

Qualification Pack



Pipe Fitter -Oil & Gas/City Gas Distribution

Electives: Pipe Fitter - Oil & Gas/ Pipe Fitter – City Gas Distribution

QP Code: HYC/Q6103

Version: 4.0

NSQF Level: 4

Hydrocarbon Sector Skill Council || OIDB Bhawan, Tower C, 2nd Floor, Plot No. 2, Vikas Marg, Sector – 73



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HYC/Q6103: Pipe Fitter -Oil & Gas/City Gas Distribution

Brief Job Description

The individual at Pipe Fitter (Oil & Gas) is responsible for pipe fitting, joining, laying and installation of metal pipe in refineries, petrochemicals, factories, etc., or any place with massive pipes, vents, and ducts. The person at Pipe Fitter (City Gas Distribution) is responsible for pipe fitting, joining and welding of different types of pipes used for Piped Natural Gas (PNG) connection to residential, commercial, industrial consumers, and CNG stations

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/N9301: Working Effectively in a team](#)
2. [HYC/N9302: Maintain health, safety and security procedures](#)
3. [DGT/VSQ/N0102: Employability Skills \(60 Hours\)](#)

Electives(*mandatory to select at least one*):

Elective 1: Pipe Fitter - Oil & Gas

The individual at Pipe Fitter (Oil & Gas) is responsible for pipe fitting, joining, laying and installation of metal pipe in refineries, petrochemicals, factories, etc., or any place with massive pipes, vents, and ducts

1. [HYC/N6109: Perform Pipe Fitting activity](#)
2. [HYC/N6110: Perform Pipe laying and joining activity](#)

Elective 2: Pipe Fitter – City Gas Distribution

The person at Pipe Fitter (City Gas Distribution) is responsible for pipe fitting, joining and welding of different types of pipes used for Piped Natural Gas (PNG) connection to residential, commercial, industrial consumers, and CNG stations

1. [HYC/N6105: Fitting, Welding Basics and Joining Process of Materials](#)
2. [HYC/N6106: Perform Electrofusion Welding](#)

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Qualification Pack (QP) Parameters

Sector	Hydrocarbon
Sub-Sector	Midstream
Occupation	Pipe Fitting in Oil and Gas, Pipe Fitting in Oil and Gas
Country	India
NSQF Level	4
Credits	33
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7126.0301
Minimum Educational Qualification & Experience	10th grade pass (with 2-years relevant experience) OR 12th grade Pass OR 8th grade pass (plus 2-years of NTC plus 1-year NAC) OR 10th grade pass (plus 2-year of National Trade Certificate (NTC) in relevant field) OR Completed 2nd year of the 3-year diploma after 10 (in relevant field and pursuing regular Diploma)
Minimum Level of Education for Training in School	10th Class
Pre-Requisite License or Training	Training on basic machining skill Training in stress management like yoga is recommended Basic technical skills knowledge on pneumatics and hydraulics
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	28/02/2026
NSQC Approval Date	17/11/2022
Version	4.0
Reference code on NQR	2022/HYC/HSSCI/06774
NQR Version	4.0

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Remarks:

NA

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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:

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- 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

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Assessment Criteria

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

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National Occupational Standards (NOS) Parameters

NOS Code	HYC/N9301
NOS Name	Working Effectively in a team
Sector	Hydrocarbon
Sub-Sector	Generic
Occupation	Generic, Generic
NSQF Level	4
Credits	2
Version	3.0
Last Reviewed Date	18/02/2025
Next Review Date	18/02/2028
NSQC Clearance Date	18/02/2025

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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:

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- 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

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Assessment Criteria

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

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

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National Occupational Standards (NOS) Parameters

NOS Code	HYC/N9302
NOS Name	Maintain health, safety and security procedures
Sector	Hydrocarbon
Sub-Sector	Generic
Occupation	Generic, Generic
NSQF Level	4
Credits	2
Version	3.0
Last Reviewed Date	18/02/2025
Next Review Date	18/02/2028
NSQC Clearance Date	18/02/2025

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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>	1	1	-	-
PC1. identify employability skills required for jobs in various industries	-	-	-	-
PC2. identify and explore learning and employability portals	-	-	-	-
<i>Constitutional values – Citizenship</i>	1	1	-	-
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	-	-	-	-
<i>Becoming a Professional in the 21st Century</i>	2	4	-	-
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	-	-	-	-
<i>Basic English Skills</i>	2	3	-	-
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	-	-	-	-
<i>Career Development & Goal Setting</i>	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. understand the difference between job and career	-	-	-	-
PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
<i>Communication Skills</i>	2	2	-	-
PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
PC13. work collaboratively with others in a team	-	-	-	-
<i>Diversity & Inclusion</i>	1	2	-	-
PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
<i>Financial and Legal Literacy</i>	2	3	-	-
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	-	-	-	-
<i>Essential Digital Skills</i>	3	4	-	-
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	-	-	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Entrepreneurship</i>	2	3	-	-
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	-	-	-	-
<i>Customer Service</i>	1	2	-	-
PC26. identify different types of customers	-	-	-	-
PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
PC28. follow appropriate hygiene and grooming standards	-	-	-	-
<i>Getting ready for apprenticeship & Jobs</i>	2	3	-	-
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	-	-	-	-
NOS Total	20	30	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0102
NOS Name	Employability Skills (60 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

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HYC/N6109: Perform Pipe Fitting activity

Description

A refinery pipefitters job entails building and ensuring the integrity of the pipes that will transport oil, gas or steam. This is achieved through many job functions

Scope

The scope covers the following :

- Understand the pipe line layout drawings
- Mathematical skills with respect to plumbing
- Knowledge on different types of materials used in plumbing
- Identify the tools and tackles that are required to carry out the assigned job
- Pipe fitting operation

Elements and Performance Criteria

Understand the pipe line layout drawings

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

- PC1.** able to understand clearly the basics of engineering drawing and how to make simple drawing.
- PC2.** able to draft and illustrate a pipe line system.
- PC3.** read the pipe chart , technical details etc
- PC4.** ability to prepare the bill of materials for doing the pipe line fabrication.
- PC5.** understand blue print reading including standard symbols used in plumbing and also different piping lines and valves used in plumbing.
- PC6.** read and interpret hangers and support drawing.

Mathematical skills with respect to Pipe fitting

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

- PC7.** mathematics knowledge of arithmetic, algebra, geometry, and their applications
- PC8.** basic knowledge on area, volume, angles and length
- PC9.** calculate length and diameter of the pipe system using the metric system as well as english system.
- PC10.** calculate dimensions of the bend required in plumbing.

Knowledge on different types of materials used in Pipe fitting

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

- PC11.** knowledge on different materials used for plumbing
- PC12.** highlight the property of different pipe material and their workability.

Preparation of pipe line

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

- PC13.** understand the different bends, elbows, shapes, joints etc used to fabricate the pipes.

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- PC14.** identify and discriminate different types of nuts, bolts, screws, clamps, fixtures etc. used in plumbing.
- PC15.** able to understand the different packing materials, adhesives, gaskets, o ring, ropes etc. and how to cut gaskets using a cutting machine.
- PC16.** install and check for the functions of different types of valves, gauges and other related accessories.

