

Model Curriculum

13. Calibration Technician

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
REF ID: CSC/Q0801, V1.0
NSQF LEVEL: 4



Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

CAPITAL GOODS SKILL COUNCIL

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Calibration Technician' QP No. 'CSC/ Qo8o1, NSQF Level 4'

Date of Issuance: April 10th, 2014

Valid up to : August 30th, 2016

*Valid up to the next review date of the Qualification Pack, or the
Valid up to date mentioned above (whichever is earlier).



Authorised Signatory
Tourism & Hospitality Skill Council

TABLE OF CONTENTS

1. Curriculum.....	01
2. Trainer Prerequisites.....	07
3. Annexure: Assessment Criteria.....	08

Calibration Technician

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Calibration Technician”, in the “Capital Goods” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Calibration –Technician		
Qualification Pack Name & Reference ID. ID	CSC/Q0801, v1.0		
Version No.	1.0	Version Update Date	
Pre-requisites to Training	Diploma – Mechanical, Electrical, Electronics/Mechatronics		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Calibrate hydraulic, pneumatic and mechanical measuring and control equipment: setting, adjustment, validation or verification of mechanical, pneumatic, hydraulic, measuring and control instruments using reference standards in accordance with predetermined procedures. • Calibrate electrical and electronic measuring and control equipment: setting, adjustment, validation or verification of electrical, electronic measuring and control instruments using reference standards in accordance with predetermined procedures. • Basic health and safety practices at the workplace: identify risks and hazards at workplace, use of PPE, and apply good housekeeping practices, etc., • Work effectively with others: effectively communicate with others and demonstrate good ethical practices and discipline. 		

