



**ADVANCE CERTIFICATE  
COURSE IN MACHINE  
MAINTENANCE (ACCMM)**



**QUALIFICATION FILE**

**Ministry of Micro, Small and  
Medium Enterprises, New Delhi  
(MSME-Technology Centre)**

# **NSQF QUALIFICATION FILE**

Version 6: Draft of 08 March 2016

## **NATIONAL SKILL QUALIFICATION FRAMEWORK QUALIFICATION FILE**

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### **CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE**

#### **Name and address of submitting body:**

O/o DC (MSME),

Ministry of Micro, Small and Medium Enterprises

Nirman Bhawan,

Maulana Azad Road,

New Delhi - 110108

#### **Name and contact details of individual dealing with the submission**

Name : Shri Kajal Kumar Saha

Position in the organisation : Project Manager

Address if different from above : MSME- TOOL ROOM, GUWAHATI

Tool Room & Training Centre

Amingaon Industrial Area

North Guwahati Road

Guwahati - 781031

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Tel number(s) : (0361) 2680907

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#### **List of documents submitted in support of the Qualifications File**

1. Curriculum
2. Industrial Validations

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## 1 SUMMARY

<b>Qualification Title</b>	<b>Advance Certificate Course In Machine Maintenance</b>
<b>Qualification Code</b>	<b>MSME/ACCMM/27</b>
<b>Nature and purpose of the qualification</b>	<b>Nature:</b> Advance Certificate Course <b>Purpose:</b> Learners who attain this qualification are competent in Machine Maintenance and can get a job as Maintenance Technician. <ul style="list-style-type: none"><li>• Qualifying learners attain skills to work in Maintenance department to carry out different types of Maintenance work for various machines &amp; equipments used in Industry.</li></ul>
<b>Body/bodies which will award the qualification</b>	<b>MSME - Technology Centre, Ministry of Micro, Small &amp; Medium Enterprises, New Delhi</b>
<b>Body which will accredit providers to offer courses leading to the</b>	<b>MSME - Technology Centre, Ministry of Micro, Small &amp; Medium Enterprises, New Delhi</b>
<b>Body/bodies which will carry out assessment of learners</b>	<b>MSME - Technology Centre, Ministry of Micro, Small &amp; Medium Enterprises, New Delhi</b>
<b>Occupation(s) to which the qualification gives</b>	<b>Maintenance Technician</b>
<b>Licensing requirements</b>	<b>Not Applicable</b>
<b>Level of the qualification in the NSQF</b>	<b>Level 5</b>
<b>Anticipated volume of training/learning required to complete the qualification</b>	<b>1560 Hours</b>
<b>Entry requirements and / or recommendations</b>	<b>ITI in Fitter/ Electrician</b>
<b>Progression from the qualification</b>	<b>Job Progression:</b> After completion of course and after 3 years of field experience the trainee can work as a Senior Maintenance Technician and after that 5 years of experience, the person can work as a Maintenance Supervisor .
<b>Planned arrangements for the Recognition of Prior learning (RPL)</b>	<b>Yes</b>
<b>International comparability where known</b>	<b>Not Known</b>
<b>Date of planned review of the qualification.</b>	<b>January 2018</b>

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<b>Formal structure of the qualification</b>				
<b>SR. NO</b>	<b>Title and identification code of component.</b>	<b>Mandatory / Optional</b>	<b>Estimated size (learning hours)</b>	<b>Level</b>
<b>1</b>	<b>Use Safety Practice In Industry</b>	M	<b>65</b>	<b>5</b>
<b>2</b>	<b>Fitting &amp; Bench work</b>	M	<b>140</b>	<b>5</b>
<b>3</b>	<b>Maintenance Work</b>	M	<b>255</b>	<b>5</b>
<b>4</b>	<b>Operations &amp; Maintenance of conventional machines</b>	M	<b>211</b>	<b>5</b>
<b>5</b>	<b>Maintenance of utility</b>	M	<b>225</b>	<b>5</b>
<b>6</b>	<b>Maintenance Of electrical equipments</b>	M	<b>234</b>	<b>5</b>
<b>7</b>	<b>Basic operation &amp; Maintenance of CNC Machines</b>	M	<b>130</b>	<b>5</b>
<b>8</b>	<b>Machine Installation</b>	M	<b>110</b>	<b>5</b>
<b>9</b>	<b>PLC Programming</b>	M	<b>120</b>	<b>5</b>
<b>10</b>	<b>Work effectively at workplace</b>	M	<b>70</b>	<b>5</b>

Please attach any document giving further detail about the structure of the qualification – e.g. a Curriculum Document or a Qualification Pack.

Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

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## **SECTION 1** **ASSESSMENT**

### **Body/Bodies which will carry out assessment:**

MSME - Technology Centre, Ministry of Micro, Small & Medium Enterprises, New Delhi

### **How will RPL assessment be managed and who will carry it out?**

*YES. Learners who have met the requirements of any Unit Standard that forms part of this qualification may apply for recognition of prior learning to the relevant Education body. The applicant must be assessed against the specific outcomes and with the assessment criteria for the relevant Unit Standards.*

**Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, reliable and fair and show that these are in line with the requirements of the NSQF.**

### **1. ASSESSMENT GUIDELINE:**

- Criteria for assessment based on each learning outcomes, will be assigned marks proportional to its importance.
- The assessment for the theory & practical part is based on knowledge bank of questions created by trainers and approved by MSME - Technology Centre, Ministry of Micro, Small & Medium Enterprises, New Delhi
- For each Individual batch, Examination cell will create unique question papers for theory part as well as practical for each candidate at each examination.
- To pass the Qualification, every trainee should score a minimum of 40% in Theory and 60% in Practical subject.
- Assessment comprises the following components:
  - >Job carried out in labs/workshop
  - >Record book/ daily diary
  - >Answer sheet of assessment
  - >Viva -voce
  - >Progress chart
  - >Attendance and punctuality

### **2. ASSESSORS:**

TRTC Guwahati faculty teaching the Advance Certificate Course In Machine Maintenance, also assesses the students as per guidelines set by Examination cell of TRTC Guwahati. Faculties are been trained from time to time to upgrade their skills on various aspects such as conduction of assessments, teaching methodology etc.

### **3. ELIGIBILITY TO APPEAR IN THE EXAM:**

Minimum 90% attendance is compulsory for the students to appear for the assessments.

### **4. MARKING SCHEME:**

Please refer Annexure - I(Curriculum) for marking

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## 5. PASSING MARKS:

Passing criteria is based on marks obtain in attendance record, term works , assignments, practical's performance, viva or oral exam, module test, class test, practical exam and final exam

Minimum Marks to pass practical exam – 60%

Minimum Marks to pass theory exam – 40%

## 6. RESULTS AND CERTIFICATION:

The assessment results are backed by evidences collected by assessors. Successful trainees are awarded the certificates by MSME - Technology Centre, Ministry of Micro, Small & Medium Enterprises, New Delhi

## ASSESSMENT EVIDENCE

### ASSESSMENT EVIDENCE

Assessment evidence comprises the following components document in the form of records:

Job carried out in labs/workshop

Record book/ daily diary

Answer sheet of assessment

Viva –voce

Progress chart

Attendance and punctuality

Title of component: Advance Certificate Course In Machine Maintenance

Outcomes to be assessed	Assessment Criteria
Identify hazards	Recognize and report all unsafe situations according to policy.
Maintain PPE	Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
Take necessary steps to prevent accident	Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
Able to maintain maintenance work sheet	Write Maintenance record details as per the maintenance activities done
Analyze machine data history card	Perform Analysis by fish bond diagram, why why analysis
Take necessary action to start maintenance	Observation of the machine condition of the machine
Handling different types of tools like marking, measuring & cutting tools	Identify tools and equipment for marking and demonstration of these tools & equipment.
Assembling & disassembling	After assembling & disassembling measure allowance widen tolerance
Performing marking, measuring & cutting operation	<ul style="list-style-type: none"><li>• Accrue correct measurement and marking and getting accuracy after cutting operation</li><li>• Identify tools and equipment for marking and use of these tools &amp; equipment.</li><li>• Mark according to drawing.</li></ul>
Carry out the preventive & periodical maintenance activities for different machine	<ul style="list-style-type: none"><li>• Describe safety aspects while working preventive &amp; periodical maintenance activities</li><li>• Select proper tools for the required task.</li><li>• Carry out the maintenance work flow instructional manual or guideline</li></ul>
Minors adjustment and	<ul style="list-style-type: none"><li>• Ensuring during preventive maintenance thoroughly check the</li></ul>

