

QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR HYDROCARBON SECTOR

What are Occupational Standards(OS)?

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

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Qualifications Pack-Industrial Electrician (Oil & Gas)

SECTOR/S: HYDROCARBON

SUB-SECTOR: Downstream

OCCUPATION: Refineries

REFERENCE ID: HYC/Q 6101

ALIGNED TO: NCO-2015/3122.1400

Brief Job Description: Industrial Electrician installs, maintains, and performs repair work of electrical, electronic, and electrical wiring for well-functioning in an industrial environment specially in petroleum refinery and Demonstrable ability to use electrical and hand tools and electrical drawings and blueprints He has a thorough knowledge of safety procedures and legal regulations and guidelines

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

Qualifications Pack Code	HYC/Q 6101		
Job Role	Industrial Electrician (Oil & Gas)		
Credits (NSQF)	TBD	Version number	1.0
Sector	Hydrocarbon	Drafted on	31/03/2017
Sub-sector	Downstream	Last reviewed on	31/03/2017
Occupation	Refineries	Next review date	31/03/2019
NSQC Clearance on*	22/06/2017		

Job Role	Industrial Electrician (Oil & Gas)
Role Description	Industrial Electrician installs, maintains, and performs repair work of electrical, electronic, and electrical wiring for well-functioning in an Petroleum Refinery
NSQF Level	4
Minimum Educational Qualifications*	Class XII, Preferably
Maximum Educational Qualifications*	Diploma in Electrical
Prerequisite License or Training	<ul style="list-style-type: none"> Some training on basic electronics Some training in stress management like yoga is recommended Basic technical skills knowledge OISD standards.
Minimum Job Entry Age	18 Years
Experience	Preferably minimum 6 months
Applicable National Occupational Standards (NOS)	<p>Compulsory:</p> <ol style="list-style-type: none"> HYC/N 6101 job requirements and related processes. HYC/N 6102 Industrial Electrical wiring HYC/N 6103 Work effectively in a team HYC/N 6104 Follow health, safety and security procedures
Performance Criteria	As described in the relevant OS units

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

Acronyms

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

National Occupational Standard



Overview

This unit is about Understand job requirements and related processes.

Job Requirement and related process

Unit Code	HYC/N 6101
Unit Title (Task)	Job Requirement and related process
Description	Industrial electricians are responsible for smooth functioning of electrical work in an industry
Scope	<p>The unit/ task covers the following:</p> <ul style="list-style-type: none"> wiring work in the installation, repair and maintenance of electrical systems. Understanding the basic drawing Mathematical skills with respect to electrician Knowledge on different types of materials used Knowledge on basic workshop practice and tools used Knowledge on basic electronics
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
wiring work in the installation	<p>PC1. Understand Health and safety legislation, obligations and documentation</p> <p>PC2. Diagnostic approaches to problem solving</p> <p>PC3. Diligently follow electrical safety procedures</p> <p>PC4. Follow the situations when personal protective equipment must be used</p> <p>PC5. Identify and use the appropriate personal protective equipment including safety footwear, ear and eye protection</p> <p>PC6. Introduce related trades to support customer requirements</p> <p>PC7. The common types of problem which can occur within the work process</p> <p>PC8. The importance of keeping a tidy work area</p> <p>PC9. The principles of working safely with electricity</p> <p>PC10. Trends and developments in the industry including new technology,</p> <p>PC11. Work efficiently and check progress and outcomes regularly</p>
Understand the basics drawings	<p>PC12. Able to understand clearly the basics of Engineering drawing and how to make simple drawing.</p> <p>PC13. Able to draft and illustrate engineering drawing.</p> <p>PC14. Use Engineering drawing- Equipment, mini drafter etc.</p> <p>PC15. Ability to prepare drawing as per standard.</p> <p>PC16. Understand Projections</p> <ul style="list-style-type: none"> Isometric, Orthographic projections First angle and third angle projects Free hand sketching <p>PC17. Understand Dimensioning and Tolerance and its importance</p> <ul style="list-style-type: none"> Dimension lines as per SP-46 Tolerance, Application and examples <p>PC18. Draw, Read, interpret and revise drawings and documentation including:</p> <ul style="list-style-type: none"> Read, interpret and revise drawings and documentation including: Layout and circuit drawings Follow written instructions

	<p>PC19. Make wiring diagram including the following items</p> <ul style="list-style-type: none"> • DOL Starter • Star delta starter • Auto Transformer Starter • Rotor Resistor Starter • Control of 2 lamps from various positions <p>PC20. Able to make dimensional drawing of D.C machine parts</p> <ul style="list-style-type: none"> • Alternator Stator without winding • Alternator Rotor for smooth cylindrical type <p>PC21. Draw sketches of the following as per BIS specifications</p> <ul style="list-style-type: none"> • Earthing installation • Double Pole structure for LT and HT distribution line <p>PC22. Generate single line diagram of</p> <ul style="list-style-type: none"> • Single line diagram of 33/11KVA distribution substation • Single line diagram of 11/440 V distribution substation <p>PC23. Ability to use the computer to generate CAD for Electrical Drawing as follows</p> <ul style="list-style-type: none"> • Draw Electrical Symbols • Draw D.C machine parts (take printout) • Draw A.C machine parts (take printout) • A.C and D.C winding diagram • Draw electrical layout of electrical installation of a building
<p>Mathematical skills with respect to electrician</p>	<p>The user/individual on the job should be able to:</p> <p>PC24. Understand basic mathematical calculation.</p> <p>Revision of Arithmetic's</p> <ul style="list-style-type: none"> • Units of Metric, ISO and FPS • Addition Subtraction Multiplication and Division <p>PC25. Select and apply basic Calculation of area and volume</p> <ul style="list-style-type: none"> • Area of a square, rectangle, triangle and circle • Volume of a cube, cuboid, cylinder, sphere and hemisphere <p>PC26. use appropriate mathematical concepts and skills to solve problems in Fractions, Decimals, Percentage and ratio</p> <ul style="list-style-type: none"> • Conversion of fraction to decimals • Conversion of decimals to fractions • Problems in percentage and ratio and averages <p>PC27. Develop ability to perform basics of Algebra and understand Simple algebraic equations and problems</p> <p>PC28. Acquire the techniques of solving simple Trigonometric problems</p> <ul style="list-style-type: none"> • Introduction to sine, cosine and tan functions • Pythagoras theorem

	<ul style="list-style-type: none"> Identifies and simple problems.
<p>Knowledge on different types of materials used</p>	<p>The user/individual on the job should be able to:</p> <p>PC29.Ability to apply knowledge of Metals and non-metals</p> <p>PC30.Ability to identify Ferrous and non-ferrous metals</p> <p>PC31.Ability to integrate Steel - Properties and applications of the following: Carbon Steels and Alloy Steels</p> <p>PC32.Apply the basic principles of material selection to specific applications</p> <ul style="list-style-type: none"> Stainless Steel Non Ferrous metal -Properties and applications of the following:- Copper and its Alloys Aluminium and its alloys <p>PC33.Explain the differences in properties of different materials, including metals, alloys, ceramics, polymers and composites</p>
<p>Knowledge on basic workshop practice and tools used</p>	<p>The user/individual on the job should be able to:</p> <p>PC 34. To be able to work independently or as part of a team in the following areas</p> <p>Filing</p> <ul style="list-style-type: none"> Files – types, Specification, Application care and maintenance Filing – straight filing, cross filing Vices – Types and its application Safety <p>PC 35. Understand the task required and plan ahead what steps must be taken to achieve the outcome.</p> <p>Hack Sawing</p> <ul style="list-style-type: none"> Types of hack saw blades, Specification Application Hack sawing-selection of blade, fixing blade, Hack sawing procedure Safety and precautions <p>PC 36. Carry out marking on the materials as per the drawing using</p> <p>Marking</p> <ul style="list-style-type: none"> Scribers, dot punch, centre punch, letter and – no punches

Job Requirement and related process

- Scribing and punching procedure

PC 37. able to do the drilling as per

Drilling

- Specification of drills
- Selection of drills,
- Drilling machine- types specification application ,care and maintenance_
- Tools holding methods, work holding methods, determination of RPM

PC 38. Set up and adjust metalworking tools and do threading

Tapping

- Specification of taps,
- Determination of tap drill size for tapping,
- Tapping procedure and care

PC 39. Set up and/or operate hand tools

Chisels

- Types of chisels,
- Specification,
- Application,
- Precautions to be taken while chiselling.

