Model Curriculum

QP Name: Cathodic Protection Technician

Code: HYC/Q6306

QP Version: 2.0

NSQF Level: 4

Model Curriculum Version: 2.0

Hydrocarbon Sector Skill Council
OIDB Bhawan, Block G+3, 2nd Floor, Plot No.2, Vikas Marg,
Sector – 73, Noida, Uttar Pradesh -201301

Table of Contents

Training Parameters

Sector	Hydrocarbon
Sub-Sector	Midstream
Occupation	Operations - Oil and Gas pipeline
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO/2015-NIl
Minimum Educational Qualification and Experience	10th Grade Pass with 2 years of relevant experience OR 12th Grade Pass OR 10th Grade Pass plus 2-year of National Trade Certificate (NTC) OR Completed 2nd year of the 3-year Diploma (after 10th) and pursuing regular Diploma
Pre-Requisite License or Training	
Minimum Job Entry Age	18 years
Last Reviewed On	
Next Review Date	3 years from the date of approval
NSQC Approval Date	
QP Version	2.0
Model Curriculum Creation Date	
Model Curriculum Valid Up to Date	3 years from the date of approval
Model Curriculum Version	2.0
Minimum Duration of the Course	--
Maximum Duration of the Course	660 Hours

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills.

- Prepare and organize CP system, tools and material for testing and maintenance activities.
- Perform the steps involve in conducting surveys and tests to identify the damage and location of damage in pipeline.
- Conduct repair and maintenance of pipeline by using CP system.
- Implement health, safety and security practices.
- Work effectively and efficiently with colleagues as per schedules and timelines.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and ModuleDetails	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	Total Duration
Bridge Module	**06:00**	**00:00**	**Nil**	**06:00**
Module 1: Introduction to Hydrocarbon sector and the jobrole of Pipeline Cathodic Protection Technician	06:00	00:00	Nil	06:00
HYC/N6312 – Prepare cathodic protection system,tools and material for testing and maintenance activity NOS Version No. – 2.0 NSQF Level – 4	**30:00**	**60:00**	**15:00**	**105:00**
Module 2: Prepare cathodic protection (CP) system for testingand maintenance activities	30:00	60:00	15:00	105:00
HYC/N6313 –Carry out cathodic protection survey and testing for identifying damage in pipeline NOS Version No. – 2.0 NSQF Level – 4	**90:00**	**120:00**	**15:00**	**225:00**
Module 3: Damage identification through testing and survey by CP System	90:00	120:00	15:00	225:00
HYC/N6314 - Carryout repair and maintenance of pipelines using Cathodic Protection Techniques NOS Version No. – 2.0 NSQF Level – 4	**30:00**	**90:00**	**Nil**	**120:00**
Module 4: Perform repair and maintenance of pipelines using CP techniques	30:00	90:00	Nil	120:00

HYC/N9301 – Working effectively in a team NOS Version No. – 3.0 NSQF Level – 4	**30:00**	**45:00**	**Nil**	**75:00**
Module 5: Effective working in a team	30:00	45:00	Nil	75:00
HYC/N9302 – Maintain health, safety and security procedures NOS Version No. – 3.0 NSQF Level – 4	**24:00**	**45:00**	**Nil**	**69:00**
Module 6: Health, safety and security	24:00	45:00	Nil	69:00
DGT/VSQ/N0102 - Employability Skills NOS Version No. – 1.0	**-**	**-**	**-**	**60:00**
Total Duration	**210:00**	**360:00**	**30:00**	**660:00**

Module Details

Module 1: Introduction to Hydrocarbon Sector and the job role of Pipeline Cathodic Protection Technician

Bridge Module

Terminal Outcomes:

- Discuss about Hydrocarbon Sector
- Discuss role and responsibility of Pipeline Cathodic Protection Technician

Duration: *06:00*	**Duration**: *00:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the oil and gas sector and its subsectors. • Explain the importance of Pipeline Cathodic Protection Technician in industry. • Discuss role and responsibilities of Pipeline Cathodic Protection Technician.	
Classroom Aids:	
White / Black board and Projector, Digital Presentation, Computer/Laptop, Public Addressing System	
Tools, Equipment and Other Requirements	
NA	

