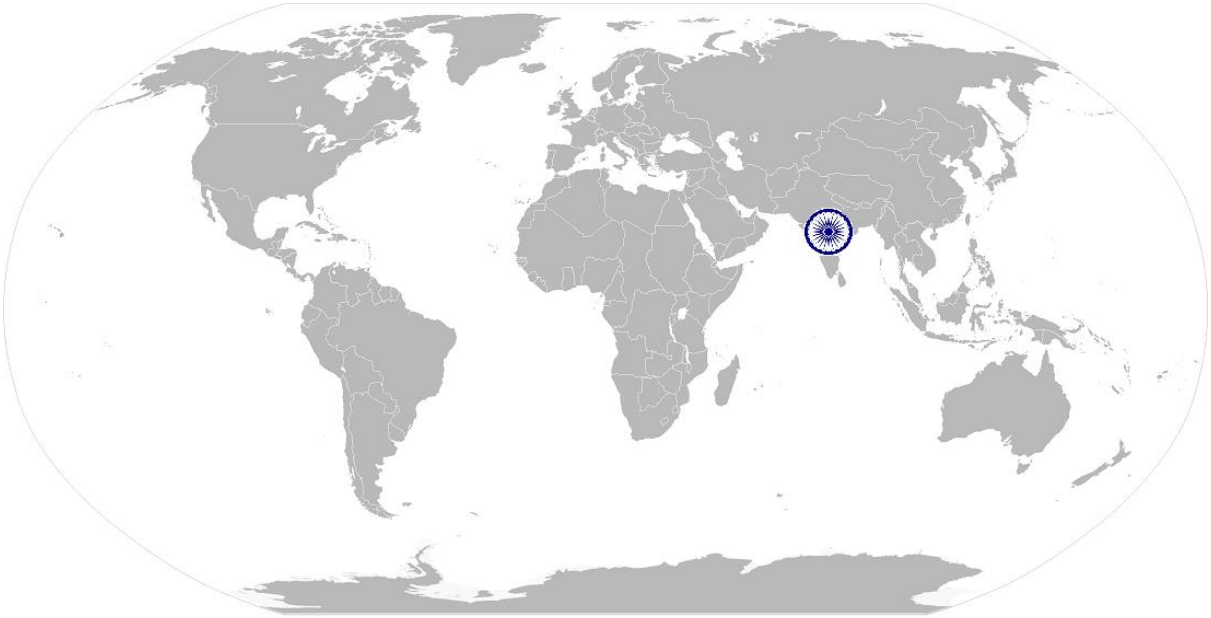
Definitions

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

Acronyms

Keywords /Terms	Description
GTAW	Gas Tungsten Arc Welding
TIG	Tungsten Inert Gas Welding
NDT	Non-Destructive Testing
DT	Destructive Testing
WPS	Welding Procedure Spefication
RT	Radiographic Testing
UT	Ultrasonic Testing
DPT	Dye Penetrant Testing
MPT	Magnetic Particle Testing
FPT	Fluoroscent Penetrant Testing
CO2	Carbon dioxide
CPR	Cardiac Pulmonary Resuscitation

National Occupational Standard



Overview

This unit is about manual operations for performing tungsten inert gas (TIG) welding also known as gas tungsten arc welding (GTAW). The person would be able to independently carry out TIG (GTAW) weld operations for welding joints in all positions as per Welding Procedure Specification (WPS).

CSC/ N 0213: Perform Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW) Welding

National Occupational Standard

Unit Code	CSC / N 0213
Unit Title (Task)	Perform Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW) Welding
Description	This unit covers the performing of manual TIG (GTAW) welding for a range of standard welding job requirements. This involves welding different materials (carbon steel, aluminum and stainless steel) in various positions. The welder can prepare various joints including corner, butt, fillet and tee. This involves setting-up and preparing for operations, interpreting the right information from the WPS, obtaining the right consumables and raw materials, etc. The candidate will be expected to work with a minimum of supervision, taking personal responsibility for own actions, quality and accuracy of the work.
Scope	This unit/task covers the following: • Working Safely • Preparing for welding operations • Carrying out welding operations • Testing for quality • Post welding techniques • Dealing with contingencies

Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working Safely	The user/individual on the job should 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 TIG 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
Preparing for welding operations	The user/individual on the job should be able to: PC5. interpret weld procedure data sheets specifications **Interpreting the WPS**: welding process (ISO Codes); parent metal; consumables; pre welding joint 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 (W); filler wire; electrical conditions required (type of current, alternating [A.C.] direct [D.C.], electrode polarity (negative), welding current ranges; methods of arc ignition (scratch, high frequency, lift start); shielding gas (type, flow rate, pre-weld gas flow, post-weld gas flow); techniques (including autogenous); control of heat input;

