Automotive Skills Development Council

QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR AUTOMOTIVE INDUSTRY

Contents

What are Occupational Standards (OS)?

- OS describe what individuals need to do, know and understand in order to carry out a particular job role or function
- OS are performance standards that individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding

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Introduction

Qualifications Pack-Heat Treatment Technician / Furnace Operator

SECTOR: AUTOMOTIVE

SUB-SECTOR: MANUFACTURING

OCCUPATION: HEAT TREATMENT

JOB ROLE: HEAT TREATMENT OPERATOR

REFERENCE ID:ASC/Q3901

ALIGNED TO: NCO-2004/8122.64

Heat Treatment Operator: Also known as furnace operator, this role is responsible for operating various furnaces like Carburising Furnace, Tempering Furnace, Annealing Furnace and Quenching Machine for different heat treatment processes

Brief Job Description: This role is responsible for loading of jigs/ work pieces into the furnace, maintaining process parameters as laid down in the Work Instructions/ SOPs, maintaining cycle time for different heat treatment phases , ensure proper quenching of the components and unloading the finished pieces into the designated area

Personal Attributes: Technical knowledge of Metallurgy and heat treatment process, Reading, writing and communication skills, ability to plan and prioritize, quality consciousness, safety orientation, Dexterity, high precision, no colour blindness, ability and desire to work in difficult workplace involving high heat, ability to lift heavy work pieces

Job Details

Qualifications Pack Code	**ASC/Q3901**		
Job Role	**Heat Treatment technician Or Furnace Operator**		
Credits(NSQF)	**TBD**	**Version number**	**1.1**
Industry	**Automotive**	**Drafted on**	**15/9/2013**
Sub-sector	**Manufacturing**	**Last reviewed on**	**10/10/2013**
Occupation	**Heat Treatment**	**Next review date**	**10/10/2015**

Job Role	**Heat Treatment Operator**
Role Description	Responsible for heat treatment of the work pieces like gears, shafts, transmission rods etc. using various processes like carburising, nitriding, annealing, tempering, induction hardening and quenching
NSQF level	4
Minimum Educational Qualifications	Class 12 (Chemistry stream)
Maximum Educational Qualifications	ITI in Heat Treatment
Training (Suggested but not mandatory)	• Different types of heat treatment processes • Reading and writing skills • 5S & Safety • ERP systems within the organization
Experience	2-3 years
Occupational Standards (OS)	1. ASC/N3901:Understand job requirements and related processes 2. ASC/N3902:Operate different furnaces and conduct the heat treatment process 3. ASC/N3903: Conduct post heat treatment processes like Quenching, Washing and Shot Blasting 4. ASC/N3904: Conduct induction hardening process for small machine components 5. ASC/N0008:Conduct regular cleaning and maintenance of the equipment 6. ASC/N0006: Maintain a safe and healthy working environment 7. ASC/N0021: Maintaining 5S at the work premises
Performance Criteria	As described in the relevant NOS units

