Model Curriculum

QP Name: Automotive Heat Treatment Technician

QP Code: ASC/Q3901

QP Version: 2.0

NSQF Level: 4

Model Curriculum Version: 2.0

Automotive Skills Development Council | 153, Gr Floor, Okhla Industrial Area, Phase – III, Leela Building, New Delhi – 110020

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Training Parameters

Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Heat Treatment
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/8121.3701
Minimum Educational Qualification and Experience	12th Class with 1 Year of relevant experience OR 10th Class+ 1 year ITI with 2 years of relevant experience OR 10th Class+ 2 year ITI with 1 year of relevant experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 years
Last Reviewed On	30/09/2021
Next Review Date	30/09/2024
NSQC Approval Date	30/09/2021
QP Version	2.0
Model Curriculum Creation Date	30/09/2021
Model Curriculum Valid Up to Date	30/09/2024
Model Curriculum Version	1.0
Minimum Duration of the Course	400 Hours 00 Minutes
Maximum Duration of the Course	400 Hours 00 Minutes

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.

- Interpret assembly drawing/work instructions/SOPs for identification of raw material, tools and equipment required for the heat treatment operations.
- Carry out pre-heat treatment activities such as lifting of workpiece, inspection of tools and equipment etc. in co-ordination with Heat treatment Technician.
- Carry out heat treatment operations.
- Perform trimming and fettling operations.
- Carry out post-heat treatment operations such as cleaning and inspection.
- Work effectively and efficiently as per schedules and timelines.
- Implement safety practices.
- Optimize the use of resources to ensure less wastage and maximum conservation.

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
Bridge Module					
Module 1: Introduction to the role of an Automotive Heat treatment Operator	8:00	0:00			8:00
ASC/N9803 – Organize work and resources (Manufacturing) NOS Version No. – 1.0 NSQF Level – 3	**16:00**	**24:00**			**40:00**
Module 2: Organize work and resources according to safety and conservation standards	16:00	24:00			40:00
ASC/N9802 – Interact effectively with colleagues, customers and others NOS Version No. – 1.0 NSQF Level - 3	**12:00**	**20:00**			**32:00**
Module 3: Communicate effectively and efficiently	12:00	20:00			32:00
ASC/N3901 – Prepare for heat treatment process NOS Version No. – 2.0 NSQF Level - 4	**104:00**	**216:00**			**320:00**
Module 4: Prepare for heat treatment process	40:00	64:00			104:00
Module 5:	64:00	152:00			216:00

Perform heat treatment and post-treatment activities					
Total Duration	**140:00**	**260:00**			**400:00**

Module Details

Module 1: Introduction to the role of an Automotive Heat Treatment Technician

Bridge module

Terminal Outcomes:

- Discuss the role and responsibilities of an Automotive Heat Treatment Technician

Duration: *<08:00>*	**Duration**: *<00:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the role and responsibilities of an Automotive Heat Treatment Technician. • Discuss the job opportunities of an Automotive Heat Treatment Technician in an automobile industry. • Explain about Indian automotive market. • List various automobile Original Equipment Manufacturers (OEMs) and different products/ models manufactured by them. • Discuss the standards and procedures involved in the different processes of heat treatment. • Identify the standard checklists and schedules recommended by OEM.	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	

Module 2: Organize work and resources according to safety and conservation standards

Mapped to ASC/N9803, v1.0

Terminal Outcomes:

- Employ appropriate ways to maintain safe and secure working environment.
- Perform work as per the quality standards.
- Apply conservation practices at the workplace.

Duration: *<16:00>*	**Duration**: *<24:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the potential workplace related risks and hazards, their causes and preventions. • Identify PPE to be used at workplace. • Identify various warning signs used at the workplace. • Describe appropriate strategies to deal with emergencies and accidents at the workplace. • Outline the organizational structure to be followed to report about health, safety and security breaches to the concerned authorities. • Discuss the importance of keeping work area clean and tidy. • Discuss the significance of conforming to basic hygiene practices such as washing hands, using alcohol based hand sanitizers or soap. • Discuss organizational hygiene and sanitation guidelines and ways of reporting breaches/gaps if any to the concerned authorities. • Discuss the ways of dealing with stress and anxiety. • Discuss how to complete the given work within the stipulated time period. • Explain how to maintain a proper balance between team and individual goals. • Explain 5S guidelines at workplace. • List the various materials used at the workplace. • Explain organisational recommended procedure for storage of tools, equipment and material after completion of work. • Explain the ways to optimize usage of resources. • Discuss various methods of waste management and its disposal.	• Apply appropriate safety practices to ensure safety of people at the workplace • Display the correct way of wearing and removing PPE such as face masks, hand gloves, face shields, PPE suits, etc. • Demonstrate the use of fire extinguisher. • Apply basic first aid procedure in case of emergencies. • Perform routine cleaning of tools, equipment and machines. • Employ various techniques for checking malfunctions in the equipment as per Standard Operating Procedure (SOP). • Show how to sanitize and disinfect one's work area regularly. • Demonstrate the correct way of washing hands using soap and water. • Demonstrate the correct way of sanitizing hands using alcohol-based hand rubs. • Demonstrate how to evacuate the workplace in case of an emergency. • Demonstrate sorting of materials, tools and equipment and spare parts after completion of work. • Demonstrate the steps involved in storage of tools, equipment and material after completion of work. • Perform basic checks to identify any spills and leaks and that need to be plugged /stopped. • Demonstrate different disposal techniques depending upon types of waste. • Employ different ways to check if equipment/machines are functioning as per requirements and report malfunctioning, if observed. • Employ ways for efficient utilization of material and water.