	interpass/run cleaning/back gouging methods; root pass with back purging of gases on the root side of the welding; post welding activities (wiring brushing, removal of excess weld metal where required); post-weld heat treatment (normalising, stress relief) PC6. select welding machines eg. transformer, inverters (AC/DC), rectifiers and generators, according to the materials and task PC7. select proper welding torch and tungsten electrode that meet the job requirement and specification **Selection and preparation of tungsten electrode**: types and classification of tungsten electrodes for different materials; angle and technique of preparation of the tungsten electrode tips; selection of the tungsten electrode diameter as per current PC8. obtain filler wire according to specifications PC9. prepare for the TIG welding process PC10. prepare the materials and joint in readiness for welding **Material and joint preparation**: made rust free; cleaned – free from scaling, paint, oil/grease; chemical cleaning; made dry and free from moisture; edges to be welded prepared as per job requirement (eg. flat, square or beveled); use various machines and techniques for the above (eg. chamfering machine, grinding and stripping, etc.); correctly positioned (Positioning: devices and techniques- jigs and fixtures; setting up the joint in the correct position and alignment) PC11. select tungsten electrode by the colour of the tip according to base metal, and correct diameter PC12. select and fit the welding shielding gases for a range of given applications PC13. plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS **Checking activities**: correct set-up of the joint; proper condition of electrical connections; welding return and earthing arrangements; operating parameters PC14. connect torches and the components **Torch components**: cables, water carrying tubes, ceramic nozzle, collet, collet holder, gas lens, teflon washers, bakelite cap, ceramic shields/nozzles PC15. connect and adjust regulators and flow meters to cylinders PC16. read, set and adjust current (amperage) as required PC17. set pre-purge with shielding gas as required PC18. prepare tungsten by sharpening or balling it to desired tip shape PC19. set and verify gas flow rates PC20. prepare and support the joint, using the appropriate methods PC21. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding PC22. obtain clearance from quality control for weld joint before welding PC23. match feed and travel speed as required

Carrying out welding operations	The user/individual on the job should be able to: PC24. perform TIG welding operations using appropriate welding techniques to meet welding procedure specification requirements **Welding techniques**: fine adjustment of parameters (current and gas flow); selection of gas nozzle if required; selection of the outer nozzle ; correct manipulation of the torch; blending in stops/starts and tack welds; starting techniques PC25. use correct technique for starting the arc (using HF (high frequency) unit, scratching the electrode on the job material, lifting the electrode immediately after touching the job material) PC26. use correct angle of torch and filler wire PC27. weld the joint to the specified quality, dimensions and profile PC28. use manual welding and related equipment, to carry out TIG welding processes PC29. use welding consumables appropriate to the material and application, to include AC current types and DC current types **Welding consumables**: filler wires for different base materials, shielding gas PC30. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level B of ISO 5817 **Weld quality check 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 (free from cracks; substantially free from porosity; free from any pronounced hump or crater; substantially free from shrinkage cavities; 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 PC31. use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously) PC32. produce joints from various materials in different forms **Materials**: ferrous : carbon steel, stainless steel (all grades); non-ferrous: aluminum and aluminum alloys; nickel and nickel alloys; titanium; copper and copper alloys **Forms**: sheet (less than 1.5 mm), plate (8 mm), section, pipe/tube, other forms PC33. weld joints in good access situations, in select positions PC34. shut down and make safe the welding equipment on completion of the welding activities PC35. make sure that the work area is maintained and left in a safe and tidy condition

Testing for quality	The user/individual on the job should be able to: PC36. use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification PC37. check that the welded joint conforms to the specification, by checking various quality parameters using visual inspection **Quality parameters**: dimensional accuracy; alignment/squareness; size and profile of weld; visual defects; NDT/DT tested defects **Types of visual inspections**: use of visual techniques, lighting, low powered magnification, fillet weld gauges PC38. identify various weld defects **Types of weld defects**: lack of continuity of the weld; uneven and irregular ripple formation, incorrect weld size or profile, undercutting, overlap, inclusions, porosity, internal cracks, surface cracks, lack of fusion, lack of penetration, welding spatter, gouges, stray arc strikes, sharp edges PC39. detect surface imperfections and deal with them appropriately PC40. carry out LPT tests to assess fine defect open to the surface not detected by visual inspection (VT)
Post welding techniques	The user/individual on the job should be able to: PC41. assist in preparation for non-destructive testing of the welds for a range of tests **Non-destructive tests (NDT)**: visual inspection, leak test: dye penetrant (DPT), fluorescent penetrant (FPT); magnetic particle (MPT); radiographic (RT); ultrasonic (UT) PC42. prepare for destructive tests on weld specimens for select tests **Destructive tests (DT)**: nick break test; bend tests (such as face, root or side, as appropriate); metallographic; mechanical (peel, tensile and shear, fatigue, impact tests); chemical PC43. follow the established organisational process for dealing with the welded pieces including handover, storage, safety and security, record keeping, etc.
Dealing with contingencies	The user/individual on the job should be able to: PC44. detect equipment malfunctions and deal with them appropriately PC45. 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
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