Definitions

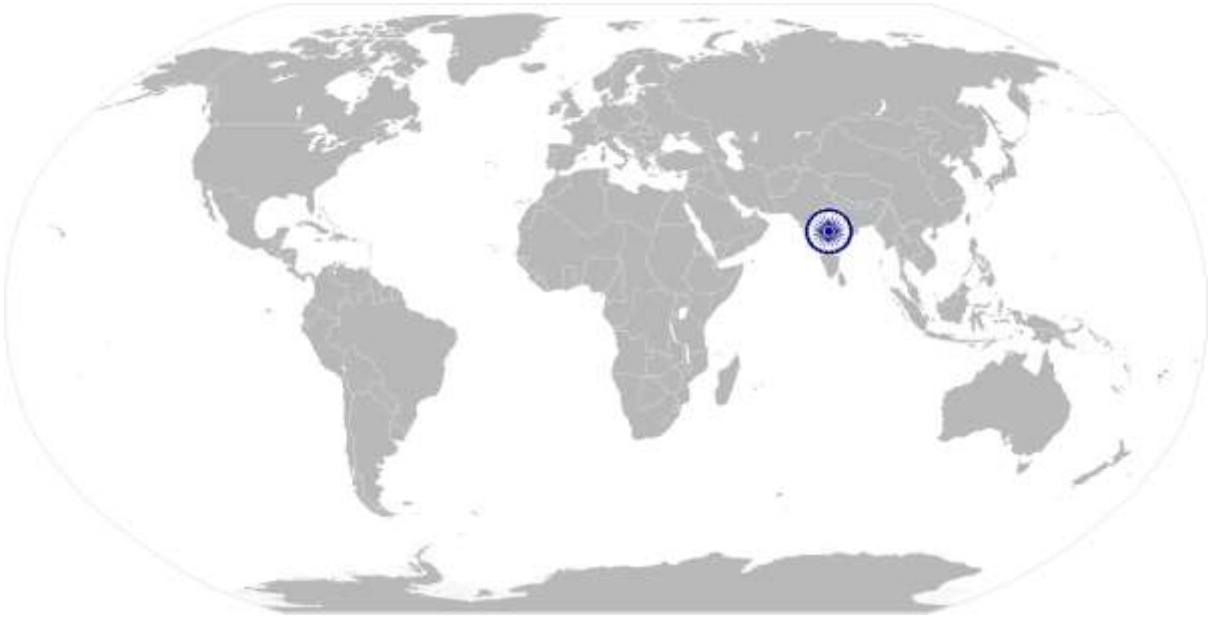
Keywords /Terms	Description
Core Skills/Generic Skills	Core Skills or Generic Skills are a group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the NOS, these include communication related skills that are applicable to most job roles.
Function	Function is an activity necessary for achieving the key purpose of the sector, occupation, or area of work, which can be carried out by a person or a group of persons. Functions are identified through functional analysis and form the basis of NOS.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organization.
Knowledge and Understanding	Knowledge and Understanding are statements which together specify the technical, generic, professional and organizational specific knowledge that an individual needs in order to perform to the required standard.
National Occupational Standards (NOS)	NOS are Occupational Standards which apply uniquely in the Indian context
Occupation	Occupation is a set of job roles, which perform similar/related set of functions in an industry.
Organisational Context	Organisational Context includes the way the organization is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Performance Criteria	Performance Criteria are statements that together specify the standard of performance required when carrying out a task.
Qualifications Pack(QP)	Qualifications Pack comprises the set of NOS, together with the educational, training and other criteria required to perform a job role. A Qualifications Pack is assigned a unique qualification pack code.
Qualifications Pack Code	Qualifications Pack Code is a unique reference code that identifies a qualifications pack.
Scope	Scope is the set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on the quality of performance required.
Sector	Sector is a conglomeration of different business operations having similar businesses and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.

Sub-Sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Sub-functions	Sub-functions are sub-activities essential to fulfil the achieving the objectives of the function.
Technical Knowledge	Technical Knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Unit Code	Unit Code is a unique identifier for a NOS unit, which can be denoted with an '**N**'
Unit Title	Unit Title gives a clear overall statement about what the incumbent should be able to do.
Vertical	Vertical may exist within a sub-sector representing different domain areas or the client industries served by the industry.

Acronyms

Keywords /Terms	Description
NOS	National Occupational Standard(s)
NVEQF	National Vocational Education Qualifications Framework
NVQF	National Vocational Qualifications Framework
NSQF	National Skills Qualifications Framework
OEM	Original Equipment Manufacturer
OS	Occupational Standard(s)
QP	Qualifications Pack

National Occupational Standards



Overview

This unit is about understanding the job requirement and the activities & equipment associated with the process to complete the job requirement.

National Occupational Standard

ASC/N3901: Understand the job requirements and related processes

Unit Code	ASC/N3901
Unit Title (Task)	Understand the job requirements and related processes
Description	This NOS is about understanding the job requirement, what processes need to be executed, what equipment will be used and what is the required output considering the standards specified
Scope	The Heat Treatment operator will be responsible for • understanding the work order and the process requirements • cleaning the furnaces, quenching machines, loading trolleys as required • checking the furnace operations before the actual process • escalations of any queries regarding the job The job holder will cover all types of heat treatment processes like carburizing, nitriding, annealing, tempering and quenching of components. The role holder will interact with the machine shop, maintenance team and material management team

Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Understand the work order and the process requirements	PC1. Understand the work order (work output) required from the process and discuss the same with the supervisor/ metallurgist PC2. Clearly understanding the does and don'ts of the manufacturing process as defined in SOPs/ Work Instructions or defined by supervisors PC3. Refer all sketches/ work orders/ process related documents to understand dimensions and properties of the required work output PC4. Understand the process requirements in terms of temperature of the furnace, pressure, cycle time for various temperature levels & time durations during the heat treatment operations as mentioned in the Work Instruction/ SOP/ Control Diagrams
Arrange for the components to be heat treated as well as the combustion material as per the process requirement	PC5. Understand the right heat treatment procedure and process to be adopted for completing the work order from the supervisor by referring the Work Instruction document/ SOP manual PC6. Note down the various heat treatment parameters like temperature, pressure, cycle time, gas flow, coolant/ water flow before starting the heat treatment process PC7. Understand the material required and the equipment availability for executing the activity PC8. Ensure that the required material is procured from the store before starting the heat treatment process
Clean the furnace and the components before executing the heat treatment process	PC9. Ensure that the internal part of the furnace used for Carburizing, Tempering, Annealing etc. process is cleaned before the starting of the process PC10. Ensure that there are not traces of oil, grease, dirt in the Heat Treatment process at the start PC11. Clean the area around the furnace for any oil, grease, combustible substances etc. so as to prevent any accident in the furnace surrounding PC12. Clean the components which will required to be treated so as to remove

