QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR HYDROCARBON SECTOR

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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:
301, 3rd Floor
World Trade Centre,
Babar Road
New Delhi-110001

E-mail:
admin@hsscindia.in

Qualifications Pack-Industrial Welder (Oil & Gas)

SECTOR/S: HYDROCARBON

SUB-SECTOR: Midstream

OCCUPATION: Construction & Services

REFERENCE ID: HYC/Q9101

ALIGNED TO: NCO-2015/7212.0303

Brief Job Description: Industrial welders (Oil & Gas) perform welding using manual and semi-automatic welding equipment to weld different types of metals together (ferrous/non-ferrous), following drawing and welding process specifications. They are specialised in certain types of welding, such as welding in refinery, aerospace precision welding, manufacturing welding, pipeline, automotive and construction welding.

Personal Attributes: The individual should have a good sense of responsibility, must be alert at all times, ability to work Independently, concentrate on work, all to work as a team and Stress Management Skills.

Qualifications Pack Code	HYC/Q 9101		
Job Role	Industrial Welder (Oil & Gas)		
Credits (NSQF)	TBD	Version number	1.0
Sector	Hydrocarbon	Drafted on	31/03/2017
Sub-sector	Construction & Services	Last reviewed on	31/03/2017
Occupation	Welding	Next review date	31/03/2019
NSQC Clearance on*	22/06/2017		

Job Role	Industrial Welder (Oil & Gas)
Role Description	Industrial Welders perform welding using manual and semi-automatic welding equipment to weld different types of metals together (ferrous/non-ferrous), following drawing and welding process specifications.
NSQF Level	4
Minimum Educational Qualifications* Maximum Educational Qualifications*	Class X, Preferably NA
Prerequisite License or Training	• Some training on basic machining skill • Some training in stress management like yoga is recommended • Knowledge on OISD standards.
Minimum Job Entry Age	18 Years
Experience	Preferably minimum 6 months as welder
Applicable National Occupational Standards (NOS)	**Compulsory:** 1. HYC/N 9101 General work shop practice followed in the shop floor 2. HYC/N 9102 Welding using Manual Metal Arc welding/Shielded metal arc welding. 3. HYC/N 9103 Manually (semi-automatic) welding joints using the MIG/MAG 4. HYC/N 9104 Perform Manually welding joints using the TIG (GTAW) Process 5. HYC/N 6103 Work effectively in a team 6. HYC/N 6104 Follow health, safety and security procedures
Performance Criteria	As described in the relevant OS units

Definitions

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

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

National Occupational Standard

Overview

This unit covers the basic workshop, fitting and assembly operations understanding drawing, material science, tolerance and inspection

Unit Code	HYC/N 9101
Unit Title (Task)	**General work shop practice followed in the shop floor**
Description	The welder can prepare various Fillet and Groove joints and prepare for operations by interpreting the right information. He will be able to understand basic drawing, workshop operation including inspection.
Scope	The unit/ task covers the following: • Understand the basic Engineering practice • Mathematical skills with respect to welding • Knowledge on different types of materials and Heat Treatment • Fundamentals of Electricity • Knowledge on basic workshop practice and tools used
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Understand the basic Engineering practice	PC1. Consistently apply and promote health and safety legislation and best practice and work in a safe manner on a worksite PC2. Health and safety legislation and best practice PC3. The range and uses of trade related equipment's PC4. How to use and operate tools safely PC5. Specific safety issues relating to work involving cutting tools PC6. The importance of working logically and in a well-organized manner. PC7. Operate trade machinery effectively, safely and in accordance with manufacturers' instructions PC8. Select and use appropriate machine tools safely and effectively
Mathematical skills with respect to welding	The user/individual on the job should be able to: PC9. Basic mathematical manipulation and unit conversion PC10. Geometrical principles, techniques and calculations PC11. Understand basic mathematical calculation. Revision of Arithmetic's • Units of Metric, ISO and FPS • Addition Subtraction Multiplication and Division PC12. Select and apply basic Calculation of area and volume • Area of a square, rectangle, triangle and circle • Volume of a cube, cuboid, cylinder, sphere and hemisphere PC13. use appropriate mathematical concepts and skills to solve problems in Fractions, Decimals, Percentage and ratio • Conversion of fraction to decimals • Conversion of decimals to fractions • Problems in percentage and ratio and averages PC14. Develop ability to perform basics of Algebra and understand Simple algebraic equations and problems PC15. Acquire the techniques of solving simple Trigonometric problems • Introduction to sine, cosine and tan functions

	• Pythagoras theorem • Identifies and simple problems.
Knowledge on different types of materials and Heat Treatment	The user/individual on the job should be able to: PC16. Ability to apply knowledge of Metals and non-metals PC17. Able to understand the types and characteristics of materials used in the manufacturing industry PC18. Ability to identify Ferrous and non-ferrous metals PC19. Ability to integrate Steel - Properties and applications of the following Carbon Steels and Alloy Steels (With Reference to welding) PC20. Apply the basic principles of material selection to specific applications Stainless Steel, Non Ferrous metal -Properties and applications PC21. Highlight the property of different material and their workability. PC22. Explain the differences in properties of different materials, including metals, alloys, ceramics, polymers and composites PC23. Describe the basics of Heat treatment principles PC24. Highlight Different Heat treatment operations, their purpose PC25. Apply and explain the application of Stress relieving with reference to welding
Fundamentals of Electricity	The user/individual on the job should be able to: PC26. Understanding written sentences and paragraphs in work related documents. PC27. Primary electrical supply circuit terminology and its operation PC28. Secondary electrical / welding circuit terminology and operation PC29. Knowledge of the practical application of electricity and technology. PC30. This includes applying principles, techniques, procedures like AC and DC current, Single phase circuit and Three phase circuit etc PC31. Perform routine maintenance on equipment and determining when and what kind of maintenance is needed. Will require you to manage systems and ensure they work smoothly. PC32. Testing existing wiring for safety and quality control. • Earth connections • Circuit protective devices PC33. Understanding of work shop safety and welding Safety
Knowledge on basic workshop practice and tools used	The user/individual on the job should be able to: PC34. able to work independently or as part of a team in the following areas PC35. Understand the task required and plan ahead what steps must be taken to achieve the outcome. PC36. Cary out marking on the materials as per the drawing using PC37. able to do the drilling as per standard specification and methods PC38. Set up and adjust metalworking tools and do threading PC39. Ability to Set up and/or operate hand tools

