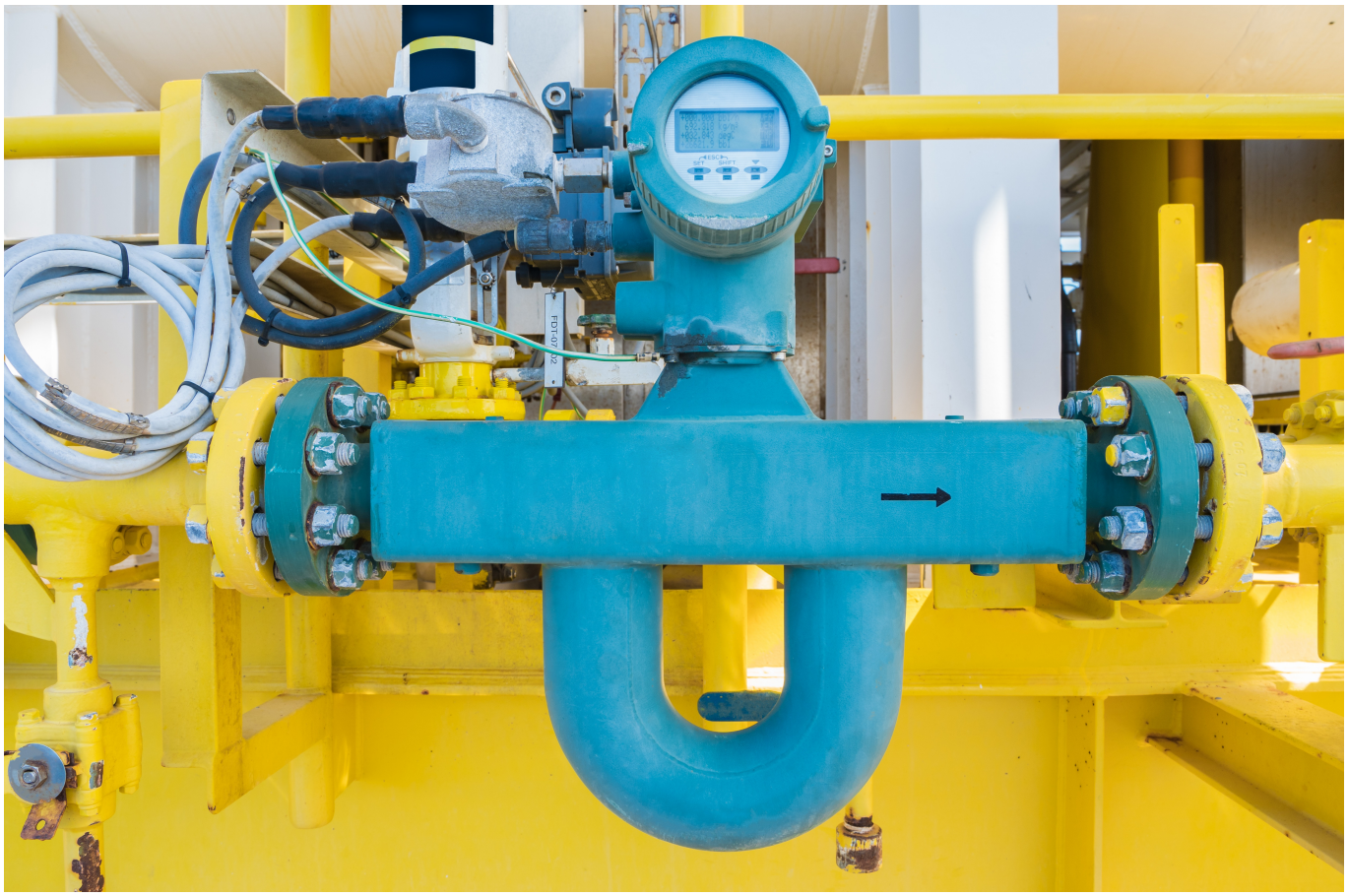
Qualification Pack



Process Instrument Operator (Oil & Gas)

QP Code: HYC/Q6201

Version: 1.0

NSQF Level: 4

Hydrocarbon Sector Skill Council || OIDB Bhawan, Tower C, 2nd Floor, Plot No. 2, Vikas Marg, Sector – 73
Noida (U.P) -201301 || email:admin@hsscindia.in

Contents

Qualification Pack

HYC/Q6201: Process Instrument Operator (Oil & Gas)

Brief Job Description

Process Instrument Operator (Oil & Gas) is required in all kinds of process industries including gas processing plants, oil refineries, fertiliser plants, chemical process plants, gas/oil pipe lines, compressor stations etc. The individual assists supervisor/engineer to perform maintenance activities of measuring and controlling process equipment in field as well as in control room in calibration and installation in accordance with approved procedures.

Personal Attributes

The individual should have a good sense of responsibility, must be alert at all times and ability to work independently. The personnel should able to concentrate on work and have process management skills.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. CSC/N0801: Calibrate hydraulic, pneumatic and mechanical measuring and control equipment
2. CSC/N0802: calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures (Testing and calibrating tools: pressure gauge; standard test gauges; micrometres; jigs and fixtures; templates and patterns; insulation testers; calibrated weights; vernier caliper; dead weight tester; test gauges, manometers; gyroscope)
3. CSC/N0803: Carry out maintenance activities on instrumentation and control equipment
4. HYC/N6201: Perform custody transfer metering
5. HYC/N6202: Maintain & calibrate pressure Safety Valves (PSV)
6. HYC/N6203: Calibrate LEL gas detector
7. HYC/N9301: Working effectively in a team
8. HYC/N9302: Maintain health, safety and security procedures

Qualification Pack (QP) Parameters

Sector	Hydrocarbon
Sub-Sector	Midstream

Qualification Pack

Occupation	Calibration and Instrumentation
Country	India
NSQF Level	4
Credits	NA
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7311.0101
Minimum Educational Qualification & Experience	12th Class (Science) OR I.T.I (two years after class 10th in relevant trade)
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	16/07/2019
Next Review Date	24/06/2023
NSQC Approval Date	25/06/2020
Version	1.0
Reference code on NQR	2020/HYC/HSSCI/03769
NQR Version	1.0

CSC/N0801: Calibrate hydraulic, pneumatic and mechanical measuring and control equipment

Description

This unit covers setting, adjustment, validation or verification of mechanical, pneumatic, hydraulic, measuring and control instruments using reference standards inaccordance with predetermined procedures. The candidate will be expected to work with minimal supervision, taking personal responsibility for own actions and for the quality and accuracy of the work carried out.

Scope

This unit/task covers the following:

- Work safely
- Check equipment for correct operation
- Test measure and control equipment
- Analyse and reporting test results
- Calibrate measuring and control equipment

Elements and Performance Criteria

Work safely

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

PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work

PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing calibration operations

PC3. work following laid down procedures and instructions

PC4. ensure work area is clean and safe from hazards

PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition

Check equipment for correct operation

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

PC6. check components, leads, fasteners, etc. for wear, loose connections or other faults

Test measure and control equipment

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

PC7. prepare and update relevant testing/calibration schedules and plans

PC8. carry out the testing/calibration activities in the specified sequence and in an agreed timescale (Testing/calibration activities: visual inspection of the instrument for completeness and freedom from damage or foreign objects; standard serviceability test/calibration; special-to-type tests; operational/function checks; gauge repeatability and reliability tests; statistical process control methods)

PC9. identify work/test requirements and define are per standard operating procedures

PC10. inspect and test the operation of instruments and systems to diagnose faults using testing devices

PC11. select correct test application principles after inspection of instrumentation systems, equipment/components

PC12. select appropriate test equipment in accordance with defined requirements

PC13. observe device isolation methods/requirements and localize

PC14. apply appropriate test procedures and application principles in assessing operation of instrumentation systems, equipment/components

PC15. report any instances where the testing/calibration activities cannot be fully met or where there are identified defects outside the planned schedule

PC16. complete relevant testing/calibration documentation accurately

Analyse and reporting test results

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

PC17. analyse and verify test results against operational specifications to identify and localise faults

PC18. report potential and real faults using standard operating procedures

PC19. evaluate faulty conditions and plan corrective action

PC20. record action plan and document according to standard operating procedures

Calibrate measuring and control equipment

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

PC21. assess calibration of measuring and control equipment to manufacturers' specifications and/or standard operating procedures (Instrumentation control equipment: for weight (e.g.. mechanical systems, load cells/strain gauges, transducers); speed measurement equipment; speed control equipment (e.g. mechanical governors,); valves and valve mechanisms (e.g.. control valves, valve actuators and positioners); other specific instrumentation)

PC22. calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures (Testing and calibrating tools: pressure gauge; standard test gauges; micrometres; jigs and fixtures; templates and patterns; insulation testers; calibrated weights; vernier caliper; dead weight tester; test gauges, manometers; gyroscope)

PC23. undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration

PC24. perform methods of adjustment using calibration devices and document prescribed procedures and operational specifications

PC25. re-commission equipment in accordance with standard operating procedures

PC26. obtain help or advice from specialist if the problem is outside his/her area of competence or experience

PC27. monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem

PC28. complete documentation post operations as per organizational procedures (Documentation: job card, progress records, incident reports, calibration labels, test reports, nonconforming calibration reports, calibration certificates, etc.)

