



# Model Curriculum

**QP Name: Service Engineer – Installation and Commissioning**

**QP Code: CSC/Q0502**

**Version: 3.0**

**NSQF Level: 4**

**Model Curriculum Version: 3.0**

Capital Goods Skill Council | | Awfice Space Solutions Pvt. Ltd, 1st Floor, L-29, Outer Circle, Connaught Place, New Delhi – 110001

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## Training Parameters

<b>Sector</b>	Capital Goods
<b>Sub-Sector</b>	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery
<b>Occupation</b>	Service
<b>Country</b>	India
<b>NSQF Level</b>	4
<b>Aligned to NCO/ISCO/ISIC Code</b>	NCO-2015/2144.1402
<b>Minimum Educational Qualification and Experience</b>	<p>10th Grade Pass with 2 years of relevant experience OR 11th Grade Pass with 1 year of relevant experience OR 10th grade pass and pursuing continuous schooling OR 8th pass plus 2-year NTC plus 1-Year NAC plus 1-Year CITS OR 10th grade pass with two years of any combination of NTC/NAC/CITS or equivalent OR Pursuing 2nd year of 3-year regular Diploma (after 10th) OR Completed 2nd year of 3-year diploma (after 10th) OR 12th grade pass OR Operator Installation Services NSQF Level 3 with 3 years of relevant experience</p>
<b>Pre-Requisite License or Training</b>	NA
<b>Minimum Job Entry Age</b>	18 Years
<b>Last Reviewed On</b>	NA
<b>Next Review Date</b>	NA
<b>NSQC Approval Date</b>	NA
<b>QP Version</b>	3.0
<b>Model Curriculum Creation Date</b>	NA
<b>Model Curriculum Valid Up to Date</b>	NA
<b>Model Curriculum Version</b>	3.0

<b>Minimum Duration of the Course</b>	390 Hours
<b>Maximum Duration of the Course</b>	510 Hours

## Program Overview

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

### Training Outcomes

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

- Explain the importance of following the health and safety practices at work.
- Demonstrate ways to coordinate with co-workers to achieve work efficiency.
- Demonstrate the process of installing the mechanical equipment.
- Demonstrate the process of commissioning the mechanical equipment.
- Describe the process of providing the breakdown service for mechanical equipment.

### Compulsory Modules

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

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
<b>CSC/N1335 Follow the health and safety practices at work</b> <b>NSQF Level- 3</b>	<b>25:00</b>	<b>35:00</b>	<b>0:00</b>	<b>00:00</b>	<b>60:00</b>
Module 1: Introduction to the role of a Service Engineer – Installation and Commissioning	05:00	0:00	0:00	00:00	05:00
Module 2: Health and safety practices	20:00	35:00	0:00	00:00	55:00
<b>CSC/N1336 Coordinate with co-workers to achieve work efficiency</b> <b>NSQF Level- 3</b>	<b>10:00</b>	<b>20:00</b>	<b>0:00</b>	<b>00:00</b>	<b>30:00</b>
Module 3: Process of coordinating with co-workers to achieve work efficiency	10:00	20:00	0:00	00:00	30:00
<b>CSC/N0501 Install the mechanical equipment</b> <b>NSQF Level- 4</b>	<b>25:00</b>	<b>65:00</b>	<b>0:00</b>	<b>00:00</b>	<b>90:00</b>
Module 4: Process of installing the mechanical equipment	25:00	65:00	0:00	00:00	90:00