	PC40. Correctly use and maintain the tools, Hammers, Spnners and Fasteners PC41. Measure and mark materials as per the drawing and Check accuracy and quality of finished parts **Measuring / Checking Instruments** • Steel rule and tape- Application, specification and care • Inside and Outside Caliper- Application, specification and care • Vernier Calliper- Application, specification and care • Micro meter- Application, specification and care • Radius and Fillet Gauges, use and care • Weld Gauges – To verify size of weld. • Bevel Protractor - Application, specification and care PC42. Safe operation of equipment and apply occupational health and safety policy and procedures to minimise risk. PC43. Knowledge and ability to use different hand tools and power tools
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	KA1. company's policies on: personnel management, duty reporting procedure and associated MIS compliance KA2. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA3. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities KA4. reporting structure within organization and relevant people and their responsibilities within the work area KA5. problem escalation procedure and escalation matrix for reporting work and employment related issues KA6. Standard operating procedure while working KA7. relevant health and safety requirements applicable in the work place KA8. importance of working in clean and safe environment KA9. documentation and related procedures applicable in the context of employment and work KA10. Importance and purpose of documentation in context of employment and work
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. Interpretation of drawing as per standard and knowledge of Geometric Dimensioning and Tolerance (GD&T). KB2. Knowledge of making Isometric drawing and orthographic projection. KB3. Selection of datum plain and its importance. KB4. knowledge to establish a proper datum KB5. to determine limits, fits and tolerance. KB6. Plan sequence of operation applying the knowledge of geometry. KB7. Know the different protective coatings used in pipe and how it protects the pipe and also the care to be taken while handling. KB8. Understand the different thread geometry, types and its application.

	KB9. Knowledge on different materials and the performance of this material in different application. KB10. Basic knowledge of the property and behaviour of fluids, liquids and gases, KB11. Awareness on basic hydraulic and pneumatic elements and the working KB12. Making of drawing using standard symbols, proper representation and layout. KB13. Application of different cutting fluids used while working on Ferrous metals: e.g. carbon steels, stainless steels, cast iron, tool steel, hard metals; Non-ferrous metals: e.g. bronze, aluminium, copper and copper alloys KB14. identify correct orientation of pipe fitting in regard to the flow. KB15. Use of different fasteners for both temporary and permanent fastening.
Skills (S)	
A. Core Skills/ Generic Skills	**Basic reading and writing skills** The user/individual on the job needs to know and understand how to: SA1. fill in the attendance sheet and the requisite details SA2. keep abreast by reading about new policies at an organization level SA3. 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 SA4. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
	Communication skills The user/individual on the job needs to know and understand how to: SA5. execute task, schedules, and work-loads with co-workers and supervisors SA6. convey and share technical information clearly using appropriate language SA7. check and clarify task-related information SA8. liaise with appropriate authorities using correct protocol SA9. communicate with people in respectful form and manner in line with organizational protocol
	Teamwork and multitasking SA10. share work load as required SA11. assist others who require help SA12. share knowledge with co-workers/assistant.
	Numerical and computational skills SA13. Undertake numerical operations, and calculations using calculators SA14. demonstrate measurement and calculation of Angle, Perimeter, Area of a common geometrical shape and can co-relate with job area requirements

	SA15. use appropriate measuring techniques and units of measurement SA16. use British and metric system of measurement and make conversions between them SA17. describe the difference between Celsius & Fahrenheit Scale and relationship between them SA18. use appropriate units and number systems to express degree of accuracy Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity interpret and express tolerance in terms of limits on dimensions perform SA19. basic operations in a computer like switching it on/off, using the mouse and keyboard, accessing files, opening, closing, creating and deleting folders, etc. SA20. SA16.use basic office applications like spread sheet, word processor, presentations SA21. use organizational software specific to quality function SA22. use email to communicate within the organization as per organization guidelines SA23. retrieve and enter data using standard system forms and templates take printouts of documents
	Learning
	The user/individual on the job needs to know and understand how to: SA24. participate in on-the-job and other learning, training and development interventions and assessments SA25. clarify task related information with appropriate personnel or technical adviser SA26. seek to improve and modify own work practices SA27. maintain current knowledge of application standards, legislation, codes of practice and product/process developments
B. Professional Skills	**Learning**
	The user/individual on the job needs to know and understand how to: SB1. identify problems with work planning, procedures, output and behaviour 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 organise

	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 analyse 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. 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: SB15. exercise restraint while expressing dissent and during conflict situations SB16. avoid and manage distractions to be disciplined at work SB17. manage own time for achieving better results
	Teamwork
	The user/individual on the job needs to know and understand how to: SB18. work in a team in order to achieve better results SB19. identify and clarify work roles within a team SB20. communicate and cooperate with others in the team for better results SB21. seek assistance from fellow team members

NOS Version Control

NOS Code	**HYC / N 9101**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Hydrocarbon**	**Drafted on**	**31/03/2017**
Industry Sub-sector	**Construction a& services**	**Last reviewed on**	**31/03/2017**
Occupation	**Welding**	**Next review date**	**31/03/2019**

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

Unit Code	HYC/N 9102
Unit Title (Task)	**weld using manual Metal Arc Welding / Shielded Metal Arc Welding**
Description	Perform manual metal arc welding (MMAW) also known as shielded metal arc welding (SMAW) for producing a fillet and groove joints on carbon and low alloy steels in a range of welding positions as per detailed instructions received **Metal Arc Welding / Shielded Metal Arc Welding**
Scope	The unit/ task covers the following: • Understand the basic Engineering practice • Mathematical skills with respect to welding • Knowledge on different types of materials and Heat Treatment • Fundamentals of Electricity • Knowledge on basic workshop practice and tools used
Performance Criteria(PC) w.r.t. the Scope	
Welding Process	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, persona protective equipment (PPE) and other relevant safety regulations PC3. check the condition of, welding leads, earthling arrangements and electrode holder PC4. report any faults or potential hazards to appropriate authority PC5. follow fume extraction safety procedures PC6. Explain different types of welding PC7. Use specific terminology used in the welding industry PC8. The selection, use and techniques of the various welding process PC9. The most Common Welding Processes PC10. Knowledge of the different Welding Terminology
Welding Equipment's	The user/individual on the job needs to know and understand: PC11. Able to differentiate AC/DC Machines PC12. Narrate and justify the advantages of DC machines PC13. Know how the specification of DC machines are done PC14. Ability to select the machine as per job specification Practical Setup the machine for welding PC15. understand all Care and maintenance of machine PC16. Arc welding accessories -Electrode holder, Earth lamp welding cables PC17. selection and use of safety equipment related to specific or dangerous tasks PC18. Knowledge on components of the Essential equipment required for welding

