

## Qualification Pack



# Industrial Welder (Oil & Gas)

QP Code: HYC/Q9101

Version: 8.0

NSQF Level: 4

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## Qualification Pack

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### HYC/Q9101: Industrial Welder (Oil & Gas)

#### 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.

#### Applicable National Occupational Standards (NOS)

##### Compulsory NOS:

1. [HYC/N9101: General work shop practice followed in the shop floor](#)
2. [HYC/N9102: Welding using Manual Metal Arc welding/Shielded metal arc welding](#)
3. [HYC/N9103: Manually \(semi-automatic\) welding joints using the MIG/MAG](#)
4. [HYC/N9104: Perform Manually welding joints using the TIG \(GTAW\) Process](#)
5. [HYC/N9301: Working Effectively in a team](#)
6. [HYC/N9302: Maintain health, safety and security procedures](#)
7. [DGT/VSQ/N0102: Employability Skills \(60 Hours\)](#)

#### Qualification Pack (QP) Parameters

<b>Sector</b>	Hydrocarbon
<b>Sub-Sector</b>	Construction & Services
<b>Occupation</b>	Welding
<b>Country</b>	India
<b>NSQF Level</b>	4

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<b>Credits</b>	20
<b>Aligned to NCO/ISCO/ISIC Code</b>	NCO-2015/7212.0303
<b>Minimum Educational Qualification &amp; Experience</b>	10th grade pass ( with 2-years relevant experience) OR 12th grade Pass OR 8th grade pass (plus 1-year of National Trade Certificate (NTC) in relevant field plus 1-year NAC) OR 10th grade pass (with 1-year of National Trade Certificate (NTC) in Welding) OR Completed 2nd year of the 3-year diploma after 10 ( in relevant field and pursuing regular Diploma)
<b>Minimum Level of Education for Training in School</b>	10th Class
<b>Pre-Requisite License or Training</b>	Some training on basic machining skill Some training in stress management like yoga is recommended Knowledge on OISD standards.
<b>Minimum Job Entry Age</b>	18 Years
<b>Last Reviewed On</b>	NA
<b>Next Review Date</b>	17/11/2025
<b>NSQC Approval Date</b>	17/11/2022
<b>Version</b>	8.0
<b>Reference code on NQR</b>	2022/HYC/HSSCI/06771
<b>NQR Version</b>	3.0

**Remarks:**

NA

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### HYC/N9101: 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 scope covers the following :

- The learner should have acquired the listed knowledge and skills to undertake welding using Manual Metal Arc welding/Shielded metal arc welding

#### Elements and Performance Criteria

##### *Understand the basic Engineering practice*

To be competent, the user/individual on the job must be able to:

- 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 equipments
- 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*

To be competent, the user/individual on the job must be able to:

- PC9.** basic mathematical manipulation and unit conversion
- PC10.** geometrical principles, techniques and calculations
- PC11.** understand basic mathematical calculation. 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*

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To be competent, the user/individual on the job must 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*

To be competent, the user/individual on the job must 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*

To be competent, the user/individual on the job must 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.** carry 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, spanners and fasteners

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- 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 (KU)

The individual on the job needs to know and understand:

- KU1.** company's policies on: personnel management, duty reporting procedure and associated mis compliance
- KU2.** legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU3.** own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU4.** reporting structure within organization and relevant people and their responsibilities within the work area
- KU5.** problem escalation procedure and escalation matrix for reporting work and employment related issues
- KU6.** standard operating procedure while working
- KU7.** relevant health and safety requirements applicable in the work place
- KU8.** importance of working in clean and safe environment
- KU9.** documentation and related procedures applicable in the context of employment and work
- KU10.** importance and purpose of documentation in context of employment and work
- KU11.** interpretation of drawing as per standard and knowledge of geometric dimensioning and tolerance (gd&t).
- KU12.** knowledge of making isometric drawing and orthographic projection.
- KU13.** selection of datum plane and its importance.
- KU14.** knowledge to establish a proper datum
- KU15.** to determine limits, fits and tolerance.
- KU16.** plan sequence of operation applying the knowledge of geometry.
- KU17.** know the different protective coatings used in pipe and how it protects the pipe and also the care to be taken while handling.
- KU18.** understand the different thread geometry, types and its application.
- KU19.** knowledge on different materials and the performance of this material in different application.
- KU20.** basic knowledge of the property and behaviour of fluids, liquids and gases,
- KU21.** awareness on basic hydraulic and pneumatic elements and the working
- KU22.** making of drawing using standard symbols, proper representation and layout.

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- KU23.** 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
- KU24.** identify correct orientation of pipe fitting in regard to the flow.
- KU25.** use of different fasteners for both temporary and permanent fastening.

## Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** fill in the attendance sheet and the requisite details
- GS2.** keep abreast by reading about new policies at an organization level
- GS3.** 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
- GS4.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS5.** execute task, schedules, and work-loads with co-workers and supervisors
- GS6.** convey and share technical information clearly using appropriate language
- GS7.** check and clarify task-related information
- GS8.** liaise with appropriate authorities using correct protocol
- GS9.** communicate with people in respectful form and manner in line with organizational protocol
- GS10.** share work load as required
- GS11.** assist others who require help
- GS12.** share knowledge with co-workers/assistant.
- GS13.** Undertake numerical operations, and calculations using calculators
- GS14.** demonstrate measurement and calculation of Angle, Perimeter, Area of a common geometrical shape and can co-relate with job area requirements
- GS15.** use appropriate measuring techniques and units of measurement
- GS16.** use British and metric system of measurement and make conversions between them
- GS17.** describe the difference between Celsius & Fahrenheit Scale and relationship between them
- GS18.** 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
- GS19.** basic operations in a computer like switching it on/off, using the mouse and keyboard, accessing files, opening, closing, creating and deleting folders, etc.
- GS20.** use basic office applications like spread sheet, word processor, presentations
- GS21.** use organizational software specific to quality function
- GS22.** use email to communicate within the organization as per organization guidelines
- GS23.** retrieve and enter data using standard system forms and templates take printouts of documents
- GS24.** participate in on-the-job and other learning, training and development interventions and assessments



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- GS25.** clarify task related information with appropriate personnel or technical adviser
- GS26.** seek to improve and modify own work practices
- GS27.** maintain current knowledge of application standards, legislation, codes of practice and product/process developments
- GS28.** identify problems with work planning, procedures, output and behaviour and their implications
- GS29.** prioritize and plan for problem solving
- GS30.** communicate problems appropriately to others
- GS31.** identify sources of information and support for problem solving
- GS32.** seek assistance and support from other sources to solve problems
- GS33.** identify effective resolution techniques
- GS34.** select and apply resolution techniques
- GS35.** seek evidence for problem resolution
- GS36.** plan, prioritize and sequence work operations as per job requirements
- GS37.** organize and analyse information relevant to work
- GS38.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS39.** undertake and express new ideas and initiatives to others
- GS40.** modify work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS41.** ones competencies in new and different situations and contexts to achieve more
- GS42.** exercise restraint while expressing dissent and during conflict situations
- GS43.** avoid and manage distractions to be disciplined at work
- GS44.** manage own time for achieving better results
- GS45.** work in a team in order to achieve better results
- GS46.** identify and clarify work roles within a team
- GS47.** communicate and cooperate with others in the team for better results
- GS48.** seek assistance from fellow team members