PC 40. Correctly use and maintain the tools

Hammers

- Types of hammers,
- Specification,
- Application

Spanners

- Types,
- Specification,
- Application

Fasteners

- Types,
- Specification,
- Application

PC 41. 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 Calliper- Application, specification and care

Job Requirement and related process

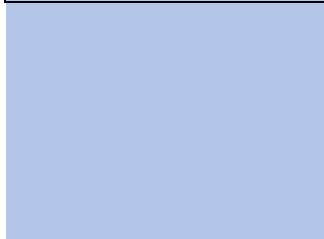
	<ul style="list-style-type: none"> • Vernier Calliper- Application, specification and care • Micro meter- Application, specification and care • Radius and Fillet Gauges, use and care • Weld Gauges – To verify size of weld. <p>PC 42. Knowledge and ability to use different hand tools and power tools in plumbing and appreciate the advantage of correct tools used.</p>
<p>Knowledge on basic electronics</p>	<p>PC 43. Understand the basics of Fundamentals of electronics and also to select and install</p> <p>PC 44 knowledge of Active & Passive components and where are they used</p> <p>PC 45. Knowledge of different application and use of electronics devices, Diode- Rectifier, Logic gate wave shaping circuits, Transistor – amplifier, switch, impedance matching, Oscillator circuit, UJT-relaxation oscillator.</p> <p>PC 46. Knowledge of the Basics of digital electronics</p> <ul style="list-style-type: none"> • Logic Gates • Combinational and sequential circuit
<p>Knowledge and Understanding (K)</p>	
<p>A. Organizational Context (Knowledge of the company / organization and its processes)</p>	<p>KA1. company’s policies on: personnel management, duty reporting procedure and associated MIS compliance</p> <p>KA2. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions</p> <p>KA3. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities</p> <p>KA4. reporting structure within organization and relevant people and their responsibilities within the work area</p> <p>KA5. problem escalation procedure and escalation matrix for reporting work and employment related issues</p> <p>KA6. Standard operating procedure while working</p> <p>KA7. relevant health and safety requirements applicable in the work place</p> <p>KA8. importance of working in clean and safe environment</p> <p>KA9. documentation and related procedures applicable in the context of employment and work</p> <p>KA10. importance and purpose of documentation in context of employment and work</p>
<p>B. Technical Knowledge</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. Should be able to use automation and as tool and has an idea of</p> <ul style="list-style-type: none"> • Basics of microprocessor and its applications • Basics micro controller and its applications • Basics of PLC system and its functions,

	<ul style="list-style-type: none"> • Application of PLC system in electrical control system <p>KB2.Application of power electronics and its use in different fields</p> <ul style="list-style-type: none"> • Power Transistor • SCR (Silicon Control Rectifier) • MOSFET (Metal Oxide Semiconductor field effect Transistor) • IGBT (Insulated gate Bipolar Transistor) <p>KB3.Knowledge on thermal power generation</p> <ul style="list-style-type: none"> • Thermal power plant operation • Functional diagram of thermal power generation <p>KB4.How mechanical maintenance of electric motor is done</p> <ul style="list-style-type: none"> • Removing and fixing bearings • Dismantling, cleaning of motors • Aligning couplings • Basics of gear and belt drives • Lubrication • Study of electrical equipment open cost mine industry • Study of electrical equipment under cost mine industry <p>KB5.Correct termination adaptors used for entry of conduits into boxes, boards and ducts</p> <p>KB6.Diagnose electrical installations and identify problems including: bad connections, incorrect wiring, high loop impedance and equipment failure</p> <p>KB7.Install and securely attach different types of cable ladder and cable tray to a surface</p> <p>KB8.nstall and securely fix double insulated cables onto cable ladder, cable tray and different surfaces as per manufacturer’s instructions and current industrial standards</p> <p>KB9.Install metal and plastic conduits/flexible conduits and attach securely onto surface, maintaining even radius bends, without distortion to conduit</p> <p>KB10.Repair and replace faulty components in electrical installations</p> <p>KB11.Rewire and or repair faulty installations</p> <p>KB12.Select and install single and double insulated cables inside ducts, conduits and flexible conduits</p> <p>KB13.Troubleshoot electrical installations and identify faults including: short and open circuits, incorrect polarity, insulation resistance and earth continuity faults, incorrect settings on equipment and incorrect program on programmable devices</p> <p>KB14.Use, test and calibrate measuring equipment including: insulation resistance, continuity and installation testers, multi, clamp and network cable testers</p>
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	<p>SA18. describe the difference between Celsius & Fahrenheit Scale and relationship between them</p> <p>SA19. 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</p> <p>SA20. interpret and express tolerance in terms of limits on dimensions perform</p> <p>SA21.basic operations in a computer like switching it on/off, using the mouse and keyboard, accessing files, opening, closing, creating and deleting folders, etc.</p> <p>SA22.use basic office applications like spread sheet, word processor, presentations</p> <p>SA23.use organizational software specific to quality function</p> <p>SA24. use email to communicate within the organization as per organization guidelines</p> <p>SA25. retrieve and enter data using standard system forms and templates</p> <p>SA26.take printouts of documents</p>
<p>B. Professional Skills</p>	<p>Decision Making</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB1.identify problems with work planning, procedures, output and behaviour and their implications</p> <p>SB2. prioritize and plan for problem solving</p> <p>SB3.communicate problems appropriately to others</p> <p>SB4.identify sources of information and support for problem solving</p> <p>SB5.seek assistance and support from other sources to solve problems</p> <p>SB6.identify effective resolution techniques</p> <p>SB7.select and apply resolution techniques</p> <p>SB8.seek evidence for problem resolution</p>
	<p>Plan and organise</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB9.plan, prioritize and sequence work operations as per job requirements</p> <p>SB10. organize and analyse information relevant to work</p> <p>SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time</p>
	<p>Problem Solving</p>
<p>The user/individual on the job needs to know and understand how to:</p> <p>SB12. undertake and express new ideas and initiatives to others</p> <p>SB13 modify work plan to overcome unforeseen difficulties or developments that occur as work progresses</p> <p>SB14. one's competencies in new and different situations and contexts to achieve more</p>	
<p>Analytical Thinking</p>	

Job Requirement and related process

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



NOS Version Control

NOS Code	HYC / N 6101		
Credits(NSQF)	TBD	Version number	1.0
Industry	Hydrocarbon	Drafted on	31/03/2017
Industry Sub-sector	Downstream	Last reviewed on	31/03/2017
Occupation	Refineries	Next review date	31/03/2019



National Occupational Standard



Overview

This unit covers the Industrial wiring, laying and maintenance operations at various types of Industry.