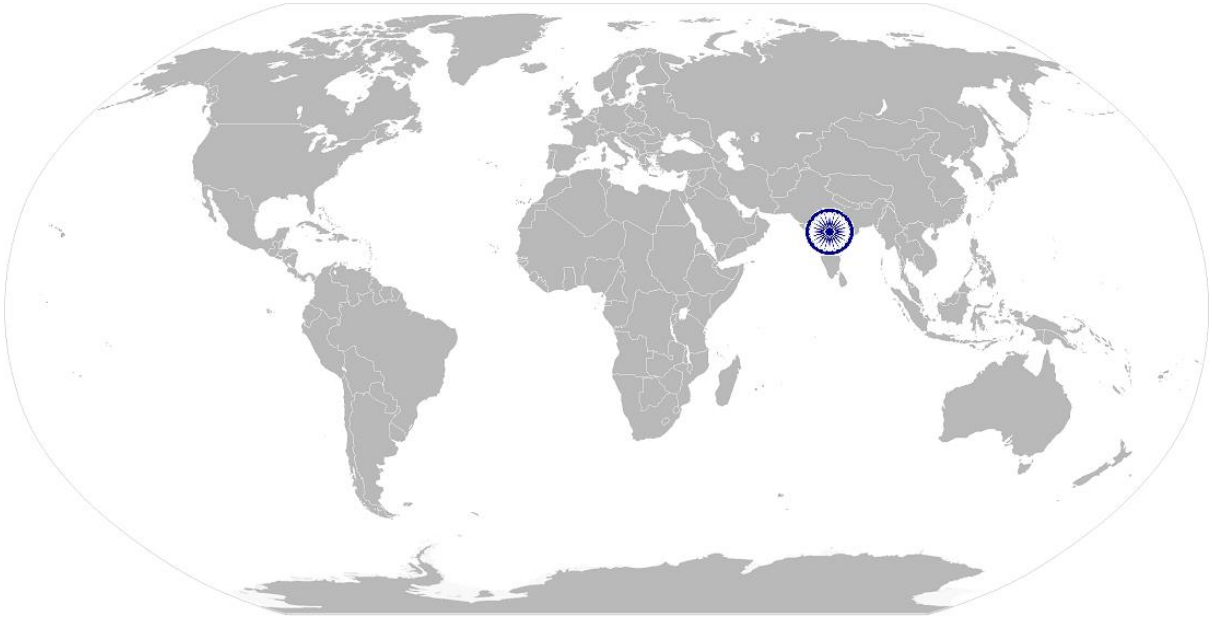
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. the types of fire extinguishers and their suitable uses in case of welding related fires KB2. the effects of exposure to welding fume KB3. range of welding equipment available **Welding equipment**: transformer (variable wave forms and wave balancing); rectifier (pulsing); inverter; generator; measuring equipment for electrical output and continuity (voltmeter/multi-meter, ammeter/shunts/coils, tong tester); equipment for current regulation; high frequency unit; torches; electrodes; filler wires; water cooling and circulation system for TIG torch (water cooled torch); return clamps; foot pedal; ancillary equipment (table grinders for tungsten electrode, wire brushes, linishers, hammer, power saw, angle, pedestal and straight grinders, chisel); other equipment **Shielding gases equipment**: cylinders; manifold systems; regulators (fixed, single stage, two-stage); gas flow meters; gas tubes and connectors; solenoid valves; economisers KB4. basic principles of TIG welding and the functions of welding equipment **Basic principles of TIG welding**: the arc burns between a non- consumable tungsten electrode and the workpiece; exclusively inert gases (Argon, Helium) are used as shielding gases; TIG welding installation; for most applications an electrode with a negative polarity is used; for welding of aluminum, alternating current must be used; for arc ignition a high-frequency high voltage is used KB5. concepts and mechanisms of welding **Welding concepts and mechanisms**: rated output (duty cycle); measurement of electrical output and continuity; power source characteristics (volt/ampere graph, flat characteristic, constant voltage output); types of current AC and DC and polarity; AC welding (square wave forms and wave balancing); DC pulsed TIG welding; function of induction (principle, effect, fixed, stepped, variable control); return; earth; indirect control of welding current; relay for electrical power KB6. different types of power source KB7. how to compare welding consumables for suitability for a range of given applications KB8. welding consumables classification **Consumables classification**: sizes [diameters, lengths]; strength and elongation of the weld metal; impact properties of the weld metal; chemical composition of the weld metal; protection of bare wires KB9. safe working practices, precautions and procedures to be followed when preparing and using TIG welding equipment **Safety precautions (TIG Welding)**: protection from live and other electrical components, including insulation, proper earthing, proper loading, etc.; proper handling and placement of hot metal; taking account of splatter and related safe distance; adequate lighting; appropriate personal protective equipment (suitable aprons, welding gloves, respirators, safety boots, correctly fitting overalls, suitable eye shields/goggles); protection of self and others from the effects of the welding arc; fume extraction/control measures; safety measures for elevated and trench working; reduction in the local air concentration due to release of argon gas during welding in confined places