## Qualification Pack

### Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Understand the basic Engineering practice</i>	<b>6</b>	<b>14</b>	-	-
<b>PC1.</b> consistently apply and promote health and safety legislation and best practice and work in a safe manner on a worksite	1	2	-	-
<b>PC2.</b> health and safety legislation and best practice	-	2	-	-
<b>PC3.</b> the range and uses of trade related equipments	1	2	-	-
<b>PC4.</b> how to use and operate tools safely	-	2	-	-
<b>PC5.</b> specific safety issues relating to work involving cutting tools	1	1	-	-
<b>PC6.</b> the importance of working logically and in a well-organized manner.	1	1	-	-
<b>PC7.</b> operate trade machinery effectively, safely and in accordance with manufacturers instructions	1	2	-	-
<b>PC8.</b> select and use appropriate machine tools safely and effectively	1	2	-	-
<i>Mathematical skills with respect to welding</i>	<b>7</b>	<b>8</b>	-	-
<b>PC9.</b> basic mathematical manipulation and unit conversion	1	2	-	-
<b>PC10.</b> geometrical principles, techniques and calculations	1	1	-	-
<b>PC11.</b> understand basic mathematical calculation. units of metric, iso and fps addition subtraction multiplication and division	1	1	-	-
<b>PC12.</b> 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	1	1	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC13.</b> 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	1	1	-	-
<b>PC14.</b> develop ability to perform basics of algebra and understand simple algebraic equations and problems	1	1	-	-
<b>PC15.</b> acquire the techniques of solving simple trigonometric problems introduction to sine, cosine and tan functions pythagoras theorem identifies and simple problems.	1	1	-	-
<i>Knowledge on different types of materials and Heat Treatment</i>	<b>9</b>	<b>15</b>	-	-
<b>PC16.</b> ability to apply knowledge of metals and non-metals	1	2	-	-
<b>PC17.</b> able to understand the types and characteristics of materials used in the manufacturing industry	1	1	-	-
<b>PC18.</b> ability to identify ferrous and non-ferrous metals	1	2	-	-
<b>PC19.</b> ability to integrate steel - properties and applications of the following carbon steels and alloy steels (with reference to welding)	1	1	-	-
<b>PC20.</b> apply the basic principles of material selection to specific applications stainless steel, non ferrous metal -properties and applications	1	1	-	-
<b>PC21.</b> highlight the property of different material and their workability.	1	2	-	-
<b>PC22.</b> explain the differences in properties of different materials, including metals, alloys, ceramics, polymers and composites	1	1	-	-
<b>PC23.</b> describe the basics of heat treatment principles	1	1	-	-
<b>PC24.</b> highlight different heat treatment operations, their purpose	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC25.</b> apply and explain the application of stress relieving with reference to welding	-	2	-	-
<i>Fundamentals of Electricity</i>	<b>6</b>	<b>11</b>	-	-
<b>PC26.</b> understanding written sentences and paragraphs in work related documents.	-	2	-	-
<b>PC27.</b> primary electrical supply circuit terminology and its operation	-	2	-	-
<b>PC28.</b> secondary electrical / welding circuit terminology and operation	1	1	-	-
<b>PC29.</b> knowledge of the practical application of electricity and technology.	1	1	-	-
<b>PC30.</b> this includes applying principles, techniques, procedures like ac and dc current, single phase circuit and three phase circuit etc	1	2	-	-
<b>PC31.</b> 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.	1	1	-	-
<b>PC32.</b> testing existing wiring for safety and quality control. earth connections circuit protective devices	1	1	-	-
<b>PC33.</b> understanding of work shop safety and welding safety	1	1	-	-
<i>Knowledge on basic workshop practice and tools used</i>	<b>6</b>	<b>18</b>	-	-
<b>PC34.</b> able to work independently or as part of a team in the following areas	1	2	-	-
<b>PC35.</b> understand the task required and plan ahead what steps must be taken to achieve the outcome.	1	2	-	-
<b>PC36.</b> carry out marking on the materials as per the drawing using	1	2	-	-
<b>PC37.</b> able to do the drilling as per standard specification and methods	-	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC38.</b> set up and adjust metalworking tools and do threading	1	2	-	-
<b>PC39.</b> ability to set up and/or operate hand tools	-	2	-	-
<b>PC40.</b> correctly use and maintain the tools, hammers, spnners and fasteners	1	2	-	-
<b>PC41.</b> measure and mark materials as per the drawing and check accuracy and quality of finished partsmeasuring / 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	-	1	-	-
<b>PC42.</b> safe operation of equipment and apply occupational health and safety policy and procedures to minimise risk.	1	1	-	-
<b>PC43.</b> knowledge and ability to use different hand tools and power tools	-	2	-	-
<b>NOS Total</b>	<b>34</b>	<b>66</b>	-	-

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### National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	HYC/N9101
<b>NOS Name</b>	General work shop practice followed in the shop floor
<b>Sector</b>	Hydrocarbon
<b>Sub-Sector</b>	Construction & Services
<b>Occupation</b>	Welding, Welding
<b>NSQF Level</b>	4
<b>Credits</b>	3.5
<b>Version</b>	2.0
<b>Last Reviewed Date</b>	NA
<b>Next Review Date</b>	17/11/2025
<b>NSQC Clearance Date</b>	17/11/2022

## Qualification Pack

# HYC/N9102: Welding 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 scope covers the following :

- The learner should have acquired the listed knowledge and skills to undertake welding using Manual Metal Arc welding/Shielded metal arc welding.

## Elements and Performance Criteria

### *Welding Process*

To be competent, the user/individual on the job must be able to:

- PC1.** work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
- PC2.** adhere to procedures or systems in place for health and safety, personal protective equipment (ppe) and other relevant safety regulations
- PC3.** check the condition of, welding leads, earthing arrangements and electrode holder
- PC4.** report any faults or potential hazards to appropriate authority
- PC5.** follow fume extraction safety procedures
- 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 Equipments*

To be competent, the user/individual on the job must be able to:

- 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

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**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*

To be competent, the user/individual on the job must be able to:

**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*

To be competent, the user/individual on the job must 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 groove 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*

To be competent, the user/individual on the job must be able to:



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- 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 (KU)

The individual on the job needs to know and understand:

- KU1.** the importance of listening as part of effective communications
- KU2.** consistently apply and promote health and safety legislation and best practice and work in a safe manner on a worksite
- KU3.** reviews and intent the requisition of materials/equipment by assigned employees; may tag and store material as necessary
- KU4.** maintains records and prepares reports on repairs completed or on units requiring future special service
- KU5.** works closely with project coordinators, administration, and/or other related staff to determine and coordinate projects, estimating and controlling craft-related project costs, operational needs, troubleshooting, etc.
- KU6.** ability to understand and carry out work direction in a safe manner
- KU7.** plan and prioritize own work and work of others to maximize efficiency and to meet prescribed timescales
- KU8.** demonstrate strong listening and questioning skills to deepen understanding of complex situations
- KU9.** they may specialize in certain types of welding, such as mobile welding, aerospace precision welding, manufacturing welding and pipeline construction welding.
- KU10.** ability to plan and think in steps and three-dimensionally
- KU11.** ability to keep up to date with changing technology
- KU12.** range of destructive and non-destructive weld testing
- KU13.** methods of distortion control in steels, alloys and aluminium effects of exposure to the electric arc
- KU14.** types of fire extinguishers and their suitable uses
- KU15.** methods of managing welding fume hazards
- KU16.** effects of exposure to welding fume
- KU17.** personal protective equipment (ppe) and clothing to be worn during
- KU18.** awareness and importance of cable size and length
- KU19.** types of polarity such as dc electrode negative and dc electrode positive for welding purposes
- KU20.** various types of base metals used in welding and their implications
- KU21.** distortion and how to control distortion

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- KU22.** magnetic arc blow or arc deflection, causes and methods to avoid or compensate
- KU23.** significance of diffusible hydrogen for welds
- KU24.** storage requirements for consumable electrodes
- KU25.** welding process specification sheet, process qualification record (pqr) and related essential variables
- KU26.** travel speed and heat inputs
- KU27.** amperage requirements for different classification of electrodes and positions
- KU28.** importance and implications of various diameters of electrodes
- KU29.** gouging and back gouging principles, methods and procedures
- KU30.** purpose and importance of pre-heating requirements for base metals
- KU31.** tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc.
- KU32.** purpose and importance of post-heating in welding
- KU33.** types of visual inspection indicators and methods

## Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** follow verbal and written instructions as per sop
- GS2.** communicate orally and in writing with other team members, leaders and operations personnel
- GS3.** determining personnel matters (such as job progress, schedule changes, time sheet review, and work performance)
- GS4.** knowledge of human resource and supervisory activities, including the coordination and management of people and resources
- GS5.** work within company policy as outlined
- GS6.** read, write and communicate using english language sufficient to perform job functions
- GS7.** ability to understand and carry out work direction in a safe manner
- GS8.** identifying complex problems and reviewing related information to develop and evaluate options and implement solutions
- GS9.** ability to listen to and understand information and ideas presented through spoken words and sentences
- GS10.** performs other related duties as assigned
- GS11.** ability to apply general rules to specific problems to produce answers that make sense
- GS12.** participates in the management of personnel matters/activities
- GS13.** feeds and speeds to operate machinery
- GS14.** basic mathematical manipulation and unit conversion
- GS15.** calculate areas and volumes using geometric formulae
- GS16.** calculate material requirements, consumables and costs of welding
- GS17.** ability to measure material and calculate the weight
- GS18.** use autocad and draw simple working sketch and do the calculation.