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repairing of the machine	<ul style="list-style-type: none"> <li>parts are function or not</li> <li>Carry out Minors adjustment by using proper tool</li> </ul>
Carry out Day to day checked activities	<ul style="list-style-type: none"> <li>Preparation of list to be check</li> <li>Create the report after checked activities</li> </ul>
Fault finding & troubleshooting of breakdown machines	<ul style="list-style-type: none"> <li>Follow proper process for fault finding</li> <li>Follow manual instruction &amp; maintain interchange parts having same specifications</li> </ul>
Carry out repair & breakdown maintenance for conventional lathe, milling, grinding, drilling and other machines	<ul style="list-style-type: none"> <li>Analyze previous maintenance records</li> <li>Create List of common problems &amp; its remedy</li> </ul>
Execute Preventive & Break down maintenance of Air compressor	<ul style="list-style-type: none"> <li>Describing working principle of air compressor</li> <li>Plan preparation for maintenance</li> <li>Carry out maintenance activity by using proper tools</li> <li>Check all safety aspect issues after performing maintenance activities</li> </ul>
Execute Preventive & Break down maintenance of Pump	<ul style="list-style-type: none"> <li>Describing working principle of pump</li> <li>Plan preparation for maintenance</li> <li>Dismantling procedure</li> <li>Carry out maintenance activity by using proper tools</li> <li>After performing maintenance activities check all safety aspect issues</li> <li>Check efficiency level of suction &amp; delivery</li> </ul>
Execute Preventive & Break down maintenance of DG set	<ul style="list-style-type: none"> <li>Describing working principle of DG set</li> <li>Plan preparation for maintenance</li> <li>Dismantling procedure</li> <li>Carry out maintenance activity by using proper tools</li> <li>After performing maintenance activities check all safety aspect issues</li> <li>Measure the volt/amp, noise level</li> </ul>
Performing basic electrical connections & fittings in different electrical equipments	<ul style="list-style-type: none"> <li>By electrical connection procedure</li> <li>Consider points during fitting electrical equipment</li> </ul>
Measuring electrical parameters	Measure parameters Amp, Voltage, resistance, continuity, temperature, Rpm using by multimeter, megar, tester, tachometer, tong tester, Amp meter etc. as per the machine requirement.
Fault finding & trouble shooting in control panels	<ul style="list-style-type: none"> <li>Follow manual instruction</li> <li>Follow proper procedure</li> <li>Check and ensure all safety related aspect</li> </ul>
Describe functions of electrical equipments like timer, contactor, relay, limit switch	<ul style="list-style-type: none"> <li>Working principle of the equipments</li> <li>Limitation of loads</li> </ul>
Examine parameters as per check list of machine manual	<ul style="list-style-type: none"> <li>Follow manual instruction</li> <li>Prepare Check list</li> </ul>
Carry out preventive maintenance of CNC machines	<ul style="list-style-type: none"> <li>Follow manual instruction</li> <li>Prepare check list</li> </ul>
Adjustment on machines & replacing parts as applicable	<ul style="list-style-type: none"> <li>Maintain Specification of replacing parts</li> <li>Properly adjustment as per require for free movement</li> </ul>
Receiving materials as per order list	<ul style="list-style-type: none"> <li>Thoroughly checked receiving items as per the order copy specification &amp; quantity</li> </ul>
Performing alignment & leveling	<ul style="list-style-type: none"> <li>Preparation the tool and equipment's list</li> <li>Properly use tool and equipment</li> <li>Checked leveling and alignment points</li> </ul>
Complete machine installation task	Observation & checking of important points before commissioning & starting the machines
Programming & Editing PLC	<ul style="list-style-type: none"> <li>Able to simulate programme properly</li> <li>Able to perform programming related wiring</li> </ul>

