

Model Curriculum

Forger

SECTOR: CAPITAL GOODS
SUB-SECTOR: 1. Light Engineering Goods
OCCUPATION: Forging
REF ID: CSC/Q1101, V1.0
NSQF LEVEL: 3



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: '**Forger**' QP No. '**CSC/Q 1101, NSQF Level 3**'

Date of Issuance: April 30th, 2014

Valid up to : August 30th, 2016

*Subject to periodic updation of the Qualification Pack to the
latest govt. approved national standards & norms.



Authorised Signatory
Tourism & Hospitality Skill Council

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Forger

CURRICULUM / SYLLABUS

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

Program Name	Forger		
Qualification Pack Name & Reference ID. ID	CSC/Q1101, v1.0		
Version No.	1.0	Version Update Date	
Pre-requisites to Training	10th Standard passed, preferably		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Perform forging technique on ferrous and non ferrous metal alloys for metal working: producing of complex solid forged shapes by forging of on ferrous & non-ferrous metals and alloys using a range of forging techniques, tools and jigs, as per approved procedures. • Perform heat treatment operations on ferrous and non-ferrous metals and alloys using a variety of equipment: performing heat treatment operations on ferrous, non-ferrous metals and alloys using a variety of equipment. The applications for it would include cast metal products, machine tooling, and forged and machined components. • 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 4 out of 4 National Occupational Standards (NOS) of “Forger” Qualification Pack issued by “Capital Goods Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p>Perform forging techniques on ferrous & non-ferrous metals and alloys for metal working</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm) 100:00</p> <p>Corresponding NOS Code CSC/N1101</p>	<ul style="list-style-type: none"> • Distinguish between ferrous and non-ferrous metal • Define various physical properties of ferrous and non-ferrous metals • State the purpose of forging • Explain the effects of oxidation/burning, carburization on ferrous metals • Explain the effects of heating and cooling on ferrous metals • State the effect of forging on the structure of ferrous metals • State the necessity of heat treatment • List and explain various heat treatment techniques • Explain various methods and techniques of forging <ul style="list-style-type: none"> ○ hammer or drop forging ○ press forging ○ open-die forging ○ closed-die forging • Differentiate between various types of forgings • Explain various activities of forging <ul style="list-style-type: none"> ○ upsetting ○ drawing down ○ spreading ○ sets ○ transitions ○ swaging ○ fullering • Explain various types of press used in gorging <ul style="list-style-type: none"> ○ hydraulic presses ○ mechanical presses ○ screw presses ○ hammers <ul style="list-style-type: none"> ▪ gravity drop ▪ power drop ▪ counter blow (two rams) ▪ high pressure gas • Explain the process of forging • List various tools and equipment required for forging <ul style="list-style-type: none"> ○ hammers <ul style="list-style-type: none"> ▪ hand hammer ▪ sledge hammer ▪ power hammer ○ tongs ○ punches ○ chisels 	<p>Training kit (Trainer guide, PowerPoint)</p> <p>hydraulic press, mechanical press, various types of hammers, tongs, punches, chisel, anvil, leg vice, swage block, floor mandrel, swages, jig setter, shafted tools, wired tools, shovel, blower, poker, fullers, flatters, various ferrous & non-ferrous metal samples, Upsetter, Material cutting machine, Personal Protective Equipment</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> ○ anvil ○ leg vice ○ swage block ○ floor mandrel ○ swages ○ swage blocks ○ jig setter ○ fly press set up ○ shafted tools ○ wired tools ○ shovel ○ blower ○ poker ○ fullers ○ flatters ● Explain various safety precautions to be followed while forging ● Identify workplace hazards and take necessary action to prevent such hazards ● List various Personal Protective Equipment required for forging operation ● Interpret job specification ● Prepare the work area for the forging operation as per the standard procedure ● Setup machines and dies for carrying out forging operation ● List various marking tools used in the forging operation ● Use templates to transfer features on to the work pieces as per the job specification ● Attach correctly hammer tools and fixtures to the power hammer ● Set the work piece correctly in the work holding devices ● Carry out the forging operation as per the standard procedure ● Check the forged component for dimensional accuracy and for any imperfections ● Prepare an inspection and maintenance check sheet ● Arrange all tools and equipment at the allocated location only ● Foresee problems that might occur during the forging operation and take appropriate measures to avoid such problems ● Communicate problems with the concerned authority ● Plan the sequence of operations as per 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>the standard operating procedure</p> <ul style="list-style-type: none"> Perform numerical calculations and explain various systems of measurements Take responsibility for the own work Manage time to achieve better results <p>Communicate and cooperate with the team members</p>	
2	<p>Perform heat treatment operations on ferrous and non ferrous metals and alloys using a variety of equipment</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm) 100:00</p> <p>Corresponding NOS Code CSC/N1001</p>	<ul style="list-style-type: none"> Identify commonly used metals, non metals and alloys <ul style="list-style-type: none"> Carbon steels Stainless steel Cast iron Tool steel Bronze Bronze alloys Copper Copper alloys Explain physical properties of commonly used ferrous and non-ferrous materials Perform numerical calculations and explain various systems of measurement State the necessity of heat treatment List various heat treatment processes and explain their process List various equipment and tools required for heat treatment <ul style="list-style-type: none"> Various types of furnaces (gas, electric, oil fired, hearth, pit, induction heating, kilns, tempering ovens, heated baths, gas torches, specialized tongs, lifting equipment etc. List Personal Protective Equipment (PPE) equipment required for heat treatment procedure State the effect of temperature and time on the heat treatment process Identify work holding devices used in the heat treatment Adhere to prescribed safety standards and procedures while carrying out the heat treatment procedure Interpret job instructions – material specification, reference tables, standards, quality control documents, operation sheets, process specifications etc. Prepare the material in readiness to receive the appropriate heat treatment <ul style="list-style-type: none"> Surface cleaning Degreasing 	<p>Training kit (Trainer guide, PowerPoint), various metal samples- carbon steel, stainless steel, cast steel, tool steel, bronze, bronze alloys, copper, copper alloys, Various types of furnaces (gas, electric, oil fired). hearth, pit, induction heating, kilns, tempering ovens, heated baths, gas torches, specialized tongs, lifting equipment etc., Personal Protective Equipment</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> ○ Drying at the correct temperature ○ Masking the materials ○ Polishing ○ Packing or coating ○ Etc. <ul style="list-style-type: none"> ● Check the condition of the heat treatment equipment and inform the immediate supervisor in case of any observations ● Carryout various heat treatment processes <ul style="list-style-type: none"> ○ Tempering ○ Annealing ○ Normalizing ○ Carburising ● Cool the heated objects as per the standard procedure ● Carry out cooling/quenching using the appropriate medium and technique ● Check the quality of the heat treated objects and observe for any defects ● Demonstrate problem solving abilities ● Plan sequence of operations as per the job instruction sheet ● Manage time better to achieve better results ● Carry out required documentation as per the organizational policy 	
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) 30:00</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, 	<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
	Corresponding NOS Code CSC/N1335	<ul style="list-style-type: none"> 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)
	Total Duration Theory Duration 84:00 Practical Duration 316:00	Unique Equipment Required: hydraulic press, mechanical press, various types of hammers, tongs, punches, chisel, anvil, leg vice, swage block, floor mandrel, swages, jig setter, shafted tools, wired tools, shovel, blower, poker, fullers, flatters, various ferrous & non-ferrous metal samples, various metal samples- carbon steel, stainless steel, cast steel, tool steel, bronze, bronze alloys, copper, copper alloys, Various types of furnaces (gas, electric, oil fired). hearth, pit, induction heating, kilns, tempering ovens, heated baths, gas torches, specialized tongs, lifting equipment etc., apron, gloves, safety boots, overalls, eye shields, goggles, ear plugs, measuring instruments,, Class A, B, C, D and K fire extinguishers, PPE, First aid kit with all contents	