## Qualification Pack

- GS19.** preparation of bill of materials and calculate the material requirement
- GS20.** mathematics knowledge of arithmetic, algebra, geometry, , and their applications.
- GS21.** welds components in flat, vertical, or overhead positions
- GS22.** parts to ensure accuracy against drawings
- GS23.** work on special projects
- GS24.** operating other necessary equipment and performing tasks necessary to complete parts to specifications
- GS25.** identify problems with work planning, procedures, output and behaviour and their implications
- GS26.** prioritize and plan for problem solving
- GS27.** communicate problems appropriately to others
- GS28.** identify sources of information and support for problem solving
- GS29.** seek assistance and support from other sources to solve problems
- GS30.** identify effective resolution techniques
- GS31.** select and apply resolution techniques
- GS32.** seek evidence for problem resolution
- GS33.** plan, prioritize and sequence work operations as per job requirements
- GS34.** organize and analyse information relevant to work
- GS35.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS36.** undertake and express new ideas and initiatives to others
- GS37.** modify work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS38.** ones competencies in new and different situations and contexts to achieve more
- GS39.** exercise restraint while expressing dissent and during conflict situations
- GS40.** avoid and manage distractions to be disciplined at work
- GS41.** manage own time for achieving better results
- GS42.** work in a team in order to achieve better results
- GS43.** identify and clarify work roles within a team
- GS44.** communicate and cooperate with others in the team for better results
- GS45.** seek assistance from fellow team members

## Qualification Pack

### Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Welding Process</i>	<b>9</b>	<b>12</b>	-	-
<b>PC1.</b> work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	1	2	-	-
<b>PC2.</b> adhere to procedures or systems in place for health and safety, persona protective equipment (ppe) and other relevant safety regulations	1	1	-	-
<b>PC3.</b> check the condition of, welding leads, earthing arrangements and electrode holder	-	2	-	-
<b>PC4.</b> report any faults or potential hazards to appropriate authority	-	2	-	-
<b>PC5.</b> follow fume extraction safety procedures	-	2	-	-
<b>PC6.</b> explain different types of welding	1	1	-	-
<b>PC7.</b> use specific terminology used in the welding industry	1	1	-	-
<b>PC8.</b> the selection, use and techniques of the various welding process	1	1	-	-
<b>PC9.</b> the most common welding processes	2	-	-	-
<b>PC10.</b> knowledge of the different welding terminology	2	-	-	-
<i>Welding Equipments</i>	<b>7</b>	<b>11</b>	-	-
<b>PC11.</b> able to differentiate ac/dc machines	-	2	-	-
<b>PC12.</b> narrate and justify the advantages of dc machines	1	1	-	-
<b>PC13.</b> know how the specification of dc machines are done	2	-	-	-
<b>PC14.</b> ability to select the machine as per job specification practical setup the machine for welding	1	1	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC15.</b> understand all care and maintenance of machine	1	1	-	-
<b>PC16.</b> arc welding accessories -electrode holder, earth lamp welding cables	-	2	-	-
<b>PC17.</b> selection and use of safety equipment related to specific or dangerous tasks	1	2	-	-
<b>PC18.</b> knowledge on components of the essential equipment required for welding	1	1	-	-
<b>PC19.</b> make essential connections for specific welding procedures being undertaken and identify welding machines eg. transformers, rectifiers, inverters and generators, according to the task	-	1	-	-
<i>Welding preparation</i>	<b>10</b>	<b>11</b>	-	-
<b>PC20.</b> ability to interpretation of welding / engineering drawings and weld symbols welding procedure specifications and standard operating procedures	1	2	-	-
<b>PC21.</b> correct alignment of process with material being used	1	1	-	-
<b>PC22.</b> knowledge of surface contamination can influence the finished weld characteristics	1	1	-	-
<b>PC23.</b> able to correct machine and settings to be aligned as per the standard procedure	1	1	-	-
<b>PC24.</b> 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	1	1	-	-
<b>PC25.</b> the characteristics and properties of filler materials	1	1	-	-
<b>PC26.</b> the methods of edge preparation to align with joint profile, strength, material and drawing specification	1	1	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC27.</b> 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	1	1	-	-
<b>PC28.</b> use manual metal-arc welding and related equipment to include alternating current (ac) equipment direct current (dc) equipment	1	1	-	-
<b>PC29.</b> report any faults or problem to appropriate authority	1	1	-	-
<i>Carrying out welding operations</i>	<b>10</b>	<b>10</b>	-	-
<b>PC30.</b> strike and maintain a stable arc	1	1	-	-
<b>PC31.</b> stop and properly re-start arc to avoid welding defects (scratch start, tapping techniques)	1	1	-	-
<b>PC32.</b> maintain constant puddle by using appropriate travel speed	1	1	-	-
<b>PC33.</b> maintain proper bead sequence with respect to groove/fillet configurations and positions	1	1	-	-
<b>PC34.</b> remove slag in an appropriate manner (eg. wire brush, hammer, etc.)	1	1	-	-
<b>PC35.</b> 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	1	1	-	-
<b>PC36.</b> 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	1	1	-	-
<b>PC37.</b> deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve	1	1	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC38.</b> produce joints on carbon and low alloy steel materials using various methods methods: drag, weave, whip	1	1	-	-
<b>PC39.</b> shut down and make safe the welding equipment on completion of the welding activities	1	1	-	-
<i>Testing for quality</i>	<b>5</b>	<b>15</b>	-	-
<b>PC40.</b> measure and check that all dimensional and geometrical aspects of the weld are as per instructions	1	3	-	-
<b>PC41.</b> check that the welded joint conforms to the instructions given, by checking various quality parameters by visual inspection	1	3	-	-
<b>PC42.</b> identify various weld defects using visual inspection	1	3	-	-
<b>PC43.</b> detect and report surface imperfections to appropriate authority	1	3	-	-
<b>PC44.</b> deal with defects in welding as per instructions given	1	3	-	-
<b>NOS Total</b>	<b>41</b>	<b>59</b>	-	-

## Qualification Pack

### National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	HYC/N9102
<b>NOS Name</b>	Welding using Manual Metal Arc welding/Shielded metal arc welding
<b>Sector</b>	Hydrocarbon
<b>Sub-Sector</b>	Construction & Services
<b>Occupation</b>	Welding, Welding
<b>NSQF Level</b>	4
<b>Credits</b>	3.5
<b>Version</b>	2.0
<b>Last Reviewed Date</b>	NA
<b>Next Review Date</b>	17/11/2025
<b>NSQC Clearance Date</b>	17/11/2022



## Qualification Pack

# HYC/N9103: Manually (semi-automatic) welding joints using the MIG/MAG

## 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 scope covers the following :

- the learner should have acquired the listed knowledge and skills to perform MIG welding to attain higher productivity, weld materials like stainless steel, carbon steel, nickel alloys, aluminium

## Elements and Performance Criteria

### *Work Safely*

To be competent, the user/individual on the job must be able to:

- PC1.** work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
- PC2.** adhere to procedures or systems in place for health and safety, personal protective equipment (ppe) and other relevant safety regulations for mig/mag welding operations
- 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 Equipments*

To be competent, the user/individual on the job must be able to:

- 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*

To be competent, the user/individual on the job must be able to:

- PC6.** interpret weld procedure data sheets specifications, pqr and wps
- PC7.** select welding machines such as inverters, rectifiers and generators, according to the task
- PC8.** select electrodes according to classification and specifications
- PC9.** prepare the materials and joint in readiness for welding
- PC10.** check the condition of, and correctly connect, welding leads/cables, hoses, shielding gas supply and wire feed mechanisms
- PC11.** prepare the welding equipment for a range of given applications welding
- PC12.** select the welding shielding gases and equipment 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.** clean wire feeder and torch tip
- PC15.** connect torches and components

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- PC16.** 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*

To be competent, the user/individual on the job must be able to:

- PC23.** use manual welding and related equipment, to carry out mig/mag welding processes
- PC24.** perform mig/mag welding operations using various welding techniques to meet welding procedure specification requirements welding techniques: e.g. fine adjustment of parameters, correct manipulation of the torch, blending in stops/starts, tack welds, angle of the torch, setting of individual parameters like wire feed speed, voltage, gas flow rate, stick-out, etc.
- PC25.** adjust wire stick-out as per requirement
- PC26.** use welding consumables appropriate to the material and application to dc current typeswelding 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*

To be competent, the user/individual on the job must be able to:

- PC31.** identify various weld defects use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specificationweld 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*

To be competent, the user/individual on the job must be able to:

- PC35.** assist in preparation for non-destructive testing of the welds, for a range of tests non-destructive tests (ndt): dye penetrant (dpt), fluorescent penetrant (fpt), magnetic particle (mpt)