ASC/N3901: Understand the job requirements and related processes

	traces of greases, oil, dirt etc.
Applying anti carburizing paste on surface which is not to be hardened	PC13. Wash the components which need to be heat treated using an organic solvent. PC14. Ensure that all the oil which is present in the components is removed PC15. Uniformly apply anti carburizing paste on the area which is not to be carburized PC16. Ensure that the applied paste dries within the timelines mentioned in the work instructions PC17. Ensure that the components are picked up and placed in the proper trolley and are ready to be heat treated
Check furnace auxiliaries for operations	PC18. Ensure that the gas flow and water flow valves are operating without any hindrances and the pipes carrying gas and water are free from any roadblocks PC19. Ensure that the furnace cover can be opened and closed whenever required PC20. Ensure that the furnace loading and unloading mechanism is in order and working properly
Escalations of queries on the given job	PC21. Refer the queries to supervisor/ metallurgist if they cannot be resolved by the operator PC22. Confirm self - understanding to the supervisor/ metallurgist once the query is resolved so that all doubts & queries can be resolved before the actual process execution
Knowledge and Understanding (K) w.r.t. the scope	
Element	**Knowledge and Understanding**
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. relevant standards and procedures followed in the company KA2. different types of products manufactured by the company KA3. functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. different types of heat treatment processes and associated equipment KB2. different types of furnaces and process nuances for each type of heat treatment process KB3. basic knowledge of the metallurgical properties of the material KB4. relationship between various process parameters like furnace temperature, pressure, carbon potential, gas flow for endothermic process, Cycle time for heating during the heat treatment process KB5. how to handle solvents and anti-carburizing paste KB6. basic principles of geometry and drawing KB7. safety aspects associated with furnace operations and heat treatment process and use of relevant PPEs for each process
Skills (S) w.r.t. the scope	
Element	**Skills**

ASC/N3901: Understand the job requirements and related processes

A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand how to: SA1. note down observations (if any) related to heat treatment process and share the same with the supervisor/ metallurgist SA2. note down the production data for the respective shifts in the log sheets/ online ERP as per applicability in the organization
	Reading skills
	The user/individual on the job needs to know and understand how to: SA3. read and interpret engineering drawing and sketches SA4. read and interpret symbols and measurements instruments SA5. read equipment manuals and process documents to understand the equipment and processes better SA6. read internal information documents send by internal customers (other functions within the organization)
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA7. discuss task lists, schedules and activities with the supervisor SA8. effectively communicate with the team members SA9. question the supervisor/ metallurgist in order to understand the nature of the problem and to clarify queries SA10. attentively listen with full attention and comprehend the information given by the speaker
B. Professional Skills	**Plan and Organize**
	The user/individual on the job needs to know and understand how to: SB1. plan and organize the work order and jobs received from the supervisor SB2. organize all process/ equipment manuals so that sorting/ accessing information is easy SB3. support the supervisor in scheduling tasks for helper grade
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB4. ability to visualize the final job product after understanding the given drawing/ sketches SB5. co relate the type of job output required ability to identify the strengths and weakness of various heat treatment related process
	Judgment and Critical Thinking
	The user/individual on the job needs to know and understand how to: SB6. use common sense and make judgments during day to day basis SB7. use reasoning skills to identify and resolve basic problems SB8. use intuition to detect any potential problems which could arise during operations
	Desire to learn and take initiatives