	PC19. Make essential connections for specific welding procedures being undertaken and identify welding machines eg. transformers, rectifiers, inverters and generators, according to the task
Welding preparation	The user/individual on the job needs to know and understand: PC20. Ability to interpretation of welding / engineering drawings and weld symbols welding procedure specifications and standard operating procedures PC21. Correct alignment of process with material being used PC22. Knowledge of surface contamination can influence the finished weld characteristics PC23. Able to correct machine and settings to be aligned as per the standard procedure PC24. able to identify and use the correct welding electrodes • Types of electrodes • Specification of electrodes • AWS coding of electrodes • Selection of electrodes • Storage of electrodes • Drying of electrodes PC25. The characteristics and properties of filler materials PC26. The methods of edge preparation to align with joint profile, strength, material and drawing specification PC27. perform measurements for joint preparation and routine MMAW prepare the materials and joint in readiness for welding ,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 PC28. use manual metal-arc welding and related equipment to include • alternating current (AC) equipment • direct current (DC) equipment PC29. report any faults or problem to appropriate authority
Carrying out welding operations	The user/individual on the job should be able to: PC30. strike and maintain a stable arc PC31. stop and properly re-start arc to avoid welding defects (scratch start, tapping techniques) PC32. maintain constant puddle by using appropriate travel speed PC33. maintain proper bead sequence with respect to groove/fillet configurations and positions PC34. remove slag in an appropriate manner (eg. wire brush, hammer, etc.) PC35. 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 PC36. 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 PC37. 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 PC38. produce joints on carbon and low alloy steel materials using various methods Methods: drag, weave, whip PC39. shut down and make safe the welding equipment on completion of the welding activities
Testing for quality	The user/individual on the job should be able to: PC40. measure and check that all dimensional and geometrical aspects of the weld are as per instructions PC41. check that the welded joint conforms to the instructions given, by checking various quality parameters by visual inspection PC42. identify various weld defects using visual inspection PC43. Detect and report surface imperfections to appropriate authority PC44. deal with defects in welding as per instructions given
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	KA1.The importance of listening as part of effective communications KA2.Consistently apply and promote health and safety legislation and best practice and work in a safe manner on a worksite KA3.Reviews and intent the requisition of materials/equipment by assigned employees; may tag and store material as necessary KA4.Maintains records and prepares reports on repairs completed or on units requiring future special service KA5.Works closely with project coordinates, administration, and/or other related staff to determine and coordinate projects, estimating and controlling craft-related project costs, operational needs, troubleshooting, etc. KA6.Ability to understand and carry out work direction in a safe manner KA7.Plan and prioritize own work and work of others to maximize efficiency and to meet prescribed timescales KA8.Demonstrate strong listening and questioning skills to deepen understanding of complex situations

B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1.They may specialize in certain types of welding, such as mobile welding, aerospace precision welding, manufacturing welding and pipeline construction welding. KB2.Ability to plan and think in steps and three-dimensionally KB3.Ability to keep up to date with changing technology KB4.Range of destructive and non-destructive weld testing KB5.Methods of distortion control in steels, alloys and aluminium effects of exposure to the electric arc KB6.types of fire extinguishers and their suitable uses KB7.methods of managing welding fume hazards KB8.effects of exposure to welding fume KB9.personal protective equipment (PPE) and clothing to be worn during 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 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
Skills (S)	
A. Core Skills/ Generic Skills	**Basic reading and writing skills** The user/individual on the job needs to know and understand how to: SA1. Follow verbal and written instructions as per SOP SA2. Communicate orally and in writing with other team members, leaders and operations personnel SA3. Determining personnel matters (such as job progress, schedule changes, time sheet review, and work performance) SA4. Knowledge of human resource and supervisory activities, including the coordination and management of people and resources

	Communication skills
	The user/individual on the job needs to know and understand how to: SA5. Work within company policy as outlined SA6. Read, write and communicate using English language sufficient to perform job functions SA7. Ability to understand and carry out work direction in a safe manner SA8. Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions SA9. Ability to listen to and understand information and ideas presented through spoken words and sentences
	Teamwork and multitasking
	SA10. Performs other related duties as assigned SA11. Ability to apply general rules to specific problems to produce answers that make sense SA12. Participates in the management of personnel matters/activities
	Numerical and computational skills
	SA13. Feeds and speeds to operate machinery SA14. Basic mathematical manipulation and unit conversion SA15. Calculate areas and volumes using geometric formulae SA16 Calculate material requirements, consumables and costs of welding SA17. Ability to measure material and calculate the weight SA18.Use Autocad and draw simple working sketch and do the calculation. SA19.Preperation of bill of materials and calculate the material requirement SA20.Mathematics –Knowledge of arithmetic, algebra, geometry, , and their applications.
	Learning
	The user/individual on the job needs to know and understand how to: SA21.Welds components in flat, vertical, or overhead positions SA22.Parts to ensure accuracy against drawings SA23.Work on special projects SA24.Operating other necessary equipment and performing tasks necessary to complete parts to specifications
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1.identify problems with work planning, procedures, output and behaviour 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 organise

	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 analyse information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Problem Solving
	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. one's competencies in new and different situations and contexts to achieve more
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB15. exercise restraint while expressing dissent and during conflict situations SB16. avoid and manage distractions to be disciplined at work SB17. manage own time for achieving better results
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB18. work in a team in order to achieve better results SB19. identify and clarify work roles within a team SB20. communicate and cooperate with others in the team for better results SB21. seek assistance from fellow team members

NOS Version Control

NOS Code	**HYC / N 9102**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Hydrocarbon**	**Drafted on**	**31/03/2017**
Industry Sub-sector	**Construction a& services**	**Last reviewed on**	**31/03/2017**
Occupation	**Welding**	**Next review date**	**31/03/2019**

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.

Unit Code	HYC/N 9103
Unit Title (Task)	**Manually (semi-automatic) weld joints using the MIG/MAG (GMAW) process**
Description	Perform Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW) Welding) 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.
Scope	The unit/ task covers the following: • Do MIG welding to attain higher productivity. • Highlight and use MIG welding because of the low cost. • Use advantage of high deposit of MIG welding and low hydrogen deposit • Able to weld stainless steel, carbon steel, nickel alloys, aluminum. • Easily used on thin materials and there is no limitation for thickness. • Advantage of MIG operation – easy to learn and it is a clean operation
Performance Criteria(PC) w.r.t. the Scope	
Work 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 MIG/MAG welding operations 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
Welding Equipment's	PC4. Understand the different elements of the equipment • DC output power source • Wire feed unit • Torch • Work return welding lead • Shielding gas supply, (normally from cylinder)
Prepare for welding operations	The user/individual on the job should be able to: PC5.interpret weld procedure data sheets specifications, PQR and WPS 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 PC9.check the condition of, and correctly connect, welding leads/cables, hoses, shielding gas supply and wire feed mechanisms PC10.prepare the welding equipment for a range of given applications **Welding**

	PC11.select the welding shielding gases and equipment for a range of given applications 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) 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	The user/individual on the job needs to know and understand: 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 PC27.produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817 PC28. produce joints from various materials in different forms, **ferrous metals/materials**: carbon steel, stainless steel and **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 PC30.make sure that the work area is maintained and left in a safe and tidy condition
Test for quality	The user/individual on the job needs to know and understand: 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