This course encompasses 5 out of 5 National Occupational Standards (NOS) of “Senior Manual Metal Arc Welding/Shielded Metal Arc Welding” Qualification Pack issued by “Capital Goods Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p>Calibrate Hydraulic, Mechanical and Pneumatic Measuring Control Equipment</p> <p>Theory Duration (hh:mm) 40:00</p> <p>Practical Duration (hh:mm) 80:00</p> <p>Corresponding NOS Code CSC/N0801</p>	<ul style="list-style-type: none"> Define the term ‘Calibration’ Explain the need for calibration of measuring equipment Explain standards and requirements applicable to the measuring equipment Explain instrumentation principles such as controlling density, level, flow, temperature and composition of range of materials State principles of hydraulic and pneumatic flow Interpret standard operating procedures for calibration Identify tools and equipment required for calibration Identify various types of measuring instruments Explain the principle of operation of various measuring instruments and identify major parts of measuring instruments List hazards and controls associated with calibration Interpret the specification of instrumentation system State procedures for recording / documenting test and calibration results Interpret tolerance levels for calibration Identify Personal Protective Equipment required for Calibration Explain statistical control methods Prepare and update relevant testing/calibration schedules and plans Carryout testing/ calibration activities as per the sequence like visual inspection, Serviceability tests/calibration, Special-to –type tests, Operational/functional checks, Gauge repeatability and reliability tests Inspect and test the operation of instruments and systems to diagnose faults using testing devices Evaluate suitable test procedures and application principles in assessing operation of instrumentation system/ equipment/component Analyze and verify test results against operational specifications to identify faults Evaluate faulty conditions and plan for corrective actions 	<p>Training Kit (PowerPoint, Trainer Guide)</p> <p>Load cells, strain gauges, transducers, mechanical governors, pressure gauges, micrometers, jigs and fixtures, templates and patterns, insulation testers, vernier calliper, dead weight tester, manometers, gyroscope, screw driver, testers etc.</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> Calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures Undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration Fill up appropriate technical forms ,process charts and activity logs as per the requirement Undertake numerical operations and calculations Identify and draw various basic, compound and solid shapes as per the requirement Demonstrate problem solving skills Plan, prioritize and sequence operations as per the job requirement Explain basic concepts of shop floor productivity including waste reduction, efficient material usage and optimization of time Work in a team to achieve better results Apply, analyze and evaluate information gathered from observation, experience, reasoning or communication as a guide to thought and action 	
2	<p>Calibrate Electrical and Electronic Measuring and Control Equipment</p> <p>Theory Duration (hh:mm) 40:00</p> <p>Practical Duration (hh:mm) 80:00</p> <p>Corresponding NOS Code CSC/N0802</p>	<ul style="list-style-type: none"> Identify various components like sensors, transmitters, converters, indicators, analyzers, controllers, power supplies, removable circuit boards etc. Identify sensor units associated with determining/ controlling density, level, flow, temperature, composition etc. Define current, voltage, resistance, impedance, capacitance, inductance etc. Explain the effects of resistance and impedance and capacitance in RLC circuit Read wiring diagrams and circuits Follow suggested safety practices Identify Personal Protective Equipment required List tools and equipment required for calibration Explain techniques of calibration Read operational specifications of the instrumentation system/ equipment State sequence of events to be undertaken to correct faults in 	<p>Training Kit (PowerPoint, Trainer Guide) Sensors, transmitters, converters, indicators, analyzers, controllers, power supplies, removable circuit boards,, absolute gauge, orifice plate, venturi tube, pressure cell, load cells, thermo couples, fiscal metering equipment, speed control equipment, speed measurement equipment, vibration switches, proximity probes,</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>instrumentation system/ equipment</p> <ul style="list-style-type: none"> • Check components, leads, fasteners, etc. for wear, loose connections or other faults • Prepare and update relevant testing/calibration schedules and plans • Carry out the testing/calibration activities in the specified sequence and in an agreed timescale – Visual inspection, standard serviceability test/calibration, equipment self diagnostic test, leak/pressure test, signal injection tests, soak test, special – to- type tests, signal measurement and transmission, operational/functional checks, five point calibration • Inspect and test the operation of instruments and systems to diagnose faults using testing devices • Identify common faults associated with measuring instruments • Analyse and verify test results against operational specifications to identify and localise faults • Calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures 	<p>linear variable differential transducer, oxygen analyzer, telemetry systems, potentiometer, Multimeter, cathode ray oscilloscope</p>
3	<p>Health and safety</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Practical Duration (hh:mm) 08:00</p> <p>Corresponding NOS Code CSC/N1335</p>	<ul style="list-style-type: none"> • Explain the importance of personal protective equipment (PPE) required for gas cutting operation • State the causes for accidents • Identify job site hazardous work and state possible causes of risk or accident at the workplace • Explain the importance of '5S' at the workplace 	<p>Training kit (Trainer guide, PowerPoint)</p> <p>Leather gloves, leather apron, welding screen – helmet types, hand screen welding and safety shoes</p>
4	<p>Fire Safety</p> <p>Theory Duration (hh:mm) 05:00</p> <p>Practical Duration (hh:mm)</p>	<ul style="list-style-type: none"> • Explain types of fires - Class A, B, C and D • Select appropriate fire extinguisher to control fire • Use PASS method to operate a fire extinguisher • Follow fire safety signs and safe evacuation method in case of a fire 	<p>Training kit (Trainer guide, PowerPoint)</p> <p>Class A, B, C, D and K fire extinguishers</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	30:00 Corresponding NOS Code CSC/N1335	<ul style="list-style-type: none"> Identify the location of assembly point, fire exit, fire alarm Follow reporting procedure in case of a fire 	
5	Emergencies, rescue and first aid procedure Theory Duration (hh:mm) 09:00 Practical Duration (hh:mm) 18:00 Corresponding NOS Code CSC/N1335	<ul style="list-style-type: none"> Follow electrical safety procedures Use approved method to rescue a person from electrocution State the importance of first aid Identify the contents of a first aid kit and their application Administer first aid in case of bleeding, burns, choking, electrical shock, poisoning, etc. Use of CPR process Bandage wounds Explain stages of crisis and crisis management Prepare an incident report 	Training kit (Trainer guide, PowerPoint) First aid kit with all contents
6	Work effectively with others Theory Duration (hh:mm) 20:00 Practical Duration (hh:mm) 60:00 Corresponding NOS Code CSC/N1336	<ul style="list-style-type: none"> Explain the importance of team work and team dynamics State 4Cs of working in a team Explain types of communication Apply effective communication technique Overcome barriers to effective communication Demonstrate active listening skills Demonstrate good customer service skills Explain the importance of ethical behaviour in your day-to-day work State the importance of discipline in life and apply the same at workplace 	Training kit (Trainer guide, PowerPoint)
7	Final Assessment Theory Duration (hh:mm) 04:00 Practical Duration (hh:mm) 06:00 Corresponding NOS Code	<ul style="list-style-type: none"> To test skills and knowledge 	
	Total Duration Theory Duration 128:00	Unique Equipment Required: Load cells, strain gauges, transducers, mechanical governors, pressure gauges, micrometers, jigs and fixtures, templates and patterns, insulation testers, vernier calliper, dead weight tester, manometers, gyroscope, screw driver, testers, Sensors,	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration 282:00	transmitters, converters, indicators, analyzers, controllers, power supplies, removable circuit boards,, absolute gauge, orifice plate, venturi tube, pressure cell, load cells, thermo couples, fiscal metering equipment, speed control equipment, speed measurement equipment, vibration switches, proximity probes, linear variable differential transducer, oxygen analyzer, telemetry systems, potentiometer, Multimeter,cathode ray oscilloscope, Personal Protective Equipment .	