<b>CSC/N0502 Commission the mechanical equipment NSQF Level- 4</b>	<b>30:00</b>	<b>90:00</b>	<b>0:00</b>	<b>00:00</b>	<b>120:00</b>
Module 5: Process of commissioning the mechanical equipment	30:00	90:00	0:00	00:00	120:00
<b>DGT/VSQ/N0102 - Employability Skills (60 hours) NSQF Level – 5</b>	<b>24:00</b>	<b>36:00</b>	<b>00:00</b>	<b>00:00</b>	<b>60:00</b>
Module 6: Introduction to Employability Skills	0.5:00	1:00	00:00	00:00	1.5:00
Module 7: Constitutional values - Citizenship	0.5:00	1:00	00:00	00:00	1.5:00
Module 8: Becoming a Professional in the 21st Century	1:00	1.5:00	00:00	00:00	2.5:00
Module 9: Basic English Skills	4:00	6:00	00:00	00:00	10:00
Module 10: Career Development & Goal Setting	1:00	1:00	00:00	00:00	2:00
Module 11: Communication Skills	2:00	3:00	00:00	00:00	5:00
Module 12: Diversity & Inclusion	1:00	1.5:00	00:00	00:00	2.5:00
Module 13: Financial and Legal Literacy	2:00	3:00	00:00	00:00	5:00
Module 14: Essential Digital Skills	4:00	6:00	00:00	00:00	10:00
Module 15: Entrepreneurship	3:00	4:00	00:00	00:00	7:00
Module 16: Customer Service	2:00	3:00	00:00	00:00	5:00
Module 17: Getting ready for apprenticeship & Jobs	3:00	5:00	00:00	00:00	8:00
<b>Total Duration</b>	<b>114:00</b>	<b>246:00</b>	<b>30:00</b>	<b>00:00</b>	<b>390:00</b>

## Optional Modules

### 6 | Service Engineer – Installation and Commissioning

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

<b>NOS and Module Details</b>	<b>Theory Duration</b>	<b>Practical Duration</b>	<b>On-the-Job Training Duration (Mandatory)</b>	<b>On-the-Job Training Duration (Recommended)</b>	<b>Total Duration</b>
<b>CSC/N0503 Provide the breakdown service for mechanical equipment</b> <b>NOS Version- 2.0</b> <b>NSQF Level- 5</b>	<b>30:00</b>	<b>60:00</b>	<b>0:00</b>	<b>00:00</b>	<b>90:00</b>
Module 18: Process of providing the breakdown service for mechanical equipment	30:00	60:00	0:00	00:00	90:00
<b>Total Duration</b>	<b>30:00</b>	<b>60:00</b>	<b>30:00</b>	<b>00:00</b>	<b>120:00</b>

# Module Details

## Module 1: Introduction to the role of a Service Engineer – Installation and Commissioning

### Bridge Module

#### Terminal Outcomes:

- Discuss the job role of a Service Engineer – Installation and Commissioning.

Duration: 05:00	Duration: 0:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Describe the size and scope of the capital good industry and its sub-sectors.</li> <li>• Discuss the role and responsibilities of a Service Engineer – Installation and Commissioning.</li> <li>• Identify various employment opportunities for a Service Engineer – Installation and Commissioning.</li> </ul>	
<b>Classroom Aids</b>	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
<b>Tools, Equipment and Other Requirements</b>	
NA	



## Module 2: Health and safety Practices

### Mapped to CSC/N1335 v2.0

#### Terminal Outcomes:

- Demonstrate ways to maintain personal health and safety.
- Describe the process of assisting in hazard management.
- Explain how to check the first aid box, firefighting and safety equipment.
- Describe the process of assisting in waste management.
- Explain the importance of following the fire safety guidelines.
- Explain the importance of following the emergency and first-aid procedures.
- Demonstrate the process of carrying out relevant documentation and review.

<b>Duration: 20:00</b>	<b>Duration: 35:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain the recommended practices to be followed to ensure protection from infections and transmission to others, such as the use of hand sanitizer and face mask.</li> <li>• Explain the importance and process of checking the work conditions, assessing the potential health and safety risks, and take appropriate measures to mitigate them.</li> <li>• Explain the importance and process of selecting and using the appropriate PPE relevant to the task and work conditions.</li> <li>• Explain the recommended techniques to be followed while lifting and moving heavy objects to avoid injury.</li> <li>• Explain the importance of following the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment.</li> <li>• Explain the importance and process of identifying existing and potential hazards at work.</li> <li>• Describe the process of assessing the potential risks and injuries associated with the various hazards.</li> <li>• Explain how to prevent or minimise different types of hazards.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate the use of appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions.</li> <li>• Demonstrate how to handle hazardous materials safely.</li> <li>• Demonstrate the process of testing the firefighting and various safety equipment to ensure they are in usable condition.</li> <li>• Demonstrate the process of recycling and disposing different types of waste appropriately.</li> <li>• Demonstrate how to use the appropriate type of fire extinguisher to extinguish different types of fires safely.</li> <li>• Demonstrate how to administer appropriate first aid to the injured personnel.</li> <li>• Demonstrate the process of performing Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest.</li> <li>• Demonstrate the process of carrying out appropriate documentation following a health and safety incident at work, including all the required information.</li> </ul>