	PC32. check that the welded joint conforms to the specification, by checking various quality parameters by visual inspection 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	The user/individual on the job should 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.
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 KB4.functions of welding equipment KB5.principles and techniques of MIG/MAG welding KB6. relationship between wire feed, speed control and welding current KB7. how to compare welding consumables for suitability for a range of given applications 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 KB11. correct handling and storage of gas cylinders for welding purposes KB12. type and thickness of base metals for welding purposes KB13.types (availability, typical sizes), storage (storage, identification, segregation (classification, size) of ferrous metals

	KB14. current and polarity required for GMAW KB15. types, selection and application of filler wires and welding electrodes KB16.reasons for using shielding gases, and the types and application of the various gases KB17.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 KB18. methods/modes of metal transfer and their uses **Methods**: globular, short circuit transfer, spray arc, pulse, surface tension transfer (STT) KB19. Understanding of types of welded joints to be produced KB20.type, components and features of a manual gas shielded arc welding torch KB21. how to prepare the materials in readiness for the welding activity KB22. purpose and correct use of anti-spatter compound KB23. importance and procedure to clean torch tip and liner KB24. 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) KB25. checks to be made prior to welding KB26. factors that determine weld bead shape **Factors**: gun angles and weld bead profiles (push, perpendicular, drag); electrode extensions stickout (short, normal, long); fillet weld electrode extension stickout (short, normal, long); gun travel speed (slow, normal, fast); current and voltage KB27. types of weld beads and uses (stringer, weave, weave patterns) KB28. weld bead quality characteristics KB29.techniques of operating the welding equipment to produce a range of joints in the various joint positions KB30. effects of the electrical characteristics of the MIG/MAG welding arc KB31. problems that can occur with the welding activities and how to address them KB37. how to close down the welding equipment safely and correctly KB32.own responsibility to assist in preparation of the welds and weld pieces for examination KB33.how to check the welded joints for uniformity, alignment, position, weld size and profile KB34.gouging and back gouging, its importance, principles, methods and procedures in welding KB35.purpose and importance of pre-heating requirements for base metals in preparation for welding KB36. purpose and importance of post-heating in welding KB37.methods to achieve pre-heat and post heat requirements for welding purposes KB38. tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc.

	KB39. significance of diffusible hydrogen for welds and how it is measured KB40. procedure to conduct dye penetrant test to assess weld quality KB41. various procedures for visual examination of the welds for cracks KB42.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 KB43. safe working practices, handling and procedures to be adopted when preparing the welds for examination KB44.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	**Basic reading and writing skills** The user/individual on the job needs to know and understand how to: SA1. Follow the instructions SA2. Ability to write the instruction to the fellow worker. SA3. Should be able to communicate job progress, schedule changes, time sheet review, and work performance SA4. Knowledge of human resource and supervisory activities, including the coordination and management of people and resources
	Communication skills The user/individual on the job needs to know and understand how to: SA5.Understanding the purpose of a communication SA6.Analyzing the audience and communicate SA7.Communicating with words as well as with body language SA8.Giving each communication greater impact SA9.You must have a clear purpose and state that purpose as quickly as possible.
	Teamwork and multitasking SA10.What is a team and why are teams important SA11.How do you and others interact in a team SA12.How can a team operate effectively and strategies help teams achieve their goals
	Numerical and computational skills The user/individual on the job needs to know and understand how to: SA13.undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages) SA14. Ability to calculate volume, area and weight of material. SA15.use appropriate measuring techniques SA16.use and convert imperial and metric systems of measurements SA17. 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 SA18. use and understand tolerance in terms of limits of size SA19. check measurements, angles, orientation and slopes SA20. types of reference lines such as tangent lines, datam lines, centre lines and work points
	Learning
	The user/individual on the job needs to know and understand how to: SA21. Use basic communication and cooperation skills when interacting with familiar people. SA22. Ability n to share feelings and meet basic needs when interacting with other people. SA23. Able to contribute for interpersonal and group interactions. SA24. Demonstrate skills required to reconcile conflict and changes in relationships and groups.
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1.identify problems with work planning, procedures, output and behaviour 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 organise
	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 analyse information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Problem Solving
	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. one's competencies in new and different situations and contexts to achieve more
	Analytical Thinking

	The user/individual on the job needs to know and understand how to: SB15. exercise restraint while expressing dissent and during conflict situations SB16. avoid and manage distractions to be disciplined at work SB17. manage own time for achieving better results
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB18. work in a team in order to achieve better results SB19. identify and clarify work roles within a team SB20. communicate and cooperate with others in the team for better results SB21. seek assistance from fellow team members

NOS Version Control

NOS Code	HYC / N 9103		
Credits(NSQF)	TBD	Version number	1.0
Industry	Hydrocarbon	Drafted on	31/03/2017
Industry Sub-sector	Construction a& services	Last reviewed on	31/03/2017
Occupation	Welding	Next review date	31/03/2019

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

Unit Code	HYC/N 9104
Unit Title (Task)	Perform Manually welding joints using the TIG (GTAW) process
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.
Scope	The unit/ task covers the following: • Maintain Safe working • Welding Equipment's • Prepare for welding • operations • Carry out welding operations • Test for quality • Post welding • activities • Other related operation
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Maintain Safe working	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 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
Welding Equipment's	PC5. Understand the different elements of the equipment • DC output power source • Wire feed unit • Torch • Work return welding lead • Shielding gas supply, (normally from cylinder)
Prepare for welding operations	The user/individual on the job should be able to: PC6. interpret weld procedure data sheets specifications Interpreting the WPS: welding process (ISO Codes); PC7. Select welding machines eg. transformer, inverters (AC/DC), rectifiers and generators, according to the materials and task PC8. select proper welding torch and tungsten electrode that meet the job requirement and specification

	PC9. obtain filler wire according to specifications PC10. prepare for the TIG welding process PC11. prepare the materials and joint in readiness for welding PC12. select tungsten electrode by the colour of the tip according to base metal, and correct diameter PC13. 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 PC14. connect torches and the components 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
Carry out welding operations	PC24. The user/individual on the job needs to know and understand: PC25. perform TIG welding operations using appropriate welding techniques to meet welding procedure specification requirements PC26. 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) PC27. use correct angle of torch and filler wire PC28. weld the joint to the specified quality, dimensions and profile PC29. use manual welding and related equipment, to carry out TIG welding processes PC30. use welding consumables appropriate to the material and application, to include AC current types and DC current types PC31. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level B of ISO 5817 PC32. use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously) PC33. 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 PC34. weld joints in good access situations, in select positions PC35. shut down and make safe the welding equipment on completion of the welding activities