Module 2: Prepare cathodic protection (CP) system for testing and maintenance activities

Mapped to HYC/N6312, v1.0

Terminal Outcomes:

- Prepare CP system, tools and material for testing and maintenance activities.
- Demonstrate procedure for checking the readiness of tools, material and CP system

Duration: *30:00*	**Duration**: *60:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the basic principle of corrosion and its protection. • Explain the basic principle of electrical and circuit system. • Explain the importance of cathodic protection in pipeline. • Discuss the importance of PPE during work. • List tools, measuring instruments and material required for testing and maintenance. • Discuss the importance of calibration of and instruments. • List the steps to be performed for assembling the CP system and other necessary equipment. • Explain importance of Earthing pit. • List the steps to be performed for adjusting the CP system and other necessary equipment during any abnormalities. • Describe NACE SP 0169 or BIS 8062-2006 standards. • Discuss documents and records needed to be updated and maintained related to results of adjustments.	• Perform steps for obtaining work permit to access the site. • Prepare plan for organizing testing and maintenance activities of the CP system. • Demonstrate the standard operating procedure to use tools, equipment and measuring instruments required during job. • Apply appropriate ways to assemble CP system and other necessary equipment required. • Employ appropriate methods to check the functioning of CP system and other equipment. • Show how to adjust the CP system and other equipment, if any abnormalities have been found.
Classroom Aids:	
White / Black board and Projector, Digital Presentation, Computer/Laptop, Public Addressing System	
Tools, Equipment and Other Requirements	
Anodic metal , Measuring tools and equipment, DC battery, Backfill (sodium sulphate, Gypsum and coke), Pipeline locator, Rubber hand gloves, Safety shoes, Safety helmet, Insulating tools, CPPSM/CPTR	

Module 3: Damage identification through testing and survey by CP system

Mapped to HYC/N6313, v1.0

Terminal Outcomes:

- Perform steps for locating pipeline and damage.
- Perform various surveys and tests to identify damages and defects in pipeline.
- Demonstrate procedure of measuring and recording readings of various surveys and tests conducted.

Duration: *90:00*	**Duration**: *120:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the importance of cathodic protection survey. • Explain different types of survey methods used for identifying any defect on pipeline. • Describe the types of damages and corrosion found on oil and gas pipeline. • List testing equipment required for conducting various surveys and tests on pipeline. • Discuss ways to identify defects through Close Interval Potential Logging (CIPL) survey reading. • List steps to be performed for Direct Current Voltage Gradient (DCVG) Survey. • Elaborate ways to measure polarized potential between the pipeline and an electrode on the ground and pipe–to–soil potential on both sides of the isolation device • List steps to be performed for DC interface testing or detection. • Describe continuity test and insulation testing of electrical system. • List steps to be performed for Casing shorting's test • Describe galvanic series • Describe galvanic corrosion performance.	• Demonstrate the standard operating procedure to use testing equipment for conducting various surveys and tests onpipeline. • Perform steps to locate pipeline and conduct survey of pipeline at required interval. • Apply appropriate ways to measure the polarized potential between the pipeline and an electrode on the ground. • Employ appropriate ways of recording and comparing pipe to soil potential reading with the CP criterion. • Perform steps to obtain the Close Interval Potential Logging (CIPL) survey reading and identify the location of damage on pipeline. • Demonstrate the organisationalspecified procedure of conducting Direct Current Voltage Gradient (DCVG) Survey at coating defect location andrecording change in frequency for further investigation. • Show how to visually inspect the electrical components and systems ofthe pipeline. • Apply appropriate ways to measure pipe–to–soil potential on both sides of the isolation device and check the adequate difference for positive isolation. • Perform steps to check the continuity between both sides of the isolation device. • Use clamp on ammeter, continuous DC or Pulsed DC Holiday detector to measure electrical insulation.

