

Model Curriculum

18. Maintenance Fitter-Mechanical

SECTOR: CAPITAL GOODS

SUB-SECTOR: MACHINE TOOLS, DIES, MOULDS AND PRESS TOOLS, PLASTICS MANUFACTURING MACHINERY, TEXTILE MANUFACTURING MACHINERY, PROCESS PLANT MACHINERY, ELECTRICAL AND POWER MACHINERY, LIGHT ENGINEERING GOODS

OCCUPATION: Maintenance

REF ID: CSC/Q0901, 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: '**Maintenance Fitter - Mechanical**' QP No. '**CSC/ Q0901, 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

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Maintenance Fitter- Mechanical

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Maintenance Fitter -Mechanical", in the "Capital Goods" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Maintenance Fitter-Mechanical		
Qualification Pack Name & Reference ID. ID	CSC/Q0901, v1.0		
Version No.	1.0	Version Update Date	
Pre-requisites to Training	12 th standard pass, preferably Customized training required on the equipment and machines		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Perform maintenance activities on mechanical equipment: maintain a range of mechanical equipment which could include gearboxes, machine tools, lifting and handling equipment, processing plant, production plant, engines, pumps, process control valves, compressors, transfer equipment, mechanical structures and work holding devices. • 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 3 out of 3 National Occupational Standards (NOS) of “Maintenance Fitter-Mechanical” Qualification Pack issued by “Capital Goods Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p>Perform Maintenance Activities on Mechanical Equipment</p> <p>Theory Duration (hh:mm) 70:00</p> <p>Practical Duration (hh:mm) 170:00</p> <p>Corresponding NOS Code CSC/No901</p>	<ul style="list-style-type: none"> Define units and explain types of measurement systems Interpret British and metric systems of measurement Convert units from one system of measurement to another Read First angle and Third angle Engineering drawings Explain the importance of safe working practices Identify hazards associated with fitting activity and take corrective action to avoid such hazards State the importance of safe material handling practices Identify Personal Protective Equipment required for fitting operation Wear correctly Personal Protective Equipment List tools and equipment required for general fitting operation –Pneumatic or magnetic table, machine vice, angle plate, vee block, clamps, fixtures, chucks, indexing head, rotary table, magnetic chucks, bench vice, collets, allen key, spanner, pliers, bearing puller, circlip pliers, scraper, various types of files, marking tools etc. List measuring instruments –external micrometers, vernier calliper, surface finish equipment, steel rules, squares, protractors, depth micrometers, feeler gauges, bore/hole gauges, slip gauges, radius/profile gauges, thread gauges, tachometers , torque wrenches, spirit levels Explain method and techniques used in dismantling and assembling – release of pressure/force, proof making, extraction, pressing, alignment etc. Explain methods to produce mechanical assemblies – interference fits, use of threaded fasteners, use of spring circlips, use of locking and retaining devices, sealing compounds and adhesives, electrical bonding, setting correct working parameters, torque setting State the functions of different types of 	<p>Training Kit (PowerPoint, Trainer Guide)</p> <p>Personal Protective Equipment, allen key, spanner, torque wrench, plier, bearing puller, circlip plier, scraper, thermal indicators, dial test indicator, audio test devices, bench vice, machine vice, clamps, three jaw chuck, four jaw chuck, collet chuck, drive plate, jigs and fixtures, shafts, couplings, gears, cutch, bearings and seals, cams and followers, chains and sprockets, pulleys and belts, valves, solenoid operated cylinders</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>bearing and gears</p> <ul style="list-style-type: none"> • Explain various types of maintenance- preventive maintenance, corrective maintenance, predictive maintenance and reactive maintenance • Explain various types of diagnostic techniques- half split technique, emergent sequence, functional/performance testing, six point testing, injection and sampling and equipment self diagnostics • Read manufacturer's manual, physical layout diagrams, fault analysis chart, troubleshooting guides and machine assembly layout • Effectively use monitoring or testing procedures in fault diagnosis – alignment checks, force/pressure check, leakage, vibration, thermal checks, visual checks • Carryout maintenance activities on various equipment • Apply correct method to dismantle mechanical assemblies • Re assemble components using suitable method • Carryout servicing and maintenance • Replace or refit basic hydraulic or pneumatic components • Confirm to the quality requirement - components to be free from false tool cuts, burrs and sharp edges; dimensional tolerance +/- 0.25mm or +/- 0.010"; flatness and squareness 0.05mm per 25mm; angles within +/- 1 degree; screw threads to Medium fit; reamed holes within H8; surface finish 1.6 µm; minimum downtime of utilities; levelling • Monitor and record measurements and observations • Deal with equipment malfunction and rectify faults during the breakdown servicing process as appropriate • Identify areas of improvement in the various maintenance services and implement the same • Fill up appropriate technical forms ,activity logs as per the requirement • Follow proper communication protocol • Communicate with people in respectful manner in line with organizational policy 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> Perform numerical operations, geometry and calculations Maintain current knowledge of application standards, legislation etc. Demonstrate problem solving abilities Plan, organize and sequence work operations as per the job requirement Work in a team to achieve better results 	
2	<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>
3	<p>Fire Safety</p> <p>Theory Duration (hh:mm) 05:00</p> <p>Practical Duration (hh:mm) 30:00</p> <p>Corresponding NOS Code CSC/N1335</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 Identify the location of assembly point, fire exit, fire alarm Follow reporting procedure in case of a fire 	<p>Training kit (Trainer guide, PowerPoint)</p> <p>Class A, B, C, D and K fire extinguishers</p>
4	<p>Emergencies, rescue and first aid procedure</p> <p>Theory Duration (hh:mm) 09:00</p> <p>Practical Duration (hh:mm) 18:00</p>	<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 	<p>Training kit (Trainer guide, PowerPoint)</p> <p>First aid kit with all contents</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code CSC/N1335	<ul style="list-style-type: none"> Bandage wounds Explain stages of crisis and crisis management Prepare an incident report 	
5	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)
6	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 118:00 Practical Duration 292:00	Unique Equipment Required: Personal Protective Equipment, allen key, spanner, torque wrench, plier, bearing puller, circlip plier, scraper, thermal indicators, dial test indicator, audio test devices, bench vice, machine vice, clamps, three jaw chuck, four jaw chuck, collet chuck, drive plate, jigs and fixtures, shafts, couplings, gears, clutch, bearings and seals, cams and followers, chains and sprockets, pulleys and belts, valves, solenoid operated cylinders , PPE, Class A, B, C, D and K fire extinguishers, First aid kit with all contents.	