Identify the tools and tackles that are required to carry out the assigned job

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

- PC17.** knowledge and ability to use different hand tools and power tools in pipe fitting (oil & gas) and appreciate the advantage of correct tools used. pipe cutter copper pipe deburring tools pipe expander set pipe bending fixtures flaring set threading tools ratchet spanner valve fix bits and drive socket set pipe pliers chain pipe vice spirit level steel rule try square plastic pipe cutter ratchet copper cutter pipe chamfering kit cartridge soldering torch drain cleaning spiral cast iron screw clamp flat chisel chisels with hand grip crow bar shovel lever bar scraper iron pick axe shop floor broom expander flaring tools portable power bender combination plier regular plier water pump plier pipe wrench adjustable wrench hammer type screw driver flat tip screw driver c clamp double open ended spanner ring spanner tubular box spanner socket set universal socket joint set claw hammer ball peen hammer soft mallet hammer hacksaw and frames different types of blades (hcs, hss and bi-metal) ptfе tape silicon paste saws portable drilling machine impact drill rotary hammer drills pullers portable tri-stand vice bench yoke vice thread cutting dies die stock

Pipe fitting Operation

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

- PC18.** install, repair and maintain high and low-pressure pipe systems used in manufacturing plants, oil refineries, chemical plants, breweries, power plants, food processing plants, paper mills, ships and factories
- PC19.** use the appropriate equipment, parts and accessories for the pipe fitting or assembling operation as per the standards.
- PC20.** check for the calibration date of all measuring equipment
- PC21.** identification and preparation of suitable datum from which to start the marking .
- PC22.** application of marking medium to enhance clarity of the marking and proper visibility.
- PC23.** carry out appropriate method of marking
- PC24.** use a range of marking out equipment (e.g. rules, squares, scribes, vernier instruments)
- PC25.** mark out a range of feature
- PC26.** plan the pipe fitting activities before starting as per the drawing.
- PC27.** cut the pipes to the appropriate lengths making allowances for bending using appropriate cutting operations and techniques
- PC28.** produce pipework bends using the appropriate tools and equipment for the types and sizes of pipe
- PC29.** assemble and secure the pipework as per job specifications using appropriate pipe assembly methods and techniques
- PC30.** produce pipework assemblies which combine a range of different fittings
- PC31.** dismantle pipework assemblies without damage to components and/or subassemblies
- PC32.** 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

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- PC33.** keep the work area in a safe and tidy condition during and on completion of the manufacturing activities
- PC34.** return all tools and equipment to the correct location on completion of the fitting activities
- PC35.** perform the necessary checks for correct pipework assembly and dimensional accuracy
- PC36.** use the appropriate measuring equipment for checking activities
- PC37.** produce components within all of the applying standards
- PC38.** generate stage inspection reports

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** companys policies on: personnel management, duty reporting procedure and associated mis compliance
- KU2.** legislation, standards, policies, and procedures followed in the company relevant to town 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 plain and its importance in piping.
- KU14.** understand to establish a proper datum
- KU15.** ensure 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 in plumbing.
- KU19.** how to make different types of threads on a pipe and also the different methods of thread production.
- KU20.** knowledge on different pipe materials and the performance of this material in different application.
- KU21.** basic knowledge of the property and behaviour of fluids, liquids and gases,
- KU22.** awareness on basic hydraulic and pneumatic elements and the working.

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- KU23.** knowledge of heating and cooling including thermal expansion and contraction of piping system under various condition.
- KU24.** knowledge to calculate pipe diameter.
- KU25.** knowledge on seal screw joint.
- KU26.** different types of equipments used for threading of pipes.
- KU27.** knowledge on behaviour of flow of liquids, gaseous and solid materials.
- KU28.** making of drawing using standard symbols, proper representation and layout.
- KU29.** thorough understanding of location and environment where the piping is done in the following area:
- KU30.** knowledge on different gadgets used in plumbing
- KU31.** knowledge on the different operation that can be carried out using earth moving equipments.
- KU32.** application of different cutting fluids used while working on ferrous metals: e.g. carbon steels, stainless steels, cast iron, toolsteel, hard metals; non-ferrous metals: e.g. bronze, aluminium, copper and copper alloys
- KU33.** knowledge to identify correct orientation of pipe fitting in regard to the flow.
- KU34.** methods used for testing the pipe line.
- KU35.** use of different fasteners for both temporary and permanent fastening.
- KU36.** importance of assembly methods, techniques and procedure to be maintained while pipe fitting.
- KU37.** how to do positioning, aliening and fastening an assembly.
- KU38.** precaution to be taken while using adhesives, cements and sealing compound.

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.

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- GS13.** Undertake numerical operations, and calculations using calculators Numerical computations: addition (with decimal digits and with carrying), subtraction (with decimal digits and with borrowing), multiplication (with decimal digits), division (with decimal digit), fractions and decimals, percentages and proportions, simple ratios and averages
- GS14.** identify and draw various basic, compound and solid shapes as per dimensions given Basic shapes: square, rectangle, triangle, circle Compound shapes: involving squares, rectangles, triangles, circles, semi-circles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder
- GS15.** demonstrate measurement and calculation of Angle, Perimeter, Area of a common geometrical shape and can co-relate with job area requirements
- GS16.** use appropriate measuring techniques and units of measurement
- GS17.** use British and metric system of measurement and make conversions between them
- GS18.** describe the difference between Celsius & Fahrenheit Scale and relationship between them
- GS19.** 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
- GS20.** interpret and express tolerance in terms of limits on dimensions perform
- GS21.** basic operations in a computer like switching it on/off, using the mouse and keyboard, accessing files, opening, closing, creating and deleting folders, etc.
- GS22.** use basic office applications like spread sheet, word processor, presentations
- GS23.** use organizational software specific to quality function
- GS24.** use email to communicate within the organization as per organization guidelines
- GS25.** retrieve and enter data using standard system forms and templates
- GS26.** take printouts of documents
- GS27.** participate in on-the-job and other learning, training and development interventions and assessments
- GS28.** clarify task related information with appropriate personnel or technical adviser
- GS29.** seek to improve and modify own work practices
- GS30.** maintain current knowledge of application standards, legislation, codes of practice and product/process developments
- GS31.** identify problems with work planning, procedures, output and behaviour and their implications
- GS32.** prioritize and plan for problem solving
- GS33.** communicate problems appropriately to others
- GS34.** identify sources of information and support for problem solving
- GS35.** seek assistance and support from other sources to solve problems
- GS36.** identify effective resolution techniques
- GS37.** select and apply resolution techniques
- GS38.** seek evidence for problem resolution
- GS39.** plan, prioritize and sequence work operations as per job requirements
- GS40.** organize and analyse information relevant to work
- GS41.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time

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- GS42.** undertake and express new ideas and initiatives to others
- GS43.** modify work plan to overcome unforeseen difficulties or developments that occurs work progresses
- GS44.** ones competencies in new and different situations and contexts to achieve more
- GS45.** exercise restraint while expressing dissent and during conflict situations
- GS46.** avoid and manage distractions to be disciplined at work
- GS47.** manage own time for achieving better results
- GS48.** work in a team in order to achieve better results
- GS49.** identify and clarify work roles within a team
- GS50.** communicate and cooperate with others in the team for better results
- GS51.** seek assistance from fellow team members