Unit Code	HYC/N 6102
Unit Title (Task)	Industrial Electrical wiring
Description	Industrial electrician installs, maintain, services and repairs wiring and other electrical devices and systems in an industry
Scope	<p>The unit/ task covers the following:</p> <ul style="list-style-type: none"> • Basics of Electricity • Single Phase and Poly Phase System • Knowledge of Indian Electrical Rules (Ie Rules) • Usage of Different Types of Wiring • Industrial Wiring • Illumination Specification Application of Different Elements Of Circuits • Transformer Care and Maintenances • Motor and D.C Motor • Generator • Single Line Diagram of Electrical Wiring System • Circuit Breaker/ Switch Gear Care and Maintenance • Cable and Cable Joints • Earthing System • Power System and Measurement
Performance Criteria(PC) w.r.t. the Scope	
Basics of Electricity	<p>The user/individual on the job needs to know and understand:</p> <p>PC1. Understand the principle of electricity</p> <p>PC2. Will be able to define</p> <ul style="list-style-type: none"> • Voltage, • resistor, • current, • power <p>PC3. The importance of basic laws – Ohms law, KVL & KCL)</p> <p>PC4. The principles D.C Circuits (Source, Load)</p> <p>PC5. Understand the basics of Cell and Battery</p> <p>PC6. The correct operation of the electrical installation in accordance with the planned specification</p>
Single Phase and Poly Phase System	<p>PC7.Able to install of various electrical power supplies, such as single phase, three-phase, direct current and low voltage.</p> <p>PC8.Follow the terminologies like</p> <ul style="list-style-type: none"> • amplitude, • phase angle, • cycle, • frequency, • power • power factor <p>PC9.Read , understand and interpret drawings and documentation including</p>

Industrial Electrical Wiring

	<ul style="list-style-type: none"> • 1\emptyset System through RLC circuits with phase diagram • 3\emptyset System- generation of 3\emptyset system • 3 \emptyset type 1.Star, 2.Delta <p>PC10.understand Conversion of Star to Delta And Conversion of Delta to Star</p>
<p>Knowledge Of Indian Electrical Rules (Ie Rules)</p>	<p>PC11. Understand Indian Electrical standard rules.</p> <p>PC12. Awareness of Rules and Regulation of Electrical Inspectorate other standardize authority</p> <p>PC13. Industrial regulations and standards applicable to different types of installations</p> <p>PC14. Verification standards, methods and reports to be used to record verification results</p>
<p>Usage of Different Types of Wiring</p>	<p>PC15. Diligently follow electrical safety procedures</p> <p>PC16. Identify and use the appropriate personal protective equipment including safety footwear, ear and eye protection</p> <p>PC17. Select, use, clean, maintain and store all tools and equipment safely</p> <p>PC18. Read, interpret and revise drawings and documentation including:</p> <ul style="list-style-type: none"> • Layout and circuit drawings • Follow written instructions <p>PC19. Plan installation work using drawings and documentation provided</p> <p>PC20. Ducting and wiring systems for commercial, domestic, residential, godown, agricultural and industrial use and when and where to use a specific ducting and/or wiring system</p> <p>PC21. The range of electrical switchboards used for commercial, domestic, residential, agricultural and industrial uses and when and where to use a specific switchboard system including staircase wiring and master control wiring</p> <p>PC22. Types of electric lighting and heating systems for commercial, domestic residential and industrial use</p> <p>PC23. Understand different control devices and socket outlets used for commercial, domestic, residential, agricultural and industrial uses</p> <p>PC24. Install structured cabling systems including: computer network cabling, fire/burglar alarm), control and monitoring, access control closed circuit television.</p>

Industrial Electrical Wiring

<p>Industrial Wiring</p>	<p>PC25. Plan installation work using drawings and documentation provided PC26. Trends and developments in the industry including new technology, standards and working methods. PC27. Range of materials and installation techniques to be used in different environments PC28. Different types of standards, drawings, installation descriptions and manuals PC29. Assemble different termination adaptors, including glands onto duct and attach ducts, of different types, securely onto a surface PC30. Ability to use</p> <ul style="list-style-type: none"> • Direct ON Line start (Both power line and control) • Star – Delta Stator
<p>Illumination Specification Application Of Different Elements Of Circuits</p>	<p>PC31. Different types of installations for</p> <ul style="list-style-type: none"> • Fluorescent Light • Metal Halide • High Pressure Mercury Vapour • High Pressure Sodium Vapour • LED • Flame Proof Lighting Fixtures
<p>Transformer Care And Maintenances</p>	<p>PC32. Select and install equipment as per drawings and documentation provided PC33. Understand the following elements</p> <ul style="list-style-type: none"> • Parts of transformer • Working principle and construction • Types of transformer and its use (Single phase & Poly phase) • Spatial Transformer (Auto, CT, PT) construction and its application • Maintenance of transformer oil testing and filtration • Inspection of silica gel, breather, conservator, temperature • Maintenance of HT and LT Transformers yards
<p>Motor</p>	<p>PC34. Connect A.C Motor as per instructions provided to include: structured cabling systems as per manufacturer's instructions and current industrial standards and regulations PC35. Understand the working A.C Motor and its Construction PC36. How the classification of A.C motor (Synchronous and Asynchronous) is done PC37. The working and type of single phase motor and its working and poly phase (3 phase) and its working PC38. Set-up equipment to Speed control and torque control of AC motor PC39. Advantage of AC drive system</p>

	<p>PC40. Ability for assembling and replacing of bearing with proper equipment's, referring to the standard catalogue.</p> <p>PC41. Troubleshoot and take general care maintenance of AC motor</p>
<p>D.C Motor</p>	<p>PC42. Different types of DC motors and the following details</p> <ul style="list-style-type: none"> • Motor construction and working • Type of DC motor • Torque equation of DC motor • Characteristics of DC motor • Application of DC motor • Speed control of DC motor • DC drive system • General care maintenance of DC motor <p>PC43. The importance of Special Electrical Motor in relation to petro chemical industry</p> <ul style="list-style-type: none"> • Universal motor • Servo motor • Stepper motor • Brush Less A.C motor and Brush Less D.C motor • Flame proof motors, Specification, Application, Care & maintenance
<p>Generator</p>	<p>PC44. Install the required electrical supply systems including transformers, generators, circuit breakers, isolators, bus bars, measuring equipment for voltage, current, power, energy, frequency, RPM, wiring, fuses, earthing, switchboard, control panels, relays etc. as per the required specifications.</p> <p>PC45. Conduct a test process to ensure the performance of installed electrical equipment as per the defined specifications</p> <p>PC46. Understand the different elements of generator as below:</p> <ul style="list-style-type: none"> • Construction and working of generator • Characteristics of generator • Type of DC generator • EMF equation • Application of DC generator • Maintenance with ABC type • Alternator construction & characteristics • Types, Application & Maintenance of alternator • Diesel Generator Care & Maintenance • Basics of engine • Basics of fuel system, Basics of air system, Basics of lubrication system, Basics of cooling system • DG control panel. • General maintenance