- Explain how to handle and store hazardous materials safely.
- Explain the importance of ensuring the first aid box is updated with the relevant first aid supplies.
- Describe the process of checking and testing the firefighting and various safety equipment to ensure they are in a usable condition.
- Explain the criteria for segregating waste into appropriate categories.
- Describe the appropriate methods for recycling the recyclable waste.
- Describe the process of disposing of the non-recyclable waste safely and the applicable regulations.
- Explain the use of different types of fire extinguishers to extinguish different types of fires.
- State the recommended practices to be followed for a safe rescue during a fire emergency.
- Explain how to request assistance from the fire department to extinguish a serious fire.
- Explain the appropriate practices to be followed during workplace emergencies to ensure safety and minimise loss to organisational property.
- State the common health and safety hazards present in a work environment, associated risks, and how to mitigate them.
- State the safe working practices to be followed while working at various hazardous sites and using electrical equipment.
- Explain the importance of ensuring easy access to firefighting and safety equipment.
- Explain the appropriate preventative and remedial actions to be taken in the case of exposure to toxic materials, such as poisonous

<p>chemicals and gases.</p> <ul style="list-style-type: none"> <li>• Explain various causes of fire in different work environments and the recommended precautions to be taken to prevent fire accidents.</li> <li>• Describe different methods of extinguishing fire.</li> <li>• List different materials used for extinguishing fire.</li> <li>• Explain the applicable rescue techniques to be followed during a fire emergency.</li> <li>• Explain the importance of placing safety signs and instructions at strategic locations in a workplace and following them.</li> <li>• Explain different types of first aid treatment to be provided for different types of injuries.</li> <li>• State the potential injuries associated with incorrect manual handling.</li> <li>• Explain how to move an injured person safely.</li> <li>• State various hazards associated with the use of various machinery, tools, implements, equipment and materials.</li> <li>• Explain the importance of ensuring no obstruction and free access to fire exits.</li> <li>• Explain how to free a person from electrocution safely.</li> <li>• Explain how to administer appropriate first aid to an injured person.</li> <li>• Explain how to perform Cardiopulmonary Resuscitation (CPR).</li> <li>• Explain the importance of coordinating with the emergency services to request urgent medical assistance for persons requiring professional medical attention or hospitalisation.</li> <li>• State the appropriate documentation</li> </ul>	
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<p>to be carried out following a health and safety incident at work, and the relevant information to be included.</p> <ul style="list-style-type: none"> <li>• Explain the importance and process of reviewing the health and safety conditions at work regularly or following an incident.</li> <li>• Explain the importance and process of implementing appropriate changes to improve the health and safety conditions at work.</li> </ul>	
<p><b>Classroom Aids</b></p>	
<p>Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator’s Guide, Participant’s Handbook.</p>	
<p><b>Tools, Equipment and Other Requirements</b></p>	
<p>Personal Protective Equipment, Cleaning Equipment and Materials, Sanitizer, Soap, Mask</p>	

## Module 3: Process of coordinating with co-workers to achieve work efficiency

*Mapped to NOS CSC/N1336 v2.0*

### Terminal Outcomes:

- Demonstrate ways to Work and communicate effectively with co-workers.
- Discuss ways to promote diversity and inclusion at the workplace.