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Understand the pipe line layout drawings</i>	6	9	-	-
PC1. able to understand clearly the basics of engineering drawing and how to make simple drawing.	1	2	-	-
PC2. able to draft and illustrate a pipe line system.	1	1	-	-
PC3. read the pipe chart , technical details etc	1	1	-	-
PC4. ability to prepare the bill of materials for doing the pipe line fabrication.	1	1	-	-
PC5. understand blue print reading including standard symbols used in plumbing and also different piping lines and valves used in plumbing.	1	2	-	-
PC6. read and interpret hangers and support drawing.	1	2	-	-
<i>Mathematical skills with respect to Pipe fitting</i>	4	7	-	-
PC7. mathematics knowledge of arithmetic, algebra, geometry, and their applications	1	2	-	-
PC8. basic knowledge on area, volume, angles and length	1	2	-	-
PC9. calculate length and diameter of the pipe system using the metric system as well as english system.	1	1	-	-
PC10. calculate dimensions of the bend required in plumbing.	1	2	-	-
<i>Knowledge on different types of materials used in Pipe fitting</i>	2	4	-	-
PC11. knowledge on different materials used for plumbing	1	2	-	-
PC12. highlight the property of different pipe material and their workability.	1	2	-	-
<i>Preparation of pipe line</i>	4	7	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. understand the different bends, elbows, shapes, joints etc used to fabricate the pipes.	1	1	-	-
PC14. identify and discriminate different types of nuts, bolts, screws, clamps, fixtures etc. used in plumbing.	1	2	-	-
PC15. able to understand the different packing materials, adhesives, gaskets, o ring, ropes etc. and how to cut gaskets using a cutting machine.	1	2	-	-
PC16. install and check for the functions of different types of valves, gauges and other related accessories.	1	2	-	-
<i>Identify the tools and tackles that are required to carry out the assigned job</i>	1	2	-	-
PC17. knowledge and ability to use different hand tools and power tools in pipe fitting (oil & gas) and appreciate the advantage of correct tools used. pipe cutter copper pipe deburring tools pipe expander set pipe bending fixtures flaring set threading tools ratchet spanner valve fix bits and drive socket set pipe pliers chain pipe vice spirit level steel rule try square plastic pipe cutter ratchet copper cutter pipe chamfering kit cartridge soldering torch drain cleaning spiral cast iron screw clamp flat chisel chisels with hand grip crow bar shovel lever bar scraper iron pick axe shop floor broom expander flaring tools portable power bender combination plier regular plier water pump plier pipe wrench adjustable wrench hammer type screw driver flat tip screw driver c clamp double open ended spanner ring spanner tubular box spanner socket set universal socket joint set claw hammer ball peen hammer soft mallet hammer hacksaw and frames different types of blades (hcs, hss and bi-metal) ptfе tape silicon paste saws portable drilling machine impact drill rotary hammer drills pullers portable tri-stand vice bench yoke vice thread cutting dies die stock	1	2	-	-
<i>Pipe fitting Operation</i>	21	33	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC18. install, repair and maintain high and low-pressure pipe systems used in manufacturing plants, oil refineries, chemical plants, breweries, power plants, food processing plants, paper mills, ships and factories	1	1	-	-
PC19. use the appropriate equipment, parts and accessories for the pipe fitting or assembling operation as per the standards.	1	2	-	-
PC20. check for the calibration date of all measuring equipment	1	2	-	-
PC21. identification and preparation of suitable datum from which to start the marking .	1	2	-	-
PC22. application of marking medium to enhance clarity of the marking and proper visibility.	1	1	-	-
PC23. carry out appropriate method of marking	1	1	-	-
PC24. use a range of marking out equipment (e.g. rules, squares, scribes, vernier instruments)	1	2	-	-
PC25. mark out a range of feature	1	2	-	-
PC26. plan the pipe fitting activities before starting as per the drawing.	1	2	-	-
PC27. cut the pipes to the appropriate lengths making allowances for bending using appropriate cutting operations and techniques	1	2	-	-
PC28. produce pipework bends using the appropriate tools and equipment for the types and sizes of pipe	1	2	-	-
PC29. assemble and secure the pipework as per job specifications using appropriate pipe assembly methods and techniques	1	1	-	-
PC30. produce pipework assemblies which combine a range of different fittings	1	1	-	-
PC31. dismantle pipework assemblies without damage to components and/or subassemblies	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC32. 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	-	-
PC33. keep the work area in a safe and tidy condition during and on completion of the manufacturing activities	1	1	-	-
PC34. return all tools and equipment to the correct location on completion of the fitting activities	1	1	-	-
PC35. perform the necessary checks for correct pipework assembly and dimensional accuracy	1	1	-	-
PC36. use the appropriate measuring equipment for checking activities	1	2	-	-
PC37. produce components within all of the applying standards	1	2	-	-
PC38. generate stage inspection reports	1	2	-	-
NOS Total	38	62	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	HYC/N6109
NOS Name	Perform Pipe Fitting activity
Sector	Hydrocarbon
Sub-Sector	Midstream
Occupation	Pipe Fitting in Oil & Gas, Pipe Fitting in Oil and Gas
NSQF Level	4
Credits	7
Version	3.0
Last Reviewed Date	NA
Next Review Date	17/11/2025
NSQC Clearance Date	17/11/2022

Qualification Pack

HYC/N6110: Perform Pipe laying and joining activity

Description

A refinery pipefitters job entails building and ensuring the integrity of the pipes that will transport oil, gas or steam.

Scope

The scope covers the following :

- Understand the pipe joining
- line layout for petroleum product distribution
- Oil and products
- Knowledge on different types of joining in plumbing
- Pipe line laying
- Physical requirement

Elements and Performance Criteria

Understand the pipe line layout for petroleum product distribution

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

- PC1.** the different procedures involved in planning of pipe line laying Natural Gas Transmission System
- PC2.** knowledge of what material to be transported
- PC3.** understand specific regulations covering pipe line operation and that could affect the populated area, drinking water sources and ecological sensitive area.
- PC4.** plan procedure for long distance pipe line. Preliminary planning Route selection Acquisition Soil boring Testing Pipe line design reading Check for legal permit availability.
- PC5.** start and execute the pipe line work Way preparation Stringing Trenching River crossing Welding, coating and wrapping Pipe laying Inspecting Back filling and restoration of land

Oil and products

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

- PC6.** knowledge of refining and how the crude oil is converted into useable products.
- PC7.** knowledge of petroleum products and their property
- PC8.** knowledge of Liquefied Natural Gas (LNG)
- PC9.** knowledge of different methods of pipe joining
- PC10.** understanding of the different welding methods used in performing pipe laying and jointing activity such as Oxyacetylene welding Shielded metal arc welding Gas-tungsten arc welding Gas-metal arc welding Flux-core arc welding Plasma arc welding Submerged arc welding Electro slag welding Electron beam welding Laser beam welding Resistance welding Friction welding
- PC11.** Care and preparation of pipe for welding depending on the material
- PC12.** Importance of joints and different types of joints.
- PC13.** Ensure the electrode positioning angle is correct.

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- PC14.** Knowledge of the pipes are classified and identify the material and dimensional and Physical characteristics as per types.
- PC15.** Read and interpret routine information on written job instructions, welding procedure specification.
- PC16.** Knowledge of the Selection of correct welding mechanic and follow factors
- PC17.** Know the fundamentals of manual metal arc welding.
- PC18.** Should be able to strike and maintain a stable arc.
- PC19.** Identify welding defects and how to rectify.
- PC20.** Check the weld joint condition.
- PC21.** Knowledge of NDT.
- PC22.** Know the AWS codification of electrodes.
- PC23.** able to do pipe welding in vertical down and should be able to do, Preparation Tacking Joint in 5G position Joint in 6G position
- PC24.** Ability to welding in vertical up with basic technique of pipe jointing
- PC25.** Highlight the automatic pipe welding and to compare with other methods.
- PC26.** Select the right tube for the job and able to recommend different types of tubes as per applications.
- PC27.** Understanding of different design and installation datas like, Main Pressure Pressure losses Pressure consideration Frictional losses Velocity unit Hydrostatic
- PC28.** knowledge on safety standards.
- PC29.** Perform different work with tubes.
- PC30.** Perform different joining methods. Soldering Brazing Electrical resistance by Butt welding
- PC31.** Knowledge on different solders and fluxes used for joining.
- PC32.** Carry out different filling operations like, Measuring and cutting Reaming Cleaning Assembly Support Testing
- PC33.** Carry out brazing with correct filler material, flux, heating and assembly.
- PC34.** Ability to create a flared joint, Roll groove joint, Press connect joint and Push connect joint.
- PC35.** knowledge to make T-joints and outlets

Pipe line laying

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

- PC37.** Understanding of the importance of the following in pipe layout process Survey Clear and grade easement Stringing and bending Welding and ultrasonic testing Weld joint coating Pre-trenching Lowering in Tie-ins Padding and backfilling Pressure testing Reinstatement Signage
- PC38.** Know the importance of physical requirements in this provision Stand or walk for long periods of time Use arms and hands to reach for, handle or manipulate objects Lift and carry materials weighing Climb up and down ladders, scaffolds and other objects Stoop, kneel, crouch and crawl See well (naturally or with correction) Eye-hand coordination Good physical fitness Good sense of balance Work at great heights
- PC36.** Determine pipeline diameter is on the basis of the main operational parameters for the pipeline system, such as: Flowrate Expected system availability e.g. tolerated uptime and downtime Requirements for delivery pressure Properties of the transported medium

Knowledge and Understanding (KU)

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The individual on the job needs to know and understand:

- KU1.** understand company's policies on: personnel management, duty reporting procedure and associated MIS compliance
- KU2.** 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
- KU3.** reviews and approves the requisition of materials/equipment by assigned employees
- KU4.** reviews and approves the requisition of materials/equipment by assigned employees; may tag and store material as necessary
- KU5.** maintains records and prepares reports on repairs completed or on units requiring future special service
- KU6.** 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.
- KU7.** ability to understand and carry out work direction in a safe manner
- KU8.** importance of working in clean and safe environment
- KU9.** ability to document related procedures applicable in the context of employment and work
- KU10.** describe the functions of typical components on gas pipeline facilities
- KU11.** describe the properties of hydrocarbons and basics of hydrocarbons processing
- KU12.** knowledge of the principles of corrosion control
- KU13.** understand the principles of gas compression
- KU14.** explain the principles of gas measurement
- KU15.** explain the principles of operation of gas analysis systems including moisture analysers, gas chromatographs, densitometers, calorimeters
- KU16.** explain the principles of operation of typical pipeline instruments, monitoring and control systems (incl. SCADA)
- KU17.** explain the principles of petroleum geology, extraction and processing
- KU18.** know the principles of pigging
- KU19.** explain the principles of rotating equipment, lubrication and bearings
- KU20.** interpret process and instrumentation diagrams for a facility
- KU21.** understand risks that transmission pipelines pose to the community and mitigation of those risks;
- KU22.** transmission pipeline historical safety performance;
- KU23.** describe what is blasting
- KU24.** explain the importance fences and grazing
- KU25.** advantage of telecommunications towers
- KU26.** importance of corrosion protection and detection systems
- KU27.** measures to taken to allow pipeline expansion
- KU28.** explain horizontal earth boring and horizontal auger boring
- KU29.** knowledge of the micro tunnelling
- KU30.** the flux used to deoxidize and cleanse the weld metal.

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- KU31.** safety precautions associated with natural gas pipelines
- KU32.** some knowledge of the performance of various pipe materials under a wide variety of conditions.
- KU33.** some knowledge of the hazards of the trade, and of necessary precautionary measures

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 sa7. ability to understand and carry out work direction in a safe manner
- GS7.** identifying complex problems and reviewing related information to develop and evaluate options and implement solutions
- GS8.** ability to listen to and understand information and ideas presented through spoken words and sentences
- GS9.** performs other related duties as assigned
- GS10.** ability to apply general rules to specific problems to produce answers that make sense
- GS11.** participates in the management of personnel matters/activities
- GS12.** identify pipe fittings by size, type, material, and service type
- GS13.** read and interpret hanger and support drawings
- GS14.** identify pipe by size, type, and wall thickness
- GS15.** calculate how threaded is measured
- GS16.** install pipe hangers, supports, anchors, and guides
- GS17.** read and interpret pipe and hanger drawings
- GS18.** calculate pressure and heat in piping systems
- GS19.** mathematics knowledge of arithmetic, algebra, geometry, , and their applications
- GS20.** participate in on-the-job and other learning, training and development interventionsand assessments
- GS21.** clarify task related information with appropriate personnel or technical adviser
- GS22.** seek to improve and modify own work practices
- GS23.** maintain current knowledge of application standards, legislation, codes of practiceand product/process developments
- GS24.** make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments
- GS25.** plan and organize work to achieve targets and deadlines

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- GS26.** check that the work meets customer requirements
- GS27.** deliver consistent and reliable service to customers
- GS28.** apply problem solving approaches in different situations
- GS29.** apply balanced judgments to different situations

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Understand the pipe line layout for petroleum product distribution</i>	5	8	-	-
PC1. the different procedures involved in planning of pipe line laying Natural Gas Transmission System	1	2	-	-
PC2. knowledge of what material to be transported	1	1	-	-
PC3. understand specific regulations covering pipe line operation and that could affect the populated area, drinking water sources and ecological sensitive area.	1	1	-	-
PC4. plan procedure for long distance pipe line. Preliminary planning Route selection Acquisition Soil boring Testing Pipe line design reading Check for legal permit availability.	1	2	-	-
PC5. start and execute the pipe line work Way preparation Stringing Trenching River crossing Welding, coating and wrapping Pipe laying Inspecting Back filing and restoration of land	1	2	-	-
<i>Oil and products</i>	28	50	-	-
PC6. knowledge of refining and how the crude oil is converted into useable products.	1	2	-	-
PC7. knowledge of petroleum products and their property	1	2	-	-
PC8. knowledge of Liquefied Natural Gas (LNG)	1	2	-	-
PC9. knowledge of different methods of pipe joining	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. understanding of the different welding methods used in performing pipe laying and jointing activity such as Oxyacetylene welding Shielded metal arc welding Gas-tungsten arc welding Gas-metal arc welding Flux-core arc welding Plasma arc welding Submerged arc welding Electro slag welding Electron beam welding Laser beam welding Resistance welding Friction welding	1	2	-	-
PC11. Care and preparation of pipe for welding depending on the material	1	2	-	-
PC12. Importance of joints and different types of joints.	1	2	-	-
PC13. Ensure the electrode positioning angle is correct.	-	3	-	-
PC14. Knowledge of the pipes are classified and identify the material and dimensional and Physical characteristics as per types.	1	2	-	-
PC15. Read and interpret routine information on written job instructions, welding procedure specification.	1	2	-	-
PC16. Knowledge of the Selection of correct welding mechanic and follow factors	1	2	-	-
PC17. Know the fundamentals of manual metal arc welding.	1	2	-	-
PC18. Should be able to strike and maintain a stable arc.	1	1	-	-
PC19. Identify welding defects and how to rectify.	1	2	-	-
PC20. Check the weld joint condition.	1	2	-	-
PC21. Knowledge of NDT.	1	2	-	-
PC22. Know the AWS codification of electrodes.	1	1	-	-
PC23. able to do pipe welding in vertical down and should be able to do, Preparation Tacking Joint in 5G position Joint in 6G position	1	1	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC24. Ability to welding in vertical up with basic technique of pipe jointing	-	2	-	-
PC25. Highlight the automatic pipe welding and to compare with other methods.	-	2	-	-
PC26. Select the right tube for the job and able to recommend different types of tubes as per applications.	1	2	-	-
PC27. Understanding of different design and installation datas like, Main Pressure Pressure losses Pressure consideration Frictional losses Velocity unit Hydrostatic	1	2	-	-
PC28. knowledge on safety standards.	2	-	-	-
PC29. Perform different work with tubes.	1	1	-	-
PC30. Perform different joining methods. Soldering Brazing Electrical resistance by Butt welding	1	1	-	-
PC31. Knowledge on different solders and fluxes used for joining.	1	2	-	-
PC32. Carry out different filling operations like, Measuring and cutting Reaming Cleaning Assembly Support Testing	1	1	-	-
PC33. Carry out brazing with correct filler material, flux, heating and assembly.	1	1	-	-
PC34. Ability to create a flared joint, Roll groove joint, Press connect joint and Push connect joint.	1	1	-	-
PC35. knowledge to make T-joints and outlets	1	1	-	-
<i>Pipe line laying</i>	3	6	-	-
PC37. Understanding of the importance of the following in pipe layout process Survey Clear and grade easement Stringing and bending Welding and ultrasonic testing Weld joint coating Pre-trenching Lowering in Tie-ins Padding and backfilling Pressure testing Reinstatement Signage	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC38. Know the importance of physical requirements in this provision Stand or walk for long periods of time Use arms and hands to reach for, handle or manipulate objects Lift and carry materials weighing Climb up and down ladders, scaffolds and other objects Stoop, kneel, crouch and crawl See well (naturally or with correction) Eye-hand coordination Good physical fitness Good sense of balance Work at great heights	1	2	-	-
PC36. Determine pipeline diameter is on the basis of the main operational parameters for the pipeline system, such as: Flowrate Expected system availability e.g. tolerated uptime and downtime Requirements for delivery pressure Properties of the transported medium	1	2	-	-
NOS Total	36	64	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	HYC/N6110
NOS Name	Perform Pipe laying and joining activity
Sector	Hydrocarbon
Sub-Sector	Midstream
Occupation	Pipe Fitting in Oil & Gas, Pipe Fitting in Oil and Gas
NSQF Level	4
Credits	6
Version	3.0
Last Reviewed Date	NA
Next Review Date	17/11/2025
NSQC Clearance Date	17/11/2022

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HYC/N6105: Fitting, Welding Basics and Joining Process of Materials

Description

A pipefitters job entails building and ensuring the integrity of the pipes that will transport oil, gas or steam. This is achieved through many job functions

Scope

The scope covers the following :

- Understand the pipe line layout drawings
- Mathematical skills with respect to plumbing
- Knowledge on different types of materials used in plumbing
- Identify the tools and tackles that are required to carry out the assigned job
- Pipe fitting operation

Elements and Performance Criteria

Understand the pipe line layout drawings

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

- PC1.** clearly the basics of engineering drawing and how to make simple drawing.
- PC2.** draft and illustrate a pipe line system.
- PC3.** read the pipe chart, technical details etc.
- PC4.** prepare the bill of materials for doing the pipe line fabrication.
- PC5.** understand blue print reading including standard symbols used in plumbing and also different piping lines and valves used in plumbing.
- PC6.** read and interpret hangers and support drawing.