## Qualification Pack

- 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 (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the company
- KU2.** key purpose of the organization
- KU3.** department structure and hierarchy protocols
- KU4.** work flow and own role in the workflow
- KU5.** dependencies and interdependencies in the workflow
- KU6.** support functions and types of support available for incumbents in this role
- KU7.** types of fire extinguishers and their suitable uses in case of welding related fires
- KU8.** effects of exposure to welding fume and related safety practices
- KU9.** range of welding equipment available for GMAW welding
- KU10.** functions of welding equipment
- KU11.** principles and techniques of MIG/MAG welding
- KU12.** relationship between wire feed, speed control and welding current
- KU13.** how to compare welding consumables for suitability for a range of given applications
- KU14.** welding consumables classification as applicable to GMAW
- KU15.** safe working practices and procedures to be followed when preparing and using MIG/MAG welding equipment
- KU16.** hazards associated with MIG/MAG welding and safety precautions to minimize risk
- KU17.** correct handling and storage of gas cylinders for welding purposes
- KU18.** type and thickness of base metals for welding purposes
- KU19.** types (availability, typical sizes), storage (storage, identification, segregation (classification, size) of ferrous metals
- KU20.** current and polarity required for GMAW
- KU21.** types, selection and application of filler wires and welding electrodes
- KU22.** reasons for using shielding gases, and the types and application of the various gases
- KU23.** 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
- KU24.** methods/modes of metal transfer and their uses Methods: globular, short circuit transfer, spray arc, pulse, surface tension transfer (STT)
- KU25.** Understanding of types of welded joints to be produced
- KU26.** type, components and features of a manual gas shielded arc welding torch
- KU27.** how to prepare the materials in readiness for the welding activity

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- KU28.** purpose and correct use of anti-spatter compound
- KU29.** importance and procedure to clean torch tip and liner
- KU30.** how to set up and restrain the joint, and the tools and techniques to be used
- KU31.** checks to be made prior to welding
- KU32.** 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
- KU33.** types of weld beads and uses (stringer, weave, weave patterns)
- KU34.** weld bead quality characteristics
- KU35.** techniques of operating the welding equipment to produce a range of joints in the various joint positions
- KU36.** effects of the electrical characteristics of the MIG/MAG welding arc
- KU37.** problems that can occur with the welding activities and how to address them
- KU38.** own responsibility to assist in preparation of the welds and weld pieces for examination
- KU39.** how to check the welded joints for uniformity, alignment, position, weld size and profile
- KU40.** gouging and back gouging, its importance, principles, methods and procedures in welding
- KU41.** purpose and importance of pre-heating requirements for base metals in preparation for welding
- KU42.** purpose and importance of post-heating in welding
- KU43.** methods to achieve pre-heat and post heat requirements for welding purposes
- KU44.** tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc.
- KU45.** significance of diffusible hydrogen for welds and how it is measured
- KU46.** procedure to conduct dye penetrant test to assess weld quality
- KU47.** various procedures for visual examination of the welds for cracks
- KU48.** 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
- KU49.** safe working practices, handling and procedures to be adopted when preparing the welds for examination
- KU50.** importance of leaving the work area and equipment in a safe condition on completion of the welding activities

## Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** follow the instructions
- GS2.** ability to write the instruction to the fellow worker.
- GS3.** should be able to communicate job progress, schedule changes, time sheet review, and work performance

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- GS4.** knowledge of human resource and supervisory activities, including the coordination and management of people and resources
- GS5.** understanding the purpose of a communication
- GS6.** analyzing the audience and communicate
- GS7.** communicating with words as well as with body language
- GS8.** giving each communication greater impact
- GS9.** you must have a clear purpose and state that purpose as quickly as possible.
- GS10.** what is a team and why are teams important
- GS11.** how do you and others interact in a team
- GS12.** how can a team operate effectively and strategies help teams achieve their goals
- GS13.** undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)
- GS14.** ability to calculate volume, area and weight of material.
- GS15.** use appropriate measuring techniques
- GS16.** use and convert imperial and metric systems of measurements
- GS17.** 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
- GS18.** use and understand tolerance in terms of limits of size
- GS19.** check measurements, angles, orientation and slope
- GS20.** types of reference lines such as tangent lines, datum lines, centre lines and work points
- GS21.** use basic communication and cooperation skills when interacting with familiar people.
- GS22.** ability to share feelings and meet basic needs when interacting with other people.
- GS23.** able to contribute for interpersonal and group interactions.
- GS24.** demonstrate skills required to reconcile conflict and changes in relationships and groups.
- GS25.** identify problems with work planning, procedures, output and behaviour and their implications
- GS26.** prioritize and plan for problem solving
- GS27.** communicate problems appropriately to others
- GS28.** identify sources of information and support for problem solving
- GS29.** seek assistance and support from other sources to solve problems
- GS30.** identify effective resolution techniques
- GS31.** select and apply resolution techniques
- GS32.** seek evidence for problem resolution
- GS33.** plan, prioritize and sequence work operations as per job requirements
- GS34.** organize and analyse information relevant to work
- GS35.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS36.** undertake and express new ideas and initiatives to others
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## Qualification Pack

- GS38.** ones competencies in new and different situations and contexts to achieve more
- GS39.** exercise restraint while expressing dissent and during conflict situations
- GS40.** avoid and manage distractions to be disciplined at work
- GS41.** manage own time for achieving better results
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- GS43.** identify and clarify work roles within a team
- GS44.** communicate and cooperate with others in the team for better results
- GS45.** seek assistance from fellow team members

## Qualification Pack

### Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work Safely</i>	<b>4</b>	<b>7</b>	-	-
<b>PC1.</b> work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	1	2	-	-
<b>PC2.</b> 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	1	2	-	-
<b>PC3.</b> check the condition of welding leads, gas connection arrangements, earthing arrangements and electrode holder	1	2	-	-
<b>PC4.</b> report any faults or potential hazards to appropriate authority	1	1	-	-
<i>Welding Equipments</i>	<b>1</b>	<b>1</b>	-	-
<b>PC5.</b> 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)	1	1	-	-
<i>Prepare for welding operations</i>	<b>17</b>	<b>26</b>	-	-
<b>PC6.</b> interpret weld procedure data sheets specifications, pqr and wps	1	2	-	-
<b>PC7.</b> select welding machines such as inverters, rectifiers and generators, according to the task	1	1	-	-
<b>PC8.</b> select electrodes according to classification and specifications	1	1	-	-
<b>PC9.</b> prepare the materials and joint in readiness for welding	1	2	-	-
<b>PC10.</b> check the condition of, and correctly connect, welding leads/cables, hoses, shielding gas supply and wire feed mechanisms	1	2	-	-
<b>PC11.</b> prepare the welding equipment for a range of given applications welding	1	2	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC12.</b> select the welding shielding gases and equipment for a range of given applications	1	1	-	-
<b>PC13.</b> plan the welding activities before they start them effectively and efficiently for achieving specifications as per wps	1	1	-	-
<b>PC14.</b> clean wire feeder and torch tip	1	2	-	-
<b>PC15.</b> connect torches and components	1	1	-	-
<b>PC16.</b> connect and adjust regulators and flow meters to cylinders pc16. adjust wire feed rate and read and set current as required	1	1	-	-
<b>PC17.</b> set other welding parameters (eg. voltage, slope of current versus voltage curve where required)	1	1	-	-
<b>PC18.</b> choose appropriate mode of metal transfer	1	1	-	-
<b>PC19.</b> set pre-purge with shielding gas as required	1	2	-	-
<b>PC20.</b> set and verify gas flow rates	1	2	-	-
<b>PC21.</b> prepare and support the joint, using the appropriate methods	1	2	-	-
<b>PC22.</b> tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding	1	2	-	-
<i>Carry out welding operations</i>	<b>9</b>	<b>13</b>	-	-
<b>PC23.</b> use manual welding and related equipment, to carry out mig/mag welding processes	1	2	-	-
<b>PC24.</b> perform mig/mag welding operations using various welding techniques to meet welding procedure specification requirementswelding 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.	1	2	-	-
<b>PC25.</b> adjust wire stick-out as per requirement	1	1	-	-



### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC26.</b> use welding consumables appropriate to the material and application to dc current typeswelding consumables: wire electrodes, wires and rods for arc welding; shielding gases; welding spools and drum packs; anti-spatter compound	2	2	-	-
<b>PC27.</b> produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to level c of iso 5817	1	1	-	-
<b>PC28.</b> 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	1	1	-	-
<b>PC29.</b> weld joints in good access situations, in select positions	1	2	-	-
<b>PC30.</b> make sure that the work area is maintained and left in a safe and tidy condition	1	2	-	-
<i>Test for quality</i>	<b>5</b>	<b>5</b>	-	-
<b>PC31.</b> 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 specificationweld defects: lack of continuity of the weld ; uneven and irregular	1	1	-	-
<b>PC32.</b> check that the welded joint conforms to the specification, by checking various quality parameters by visual inspection	2	-	-	-
<b>PC33.</b> detect surface imperfections and deal with them appropriately	1	2	-	-
<b>PC34.</b> carry out dpt tests to assess fine defect open to the surface not detected by visual inspection (vt)	1	2	-	-
<i>Post weldingactivities</i>	<b>4</b>	<b>8</b>	-	-
<b>PC35.</b> 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)	1	2	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC36.</b> 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	1	2	-	-
<b>PC37.</b> shut down and make safe the welding equipment on completion of the welding activities	1	2	-	-
<b>PC38.</b> follow the established organisational process for dealing with the welded pieces including handover, storage, safety and security, record keeping, etc.	1	2	-	-
<b>NOS Total</b>	<b>40</b>	<b>60</b>	-	-