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. relevant legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
KU2. relevant health and safety requirements applicable in the work place
KU3. importance of working in clean and safe environment
KU4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
KU5. reporting structure, inter-dependent functions, lines and procedures in the work area
KU6. relevant people and their responsibilities within the work area
KU7. escalation matrix and procedures for reporting work and employment related issues
KU8. documentation and related procedures applicable in the context of employment and work
KU9. importance and purpose of documentation in context of employment and work
KU10. knowledge of standards, legislative or regulatory requirements applicable to the measuring equipment and/or its calibration
KU11. standard operating procedures for calibrating the measuring equipment and the tools and equipment required to do so
KU12. standard operating procedures for commissioning the measuring equipment
KU13. calibration records to be kept/maintained in accordance with standard operating procedures
KU14. measuring equipment specifications, operation, wearing parts, connections and components
KU15. using appropriate tools and equipment to check measuring equipment for faults
KU16. using appropriate techniques to check the calibration of the measuring equipment for conformance to specifications
KU17. calibrating the measuring equipment against the appropriate physical standard
KU18. re-commissioning the measuring equipment
KU19. checks that are to be made of the measuring equipment and the tools and equipment to be used when checking the measuring equipment
KU20. common fault(s) that may be found in the measuring equipment
KU21. effects of faults on the performance/accuracy of the measuring equipment
KU22. hazards and controls associated with calibrating measuring equipment
KU23. functionality of the equipment and tolerance levels for calibration
KU24. instrumentation principles (eg. controlling density, level, flow, temperature, composition of a range of materials)
KU25. principles of hydraulic and pneumatic flow
KU26. application principles in assessing operation of instrumentation systems, equipment/components
KU27. procedures and equipment for inspecting and testing instrumentation system
KU28. calibration procedures of instrumentation systems and equipment/ components
KU29. purpose/operational function of instrumentation system
KU30. specifications of each instrumentation system and acceptable deviations from specifications
KU31. procedures for repairing faulty instrumentation system
KU32. dismantling, reassembly and testing techniques

KU33. correct operation of the instrumentation system including the procedures for isolating instrumentation systems

KU34. range of faults in instrumentation system/equipment components

KU35. procedures for checking and verifying the operational function of the instrumentation system/equipment

KU36. procedures for recording and completing service reports

KU37. operational specifications of the instrumentation system/equipment

KU38. variations between test results and operational specifications

KU39. probable causes of faults in instrumentation system/equipment components

KU40. action to be taken to rectify the causes of faults in instrumentation systems/ equipment

KU41. sequence of events to be undertaken to correct faults in the instrumentation system/equipment components

KU42. methods of determining procedures

KU43. procedures for reporting faults

KU44. difference between real and potential faults

KU45. procedures for recording/documenting test and calibration results

KU46. function and procedures for zero, span and range checks on instrumentation systems/equipment

KU47. equipment required to carry out the calibration of instrumentation systems/ equipment

Generic Skills (GS)

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

GS1. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language

GS2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language

GS3. undertake numerical operations, and calculations/ formulae (Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)

GS4. 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, semicircles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder)

GS5. use appropriate measuring techniques and units of measurement

GS6. 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)

GS7. interpret and express tolerance in terms of limits on dimensions

GS8. describe and define the seven base units: (meter, kilogram, second, ampere, kelvin, candela, and mole)

GS9. identify the correct order for performing mathematical operations and solve equations that contain multiple operations

GS10. use basic algebra to solve for the unknown

GS11. convert between various angular units such as degrees, minutes, seconds, grads, radians, etc.

GS12. interpret tables and graphs to determine intermediate and extrapolated values

GS13. calculate the slope, intercept, and linearity of data sets, and interpret graphs and plots that illustrate these aspects of data

GS14. convert various units of measurement between English and metric units, including length, area, volume, capacity, and weight

GS15. describe and define the seven base units: meter, kilogram, second, ampere, kelvin, candela, and mole

GS16. identify fundamental constants c (velocity or speed of light in a vacuum), g (gravitational constant), and R (universal gas constant), their standard symbols, and their common applications

GS17. convey and share technical information clearly using appropriate language

GS18. check and clarify task-related information

GS19. liaise with appropriate authorities using correct protocol

GS20. communicate with people in respectful form and manner in line with organizational protocol

GS21. plan, prioritize and sequence work operations as per job requirements

GS22. organize and analyze information relevant to work

GS23. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time

GS24. exercise restraint while expressing dissent and during conflict situations

GS25. avoid and manage distractions to be disciplined at work

GS26. manage own time for achieving better results

GS27. work in a team in order to achieve better results

GS28. identify and clarify work roles within a team

GS29. communicate and cooperate with others in the team for better results

GS30. seek assistance from fellow team members

GS31. identify problems with work planning, procedures, output and behavior 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. undertake and express new ideas and initiatives to others

GS40. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses

GS41. participate in improvement procedures including process, quality and internal/external customer/supplier relationships

GS42. enhance ones competencies in new and different situations and contexts to achieve more

GS43. participate in on-the-job and other learning, training and development interventions and assessments

GS44. clarify task related information with appropriate personnel or technical adviser

GS45. seek to improve and modify own work practices

GS46. maintain current knowledge of application standards, legislation, codes of practice and product/process developments

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Work safely	**3**	**10**	**-**	**-**
PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	1	2	-	-
PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing calibration operations	1	2	-	-
PC3. work following laid down procedures and instructions	1	2	-	-
PC4. ensure work area is clean and safe from hazards	-	2	-	-
PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition	-	2	-	-
Check equipment for correct operation	**-**	**3**	**-**	**-**
PC6. check components, leads, fasteners, etc. for wear, loose connections or other faults	-	3	-	-
Test measure and control equipment	**9**	**27**	**-**	**-**
PC7. prepare and update relevant testing/calibration schedules and plans	-	3	-	-
PC8. carry out the testing/calibration activities in the specified sequence and in an agreed timescale (Testing/calibration activities: visual inspection of the instrument for completeness and freedom from damage or foreign objects; standard serviceability test/calibration; special-to-type tests; operational/function checks; gauge repeatability and reliability tests; statistical process control methods)	2	3	-	-
PC9. identify work/test requirements and define are per standard operating procedures	2	2	-	-
PC10. inspect and test the operation of instruments and systems to diagnose faults using testing devices	1	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. select correct test application principles after inspection of instrumentation systems, equipment/components	2	3	-	-
PC12. select appropriate test equipment in accordance with defined requirements	1	2	-	-
PC13. observe device isolation methods/requirements and localize	-	3	-	-
PC14. apply appropriate test procedures and application principles in assessing operation of instrumentation systems, equipment/components	1	4	-	-
PC15. report any instances where the testing/calibration activities cannot be fully met or where there are identified defects outside the planned schedule	-	2	-	-
PC16. complete relevant testing/calibration documentation accurately	-	2	-	-
Analyse and reporting test results	**4**	**11**	**-**	**-**
PC17. analyse and verify test results against operational specifications to identify and localise faults	1	3	-	-
PC18. report potential and real faults using standard operating procedures	1	3	-	-
PC19. evaluate faulty conditions and plan corrective action	1	3	-	-
PC20. record action plan and document according to standard operating procedures	1	2	-	-
Calibrate measuring and control equipment	**10**	**23**	**-**	**-**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. assess calibration of measuring and control equipment to manufacturers' specifications and/or standard operating procedures (Instrumentation control equipment: for weight (e.g.. mechanical systems, load cells/strain gauges, transducers); speed measurement equipment; speed control equipment (e.g. mechanical governors,); valves and valve mechanisms (e.g.. control valves, valve actuators and positioners); other specific instrumentation)	2	4	-	-
PC22. calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures (Testing and calibrating tools: pressure gauge; standard test gauges; micrometres; jigs and fixtures; templates and patterns; insulation testers; calibrated weights; vernier caliper; dead weight tester; test gauges, manometers; gyroscope)	2	3	-	-
PC23. undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration	2	3	-	-
PC24. perform methods of adjustment using calibration devices and document prescribed procedures and operational specifications	2	3	-	-
PC25. re-commission equipment in accordance with standard operating procedures	1	3	-	-
PC26. obtain help or advice from specialist if the problem is outside his/her area of competence or experience	-	3	-	-
PC27. monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem	-	2	-	-
PC28. complete documentation post operations as per organizational procedures (Documentation: job card, progress records, incident reports, calibration labels, test reports, nonconforming calibration reports, calibration certificates, etc.)	1	2	-	-
NOS Total	**26**	**74**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0801
NOS Name	Calibrate hydraulic, pneumatic and mechanical measuring and control equipment
Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Calibration and Instrumentation
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	31/03/2022
NSQC Clearance Date	18/06/2015

CSC/N0802: Calibrate electrical and electronic measuring and control equipment

Description

This unit covers setting, adjustment, validation or verification of electrical, electronic measuring and control instruments using reference standards in accordance with predetermined procedures. The candidate will be expected to work with minimal supervision, taking personal responsibility for own actions, and for the quality and accuracy of the work carried out.