Mathematical skills with respect to plumbing

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

- PC7.** mathematics knowledge of arithmetic, algebra, geometry, and their applications
- PC8.** calculate area, volume, angles and length
- PC9.** calculate length and diameter of the pipe system using the metric system as well as english system.
- PC10.** calculate dimensions of the bend required in plumbing.

Knowledge on different types of materials used in plumbing

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

- PC11.** Knowledge on different materials used for plumbing Black iron Galvanized iron Cast iron Stainless steel Copper Cement Plastic/Synthetic
- PC12.** highlight the property of different pipe material and their workability.

Preparation of pipe line

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

- PC13.** the different bends, elbows, shapes, joints etc. used to fabricate the pipes.

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- PC14.** identify and discriminate different types of nuts, bolts, screws, clamps, fixtures etc. used in plumbing.
- PC15.** the different packing materials, adhesives, gaskets, ropes etc. and how to cut gaskets using a cutting machine.
- PC16.** install and check for the functions of different types of valves, gauges and other related accessories.

Identify the tools and tackles that are required to carry out the assigned job

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

- PC17.** knowledge and ability to use different hand tools and power tools in plumbing and appreciate the advantage of correct tools used. i.e. pipe cutter, copper pipe deburring tools, pipe expander set, pipe bending fixtures, flaring set, threading tools, ratchet spanner, valve fix, bits and drive socket set, pipe pliers, chain pipe vice, spirit level, steel rule, try square, plastic pipe cutter, ratchet copper cutter, pipe chamfering kit, cartridge soldering torch, drain cleaning spiral, cast iron screw clamp, flat chisel, chisels with hand grip, crow bar, shovel, lever bar, scraper iron, pick axe, shop floor broom, expander, flaring tools, portable power bender, combination plier, regular plier, water pump plier, pipe wrench, adjustable wrench, hammer type screw driver, flat tip screw driver, c clamp, double open ended spanner, ring spanner, tubular box spanner, socket set, universal socket joint set, claw hammer, ball peen hammer, soft mallet hammer, hacksaw and frames, different types of blades (hcs, hss and bi-metal), ptfе tape, silicon paste, saws, portable drilling machine, impact drill, rotary hammer, drills, pullers, portable tri-stand vice, bench yoke vice, thread cutting dies, die stock

Perform Pipe fitting operation

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

- PC18.** install, repair and maintain high and low-pressure pipe systems used in manufacturing plants, oil refineries, chemical plants, breweries, power plants, food processing plants, paper mills, ships and factories
- PC19.** use the appropriate equipment, parts and accessories for the pipe fitting or assembling operation as per the standards.
- PC20.** check for the calibration date of all measuring equipment
- PC21.** identification and preparation of suitable datum from which to start the marking.
- PC22.** application of marking medium to enhance clarity of the marking and proper visibility.
- PC23.** carry out appropriate method of marking
- PC24.** use a range of marking out equipment (e.g. rules, squares, scribes, vernier instruments)
- PC25.** mark out a range of feature features: datum lines; cutting guidelines; square and rectangular profiles; circular and radial profiles; angles; holes linearly positioned, boxed and on pitch circles
- PC26.** plan the pipe fitting activities before starting as per the drawing.
- PC27.** cut the pipes to the appropriate lengths making allowances for bending using appropriate cutting operations and techniques
- PC28.** produce pipework bends using the appropriate tools and equipment for the types and sizes of pipe
- PC29.** assemble and secure the pipework as per job specifications using appropriate pipe assembly methods and techniques
- PC30.** produce pipework assemblies which combine a range of different fittings
- PC31.** dismantle pipework assemblies without damage to components and/or subassemblies

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- PC32.** 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
- PC33.** keep the work area in a safe and tidy condition during and on completion of the manufacturing activities
- PC34.** return all tools and equipment to the correct location on completion of the fitting activities
- PC35.** perform the necessary checks for correct pipework assembly and dimensional accuracy
- PC36.** use the appropriate measuring equipment for checking activities
- PC37.** produce components within all of the applying standards
- PC38.** generate stage inspection reports

Pipe Joining

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

- PC39.** understanding of different methods of pipe joining
- PC40.** knowledge of different welding methods
- PC41.** care and preparation of pipe for welding depending on the material
- PC42.** importance of joints and different types of joints.
- PC43.** ensure the electrode positioning angle is correct.
- PC44.** select the correct welding mechanic and follow factors,
- PC45.** knowledge of the fundamentals of manual metal arc welding.
- PC46.** should be able to strike and maintain a stable arc.
- PC47.** identify welding defects and how to rectify.
- PC48.** check the weld joint condition.
- PC49.** knowledge of ndt.
- PC50.** knowledge of the aws codification of electrodes.
- PC51.** The individual should be able to do pipe welding in vertical down and should be able to do, Preparation Tacking Joint in 5G position Joint in 6G position
- PC52.** ability to welding in vertical up with basic different techniques
- PC53.** knowledge to make t-joints and outlets

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** companys 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

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- 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 plain and its importance in piping.
- KU14.** ensure to establish a proper datum
- KU15.** knowledge 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 in plumbing.
- KU19.** make different types of threads on a pipe and also the different methods of thread production.
- KU20.** knowledge on different pipe materials and the performance of this material in different application.
- KU21.** basic knowledge of the property and behaviour of fluids, liquids and gases
- KU22.** awareness on basic hydraulic and pneumatic elements and the working
- KU23.** knowledge of heating and cooling including thermal expansion and contraction of piping system under various condition.
- KU24.** knowledge to calculate pipe diameter.
- KU25.** knowledge on seal screw joint.
- KU26.** different types of equipments used for threading of pipes.
- KU27.** knowledge on behaviour of flow of liquids, gaseous and solid materials.
- KU28.** making of drawing using standard symbols, proper representation and layout.
- KU29.** thorough understanding of location and environment where the piping is done in the different area
- KU30.** knowledge on different gadgets used in plumbing
- KU31.** knowledge on the different operation that can be carried out using earth moving equipments.
- KU32.** 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
- KU33.** identify correct orientation of pipe fitting in regard to the flow.
- KU34.** methods used for testing the pipe line.
- KU35.** use of different fasteners for both temporary and permanent fastening.
- KU36.** importance of assembly methods, techniques and procedure to be maintained while pipe fitting.
- KU37.** knowledge to do positioning, aliening and fastening an assembly.