	PC36. make sure that the work area is maintained and left in a safe and tidy condition
Test for quality	PC37. The user/individual on the job needs to know and understand: PC38. use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification PC39. 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 PC40. Types of visual inspections: use of visual techniques, lighting, low powered magnification, fillet weld gauges PC41. identify various weld defects PC42. 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 PC43. detect surface imperfections and deal with them appropriately PC44. carry out LPT tests to assess fine defect open to the surface not detected by visual inspection (VT) PC45.
Post welding activities	PC46. 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) PC47. prepare for destructive tests on weld specimens for select tests PC48. 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 PC49. follow the established organisational process for dealing with the welded pieces including handover, storage, safety and security, record keeping, etc.
Other related operation	PC44. Ability do the following related operation • Oxy fuel Cutting • Manual Cutting • Machine Cutting • Plasma Cutting PC45.Ability to do pipe welding following the standard practices
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: 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 KB4. basic principles of TIG welding and the functions of welding equipment KB5. concepts and mechanisms of welding KB6. different types of power source KB7. how to compare welding consumables for suitability for a range of given applications KB8.welding consumables classification 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 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 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 KB25. terminology used for the appropriate welding positions 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 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 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)	
A. Core Skills/ Generic Skills	**Basic reading and writing skills** The user/individual on the job needs to know and understand how to: SA1. Follow verbal and written instructions SA2. Communicate orally and in writing with other team members, leaders and operations personnel SA3. Determining personnel matters (such as job progress, schedule changes, time sheet review, and work performance) SA4. Knowledge of human resource and supervisory activities, including the coordination and management of people and resources **Communication skills** The user/individual on the job needs to know and understand how to: SA5. Work within company policy as outlined SA6. Read, write and communicate using English language sufficient to perform job functions SA7. Ability to understand and carry out work direction in a safe manner SA8. Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions

	SA9. Ability to listen to and understand information and ideas presented through spoken words and sentences
	Teamwork and multitasking
	SA10. Performs other related duties as assigned SA11. Ability to apply general rules to specific problems to produce answers that make sense SA12. Participates in the management of personnel matters/activities
	Numerical and computational skills
	SA13.Identify pipe fittings by size, type, material, and service type SA14.Read and interpret hanger and support drawings SA15.Identify pipe by size, type, and wall thickness SA16.Calculate how threaded is measured SA17.Install pipe hangers, supports, anchors, and guides SA18.Read and interpret pipe and hanger drawings SA19.Calculate pressure and heat in piping systems SA20.Mathematics –Knowledge of arithmetic, algebra, geometry, , and their applications
	Learning
	The user/individual on the job needs to know and understand how to: SA21. participate in on-the-job and other learning, training and development interventions and assessments SA22. clarify task related information with appropriate personnel or technical adviser SA23. seek to improve and modify own work practices SA24. maintain current knowledge of application standards, legislation, codes of practice and product/process developments
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1.identify problems with work planning, procedures, output and behaviour 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 organise
	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 analyse information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time

	Problem Solving
	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. one's competencies in new and different situations and contexts to achieve more
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB15. exercise restraint while expressing dissent and during conflict situations SB16. avoid and manage distractions to be disciplined at work SB17. manage own time for achieving better results
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB18. work in a team in order to achieve better results SB19. identify and clarify work roles within a team SB20. communicate and cooperate with others in the team for better results SB21. seek assistance from fellow team members

NOS Version Control

NOS Code	**HYC / N 9104**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Hydrocarbon**	**Drafted on**	**31/03/2017**
Industry Sub-sector	**Construction a& services**	**Last reviewed on**	**31/03/2017**
Occupation	**Welding**	**Next review date**	**31/03/2019**

National Occupational Standard

Overview

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

Unit Code	HYC/N 6103
Unit Title (Task)	**Work effectively in a team**
Description	This NOS unit is about working effectively within a team, either in individual's own work group or in other work groups outside the organization.
Scope	This unit/task covers the following: • Effective team work
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Effectively Work in team	To be competent, the user/individual on the job must be able to: PC1. maintain clear communication with colleagues PC2. work with colleagues as a team PC3. pass on information to in line with organisational requirements PC4. work in ways that show respect for colleagues PC5. carry out commitments made to colleagues PC6. let colleagues know in good time if cannot carry out commitments, explaining the reasons PC7. identify problems in working with colleagues and take the initiative to solve these problems PC8. follow the organisation's policies and procedures for working with colleagues PC9. ability to share resources with other members as per priority of tasks
Knowledge and Understanding (K) w.r.t. the scope	
A. Organisational Context (Knowledge of the Company/Organisation and its processes)	The user/individual on the job needs to know and understand: KA1. the organization's policies and procedures for working with colleagues, role and responsibilities in relation to this KA2. the importance of effective communication and establishing good working relationships with colleagues KA3. different methods of communication and the circumstances in which it is appropriate to use these KA4. the importance of creating an environment of trust and mutual respect KA5. the implications of own work on the work and schedule of others
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. different types of information that colleagues might need and the importance of providing this information when it is required

	KB2. the importance of helping colleagues with problems, in order to meet quality and time standards as a team
Skills (S)	
A. Core Skills/ Generic Skills	The user/individual on the job needs to know and understand how to: SA1. complete written work with attention to detail
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA2. read instructions, guidelines/procedures
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA3. listen effectively and orally communicate information SA4. ask for clarification and advice from the concerned person
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1. make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB2. plan and organize work to achieve targets and deadlines
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB3. check that the work meets customer requirements SB4. deliver consistent and reliable service to customers
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB5. apply problem solving approaches in different situations
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB6. apply balanced judgments to different situations

NOS Version Control

NOS Code	**HYC / N 6103**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Hydrocarbon**	**Drafted on**	**31/03/2017**
Industry Sub-sector	**Construction & Services**	**Last reviewed on**	**31/03/2017**
Occupation	**Welding**	**Next review date**	**31/03/2019**

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.

Unit Code	HYC/N 6104
Unit Title (Task)	**Follow health, safety and security procedures**
Description	This OS unit is about knowledge and practices relating to health, safety and security that need to use.
Scope	This unit/task covers the following: • Health and Safety • Fire safety • Safety systems • Emergencies, rescue and first-aid procedures
Performance Criteria(PC) w.r.t. the Scope	
Health and safety	The user/individual on the job should be able to: PC1.use protective clothing/equipment for specific tasks and work Conditions 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 PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others PC6.state methods of accident prevention in the work environment of the job role **Methods of accident prevention** PC7.state location of general health and safety equipment in the workplace PC8.inspect for faults, set up and safely use steps and ladders in general use 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 PC12. identify common hazard signs displayed in various areas PC13.retrieve and/or point out documents that refer to health and safety in the workplace
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 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
Safety systems	PC18. List issue concerning the safety and familiar in your work style PC19. Empower to address the unsafe condition in your work place or to stop the unsafe behaviour PC20. Record all miss incidents ,damages, illness or injury