Grand Total Course Duration: **410 Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by [Capital Goods Skill Council](#))

Trainer Prerequisites for Job role: “Senior MMAW/SMAW” mapped to Qualification Pack: “CSC/Q0801 v1.0”

Sr. No.	Area	Details
1	Description	Perform testing and calibration of measuring and control equipment for correct operation in accordance with pre-determined procedures
2	Personal Attributes	Basic communication, numerical and computational abilities. Openness to learning, ability to plan and organize own work and identify and solve problems in the course of working. Understanding the need to take initiative and manage self and work to improve efficiency and effectiveness.
3	Minimum Educational Qualifications	Diploma /Degree in Mechanical Engineering
4a	Domain Certification	Certified for Job Role: “Calibration Technician” mapped to QP: “CSC/Q0801, v1.0”. Minimum accepted score is 80%
4b	Platform Certification	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “SSC/Q1402”. Minimum accepted 70 % as per respective SSC guidelines is 70%.
5	Experience	<ul style="list-style-type: none"> 3-4 years of industry experience in the relevant field 3-4 years of teaching experience

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Calibration Technician
Qualification Pack	CSC/Q0801, v1.0
Sector Skill Council	Capital Goods Skill Council

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 60% in aggregate and 40% in each NOS
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
1.CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work	100	3	1	2
	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fabrication and fitting operations		4	1	3
	PC3.work following laid down procedures and instructions		2	0	2
	PC4.ensure work area is clean and safe from hazards		2	0	2
	PC5.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC6.checks components, leads, fasteners, etc. for wear, loose connections or other faults		3	0	3
	PC7. prepare and update relevant testing/calibration schedules and plans		3	0	3
	PC8.carry out the testing/calibration activities in the specified sequence and in an agreed timescale		5	2	3
	PC9. identify work/test requirements and define are per standard operating procedures		4	2	2
	PC10.inspect and test the operation of instruments and systems to diagnose faults using testing devices		4	1	3
	PC11.select correct test application principles after inspection of instrumentation systems, equipment/components		2	0	2
	PC12.select appropriate test equipment in accordance with defined requirements		3	1	2
	PC13.observe device isolation methods/requirements and localize		2	0	2
	PC14.appropriate test procedures and application principles are applied in assessing operation of instrumentation systems, equipment/components		4	0	4
	PC15.report any instances where the testing/calibration activities cannot be fully met or where there are identified defects outside the planned schedule		4	1	3
	PC16.complete relevant testing/calibration documentation accurately		3	0	3
	PC17.analyse and verify test results against operational specifications to identify and localize faults		4	1	3
	PC18.report potential and real faults using standard operating procedures		4	1	3
	PC19.evaluate faulty conditions and plan		3	0	3

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	corrective action				
	PC20.record action plan and document according to standard operating procedures		4	1	3
	PC21.assess calibration of measuring and control equipment to manufacturers' specifications and/or standard operating procedures		6	2	4
	PC22.calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures		6	2	4
	PC23.undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration		4	0	4
	PC24.perform methods of adjustment using calibration devices and document prescribed procedures and operational specifications		5	1	4
	PC25.re-commission equipment in accordance with standard operating procedures		5	2	3
	PC26.obtain help or advice from specialist if the problem is outside his/her area of competence or experience		3	0	3
	PC27.monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem		3	0	3
	PC28.complete documentation post operations as per organizational procedures		3	0	3
	Total		100	19	81
2.CSC/N0802 Calibrate electrical and electronic measuring and control equipment	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work	100	3	1	2
	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fabrication and fitting operations		4	1	3
	PC3.work following laid down procedures and instructions		2	0	2
	PC4.ensure work area is clean and safe from hazards		2	0	2
	PC5.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC6.checks components, leads, fasteners, etc. for wear, loose connections or other faults		3	0	3
	PC7.prepare and update relevant testing/calibration schedules and plans		3	0	3
	PC8.carry out the testing/calibration activities in the specified sequence and in an agreed timescale		5	2	3
	PC9.identify work/test requirements and define		4	2	2