## Qualification Pack

### National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	HYC/N9103
<b>NOS Name</b>	Manually (semi-automatic) welding joints using the MIG/MAG
<b>Sector</b>	Hydrocarbon
<b>Sub-Sector</b>	Construction & Services
<b>Occupation</b>	Welding, Welding
<b>NSQF Level</b>	4
<b>Credits</b>	4
<b>Version</b>	2.0
<b>Last Reviewed Date</b>	NA
<b>Next Review Date</b>	17/11/2025
<b>NSQC Clearance Date</b>	17/11/2022

## Qualification Pack

### **HYC/N9104: 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 scope covers the following :

- The learner should have acquired the listed knowledge and skills to perform manual TIG (GTAW) welding for a range of standard welding requirements. Weld different materials (carbon steel, aluminum and stainless steel)

#### **Elements and Performance Criteria**

##### *Maintain Safe working*

To be competent, the user/individual on the job must be able to:

- PC1.** work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
- PC2.** adhere to procedures or systems in place for health and safety, personal protective equipment (ppe) and other relevant safety regulations for 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 Equipments*

To be competent, the user/individual on the job must be able to:

- 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 weldingoperations*

To be competent, the user/individual on the job must 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

## Qualification Pack

- 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*

To be competent, the user/individual on the job must be able to:

- PC24.** perform tig welding operations using appropriate welding techniques to meet welding procedure specification requirements
- PC25.** use correct technique for starting the arc (using hf (high frequency) unit, scratching the electrode on the job material, lifting the electrode immediately after touching the job material)
- PC26.** use correct angle of torch and filler wire
- PC27.** weld the joint to the specified quality, dimensions and profile
- PC28.** use manual welding and related equipment, to carry out tig welding processes
- PC29.** use welding consumables appropriate to the material and application, to include ac current types and dc current types
- PC30.** produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to level b of iso 5817
- PC31.** use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously)
- PC32.** produce joints from various materials in different forms materials: ferrous : carbon steel, stainless steel (all grades); non-ferrous: aluminum and aluminum alloys; nickel and nickel alloys; titanium; copper and copper alloys forms: sheet (less than 1.5 mm), plate (8 mm), section, pipe/tube, other forms
- PC33.** weld joints in good access situations, in select positions
- PC34.** shut down and make safe the welding equipment on completion of the welding activities
- PC35.** make sure that the work area is maintained and left in a safe and tidy condition

### *Test for quality*

To be competent, the user/individual on the job must be able to:

- PC36.** use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification

## Qualification Pack

- PC37.** check that the welded joint conforms to the specification, by checking various quality parameters using visual inspection quality parameters: dimensional accuracy; alignment/squareness; size and profile of weld; visual defects; ndt/dt tested defects; types of visual inspections: use of visual techniques, lighting, low powered magnification, fillet weld gauges
- PC38.** identify various weld defects; types of weld defects: lack of continuity of the weld; uneven and irregular ripple formation, incorrect weld size or profile, undercutting, overlap, inclusions, porosity, internal cracks, surface cracks, lack of fusion, lack of penetration, welding spatter, gouges, stray arc strikes, sharp edges
- PC39.** detect surface imperfections and deal with them appropriately
- PC40.** carry out lpt tests to assess fine defect open to the surface not detected by visual inspection (vt)

### *Post welding activities*

To be competent, the user/individual on the job must be able to:

- PC41.** assist in preparation for non-destructive testing of the welds for a range of tests non-destructive tests (ndt): visual inspection, leak test: dye penetrant (dpt), fluorescent penetrant (fpt); magnetic particle (mpt); radiographic (rt); ultrasonic (ut)
- PC42.** prepare for destructive tests on weld specimens for select tests; destructive tests (dt): nick break test; bend tests (such as face, root or side, as appropriate); metallographic; mechanical (peel, tensile and shear, fatigue, impact tests); chemical
- PC43.** follow the established organisational process for dealing with the welded pieces including handover, storage, safety and security, record keeping, etc.

### *Other related operation*

To be competent, the user/individual on the job must be able to:

- 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 (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the company
- KU2.** key purpose of the organization
- KU3.** department structure and hierarchy protocols
- KU4.** work flow and own role in the workflow
- KU5.** dependencies and interdependencies in the workflow
- KU6.** support functions and types of support available for incumbents in this role
- KU7.** types of fire extinguishers and their suitable uses in case of welding related fires
- KU8.** the effects of exposure to welding fume
- KU9.** range of welding equipment available
- KU10.** basic principles of tig welding and the functions of welding equipment
- KU11.** concepts and mechanisms of welding
- KU12.** different types of power source

## Qualification Pack

- KU13.** how to compare welding consumables for suitability for a range of given applications
- KU14.** welding consumables classification chemical composition of the weld metal; protection of bare wires
- KU15.** safe working practices, precautions and procedures to be followed when preparing and using tig welding equipment
- KU16.** different variants of the tig welding (eg. orbital welding, internal bore welding, ng-tig etc.)
- KU17.** personal protective equipment to be worn for the welding activities
- KU18.** correct handling and storage of gas cylinders
- KU19.** manual tig welding process
- KU20.** type and thickness of base metals
- KU21.** current types and polarity
- KU22.** types of tungsten
- KU23.** types, selection and application of filler wires and welding electrodes
- KU24.** reasons for using shielding gases, and the types and application of the various gases
- KU25.** impact of shielding gas composition and purity on welding quality
- KU26.** use, impact and importance of gas pressures and flow rates in relationship to the type of material being welded
- KU27.** pre- and post-flow purge and its importance
- KU28.** importance and application of back purging
- KU29.** types of welded joints to be produced
- KU30.** terminology used for the appropriate welding positions
- KU31.** types of torches such as air cooled and liquid cooled
- KU32.** how to prepare the materials in readiness for the welding activity
- KU33.** how to set up and restrain the joint, and the tools and techniques to be used
- KU34.** appropriate tack welding size and spacing (in relationship to material thickness)
- KU35.** 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
- KU36.** operating the welding equipment to produce a range of joints in the various joint positions
- KU37.** effects of the electrical characteristics of the tig welding arc
- KU38.** gouging and back gouging principles, methods and procedures
- KU39.** purpose and importance of pre-heating requirements for base metals
- KU40.** purpose and importance of post-heating in welding
- KU41.** methods to achieve pre-heat and post heat requirements
- KU42.** tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc.
- KU43.** how to control distortion (such as welding sequence; deposition technique)
- KU44.** problems that can occur with the welding activities
- KU45.** how to close down the welding equipment safely and correctly
- KU46.** how to prepare the welds for examination
- KU47.** how to check the welded joints for uniformity, alignment, position, weld size and profile

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- KU48.** various procedures for visual examination of the welds for cracks
- KU49.** types of non-destructive and destructive tests
- KU50.** correct procedure for carrying out the dye penetrant test
- KU51.** handling of weld specimens for tests and methods of removing a test piece of weld from a suitable position in the joint
- KU52.** safe working practices and procedures to be adopted when preparing the welds for examination
- KU53.** importance of leaving the work area and equipment in a safe condition on completion of the welding activities

## Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** follow verbal and written instructions
- GS2.** communicate orally and in writing with other team members, leaders and operations personnel
- GS3.** determining personnel matters (such as job progress, schedule changes, time sheet review, and work performance)
- GS4.** knowledge of human resource and supervisory activities, including the coordination and management of people and resources
- GS5.** work within company policy as outlined
- GS6.** read, write and communicate using english language sufficient to perform job functions
- GS7.** ability to understand and carry out work direction in a safe manner
- GS8.** identifying complex problems and reviewing related information to develop and evaluate options and implement solutions
- GS9.** Ability to listen to and understand information and ideas presented through spoken words and sentences
- GS10.** performs other related duties as assigned
- GS11.** ability to apply general rules to specific problems to produce answers that make sense
- GS12.** participates in the management of personnel matters/activities
- GS13.** identify pipe fittings by size, type, material, and service type
- GS14.** read and interpret hanger and support drawings
- GS15.** identify pipe by size, type, and wall thickness
- GS16.** calculate how threaded is measured
- GS17.** install pipe hangers, supports, anchors, and guides
- GS18.** read and interpret pipe and hanger drawings
- GS19.** calculate pressure and heat in piping systems
- GS20.** mathematics knowledge of arithmetic, algebra, geometry, , and their applications
- GS21.** participate in on-the-job and other learning, training and development interventions and assessments
- GS22.** clarify task related information with appropriate personnel or technical adviser
- GS23.** seek to improve and modify own work practices