Grand Total Course Duration: **400 Hours, 0 Minutes**

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

Trainer Prerequisites for Job role: “Forger” mapped to Qualification Pack: “CSC/Q1101 v1.0”

Sr. No.	Area	Details
1	Description	Producing of complex solid forged shapes by forging of on ferrous & non-ferrous metals and alloys using a range of forging techniques, tools and jigs, as per approved 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: “Forger” mapped to QP: “CSC/Q1101, 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: “MEP/Q0102”. Minimum accepted as per respective SSC guidelines is 80%.
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	Forger
Qualification Pack	CSC/Q1101, 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 center (as per assessment criteria below).
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on these criteria.
5	To pass the Qualification Pack , every trainee should score a minimum of 70% in every NOS.
6	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
1.CSC/N1101 Perform forging techniques on ferrous & non-ferrous metals and alloys for metal working	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work and ensure process compliance	100	3	1	2
	PC2.adhere to procedures or systems in place for risk assessment, occupational standards, personal protective equipment (PPE) and other relevant occupational safety regulations		4	1	3
	PC3.work following laid down procedures and instructions		3	1	2
	PC4.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition and are kept at secured location		2	0	2
	PC5.ensure that all measuring equipment are within calibration date and are approved for usage		2	0	2
	PC6.ensure work area is clean and safe from hazards before and after the job is completed		2	0	2
	PC7.obtain job specification from a valid and approved source following due procedure		2	0	2
	PC8.read and establish job requirements from the job specification document accurately		3	1	2
	PC9.report and rectify incorrect and inconsistent information in job specification documents as per organization procedures		3	1	2
	PC10.prepare the work area for the forging operations as per procedure		2	0	2
	PC11.ensure availability of prepared work pieces /raw materials for forging as per job Requirements		3	1	2
	PC12.ensure availability appropriate tools and equipment per job requirements		2	0	2
	PC13.set up machines and dies for carrying out forging		2	0	2
	PC14.measure and mark out specified features for plate bending and forming on the work pieces as per job specification using appropriate measuring and marking out tools and equipment		3	1	2
	PC15.trace/transfer the specified features from the templates onto the work pieces as per job specification		3	1	2
	PC16.ensure that the material to be forged is safely and correctly positioned in the forming equipment as per specification		3	1	2
	PC17.maintain and control a solid fuel forge hearth safely to meet given objectives		4	2	2
	PC18.attach hammer tools and fixtures to power hammer correctly		2	0	2
	PC19.select and combine common forge work techniques to produce forged products and		2	0	2