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Explain the importance and process of effective communication in the workplace.</li> <li>• Explain the barriers to effective communication and how to overcome them.</li> <li>• Explain the importance of teamwork in an organisation’s and individual’s success.</li> <li>• Explain the importance of active listening in the work environment.</li> <li>• State the appropriate techniques to be followed for active listening.</li> <li>• Explain the importance of tone and pitch ineffective communication.</li> <li>• Explain the importance of avoiding casual expletives and unpleasant terms while communicating professional circles.</li> <li>• Explain the importance of maintaining discipline and ethical behaviour at work.</li> <li>• <b>State</b> the common reasons for interpersonal conflict and how to resolve them.</li> <li>• Explain the importance of developing effective working relationships for professional success.</li> <li>• Describe the process of expressing and addressing grievances appropriately and effectively.</li> <li>• Explain the importance and process of planning daily tasks to ensure their timely completion and efficient use of</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate the process of preparing the relevant documents and reports as per the supervisor’s instructions, providing appropriate information clearly and systematically.</li> <li>• Demonstrate how to mentor and assist subordinates in the execution of their work responsibilities.</li> <li>• Demonstrate the process of using various resources efficiently to ensure maximum utilisation and minimum wastage.</li> <li>• Demonstrate how to communicate clearly and politely to ensure effective communication with co-workers.</li> <li>• Demonstrate appropriate verbal and non-verbal communication that is respectful of genders and disability.</li> </ul>

<p>time.</p> <ul style="list-style-type: none"> <li>• Explain the importance of adhering to the limits of authority at work.</li> <li>• Explain the importance of following the applicable quality standards and timescales at work.</li> <li>• Explain the importance of coordinating with co-workers to achieve the work objectives efficiently.</li> <li>• Explain the relevant documentation requirements.</li> <li>• Explain the importance of providing appropriate information clearly and systematically in work documents.</li> <li>• State the escalation matrix to be followed to deal with out of authority tasks and concerns.</li> <li>• Explain the importance and process of mentoring and assisting subordinates in the execution of their work responsibilities.</li> <li>• Explain how to identify possible disruptions to work prevent them.</li> <li>• Explain how to use various resources efficiently to ensure maximum utilisation and minimum wastage.</li> <li>• Explain the recommended practices to be followed at work to avoid and resolve conflicts at work.</li> <li>• Explain the importance and process of efficient and timely dissemination of information to the authorised personnel.</li> <li>• Explain the procedure to report inappropriate behaviour e.g., harassment.</li> </ul>	
<p><b>Classroom Aids:</b></p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p><b>Tools, Equipment and Other Requirements</b></p>	
<p>NA</p>	

## Module 4: Process of installing the mechanical equipment

### Mapped to CSC/N0501 v2.0

#### Terminal Outcomes:

- Describe the process of planning and conducting the site survey.
- Describe the process of preparing for the installation of equipment.
- Demonstrate the process of installing and testing the equipment.
- Explain the importance of using resources optimally.

<b>Duration: 25:00</b>	<b>Duration: 65:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain the use of the relevant terminology.</li> <li>• Explain the concepts and benefits of Industry 4.0 and Industrial Internet of Things (IIoT).</li> <li>• List the relevant precautions to be taken before and during the installation activities.</li> <li>• Describe the installation procedures and environmental regulations.</li> <li>• Explain how to minimise various hazards associated with carrying out the installation of machinery and plant equipment.</li> <li>• List the relevant job specification documents to be referred to such as assembly drawings; layout drawings; etc.</li> <li>• Explain how to interpret various drawings such as assembly, engineering, and component drawings.</li> <li>• Describe the applicable standards and quality control procedures</li> <li>• Describe the operating procedures and functions of various mechanical equipment.</li> <li>• Describe the process of marking the site for positioning of the equipment, and the use of relevant tools and equipment for the purpose.</li> <li>• Describe the process of drilling holes for rag and expanding bolts.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate how to conduct a load test to test the suitability of the foundation at the installation site.</li> <li>• Demonstrate the process of installing the equipment as per the manufacturer’s instructions and client’s requirements.</li> <li>• Show how to use various installation tools and equipment such as plumb lines and taut wires, tension meters, customised gauges, multimeter.</li> <li>• Demonstrate the use of the relevant installation techniques such as levelling, aligning, coupling and connecting as per the requirement.</li> <li>• Demonstrate the process of carrying out appropriate modifications/ adjustments to the equipment to ensure its optimum performance.</li> <li>• Demonstrate the use of various industry 4.0 manufacturing technologies.</li> <li>• Demonstrate the process of carrying out appropriate documentation with respect to the installation of equipment, including all the relevant information.</li> <li>• Show how to optimise the usage of electricity and other resources in various tasks and processes</li> </ul>