## Qualification Pack

- GS24.** maintain current knowledge of application standards, legislation, codes of practice and product/process developments
- GS25.** identify problems with work planning, procedures, output and behaviour and their implications
- GS26.** prioritize and plan for problem solving
- GS27.** communicate problems appropriately to others
- GS28.** identify sources of information and support for problem solving
- GS29.** seek assistance and support from other sources to solve problems
- GS30.** identify effective resolution techniques
- GS31.** select and apply resolution techniques
- GS32.** seek evidence for problem resolution
- GS33.** plan, prioritize and sequence work operations as per job requirements
- GS34.** organize and analyse information relevant to work
- GS35.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS36.** undertake and express new ideas and initiatives to others
- GS37.** modify work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS38.** ones competencies in new and different situations and contexts to achieve more
- GS39.** exercise restraint while expressing dissent and during conflict situations
- GS40.** avoid and manage distractions to be disciplined at work
- GS41.** manage own time for achieving better results
- GS42.** work in a team in order to achieve better results
- GS43.** identify and clarify work roles within a team
- GS44.** communicate and cooperate with others in the team for better results
- GS45.** seek assistance from fellow team members

## Qualification Pack

### Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Maintain Safe working</i>	<b>3</b>	<b>5</b>	-	-
<b>PC1.</b> work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	1	1	-	-
<b>PC2.</b> adhere to procedures or systems in place for health and safety, personal protective equipment (ppe) and other relevant safety regulations for tig welding operations	1	1	-	-
<b>PC3.</b> check the condition of welding leads, gas connection arrangements, earthing arrangements and electrode holder	1	1	-	-
<b>PC4.</b> report any faults or potential hazards to appropriate authority	-	2	-	-
<i>Welding Equipments</i>	<b>1</b>	<b>2</b>	-	-
<b>PC5.</b> 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)	1	2	-	-
<i>Prepare for welding operations</i>	<b>18</b>	<b>21</b>	-	-
<b>PC6.</b> interpret weld procedure data sheets specifications interpreting the wps: welding process (iso codes);	1	1	-	-
<b>PC7.</b> select welding machines eg. transformer, inverters (ac/dc), rectifiers and generators, according to the materials and task	1	1	-	-
<b>PC8.</b> select proper welding torch and tungsten electrode that meet the job requirement and specification	1	1	-	-
<b>PC9.</b> obtain filler wire according to specifications	1	1	-	-
<b>PC10.</b> prepare for the tig welding process	1	2	-	-
<b>PC11.</b> prepare the materials and joint in readiness for welding	1	1	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC12.</b> select tungsten electrode by the colour of the tip according to base metal, and correct diameter	1	1	-	-
<b>PC13.</b> 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	1	1	-	-
<b>PC14.</b> connect torches and the components	1	1	-	-
<b>PC15.</b> connect and adjust regulators and flow meters to cylinders	1	2	-	-
<b>PC16.</b> read, set and adjust current (amperage) as required	1	1	-	-
<b>PC17.</b> set pre-purge with shielding gas as required	1	1	-	-
<b>PC18.</b> prepare tungsten by sharpening or balling it to desired tip shape	1	1	-	-
<b>PC19.</b> set and verify gas flow rates	1	1	-	-
<b>PC20.</b> prepare and support the joint, using the appropriate methods	1	2	-	-
<b>PC21.</b> tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding	1	1	-	-
<b>PC22.</b> obtain clearance from quality control for weld joint before welding	1	1	-	-
<b>PC23.</b> match feed and travel speed as required	1	1	-	-
<i>Carry out welding operations</i>	<b>12</b>	<b>12</b>	-	-
<b>PC24.</b> perform tig welding operations using appropriate welding techniques to meet welding procedure specification requirements	1	1	-	-
<b>PC25.</b> 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)	1	1	-	-
<b>PC26.</b> use correct angle of torch and filler wire	1	1	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC27.</b> weld the joint to the specified quality, dimensions and profile	1	1	-	-
<b>PC28.</b> use manual welding and related equipment, to carry out tig welding processes	1	1	-	-
<b>PC29.</b> use welding consumables appropriate to the material and application, to include ac current types and dc current types	1	1	-	-
<b>PC30.</b> produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to level b of iso 5817	1	1	-	-
<b>PC31.</b> use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously)	1	1	-	-
<b>PC32.</b> 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	1	1	-	-
<b>PC33.</b> weld joints in good access situations, in select positions	1	1	-	-
<b>PC34.</b> shut down and make safe the welding equipment on completion of the welding activities	1	1	-	-
<b>PC35.</b> make sure that the work area is maintained and left in a safe and tidy condition	1	1	-	-
<i>Test for quality</i>	<b>5</b>	<b>6</b>	-	-
<b>PC36.</b> use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification	1	1	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC37.</b> check that the welded joint conforms to the specification, by checking various quality parameters using visual inspection quality parameters: dimensional accuracy; alignment/squareness; size and profile of weld; visual defects; ndt/dt tested defects; types of visual inspections: use of visual techniques, lighting, low powered magnification, fillet weld gauges	1	2	-	-
<b>PC38.</b> 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	1	1	-	-
<b>PC39.</b> detect surface imperfections and deal with them appropriately	1	1	-	-
<b>PC40.</b> carry out lpt tests to assess fine defect open to the surface not detected by visual inspection (vt)	1	1	-	-
<i>Post welding activities</i>	<b>3</b>	<b>4</b>	-	-
<b>PC41.</b> 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)	1	1	-	-
<b>PC42.</b> 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	1	2	-	-
<b>PC43.</b> follow the established organisational process for dealing with the welded pieces including handover, storage, safety and security, record keeping, etc.	1	1	-	-
<i>Other related operation</i>	<b>2</b>	<b>6</b>	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC44.</b> ability do the following related operation oxy fuel cutting manual cutting machine cutting plasma cutting	1	3	-	-
<b>PC45.</b> ability to do pipe welding following the standard practices	1	3	-	-
<b>NOS Total</b>	<b>44</b>	<b>56</b>	-	-

## Qualification Pack

### National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	HYC/N9104
<b>NOS Name</b>	Perform Manually welding joints using the TIG (GTAW) Process
<b>Sector</b>	Hydrocarbon
<b>Sub-Sector</b>	Construction & Services
<b>Occupation</b>	Welding, Welding
<b>NSQF Level</b>	4
<b>Credits</b>	3.5
<b>Version</b>	2.0
<b>Last Reviewed Date</b>	NA
<b>Next Review Date</b>	17/11/2025
<b>NSQC Clearance Date</b>	17/11/2022

## Qualification Pack

### HYC/N9301: Working Effectively in a team

#### Description

This unit is about working effectively within a team.

#### Scope

The scope covers the following :

- Effective team work

#### Elements and Performance Criteria

##### *Effective team work*

To be competent, the user/individual on the job must be able to:

- PC1.** maintain clear communication with colleagues
- PC2.** pass on information to colleagues in line with organisational requirements
- PC3.** provide support to the team members
- PC4.** respect the colleagues
- PC5.** fulfil commitments made to colleagues
- PC6.** inform team members timely, if timelines can't be met
- PC7.** take the necessary initiatives to resolve the issues while working in team
- PC8.** adopt gender neutral behaviour while interacting with colleagues
- PC9.** offer assistance to a person with disability (PWD), only if required

#### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the organization policies and procedures related to team performance
- KU2.** the importance of effective communication and establishing good working relationships with colleagues
- KU3.** the importance of creating an environment of trust and mutual respect
- KU4.** the implications of own work on the work and schedule of others
- KU5.** the standard practices in organisation w.r.t communication at various levels
- KU6.** the personal responsibility for completing the task in time
- KU7.** importance of gender equality
- KU8.** importance of showing empathy while interacting with a PwD

#### Generic Skills (GS)

User/individual on the job needs to know how to:



## Qualification Pack

- GS1.** communicate effectively in writing
- GS2.** read instructions, guidelines/procedures
- GS3.** work in a disciplined manner for meeting commitments and deadline
- GS4.** how to plan and prioritise the work
- GS5.** the importance of consistent and reliable services
- GS6.** apply problem solving approaches in different situations
- GS7.** apply balanced judgments to different situations