<p>Study Of Single Line Diagram Of Electrical Wiring System</p>	<p>PC47. Read, interpret and study drawings and documentation including:</p> <ul style="list-style-type: none"> • Layout and circuit drawings • Follow written instructions <p>PC48. Plan installation work using drawings and documentation provided</p> <p>PC49. Understand and read the Symbol of electrical parts</p> <p>PC50. Ability to connect and track of electrical diagram</p> <p>PC51. Able to properly layout structure of substation and work instruction</p>
<p>Circuit Breaker/ Switch Gear Care And Maintenance</p>	<p>PC52. Install electrical switchboards onto a surface in a secure way and assemble switchboard apparatus in a switchboard as per layout drawings</p> <p>PC53. Test installations before energizing and check for proper connection</p> <p>PC54. Test installations when energized by checking complete function on all equipment and installed to ensure correct operation of new installation as per instructions</p> <p>PC55. Understand the working of the following elements</p> <ul style="list-style-type: none"> • Definition and use of circuit breaker • Type of switch • SPST, SPDT, DPST, DPDT, Toggle switch, pushbutton switch, level actuator, limit switch, selector switch, flame proof switch • Types of circuit breaker : <ul style="list-style-type: none"> ▪ MCB ▪ MCCB ▪ ELCB ▪ Air circuit breaker (ACB) ▪ SF6 ▪ Vacuum Breaker (VCB) ▪ Flame Proof Switch gears Specification, Application, Care & maintenance.
<p>Cable And Cable Joints</p>	<p>PC56. Identify cable types and sizes Types of cables, specification current rating, application</p> <p>PC57. Identify sub-circuits and determine cable for connection of security control panel.</p> <p>PC58. Install and terminate cable to connect security control panel to existing sub-circuit.</p> <p>PC59. Knowledge of Flame proof cables Specification, Application, Care & maintenance.</p> <p>PC60. Inspect, test, rectify abnormal conditions, and commission connection of circuit.</p> <p>PC61. The ability to different joints in the cable</p> <ul style="list-style-type: none"> • Straight through, long routes and repaired section • Branch Y joints – for branch of a sector • T- Joint – for branching of a sector • Transition Joints – Special joint between two different types of cable <p>PC62. Troubleshoot electrical installations and identify faults in cable</p>

<p>Earthing System</p>	<p>PC63. Understand earth attachment positions on conductors, plant and equipment and the local earth are described in terms of earthing terminals, tail clamp attachment points, clamp rating and compatibility.</p> <p>PC64. Check earthing in terms of portable earths, voltage rating, fault level, and conductor rating.</p> <p>PC65. Ability to do earthing compliance requirements are described in terms of acceptable surface condition and cleanliness; and clamps, leads, fittings, sticks and poles, and terminations.</p> <p>PC66. Understand the importance of</p> <ul style="list-style-type: none"> • Importance of earthing in electrical and hazard system • Types of earthing system desired value • Measurement of earth resistance • Earthing in Transformer • Earthing in substation
<p>Power System and Measurement</p>	<p>STAND BY POWER SYSTEM</p> <p>PC67. Explain the type and working of different stand by power systems like</p> <ul style="list-style-type: none"> • Basics of UPS, online and offline • Basics of inverter and its controls • Basics of cells and battery and rating • Care and maintenance of battery banks and its controls <p>MEASURING INSTRUMENTS AND MEASURING EQUIPMENTS</p> <p>PC68. Ability to use different measuring instruments and their calibration</p> <ul style="list-style-type: none"> • Digital multimeter and adaptor • Power meter • Phase sequence meter • Clamp on multi meter • Continuity tester • Ground Fault tester • Insulation tester (meger) • Versatile Data logger <p>Ability to handle the following equipment's, their function, care and calibration</p> <ul style="list-style-type: none"> • Study of CRO • Study of Tacho meter and speed measurement using proximity • Study of vibration analyzer • Study of frequency analyzer • Study of phase sequence analyzer • Study of Temperature controller • Study of pressure measurement

Knowledge and Understanding (K)	
<p>A. Organizational Context (Knowledge of the company / organization and its processes)</p>	<p>KA1. Understand company's policies on: personnel management, duty reporting procedure and associated MIS compliance</p> <p>KA2. Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction</p> <p>KA3. Reviews and approves the requisition of materials/equipment by assigned employees</p> <p>KA4. Reviews and approves the requisition of materials/equipment by assigned employees; may tag and store material as necessary</p> <p>KA5. Maintains records and prepares reports on repairs completed or on units requiring future special service</p> <p>KA6. Works closely with project coordinates, administration, and/or other related staff to determine and coordinate projects, estimating and controlling craft-related project costs, operational needs, troubleshooting, etc.</p> <p>KA7. Ability to understand and carry out work direction in a safe manner</p> <p>KA8. Importance of working in clean and safe environment</p> <p>KA9. Ability to document related procedures applicable in the context of employment and work</p>
<p>B. Technical Knowledge</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. Knowledge codes, legislation and regulations</p> <p>KB2. What are the installation methods and instrumentation conductors and cables, grounding and bonding</p> <p>KB3. Type of distribution equipment, electronics and electrical equipment power distribution protective devices, fluid power</p> <p>KB4. Knowledge on pneumatic and hydraulic systems, high voltage systems, and fire alarm, building</p> <p>KB5. Understand systems and control systems including programmable logic controller</p> <p>KB6. Able to systematically diagnose faults in electrical and electronic systems and equipment and repairs or replaces electrical and electronic</p> <p>KB7. Ability to splice and terminate electrical conductors</p> <p>KB8. Do the tests electrical and electronic equipment for proper function</p> <p>KB9. Understand magnetism, direct current machines, alternating current circuit theory and single phase transformers</p> <p>KB10. Electrical Code dealing with commercial wiring practices</p> <p>KB11. Introduces the student to the basic principles of fluid mechanics and hydraulic system</p>
Skills (S)	
<p>A. Core Skills/ Generic Skills</p>	<p>Basic reading and writing skills</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA1. Follow verbal and written instructions</p> <p>SA2. Communicate orally and in writing with other team members, leaders and operations personnel</p>

Industrial Electrical Wiring

	SA3. Determining personnel matters (such as job progress, schedule changes, time sheet review, and work performance)
	SA4. Knowledge of human resource and supervisory activities, including the coordination and management of people and resources
	Communication skills
	The user/individual on the job needs to know and understand how to:
	SA5. Work within company policy as outlined
	SA6. Read, write and communicate using English language sufficient to perform job functions
	SA7. Ability to understand and carry out work direction in a safe manner
	SA8. Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions
	SA9. Ability to listen to and understand information and ideas presented through spoken words and sentences
	Teamwork and multitasking
SA10. Performs other related duties as assigned	
SA11. Ability to apply general rules to specific problems to produce answers that make sense	
SA12. Participates in the management of personnel matters/activities	
Numerical and computational skills	
SA13. Mathematics –Knowledge of arithmetic, algebra, geometry, , and their applications	
Learning	
The user/individual on the job needs to know and understand how to:	
SA14. participate in on-the-job and other learning, training and development interventions and assessments	
SA15. clarify task related information with appropriate personnel or technical adviser	
SA16. seek to improve and modify own work practices	
SA17. maintain current knowledge of application standards, legislation, codes of practice and product/process developments	
B. Professional Skills	Decision Making
	The user/individual on the job needs to know and understand how to:
	SB1.identify problems with work planning, procedures, output and behaviour and their implications
	SB2. prioritize and plan for problem solving
	SB3.communicate problems appropriately to others
	SB4.identify sources of information and support for problem solving
	SB5.seek assistance and support from other sources to solve problems
	SB6.identify effective resolution techniques
	SB7.select and apply resolution techniques
	SB8.seek evidence for problem resolution