	PC21. Comprehend the applicable laws, regulations and codes as per standard PC22. Promote and maintain a positive safety culture PC23. Apply and appraise the use and storage of hazardous substance and their safety PC24. Assess the threats and to protect from the threats PC25. Awareness of own safety and safety of others PC26. Bring the concern and report the HSE concern PC27. Report all incident to the supervisor PC28. Identifies and describes the property of different petroleum products. Characteristics and potential Hazardous • Volatile products • Light distillates • Middle distillates • Fuel oils • Lubrication Oils • Waxes • Bitumen PC29. Operates and handle spills and respond to the spills
Emergencies ,rescue and first-aid procedures	The user/individual on the job should be able to: PC30. demonstrate how to free a person from electrocution PC31. Administer appropriate first aid to victims were required eg. in case of bleeding, burns, choking, electric shock, poisoning etc. PC32. demonstrate basic techniques of bandaging PC33. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments PC34. perform and organize loss minimization or rescue activity during an accident in real or simulated environments PC35. 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 PC36. demonstrate the artificial respiration and the CPR Process PC37. participate in emergency procedures PC38. complete a written accident/incident report or dictate a report to another person, and send report to person responsible PC39. demonstrate correct method to move injured people and others during an emergency
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	KA1. company's policies on: personnel management, duty reporting procedure and associated MIS compliance KA2. reporting structure within organization KA3. problem escalation procedure KA4. Standard operating procedure while transporting petroleum products
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 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 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, 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) [Optional] **A. Core Skills/ Generic Skills**	**Communication skills**
	The user/ individual on the job needs to know and understand how to: SA1. communicate the safety, cleanliness and emergency issues to supervisor. SA2. read and comprehend basic content to read labels, charts, signage SA3. read and comprehend basic English to read manuals of operations SA4. 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: The user/individual on the job needs to know and understand how to:

	SA5. question co-workers appropriately in order to clarify instructions and other issues SA6. give clear instructions to co-workers, subordinates others
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1. make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB2. plan and organize work to achieve targets and deadlines
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB3. check that the work meets customer requirements SB4. deliver consistent and reliable service to customers
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB5. apply problem solving approaches in different situations
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB6. apply balanced judgments to different situations

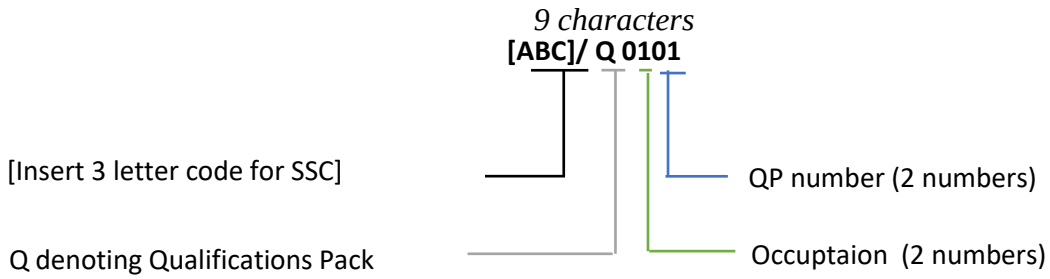
NOS Version Control

NOS Code	**HYC / N 6104**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Hydrocarbon**	**Drafted on**	**31/03/2017**
Industry Sub-sector	**Construction & Services**	**Last reviewed on**	**31/03/2017**
Occupation	**Welding**	**Next review date**	**31/03/2019**

Annexure

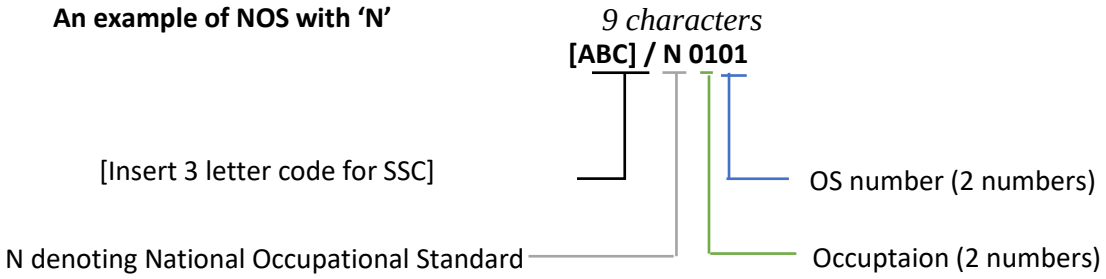
Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard

An example of NOS with 'N'



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CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role LPG Delivery Personnel

Qualification Pack HYC/Q 3201

Sector Skill Council Hydrocarbon Sector 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).
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criterion.
5. To pass the Qualification Pack , every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
6. In case of *unsuccessful completion*, the trainee may seek reassessment on the Qualification Pack.

Compulsory NOS **Total Marks: [100]**				**Marks Allocation**	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
HYC/N 9101 General workshop practice followed in the shop floor.	PC1.Consistently apply and promote health and safety legislation and best practice and work in a safe manner on a worksite	100	3	1	2
	PC2.Health and safety legislation and best practice		2	0	2
	PC3.The range and uses of trade related equipment's		3	1	2
	PC4.How to use and operate tools safely		2	0	2
	PC5.Specific safety issues relating to work involving cutting tools		2	1	1
	PC6.The importance of working logically and in a well-organized manner.		2	1	1
	PC7.Operate trade machinery effectively, safely and in accordance with manufacturers' instructions		3	1	2
	PC8.Select and use appropriate machine tools safely and effectively		3	1	2
	PC9. Basic mathematical manipulation and unit conversion		3	1	2
	PC10.Geometrical principles, techniques and calculations		2	1	1

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	PC11.Understand basic mathematical calculation.		2	1	1
	PC12. Select and apply basic Calculation of area and volume		2	1	1
	PC13.use appropriate mathematical concepts and skills to solve problems in Fractions, Decimals, Percentage and ratio		2	1	1
	PC14.Develop ability to perform basics of Algebra and understand Simple algebraic equations and problems		2	1	1
	PC15.Acquire the techniques of solving simple Trigonometric problems		2	1	1
	PC16. Ability to apply knowledge of Metals and non-metals		3	1	2
	PC17. Types and characteristics of materials used in the manufacturing industry		2	1	1
	PC18.Ability to identify Ferrous and non-ferrous metals		3	1	2
	PC19Ability to integrate Steel - Properties and applications of the following Carbon Steels and Alloy Steels (With Reference to welding)		2	1	1
	PC20Apply the basic principles of material selection to specific applications Stainless Steel		2	1	1
	PC21. Highlight the property of different material and their workability.		3	1	2
	PC22Explain the differences in properties of different materials, including metals, alloys, ceramics, polymers and composites		2	1	1
	PC23.Describe the basics of Heat treatment principles		2	1	1
	PC24.Highlight Different Heat treatment operations, their purpose		3	1	2
	PC25.Apply and explain the application of Stress relieving with reference to welding		2	0	2
	PC26.Understanding written sentences and paragraphs in work related documents.		2	0	2
	PC27.Primary electrical supply circuit terminology and its operation		2	0	2
	PC28.Secondary electrical / welding circuit terminology and operation		2	1	1
	PC29.Knowledge of the practical application of electricity an technology.		2	1	1
	PC30.This includes applying principles, techniques, procedures like AC and DC current, Single phase circuit and Three phase circuit etc		3	1	2
	PC31.Perform routine maintenance on equipment and determining when and what kind of		2	1	1