## Qualification Pack

### Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Effective team work</i>	<b>20</b>	<b>30</b>	-	-
<b>PC1.</b> maintain clear communication with colleagues	2	3	-	-
<b>PC2.</b> pass on information to colleagues in line with organisational requirements	2	3	-	-
<b>PC3.</b> provide support to the team members	2	4	-	-
<b>PC4.</b> respect the colleagues	3	4	-	-
<b>PC5.</b> fulfil commitments made to colleagues	2	3	-	-
<b>PC6.</b> inform team members timely, if timelines can't be met	2	4	-	-
<b>PC7.</b> take the necessary initiatives to resolve the issues while working in team	3	4	-	-
<b>PC8.</b> adopt gender neutral behaviour while interacting with colleagues	2	2	-	-
<b>PC9.</b> offer assistance to a person with disability (PWD), only if required	2	3	-	-
<b>NOS Total</b>	<b>20</b>	<b>30</b>	-	-

## Qualification Pack

### National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	HYC/N9301
<b>NOS Name</b>	Working Effectively in a team
<b>Sector</b>	Hydrocarbon
<b>Sub-Sector</b>	Generic
<b>Occupation</b>	Generic, Generic
<b>NSQF Level</b>	4
<b>Credits</b>	2
<b>Version</b>	3.0
<b>Last Reviewed Date</b>	NA
<b>Next Review Date</b>	17/11/2025
<b>NSQC Clearance Date</b>	17/11/2022

## Qualification Pack

### HYC/N9302: Maintain health, safety and security procedures

#### Description

This unit is about maintaining health, safety and security procedure at workplace. It covers responsibilities towards self, others, assets and the environment.

#### Scope

The scope covers the following :

- Follow health and safety measures
- Follow safety procedures during emergency

#### Elements and Performance Criteria

##### *Follow health and safety measures*

To be competent, the user/individual on the job must be able to:

- PC1.** use protective clothing/equipment such as face mask, hand gloves, goggle etc for specific tasks and work conditions
- PC2.** identify the people responsible for maintaining health and safety in the workplace
- PC3.** identify possible causes of risk or accident in the workplace
- PC4.** follow safe working practices while dealing with hazards to ensure the safety of self and others
- PC5.** lift heavy objects safely using correct procedures
- PC6.** follow safety signages
- PC7.** maintain hands hygiene by washing hand frequently and thoroughly with soap and water or alcohol-based hand rub
- PC8.** inform the concerned person of any illness related to self and others
- PC9.** maintain workplace hygiene by disinfecting the equipment and tools regularly

##### *Follow safety procedures during emergency*

To be competent, the user/individual on the job must be able to:

- PC10.** respond promptly and appropriately to an accident or in an emergency situation
- PC11.** use appropriate fire extinguishers for different types of fires correctly
- PC12.** follow appropriate rescue techniques during fire hazard
- PC13.** follow good housekeeping practice in order to prevent fire hazards
- PC14.** inform fire safety department about any near-miss incidents in the work place
- PC15.** provide appropriate first aid to victims in an emergency situation
- PC16.** follow the applicable regulations and codes as per safety standard
- PC17.** prepare written accident/incident report and share with the concerned officer/department

#### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

## Qualification Pack

- KU1.** company's policies on personnel management and duty reporting procedure
- KU2.** reporting structure within organization
- KU3.** health and safety hazards commonly affecting the work environment and related precautions
- KU4.** importance of maintaining personal hygiene using PPE kit, sanitizer and soap
- KU5.** importance of maintaining workplace hygiene
- KU6.** preventative and remedial actions to be taken in the case of exposure to toxic materials
- KU7.** importance of using protective clothing/equipment while working
- KU8.** various causes of fire
- KU9.** techniques of using different types of fire extinguishers
- KU10.** different materials used for extinguishing fire
- KU11.** various types of safety signs and their significance

## Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** communicate effectively by writing
- GS2.** read instructions, guidelines/procedures and reports
- GS3.** identify and report potential sources of danger
- GS4.** how to plan the work to meet the deadline
- GS5.** the importance of on time services
- GS6.** apply problem solving approaches in different situations
- GS7.** apply balanced judgments in different situations

## Qualification Pack

### Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Follow health and safety measures</i>	<b>9</b>	<b>15</b>	-	-
<b>PC1.</b> use protective clothing/equipment such as face mask, hand gloves, goggle etc for specific tasks and work conditions	1	2	-	-
<b>PC2.</b> identify the people responsible for maintaining health and safety in the workplace	1	-	-	-
<b>PC3.</b> identify possible causes of risk or accident in the workplace	1	2	-	-
<b>PC4.</b> follow safe working practices while dealing with hazards to ensure the safety of self and others	1	2	-	-
<b>PC5.</b> lift heavy objects safely using correct procedures	1	2	-	-
<b>PC6.</b> follow safety signages	1	2	-	-
<b>PC7.</b> maintain hands hygiene by washing hand frequently and thoroughly with soap and water or alcohol-based hand rub	1	2	-	-
<b>PC8.</b> inform the concerned person of any illness related to self and others	1	1	-	-
<b>PC9.</b> maintain workplace hygiene by disinfecting the equipment and tools regularly	1	2	-	-
<i>Follow safety procedures during emergency</i>	<b>11</b>	<b>15</b>	-	-
<b>PC10.</b> respond promptly and appropriately to an accident or in an emergency situation	1	2	-	-
<b>PC11.</b> use appropriate fire extinguishers for different types of fires correctly	2	2	-	-
<b>PC12.</b> follow appropriate rescue techniques during fire hazard	1	2	-	-
<b>PC13.</b> follow good housekeeping practice in order to prevent fire hazards	1	1	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC14.</b> inform fire safety department about any near-miss incidents in the work place	2	2	-	-
<b>PC15.</b> provide appropriate first aid to victims in an emergency situation	1	2	-	-
<b>PC16.</b> follow the applicable regulations and codes as per safety standard	1	2	-	-
<b>PC17.</b> prepare written accident/incident report and share with the concerned officer/department	2	2	-	-
<b>NOS Total</b>	<b>20</b>	<b>30</b>	-	-

## Qualification Pack

### National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	HYC/N9302
<b>NOS Name</b>	Maintain health, safety and security procedures
<b>Sector</b>	Hydrocarbon
<b>Sub-Sector</b>	Generic
<b>Occupation</b>	Generic, Generic
<b>NSQF Level</b>	4
<b>Credits</b>	2
<b>Version</b>	3.0
<b>Last Reviewed Date</b>	NA
<b>Next Review Date</b>	17/11/2025
<b>NSQC Clearance Date</b>	17/11/2022



## Qualification Pack

### DGT/VSQ/N0102: Employability Skills (60 Hours)

#### Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

#### Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Career Development & Goal Setting
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

#### Elements and Performance Criteria

##### *Introduction to Employability Skills*

To be competent, the user/individual on the job must be able to:

- PC1.** identify employability skills required for jobs in various industries
- PC2.** identify and explore learning and employability portals

##### *Constitutional values - Citizenship*

To be competent, the user/individual on the job must be able to:

- PC3.** recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.
- PC4.** follow environmentally sustainable practices

##### *Becoming a Professional in the 21st Century*

To be competent, the user/individual on the job must be able to:

- PC5.** recognize the significance of 21st Century Skills for employment
- PC6.** practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life

##### *Basic English Skills*

To be competent, the user/individual on the job must be able to:

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- PC7.** use basic English for everyday conversation in different contexts, in person and over the telephone
- PC8.** read and understand routine information, notes, instructions, mails, letters etc. written in English
- PC9.** write short messages, notes, letters, e-mails etc. in English

### *Career Development & Goal Setting*

To be competent, the user/individual on the job must be able to:

- PC10.** understand the difference between job and career
- PC11.** prepare a career development plan with short- and long-term goals, based on aptitude

### *Communication Skills*

To be competent, the user/individual on the job must be able to:

- PC12.** follow verbal and non-verbal communication etiquette and active listening techniques in various settings
- PC13.** work collaboratively with others in a team

### *Diversity & Inclusion*

To be competent, the user/individual on the job must be able to:

- PC14.** communicate and behave appropriately with all genders and PwD
- PC15.** escalate any issues related to sexual harassment at workplace according to POSH Act

### *Financial and Legal Literacy*

To be competent, the user/individual on the job must be able to:

- PC16.** select financial institutions, products and services as per requirement
- PC17.** carry out offline and online financial transactions, safely and securely
- PC18.** identify common components of salary and compute income, expenses, taxes, investments etc
- PC19.** identify relevant rights and laws and use legal aids to fight against legal exploitation

### *Essential Digital Skills*

To be competent, the user/individual on the job must be able to:

- PC20.** operate digital devices and carry out basic internet operations securely and safely
- PC21.** use e- mail and social media platforms and virtual collaboration tools to work effectively
- PC22.** use basic features of word processor, spreadsheets, and presentations

### *Entrepreneurship*

To be competent, the user/individual on the job must be able to:

- PC23.** identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research
- PC24.** develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion
- PC25.** identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity

### *Customer Service*

To be competent, the user/individual on the job must be able to:

- PC26.** identify different types of customers
- PC27.** identify and respond to customer requests and needs in a professional manner.