	• Perform steps to verify the insulation of joint/ flange assembly. • Role play a situation on how to co-ordinate with the supervisor in case of short circuit is observed in pipeline. • Perform steps for conducting DC interface testing or detection on pipeline. • Apply appropriate ways to check the interfering pipeline/metallic structure near cathodic protected buried pipeline. • Demonstrate the organisation specified procedure of conducting close interval potential survey on affected pipeline and recording data in both ON and OFF state. • Use Geographic information system (GIS) system to identify pipeline network and Global Positioning System (GPS) location-based data recording for TLP • Show how to measure the recorded data as per Bureau of Indian Standards (BIS) 8062. • Perform steps to conduct Casing shorting's test to measure the flow of current from anode to the pipe. • Demonstrate how to use galvanic series for predicting galvanic corrosion performance.
Classroom Aids:	
White / Black board and Projector, Digital Presentation, Computer/Laptop, Public Addressing System	
Tools, Equipment and Other Requirements	
Pipeline locator, Close Interval Potential Survey instrument kit, Coating integrity Survey instrument kit, Pipeline Current Attenuation Test (CAT) kit, Alternating Current Voltage Gradient (ACVG) kit, Direct Current Voltage Gradient (DCVG) kit, ACVG/DCVG meter, CIPS meter, Multimeter, Megger, Electrical isolation testing kit, Clamp on ammeter, Continuous DC, Pulsed DC Holiday detector, Detecting/Testing of DC Interference kit, Testing of Casing shorting's (electrical /electrolytic) kit, data logger, Transformer Rectifier, Micro Ammeter, meter for pipe to soil,electrolyte sample, steel coupon,	

Module 4: Perform repair and maintenance of pipelines using CP techniques

Mapped to HYC/N6314, v1.0

Terminal Outcomes:

- Perform steps to repair and maintain pipelines using CP techniques.
- Perform maintenance and repairing of CP system

Duration: *60:00*	**Duration**: *90:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain different types of cathodic protection techniques applied to oil and gas pipeline. • Explain different maintenance methods used for cathodic protection. • Discuss selection criteria of sacrificial anodic protection or impressed current cathodic protection based on the requirement. • Recall the process for calculating the data for carrying out adjustments and maintenance of surface. • Describe thermit weld/Pin brazing. • Discuss the process of placing the copper cable on abraded pipe and graphite mould at the end of copper cable. • Discuss the process of inserting and igniting thermit mixture powder and ignite powder into the mould. • Discuss the process of minimizing the waste and storing the unused or reusable material as per organisational guidelines. • Explain maintenance process of CP system. • Discuss the ways of efficiently utilizing the material for conducting maintenance of pipeline through cathodic protection technique. • Describe methods for inspecting and repairing equipment during cathodic protection activity.	• Show how to review the findings of survey and testing to identify the damage or abnormalities on pipeline. • Perform steps to connect highly anodic metal with the base metal in case of sacrificial anodic protection method and positive terminal of battery to backfill and negative terminal to the base metal under Impressed Current Cathodic Protection (ICCP) method. • Apply appropriate ways to identify a highly anodic metal for connecting it to the base metal to protect pipeline from corrosion. • Employ appropriate ways for calculating the data for carrying out adjustments and maintenance of surface if found any abnormalities. • Perform steps to make cable connection from Test station to Pipe using thermit weld/Pin brazing. • Demonstrate the use of using abrasion tool for removing the coating of pipe. • Show how to place the copper cable on abraded pipe and graphite mould at the end of copper cable. • Show how to insert and ignite thermit mixture powder and ignite powder into the mould. • Perform steps for removing the mould and checking the quality connection by hammer blow.