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KU38. precaution to be taken while using adhesives, cements and sealing compound

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 Numerical computations: addition(with decimal digits and with carrying), subtraction(with decimal digits and with borrowing), multiplication(with decimal digits), division(with decimal digit), fractions and decimals, percentages and proportions, simple ratios and averages
- GS14.** Identify and draw various basic, compound and solid shapes as per dimensions given Basic shapes: square, rectangle, triangle, circle Compound shapes: involving squares, rectangles, triangles, circles, semi-circles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder
- GS15.** Demonstrate measurement and calculation of Angle, Perimeter, Area of a common geometrical shape and can co-relate with job area requirements
- GS16.** Use appropriate measuring techniques and units of measurement
- GS17.** Use British and metric system of measurement and make conversions between them
- GS18.** Describe the difference between Celsius & Fahrenheit Scale and relationship between them
- GS19.** 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
- GS20.** Interpret and express tolerance in terms of limits on dimensions perform
- GS21.** Basic operations in a computer like switching it on/off, using the mouse and keyboard, accessing files, opening, closing, creating and deleting folders, etc.
- GS22.** Use basic office applications like spread sheet, word processor, presentations
- GS23.** Use organizational software specific to quality function
- GS24.** Use email to communicate within the organization as per organization guidelines
- GS25.** Retrieve and enter data using standard system forms and templates

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- GS26.** Take printouts of documents
- GS27.** Participate in on-the-job and other learning, training and development interventions and assessments
- GS28.** Clarify task related information with appropriate personnel or technical adviser
- GS29.** Seek to improve and modify own work practices
- GS30.** Maintain current knowledge of application standards, legislation, codes of practice and product/process developments
- GS31.** Identify problems with work planning, procedures, output and behaviour and their implications
- GS32.** Prioritize and plan for problem solving
- GS33.** Communicate problems appropriately to others
- GS34.** Identify sources of information and support for problem solving
- GS35.** Seek assistance and support from other sources to solve problems
- GS36.** Identify effective resolution techniques
- GS37.** Select and apply resolution techniques
- GS38.** Seek evidence for problem resolution
- GS39.** Plan, prioritize and sequence work operations as per job requirements
- GS40.** Organize and analyse information relevant to work
- GS41.** Basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS42.** Undertake and express new ideas and initiatives to others
- GS43.** Modify work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS44.** Ones competencies in new and different situations and contexts to achieve more
- GS45.** Exercise restraint while expressing dissent and during conflict situations
- GS46.** Avoid and manage distractions to be disciplined at work
- GS47.** Manage own time for achieving better results
- GS48.** Work in a team in order to achieve better results
- GS49.** Identify and clarify work roles within a team
- GS50.** Communicate and cooperate with others in the team for better results
- GS51.** 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 pipe line layout drawings</i>	8	4	-	-
PC1. clearly the basics of engineering drawing and how to make simple drawing.	1	1	-	-
PC2. draft and illustrate a pipe line system.	1	1	-	-
PC3. read the pipe chart, technical details etc.	2	-	-	-
PC4. prepare the bill of materials for doing the pipe line fabrication.	1	1	-	-
PC5. understand blue print reading including standard symbols used in plumbing and also different piping lines and valves used in plumbing.	1	1	-	-
PC6. read and interpret hangers and support drawing.	2	-	-	-
<i>Mathematical skills with respect to plumbing</i>	6	2	-	-
PC7. mathematics knowledge of arithmetic, algebra, geometry, and their applications	2	-	-	-
PC8. calculate area, volume, angles and length	2	-	-	-
PC9. calculate length and diameter of the pipe system using the metric system as well as english system.	1	1	-	-
PC10. calculate dimensions of the bend required in plumbing.	1	1	-	-
<i>Knowledge on different types of materials used in plumbing</i>	4	-	-	-
PC11. Knowledge on different materials used for plumbing Black iron Galvanized iron Cast iron Stainless steel Copper Cement Plastic/Synthetic	2	-	-	-
PC12. highlight the property of different pipe material and their workability.	2	-	-	-
<i>Preparation of pipe line</i>	-	8	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. the different bends, elbows, shapes, joints etc. used to fabricate the pipes.	-	2	-	-
PC14. identify and discriminate different types of nuts, bolts, screws, clamps, fixtures etc. used in plumbing.	-	2	-	-
PC15. the different packing materials, adhesives, gaskets, ropes etc. and how to cut gaskets using a cutting machine.	-	2	-	-
PC16. install and check for the functions of different types of valves, gauges and other related accessories.	-	2	-	-
<i>Identify the tools and tackles that are required to carry out the assigned job</i>	-	2	-	-
PC17. knowledge and ability to use different hand tools and power tools in plumbing and appreciate the advantage of correct tools used. i.e. pipe cutter, copper pipe deburring tools, pipe expander set, pipe bending fixtures, flaring set, threading tools, ratchet spanner, valve fix, bits and drive socket set, pipe pliers, chain pipe vice, spirit level, steel rule, try square, plastic pipe cutter, ratchet copper cutter, pipe chamfering kit, cartridge soldering torch, drain cleaning spiral, cast iron screw clamp, flat chisel, chisels with hand grip, crow bar, shovel, lever bar, scraper iron, pick axe, shop floor broom, expander, flaring tools, portable power bender, combination plier, regular plier, water pump plier, pipe wrench, adjustable wrench, hammer type screw driver, flat tip screw driver, c clamp, double open ended spanner, ring spanner, tubular box spanner, socket set, universal socket joint set, claw hammer, ball peen hammer, soft mallet hammer, hacksaw and frames, different types of blades (hcs, hss and bi-metal), ptfе tape, silicon paste, saws, portable drilling machine, impact drill, rotary hammer, drills, pullers, portable tri-stand vice, bench yoke vice, thread cutting dies, die stock	-	2	-	-
<i>Perform Pipe fitting operation</i>	4	37	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC18. install, repair and maintain high and low-pressure pipe systems used in manufacturing plants, oil refineries, chemical plants, breweries, power plants, food processing plants, paper mills, ships and factories	-	2	-	-
PC19. use the appropriate equipment, parts and accessories for the pipe fitting or assembling operation as per the standards.	-	2	-	-
PC20. check for the calibration date of all measuring equipment	-	2	-	-
PC21. identification and preparation of suitable datum from which to start the marking.	-	2	-	-
PC22. application of marking medium to enhance clarity of the marking and proper visibility.	1	1	-	-
PC23. carry out appropriate method of marking	-	2	-	-
PC24. use a range of marking out equipment (e.g. rules, squares, scribes, vernier instruments)	-	2	-	-
PC25. mark out a range of feature features: datum lines; cutting guidelines; square and rectangular profiles; circular and radial profiles; angles; holes linearly positioned, boxed and on pitch circles	-	2	-	-
PC26. plan the pipe fitting activities before starting as per the drawing.	1	-	-	-
PC27. cut the pipes to the appropriate lengths making allowances for bending using appropriate cutting operations and techniques	-	2	-	-
PC28. produce pipework bends using the appropriate tools and equipment for the types and sizes of pipe	-	2	-	-
PC29. assemble and secure the pipework as per job specifications using appropriate pipe assembly methods and techniques	-	2	-	-
PC30. produce pipework assemblies which combine a range of different fittings	-	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC31. dismantle pipework assemblies without damage to components and/or subassemblies	-	2	-	-
PC32. deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve	-	2	-	-
PC33. keep the work area in a safe and tidy condition during and on completion of the manufacturing activities	-	2	-	-
PC34. return all tools and equipment to the correct location on completion of the fitting activities	-	2	-	-
PC35. perform the necessary checks for correct pipework assembly and dimensional accuracy	-	2	-	-
PC36. use the appropriate measuring equipment for checking activities	-	2	-	-
PC37. produce components within all of the applying standards	1	1	-	-
PC38. generate stage inspection reports	1	1	-	-
<i>Pipe Jointing</i>	6	19	-	-
PC39. understanding of different methods of pipe joining	1	-	-	-
PC40. knowledge of different welding methods	1	-	-	-
PC41. care and preparation of pipe for welding depending on the material	-	2	-	-
PC42. importance of joints and different types of joints.	1	1	-	-
PC43. ensure the electrode positioning angle is correct.	-	2	-	-
PC44. select the correct welding mechanic and follow factors,	1	-	-	-
PC45. knowledge of the fundamentals of manual metal arc welding.	1	-	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC46. should be able to strike and maintain a stable arc.	-	2	-	-
PC47. identify welding defects and how to rectify.	-	2	-	-
PC48. check the weld joint condition.	-	2	-	-
PC49. knowledge of ndt.	1	-	-	-
PC50. knowledge of the aws codification of electrodes.	-	2	-	-
PC51. The individual should be able to do pipe welding in vertical down and should be able to do, Preparation Tacking Joint in 5G position Joint in 6G position	-	2	-	-
PC52. ability to welding in vertical up with basic different techniques	-	2	-	-
PC53. knowledge to make t-joints and outlets	-	2	-	-
NOS Total	28	72	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	HYC/N6105
NOS Name	Fitting, Welding Basics and Joining Process of Materials
Sector	Hydrocarbon
Sub-Sector	Midstream
Occupation	Pipe Fitting in Oil & Gas, Pipe Fitting in Oil and Gas
NSQF Level	4
Credits	7
Version	3.0
Last Reviewed Date	NA
Next Review Date	17/11/2025
NSQC Clearance Date	17/11/2022

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HYC/N6106: Perform Electrofusion Welding

Description

He will be able to join HDPE and other plastic pipes using special fittings that have built-in electric heating elements which are used to weld the joint together by Electrofusion.