- State the torque loading requirements of fasteners, and the appropriate action to be taken when the loadings are exceeded or not achieved.
- Explain the use of various relevant instruments, such as feeler gauges; spirit levels, mandrels, etc.
- List the tools and instruments used to position, secure and align the equipment.
- Explain how to position, align, level and adjust mechanical equipment.
- Describe the process of connecting mechanical power transmission devices such as belt and chain drives, couplings, clutches and brakes, etc.
- Explain how to connect mechanical equipment to electrical, fluid power, compressed air oil and fuel supplies.
- Explain how to identify installation defects such as leaks, misalignment, ineffective fasteners, foreign object damage, contamination, vibration and how to address them appropriately.
- Explain the importance of ensuring the completed installation is free from dirt, foreign objects and damage.
- Explain the importance of covering/protecting the relevant exposed cables, components, and pipes.
- List the common problems encountered during the installation of mechanical equipment and how to overcome them.
- Explain the importance of ensuring that moving parts are guarded and clear of obstruction.
- Explain how to check the torque settings of fasteners.
- Explain the benefits and methods of resource optimisation.

**Classroom Aids**



Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop

**Tools, Equipment and Other Requirements**

Spanners, Wrenches, Crow Bars, Torque Wrenches, Engineer's Level, Alignment Telescope, Laser Devices Etc. Straight Edges, Feeler Gauges, Spirit Level, Mandrels, Dial Test Indicator (DTI), Meter Tape, Vernier Calliper, Micrometer, Depth Gauge, Plump Lines, Taut Wires, Tension Meters, Customized Gauges, Multimeter, Autocollimator, Personal Protective Equipment (PPE)

## Module 5: Process of commissioning the mechanical equipment

### Mapped to CSC/N0502 v2.0

#### Terminal Outcomes:

- Describe the process of preparing to commission the mechanical equipment.
- Demonstrate the process of commissioning the mechanical equipment.

Duration: 30:00	Duration: 90:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Describe the calibration and control procedures for various tools and equipment.</li> <li>• Describe the process of commissioning various mechanical equipment.</li> <li>• Explain the use of the relevant tools and equipment.</li> <li>• State the applicable environmental, health and safety regulations</li> <li>• Explain how to deal with various hazards associated with carrying out the installation of machinery and plant equipment.</li> <li>• Explain how to conduct the necessary checks to ensure the equipment integrity, functionality, accuracy, and quality of the installation.</li> <li>• Explain the importance of using the appropriate PPE while commissioning various equipment.</li> <li>• List the sources for obtaining appropriate job specifications.</li> <li>• List the necessary checks to be performed before handing over the equipment to the client.</li> <li>• Describe the applicable quality control and testing procedures.</li> <li>• Describe the applicable standards and quality control procedures.</li> <li>• Explain how to lift, handle and support the equipment.</li> <li>• Explain the importance and process of positioning, aligning and levelling the equipment before commissioning</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate the process of carrying out start-up procedures as per the manufacturer’s instructions, and testing the functioning meets the required specifications.</li> <li>• Demonstrate the process of operating the equipment at the recommended initial settings, such as power and speed.</li> <li>• Show how to monitor and record measurements and observations.</li> <li>• Demonstrate the process of carrying out troubleshooting to rectify any faults identified with equipment performance during the commissioning process.</li> <li>• Show how to replace various faults components and adjust them to meet the operational specifications.</li> <li>• Demonstrate the process of carrying out appropriate documentation with respect to the commissioning of the equipment.</li> <li>• Roleplay how to conduct a session with the client to complete handover and guide them regarding the use and general maintenance of the equipment.</li> </ul>

<p>it.</p> <ul style="list-style-type: none"> <li>• Describe different methods of connecting the mechanical power transmission devices.</li> <li>• Explain how to dispose of industrial waste safely.</li> </ul>	
<p><b>Classroom Aids</b></p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p><b>Tools, Equipment and Other Requirements</b></p>	
<p>Linear Measuring Instruments, Speed Measuring Devices, Multimeter, Continuity Tester, Pressure Testing Devices, Flow Testing Devices, Linear Measuring Instruments, Personal Protective Equipment (PPE)</p>	

## Module 6: Process of providing the breakdown service for mechanical equipment

*Mapped to CSC/N0503 v2.0*

### Terminal Outcomes:

- Describe the process of identifying the fault.
- Describe the process of preparing for carrying out repair and maintenance.
- Demonstrate the process of carrying out repair and maintenance.