	Plan and organise
	The user/individual on the job needs to know and understand how to: SB9.plan, prioritize and sequence work operations as per job requirements SB10. organize and analyse information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB12. undertake and express new ideas and initiatives to others SB13 modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB14. one's competencies in new and different situations and contexts to achieve more
	Analytical Thinking
The user/individual on the job needs to know and understand how to: SB15. exercise restraint while expressing dissent and during conflict situations SB16. avoid and manage distractions to be disciplined at work SB17. manage own time for achieving better results	
Critical Thinking	
The user/individual on the job needs to know and understand how to: SB18. work in a team in order to achieve better results SB19. identify and clarify work roles within a team SB20. communicate and cooperate with others in the team for better results SB21. seek assistance from fellow team members	

NOS Version Control

NOS Code	HYC / N 6102		
Credits(NSQF)	TBD	Version number	1.0
Industry	Hydrocarbon	Drafted on	31/03/2017
Industry Sub-sector	Downstream	Last reviewed on	31/03/2017
Occupation	Refineries	Next review date	31/03/2019



National Occupational Standard



Overview

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

Unit Code	HYC/N 6103
Unit Title (Task)	Work effectively in a team
Description	This NOS unit is about working effectively within a team, either in individual's own work group or in other work groups outside the organization.
Scope	This unit/task covers the following: <ul style="list-style-type: none"> Effective team work
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria
Effectively work in team	To be competent, the user/individual on the job must be able to: <ul style="list-style-type: none"> PC1. maintain clear communication with colleagues PC2. work with colleagues as a team PC3. pass on information to in line with organisational requirements PC4. work in ways that show respect for colleagues PC5. carry out commitments made to colleagues PC6. let colleagues know in good time if cannot carry out commitments, explaining the reasons PC7. identify problems in working with colleagues and take the initiative to solve these problems PC8. follow the organisation's policies and procedures for working with colleagues PC9. ability to share resources with other members as per priority of tasks
Knowledge and Understanding (K) w.r.t. the scope	
A. Organisational Context (Knowledge of the Company/Organisation and its processes)	The user/individual on the job needs to know and understand: <ul style="list-style-type: none"> KA1. the organization's policies and procedures for working with colleagues, role and responsibilities in relation to this KA2. the importance of effective communication and establishing good working relationships with colleagues KA3. different methods of communication and the circumstances in which it is appropriate to use these KA4. the importance of creating an environment of trust and mutual respect KA5. the implications of own work on the work and schedule of others
B. Technical Knowledge	The user/individual on the job needs to know and understand: <ul style="list-style-type: none"> KB1. different types of information that colleagues might need and the importance of providing this information when it is required KB2. the importance of helping colleagues with problems, in order to meet quality and time standards as a team

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

HYC /N 6103

Work effectively in team

NOS Version Control

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



National Occupational Standard



Overview

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

Unit Code	HYC/N 6104
Unit Title (Task)	Follow health, safety and security procedures
Description	This OS unit is about knowledge and practices relating to health, safety and security that need to use. It covers responsibilities towards self, others, assets and the environment. It includes Knowledge of Hazardous Materials Rules, understanding of risks and hazards in the workplace, deal with accidents, emergencies, etc. It covers knowledge of fire safety, common first aid applications, safe practices and emergency procedures.
Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Health and Safety • Fire safety • Safety systems • Emergencies, rescue and first-aid procedures
Performance Criteria(PC) w.r.t. the Scope	
Health and safety	<p>The user/individual on the job should be able to:</p> <p>PC1.use protective clothing/equipment for specific tasks and work Conditions</p> <p>PC2.state the name and location of people responsible for health and safety in the workplace</p> <p>PC3.state the names and location of documents that refer to health and safety in the workplace</p> <p>PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace</p> <p>PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others</p> <p>PC6.state methods of accident prevention in the work environment of the job role Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors</p> <p>PC7.state location of general health and safety equipment in the workplace</p> <p>PC8.inspect for faults, set up and safely use steps and ladders in general use</p> <p>Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/ unfixed nuts or bolts, etc.</p> <p>Ladders set up: firm/level base, clip/lash down, leaning at the correct angle, etc.</p> <p>PC9.work safely in and around trenches, elevated places and confined areas</p> <p>PC10. lift heavy objects safely using correct procedures</p>

	<p>PC11. apply good housekeeping practices</p> <p>PC12. identify common hazard signs displayed in various areas</p> <p>PC13. retrieve and/or point out documents that refer to health and safety in the workplace</p>
Fire safety	<p>The user/individual on the job should be able to:</p> <p>PC14. use the various appropriate fire extinguishers on different types of fires correctly</p> <p>PC15. demonstrate rescue techniques applied during fire hazard</p> <p>PC16. demonstrate good housekeeping in order to prevent fire hazards</p> <p>PC17. demonstrate the correct use of a fire extinguisher</p>
Safety systems	<p>PC18. List issue concerning the safety and familiar in your work style</p> <p>PC19. Empower to address the unsafe condition in your work place or to stop the unsafe behaviour</p> <p>PC20. Record all miss incidents ,damages, illness or injury</p> <p>PC21. Comprehend the applicable laws, regulations and codes as per standard</p> <p>PC22. Promote and maintain a positive safety culture</p> <p>PC23. Apply and appraise the use and storage of hazardous substance and their safety</p> <p>PC24. Assess the threats and to protect from the threats</p> <p>PC25. Awareness of own safety and safety of others</p> <p>PC26. Bring the concern and report the HSE concern</p> <p>PC27. Report all incident to the supervisor</p> <p>PC28. Identifies and describes the property of different petroleum products. Characteristics and potential Hazardous</p> <ul style="list-style-type: none"> • Volatile products • Light distillates • Middle distillates • Fuel oils • Lubrication Oils • Waxes • Bitumen <p>PC29. Operates and handle spills and respond to the spills</p>
Emergencies, rescue and first-aid procedures	<p>The user/individual on the job should be able to:</p> <p>PC30. demonstrate how to free a person from electrocution</p> <p>PC31. Administer appropriate first aid to victims were required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.</p> <p>PC32. demonstrate basic techniques of bandaging</p> <p>PC33. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments</p> <p>PC34. perform and organize loss minimization or rescue activity during an accident in real or simulated environments</p>

Follow health, safety and security procedures

	<p>PC35. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases</p> <p>PC36. demonstrate the artificial respiration and the CPR Process</p> <p>PC37. participate in emergency procedures Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work</p> <p>PC38. complete a written accident/incident report or dictate a report to another person, and send report to person responsible Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified</p> <p>PC39. demonstrate correct method to move injured people and others during an emergency</p>
Knowledge and Understanding (K)	
<p>A. Organizational Context (Knowledge of the company / organization and its processes)</p>	<p>KA1. company's policies on: personnel management, duty reporting procedure and associated MIS compliance</p> <p>KA2. reporting structure within organization</p> <p>KA3. problem escalation procedure</p> <p>KA4. Standard operating procedure while transporting petroleum products</p>
<p>B. Technical Knowledge</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. meaning of "hazards" and "risks"</p> <p>KB2. health and safety hazards commonly present in the work environment and related precautions</p> <p>KB3. possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible</p> <p>KB4. possible causes of risk and accident Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness)</p> <p>KB5.methods of accident prevention Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors</p> <p>KB6.safe working practices when working with tools and machines</p> <p>KB7.safe working practices while working at various hazardous sites</p> <p>KB8.where to find all the general health and safety equipment in the workplace</p> <p>KB9.various dangers associated with the use of electrical equipment</p>