Scope

The scope covers the following :

- Procedures & Techniques for PE Pipeline Installations
- Electrofusion Principles
- Preparing the pipe
- Manual Welding Procedure
- Electrofusion Principles
- Physical properties

Elements and Performance Criteria

Procedures & Techniques for PE Pipeline Installations

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

- PC1.** understand conventionally buried pipelines
- PC2.** perform narrow/chain trenching
- PC3.** perform mole ploughing
- PC4.** perform impact moling
- PC5.** carry out directional drilling

Electrofusion Principles

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

- PC6.** understand fusion technology
- PC7.** heating coils are as close to the joint surfaces as possible.
- PC8.** wire position is accurately controlled during manufacture and during the subsequent fusion process.
- PC9.** the importance of heat distribution uniform over the length of the hot zone.
- PC10.** ensure to melt pressure and temperature are both accurately controlled.
- PC11.** importance why coils are protected from damage prior to, during and after fusion.
- PC12.** define electrofusion control units

Preparing the pipe

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

- PC13.** check the pipe for any abrasions or impact damage that may provide a detrimental effect to the performance of the coupler.
- PC14.** ensure that the pipe end is cut square
- PC15.** mechanical scraper takes off approximately 0.5mm of the pipe surface of the pipe diameter.
- PC16.** mark the pipe end for the couplers insertion depth.

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- PC17.** carry out scraping before clean the surface of the pipe to remove as much grease, oil or surface dirt as possible.
- PC18.** use your hand scraper to create a chamfer on the leading edge of the pipe and remove all swarf from the pipe.
- PC19.** mark the pipe end for the couplers insertion depth
- PC20.** importance of checking the scraper blade for its good condition.
- PC21.** scrape off any remaining line markings using hand scrapper
- PC22.** ensure not to touch the cleaned ends of the pipe or the inside of the coupler with your hands or rags.
- PC23.** protect the end against the ingress of dirt, dust or water.

Manual Welding Procedure

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

- PC24.** importance of placing the pipes in the clamps with the ends against the trimming tool and with the pipe markings aligned.
- PC25.** align and level the components using the support rollers.
- PC26.** method of tightening the pipe clamps to grip and re-round the pipes.
- PC27.** understanding to cover the free ends of the pipes to prevent cooling of the plate by internal draughts.
- PC28.** switching on the trimming tool and close the clamps slowly so that the pipe ends are moved against the trimming tool until continuous shavings are cut from each surface.
- PC29.** ensure to keep the trimming tool turning whilst opening the clamps to avoid steps on the trimmed surfaces.
- PC30.** method of removing the trimming tool taking care not to touch the trimmed ends.
- PC31.** ensure to remove loose shavings from the machine and component ends.
- PC32.** importance of why not to touch the prepared surface
- PC33.** check that both surfaces are completely planed. if they are not then repeat the trimming process.
- PC34.** ensure to close the clamps and check that there is no visible gap between the trimmed faces.
- PC35.** the maximum permitted outsider diameter mismatch is: 1.0 mm for pipe sizes 90 mm to 315 mm, 2.0 mm for pipe sizes 316 mm to 800 mm
- PC36.** ensure the mismatch is greater than these values then the pipe must be realigned and re-trimmed.
- PC37.** make certain to open and then close the clamps and note the drag pressure needed to move the pipes together using the hydraulic system.

Perform Electrofusion

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

- PC38.** heating coils are as close to the joint surfaces as possible.
- PC39.** wire position is accurately controlled during manufacture and during the subsequent fusion process.
- PC40.** importance of heat distribution which has to be uniform over the length of the hot zone.
- PC41.** melt pressure and temperature are accurately controlled.
- PC42.** coils are to be protected from damage prior to, during and after fusion.

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- PC43.** spigot ends are scraped.
- PC44.** importance of cutting the pipe square and remove burrs.
- PC45.** carry out wipe loose dirt from pipe ends.
- PC46.** place the centre of the electrofusion fitting alongside the pipe end and mark the pipe around the circumference.
- PC47.** pipe end preparation tool, remove the entire surface of the pipe over the marked area
- PC48.** remove the fitting from its packaging and check that the bore of the fitting is clean and dry.
- PC49.** insert the pipe ends into the fitting so that they are in contact with the centre stop.
- PC50.** socket electrofusion fittings (couplers, reducers, elbows and tees) clamps must be used.
- PC51.** remove the terminal protection caps from the terminal shrouds.
- PC52.** connect the output leads to the fitting terminals.
- PC53.** check that there is sufficient fuel in the generator to complete the joint.
- PC54.** operate as per the instructions, which should have been thoroughly read and understood prior to any welding operations.
- PC55.** understand that the joint must be left in the clamps for the cooling time specified on the fitting

Physical properties

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

- PC56.** understand different material properties & compatibility
- PC57.** understand importance of standard dimensional ratio
- PC58.** effect of expansion and contraction
- PC59.** perform pipe bending and the radius for pe
- PC60.** electrofusion fittings are able to weld pipes having different wall thicknesses
- PC61.** carry out pressure testing

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** understand company's policies on: personnel management, duty reporting procedure and associated mis compliance
- KU2.** 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
- KU3.** reviews and approves the requisition of materials/equipment by assigned employees
- KU4.** reviews and approves the requisition of materials/equipment by assigned employees; may tag and store material as necessary
- KU5.** maintains records and prepares reports on repairs completed or on units requiring future special service
- KU6.** 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.
- KU7.** ability to understand and carry out work direction in a safe manner

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- KU8.** importance of working in clean and safe environment
- KU9.** ability to document related procedures applicable in the context of employment and work
- KU10.** describe the functions of typical components on gas pipeline facilities
- KU11.** describe the properties of hydrocarbons and basics of hydrocarbons processing
- KU12.** understand the principles of corrosion control
- KU13.** knowledge of the principles of gas compression
- KU14.** explain the principles of gas measurement
- KU15.** explain the principles of operation of gas analysis systems including moisture analysers, gas chromatographs, densitometers, calorimeters
- KU16.** explain the principles of operation of typical pipeline instruments, monitoring and control systems (incl. scada)
- KU17.** explain the principles of petroleum geology, extraction and processing
- KU18.** explain the principles of pigging
- KU19.** explain the principles of rotating equipment, lubrication and bearings
- KU20.** interpret process and instrumentation diagrams for a facility
- KU21.** understand risks that transmission pipelines pose to the community and mitigation of those risks;
- KU22.** transmission pipeline historical safety performance;
- KU23.** describe what is blasting
- KU24.** explain the importance fences and grazing
- KU25.** advantage of telecommunications towers
- KU26.** importance of corrosion protection and detection systems
- KU27.** measures to taken to allow pipeline expansion
- KU28.** explain horizontal earth boring and horizontal auger boring
- KU29.** knowledge of micro tunnelling
- KU30.** the flux used to deoxidize and cleanse the weld metal.
- KU31.** safety precautions associated with natural gas pipelines
- KU32.** some knowledge of the performance of various pipe materials under a wide variety of conditions.
- KU33.** knowledge of the hazards of the trade, and of necessary precautionary measures