Scope

This unit/task covers the following:

- Work safely
- Check equipment for correct operation
- Test measure and control equipment
- Analyse and reporting test results
- Calibrate measuring and control equipment

Elements and Performance Criteria

Work safely

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

PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work

PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing calibration operations

PC3. work following laid down procedures and instructions

PC4. ensure work area is clean and safe from hazards

PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition

Check equipment for correct operation

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

PC6. check components, leads, fasteners, etc. for wear, loose connections or other faults (Components: sensors, transmitters, converters, indicators, analysers, controllers, power supplies, removable circuit boards, sensor units associated with determining/controlling density, level, flow, temperature, composition etc. of a range of materials)

Test measure and control equipment

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

PC7. prepare and update relevant testing/calibration schedules and plans

PC8. carry out the testing/calibration activities in the specified sequence and in an agreed timescale (Testing/calibration activities: visual inspection of the instrument for completeness and freedom from damage or foreign objects; standard serviceability test/calibration; special-to-type tests; operational/function checks; gauge repeatability and reliability tests; statistical process control methods)

PC9. identify work/test requirements and define are per standard operating procedures

PC10. inspect and test the operation of instruments and systems to diagnose faults using testing devices

PC11. select correct test application principles after inspection of instrumentation systems, equipment/components

PC12. select appropriate test equipment in accordance with defined requirements

PC13. ensure appropriate device isolation methods/requirements are observed

PC14. apply appropriate test procedures and application principles in testing the operation of instrumentation systems, equipment/components

PC15. report any instances where the testing/calibration activities cannot be fully met or where there are identified defects outside the planned schedule

PC16. complete relevant testing/calibration documentation accurately

Analyse and reporting test results

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

PC17. analyse and verify test results against operational specifications to identify and localise faults

PC18. report potential and real faults using standard operating procedures

PC19. evaluate faulty conditions and plan corrective action

PC20. record action plan and document according to standard operating procedures

Calibrate measuring and control equipment

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

PC21. assess calibration of measuring and control equipment to manufacturers' specifications and/or standard operating procedures (Instrumentation control equipment: for pressure (e.g.. absolute, gauge, vacuum); for flow (e.g.. orifice plate, venture tube, electromagnetic, ultrasonic, differential pressure cell, positive displacement); for level (e.g.. floats, displacer, differential pressure cells, load cells, ultrasonic, conductivity); for temperature (e.g.. bi-metallic, thermocouples, resistance, infra-red, thermal imaging); fiscal metering equipment (e.g.. gas, electricity, water, fuel); detection and alarm equipment (e.g.. smoke, heat, gas, chemical, water, metal); speed measurement equipment (e.g.. electrical, stroboscopic); emergency shutdown equipment; speed control equipment (e.g.. electrical governors, DC speed controller, AC motor control systems, stepper motors, invertors); vibration monitoring equipment (e.g.. vibration switches, proximity probes, seismic velocity transducer, linear variable differential transform portable data collectors); analysers (e.g.. gas detection, spectroscopy, oxygen analyser, water analysis, moisture measurement, density); recorders and indicators; telemetry systems (e.g.. master station, outstation, standalone systems); other specific instrumentation)

PC22. calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures (Testing and calibrating tools: oscilloscopes; pressure gauge; standard test gauges; temperature controllers; temperature baths; current injection devices; voltmeter; insulation testers; pressure sources; analogue and digital meters; digital pressure indicators; logic probes; calibrated flow meters; special purpose test equipment; system calibrators; manometers; pH simulator/buffers; Wheatstone bridge; potentiometers; frequency/signal generators; logic probes; multimeters, (analog/digital); test gauges; cathode ray oscilloscopes and other associated equipment)

PC23. undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration

PC24. perform methods of adjustment using calibration devices and document prescribed procedures and operational specifications

PC25. re-commission equipment in accordance with standard operating procedures

PC26. refer the problem to a competent internal/external specialist if it cannot be resolved

PC27. obtain help or advice from specialist if the problem is outside his/her area of competence or experience

PC28. monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem

PC29. complete documentation post operations as per organizational procedures (Documentation: job card, progress records, incident reports, calibration labels, test reports, nonconforming calibration reports, calibration certificates, etc.)

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions

KU2. relevant health and safety requirements applicable in the work place

KU3. importance of working in clean and safe environment

KU4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities

KU5. reporting structure, inter-dependent functions, lines and procedures in the work area

KU6. relevant people and their responsibilities within the work area

KU7. escalation matrix and procedures for reporting work and employment related issues

KU8. documentation and related procedures applicable in the context of employment and work

KU9. importance and purpose of documentation in context of employment and work

KU10. knowledge of standards, legislative or regulatory requirements applicable to the measuring and control equipment and/or its calibration

KU11. standard operating procedures for calibrating the measuring and control equipment and the tools and equipment required to do so

KU12. standard operating procedures for commissioning the measuring and control equipment

KU13. calibration records to be kept/maintained in accordance with standard operating procedures measuring and control equipment specifications, operation, wearing parts, connections and components (Components: sensors, transmitters, converters, indicators, analysers, controllers, power supplies, removable circuit boards, sensor units associated with determining/controlling density, level, flow, temperature, composition etc. of a range of materials)

KU14. using appropriate tools and equipment to check measuring and control equipment for faults

KU15. using appropriate techniques to check the calibration of the measuring and control equipment for conformance to specifications

KU16. calibrating the measuring and control equipment against the appropriate physical standard

KU17. checks that are to be made of the measuring and control equipment and the tools and equipment to be used when checking the measuring and control equipment

KU18. common fault(s) that may be found in the measuring and control equipment

KU19. effects of faults on the performance/accuracy of the measuring and control equipment

KU20. hazards and controls associated with calibrating measuring and control equipment

KU21. functionality of the equipment and tolerance levels for calibration

KU22. instrumentation principles (e.g.. controlling density, level, flow, temperature, composition of a range of materials)

KU23. effects of resistance, capacitance, inductance and impedance upon electrical circuit including RLC series circuit

KU24. interpretation requirements of schematic, wiring and block diagrams and circuits

KU25. principles of electrical flow

KU26. calibration procedures of instrumentation systems and equipment/ components

KU27. purpose/operational function of instrumentation system

KU28. procedures and equipment for inspecting and testing instrumentation system

KU29. specifications of each instrumentation system and acceptable deviations from specifications

KU30. procedures for repairing faulty instrumentation system

KU31. dismantling, reassembly and testing techniques

KU32. correct operation of the instrumentation system including the procedures for isolating instrumentation systems

KU33. range of faults in instrumentation system/equipment components

KU34. procedures for checking and verifying the operational function of the instrumentation system/equipment

KU35. procedures for recording and completing service reports

KU36. operational specifications of the instrumentation system/equipment

KU37. variations between test results and operational specifications

KU38. probable causes of faults in instrumentation system/equipment components

KU39. action to be taken to rectify the causes of faults in instrumentation systems/ equipment

KU40. sequence of events to be undertaken to correct faults in the instrumentation system/equipment components

KU41. errors indicated by built-in devices

KU42. methods of determining procedures

KU43. procedures for reporting faults

KU44. difference between real and potential faults

KU45. procedures for recording/documenting test and calibration results

KU46. function and procedures for zero, span and range checks on instrumentation systems/equipment

KU47. equipment required to carry out the calibration of instrumentation systems/ equipment

Generic Skills (GS)

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

GS1. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language

GS2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language

GS3. undertake numerical operations, and calculations/ formulae Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages

GS4. 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, semicircles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder)

GS5. 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)

GS6. 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)

GS7. interpret and express tolerance in terms of limits on dimensions

GS8. calculation of the value of angles in a triangle (Angles in a triangle: right-angled, isosceles, equilateral)

GS9. identify the correct order for performing mathematical operations and solve equations that contain multiple operations

GS10. use basic algebra to solve for the unknown

GS11. convert between various angular units such as degrees, minutes, seconds, grads, radians, etc.

GS12. interpret tables and graphs to determine intermediate and extrapolated values

GS13. calculate the slope, intercept, and linearity of data sets, and interpret graphs and plots that illustrate these aspects of data

GS14. convert various units of measurement between English and metric units, including length, area, volume, capacity and weight

GS15. describe and define the seven base units: meter, kilogram, second, ampere, kelvin, candela, and mole

GS16. identify fundamental constants c (velocity or speed of light in a vacuum), g (gravitational constant), and R (universal gas constant), their standard symbols, and their common applications

GS17. convey and share technical information clearly using appropriate language

GS18. check and clarify task-related information

GS19. liaise with appropriate authorities using correct protocol

GS20. communicate with people in respectful form and manner in line with organizational protocol

GS21. plan, prioritize and sequence work operations as per job requirements

GS22. organize and analyse information relevant to work

GS23. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time

GS24. exercise restraint while expressing dissent and during conflict situations

GS25. avoid and manage distractions to be disciplined at work

GS26. manage own time for achieving better results

GS27. work in a team in order to achieve better results

GS28. identify problems with work planning, procedures, output and behaviour and their implications

GS29. communicate and cooperate with others in the team for better results

GS30. seek assistance from fellow team members

GS31. identify problems with work planning, procedures, output and behavior 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. undertake numerical operations, and calculations/ formulae (Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)

GS40. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses

GS41. participate in improvement procedures including process, quality and internal/external customer/supplier relationships

GS42. enhance ones competencies in new and different situations and contexts to achieve more

GS43. participate in on-the-job and other learning, training and development interventions and assessments

GS44. clarify task related information with appropriate personnel or technical adviser

GS45. seek to improve and modify own work practices

GS46. maintain current knowledge of application standards, legislation, codes of practice and product/process developments