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	are per standard operating procedures				
	PC10.inspect and test the operation of instruments and systems to diagnose faults using testing devices		3	0	3
	PC11.select correct test application principles after inspection of instrumentation systems, equipment/components		2	0	2
	PC12.select appropriate test equipment in accordance with defined requirements		3	1	2
	PC13.ensure appropriate device isolation methods/requirements are observed		2	0	2
	PC14.apply appropriate test procedures and application principles in testing the operation of instrumentation systems, equipment/components		4	0	4
	PC15.report any instances where the testing/calibration activities cannot be fully met or where there are identified defects outside the planned schedule		3	0	3
	PC16.complete relevant testing/calibration documentation accurately		2	0	2
	PC17.analyse and verify test results against operational specifications to identify and localize faults		4	1	3
	PC18.report potential and real faults using standard operating procedures		4	1	3
	PC19.evaluate faulty conditions and plan corrective action		3	0	3
	PC20.record action plan and document according to standard operating procedures		4	1	3
	PC21.assess calibration of measuring and control equipment to manufacturers' specifications and/or standard operating procedures		6	2	4
	PC22.calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures		6	2	4
	PC23.undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration		4	0	4
	PC24.perform methods of adjustment using calibration devices and document prescribed procedures and operational specifications		5	1	4
	PC25.re-commission equipment in accordance with standard operating procedures		5	2	3
	PC26.refer the problem to a competent internal/external specialist if it cannot be resolved		3	0	3
	PC27.obtain help or advice from specialist if the problem is outside his/her area of competence or		3	0	3

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	experience				
	PC28.monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem		3	0	3
	PC29.complete documentation post operations as per organizational procedures		3	0	3
	Total		100	17	83
3. CSC/N1335 Use basic health and safety practices at the workplace	PC1. use protective clothing/equipment for specific tasks and work conditions	100	5	2	3
	PC2.state the name and location of people responsible for health and safety in the workplace		3	1	2
	PC3.state the names and location of documents that refer to health and safety in the workplace		3	1	2
	PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace		5	2	3
	PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others state methods of accident prevention in the work environment of the job role		4	2	2
	PC6.state location of general health and safety equipment in the workplace		3	2	1
	PC7.inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC8.work safely in and around trenches, elevated places and confined areas		5	2	3
	PC9.lift heavy objects safely using correct procedures		5	2	3
	PC10.apply good housekeeping practices at all times		4	2	2
	PC11.identify common hazard signs displayed in various areas		5	2	3
	PC12.retrieve and/or point out documents that refer to health and safety in the workplace		3	1	2
	PC13.use the various appropriate fire extinguishers on different types of fires correctly		4	1	3
	PC14.demonstrate rescue techniques applied during fire hazard		4	1	3
	PC15.demonstrate good housekeeping in order to prevent fire hazards		3	1	2
	PC16.demonstrate the correct use of a fire extinguisher		4	1	3
	PC17.demonstrate how to free a		4	1	3

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	person from electrocution				
	PC18.administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		4	1	3
	PC19.demonstrate basic techniques of bandaging		3	1	2
	PC20.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		4	1	3
	PC21.perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC22.administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	PC23.demonstrate the artificial respiration and the CPR Process		3	1	2
	PC24.participate in emergency procedures		3	2	1
	PC25.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		4	1	3
	PC26.demonstrate correct method to move injured people and others during an emergency		4	1	3
	Total		100	36	64
4.CSC/N1336 Work effectively with others	PC1. accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	100	10	3	7
	PC2.accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7
	PC3.give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7
	PC4.display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5.consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7
	PC6.display appropriate communication etiquette while working		10	3	7
	PC7.display active listening skills while interacting with others at work		10	3	7
	PC8.use appropriate tone, pitch and language to		10	3	7

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	convey politeness, assertiveness, care and professionalism				
	PC9.demonstrate responsible and disciplined behaviors at the workplace		10	3	7
	PC10.escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
	Total		100	30	70
	Grand Total	400	400	102	298
	Percentage Weightage:			26	74
	Minimum Pass% to qualify (aggregate):				60