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

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

Trainer Prerequisites for Job role: “Maintenance Fitter-Mechanical” mapped to Qualification Pack: “CSC/Q0901 v1.0”

Sr. No.	Area	Details
1	Description	Dismantling, removing and replacing faulty equipment at component or unit level on a variety of different types of mechanical assemblies and sub-assemblies and diagnosing, locating faults, overhauling, fitting and adjusting mechanical systems and equipment.
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: “ <u>Lab Technician-Metal Testing</u> ” mapped to QP: “ <u>CSC/Q0901, v1.0</u> ”. 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	Maintenance Fitter-Mechanical
Qualification Pack	CSC/Q0901, 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 (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
1.CSC/No6o2 Carry out testing on metals	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		3	1	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.follow all relevant setting up and operating specifications for the products or mechanical equipment being commissioned		3	1	2
	PC7.follow the defined procedures and set up the equipment correctly ensuring that all operating parameters are achieved		3	1	2
	PC8.obtain job specifications and requirements from valid sources and find out the fault		2	0	2
	PC9.obtain and interpret drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process		3	1	2
	PC10.follow the procedure to be adopted to establish the background of the fault and the tools to be used		3	1	2
	PC11.evaluate various types of information available for fault diagnosis		3	0	3
	PC12.evaluate sensory information to assess likely faults eg. sound, visual		3	0	3
	PC13.collect evidence regarding the fault from the sources using a range of diagnostic equipment and techniques		3	0	3
	PC14.apply monitoring or testing procedures to help in the fault diagnosis using a range of test equipment		4	1	3
	PC15.relate previous reports/records of similar fault conditions		2	0	2
	PC16.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		3	0	3
	PC17.carry out the maintenance activities in the specified sequence and in an agreed timescale		5	1	4
	PC18.carry out maintenance activities on various equipment		4	0	4
	PC19.perform dismantling processes mechanical		4	0	4

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	equipment using appropriate method or technique in order to replace defective components				
	PC20.re-assemble the components using appropriate methods, and adjust them to meet the operating specification		5	1	4
	PC21.carry out servicing and maintenance techniques as applicable		5	1	4
	PC22.replace or refit basic hydraulic and pneumatic components		4	0	4
	PC23.identify requirements for welding, machining, electric or electronic repair and handover to the relevant personal after following due process		3	0	3
	PC24.conduct a trial run of the equipment at full power/speed/flow		3	0	3
	PC25.confirm that the produced component/process outcomes meet specifications		3	0	3
	PC26.monitor and record measurements and observations		3	0	3
	PC27.review and update maintenance procedures and plans		3	0	3
	PC28.deal with equipment malfunction and rectify faults during the breakdown servicing process as appropriate		4	1	3
	PC29.identify areas of improvements in the various maintenance services and implement the improvement activities agreed upon by the relevant authorities		3	0	3
	PC30.deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve		3	0	3
	PC31.leave the work area in a safe and tidy condition on completion of the manufacturing activities		2	0	2
	Total		100	12	88
2.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		4	2	2

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	environment of the job role				
	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 person from electrocution		4	1	3
	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

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	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
3.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 convey politeness, assertiveness, care and professionalism		10	3	7
	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	300	300	78	222
	Percentage Weightage:			26	74
	Minimum Pass% to qualify (aggregate):				60