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Work safely	**3**	**10**	**-**	**-**
PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	1	2	-	-
PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing calibration operations	1	2	-	-
PC3. work following laid down procedures and instructions	1	2	-	-
PC4. ensure work area is clean and safe from hazards	-	2	-	-
PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition	-	2	-	-
Check equipment for correct operation	**-**	**3**	**-**	**-**
PC6. check components, leads, fasteners, etc. for wear, loose connections or other faults (Components: sensors, transmitters, converters, indicators, analysers, controllers, power supplies, removable circuit boards, sensor units associated with determining/controlling density, level, flow, temperature, composition etc. of a range of materials)	-	3	-	-
Test measure and control equipment	**10**	**26**	**-**	**-**
PC7. prepare and update relevant testing/calibration schedules and plans	-	3	-	-
PC8. carry out the testing/calibration activities in the specified sequence and in an agreed timescale (Testing/calibration activities: visual inspection of the instrument for completeness and freedom from damage or foreign objects; standard serviceability test/calibration; special-to-type tests; operational/function checks; gauge repeatability and reliability tests; statistical process control methods)	2	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. identify work/test requirements and define are per standard operating procedures	2	2	-	-
PC10. inspect and test the operation of instruments and systems to diagnose faults using testing devices	1	3	-	-
PC11. select correct test application principles after inspection of instrumentation systems, equipment/components	2	3	-	-
PC12. select appropriate test equipment in accordance with defined requirements	1	2	-	-
PC13. ensure appropriate device isolation methods/requirements are observed	1	3	-	-
PC14. apply appropriate test procedures and application principles in testing the operation of instrumentation systems, equipment/components	1	3	-	-
PC15. report any instances where the testing/calibration activities cannot be fully met or where there are identified defects outside the planned schedule	-	2	-	-
PC16. complete relevant testing/calibration documentation accurately	-	2	-	-
Analyse and reporting test results	**4**	**11**	**-**	**-**
PC17. analyse and verify test results against operational specifications to identify and localise faults	1	3	-	-
PC18. report potential and real faults using standard operating procedures	1	3	-	-
PC19. evaluate faulty conditions and plan corrective action	1	3	-	-
PC20. record action plan and document according to standard operating procedures	1	2	-	-
Calibrate measuring and control equipment	**8**	**25**	**-**	**-**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. assess calibration of measuring and control equipment to manufacturers' specifications and/or standard operating procedures (Instrumentation control equipment: for pressure (e.g.. absolute, gauge, vacuum); for flow (e.g.. orifice plate, venture tube, electromagnetic, ultrasonic, differential pressure cell, positive displacement); for level (e.g.. floats, displacer, differential pressure cells, load cells, ultrasonic, conductivity); for temperature (e.g.. bi-metallic, thermocouples, resistance, infra-red, thermal imaging); fiscal metering equipment (e.g.. gas, electricity, water, fuel); detection and alarm equipment (e.g.. smoke, heat, gas, chemical, water, metal); speed measurement equipment (e.g.. electrical, stroboscopic); emergency shutdown equipment; speed control equipment (e.g.. electrical governors, DC speed controller, AC motor control systems, stepper motors, invertors); vibration monitoring equipment (e.g.. vibration switches, proximity probes, seismic velocity transducer, linear variable differential transform portable data collectors); analysers (e.g.. gas detection, spectroscopy, oxygen analyser, water analysis, moisture measurement, density); recorders and indicators; telemetry systems (e.g.. master station, outstation, standalone systems); other specific instrumentation)	1	3	-	-
PC22. calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures (Testing and calibrating tools: oscilloscopes; pressure gauge; standard test gauges; temperature controllers; temperature baths; current injection devices; voltmeter; insulation testers; pressure sources; analogue and digital meters; digital pressure indicators; logic probes; calibrated flow meters; special purpose test equipment; system calibrators; manometers; pH simulator/buffers; Wheatstone bridge; potentiometers; frequency/signal generators; logic probes; multimeters, (analog/digital); test gauges; cathode ray oscilloscopes and other associated equipment)	2	4	-	-
PC23. undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration	1	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC24. perform methods of adjustment using calibration devices and document prescribed procedures and operational specifications	2	3	-	-
PC25. re-commission equipment in accordance with standard operating procedures	1	2	-	-
PC26. refer the problem to a competent internal/external specialist if it cannot be resolved	-	3	-	-
PC27. obtain help or advice from specialist if the problem is outside his/her area of competence or experience	-	3	-	-
PC28. monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem	-	2	-	-
PC29. complete documentation post operations as per organizational procedures (Documentation: job card, progress records, incident reports, calibration labels, test reports, nonconforming calibration reports, calibration certificates, etc.)	1	2	-	-
NOS Total	**25**	**75**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0802
NOS Name	Calibrate electrical and electronic measuring and control equipment
Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Calibration and Instrumentation
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	31/03/2022
NSQC Clearance Date	19/05/2015

CSC/N0803: Carry out maintenance activities on instrumentation and control equipment

Description

This unit covers maintenance activities on instrumentation and control equipment, inaccordance with approved procedures. This will involve dismantling, removing and replacing a range of instruments and faulty peripheral components down to unit andcomponent level, as appropriate.

Scope

This unit/task covers the following:

- Work safely
- Perform maintenance activities
- Escalations of unresolved problems as per protocol
- Interim Feedback to superior in case of delay
- Process Compliances

Elements and Performance Criteria

Work safely

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

PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work

PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing instrumentation operations

PC3. ensure work area is clean and safe from hazards

PC4. ensure that all tools, equipment, power tool cables, extension leads are in asafe and usable condition

Performmaintenanceactivities

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

PC5. obtain and use the correct version of company and/or manufacturers drawings and maintenance documentation

PC6. produce and update relevant maintenance schedules and plans

PC7. carry out the maintenance activities by appropriate techniques & procedures on a range of instrumentation and control equipment Maintenance procedures: e.g. preventive maintenance (routine inspections, and adjustments); corrective maintenance (activities identified from preventative maintenance activities); predictive maintenance (analysis of the equipments condition); reactive maintenance (unexpected equipment/component failure); maintenance prevention (equipment/component design and development); equipment performance; equipment downtime/failure; overall equipment effectiveness (OEE); maintenance costs; health and safety; staff development and training; maintenance rocedures/instructions; operator manuals/working instructions; regulatory compliance; etc. Equipment: eg. pressure, flow, level and temperature instruments); fiscal monitoring equipment; smoke, heat, gas, water, chemical and metal detection and alarm systems; industrial weighing systems; linear and rotational speed measurement and control;vibration monitoring equipment; photo-optic instruments; analyzers recorders and indicators; telemetry systems; emergency shutdown systems and other specific instrumentation equipment

PC8. re-connect and return the system to service on completion of activities

PC9. conduct maintenance activities within the limits of their personal authority

PC10. carry out the maintenance activities by appropriate techniques & procedures on a range of instrumentation and control equipment (Maintenance procedures: e.g. preventive maintenance (routine inspections, and adjustments); corrective maintenance (activities identified from preventative maintenance activities); predictive maintenance (analysis of the equipments condition); reactive maintenance (unexpected equipment/component failure); maintenance prevention (equipment/component design and development); equipment performance; equipment downtime/failure; overall equipment effectiveness (OEE); maintenance costs; health and safety; staff development and training; maintenance procedures/instructions; operator manuals/working instructions; regulatory compliance; etc. Equipment: e.g.. pressure, flow, level and temperature instruments); fiscal monitoring equipment; smoke, heat, gas, water, chemical and metal detection and alarm systems; industrial weighing systems; linear and rotational speed measurement and control; vibration monitoring equipment; photo-optic instruments; analysers recorders and indicators; telemetry systems; emergency shutdown systems and other specific instrumentation equipment)

PC11. report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule

PC12. complete relevant maintenance documentation accurately (Documentation: job cards; permit to work/formal risk assessment and/or sign-on/off procedures; maintenance log or report; company-specific recording system)

PC13. dispose of waste materials in accordance with safe working practices and approved procedures

PC14. identify and lead on making improvements to maintenance processes and procedures

Escalations ofunresolved problemsas per protocol

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

PC15. refer the problem to a competent internal/external specialist if it cannot be resolved

PC16. obtain help or advice from specialist if the problem is outside candidates area of competence or experience

Interim Feedback tosuperior, in case ofdelay

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

PC17. monitor the problem and keep the superior informed about progress or any delays in resolving the problem

Process Compliances

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

PC18. comply with relevant legislation, standards, policies and procedures

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions

KU2. relevant health and safety requirements applicable in the work place

KU3. importance of working in clean and safe environment

KU4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities

KU5. reporting structure, inter-dependent functions, lines and procedures in the work area

KU6. relevant people and their responsibilities within the work area

KU7. escalation matrix and procedures for reporting work and employment related issues

KU8. documentation and related procedures applicable in the context of employment and work

KU9. importance and purpose of documentation in context of employment and work

KU10. isolation and lock-off procedures or permit-to-work procedure that applies

KU11. health and safety precautions to be applied during the maintenance procedure, and their effects on others

KU12. hazards associated with carrying out mechanical maintenance activities (e.g.. handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risks

KU13. importance of wearing protective clothing and other appropriate safety equipment during maintenance process

KU14. how to obtain and interpret drawings, specifications, manufacturers manuals and other documents needed in the maintenance process

KU15. functioning of different process plant and its measuring and control equipment

KU16. procedure to be adopted to establish the background of the fault

KU17. how to evaluate the various types of information available for fault diagnosis (Sources of evidence of fault diagnostic: person or operator who reported the fault; equipment self-diagnosis; test instrument measurements (e.g.. multimeter, oscilloscope, logic probe, signal tracer, signal generator); recording devices; plant/equipment records; circuit outputs/computer display (e.g.. pressure, flow, temperature); equipment outputs; sensory input (sight, sound, smell, touch))

KU18. how to use the various aids and reports available for fault diagnosis (Diagnostic aids: logic diagrams; fault analysis charts (e.g.. fault trees); flow charts or algorithms; manufacturers' manuals; probability charts/reports; troubleshooting guides; computer-aided test equipment; electronic aids)

KU19. various fault finding techniques that can be used and how they are applied (Range of fault diagnostic techniques: e.g. half-split technique; input/output technique; injection and sampling; six point technique; emergent sequence; unit substitution; function/performance testing; equipment self-diagnostics; etc.)

KU20. various fault finding techniques that can be used and how they are applied (Range of fault diagnostic techniques: e.g. half-split technique; input/output technique; injection and sampling; six point technique; emergent sequence; unit substitution; function/performance testing; equipment self-diagnostics; etc.)