• List the documents needed to be prepared related to CP system maintenance, inspection and repairing.	• Show how to minimize the waste and store the unused or reusable material as per organisational guidelines. • Apply appropriate methods to inspect problems or faults and repair the equipment during cathodic protection operation. • Role play a situation to report the CP work completion and un-attended problem to supervisor or competent authority.
Classroom Aids:	
White / Black board and Projector, Digital Presentation, Computer/Laptop, Public Addressing System	
Tools, Equipment and Other Requirements	
Pipeline locator, Thermit welding tool, Copper wire, Brazing material, Battery, Cable flux, Sacrificial anodic metal, Abrasion tool, Graphite mould, Thermit mixture powder, Ignite powder, Propane torch, Hammer, cathode alxender cell, electrostatic tray,	

Module 5: Effective working in a team

Mapped to HYC/N9301, v2.0

Terminal Outcomes:

- Describe how to interact with others effectively and appropriately.
- Demonstrate how to deal with colleagues at workplace

Duration: *12:00*	**Duration**: *30:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe methods to communicate clearly with the supervisor and reporting authorities. • Explain how to share information in line with organisational requirements. • Explain the organisation's policies and procedures. • Explain how to identify causes of interpersonal conflict at workplace. • Describe ways/methods to resolve interpersonal conflict. • Explain the importance of gender equality. • Explain the importance of supporting and respecting colleagues and other members of the organisation without any bias based on gender, culture, disability etc. • Explain the importance of gender-neutral behaviour while interacting with others.	• Demonstrate ways to handle interpersonal conflict at the workplace. • Demonstrate the ways of developing suitable rapport with other team members. • Demonstrate role of cathodic protection technician. • Demonstrate how to communicate in a manner that is respectful of gender, culture and disability.
• Classroom Aids:	
• White / Black board and Projector • Digital Presentation • Computer/Laptop • Public Addressing System	
Tools, Equipment and Other Requirements	
• Dummy team	

Module 6: Health, safety and security

Mapped to HYC/N9302, v2.0

Terminal Outcomes:

- Identify the possible cause of accident and hazards
- Explain how to maintain safety and healthy environment
- Demonstrate how to use PPE kit at workplace

Duration: *08:00*	**Duration**: *30:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain importance of using PPE like face mask, hand gloves, goggle, protective clothing/equipment, etc. at workplace • Explain how to monitor the health and safety of self and other team members • Explain the hazard and risk associated with mishandling various tools and equipment • Discuss safe work practices as per the company's guidelines and procedures • Explain the good housekeeping practices to prevent any hazard • Explain how to record and report all incidents, damages or injury • Explain importance of personal and workplace hygiene	• Demonstrate how to appropriately wear and discard PPE kit • Demonstrate how to respond promptly and appropriately to an accident • Demonstrate how to administer first aid • Demonstrate various rescue techniques • Demonstrate how to use fire extinguishers • Show the correct way to lift heavy objects. • Demonstrate SOP, Safety pamphlets, Do & Don't at workplace
Classroom Aids:	
• White / Black board and Projector • Digital Presentation • Computer/Laptop • Public Addressing System	
Tools, Equipment and Other Requirements	
• First aid kit • Dummy for first aid treatment • Housekeeping kit • Personal Protective Equipment (PPE)	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma	Electrical/ chemical / petroleum	2	Electrical/ chemical / petroleum	1	-	-

Trainer Certification	
Domain Certification	**Platform Certification**
"Cathodic Protection Technician, HYC/Q6306, v1.0". Minimum accepted score is 80%	"Trainer, MEP/Q2601,v1.0". Minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma	Electrical/ chemical / petroleum	2	Electrical/ chemical / petroleum	1	-	-

Assessor Certification	
Domain Certification	**Platform Certification**
"Cathodic Protection Technician, HYC/Q6306, v1.0". Minimum accepted score is 80%	"Assessor, MEP/Q2701,v1.0". Minimum accepted score is 80%.

Assessment Strategy

The assessment of candidates/trainees will be on the basis on assessment outcome/assessment criteria of the Qualification. In the assessment criteria for each NOS marks have been defined for theoretical and practical skills, on which the candidate will be assessed. The emphasis is on 'learning-by-doing' and performance criteria is based on the practical demonstration of skills and knowledge.

Theory/Knowledge test– This section will test the trainee on his/her knowledge on the subject/trade. The test will be carried out online/offline with a set of random Question paper that include multiple choice questions in multilingual, True/False Statement, audio-video question etc.