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	maintenance is needed. Will, require you to manage systems and ensure they work smoothly.				
	PC32.Testing existing wiring for safety and quality control.		2	1	1
	PC33. Understanding of work shop safety and welding Safety		2	1	1
	PC34.To be able to work independently or as part of a team in the following areas **Filing -**Files – types, Specification, Application care and maintenance, Filing – straight filing, cross filing, Vices – Types and its application Safety		3	1	2
	PC35.Understand the task required and plan ahead what steps must be taken to achieve the outcome.		3	1	2
	PC36.Cary out marking on the materials as per the drawing using **Marking**-Scribers, dot punch, centre punch, letter and – no punches Scribing and punching procedure		3	1	2
	PC37.Will be able to do the drilling as per		2	0	2
	PC38.Set up and adjust metalworking tools and do threading **Tapping**-Specification of taps, Determination of tap drill size for tapping, Tapping procedure and care		3	1	2
	PC39.Set up and/or operate hand tools **Chisels -** Types of chisels, Specification, Application, Precautions to be taken while chiselling.		2	0	2
	PC40.Correctly use and maintain the tools		3	1	2
	PC42.Safe operation of equipment and apply occupational health and safety policy and procedures to minimise risk.		3	1	2
	PC43. Knowledge and ability to use different hand tools and power tools		2	0	2
	Total.		100	34	66

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
HYC/N 9102 Welding using Manual Metal Arc welding/Shielded metal arc welding	PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	100	3	1	2
	PC2. adhere to procedures or systems in place for health and safety, persona protective equipment (PPE) and other relevant safety regulations		2	1	1
	PC3. check the condition of, welding leads, earthling arrangements and electrode holder		2	0	2
	PC4. report any faults or potential hazards to appropriate authority		2	0	2
	PC5. follow fume extraction safety procedures		2	0	2
	PC6. Explain different types of welding		2	1	1
	PC7. Use specific terminology used in the welding industry		2	1	1
	PC8. The selection, use and techniques of the various welding process		2	1	1
	PC9. The most Common Welding Processes		2	2	0
	PC10. What are the different Welding Terminology		2	2	0
	PC11.Able to differentiate AC/DC Machines		2	0	2
	PC12.Narrate and justify the advantages of DC machines		2	1	1
	PC13.Know how the specification of DC machines are done		2	2	0
	PC14.Ability to select the machine as per job specification Practical Setup the machine for welding		2	1	1
	PC15.What all Care and maintenance of machine		3	1	1
	PC16.Arc welding accessories -Electrode holder, Earth lamp welding cables		2	0	2
	PC17.The selection and use of safety equipment related to specific or dangerous tasks		3	1	2
	PC18.Knowledge on components of the Essential equipment required for welding are:		2	1	1
	PC20.Ability to interpretation of welding / engineering drawings and weld symbols welding procedure specifications and standard operating procedures as given below-welding process (ISO codes); parent metal		4	1	3
	PC21.Correct alignment of process with material being used		2	1	1
	PC22.How surface contamination can influence the finished weld characteristics		2	1	1
	PC23.The correct machine settings to be aligned to:		2	1	1
	PC24.Use the correct welding electrodes Types of electrodes Specification of electrodes AWS coding of electrodes Selection of electrodes		2	1	1
	PC25.The characteristics and properties of filler materials		2	1	1

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	PC26.The methods of edge preparation to align with joint profile, strength, material and drawing specification		2	1	1
	PC27.perform measurements for joint preparation and routine MMAW		2	1	1
	prepare the materials and joint in readiness for welding ,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		2	1	1
	PC28.use manual metal-arc welding and related equipment to include alternating current (AC) equipment direct current (DC) equipment		2	1	1
	PC29.report any faults or problem to appropriate authority		2	1	1
	PC30. strike and maintain a stable arc		2	1	1
	PC31. stop and properly re-start arc to avoid welding defects (scratch start, tapping techniques)		2	1	1
	PC32 maintain constant puddle by using appropriate travel speed		2	1	1
	PC33. maintain proper bead sequence with respect to groove/fillet configurations and positions		2	1	1
	PC34. remove slag in an appropriate manner (eg. wire brush, hammer, etc.)		2	1	1
	PC35. produce welded joints to the specified quality, dimensions and profile		2	1	1
	PC36. 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		2	1	1
	PC37. 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	1	1
	PC38. produce joints on carbon and low alloy steel materials using various methods **Methods**: drag, weave, whip PC39. shut down and make safe the welding equipment on completion of the welding activities		2	1	1
	PC40. measure and check that all dimensional and geometrical aspects of the weld are as per instructions		4	1	3
	PC41. check that the welded joint conforms to the instructions given, by checking various quality parameters by visual inspection		4	1	3
	PC42. identify various weld defects using visual inspection		4	1	3
	PC43. Detect and report surface imperfections to appropriate authority		4	1	3

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	PC44. deal with defects in welding as per instructions given		4	1	3
	TOTAL		100	41	59

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
HYC/N 9103 Manually (semi-automatic) welding joints using the MIG/MAG	PC1.work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	100	5	2	3
	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		5	2	3
	PC3.check the condition of welding leads, gas connection arrangements, earthing arrangements and electrode holder		3	1	2
	PC4.report any faults or potential hazards to appropriate authority		3	1	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		3	1	2
	PC7. select electrodes according to classification and specifications PC8. prepare the materials and joint in readiness for welding		4	2	2
	PC9.check the condition of, and correctly connect, welding leads/cables, hoses, shielding gas supply and wire feed mechanisms		4	2	2
	PC10.prepare the welding equipment for a range of given applications **Welding equipment**: rectifier		3	1	2
	PC12.plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS		4	2	2
	PC13. clean wire feeder and torch tip		3	1	2
	PC14. connect torches and components		3	1	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		3	1	2