<b>Duration: 30:00</b>	<b>Duration: 60:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• State the applicable safe working practices to be followed during the repair and maintenance activities.</li> <li>• Explain how to minimise the hazards associated with carrying out repair and maintenance services, such as dealing with stored pressure/force; use of power tools and equipment; repair and replacement of sharp components, etc.</li> <li>• Explain the importance of ensuring that only trained personnel carry out or assist in the repair and maintenance of equipment.</li> <li>• State the applicable quality and safety standards.</li> <li>• Explain how various mechanical equipment functions, along with the purpose of various units/components in the equipment and how they interact.</li> <li>• Explain the applicable isolation and lock-off procedures for different mechanical equipment.</li> <li>• Describe the procedures to be followed for investigating the faults, and how to deal with intermittent faults.</li> <li>• List the possible causes for various faults.</li> <li>• List the relevant components, materials and consumables required for the repair and maintenance of mechanical equipment.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate how to conduct relevant checks on the equipment to test its performance and determine the cause of the issue being experienced.</li> <li>• Demonstrate the process of carrying out the repair and maintenance of the equipment according to the manufacturer’s instructions.</li> <li>• Show how to replace the faulty components appropriately and secure them appropriately.</li> <li>• Demonstrate how to reassemble the equipment after carrying out repair and maintenance activities.</li> <li>• Show how to test the performance of the equipment after reassembling it and carry out troubleshooting for any issues identified.</li> <li>• Prepare sample records with respect to the repair and maintenance of the equipment.</li> </ul>

<ul style="list-style-type: none"> <li>• Explain the recommended sequence to be followed for dismantling/reassembling different types of mechanical equipment.</li> <li>• Explain how to identify wear and tear or damage in various mechanical equipment components and ensure they are fit for purpose.</li> <li>• Explain how to determine if the removed components are fit for purpose, and the need to replace them.</li> <li>• Explain the use of various aids for equipment testing and fault diagnosis such as manufacturer's manual, layout diagram, flow charts, fault analysis charts, etc.</li> <li>• Explain the use of relevant testing devices such as thermal indicator, dial test indicator, torque measuring devices, self-diagnostic, and relevant testing devices.</li> <li>• Explain how to make relevant adjustments to components/assemblies to ensure their smooth functioning.</li> <li>• Explain the importance of making 'off-load' checks before running the equipment under power.</li> <li>• Explain the importance of carrying out appropriate documentation and/ the respect to repair and maintenance such as breakdown report, service report, conformance report.</li> <li>•</li> <li>• List various problems associated with mechanical equipment components, such as pumps, process control valves, compressor, etc.</li> <li>•</li> <li>• Explain how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points.</li> <li>• List various components, materials</li> </ul>	
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<p>and machine consumables required for the repair and maintenance of mechanical equipment.</p> <ul style="list-style-type: none"> <li>• Explain the fault diagnostic techniques that can be used to help identify problems with the equipment such as half-split technique, emergent sequence, unit substitution, six-point technique, etc.</li> <li>• Explain the relevant techniques used to dismantle mechanical equipment in order to replace defective components.</li> <li>• List the common issues encountered with electrical connections in mechanical equipment and how to resolve them.</li> <li>• Explain how to repair various electronic components used in the mechanical equipment.</li> </ul>	
<p><b>Classroom Aids</b></p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p><b>Tools, Equipment and Other Requirements</b></p>	
<p>Straight Edges, Feeler Gauge, Spirit Levels, Mandrels, Dial Test Indicator, Meter Tape, Vernier Calliper, Micrometer, Depth Gauge, Plumb Line, Taut Wires, Tension Meter, Customized Gauges, Pressure Testing Device, Flow Testing Device, Multimeter, Continuity Tester, PLC/PC Equipment, Spanners, Wrenches, Crow Bars, Autocollimator, Gearbox, Machine Tools, Engine, Pump, Process Control Valves, Compressor, Work Holding Devices, Personal Protective Equipment (PPE)</p>	

# Annexure

## Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
Diploma /Degree	Diploma /Degree in Mechanical Engineering	4	Service Engineer – Installation and Commissioning	0		Practical skills and knowledge required in the relevant field

Trainer Certification	
Domain Certification	Platform Certification
Certified for Job Role: “ <b>Service Engineer – Installation and Commissioning</b> ” mapped to QP: “CSC/Q0502, v1.0”. Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “MEP/Q2601”. Minimum accepted as per respective SSC guidelines is 80%.

## Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
Diploma /Degree	Diploma /Degree in Mechanical Engineering	4	Service Engineer – Installation and Commissioning	0		Practical skills and knowledge required in the relevant field

Assessor Certification	
Domain Certification	Platform Certification
Certified for Job Role: <b>“Service Engineer – Installation and Commissioning”</b> mapped to QP: <b>“CSC/Q0502, v1.0”</b> . Minimum accepted score is 80%	Certified for the Job Role: <b>“Assessor”</b> (VET and skills, mapped to the Qualification Pack: <b>“MEP/Q2701, v2.0”</b> , with a minimum score of 80%.



## Assessment Strategy

### 1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
- Assessment agencies send the assessment confirmation to VTP/TC looping SSC
- The assessment agency deploys the ToA certified Assessor for executing the assessment
- SSC monitors the assessment process & records

### 2. Testing Environment

To ensure a conducive environment for conducting a test, the trainer will:

- Confirm that the centre is available at the same address as mentioned on SDMS or SIP
- Check the duration of the training.
- Check the Assessment Start and End time to be 10 a.m. and 5 p.m. respectively
- Ensure there are 2 Assessors if the batch size is more than 30.
- Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
- Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
- Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
- Check the availability of the Lab Equipment for the particular Job Role.

### 3. Assessment Quality Assurance levels / Framework:

- Question papers created by the Subject Matter Experts (SME)
- Question papers created by the SME verified by the other subject Matter Experts
- Questions are mapped with NOS and PC
- Question papers are prepared considering that levels 1 to 3 are for the unskilled & semi-skilled individuals, and levels 4 and above are for the skilled, supervisor & higher management
- The assessor must be ToA certified and the trainer must be ToT Certified
- The assessment agency must follow the assessment guidelines to conduct the assessment

### 4. Types of evidence or evidence-gathering protocol:

- Time-stamped & geotagged reporting of the assessor from assessment location
- Centre photographs with signboards and scheme-specific branding
- Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
- Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

### 5. Method of verification or validation:

To verify the details submitted by the training centre, the assessor will undertake:

- A surprise visit to the assessment location
- A random audit of the batch
- A random audit of any candidate

### 6. Method for assessment documentation, archiving, and access

To protect the assessment papers and information, the assessor will ensure:

- Hard copies of the documents are stored

- Soft copies of the documents & photographs of the assessment are uploaded/accessed from Cloud Storage
- Soft copies of the documents & photographs of the assessment are stored on the Hard drive

# References

## Glossary

Term	Description
<b>Declarative knowledge</b>	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
<b>Key Learning</b>	The key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
<b>OJT (M)</b>	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on-site
<b>OJT (R)</b>	On-the-job training (Recommended); trainees are recommended the specified hours of training on-site
<b>Procedural Knowledge</b>	Procedural knowledge addresses how to do something, or how to perform a
<b>Training Outcome</b>	Training outcome is a statement of what a learner will know, understand and be able to do <b>upon the completion of the training.</b>
<b>Terminal Outcome</b>	The terminal outcome is a statement of what a learner will know, understand and be able to do <b>upon the completion of a module.</b> A set of terminal outcomes help to achieve the training outcome.

## Acronyms and Abbreviations

Term	Description
<b>NOS</b>	National Skills Qualification Committee
<b>NSQF</b>	National Skills Qualification Framework
<b>OJT</b>	On-the-Job Training
<b>OMR</b>	Optical Mark Recognition
<b>PC</b>	Performance Criteria
<b>PwD</b>	Persons with Disabilities
<b>QP</b>	Qualification Pack
<b>SDMS</b>	Skill Development & Management System
<b>SIP</b>	Skill India Portal
<b>SSC</b>	Sector Skill Council
<b>TC</b>	Trainer Certificate
<b>ToA</b>	Training of Assessors
<b>ToT</b>	Training of Trainers
<b>TP</b>	Training Provider