	<p>KB10. preventative and remedial actions to be taken in the case of exposure to toxic materials Exposure: ingested, contact with skin, inhaled Preventative action: ventilation, masks, protective clothing/ equipment); Remedial action: immediate first aid, report to supervisor Toxic materials: solvents, flux, lead</p> <p>KB11. importance of using protective clothing/equipment while working</p> <p>KB12. precautionary activities to prevent the fire accident</p> <p>KB13. various causes of fire Causes of fires: heating of metal; spontaneous ignition; sparking; electrical heating; loose fires (smoking, welding, etc.); chemical fires; etc.</p> <p>KB14. techniques of using the different fire extinguishers</p> <p>KB15. different methods of extinguishing fire</p> <p>KB16. different materials used for extinguishing fire Materials: sand, water, foam, CO2, dry powder</p> <p>KB17. rescue techniques applied during a fire hazard</p> <p>KB18. various types of safety signs and what they mean</p> <p>KB19. appropriate basic first aid treatment relevant to the condition eg. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries</p> <p>KB20. content of written accident report</p> <p>KB21. potential injuries and ill health associated with incorrect manual handling</p> <p>KB22. safe lifting and carrying practices</p> <p>KB23. personal safety, health and dignity issues relating to the movement of a person by others</p> <p>KB24. potential impact to a person who is moved incorrectly</p>
<p>Skills (S) [Optional] A. Core Skills/ Generic Skills</p>	<p>Communication skills</p> <p>The user/ individual on the job needs to know and understand how to:</p> <p>SA1. communicate the safety, cleanliness and emergency issues to supervisor.</p> <p>SA2. read and comprehend basic content to read labels, charts, signage</p> <p>SA3. read and comprehend basic English to read manuals of operations</p> <p>SA4. read and write an accident/incident report in local language or English</p> <p>Oral Communication (Listening and Speaking skills)</p> <p>The user/ individual on the job needs to know and understand how to:</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA5. question co-workers appropriately in order to clarify instructions and other issues</p> <p>SA6. give clear instructions to co-workers, subordinates others</p>
<p>B. Professional Skills</p>	<p>Decision Making</p>

	The user/individual on the job needs to know and understand how to: SB1. make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB2. plan and organize work to achieve targets and deadlines
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB3. check that the work meets customer requirements SB4. deliver consistent and reliable service to customers
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB5. apply problem solving approaches in different situations
	Critical Thinking
The user/individual on the job needs to know and understand how to: SB6. apply balanced judgments to different situations	



HYC / N 6104

Follow health, safety and security procedures

NOS Version Control

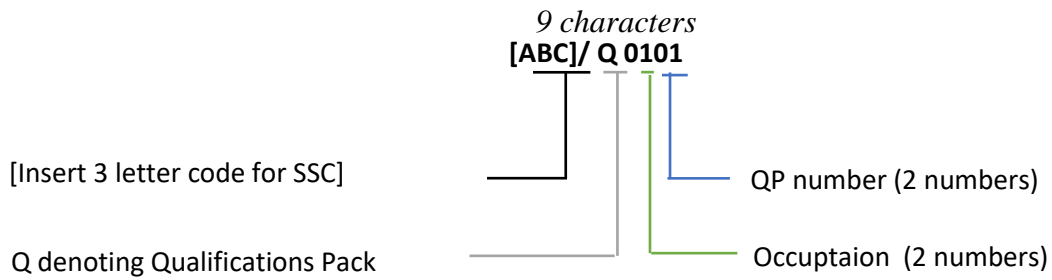
NOS Code	HYC / N 6104		
Credits(NSQF)	TBD	Version number	1.0
Industry	Hydrocarbon	Drafted on	31/03/2017
Industry Sub-sector	Downstream	Last reviewed on	31/03/2017
Occupation	Refineries	Next review date	31/03/2019



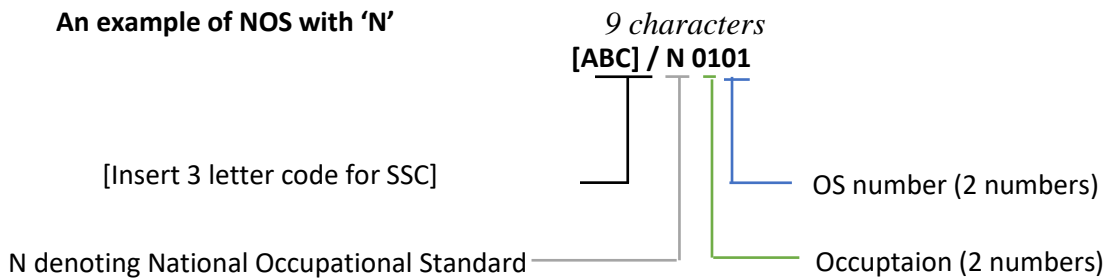
Annexure

Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard



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CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role Industrial Electrician (Oil & Gas)

Qualification Pack HYC/Q 6101

Sector Skill Council Hydrocarbon Sector Skill Council

Guidelines for Assessment

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

Compulsory NOS				Marks Allocation	
Total Marks: [45]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
HYC/N 6101 Job requirements and related processes	PC1.Understand Health and safety legislation, obligations and documentation	45	1	1	0
	PC2.Diagnostic approaches to problem solving		1	0.5	0.5
	PC3. Diligently follow electrical safety procedures		1	0.5	0.5
	PC4. Follow the situations when personal protective equipment must be used		1	0.5	0.5
	PC5. Identify and use the appropriate personal protective equipment including safety footwear, ear and eye protection		1	0.5	0.5
	PC6. Introduce related trades to support customer requirements		1	0.5	0.5
	PC7. The common types of problem which can occur within the work process		1	0.5	0.5
	PC8.The importance of keeping a tidy work area		1	0.5	0.5
	PC9.The principles of working safely with		1	0.5	0.5

Compulsory NOS				Marks Allocation	
Total Marks: [45]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
	electricity				
	PC10. Trends and developments in the industry including new technology,		1	0.5	0.5
	PC11. Work efficiently and check progress and outcomes regularly		1	0.5	0.5
	PC12. Able to understand clearly the basics of Engineering drawing and how to make simple drawing.		1	0.5	0.5
	PC13. Able to draft and illustrate engineering drawing.		1	0.5	0.5
	PC14. Use Engineering drawing- Equipment, mini drafter etc		1	0.5	0.5
	PC15. Ability to prepare drawing as per standard.		1	0.5	0.5
	PC16. Understand Projections		1	0.5	0.5
	PC17. Understand Dimensioning and Tolerance and its importance		1	0.5	0.5
	PC18. Draw ,Read, interpret and revise drawings and documentation including:		1	0.5	0.5
	PC19. Make wiring diagram of DOL starter, star delta starter		1	0.5	0.5
	PC20. Able to make dimensional drawing of D.C machine parts		1	0.5	0.5
	PC21. Draw sketches of the following as per BIS specifications		1	0.5	0.5
	PC22. Generate single line diagram of distribution substation		1	0.5	0.5
	PC23. Ability to use the computer to generate CAD for Electrical Drawing		1	0.5	0.5
	PC24. Understand basic mathematical calculation.		1	0.5	0.5
	PC25. Select and apply basic Calculation of area and volume		1	0.5	0.5
	PC26. use appropriate mathematical concepts and skills to solve problems in Fractions, Decimals, Percentage and ratio		1	0.5	0.5
	PC27. Develop ability to perform basics of Algebra and understand Simple algebraic equations and problem		1	0.5	0.5
	PC28. Acquire the techniques of solving simple Trigonometric problems		1	0.5	0.5
	PC29. Ability to apply knowledge of Metals and non-metals		1	0.5	0.5
	PC30. Ability to identify Ferrous and non-ferrous metals		1	0.5	0.5
	PC31. Ability to integrate Steel - Properties and applications of the following Carbon Steels and Alloy Steels		1	0.5	0.5