KU21. how to evaluate sensory conditions (by sight, sound, smell, touch)

KU22. how to analyze evidence and evaluate possible characteristics and causes of specific faults/problems

KU23. how to relate previous reports/records of similar fault conditions

KU24. how to evaluate the likely risk of running the equipment with the displayed fault, and the effects the fault could have on health and safety, and on the overall process or system

KU25. care, handling and application of instrumentation test instruments

KU26. how to check that test instruments are within current calibration dates, and that they are free from damage and defects

KU27. precautions to be taken to prevent electrostatic discharge (ESD) damage to electronic circuits and components

KU28. basic principles of operation of the instrumentation and control equipment being maintained, how the system functions, its operating sequence, the working purpose of individual units/components and how they interact (Control equipment maintenance activities: pressure (e.g.. absolute, gauge, vacuum); flow (e.g.. orifice plate, venturi tube, electromagnetic, ultrasonic, differential pressure cell, positive displacement); level (e.g.. floats, displacer, differential pressure cells, load cells, ultrasonic, conductivity); temperature (e.g.. bi-metallic, thermocouples, resistance, infra-red, thermal imaging); weight (e.g.. mechanical systems, load cells/strain gauges, transducers); fiscal metering (e.g.. gas, electricity, water, fuel); detection and alarm (e.g.. smoke, heat, gas, chemical, water, metal); speed measurement (e.g.. mechanical, electrical, stroboscopic); emergency shutdown; speed control (e.g.. mechanical governors, electrical governors, DC speed controller, AC motor control systems, stepper motors, invertors); vibration monitoring (e.g.. vibration switches, proximity probes, seismic velocity transducer, linear variable differential transformers, portable data collectors); analysers (e.g.. gas detection, spectroscopy, oxygen analyser, water analysis, moisture measurement, density); recorders and indicators; telemetry systems (e.g.. master station, outstation, standalone systems); valves and valve mechanisms (e.g.. control valves, valve actuators and positioners); other specific instrumentation)

KU29. reasons for making sure that control systems are isolated or put into manual control, and appropriate trip locks, keys or program overrides are inserted, before removing any sensors or instruments from the system

KU30. identification and selection of instrument sensors (including how to identify their markings, calibration information, component values, operating parameters and working range)

KU31. correct way of fitting instruments to avoid faulty readings (caused by head correction, poor flow past sensor, blockages, incorrect wiring, poor insulation or incorrect materials)

KU32. correct and tidy installation and connection of external wiring and components, to avoid electronic interference or mechanical damage

KU33. how to carry out visual checks of the instruments (e.g.. checking for leaks, security of joints and physical damage)

KU34. procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance process

KU35. techniques used to dismantle/assemble integrated equipment (e.g.. release of pressures/force, proof marking to aid reassembly, plugging exposed pipe/component openings, dealing with soldered joints, screwed, clamped and crimped connections)

KU36. methods of attaching identification marks/labels to removed components or cables, to assist with reassembly

KU37. methods of checking that components are fit for purpose, and the need to replace electronic modules, sensors, transmitters, transducers, electronic boards and other failed items

KU38. how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for their intended purpose

KU39. equipment operating and control procedures to be applied during the maintenance activity

KU40. problems that can occur during the maintenance of the instrumentation and control system, and how they can be overcome

KU41. how to conduct a systematic plan, do, check, act (PDCA) approach to problem-solving and business improvement

KU42. how to evaluate improvement ideas in order to select those that are to be pursued

KU43. improvements to the process are achieved by engaging the knowledge and experience of the people working on the process

KU44. how to create or update Standard Operating Procedures (SOP's) maintenance schedules and plans

KU45. the techniques required to communicate information using visual control systems (e.g.. card systems, colour coding, floor footprints, graphs and charts, team boards, tool/equipment shadow boards)

Generic Skills (GS)

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

GS1. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language

GS2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language

GS3. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals)

GS4. 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, semicircles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder)

GS5. use appropriate measuring techniques and units of measurement 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

GS6. interpret and express tolerance in terms of limits on dimensions

GS7. calculation of the value of angles in a triangle Angles in a triangle: right-angled, isosceles, equilateral

GS8. identify the correct order for performing mathematical operations and solve equations that contain multiple operations

GS9. use basic algebra to solve for the unknown

GS10. convert between various angular units such as degrees, minutes, seconds, grads, radians, etc.

GS11. interpret tables and graphs to determine intermediate and extrapolated values

GS12. calculate the slope, intercept, and linearity of data sets, and interpret graphs and plots that illustrate these aspects of data

GS13. convert various units of measurement between English and metric units, including length, area, volume, capacity, and weight

GS14. describe and define the seven base units: meter, kilogram, second, ampere, kelvin, candela, and mole

GS15. identify fundamental constants c (velocity or speed of light in a vacuum), g (gravitational constant), and R (universal gas constant), their standard symbols, and their common applications

GS16. convey and share technical information clearly using appropriate language

GS17. check and clarify task-related information

GS18. liaise with appropriate authorities using correct protocol

GS19. communicate with people in respectful form and manner in line with organizational protocol

GS20. plan, prioritize and sequence work operations as per job requirements

GS21. organize and analyse information relevant to work

GS22. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time

GS23. importance of taking responsibility for own work outcomes

GS24. importance of adherence to work timings, dress code and other organizational policies

GS25. importance of following laid down rules, procedures, instructions and policies

GS26. importance of exercising restraint while expressing dissent and during conflict situations

GS27. how to avoid and manage distractions to be disciplined at work

GS28. importance of time management for achieving better results work in a team in order to achieve better results

GS29. work in a team in order to achieve better results

GS30. identify and clarify work roles within a team

GS31. communicate and cooperate with others in the team for better results

GS32. seek assistance from fellow team members

GS33. identify problems with work planning, procedures, output and behaviour and their implications

GS34. prioritize and plan for problem solving

GS35. communicate problems appropriately to others

GS36. identify sources of information and support for problem solving

GS37. seek assistance and support from other sources to solve problems

GS38. identify effective resolution techniques

GS39. select and apply resolution techniques

GS40. seek evidence for problem resolution

GS41. importance and impact of initiative and enterprise for achieving better results for self, others and organization

GS42. how to 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. participate in improvement procedures including process, quality and internal/external customer/supplier relationships

GS45. enhance ones competencies can and should be applied in new and different situations and contexts to achieve more

GS46. participate in on-the-job and other learning, training and development interventions and assessments

GS47. maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments

GS48. participate in on-the-job and other learning, training and development interventions and assessment

GS49. clarify task related information with appropriate personnel or technical adviser

GS50. seek to improve and modify own work practices

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Work safely	**4**	**17**	**-**	**-**
PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	2	4	-	-
PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing instrumentation operations	2	5	-	-
PC3. ensure work area is clean and safe from hazards	-	4	-	-
PC4. ensure that all tools, equipment, power tool cables, extension leads are in asafe and usable condition	-	4	-	-
Performmaintenanceactivities	**12**	**46**	**-**	**-**
PC5. obtain and use the correct version of company and/or manufacturers drawings and maintenance documentation	2	5	-	-
PC6. produce and update relevant maintenance schedules and plans	-	6	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC7. carry out the maintenance activities by appropriate techniques & procedures on a range of instrumentation and control equipment Maintenance procedures: e.g. preventive maintenance (routine inspections, and adjustments); corrective maintenance (activities identified from preventative maintenance activities); predictive maintenance (analysis of the equipments condition); reactive maintenance (unexpected equipment/component failure); maintenance prevention (equipment/component design and development); equipment performance; equipment downtime/failure; overall equipment effectiveness (OEE); maintenance costs; health and safety; staff development and training; maintenance rocedures/instructions; operator manuals/working instructions; regulatory compliance; etc. Equipment: eg. pressure, flow, level and temperature instruments); fiscal monitoring equipment; smoke, heat, gas, water, chemical and metal detection and alarm systems; industrial weighing systems; linear and rotational speed measurement and control;vibration monitoring equipment; photo-optic instruments; analyzers recorders and indicators; telemetry systems; emergency shutdown systems and other specific instrumentation equipment	2	6	-	-
PC8. re-connect and return the system to service on completion of activities	-	5	-	-
PC9. conduct maintenance activities within the limits of their personal authority	2	4	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. carry out the maintenance activities by appropriate techniques & procedures on a range of instrumentation and control equipment (Maintenance procedures: e.g. preventive maintenance (routine inspections, and adjustments); corrective maintenance (activities identified from preventative maintenance activities); predictive maintenance (analysis of the equipments condition); reactive maintenance (unexpected equipment/component failure); maintenance prevention (equipment/component design and development); equipment performance; equipment downtime/failure; overall equipment effectiveness (OEE); maintenance costs; health and safety; staff development and training; maintenance procedures/instructions; operator manuals/working instructions; regulatory compliance; etc. Equipment: e.g.. pressure, flow, level and temperature instruments); fiscal monitoring equipment; smoke, heat, gas, water, chemical and metal detection and alarm systems; industrial weighing systems; linear and rotational speed measurement and control; vibration monitoring equipment; photo-optic instruments; analysers recorders and indicators; telemetry systems; emergency shutdown systems and other specific instrumentation equipment)	2	4	-	-
PC11. report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule	-	3	-	-
PC12. complete relevant maintenance documentation accurately (Documentation: job cards; permit to work/formal risk assessment and/or sign-on/off procedures; maintenance log or report; company-specific recording system)	-	4	-	-
PC13. dispose of waste materials in accordance with safe working practices and approved procedures	2	4	-	-
PC14. identify and lead on making improvements to maintenance processes and procedures	2	5	-	-
Escalations ofunresolved problemsas per protocol	**2**	**9**	**-**	**-**
PC15. refer the problem to a competent internal/external specialist if it cannot be resolved	2	4	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC16. obtain help or advice from specialist if the problem is outside candidates area of competence or experience	-	5	-	-
Interim Feedback tosuperior, in case ofdelay	**-**	**4**	**-**	**-**
PC17. monitor the problem and keep the superior informed about progress or any delays in resolving the problem	-	4	-	-
Process Compliances	**2**	**4**	**-**	**-**
PC18. comply with relevant legislation, standards, policies and procedures	2	4	-	-
NOS Total	**20**	**80**	**-**	**-**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0803
NOS Name	Carry out maintenance activities on instrumentation and control equipment
Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Calibration and Instrumentation
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	31/03/2022
NSQC Clearance Date	19/05/2015

HYC/N6201: Perform custody transfer metering

Description

This unit covers setting, adjustment, validation or verification of custody transfer metering by using reference standards in accordance with predetermined standard procedures.The candidate will be expected to work under minimal supervision, taking personal responsibility for own actions, and for the quality and accuracy of the work carried out.