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

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- 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.** pipe fittings by size, type, material, and service type
- GS14.** and interpret hanger and support drawings
- GS15.** pipe by size, type, and wall thickness
- GS16.** how threaded is measured
- GS17.** pipe hangers, supports, anchors, and guides
- GS18.** and interpret pipe and hanger drawings
- GS19.** pressure and heat in piping systems
- GS20.** 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
- GS24.** maintain current knowledge of application standards, legislation, codes of practice and product/process developments
- GS25.** make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments
- GS26.** plan and organize work to achieve targets and deadlines
- GS27.** check that the work meets customer requirements
- GS28.** deliver consistent and reliable service to customers
- GS29.** apply problem solving approaches in different situations
- GS30.** apply balanced judgments to different situations
- GS31.** work in a team in order to achieve better results
- GS32.** identify and clarify work roles within a team
- GS33.** communicate and cooperate with others in the team for better results
- GS34.** seek assistance from fellow team members

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Procedures & Techniques for PE Pipeline Installations</i>	4	6	-	-
PC1. understand conventionally buried pipelines	1	1	-	-
PC2. perform narrow/chain trenching	1	1	-	-
PC3. perform mole ploughing	-	2	-	-
PC4. perform impact moling	1	1	-	-
PC5. carry out directional drilling	1	1	-	-
<i>Electrofusion Principles</i>	13	1	-	-
PC6. understand fusion technology	2	-	-	-
PC7. heating coils are as close to the joint surfaces as possible.	1	1	-	-
PC8. wire position is accurately controlled during manufacture and during the subsequent fusion process.	2	-	-	-
PC9. the importance of heat distribution uniform over the length of the hot zone.	2	-	-	-
PC10. ensure to melt pressure and temperature are both accurately controlled.	2	-	-	-
PC11. importance why coils are protected from damage prior to, during and after fusion.	2	-	-	-
PC12. define electrofusion control units	2	-	-	-
<i>Preparing the pipe</i>	1	21	-	-
PC13. check the pipe for any abrasions or impact damage that may provide a detrimental effect to the performance of the coupler.	-	2	-	-
PC14. ensure that the pipe end is cut square	-	2	-	-
PC15. mechanical scraper takes off approximately 0.5mm of the pipe surface of the pipe diameter.	1	1	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC16. mark the pipe end for the couplers insertion depth.	-	2	-	-
PC17. carry out scraping before clean the surface of the pipe to remove as much grease, oil or surface dirt as possible.	-	2	-	-
PC18. use your hand scraper to create a chamfer on the leading edge of the pipe and remove all swarf from the pipe.	-	2	-	-
PC19. mark the pipe end for the couplers insertion depth	-	2	-	-
PC20. importance of checking the scraper blade for its good condition.	-	2	-	-
PC21. scrape off any remaining line markings using hand scraper	-	2	-	-
PC22. ensure not to touch the cleaned ends of the pipe or the inside of the coupler with your hands or rags.	-	2	-	-
PC23. protect the end against the ingress of dirt, dust or water.	-	2	-	-
<i>Manual Welding Procedure</i>	4	24	-	-
PC24. importance of placing the pipes in the clamps with the ends against the trimming tool and with the pipe markings aligned.	1	1	-	-
PC25. align and level the components using the support rollers.	-	2	-	-
PC26. method of tightening the pipe clamps to grip and re-round the pipes.	1	1	-	-
PC27. understanding to cover the free ends of the pipes to prevent cooling of the plate by internal draughts.	-	2	-	-
PC28. switching on the trimming tool and close the clamps slowly so that the pipe ends are moved against the trimming tool until continuous shavings are cut from each surface.	-	2	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC29. ensure to keep the trimming tool turning whilst opening the clamps to avoid steps on the trimmed surfaces.	-	2	-	-
PC30. method of removing the trimming tool taking care not to touch the trimmed ends.	1	1	-	-
PC31. ensure to remove loose shavings from the machine and component ends.	-	2	-	-
PC32. importance of why not to touch the prepared surface	1	1	-	-
PC33. check that both surfaces are completely planed. if they are not then repeat the trimming process.	-	2	-	-
PC34. ensure to close the clamps and check that there is no visible gap between the trimmed faces.	-	2	-	-
PC35. the maximum permitted outsider diameter mismatch is: 1.0 mm for pipe sizes 90 mm to 315 mm, 2.0 mm for pipe sizes 316 mm to 800 mm	-	2	-	-
PC36. ensure the mismatch is greater than these values then the pipe must be realigned and re-trimmed.	-	2	-	-
PC37. make certain to open and then close the clamps and note the drag pressure needed to move the pipes together using the hydraulic system.	-	2	-	-
<i>Perform Electrofusion</i>	9	27	-	-
PC38. heating coils are as close to the joint surfaces as possible.	1	1	-	-
PC39. wire position is accurately controlled during manufacture and during the subsequent fusion process.	1	1	-	-
PC40. importance of heat distribution which has to be uniform over the length of the hot zone.	1	1	-	-
PC41. melt pressure and temperature are accurately controlled.	1	1	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC42. coils are to be protected from damage prior to, during and after fusion.	1	1	-	-
PC43. spigot ends are scraped.	1	1	-	-
PC44. importance of cutting the pipe square and remove burrs.	1	1	-	-
PC45. carry out wipe loose dirt from pipe ends.	-	2	-	-
PC46. place the centre of the electrofusion fitting alongside the pipe end and mark the pipe around the circumference.	-	2	-	-
PC47. pipe end preparation tool, remove the entire surface of the pipe over the marked area	-	2	-	-
PC48. remove the fitting from its packaging and check that the bore of the fitting is clean and dry.	-	2	-	-
PC49. insert the pipe ends into the fitting so that they are in contact with the centre stop.	-	2	-	-
PC50. socket electrofusion fittings (couplers, reducers, elbows and tees) clamps must be used.	1	1	-	-
PC51. remove the terminal protection caps from the terminal shrouds.	-	2	-	-
PC52. connect the output leads to the fitting terminals.	-	2	-	-
PC53. check that there is sufficient fuel in the generator to complete the joint.	-	2	-	-
PC54. operate as per the instructions, which should have been thoroughly read and understood prior to any welding operations.	-	2	-	-
PC55. understand that the joint must be left in the clamps for the cooling time specified on the fitting	1	1	-	-
<i>Physical properties</i>	6	9	-	-
PC56. understand different material properties & compatibility	1	1	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC57. understand importance of standard dimensional ratio	1	1	-	-
PC58. effect of expansion and contraction	1	1	-	-
PC59. perform pipe bending and the radius for pe	1	2	-	-
PC60. electrofusion fittings are able to weld pipes having different wall thicknesses	1	2	-	-
PC61. carry out pressure testing	1	2	-	-
NOS Total	37	88	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	HYC/N6106
NOS Name	Perform Electrofusion Welding
Sector	Hydrocarbon
Sub-Sector	Midstream
Occupation	Pipe Fitting in Oil & Gas, Pipe Fitting in Oil and Gas
NSQF Level	4
Credits	6
Version	3.0
Last Reviewed Date	NA
Next Review Date	17/11/2025
NSQC Clearance Date	17/11/2022

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/N9301.Working Effectively in a team	20	30	-	-	50	20
HYC/N9302.Maintain health, safety and security procedures	20	30	-	-	50	20
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	0	0	50	20
Total	60	90	0	0	150	60

Elective: 1 Pipe Fitter - Oil & Gas

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
HYC/N6109.Perform Pipe Fitting activity	38	62	-	-	100	20
HYC/N6110.Perform Pipe laying and joining activity	36	64	-	-	100	20
Total	74	126	-	-	200	40

Elective: 2 Pipe Fitter – City Gas Distribution

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National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
HYC/N6105.Fitting, Welding Basics and Joining Process of Materials	28	72	-	-	100	20
HYC/N6106.Perform Electrofusion Welding	37	88	-	-	125	20
Total	65	160	-	-	225	40

Qualification Pack

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
PPE	Personal Protective Equipment
CGD	City Gas Distribution
PNG	Piped Natural Gas
SS	Stainless Steel
PPE	Personal Protective Equipment

Qualification Pack

Glossary

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 (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) 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 OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
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.

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Knowledge and Understanding (KU)	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.
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 (GS)	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.
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.