Compulsory NOS				Marks Allocation	
Total Marks: [45]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
	PC33.Explain the differences in properties of different materials, including metals, alloys, ceramics, polymers and composites		1	0.5	0.5
	PC 34.To be able to work independently or as part of a team in the following areas		1	0.5	0.5
	PC 35.Understand the task required and plan ahead what steps must be taken to achieve the outcome		1	0.5	0.5
	PC 36.Carry out marking on the materials as per the drawing using		1	0.5	0.5
	PC 37.Will be able to do the drilling		1	0.5	0.5
	PC 38.Set up and adjust metalworking tools and do threading		1	0.5	0.5
	PC 39.Set up and/or operate hand tools		1	0.5	0.5
	PC 40.Correctly use and maintain the tools		1	0.5	0.5
	PC 41.Measure and mark materials as per the drawing and Check accuracy and quality of finished parts		1	0.5	0.5
	PC 42. Knowledge and ability to use different hand tools and power tools in plumbing and appreciate the advantage of correct tools used.		1	0.5	0.5
	PC 43.Under the basics of Fundamentals of electronics and also to select and install		1	0.5	0.5
	PC 44. Active & Passive components and where are they used		1	0.5	0.5
	PC 45.Different application and use of electronics devices ,Diode- Rectifier, Logic gate wave shaping circuits, Transistor – amplifier, switch, impedance matching, Oscillator circuit, UJT- relaxation oscillator.		1	0.5	0.5
	PC 46. Knowledge of the Basics of digital electronics		1	0.5	0.5
		total	45	23	22

Compulsory NOS				Marks Allocation	
Total Marks: [100]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
HYC/N 6102 Industrial Electrical wiring	PC1.Understand the principle of electricity	100	1	1	0
	PC2.Will be able to define <ul style="list-style-type: none"> ○ Voltage, ○ resistor, ○ current, power 		1	1	0
	PC3.The importance of basic laws – Ohms law		1	0.5	0.5
	PC4.The principles D.C Circuits (Source		2	1	1
	PC5.Understand the basics of Cell and Battery		2	1	1
	PC6.The correct operation of the electrical installation in accordance with the planned specification		1	0.5	0.5
	PC7.Able to install of various electrical power supplies, such as single phase, three-phase, direct current and low voltage.		2	1	1
	PC8.Follow the terminologies like <ul style="list-style-type: none"> ○ amplitude, ○ phase angle, ○ cycle, ○ frequency, ○ power ○ power factor 		1	0.5	0.5
	PC9.Read , understand and interpret drawings and documentation including <ul style="list-style-type: none"> ○ 1∅ System through RLC circuits with phase diagram ○ 3∅ System- generation of 3∅ system ○ 3 ∅ type 1.Star, 2.Delta 		2	1	1
	PC10.understand Conversion of Star to Delta And Conversion of Delta to Star		1	0.5	0.5
	PC11.Understand Indian Electrical standard rules.		2	1	1
	PC12.Awareness of Rules and Regulation of Electrical Inspectorate other standardize authority		1	0.5	0.5
	PC13.Industrial regulations and standards applicable to different types of installations		1	0.5	0.5
	PC 14. Verification standards, methods and reports to be used to record verification results		1	1	0
	PC15.Diligently follow electrical safety procedures		1	0	1
	PC16.Identify and use the appropriate personal protective equipment including safety footwear, ear and eye protection		1	0.5	0.5
	PC17.Select, use, clean, maintain and store all tools and equipment safely		1	0.5	0.5
	PC18.Read, interpret and revise drawings and documentation including: <ul style="list-style-type: none"> • Layout and circuit drawings 		2	1	1

Compulsory NOS				Marks Allocation	
Total Marks: [100]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
	<ul style="list-style-type: none"> Follow written instructions 				
	PC19. Plan installation work using drawings and documentation provided		1	0.5	0.5
	PC20. Ducting and wiring systems for commercial, domestic, residential, godown, agricultural and industrial use and when and where to use a specific ducting and/or wiring system		1	0.5	0.5
	PC21. The range of electrical switchboards used for commercial, domestic, residential, agricultural and industrial uses and when and where to use a specific switchboard system including staircase wiring and master control wiring		1	0.5	0.5
	PC22. Types of electric lighting and heating systems for commercial, domestic residential and industrial use		1	0.5	0.5
	PC23. Understand different control devices and socket outlets used for commercial, domestic, residential, agricultural and industrial uses		1	0.5	0.5
	PC24. Install structured cabling systems including: computer network cabling, fire/burglar alarm), control and monitoring, access control closed circuit television.		1	0.5	0.5
	PC25. Plan installation work using drawings and documentation provided Trends and developments in the industry including new technology, standards and working methods.		1	0.5	0.5
	PC26. Range of materials and installation techniques to be used in different environments		1	0.5	0.5
	PC28. Different types of standards, drawings, installation descriptions and manuals		1	0.5	0.5
	PC30. Ability to use <ul style="list-style-type: none"> Direct ON Line start (Both power line and control) Star – Delta Stator 		2	1	1
	PC31. Different types of installations for <ul style="list-style-type: none"> Fluorescent Light Metal Halide High Pressure Mercury Vapour High Pressure Sodium Vapour LED Flame Proof Lighting Fixtures 		2	1	1
	PC32. Select and install equipment as per drawings and documentation provided		2	1	1
	PC33. Understand the following elements <ul style="list-style-type: none"> Parts of transformer Working principle and construction Types of transformer and its use (Single phase & Poly phase) 		3	1.5	1.5