Scope

This unit/task covers the following:

- Checking installation of custody meters
- Observing the process and diagnostic parameters
- Calibration of custody meters and auxiliary instruments
- Analyze and report test results

Elements and Performance Criteria

Checking installation of custody meters

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

PC1. identify type of custody flow meter - eg-Turbine, Ultrasonic, Coriolis and principle of their operation

PC2. check installation as per design considerations like maximum/minimum operating process parameters of the fluid, the general characteristics of the fluid, ambient conditions and location of skid

PC3. check installation as per design consideration for uni-directional or bi-directional flow

PC4. read general arrangement design for flowmeter skid as per the selected type of flowmeter

PC5. apply relevant standard while installing flow meter depending on the type - eg - American Gas Association (AGA) report 7 for turbine flowmeter, AGA report 9 for ultrasonic flowmeter etc.

PC6. interpret installation requirements for auxiliary instruments as per standard

PC7. identify upstream and downstream header piping and pipe components as per relevant standard specifications eg- straight run requirements, flow condition etc.

PC8. identify material of construction (MOC) and corrosion resistance of the materials used, hot/cold insulation requirements

PC9. check meter body, bore, tapping, electronic housing, ports and cable entry as per relevant standard recommendations for the hazardous zone classification

PC10. follow Original Equipment Manufacturer (OEM) recommendations specific for the installation of flowmeter e.g.- electro-magnetic interference, skid vibration limits etc.

Observing the process and diagnostic parameters

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

PC11. observe the physical condition of upstream & downstream piping, pipe components, hot/cold insulation, auxiliary instruments

PC12. analyse process parameters and their variation over time, sudden peak or fluctuations

PC13. interpret flowmeter parameters, various component status, self-diagnostics, alarms and events logging

PC14. analyse input sensor status, output signals and process diagnostic parameter and history trends

PC15. verify meter reading using meter prover system

PC16. perform leak test on joints, tapings, flanges, gasket etc.

Calibration of custody meters and auxiliary instruments

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

PC17. calibrate custody meter periodically as per standard requirement

PC18. check configuration database, calibration constant, meter dimensions, parameter constant values, time averaging and sampling rate, hysteresis, flow cut-offs etc. and record it in calibration report As-found

PC19. check and record line condition values on display such as flowrate, velocity, meter diagnostic parameters like gain, performance, signal t noise ratio etc.

PC20. undertake zero flow verification with wet or dry calibration

PC21. calculate error by comparing reading with reference/master flowmeter

PC22. implement appropriate error correction method like flow weighted mean average, second order polynomial or piecewise linearization

PC23. calculate calibration constants for meter configuration and prepare calibration report

PC24. record configuration parameters

PC25. calibrate auxiliary instruments like pressure & temperature transmitter, gas chromatograph etc.

PC26. perform auto calibration setting and configuration for gas chromatograph

PC27. validate calculations and constants used in flow-computer

PC28. trace master calibration instruments used

Analyze and report test results

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

PC29. prepare spare parts list for repairing tools and special tools

PC30. analyse OEM factory calibration report, factory configuration and calibration constants report.

PC31. facilitate third party to witness calibration report based on as-found and as-left parameter records

PC32. validate the calculation of flowmeter and calibration reports of Pressure Transmitter (PT), Temperature Transmitter (TT) and Gas chromatograph (GC)

PC33. analyse reports specific to the type of flowmeter chosen like speed of sound and test report for ultrasound meter as per AGA report 10

PC34. perform repeatability test results for GC

PC35. upgrade firmware, hardware and related parts replacement

PC36. maintain diagnostic software upgradation

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. principles and processes for providing customer services and includes customer needs assessment, meeting quality standards for services and evaluation of customer satisfaction

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 to the work place

KU8. importance of working in a 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. functions of typical components on Oil & gas pipeline facilities

KU12. properties of hydrocarbons and basics of hydrocarbons processing

KU13. principles of custody transfer measurement, gas & liquid chromatograph, liquid hydrocarbon loading operation, operation of gas analysis systems including gas chromatographs, densitometers, calorimeters, typical monitoring and control systems (incl. PLC, SCADA)

KU14. operation of weighment controllers and earthing

KU15. safety precautions associated with natural gas pipelines

KU16. performance of various pipe materials under a wide variety of conditions.

KU17. hazards of the trade and precautionary measures

Generic Skills (GS)

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

GS1. follow written instructions

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. communicate with other team members, leaders and operations personnel in writing through appropriate method like letter, memos, email etc.

GS6. undertake numerical operations, geometry and calculations

GS7. convey and share technical information clearly using appropriate language

GS8. check and clarify task-related information

GS9. liaise with appropriate authorities using correct protocol

GS10. communicate with people in respectful form and manner in line with organizational protocol

GS11. make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments

GS12. plan, prioritize and sequence work operations as per job requirements

GS13. organize and analyse information relevant to work

GS14. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time

GS15. deliver consistent and reliable service as per the job requirement

GS16. apply problem solving approaches in different situations

GS17. identify defects in the material and communicate it at the earliest and suggest improvements (if any) in process/material based on experience

GS18. apply problem-solving approaches in different situations

GS19. refer anomalies to the line manager

GS20. identify any issues affecting the material, equipment or surroundings

GS21. escalate issues that cannot be solved as per the troubleshooting/company manual

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Checking installation of custody meters	**10**	**18**	**-**	**-**
PC1. identify type of custody flow meter - eg- Turbine, Ultrasonic, Coriolis and principle of their operation	1	2	-	-
PC2. check installation as per design considerations like maximum/minimum operating process parameters of the fluid, the general characteristics of the fluid, ambient conditions and location of skid	1	2	-	-
PC3. check installation as per design consideration for uni-directional or bi-directional flow	1	2	-	-
PC4. read general arrangement design for flowmeter skid as per the selected type of flowmeter	1	2	-	-
PC5. apply relevant standard while installing flow meter depending on the type - eg - American Gas Association (AGA) report 7 for turbine flowmeter, AGA report 9 for ultrasonic flowmeter etc.	1	2	-	-
PC6. interpret installation requirements for auxiliary instruments as per standard	1	1	-	-
PC7. identify upstream and downstream header piping and pipe components as per relevant standard specifications eg- straight run requirements, flow condition etc.	1	2	-	-
PC8. identify material of construction (MOC) and corrosion resistance of the materials used, hot/cold insulation requirements	1	1	-	-
PC9. check meter body, bore, tapping, electronic housing, ports and cable entry as per relevant standard recommendations for the hazardous zone classification	1	2	-	-
PC10. follow Original Equipment Manufacturer (OEM) recommendations specific for the installation of flowmeter e.g.- electro-magnetic interference, skid vibration limits etc.	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Observing the process and diagnostic parameters	**6**	**11**	**-**	**-**
PC11. observe the physical condition of upstream & downstream piping, pipe components, hot/cold insulation, auxiliary instruments	1	2	-	-
PC12. analyse process parameters and their variation over time, sudden peak or fluctuations	1	1	-	-
PC13. interpret flowmeter parameters, various component status, self-diagnostics, alarms and events logging	1	2	-	-
PC14. analyse input sensor status, output signals and process diagnostic parameter and history trends	1	2	-	-
PC15. verify meter reading using meter prover system	1	2	-	-
PC16. perform leak test on joints, tapings, flanges, gasket etc.	1	2	-	-
Calibration of custody meters and auxiliary instruments	**12**	**22**	**-**	**-**
PC17. calibrate custody meter periodically as per standard requirement	1	2	-	-
PC18. check configuration database, calibration constant, meter dimensions, parameter constant values, time averaging and sampling rate, hysteresis, flow cut-offs etc. and record it in calibration report As-found	1	2	-	-
PC19. check and record line condition values on display such as flowrate, velocity, meter diagnostic parameters like gain, performance, signal t noise ratio etc.	1	2	-	-
PC20. undertake zero flow verification with wet or dry calibration	1	2	-	-
PC21. calculate error by comparing reading with reference/master flowmeter	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. implement appropriate error correction method like flow weighted mean average, second order polynomial or piecewise linearization	1	2	-	-
PC23. calculate calibration constants for meter configuration and prepare calibration report	1	2	-	-
PC24. record configuration parameters	1	1	-	-
PC25. calibrate auxiliary instruments like pressure & temperature transmitter, gas chromatograph etc.	1	2	-	-
PC26. perform auto calibration setting and configuration for gas chromatograph	1	2	-	-
PC27. validate calculations and constants used in flow-computer	1	1	-	-
PC28. trace master calibration instruments used	1	2	-	-
Analyze and report test results	**7**	**14**	**-**	**-**
PC29. prepare spare parts list for repairing tools and special tools	1	2	-	-
PC30. analyse OEM factory calibration report, factory configuration and calibration constants report.	1	1	-	-
PC31. facilitate third party to witness calibration report based on as-found and as-left parameter records	1	2	-	-
PC32. validate the calculation of flowmeter and calibration reports of Pressure Transmitter (PT), Temperature Transmitter (TT) and Gas chromatograph (GC)	1	2	-	-
PC33. analyse reports specific to the type of flowmeter chosen like speed of sound and test report for ultrasound meter as per AGA report 10	1	2	-	-
PC34. perform repeatability test results for GC	1	1	-	-
PC35. upgrade firmware, hardware and related parts replacement	-	2	-	-
PC36. maintain diagnostic software upgradation	1	2	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS Total	**35**	**65**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	HYC/N6201
NOS Name	Perform custody transfer metering
Sector	Hydrocarbon
Sub-Sector	Midstream
Occupation	Calibration & Instrumentation
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	16/07/2019
Next Review Date	16/07/2023
NSQC Clearance Date	NA