	KB10. hazards associated with TIG welding and safety precautions to minimize risk **Safety precautions (general)**: general workshop safety; fire prevention; general hazards; manual lifting; overhead lifting; surface conditions stability of surrounding structures, furniture, etc KB11. different variants of the TIG welding (eg. orbital welding, internal bore welding, NG-TIG etc.) KB12. personal protective equipment to be worn for the welding activities KB13. correct handling and storage of gas cylinders KB14. manual TIG welding process KB15. type and thickness of base metals KB16. current types and polarity KB17. types of tungsten KB18. types, selection and application of filler wires and welding electrodes KB19. reasons for using shielding gases, and the types and application of the various gases **Shielding gases**: shielding gases for GTAW; applications for shielding gases/gas mixtures (argon, argon/helium mixtures, argon/hydrogen mixtures, nitrogen argon/nitrogen mixtures); gas pressure requirements; flow rates for applications; back purging; trialing shield for material like titanium KB20. impact of shielding gas composition and purity on welding quality KB21. use, impact and importance of gas pressures and flow rates in relationship to the type of material being welded KB22. pre- and post-flow purge and its importance KB23. importance and application of back purging KB24. 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, single j (for higher thickness), double j) KB25. 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, Pipe to Pipe 5G, Pipe welding at inclined position 6G KB26. types of torches such as air cooled and liquid cooled KB27. how to prepare the materials in readiness for the welding activity KB28. how to set up and restrain the joint, and the tools and techniques to be used KB29. appropriate tack welding size and spacing (in relationship to material thickness) KB30. checks to be made prior to welding **Checking activities**: correct set-up of the joint; proper condition of electrical connections; welding return and earthing arrangements; operating parameters KB31. operating the welding equipment to produce a range of joints in the various joint positions KB32. effects of the electrical characteristics of the TIG welding arc **Electrical characteristics**: power source characteristics (volt/ampere graph, drooping characteristic, constant current output); effects of types of current and electrode polarity: heat input/distribution, electrode, weld bead profile, penetration, methods of a.c. arc stabilisation (including: square wave), welding current features (pulse current, slope in, slope out), voltage (open circuit, arc)

	KB33. gouging and back gouging principles, methods and procedures KB34. purpose and importance of pre-heating requirements for base metals KB35. purpose and importance of post-heating in welding KB36. methods to achieve pre-heat and post heat requirements KB37. tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc. KB38. how to control distortion (such as welding sequence; deposition technique) KB39. problems that can occur with the welding activities KB40. how to close down the welding equipment safely and correctly KB41. how to prepare the welds for examination KB42. how to check the welded joints for uniformity, alignment, position, weld size and profile KB43. various procedures for visual examination of the welds for cracks KB44. types of non-destructive and destructive tests KB45. correct procedure for carrying out the Dye Penetrant Test KB46. handling of weld specimens for tests and methods of removing a test piece of weld from a suitable position in the joint **Handling specimens for tests**: handling hot materials, using chemicals for cleaning and etching; using equipment to fracture welds. KB47. safe working practices and procedures to be adopted when preparing the welds for examination KB48. importance of leaving the work area and equipment in a safe condition on completion of the welding activities
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Communication**
	The user/ individual on the job needs to know and understand how to: SA1. read and interpret information correctly from various job specification documents, manuals, health and safety instructions, memos, etc. applicable to the job in English and/or local language SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language SA3. convey and share technical information clearly using appropriate language SA4. check and clarify task-related information SA5. liaise with appropriate authorities using correct protocol SA6. communicate with people in respectful form and manner in line with organizational protocol
	Numerical and computational skills
	The user/individual on the job needs to know and understand how to: SA7. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages) SA8. use appropriate measuring techniques SA9. use and convert imperial and metric systems of measurements SA10. 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 SA11. use and understand tolerance in terms of limits of size

	SA12. check measurements, angles, orientation and slopes SA13. types of reference lines such as tangent lines, datam lines, centre lines and work points SA14. check square of material using corner-to-corner dimensions and triangulation (3-4-5) method SA15. select and use tools and equipment such as measuring tapes, levels, squares, protractors and dividers SA16. ability to check dimensions of components SA17. calculate the value of angles in a triangle
	Learning
	The user/individual on the job needs to know and understand how to: SA18. participate in on-the-job and other learning, training and development interventions and assessments SA19. clarify task related information with appropriate personnel or technical adviser SA20. seek to improve and modify own work practices SA21. maintain current knowledge of application standards, legislation, codes of practice and product/process developments
B. Professional Skills	**Problem Solving**
	The user/individual on the job needs to know and understand how to: SB1. identify problems with work planning, procedures, output and behavior and their implications SB2. prioritize and plan for problem solving SB3. communicate problems appropriately to others SB4. identify sources of information and support for problem solving SB5. seek assistance and support from other sources to solve problems SB6. identify effective resolution techniques SB7. select and apply resolution techniques SB8. seek evidence for problem resolution
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB9. plan, prioritize and sequence work operations as per job requirements SB10. organize and analyze information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Initiative and Enterprise
	The user/individual on the job needs to know and understand how to: SB12. undertake and express new ideas and initiatives to others SB13. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB14. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB15. one's competencies in new and different situations and contexts to achieve more

	Self-Management
	The user/individual on the job needs to know and understand how to: SB16. exercise restraint while expressing dissent and during conflict situations SB17. avoid and manage distractions to be disciplined at work SB18. manage own time for achieving better results
	Teamwork
	The user/individual on the job needs to know and understand how to: SB19. work in a team in order to achieve better results SB20. identify and clarify work roles within a team SB21. communicate and cooperate with others in the team for better results SB22. seek assistance from fellow team members



CSC/ N 0213: Perform Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW) Welding

