

Model Curriculum

Heat Treatment Operator

SECTOR: CAPITAL GOODS
SUB-SECTOR: 1. Machine Tools
2. Plastics Manufacturing Machinery
3. Textile Manufacturing Machinery
4. Process Plant Machinery
5. Electrical and Power Machinery
6. Light Engineering Goods
OCCUPATION: Material Preparation
REF ID: CSC/Q1001, V1.0
NSQF LEVEL: 2



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: **'Heat Treatment Operator'** QP No. **'CSC/ Q 1001, NSQF Level 2'**

Date of Issuance: April 10th, 2014

Valid up to : August 30th, 2016

*Valid up to the revision date of the Qualification Pack in the
field of skill development unless otherwise notified



Authorised Signatory
Tourism & Hospitality Skill Council

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Heat Treatment Operator

CURRICULUM / SYLLABUS

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

Program Name	Heat Treatment Operator		
Qualification Pack Name & Reference ID. ID	CSC/Q1001, v1.0		
Version No.	1.0	Version Update Date	
Pre-requisites to Training	8th Standard passed, preferably		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • 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. This involves preparing for the heat treatment activities by obtaining all the necessary job instructions, materials, tools and methods to suit work requirements; preparing the tools and equipment, applying heat treatment procedures, identifying imperfections, using measuring equipment, understanding processing hazards and finally carrying out heat treatment on the material with appropriate tools and process to match specifications. • 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 “Heat Treatment Operator” Qualification Pack issued by “Capital Goods Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p>Perform heat treatment operations on ferrous & non-ferrous metals and alloys using a variety of equipment</p> <p>Theory Duration (hh:mm) 40:00</p> <p>Practical Duration (hh:mm) 100:00</p> <p>Corresponding NOS Code CSC/N1001</p>	<ul style="list-style-type: none"> • Distinguish between metals and non metals • Identify ferrous and non ferrous metals • Define common terms used in heat treatment operation • Identify various ferrous metals <ul style="list-style-type: none"> ○ Carbon steel ○ Stainless steel ○ Cast iron ○ Tool steel ○ Hard metals • Identify various non ferrous metals <ul style="list-style-type: none"> ○ Bronze ○ Bronze alloys ○ Copper and copper alloys • State the importance of heat treatment and explain different types of heat treatment processes • Identify main heat treatment equipment • Identify work holding devices <ul style="list-style-type: none"> ○ Wires ○ Hooks ○ Jigs • Identify Personal Protective Equipment (PPE) required for the heat treatment • Wear Personal Protective Equipment correctly • Adhere to all safety norms while performing heat treatment operation • Interpret job instruction sheet/job card or drawing • Identify potential hazards at the work place and take corrective actions to avoid such hazards • List equipment and tools required heat treatment <ul style="list-style-type: none"> ○ Furnaces (gas, electric, oil fired, vacuum, hearth, pit type, muffle) ○ Induction heating equipment ○ Kilns ○ Tempering ovens ○ Heated baths ○ Salt baths ○ Gas torches ○ Specialized tongs ○ Lifting equipment • Prepare the materials in readiness to receive the appropriate heat treatment <ul style="list-style-type: none"> ○ Cleaning the surface ○ Degreasing 	<p>Training kit (Trainer guide, PowerPoint)</p> <p>Ferrous metal samples, non-ferrous metal samples, wires, hooks, jigs, Furnaces (gas, electric, oil fired, vacuum, hearth, pit type, muffle)</p> <p>Induction heating equipment, kilns, tempering ovens, heated baths, salt baths, gas torches, specialized tongs, lifting equipment</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> ○ Drying at the right temperature ○ Masking for case hardening or carburising ○ Polishing ○ Packing or coating ○ Pre heating ○ Pickling ○ Sand blasting ● Prepare the components, tools and equipment for the heat treatment activities ● Carryout various kinds heat treatment processes <ul style="list-style-type: none"> ○ Tempering ○ Annealing ○ Normalising ○ Carburising ● Remove the components safely and correctly from the heat source or solution ● Carryout Quenching /cooling of the components ● Inspect the final component for correct dimensions and without defects 	
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	Emergencies, rescue	<ul style="list-style-type: none"> ● Follow electrical safety procedures 	Training kit

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<p>and first aid procedure</p> <p>Theory Duration (hh:mm) 09:00</p> <p>Practical Duration (hh:mm) 18:00</p> <p>Corresponding NOS Code CSC/N1335</p>	<ul style="list-style-type: none"> • 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 	<p>(Trainer guide, PowerPoint)</p> <p>First aid kit with all contents</p>
5	<p>Work effectively with others</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm) 60:00</p> <p>Corresponding NOS Code CSC/N1336</p>	<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 	<p>Training kit (Trainer guide, PowerPoint)</p>
	<p>Total Duration</p> <p>Theory Duration 84:00</p> <p>Practical Duration 216:00</p>	<p>Unique Equipment Required: Ferrous metal samples, non-ferrous metal samples, wires, hooks, jigs, Furnaces (gas, electric, oil fired, vacuum, hearth, pit type, muffle), induction heating equipment, kilns, tempering ovens, heated baths, salt baths, gas torches, specialized tongs, lifting equipment, PPE, First aid kit with all contents</p>	

Grand Total Course Duration: **300 Hours, 0 Minutes**

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

Trainer Prerequisites for Job role: “Heat Treatment Operator” mapped to Qualification Pack: “CSC/Q1001 v1.0”

Sr. No.	Area	Details
1	Description	Perform heat treatment operations on ferrous & non-ferrous metals and alloys using a variety of 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: “Heat Treatment Operator” mapped to QP: “CSC/Q1001, 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	Heat Treatment Operator
Qualification Pack	CSC/Q1001, 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 this 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 (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
1.CSC/N1001 Perform heat treatment operations on ferrous & non-ferrous metals and alloys using a variety of equipment	PC1.comply with health and safety, nvironmental and other relevant regulations and guidelines at work and ensure process compliance	100	4	1	3
	PC2.adhere to procedures or systems in place for risk assessment, occupational standards, personal protective equipment (PPE) and other relevant occupational safety regulations		5	1	4
	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, carburising heat treatment process		5	0	5
	PC14.prepare furnace/forge or torch by lighting, using approved procedures		6	2	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		4	0	4
	PC18.carry out quenching/cooling of the		5	0	5

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	components, using the appropriate medium and technique				
	PC19.inspect the final heat treated component to check if it is as per specification and without defects		6	2	4
	PC20.deal promptly and effectively with problems within control, and seek help and guidance from the relevant people for problems that cannot be resolved		3	0	3
	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		4	0	4
	Total		100	13	87
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 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		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	documents that refer to health and safety in the workplace				
	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
	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
	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

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
3.CSC/N1336 Work effectively with others	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	79	221
Percentage Weightage:				26	76
Minimum Pass% to qualify (aggregate):				70	