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Fault finding in PLC	<ul style="list-style-type: none"><li>• Able to configure PLC hardware part &amp; software</li><li>• Able to check input &amp; output signals</li></ul>
Interchanging PLC	<ul style="list-style-type: none"><li>• Able to communicate PLC with different devices</li><li>• Describe about error status</li></ul>
<b>Means of Assessment 1</b>  <i>Written Test:</i> This will comprise of (i) True / False Statements (ii) Multiple Choice Questions (iii) Matching Type Questions(iv) Descriptive Questions, Assessment of theory part will be based on Technical knowledge, numerical ability & reasoning. Individual assessment will be evaluated in the answer sheet.	
<b>Means of Assessment 2</b>  <i>Practical Test:</i> This will comprise a test job by following appropriate working steps such as objective, necessary tools, equipment and instruments, job sequence, safety procedures & conclusion. Through observation it will be possible to ascertain candidate's aptitude, safety consciousness, quality consciousness etc. The end product will be measured against the pre-decided standards (like tolerance, finish, accuracy, time etc.) to gauge the level of his skill achievements. Individual assessment will be evaluated for skill practice for every candidate.	
<b>Means of Assessment 3</b>  <i>Viva:</i> This tool will be used to assess the conceptual understanding and the behavioral aspects as regards the job role and the specific task at hand.	
<b>Pass/Fail</b> <ul style="list-style-type: none"><li>➤ A candidate must secure minimum 80% attendance in their theory and practical classes to appear in examination.</li><li>➤ A candidate must secure minimum 60% marks to qualify in their practical test .</li><li>➤ A candidate must secure minimum 40% marks to qualify in their theory exams.</li></ul>	



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## SECTION 2

### **EVIDENCE OF LEVEL**

**Awarding bodies will enter a proposed NSQF level for the qualification in the Qualification File Summary. This section asks for the evidence on which that proposal is based. The evidence must refer to the level descriptors of the NSQF.**

NSDA recommends an approach to working out the level of qualifications which starts with the level descriptor domains (Process, Professional knowledge, Professional skill, Core skill and Responsibility: see annex A). Two variants for providing the evidence of level are offered here: Option A and Option B in the following pages. Awarding bodies should choose the option which best suits the qualification.

## OPTION A

<b>Title/Name of qualification/component: Advance Certificate Course In Machine Maintenance</b> <b>Level: 5</b>			
NSQF Domain	Outcomes of the Qualification/Component	How the job role relates to the NSQF level descriptors	NSQF Level
Process	<ul style="list-style-type: none"> <li>➤ Carryout different types of maintenance work maintaining all safety aspect</li> <li>➤ Perform fitting works</li> <li>➤ Perform installation of different types of machine as per instruction manual.</li> <li>➤ Operate Conventional Machines</li> <li>➤ Operate CNC Machines</li> <li>➤ Create and modify PLC program</li> </ul>	<p>Job holders will perform repair &amp; maintenance work of different machines and equipments like Conventional, CNC Machines, Air Compressor, DG Sets, Pump, etc by using different tools &amp; equipments maintaining safety aspects, they can perform machine installation &amp; fitting work.</p> <p>Job holder will create PLC program &amp; they are capable to modify PLC program.</p> <p>Job holder can operate different types of conventional &amp; CNC machines.</p> <p>Job holders are capable to perform mechanical &amp; electrical maintenance work for machines &amp; equipments</p>	5
Professional knowledge	<ul style="list-style-type: none"> <li>➤ Describe types of safety, hazards, safety signs &amp; symbols</li> <li>➤ Describe different types of maintenance activity</li> <li>➤ Describe tools &amp; instruments used in maintenance activity</li> <li>➤ Describe limit fit tolerance</li> <li>➤ Describe different types of operations that are performed in conventional &amp; CNC machines</li> <li>➤ Describe about electrical tools &amp; equipments &amp; electrical maintenance activity</li> <li>➤ Describe about leveling &amp; alignment</li> <li>➤ Describe the logics/methods for PLC programming</li> <li>➤ Gains knowledge on electrical, hydraulic, pneumatic systems related to maintenance</li> </ul>	<p>Job holder will be able to explain different parts of the machine, function of different parts of a machine, application of precision measuring &amp; marking tools &amp; equipments, interpreting drawing, read &amp; understand the machine manuals, basic knowledge of machining, Electrical Transmission systems, hydraulic &amp; pneumatic, knowledge about check point at the time of m/c installation &amp; machine installation, fastening device, basic fitting equipments used in pipe fitting, classification of pumps</p> <p>They will know method of maintenance, procedure of fault finding &amp; its remedies, knowledge of limit, fit &amp; tolerance, method of power transmission, type of lubricant &amp; its application, maintaining m/c data card, maintenance record, preventive/schedule maintenance plan, changeable part specification etc.</p> <p>Jobholder will know the</p>	5