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	PC17.set other welding parameters (eg. voltage, slope of current versus voltage curve where required)		4	2	2
	PC18. choose appropriate mode of metal transfer		3	1	2
	PC19. set pre-purge with shielding gas as required		3	1	2
	PC20. set and verify gas flow rates		3	1	2
	PC21. prepare and support the joint, using the appropriate methods		3	1	2
	PC22.tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding		3	1	2
	PC23.use manual welding and related equipment, to carry out MIG/MAG welding processes		3	1	2
	PC24.perform MIG/MAG welding operations using various welding techniques to meet welding procedure specification requirements		5	2	3
	PC25. adjust wire stick-out as per requirement		3	1	2
	PC26.use welding consumables appropriate to the material and application to DC current types		3	1	2
	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)		4	2	2
	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		4	2	2
	PC37. shut down and make safe the welding equipment on completion of the welding activities		4	2	2
	PC38. follow the established organisational process for dealing with the welded pieces including handover, storage, safety and security, record keeping, etc.		4	2	2
			100	40	60

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
HYC/N 9104 Perform 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		2	1	1
	PC4.report any faults or potential hazards to appropriate authority		2	0	2
	PC5.interpret weld procedure data sheets specifications **Interpreting the WPS**: welding process (ISO Codes); parent metal; consumables; pre welding joint preparation		2	1	1
	PC6.select welding machines eg. transformer, inverters (AC/DC), rectifiers and generators, according to the materials and task		2	1	1
	PC7.select proper welding torch and tungsten electrode that meet the job requirement and specification **Selection and preparation of tungsten electrode**:		2	1	1
	PC8.obtain filler wire according to specifications		2	1	1
	PC9.prepare for the TIG welding process		2	1	1
	PC10. prepare the materials and joint in readiness for welding		2	1	1
	PC11.select tungsten electrode by the colour of the tip according to base metal, and correct diameter		2	1	1
	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 **Checking activities**: correct set-up of the joint; proper condition of electrical connections; welding return and earthing arrangements; operating parameters		2	1	1
	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		2	1	1
	PC15. connect and adjust regulators and flow meters to cylinders		2	1	1
	PC16. read, set and adjust current (amperage) as required		2	1	1
	PC17. set pre-purge with shielding gas as required		2	1	1

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	PC18. prepare tungsten by sharpening or balling it to desired tip shape		2	1	1
	PC19. set and verify gas flow rates		2	1	1
	PC20. prepare and support the joint, using the appropriate methods		2	1	1
	PC21.tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding		2	1	1
	PC22. obtain clearance from quality control for weld joint before welding		2	1	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 pacification requirements		2	1	1
	PC25. use correct technique for starting the arc (using HF (high frequency) unit, scratching the electrode on the job material, lifting the electrode immediately		2	1	1
	PC26. use correct angle of torch and filler wire		2	1	1
	PC27. weld the joint to the specified quality, dimensions and profile		2	1	1
	PC28. use manual welding and related equipment, to carry out TIG welding processes		2	1	1
	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		2	1	1
	PC31. use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously)		2	1	1
	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		2	1	1
	PC33. weld joints in good access situations, in select positions		2	1	1
	PC34. shut down and make safe the welding equipment on completion of the welding activities		2	1	1
	PC35. make sure that the work area is maintained and left in a safe and tidy		2	1	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		2	1	1

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	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		3	1	1
	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		2	1	1
	PC39. detect surface imperfections and deal with them appropriately		2	1	1
	PC40. carry out LPT tests to assess fine defect open to the surface not detected by visual inspection (VT)		2	1	1
	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)		2	1	1
	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		3	1	2
	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. Ability do the following related operation		4	1	3
	PC45.Ability to do pipe welding following the practice: Types of pipe welding,Preparation of pipes ,Welding procedure in different position ,Different welding processes and their advantages and disadvantages .		4	1	3
			100	44	56

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
HYC/N 6104 Follow health, safety and security procedures	PC1.use protective clothing/equipment for specific tasks and work Conditions	100	2	1	1
	PC2.state the name and location of people responsible for health and safety in the workplace		2	1	1
	PC3.state the names and location of documents that refer to health and safety in the workplace		2	1	1
	PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace		2	1	1
	PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others		2	1	1
	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		3	1	2
	PC7.state location of general health and safety equipment in the workplace		2	1	1
	PC8.inspect for faults, set up and safely use steps and ladders in general use		2	1	1
	PC9.work safely in and around trenches, elevated places and confined areas		2	1	1
	PC10. lift heavy objects safely using correct procedures		2	1	1
	PC11. apply good housekeeping practices		2	1	1
	PC12. identify common hazard signs displayed in various areas		2	1	1
	PC13.retrieve and/or point out documents that refer to health and safety in the workplace		2	1	1
	PC14. use the various appropriate fire extinguishers on different types of fires correctly		3	1	2
	PC15. demonstrate rescue techniques applied during fire hazard		3	1	2
	PC16. demonstrate good housekeeping in order to prevent fire hazards		3	1	2
	PC17. demonstrate the correct use of a fire extinguisher		3	1	2
	PC18. List issue concerning the safety and familiar in your work style		3	1	2
	PC19. Empower to address the unsafe condition in your work place or to stop the unsafe behaviour		3	1	2

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	PC20. Record all miss incidents ,damages, illness or injury		2	1	1
	PC21. Comprehend the applicable laws, regulations and codes as per standard		3	1	2
	PC22. Promote and maintain a positive safety culture		2	1	1
	PC23. Apply and appraise the use and storage of hazardous substance and their safety		3	1	2
	PC24. Assess the threats and to protect from the threats		2	1	1
	PC25. Awareness of own safety and safety of others		3	1	2
	PC26. Bring the concern and report the HSE concern		2	1	1
	PC27. Report all incident to the supervisor		3	1	2
	PC28. Identifies and describes the property of different petroleum products.		2	1	1
	PC29. Operates and handle spills and respond to the spills		3	1	2
	PC30. demonstrate how to free a person from electrocution		2	1	1
	PC31. Administer appropriate first aid to victims were required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		3	1	2
	PC32. demonstrate basic techniques of bandaging		2	1	1
	PC33. respond promptly and appropriately to an accident situation		3	1	2
	PC34. perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC35. 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
	PC36. demonstrate the artificial respiration and the CPR Process		2	1	1
	PC37. participate in emergency procedures		2	1	1
	PC38. 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		5	2	3
	PC39. demonstrate correct method to move injured people and others during an emergency		2	1	1
	TOTAL		100	41	59

Compulsory NOS Total Marks: [100]				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
HYC/N 6103 Work effectively in a team	PC1. maintain clear communication with colleagues	50	5	2	3
	PC2. work with colleagues as a team		5	2	3
	PC3. pass on information to in line with organisational requirements		6	2	4
	PC4. work in ways that show respect for colleagues		5	2	3
	PC5. carry out commitments made to colleagues		6	2	4
	PC6. let colleagues know in good time if cannot carry out commitments, explaining the reasons		6	2	4
	PC7. identify problems in working with colleagues and take the initiative to solve these problems		5	2	3
	PC8. follow the organisation's policies and procedures for working with colleagues		6	3	3
	PC9. ability to share resources with other members as per priority of tasks		6	3	3
	TOTAL		50	21	29