HYC/N6202: Maintain & calibrate pressure Safety Valves (PSV)

Description

This unit covers calibration, setting, adjustment, validation of Pressure Safety Valves (PSV) by using reference standards in accordance with predetermined standard procedures.The candidate will be expected to work under minimal supervision, taking personal responsibility for own actions, and for the quality and accuracy of the work carried out

Scope

This unit/task covers the following:

- Prepare Pressure Safety Valves (PSV) for inspection, testing and calibration
- Inspection of Pressure Safety Valve (PSV)
- Testing and calibration of Pressure Safety Valves (PSV)
- Maintenance of Pressure Safety Valve (PSV) and report preparation

Elements and Performance Criteria

Prepare Pressure Safety Valves (PSV) for inspection, testing and calibration

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

PC1. obtain proper work permit from operation

PC2. check availability of proper non-sparking tools

PC3. ensure proper PPEs are used while carrying out the job

PC4. check proper isolation of the safety valve from the process line and communicate the status to process department

PC5. remove PSV from line with applicable safety permits & precautions

PC6. provide necessary blind after removal of PSV

PC7. check any hydrocarbon gas leakage by Lower Explosive Limit (LEL) meter

Inspection of Pressure Safety Valve (PSV)

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

PC8. shift PSV to work shop for physical internal inspection and testing

PC9. dismantle PSV for internal inspection

PC10. carry out following activities depending upon the internal inspection: (i) Lapping of disk / Nozzle(ii) Machining of disk / Nozzle(iii) Replacement of Disk / Nozzle / spring etc

PC11. assemble the valve back and place in test bench for testing & calibration

Testing and calibration of Pressure Safety Valves (PSV)

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

PC12. calibrate pressure gauges used for Calibration of PSV with secondary master test equipment.

PC13. fix PSV on test bench, check all connections and pressurize the system near Cold Differential Set Pressure CDSP level (as provided in data sheet)

PC14. test pressure safety valve for Poping at its cold differential set pressure (CDSP) value.

PC15. perform satisfactory pop test, leakage/passing test as per permissible limit (normally, no passing is ensured up to 90% of set pressure).

PC16. paste sticker containing relevant data on PSV on acceptance of calibration

PC17. remove PSV from test bench after satisfaction of above testing and shift back to site for re-installation

Maintenance of Pressure Safety Valve (PSV) and report preparation

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

PC18. remove blind from line and install back PSV with proper gasket with safety precautions, after tightening of flange bolts check leakages if any and then take back in-line

PC19. return the work permit to shift in-charge with confirmation from field operator

PC20. prepare calibration certificate

PC21. update calibration data in the applicable format.

PC22. maintain records of tests and results in accordance with procedures

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. principles and processes for providing customer and includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction

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 a 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. functions of typical components on Oil & gas pipeline facilities

KU12. properties of hydrocarbons and basics of hydrocarbons processing

KU13. operation of weighment controllers and earthing

KU14. safety precautions associated with natural gas pipelines

KU15. performance of various pipe materials under a wide variety of conditions.

KU16. hazards of the trade and precautionary measures

Generic Skills (GS)

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

GS1. follow written instructions

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. communicate with other team members, leaders and operations personnel in writing through appropriate method like letter, memos, email etc.

GS6. undertake numerical operations, geometry and calculations

GS7. convey and share technical information clearly using appropriate language

GS8. check and clarify task-related information

GS9. liaise with appropriate authorities using correct protocol

GS10. communicate with people in respectful form and manner in line with organizational protocol

GS11. make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments

GS12. plan, prioritize and sequence work operations as per job requirements

GS13. organize and analyse information relevant to work

GS14. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time

GS15. deliver consistent and reliable service as per the job requirement

GS16. apply problem solving approaches in different situations

GS17. identify defects in the material and communicate it at the earliest and suggest improvements (if any) in process/material based on experience

GS18. apply problem-solving approaches in different situations

GS19. refer anomalies to the line manager

GS20. identify any issues affecting the material, equipment or surroundings

GS21. escalate issues that cannot be solved as per the troubleshooting/company manual

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare Pressure Safety Valves (PSV) for inspection, testing and calibration	**3**	**12**	**-**	**-**
PC1. obtain proper work permit from operation	-	2	-	-
PC2. check availability of proper non-sparking tools	1	1	-	-
PC3. ensure proper PPEs are used while carrying out the job	-	2	-	-
PC4. check proper isolation of the safety valve from the process line and communicate the status to process department	-	2	-	-
PC5. remove PSV from line with applicable safety permits & precautions	1	2	-	-
PC6. provide necessary blind after removal of PSV	1	1	-	-
PC7. check any hydrocarbon gas leakage by Lower Explosive Limit (LEL) meter	-	2	-	-
Inspection of Pressure Safety Valve (PSV)	**3**	**6**	**-**	**-**
PC8. shift PSV to work shop for physical internal inspection and testing	1	1	-	-
PC9. dismantle PSV for internal inspection	1	1	-	-
PC10. carry out following activities depending upon the internal inspection: (i) Lapping of disk / Nozzle(ii) Machining of disk / Nozzle(iii) Replacement of Disk / Nozzle / spring etc	1	2	-	-
PC11. assemble the valve back and place in test bench for testing & calibration	-	2	-	-
Testing and calibration of Pressure Safety Valves (PSV)	**5**	**10**	**-**	**-**
PC12. calibrate pressure gauges used for Calibration of PSV with secondary master test equipment.	1	1	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. fix PSV on test bench, check all connections and pressurize the system near Cold Differential Set Pressure CDSP level (as provided in data sheet)	1	1	-	-
PC14. test pressure safety valve for Poping at its cold differential set pressure (CDSP) value.	1	2	-	-
PC15. perform satisfactory pop test, leakage/passing test as per permissible limit (normally, no passing is ensured up to 90% of set pressure).	-	2	-	-
PC16. paste sticker containing relevant data on PSV on acceptance of calibration	1	2	-	-
PC17. remove PSV from test bench after satisfaction of above testing and shift back to site for re-installation	1	2	-	-
Maintenance of Pressure Safety Valve (PSV) and report preparation	**4**	**7**	**-**	**-**
PC18. remove blind from line and install back PSV with proper gasket with safety precautions, after tightening of flange bolts check leakages if any and then take back in-line	1	1	-	-
PC19. return the work permit to shift in-charge with confirmation from field operator	-	2	-	-
PC20. prepare calibration certificate	1	1	-	-
PC21. update calibration data in the applicable format.	1	2	-	-
PC22. maintain records of tests and results in accordance with procedures	1	1	-	-
NOS Total	**15**	**35**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	HYC/N6202
NOS Name	Maintain & calibrate pressure Safety Valves (PSV)
Sector	Hydrocarbon
Sub-Sector	Midstream
Occupation	Calibration & Instrumentation
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	16/07/2019
Next Review Date	16/07/2023
NSQC Clearance Date	NA

HYC/N6203: Calibrate LEL gas detector

Description

This unit covers calibration, setting, adjustment, validation of Lower Explosive Limit (LEL) detector by using reference standards in accordance with predetermined standard procedures.The candidate will be expected to work under minimal supervision, taking personal responsibility for own actions, and for the quality and accuracy of the work carried out.

Scope

This unit/task covers the following:

- Prepare for LEL gas detection system testing and calibration
- Perform calibration of LEL detectors
- Maintain LEL detection equipment and prepare reports

Elements and Performance Criteria

Prepare for LEL Gas Detection System testing and calibration

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

PC1. obtain proper work permit from operations team

PC2. check healthiness of cylinder pressure regulator and flow meter

PC3. check LEL cylinder gas composition and validity certificate

PC4. ensure PPEs are used while handling the cylinders

PC5. identify hazards from possible gas leakage

PC6. implement hazard control measures and use of appropriate personal protective equipment (PPE)

Perform calibration of LEL detectors

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

PC7. check LEL detector and ensure junction box is thoroughly inspected for any abnormality

PC8. check the following: a. 24V DC supply indicator and alarm indicator. If not, check for blown fuse or power supply from control room (Type 1)b. Head Voltage (2V DC). If required, adjust voltage from control module installed in control room (Type2)

PC9. purge the detector with air and observe the reading on the display unit as applicable. If required, adjust the zero reading

PC10. apply calibration gas, as applicable, to the detector and observe the reading on the display as per gas concentration. If required, adjust by span reading.

PC11. apply suitable correction factors for the intended LEL application as per OEM manual

PC12. repeat above steps from PC 9 to PC 11 till the readings are within required range

PC13. check the execution of alarm 1 (set as 20% of reading) and alarm 2 (set as 60% of reading) and adjust respective pot-meters, if required

PC14. take detector in line after satisfactory completion of calibration and purging

Maintain LEL detection equipment and prepare reports

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

PC15. clean and maintain LEL gas detection system & testing kit in accordance with procedures and return the work permit to operation shift in-charge

PC16. update calibration data in the applicable format

PC17. maintain records of tests and results in accordance with procedures

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. companys policies on: personnel management, duty report in procedure and associated MIS compliance

KU2. 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. 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. functions of typical components on Oil & gas pipeline facilities

KU12. properties of hydrocarbons and basics of hydrocarbons processing

KU13. operation of weighment controllers and earthing

KU14. safety precautions associated with natural gas pipelines

KU15. performance of various pipe materials under a wide variety of conditions.

KU16. hazards of the trade and precautionary measures

Generic Skills (GS)

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

GS1. follow written instructions

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. communicate with other team members, leaders and operations personnel in writing through appropriate method like letter, memos, email etc.