NOS Version Control

NOS Code	**CSC / N 0213**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Capital Goods**	**Drafted on**	**10/04/14**
Industry Sub-sector	1. Machine Tools 2. Dies, Moulds and Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods	**Last reviewed on**	**30/12/14**
Occupation	**Welding and Cutting**	**Next review date**	**30/08/16**

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

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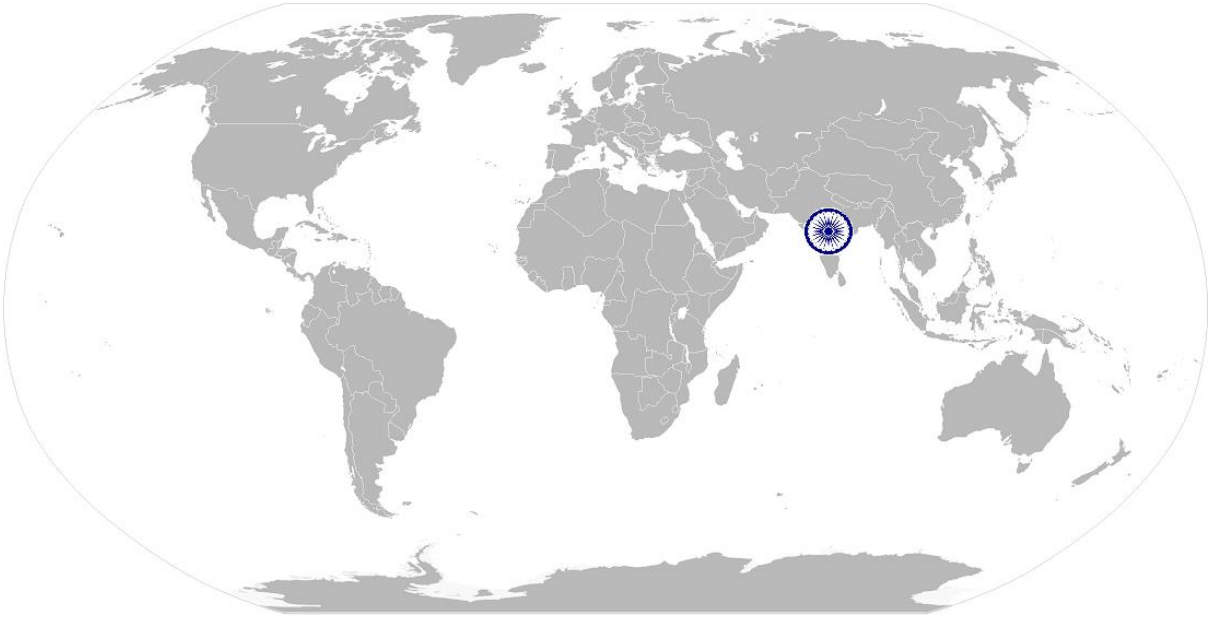
National Occupational Standard



Overview

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

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

National Occupational Standard

Unit Code	CSC / N 1335
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. It includes understanding of risks and hazards in the workplace, along with common techniques to minimize risk, deal with accidents, emergencies, etc. It covers knowledge of fire safety, common first aid applications, safe practices and emergency procedures.
Scope	This unit/task covers the following: • Health and safety • Fire safety • Emergencies, rescue and first-aid procedures
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Health and safety	The user/individual on the job should be able to: PC1. use protective clothing/equipment for specific tasks and work conditions **Protective clothing**: leather or asbestos gloves, flame proof aprons, flame proof overalls buttoned to neck, cuffless (without folds), trousers, reinforced footwear, helmets/hard hats, cap and shoulder covers, ear defenders/plugs, safety boots, knee pads, particle masks, glasses/goggles/visors **Equipment**: hand shields, machine guards, residual current devices, shields, dust sheets, respirator PC2. state the name and location of people responsible for health and safety in the workplace PC3. state the names and location of documents that refer to health and safety in the workplace PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace **Hazards**: sharp edged and heavy tools; heated metals; oxyfuel and gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, oxy-fuel, fumes, dust, etc.); physical hazards(working at heights, large and heavy objects and machines, sharp and piercing objects, tolls and machines, intense light, load noise, obstructions in corridors, by doors, blind turns, noise, over stacked shelves and packages, etc.) electrical hazards (power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.)

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

	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) 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

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

	Documents: fire notices, accident reports, safety instructions for equipment and procedures, company notices and documents, legal documents (eg government notices)
Fire safety	The user/individual on the job should 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	The user/individual on the job should 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/ N 1335: Use basic health and safety practices at the workplace