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		programming of PLC, they can explain CNC programming and different operations of conventional machines	
Professional skill	<ul style="list-style-type: none"> <li>➤ Carry out maintenance and repairs on machines and equipments.</li> <li>➤ Dismantle, repair, re-assemble, install and do functions tests on machine components.</li> <li>➤ Plan jobs and do maintenance, troubleshoot, repair and carry out functions tests on mechanical components, and elaborate on the alternative solutions available</li> <li>➤ Carryout machine installation</li> <li>➤ Carryout maintenance work for machine utility</li> <li>➤ Operate conventional machine tools</li> <li>➤ Programming &amp; operations of CNC machines</li> <li>➤ Perform electrical wiring &amp; maintenance of electrical equipments</li> <li>➤ Programming &amp; modifying PLC</li> </ul>	<p>Job holder will perform different type of maintenance work as like preventive, schedule &amp; break down maintenance of different machines, they are capable to change different parts of machine, performing basic machining operation, maintenance in electrical parts of machine, leveling &amp; alignment of the machine, fault finding &amp; trouble shooting in machine.</p> <p>They can also perform fitting &amp; bench work</p> <p>They will be able to perform maintenance of DG set &amp; Air compressor, Pump etc</p> <p>Job holder will be able to create &amp; modify PLC program, they are capable to do PLC wiring.</p> <p>Job holder will be capable to do monitoring &amp; tests, they are capable to write programs for CNC machines &amp; also perform maintenance work of CNC machines.</p> <p>Job holders are capable to documents their work</p>	5
Core skill	<ul style="list-style-type: none"> <li>➤ Able to receive and pass information from and to authorized persons and seeking clarification from authorized persons where required</li> <li>➤ Able to do basic arithmetic &amp; geometrical calculations</li> <li>➤ Be able to identify job site hazards like sharp edged heavy tools, gas cylinders, welding radiations, chemicals, fumes, obstructions in corridors, naked wires / cables etc</li> </ul>	<p>Job holders is having good communication, team work capability, discipline &amp; punctuality, they will be capable to perform basic arithmetic calculations, measuring techniques, maintaining accuracy, candidates must able to handle safety and fire fighting equipments, they must have good housekeeping practice, they must have openness to learning, ability to do plan and organize own work area, identify &amp; solving problems, they must be environmental conscious</p>	5
Responsibility	<ul style="list-style-type: none"> <li>➤ Responsible for the completion of all maintenance service assigned by the supervisor in stipulated time.</li> <li>➤ Responsible to operate CNC &amp;</li> </ul>	<p>Job holders will correctly diagnose a range of mechanical &amp; electrical faults and plan a suitable course of action, they will perform the maintenance work as per course of action.</p> <p>Job holders can assemble, modify and test mechanical &amp;</p>	5

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	<p>conventional machines</p> <ul style="list-style-type: none"><li>➤ Responsible to perform machine installation</li><li>➤ Responsible to program on PLC</li></ul>	<p>electrical components according to specifications</p> <p>They will be responsible to install machines &amp; its components as per instructions. They will document finished work.</p>	
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## India-EU Skills Development project: Qualification File

### SECTION 3

#### EVIDENCE OF NEED

##### **What evidence is there that the qualification is needed?**

The industrial growth in India is increasing day by day. New machines which works in the principle of latest technology are used in this region, Automatic machines are installed in industries. High skilled maintenance work is required to run the plant smoothly.