GS6. undertake numerical operations, geometry and calculations

GS7. convey and share technical information clearly using appropriate language

GS8. check and clarify task-related information

GS9. liaise with appropriate authorities using correct protocol

GS10. communicate with people in respectful form and manner in line with organizational protocol

GS11. make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments

GS12. plan, prioritize and sequence work operations as per job requirements

GS13. organize and analyse information relevant to work

GS14. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time

GS15. deliver consistent and reliable service as per the job requirement

GS16. apply problem solving approaches in different situations

GS17. Identify defects in the material and communicate it at the earliest and suggest improvements (if any) in process/material based on experience

GS18. apply problem-solving approaches in different situations

GS19. refer anomalies to the line manager

GS20. identify any issues affecting the material, equipment or surroundings

GS21. escalate issues that cannot be solved as per the troubleshooting/company manual

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare for LEL Gas Detection System testing and calibration	**7**	**9**	**-**	**-**
PC1. obtain proper work permit from operations team	1	2	-	-
PC2. check healthiness of cylinder pressure regulator and flow meter	1	2	-	-
PC3. check LEL cylinder gas composition and validity certificate	1	1	-	-
PC4. ensure PPEs are used while handling the cylinders	1	2	-	-
PC5. identify hazards from possible gas leakage	2	1	-	-
PC6. implement hazard control measures and use of appropriate personal protective equipment (PPE)	1	1	-	-
Perform calibration of LEL detectors	**10**	**16**	**-**	**-**
PC7. check LEL detector and ensure junction box is thoroughly inspected for any abnormality	1	2	-	-
PC8. check the following: a. 24V DC supply indicator and alarm indicator. If not, check for blown fuse or power supply from control room (Type 1)b. Head Voltage (2V DC). If required, adjust voltage from control module installed in control room (Type2)	1	2	-	-
PC9. purge the detector with air and observe the reading on the display unit as applicable. If required, adjust the zero reading	1	2	-	-
PC10. apply calibration gas, as applicable, to the detector and observe the reading on the display as per gas concentration. If required, adjust by span reading.	2	2	-	-
PC11. apply suitable correction factors for the intended LEL application as per OEM manual	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. repeat above steps from PC 9 to PC 11 till the readings are within required range	1	2	-	-
PC13. check the execution of alarm 1 (set as 20% of reading) and alarm 2 (set as 60% of reading) and adjust respective pot-meters, if required	2	2	-	-
PC14. take detector in line after satisfactory completion of calibration and purging	1	2	-	-
Maintain LEL detection equipment and prepare reports	**3**	**5**	**-**	**-**
PC15. clean and maintain LEL gas detection system & testing kit in accordance with procedures and return the work permit to operation shift in-charge	-	1	-	-
PC16. update calibration data in the applicable format	2	2	-	-
PC17. maintain records of tests and results in accordance with procedures	1	2	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	HYC/N6203
NOS Name	Calibrate LEL gas detector
Sector	Hydrocarbon
Sub-Sector	Midstream
Occupation	Calibration & Instrumentation
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	16/07/2019
Next Review Date	16/07/2023
NSQC Clearance Date	NA

HYC/N9301: Working effectively in a team

Description

This unit is about working effectively within a team.

Scope

This unit/task 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. work in a team and support the team members
PC4. work in ways that show respect to colleagues
PC5. fulfil commitments made to colleagues
PC6. inform team members timely, if timelines cant be met
PC7. take the necessary initiatives to resolve the issues while working in team

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the organizations policies and procedures related to team work in workplace
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 practice in organisation w.r.t communication at various levels
KU6. the instructions at individual level or at group level
KU7. individual work responsibility and corrective measures required to complete task in time
KU8. the importance of personal qualities like discipline and confidence to achieve success in work assigned

Generic Skills (GS)

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

GS1. communicate effectively in writing

GS2. read instructions, guidelines/procedures

GS3. communicate information effectively

GS4. make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments

GS5. how to plan the work to meet the deadline

GS6. the importance of consistent and reliable services for customer satisfaction

GS7. apply problem solving approaches in different situations

GS8. apply balanced judgments to different situations

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Effective team work	**20**	**30**	**-**	**-**
PC1. maintain clear communication with colleagues	2	4	-	-
PC2. pass on information to colleagues in line with organisational requirements	3	5	-	-
PC3. work in a team and support the team members	3	4	-	-
PC4. work in ways that show respect to colleagues	3	4	-	-
PC5. fulfil commitments made to colleagues	3	5	-	-
PC6. inform team members timely, if timelines cant be met	3	4	-	-
PC7. take the necessary initiatives to resolve the issues while working in team	3	4	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	HYC/N9301
NOS Name	Working effectively in a team
Sector	Hydrocarbon
Sub-Sector	Generic
Occupation	Generic
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	16/07/2019
Next Review Date	16/07/2023
NSQC Clearance Date	NA

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

This unit/task covers the following:

- Practice health and safety measures
- Follow fire safety procedures
- Follow emergencies, rescue and first-aid procedures

Elements and Performance Criteria

Practice health and safety measures

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

PC1. use protective clothing/equipment for specific tasks and work conditions

PC2. identify documents, location and people responsible for health and safety in the workplace

PC3. identify possible causes of risk or accident in the workplace

PC4. carry out safe working practices while dealing with hazards to ensure the safety of self and others

PC5. lift heavy objects safely using correct procedures

PC6. identify common safety signs, displayed in various areas

Follow fire safety procedures

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

PC7. use the various appropriate fire extinguishers on different types of fires correctly

PC8. follow rescue techniques applied during fire hazard

PC9. follow good housekeeping practice in order to prevent fire hazards

PC10. list issues concerning the safety in work place

PC11. inform fire safety department about any near-miss incidents in the work place

PC12. follow the applicable laws, regulations and codes as per safety standard

PC13. prepare written accident/incident report and share with the concerned officer/department

Follow emergencies, rescue and first-aid procedures

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

PC14. provide appropriate first aid to victims in emergency situation

PC15. demonstrate basic techniques of bandaging

PC16. respond promptly and appropriately to an accident

PC17. perform rescue activity during an accident in real or simulated environments

PC18. demonstrate correct method to rescue injured people and others during an emergency

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. companys policies on personnel management and duty reporting procedure
KU2. reporting structure within organization
KU3. how to escalate problem
KU4. concept of hazards and risks
KU5. health and safety hazards commonly affecting the work environment and related precautions
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 by writing
GS2. read instructions, guidelines/procedures and reports
GS3. communicate effectively and share the information efficiently
GS4. identify and report potential sources of danger
GS5. how to plan the work to meet the deadline
GS6. the importance of on time services
GS7. apply problem solving approaches in different situations
GS8. apply balanced judgments to different situations

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Practice health and safety measures	**9**	**15**	**-**	**-**
PC1. use protective clothing/equipment for specific tasks and work conditions	1	4	-	-
PC2. identify documents, location and people responsible for health and safety in the workplace	2	1	-	-
PC3. identify possible causes of risk or accident in the workplace	1	3	-	-
PC4. carry out safe working practices while dealing with hazards to ensure the safety of self and others	2	2	-	-
PC5. lift heavy objects safely using correct procedures	1	3	-	-
PC6. identify common safety signs, displayed in various areas	2	2	-	-
Follow fire safety procedures	**12**	**16**	**-**	**-**
PC7. use the various appropriate fire extinguishers on different types of fires correctly	2	2	-	-
PC8. follow rescue techniques applied during fire hazard	2	2	-	-
PC9. follow good housekeeping practice in order to prevent fire hazards	2	2	-	-
PC10. list issues concerning the safety in work place	1	3	-	-
PC11. inform fire safety department about any near-miss incidents in the work place	2	2	-	-
PC12. follow the applicable laws, regulations and codes as per safety standard	1	3	-	-
PC13. prepare written accident/incident report and share with the concerned officer/department	2	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Follow emergencies, rescue and first-aid procedures	**4**	**19**	**-**	**-**
PC14. provide appropriate first aid to victims in emergency situation	1	4	-	-
PC15. demonstrate basic techniques of bandaging	1	4	-	-
PC16. respond promptly and appropriately to an accident	-	3	-	-
PC17. perform rescue activity during an accident in real or simulated environments	1	4	-	-
PC18. demonstrate correct method to rescue injured people and others during an emergency	1	4	-	-
NOS Total	**25**	**50**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	HYC/N9302
NOS Name	Maintain health, safety and security procedures
Sector	Hydrocarbon
Sub-Sector	Generic
Occupation	Generic
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	16/07/2019
Next Review Date	16/07/2023
NSQC Clearance Date	NA

Assessment Guidelines and Assessment Weightage

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 proportion of marks for Theory and Skills Practical for each PC.

2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.

3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).

4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.

5. In case of successfully passing only certain number of NOSs, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

6. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack

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
CSC/N0801.Calibrate hydraulic, pneumatic and mechanical measuring and control equipment	26	74	-	-	100	15
CSC/N0802.calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures (Testing and calibrating tools: pressure gauge; standard test gauges; micrometres; jigs and fixtures; templates and patterns; insulation testers; calibrated weights; vernier caliper; dead weight tester; test gauges, manometers; gyroscope)	25	75	-	-	100	15
CSC/N0803.Carry out maintenance activities on instrumentation and control equipment	20	80	-	-	100	15
HYC/N6201.Perform custody transfer metering	35	65	-	-	100	15
HYC/N6202.Maintain & calibrate pressure Safety Valves (PSV)	15	35	-	-	50	10
HYC/N6203.Calibrate LEL gas detector	20	30	-	-	50	10

Qualification Pack

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
HYC/N9301.Working effectively in a team	20	30	-	-	50	10
HYC/N9302.Maintain health, safety and security procedures	25	50	-	-	75	10
Total	**186**	**439**	**-**	**-**	**625**	**100**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

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.

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.