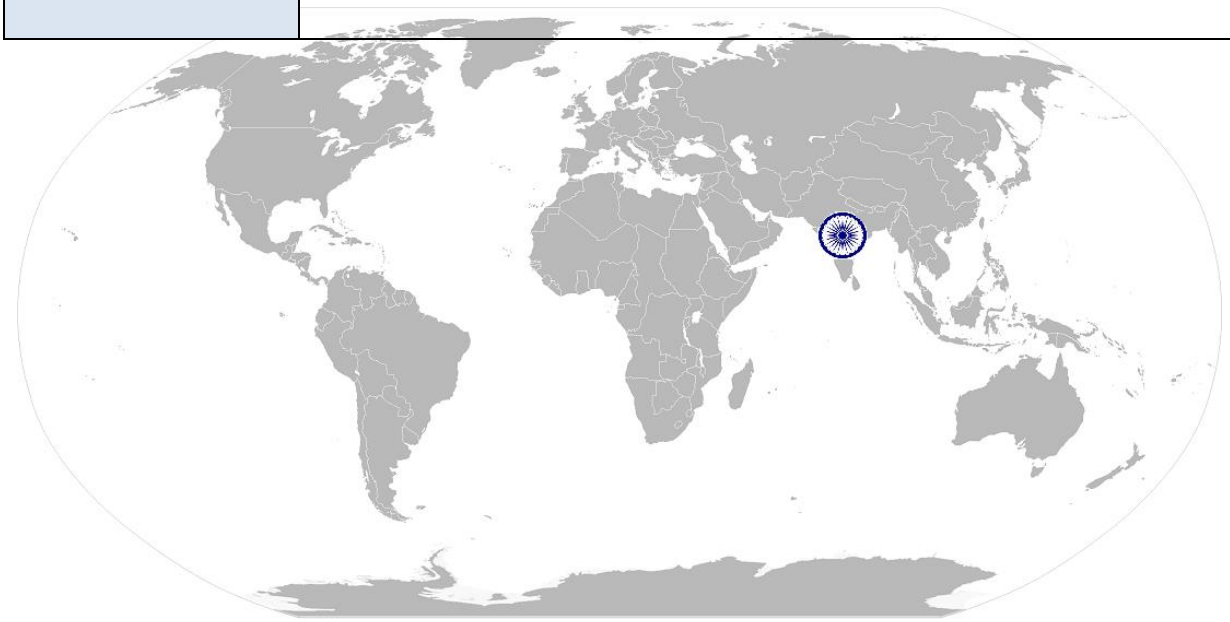
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. names (and job titles if applicable), and where to find, all the people responsible for health and safety in a workplace. KA2. names and location of 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 **Materials**: sand, water, foam, CO2, dry powder KB17. rescue techniques applied during a fire hazard KB18. various types of safety signs and what they mean

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

	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) [Optional]	
A. Core Skills/ Generic Skills	**Reading and Writing Skills**
	The user/individual on the job needs to know and understand how to: SA1. read and comprehend basic content to read labels, charts, signages SA2. read and comprehend basic English to read manuals of operations SA3. read and write an accident/incident report in local language or English
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA4. question coworkers appropriately in order to clarify instructions and other issues SA5. give clear instructions to coworkers, subordinates others
	Decision Making
	The user/individual on the job needs to know and understand how to: SA6. make appropriate decisions pertaining to the concerned area of work with respect to intended work objective, span of authority, responsibility, laid down procedure and guidelines
B. Professional Skills	**Plan and Organize**
	The user/individual on the job needs to know and understand how to: SB1. plan and organize their own work schedule, work area, tools, equipment and materials to maintain decorum and for improved productivity
	Working with others
	The user/individual on the job needs to know and understand how to: SB2. remain congenial while discussing and debating issues with co-workers SB3. follow appropriate protocols for communication based on situation, hierarchy, organizational culture and practice SB4. ask for, provide and receive required assistance where possible to ensure achievement of work related objectives SB5. thank coworkers for any assistance received SB6. offer appropriate respect based on mutuality and respect for fellow worksmanship and authority