Compulsory NOS				Marks Allocation	
Total Marks: [100]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
	<ul style="list-style-type: none"> ○ Spatial Transformer (Auto, CT, PT) construction and its application ○ Maintenance of transformer oil testing and filtration ○ Inspection of silica gel, breather, conservator, temperature ○ Maintenance of HT and LT Transformers yards 				
	PC34. Connect A.C Motor as per instructions provided to include: structured cabling systems as per manufacturer's instructions and current industrial standards and regulations		3	1.5	1.5
	PC35 Understand the working A.C Motor and its Construction		2	1	1
	PC36 How the classification of A.C motor (Synchronous and Asynchronous) is done		1	0.5	0.5
	PC37 The working and type of single phase motor and its working and poly phase (3 phase) and its working		1	0.5	0.5
	PC38 Set-up equipment to Speed control and torque control of AC motor		1	0.5	0.5
	PC39 Advantage of AC drive system		2	1	1
	PC40 Ability for assembling and replacing of bearing with proper equipment's, referring to the standard catalogue.		1	0.5	0.5
	PC41 Troubleshoot and take general care maintenance of AC motor		1	0.5	0.5
	PC42. Different types of DC motors and the following details <ul style="list-style-type: none"> ○ Motor construction and working ○ Type of DC motor ○ Torque equation of DC motor ○ Characteristics of DC motor ○ Application of DC motor ○ Speed control of DC motor ○ DC drive system ○ General care maintenance of DC motor 		2	1	1
	PC43. The importance of Special Electrical Motor in relation to petro chemical industry <ul style="list-style-type: none"> ○ Universal motor ○ Servo motor ○ Stepper motor ○ Brush Less A.C motor and Brush Less D.C motor Flame proof motors, Specification, Application, Care & maintenance		2	1	1
	PC44. Install the required electrical supply systems including transformers, generators, circuit breakers, isolators, bus bars, measuring		2	1	1

Compulsory NOS				Marks Allocation	
Total Marks: [100]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
	equipment for voltage, current, power, energy, frequency, RPM, wiring, fuses, earthing, switchboard, control panels, relays etc. as per the required specifications.				
	PC45 Conduct a test process to ensure the performance of installed electrical equipment as per the defined specifications		2	1	1
	PC46 Understand the different elements of generator as below: ○		2	1	1
	PC47. Read, interpret and study drawings and documentation including: • Layout and circuit drawings • Follow written instructions		3	1.5	1.5
	PC48. Plan installation work using drawings and documentation provided		1	0.5	0.5
	PC49. Understand and read the Symbol of electrical parts		1	0.5	0.5
	PC50. Ability to connect and track of electrical diagram		1	0.5	0.5
	PC51. Able to properly layout structure of substation and work instruction		1	0.5	0.5
	PC52. Install electrical switchboards onto a surface in a secure way and assemble switchboard apparatus in a switchboard as per layout drawings		1	0.5	0.5
	PC53. Test installations before energizing and check for proper connection PC54. Test installations when energized by checking complete function on all equipment and installed to ensure correct operation of new installation as per instructions		2	1	1
	PC55. Understand the working of the following elements		4	2	2
	PC56. Identify cable types and sizes Types of cables, specification current rating, application		2	1	1
	PC57. Identify sub-circuits and determine cable for connection of security control panel.		1	0.5	0.5
	PC58. Install and terminate cable to connect security control panel to existing sub-circuit.		1	0.5	0.5
	PC59. Knowledge of Flame proof cables Specification, Application, Care & maintenance.		2	1	1
	PC60. Inspect, test, rectify abnormal conditions, and commission connection of circuit		1	0.5	0.5
	PC61. The ability to different joints in the cable		3	1.5	1.5
	PC62. Troubleshoot electrical installations and identify faults in cable		1	0.5	0.5
	PC63. Understand earth attachment positions on conductors, plant and equipment and the local		3	1.5	1.5

Compulsory NOS				Marks Allocation	
Total Marks: [100]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
	earth are described in terms of earthing terminals, tail clamp attachment points, clamp rating and compatibility.				
	PC64. Check earthing in terms of portable earths, voltage rating, fault level, and conductor rating.		1	0.5	0.5
	PC65. Ability to do earthing compliance requirements are described in terms of acceptable surface condition and cleanliness; and clamps, leads, fittings, sticks and poles, and terminations.		1	0.5	0.5
	PC66. Understand the importance of <ul style="list-style-type: none"> ○ Importance of earthing in electrical and hazard system ○ Types of earthing system desired value ○ Measurement of earth resistance ○ Earthing in Transformer ○ Earthing in substation 		2	1	1
	PC67. Explain the type and working of different stand by power systems like <ul style="list-style-type: none"> ○ Basics of UPS, online and offline ○ Basics of inverter and its controls ○ Basics of cells and battery and rating ○ Care and maintenance of battery banks and its controls 		2	1	1
	PC68. Ability to use different measuring instruments and their calibration <ul style="list-style-type: none"> ○ Digital multimeter and adaptor ○ Power meter ○ Phase sequence meter ○ Clamp on multi meter ○ Continuity tester ○ Ground Fault tester ○ Insulation tester (meger) Versatile Data logger Ability to handle the following equipment's, their function, care and calibration		2	1	1
		total	100	51	49

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

Compulsory NOS				Marks Allocation	
Total Marks: [100]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
HYC/N 6104 <u>Follow health, safety and security procedures</u>	PC1.use protective clothing/equipment for specific tasks and work Conditions	100	2	1	1
	PC2.state the name and location of people responsible for health and safety in the workplace		2	1	1
	PC3.state the names and location of documents that refer to health and safety in the workplace		2	1	1
	PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace		3	1	2
	PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others		2	1	1
	PC6.state methods of accident prevention in the work environment of the job role Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors		3	1	2
	PC7.state location of general health and safety equipment in the workplace		2	1	1
	PC8.inspect for faults, set up and safely use steps and ladders in general use		2	1	1

Compulsory NOS				Marks Allocation	
Total Marks: [100]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
	PC9.work safely in and around trenches, elevated places and confined areas		3	2	1
	PC10. lift heavy objects safely using correct procedures		2	1	1
	PC11. apply good housekeeping practices		2	1	1
	PC12. identify common hazard signs displayed in various areas		2	1	1
	PC13.retrieve and/or point out documents that refer to health and safety in the workplace		2	1	1
	PC14. use the various appropriate fire extinguishers on different types of fires correctly		3	1	2
	PC15. demonstrate rescue techniques applied during fire hazard		3	1	2
	PC16. demonstrate good housekeeping in order to prevent fire hazards		3	1	2
	PC17. demonstrate the correct use of a fire extinguisher		3	1	2
	PC18. List issue concerning the safety and familiar in your work style		3	1	2
	PC19. Empower to address the unsafe condition in your work place or to stop the unsafe behaviour		3	1	2
	PC20. Record all miss incidents ,damages, illness or injury		2	1	1
	PC21. Comprehend the applicable laws, regulations and codes as per standard		3	1	2
	PC22. Promote and maintain a positive safety culture		2	1	1
	PC23. Apply and appraise the use and storage of hazardous substance and their safety		3	1	2
	PC24. Assess the threats and to protect from the threats		2	1	1
	PC25. Awareness of own safety and safety of others		3	1	2
	PC26. Bring the concern and report the HSE concern		2	1	1
	PC27. Report all incident to the supervisor		3	1	2
	PC28. Identifies and describes the property of different petroleum products.		2	1	1
	PC29. Operates and handle spills and respond to the spills		3	1	2
	PC30. demonstrate how to free a person from electrocution		3	1	2
	PC31. Administer appropriate first aid to victims were required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		3	1	2
	PC32. demonstrate basic techniques of bandaging		2	1	1

Compulsory NOS				Marks Allocation	
Total Marks: [100]					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
	PC33. respond promptly and appropriately to an accident situation		3	1	2
	PC34. perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC35. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	PC36. demonstrate the artificial respiration and the CPR Process		2	1	1
	PC37. participate in emergency procedures		2	1	1
	PC38. complete a written accident/incident report or dictate a report to another person, and send report to person responsible Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified		5	2	3
	PC39. demonstrate correct method to move injured people and others during an emergency		2	1	1
	TOTAL		100	41	59