The Question Bank will be developed by Subject Matter Experts (SME) of the hydrocarbon sector and these questions again be vetted by the Industry Experts, each performance criteria have its marks for theory based on the level of question i.e. easy, medium and difficult.

Practical/Demonstration Test– This stage involves the face to face interaction between Assessor and each trainee. The practical knowledge will be tested through trade test which demonstrates the skill required for the job, by which assessor would be able to evaluate the trainee for his/her practical knowledge on respective Qualification.

To ensure the maximum possible consistency in the assessment by different assessors at different locations, orientation of the assessors is also required about the stages involved in the assessment and the assessor role in the assessment process. The assessor must have knowledge of the following concepts before assessment:

- Qualification Pack Structure
- Guidance for the assessor to conduct theory and practical assessments
- Guidance for trainees to be given by assessor before the start of the assessments.
- Guidance on assessments process, practical brief with steps of operations practical observation checklist
- Practical/Demonstration Test guidance for uniformity and consistency.
- Guidance on assessment evidence collection (signed attendance copy, verification of the authenticity of the candidate by checking the photo ID card, Photographs-while assessment undergoing etc.)

The empanelled assessment agencies will be instructed to hire assessors with integrity, reliability and fairness. Each assessor shall sign a document with its assessment agency by which they commit themselves to comply with the rules of confidentiality and conflict of interest, independence from commercial and other interests that would compromise impartiality of the assessments. The assessment agencies are instructed to ideally have assessor with sufficient amount of relevantindustry experience related to Qualification. The assessors will also have scrutinized and have to undergo orientation of assessment framework, competency-based assessments etc.

Recognition of Prior Learning (RPL)

Under the Recognition of Prior Learning (RPL), the candidates enrolled and the assessment will be carried out as per the assessment criteria and assessment outcome of the full Qualification and the process of assessment will be carry out by the body/bodies empanelled by Hydrocarbon Sector Skill Council

In RPL, the candidate already has the skills and knowledge while working on the job from long, the learners only requires to undergo a brief orientation training and the subsequent assessment process

and certification is awarded to those candidates who successfully clears the assessment. The tentative process of RPL would include the flowing stages:

1 Cluster Mapping and Mobilisation of the candidates
2 Counselling & Pre-Screening
4 Candidate registration, batch creation and enrolment
5 conduction of an orientation program for candidates before assessment
7 Assessment by HSSC
8 Evaluation of Assessment Result
9 Issuance of the Certificate to successful candidates

Assessment Strategy:

- For each Qualification Pack assessment criteria has been developed, which describe the weightage for each NOS/Performance criteria (PC) and assigned marks based on each NOS separately for theoretical and practical skills
- The question bank will be developed by the subject matter experts to assess the theoretical and practical knowledge.
- The accredited assessment agency will carry out the assessment process on the date proposed after completion of the training. The assessment will be carried out on the basis of the two parameters i.e. Theoretical test and Practical test.
- The result of the assessment will be shared by assessment body to the HSSC for review and compliance, after that result will be processed and certificates will be generated
- Assessments shall be conducted in the regional languages in case of any specific requirement from the concerned Training Provider.
- For ensuring the impartial assessment it will be ensured that the Assessment Bodies (AB) are not involved in any type of training delivery with respect to this project.

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down the proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on the 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 the 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 a minimum of 70% of % aggregate marks to successfully clear the assessment.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Recommended Pass % aggregate for QP: 70%

References

Glossary

Term	Description
Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards(OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (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 aunique 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.
Knowledge and Understanding(KU)	Knowledge and Understanding (KU) are statements that together specify the technical, generic, professional and organisational specific knowledge that an individual need 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 arethe key to learning and working in today's world. These skills are typically neededin 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 selectat 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.

Acronyms and Abbreviations

Term	Description
NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
OS	Occupational Standard(s)
QP	Qualifications Pack
KU	Knowledge and Understanding
GS	Generic Skills
SOP	Standard Operating Procedure