Tool Room & Training Centre, Guwahati has conducted this type of courses and it's having market demand in the field of maintenance work. Placement is also available in micro & small industries.

##### **What is the estimated uptake of this qualification and what is the basis of this estimate?**

Skills Gap analysis Reports for industry demand and secondary research data, though these do not lend to accurate demand projection. The link to NSDC Human Resource & Skills Requirement in Capital Goods Sector is [http://cgsc.in/Humanresource\\_skill\\_requirement.pdf](http://cgsc.in/Humanresource_skill_requirement.pdf)

##### **What steps were taken to ensure that the qualification(s) does (do) not duplicate already existing or planned qualifications in the NSQF?**

NSDC list of Approved and Under-Development QPs was checked prior to commissioning the work

This qualification is developed by Tool Room & Training Centre, Guwahati and this qualification is not matching with existing qualifications under NSDC.

##### **What arrangements are in place to monitor and review the qualification(s)? What data will be used and at what point will the qualification(s) be revised or updated?**

- The curriculum committee meeting for review will be in the month of Jan 2018 which comprising industrial expert, educational experts with subject specialization.
- The data used for revision or update will be impact analysis (student and industries) and new subject area opportunities, multiple entry and exits incorporated or RPL strategy implementations.
- The curriculum review and updates, in consultation with industries and expert of respective domain, NOS approved by NSDA will also be referred to from time to time.

## SECTION 4

### EVIDENCE OF PROGRESSION

**What steps have been taken in the design of this or other qualifications to ensure that there is a clear path to other qualifications in this sector?**

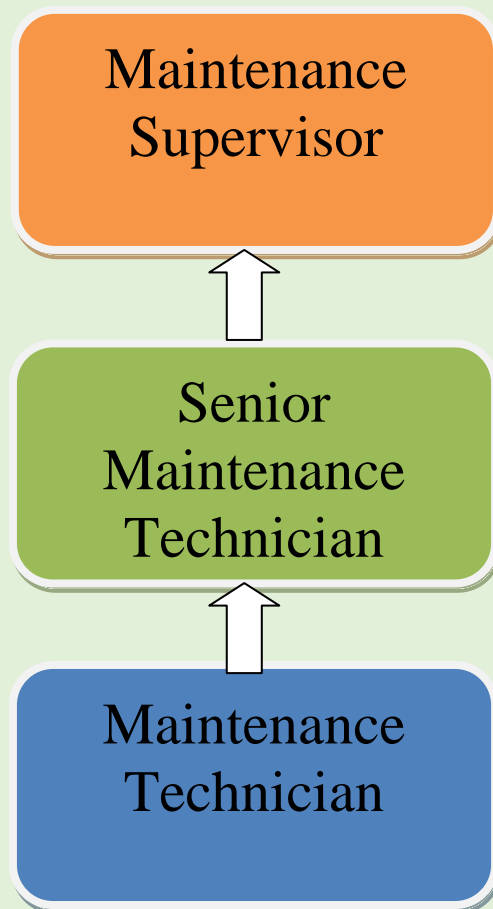
Approved Qualification packs available under NSDC related to maintenance & installation field has been studied before designing this qualification.

This qualification pack is so designed to ensure that the trainee after undergoing this qualification gains high quality skills & enhance knowledge that are compatible to work with the present demand of industry at the same time they will fulfill the entry requirement for next higher level qualification.

After completion of course and after 3 years of field experience the trainee can work as a Senior Maintenance Technician and after that 5 years of experience, the person can work as a Maintenance Supervisor .

Please attach any documents giving further information about any of the topics above.

Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.



**Career Progression of Maintenance Technician**