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	tools that are fit for purpose				
	PC20.select heating plant and equipment as per the work undertaken		2	0	2
	PC21.set work pieces as per job requirements using appropriate positioning and/or holding Devices		4	1	3
	PC22.apply techniques used to heat heavy and complex forgings correctly		3	0	3
	PC23.carry out common heat treatments of normalizing and annealing on forged steel and minimize the effects of oxidation and overheating		4	0	4
	PC24.apply post-forging heating safely and as per organizational procedures		5	1	4
	PC25.deal with the hot forgings safely and as per organizational procedures		3	1	2
	PC26.prepare and use an inspection and maintenance checklist and report on the condition of a range of common forge equipment		2	0	2
	PC27.carry out the necessary repair/maintenance of forge hand tooling		2	0	2
	PC28.check forging to ensure conformance to tolerances and specifications to ensure completeness of work		5	2	3
	PC29.identify common forging imperfections and correct errors		2	0	2
	PC30.keep finished components as well as raw material as per organizational procedure Established		3	1	2
	PC31.produce components as per standards applicable to the process and in line with production targets		3	1	2
	PC32.report conditions and seek appropriate assistance in a timely manner to address risk of failure to comply with necessary targets and specifications		2	0	2
	PC33.deal with finished components as per organizational guidelines		3	1	2
	PC34.complete documentation during and post operations as per organizational procedures		3	1	2
	PC35.return all tools and equipment to the correct location on completion of the forging activities		2	0	2
	PC36.leave the work area in a safe and tidy condition on completion of job activities		2	0	2
	Total		100	20	80
2.CSC/N1001 Perform heat treatment operations on ferrous and non –ferrous	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work and ensure process compliance		4	1	3
	PC2.adhere to procedures or systems in place for risk assessment, occupational standards, personal protective equipment		5	1	4

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
and metal alloys using a variety of equipment	(PPE) and other relevant occupational safety Regulations	100			
	PC3.work following laid down procedures and instructions		4	1	3
	PC4.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition and are kept at secured location		3	0	3
	PC5.ensure work area is clean and safe from hazards before and after the job is completed		3	0	3
	PC6.prepare and maintain the work area as per procedure or operation specification		6	2	4
	PC7.obtain production and consumables materials required for performing heat treatment operations as per specifications from valid sources and job requirements		4	1	3
	PC8.obtain various tools and equipment required for performing heat treatment operations as per specifications		4	1	3
	PC9.ensure that all measuring equipment are within calibration date and are approved for usage		3	0	3
	PC10.prepare the materials in readiness to receive the appropriate heat treatment		4	0	4
	PC11.prepare the components, tools and equipment for the heat treatment activities as specified in the job specification documents		6	2	4
	PC12.check that the heat treatment equipment is at satisfactory operating conditions		4	0	4
	PC13.carry out various kinds of heat treatment processes eg. tempering heat treatment process, annealing heat treatment process, normalizing/stress relieving heat treatment process, carburizing heat treatment process		8	3	5
	PC14.prepare furnace/forging or torch by lighting, using approved procedures		7	3	4
	PC15.cool the treated object using appropriate amounts of cooling medium so that it will not overheat or reach flash point		5	0	5
	PC16.ensure that components are loaded safely into the heat source/solution and are left for the required induction period		3	0	3
	PC17.remove the components safely and correctly from the heat source/solution		3	0	3
	PC18.carry out quenching/cooling of the components, using the appropriate medium and technique		4	0	4
	PC19.inspect the final heat treated component to check if it is as per specification and without defects		5	2	3
	PC20.deal promptly and effectively with problems within control, and seek help and guidance from		3	0	3

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	the relevant people for problems that cannot be resolved				
	PC21.shut down the heat treatment equipment to a safe condition on completion of the activities		3	0	3
	PC22.leave the work area in a safe and tidy condition on completion of the fitting activities		3	0	3
	PC23.refer unresolved job related problems to appropriate personnel for support		3	0	3
	PC24.monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem		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

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	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
	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	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

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
effectively with others	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		400	103	297
	Percentage Weightage:			25	75
	Minimum Pass% to qualify (aggregate):			70	