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

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

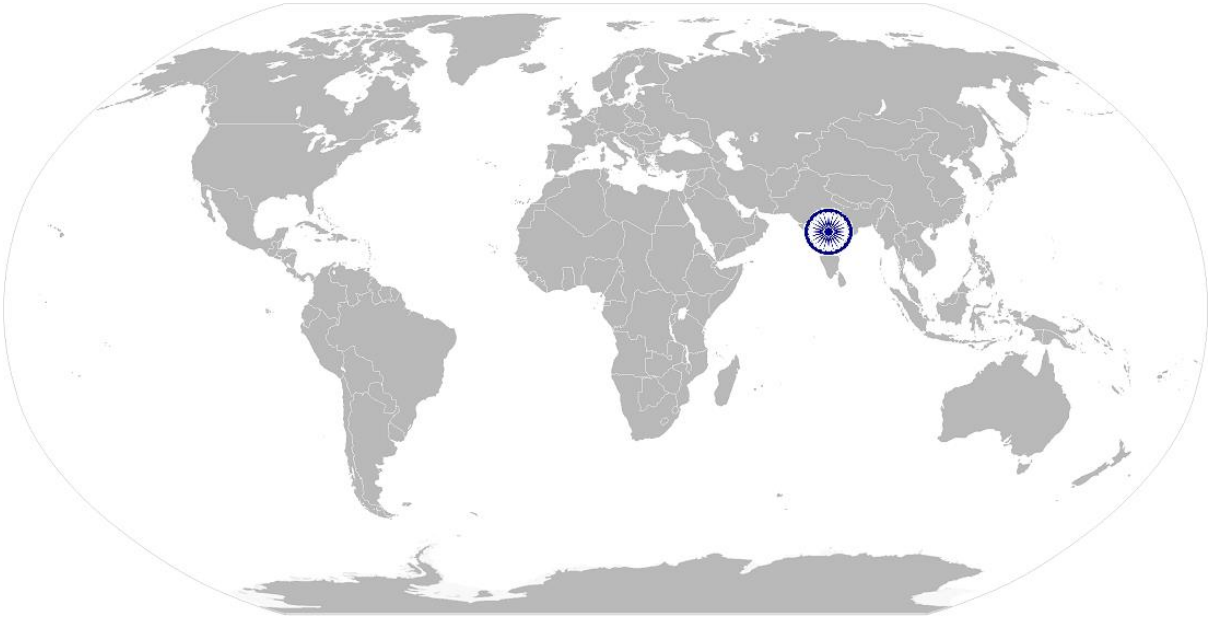


CSC/ N 1335: Use basic health and safety practices at the workplace

NOS Version Control

NOS Code	CSC / N 1335		
Credits (NSQF)	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	10/04/14
Industry Sub-sector	1. Machine Tools 2. Dies, Moulds And Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Generation Machinery 7. Light Engineering Goods	Last reviewed on	30/12/14
Occupation	Welding and Cutting	Next review date	30/08/16

National Occupational Standard



Overview

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

National Occupational Standard

CSC/ N 1336: Work effectively with others

Unit Code	**CSC / N 1336**
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, handling conflict and grievances.
Scope	This unit/task covers the following: • Working with others

Performance Criteria (PC) w.r.t. the Scope

Element	Performance Criteria
Working with others	The user/individual on the job should 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 its processes)	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 KA3. relevant people and their responsibilities within the work area KA4. escalation matrix and procedures for reporting work and employment related issues

CSC/ N 1336: Work effectively with others

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

CSC/ N 1336: **Work effectively with others**

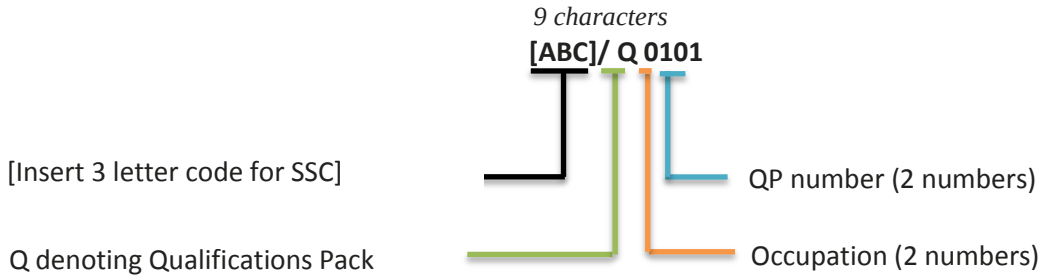
NOS Version Control

NOS Code	**CSC / N 1336**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Capital Goods**	**Drafted on**	**10/04/14**
Industry Sub-sector	1. Machine Tools 2. Dies, Moulds And Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods	**Last reviewed on**	**30/12/14**
Occupation	**Welding and Cutting**	**Next review date**	**30/08/16**

Annexure

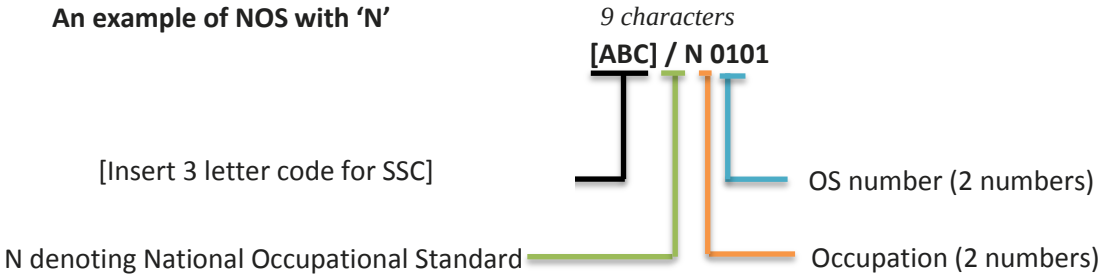
Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard

An example of NOS with 'N'



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

Sub-sector	Range of Occupation numbers
Machine Tools	01-13
Dies, Moulds and Press Tools	01-13
Plastics 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 **Tungsten Inert Gas Welder (GTAW)**

Qualification Pack **CSC/ Q 0213**

Sector Skill Council **Capital Goods Sector Skills Council**

Guidelines for Assessment:

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below)
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criteria
5. To pass the Qualification Pack , every trainee should score a minimum of 70% in every NOS
6. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