• List the different categories of waste for the purpose of segregation • Differentiate between recyclable and non-recyclable waste • State the importance of using appropriate colour dustbins for different types of waste. • Discuss common practices for conserving electricity at workplace. • Discuss the common sources of pollution and ways to minimize it.	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Housekeeping material: Cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel, fire extinguisher • Safety gears: Safety shoes, ear plug, goggles, gloves, helmet, first-aid kit	

Module 3: Communicate Effectively and Efficiently

Mapped to ASC/N9802, v1.0

Terminal Outcomes:

- Use effective communication and interpersonal skills.
- Apply sensitivity while interacting with different genders and people with disabilities.

Duration: *<12:00>*	**Duration**: *<20:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the organizational structure for communicating with colleagues, seniors and others. • Discuss the ways to adjust the communication styles to reflect sensitivity towards gender and persons with disability (PwD). • Explain the importance of respecting personal space of colleagues. • State the procedure to receive work instructions and report problems to the supervisor. • List the various organizational policies and procedures to be followed at the workplace. • Describe different ways to rectify commonly occurring errors. • Explain the importance of complying with the instructions/guidelines and procedures while performing tasks related to the job specifications. • Discuss the importance of PwD and gender sensitization.	• Employ different means of communication depending upon the requirement while interacting with others. • Demonstrate using new ways to maintain good relationships with colleagues and supervisor. • Prepare a sample report to send the work status to the supervisor. • Demonstrate how to communicate with different genders and persons with disability (PwD) in a sensitive manner.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Sample of escalation matrix, organisation structure.	

Module 4: Prepare for heat treatment process

Mapped to ASC/N3901, v2.0

Terminal Outcomes:

- Identify tools and equipment required for heat treatment process.
- Perform the steps to carry out pre- heat treatment activities such as lifting of workpiece, collection and inspection of tools and equipment etc.

Duration: *<40:00>*	**Duration**: *<64:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe different types of heat treatment processes. • Describe various mechanical and heat laws applicable on heat treatment. • Discuss the information derived from the engineering drawings, work order, SOPs and instructions from supervisor. • List the tools, heat treatment machine, equipment, consumables and input materials required during heat treatment work. • Discuss the organisational process of collecting and arranging the tools, heat treatment machine, equipment, consumables and input materials from the store. • Discuss the necessary precautions to avoid any hazard and accident during heat treatment activities. • Summarise the steps to be performed for checking and cleaning the input material, tools and equipment before use. • Discuss heat treatment parameters like sand properties - GCS, compatibility, clay and moisture percentage, squeeze pressure, metal temperature, inoculation addition, cooling time, heat treatment hardness, tensile strength, elongation and microstructure requirement etc. and their impact on output. • Discuss the process of lifting and placing the workpieces on heat treatment line as per the work instructions.	• Demonstrate the standard operating procedure to use tools, heat treatment machine and equipment required during heat treatment process. • Show how to collect the required tools, equipment, consumables and input materials from the store. • Apply appropriate ways to check and clean the input material, tools and equipment before use. • Demonstrate how to support the heat treatment Technician in setting of the equipment and its parameters as per the SOP. • Perform the steps of lifting and placing the workpieces on heat treatment line by using lifting tools.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• PPT's, teaching aids, drawing / blue print, work order • **Raw Materials:** Sand, die • **Machinery:** Moulding machine, Heat treatment machine, Die Heat treatment machine, Heat	

treatment die, Trim press , Shot blasting machine, mixers, hoppers, feeders etc.

- **Auxiliaries:** spatulas, chippers etc.
- **Fuel:** Charcoal
- **Measuring Tools:** Steel tape, Steel rule, Vernier calliper, Micrometer, Compass
- **Cutting Tools:** Hacksaw frame adjustable, chisel, scissor, Sand paper
- **Driving Tools:** Chipping hammer, wooden mallet
- **Lifting devices:** Hoists, cranes, bins, part trolleys, pallet trucks
- **Safety materials**: Fire extinguisher, portable welding curtains, leather safety gloves, leather aprons, safety glasses, helmet, safety shoe and first-aid kit
- **Cleaning material**: Wire brush (M.S.), cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel

Module 5: Perform heat treatment and post-treatment activities

Mapped to ASC/N3901, v2.0

Terminal Outcomes:

- Demonstrate various heat treatment processes such as furnace operation, melting process, charging method and safety process of handling hot liquid iron, furnace lining process etc.
- Perform steps to carry out post-heat treatment activities.