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**PC28.** follow appropriate hygiene and grooming standards

*Getting ready for apprenticeship & Jobs*

To be competent, the user/individual on the job must be able to:

**PC29.** create a professional Curriculum vitae (Résumé)

**PC30.** search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively

**PC31.** apply to identified job openings using offline /online methods as per requirement

**PC32.** answer questions politely, with clarity and confidence, during recruitment and selection

**PC33.** identify apprenticeship opportunities and register for it as per guidelines and requirements

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** need for employability skills and different learning and employability related portals

**KU2.** various constitutional and personal values

**KU3.** different environmentally sustainable practices and their importance

**KU4.** Twenty first (21st) century skills and their importance

**KU5.** how to use English language for effective verbal (face to face and telephonic) and written communication in formal and informal set up

**KU6.** importance of career development and setting long- and short-term goals

**KU7.** about effective communication

**KU8.** POSH Act

**KU9.** Gender sensitivity and inclusivity

**KU10.** different types of financial institutes, products, and services

**KU11.** how to compute income and expenditure

**KU12.** importance of maintaining safety and security in offline and online financial transactions

**KU13.** different legal rights and laws

**KU14.** different types of digital devices and the procedure to operate them safely and securely

**KU15.** how to create and operate an e- mail account and use applications such as word processors, spreadsheets etc.

**KU16.** how to identify business opportunities

**KU17.** types and needs of customers

**KU18.** how to apply for a job and prepare for an interview

**KU19.** apprenticeship scheme and the process of registering on apprenticeship portal

## Generic Skills (GS)

User/individual on the job needs to know how to:

**GS1.** read and write different types of documents/instructions/correspondence

**GS2.** communicate effectively using appropriate language in formal and informal settings

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- GS3.** behave politely and appropriately with all
- GS4.** how to work in a virtual mode
- GS5.** perform calculations efficiently
- GS6.** solve problems effectively
- GS7.** pay attention to details
- GS8.** manage time efficiently
- GS9.** maintain hygiene and sanitization to avoid infection

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### Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Introduction to Employability Skills</i>	<b>1</b>	<b>1</b>	-	-
<b>PC1.</b> identify employability skills required for jobs in various industries	-	-	-	-
<b>PC2.</b> identify and explore learning and employability portals	-	-	-	-
<i>Constitutional values - Citizenship</i>	<b>1</b>	<b>1</b>	-	-
<b>PC3.</b> recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
<b>PC4.</b> follow environmentally sustainable practices	-	-	-	-
<i>Becoming a Professional in the 21st Century</i>	<b>2</b>	<b>4</b>	-	-
<b>PC5.</b> recognize the significance of 21st Century Skills for employment	-	-	-	-
<b>PC6.</b> practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
<i>Basic English Skills</i>	<b>2</b>	<b>3</b>	-	-
<b>PC7.</b> use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
<b>PC8.</b> read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
<b>PC9.</b> write short messages, notes, letters, e-mails etc. in English	-	-	-	-
<i>Career Development &amp; Goal Setting</i>	<b>1</b>	<b>2</b>	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC10.</b> understand the difference between job and career	-	-	-	-
<b>PC11.</b> prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
<i>Communication Skills</i>	<b>2</b>	<b>2</b>	-	-
<b>PC12.</b> follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
<b>PC13.</b> work collaboratively with others in a team	-	-	-	-
<i>Diversity &amp; Inclusion</i>	<b>1</b>	<b>2</b>	-	-
<b>PC14.</b> communicate and behave appropriately with all genders and PwD	-	-	-	-
<b>PC15.</b> escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
<i>Financial and Legal Literacy</i>	<b>2</b>	<b>3</b>	-	-
<b>PC16.</b> select financial institutions, products and services as per requirement	-	-	-	-
<b>PC17.</b> carry out offline and online financial transactions, safely and securely	-	-	-	-
<b>PC18.</b> identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
<b>PC19.</b> identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
<i>Essential Digital Skills</i>	<b>3</b>	<b>4</b>	-	-
<b>PC20.</b> operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
<b>PC21.</b> use e- mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-
<b>PC22.</b> use basic features of word processor, spreadsheets, and presentations	-	-	-	-

### Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Entrepreneurship</i>	<b>2</b>	<b>3</b>	-	-
<b>PC23.</b> identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-
<b>PC24.</b> develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
<b>PC25.</b> identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
<i>Customer Service</i>	<b>1</b>	<b>2</b>	-	-
<b>PC26.</b> identify different types of customers	-	-	-	-
<b>PC27.</b> identify and respond to customer requests and needs in a professional manner.	-	-	-	-
<b>PC28.</b> follow appropriate hygiene and grooming standards	-	-	-	-
<i>Getting ready for apprenticeship &amp; Jobs</i>	<b>2</b>	<b>3</b>	-	-
<b>PC29.</b> create a professional Curriculum vitae (Résumé)	-	-	-	-
<b>PC30.</b> search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
<b>PC31.</b> apply to identified job openings using offline /online methods as per requirement	-	-	-	-
<b>PC32.</b> answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
<b>PC33.</b> identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
<b>NOS Total</b>	<b>20</b>	<b>30</b>	-	-

## Qualification Pack

### National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	DGT/VSQ/N0102
<b>NOS Name</b>	Employability Skills (60 Hours)
<b>Sector</b>	Cross Sectoral
<b>Sub-Sector</b>	Professional Skills
<b>Occupation</b>	Employability
<b>NSQF Level</b>	4
<b>Credits</b>	2
<b>Version</b>	1.0
<b>Last Reviewed Date</b>	NA
<b>Next Review Date</b>	31/03/2025
<b>NSQC Clearance Date</b>	31/03/2022

## Assessment Guidelines and Assessment Weightage

### Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Element/ 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 Element/ PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.
6. To pass the Qualification Pack assessment, every trainee should score the Recommended Pass % aggregate for the QP.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.



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**Minimum Aggregate Passing % at QP Level : 70**

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

## Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
HYC/N9101.General work shop practice followed in the shop floor	34	66	-	-	100	10
HYC/N9102.Welding using Manual Metal Arc welding/Shielded metal arc welding	41	59	-	-	100	15
HYC/N9103.Manually (semi-automatic) welding joints using the MIG/MAG	40	60	-	-	100	15
HYC/N9104.Perform Manually welding joints using the TIG (GTAW) Process	44	56	-	-	100	15
HYC/N9301.Working Effectively in a team	20	30	-	-	50	15
HYC/N9302.Maintain health, safety and security procedures	20	30	-	-	50	15
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	15
<b>Total</b>	<b>219</b>	<b>331</b>	<b>-</b>	<b>-</b>	<b>550</b>	<b>100</b>

## Qualification Pack

### Acronyms

<b>NOS</b>	National Occupational Standard(s)
<b>NSQF</b>	National Skills Qualifications Framework
<b>QP</b>	Qualifications Pack
<b>TVET</b>	Technical and Vocational Education and Training
<b>SS</b>	Stainless Steel
<b>PPE</b>	Personal Protective Equipment

## Qualification Pack

### Glossary

<b>Sector</b>	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.
<b>Sub-sector</b>	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
<b>Occupation</b>	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
<b>Job role</b>	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
<b>Occupational Standards (OS)</b>	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
<b>Performance Criteria (PC)</b>	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
<b>National Occupational Standards (NOS)</b>	NOS are occupational standards which apply uniquely in the Indian context.
<b>Qualifications Pack (QP)</b>	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
<b>Unit Code</b>	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
<b>Unit Title</b>	Unit title gives a clear overall statement about what the incumbent should be able to do.
<b>Description</b>	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.
<b>Scope</b>	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.

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<b>Knowledge and Understanding (KU)</b>	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
<b>Organisational Context</b>	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.
<b>Technical Knowledge</b>	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
<b>Core Skills/ Generic Skills (GS)</b>	Core skills or Generic Skills (GS) 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. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
<b>Electives</b>	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.
<b>Options</b>	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.