Assessment outcomes	Assessment Criteria	Total Marks	Out of	Theory	Practical Skill
CSC/ N 0213: (Manually welding joints using the TIG (GTAW) Process)	PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	**100**	2	1	1
	PC2. adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations for TIG welding operations		2	1	1
	PC3. check the condition of welding leads, gas connection arrangements, earthing arrangements and electrode holder		1	0	1
	PC4. report any faults or potential hazards to appropriate authority		1	0	1
	PC5. interpret weld procedure data sheets specifications		2	1	1
	PC6. select welding machines eg. transformer, inverters (AC/DC), rectifiers and generators, according to the materials and task		2	0	2
	PC7. select proper welding torch and tungsten electrode that meet the job requirement and specification		1	0	1
	PC8. obtain filler wire according to		2	1	1

	specifications			
	PC9. prepare for the TIG welding process	2	0	2
	PC10. prepare the materials and joint in readiness for welding	2	0	2
	PC11. select tungsten electrode by the colour of the tip according to base metal, and correct diameter	3	1	2
	PC12. select and fit the welding shielding gases for a range of given applications	2	1	1
	PC13. plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS	3	1	2
	PC14. connect torches and components	3	1	2
	PC15. connect and adjust regulators and flow meters to cylinders	2	0	2
	PC16. read, set and adjust current (amperage) as required	2	0	2
	PC17. set pre-purge with shielding gas as required	2	0	2
	PC18. prepare tungsten by sharpening or balling it to desired tip shape	2	0	2
	PC19. set and verify gas flow rates	2	0	2
	PC20. prepare and support the joint, using the appropriate methods	3	1	2
	PC21. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding	2	0	2
	PC22. obtain clearance from quality control for weld joint before welding	1	0	1
	PC23. match feed and travel speed as required	2	1	1
	PC24. perform TIG welding operations using appropriate welding techniques to meet welding procedure specification requirements	4	1	3
	PC25. use correct technique for starting the arc (using HF (high frequency) unit, scratching the electrode on the job material, lifting the electrode immediately after touching the job material)	3	1	2
	PC26. use correct angle of torch and	2	1	1

	filler wire			
	PC27. weld the joint to the specified quality, dimensions and profile	3	1	2
	PC28. use manual welding and related equipment, to carry out TIG welding processes	3	1	2
	PC29. use welding consumables appropriate to the material and application, to include AC current types and DC current types	2	1	1
	PC30. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level B of ISO 5817	4	1	3
	PC31. use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously)	3	1	2
	PC32. produce joints from various materials in different forms	3	1	2
	PC33. weld joints in good access situations, in select positions	3	1	2
	PC34. shut down and make safe the welding equipment on completion of the welding activities	2	0	2
	PC35. make sure that the work area is maintained and left in a safe and tidy condition	1	0	1
	PC36. 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
	PC37. check that the welded joint conforms to the specification, by checking various quality parameters using visual inspection	3	1	2
	PC38. identify various weld defects	2	0	2
	PC39. detect surface imperfections and deal with them appropriately	2	0	2
	PC40. carry out LPT tests to assess fine defect open to the surface not detected by visual inspection (VT)	3	1	2
	PC41. assist in preparation for non-destructive testing of the welds for a range of tests	2	1	1
	PC42. prepare for destructive tests on weld specimens for select tests	2	1	1

	PC43. follow the established organisational process for dealing with the welded pieces including handover, storage, safety and security, record keeping, etc.		2	1	1
	PC44. detect equipment malfunctions and deal with them appropriately		1	0	1
	PC45. 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		1	0	1
		Total	**100**	**26**	**74**
CSC/ N 1335: (Use basic health and safety practices at the workplace)	PC1. use protective clothing/equipment for specific tasks and work conditions	**100**	5	2	3
	PC2. state the name and location of people responsible for health and safety in the workplace		3	1	2
	PC3. state the names and location of documents that refer to health and safety in the workplace		3	1	2
	PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace		5	2	3
	PC5. carry out safe working practices while dealing with hazards to ensure the safety of self and others state methods of accident prevention in the work environment of the job role		4	2	2
	PC6. state location of general health and safety equipment in the workplace		3	2	1
	PC7. inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC8. work safely in and around trenches, elevated places and confined areas		5	2	3
	PC9. lift heavy objects safely using correct procedures		5	2	3
	PC10. apply good housekeeping practices at all times		4	2	2
	PC11. identify common hazard signs displayed in various areas		5	2	3
	PC12. retrieve and/or point out documents that refer to health and		3	1	2

	safety in the workplace				
	PC13. use the various appropriate fire extinguishers on different types of fires correctly		4	1	3
	PC14. demonstrate rescue techniques applied during fire hazard		4	1	3
	PC15. demonstrate good housekeeping in order to prevent fire hazards		3	1	2
	PC16. demonstrate the correct use of a fire extinguisher		4	1	3
	PC17. demonstrate how to free a person from electrocution		4	1	3
	PC18. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		4	1	3
	PC19. demonstrate basic techniques of bandaging		3	1	2
	PC20. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		4	1	3
	PC21. perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC22. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	PC23. demonstrate the artificial respiration and the CPR Process		3	1	2
	PC24. participate in emergency procedures		3	2	1
	PC25. complete a written accident/incident report or dictate a report to another person, and send report to person responsible		4	1	3
	PC26. demonstrate correct method to move injured people and others during an emergency		4	1	3
		Total	**100**	**36**	**64**
CSC/ N 1336: (Work effectively with others)	PC1. accurately receive information and instructions from the supervisor and fellow workers, getting	**100**	10	3	7

	clarification where required				
	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**