Duration: *<64:00>*	**Duration**: *<152:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe various processes such as furnace operation, melting process, charging method and safety process of handling hot liquid iron, furnace lining process etc. • Discuss the importance of pre-heated and red hot condition refractory ladles. • Discuss the importance of adding ferro alloys or inoculants during tapping or transfer operation. • Describe various abnormalities like parting leak, gas evolution, interrupted pouring etc. generally occur during the heat treatment process. • Elaborate the importance and ways of solidify and cool the hot metal. • Discuss the importance of monitoring process parameters during the heat treatment process and correcting them as per the requirements. • Describe fettling and trimming operation. • Describe the impact of runners & risers on the surfaces and final output. • List the tools such as swing frame or pedestal grinders, chipping tools, hammers, hand saws, pneumatic or electrical tools etc. required for manual fettling. • Describe gas cutting and flame cutting methods for semi manual fettling. • List the steps to be performed for fettling and trimming operation.	• Demonstrate how to support technician in preparation of mold by holding it properly in metal frame. • Show how to pour the molten metal into the mold from the refractory ladle. • Apply appropriate ways to check that refractory ladles are pre-heated and in red hot condition and its pouring spout or lip is repaired and free from slag. • Demonstrate how to adjust the temperature and other heat treatment parameters as per the work instructions and in coordination with the heat treatment technician. • Apply appropriate ways to record the pouring observations like parting leak, gas evolution, interrupted pouring or any abnormality during the heat treatment process. • Show how to turn valves to circulate water through cores and spray water on filled molds to solidify and cool the hot metal as per the work instructions and in coordination with the heat treatment technician. • Read the measurement gauges and monitor the process parameters to maintain the quality standards. • Demonstrate the standard operating procedure to use tools such as swing frame or pedestal grinders, chipping tools, hammers, hand saws, pneumatic or electrical tools etc. required for manual fettling • Demonstrate how to support technician by taking out the metal from mold for fettling and trimming process. • Apply appropriate ways to remove any dirt, sand, excess metal etc. from the

	treated workpiece. • Perform steps to trim the cast for removing fins, flashes and excess metal from the surface of treated workpiece. • Demonstrate the organisational procedure involved in storage of the excess material (or runners/ risers etc.) for the reuse. • Employ appropriate ways of measuring and comparing treated piece dimensions with the specified dimensions in the job orders. • Show how to shape the metal heat treatment as per the required measurements.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• PPT's, teaching aids, drawing / blue print, work order • **Raw Materials:** Sand, die • **Machinery:** Moulding machine, Heat treatment machine, Die Heat treatment machine, Heat treatment die, Trim press , Shot blasting machine, mixers, hoppers, feeders etc. • **Auxiliaries:** spatulas, chippers etc. • **Fuel:** Charcoal • **Measuring Tools:** Steel tape, Steel rule, Vernier calliper, Micrometer, Compass • **Cutting Tools:** Hacksaw frame adjustable, chisel, scissor, Sand paper • **Driving Tools:** Chipping hammer, wooden mallet • **Lifting devices:** Hoists, cranes, bins, part trolleys, pallet trucks • **Safety materials**: Fire extinguisher, portable welding curtains, leather safety gloves, leather aprons, safety glasses, helmet, safety shoe and first-aid kit • **Cleaning material**: Wire brush (M.S.), cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
ITI	Machinist/Turner	5	Heat Treatment	1	Heat Treatment	NA
ITI	Machinist/Turner	6	Heat Treatment	0	Heat Treatment	NA
Diploma	Mechanical/ Automobile	3	Heat Treatment	1	Heat Treatment	NA
Diploma	Mechanical/ Automobile	4	Heat Treatment	0	Heat Treatment	NA

Trainer Certification	
Domain Certification	**Platform Certification**
"Automotive Heat Treatment Technician, ASC/Q3901, version 2.0". Minimum accepted score is 80%.	"Trainer, MEP/Q2601 v1.0" Minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
ITI	Machinist/Turner	6	Heat Treatment	1	Heat Treatment	NA
ITI	Machinist/Turner	7	Heat Treatment	0	Heat Treatment	NA
Diploma	Mechanical/ Automobile	4	Heat Treatment	1	Heat Treatment	NA
Diploma	Mechanical/ Automobile	5	Heat Treatment	0	Heat Treatment	NA

Assessor Certification	
Domain Certification	**Platform Certification**
"Automotive Heat Treatment Technician, ASC/Q3901, version 2.0". Minimum accepted score is 80%.	"Assessor; MEP/Q2701 v1.0" Minimum accepted score is 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
    - Assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records

2. Testing Environment:
    - 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 as 10 a.m. and 5 p.m.
    - If the batch size is more than 30, then there should be 2 Assessors.
    - 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 level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
    - Assessor must be ToA certified & trainer must be ToT Certified
    - 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:
    - Surprise visit to the assessment location
    - Random audit of the batch
    - Random audit of any candidate

6. Method for assessment documentation, archiving, and access
    - 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 in the Hard Drives

References

Glossary

Term	Description
Declarative Knowledge	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.
Key Learning Outcome	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).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
SOP	Standard Operating Procedure
WI	Work Instructions
PPE	Personal Protective equipment