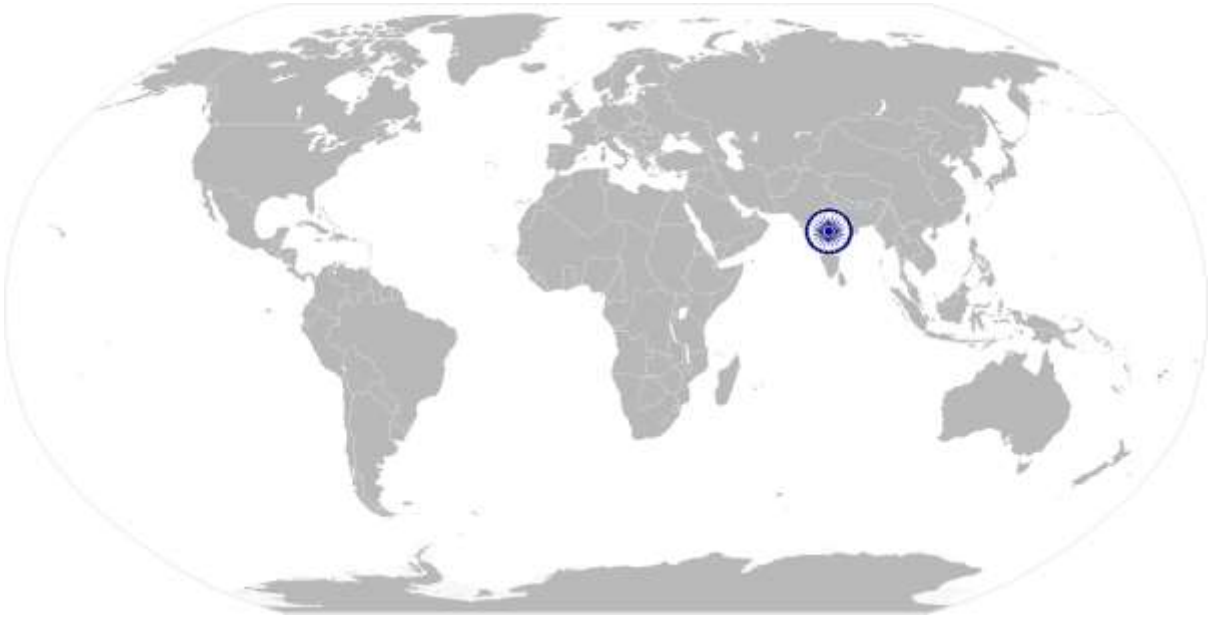
ASC/N3901: Understand the job requirements and related processes

	The user/individual on the job needs to know and understand how to: SB9. follow instructions and work on areas of improvement identified SB10. complete the assigned tasks with minimum supervision SB11. complete the job defined by the supervisor within the timelines and quality norms
	Problem Solving and Decision making
	The user/individual on the job needs to know and understand how to: SB12. detect problems in day to day tasks SB13. support supervisor in using specific problem solving techniques and detailing out the problems SB14. discuss possible solution with the supervisor for problem solving SB15. make decisions in emergency conditions in case the supervisor is not available(as per the authority matrix defined by the organization)

NOS Version Control

NOS Code	**ASC/N3901**		
Credits(NSQF)	**TBD**	**Version number**	**1**
Industry	**Automotive**	**Drafted on**	**15/9/2013**
Industry Sub-sector	**Manufacturing**	**Last reviewed on**	**10/10/2013**
Occupation	**Heat Treatment**	**Next review date**	**10/10/2015**

National Occupational Standards



Overview

This unit is about operating the heat treatment furnace for processes like carburising, tempering and annealing in order to improve the metallic properties of the components and relieve any metallurgical stresses created during machining process

National Occupational Standard

ASC/N3902: Operate different furnaces and conduct the heat treatment process

Unit Code	ASC/ N/3902
Unit Title (Task)	**Operate different types of furnaces and conduct the heat treatment process**
Description	This NOS is about loading the charge (Components) into the relevant treatment furnace and operate the furnace to heat treat the components and improve their metallic properties as well as relieve any metallurgical stresses created during machining process
Scope	The Heat Treatment operator will be responsible for • loading the charge material in the furnace • conducting the carburizing process and the tempering process • monitoring the process parameters The job holder will cover all types of heat treatment processes like carburizing, nitriding, annealing, tempering and quenching of components. The role holder will interact with the machine shop, maintenance team and material management team
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Load the Charge into the Furnace	PC1. Open the furnace cover and check the furnace internally for any impurities/ material from the previous heat treatment process PC2. Ensure that the furnace checking is done using a torch and not using any combustible material like match stick, fire etc. PC3. Once the furnace is inspected, load the furnace with the Charge material (Components to be heat treated) using hoists, conveyors etc.
Carburise the charge loaded in the furnace	PC4. Once the loading is completed and the furnace thoroughly checked, close the door of the furnace PC5. Select the right program from the list for the carburizing process/ tempering process as per the instructions given in the SOP manual/ Work Instructions PC6. Switch ON the furnace and ensure that the furnace temperature reaches the desired temperature as per the SOPs/ Work Instructions. PC7. Ensure that the cycle time for furnace temperature is maintained throughout the process. The cycle time for each process is mentioned in the process Work Instructions PC8. Ensure that the furnace fan operations is in the ON mode and air circulation is as per requirement PC9. Once the temperature in the furnace reaches the desired value, switch ON the Carburising Valve and ensure the flow of the carburizing fluid within the furnace PC10. Regularly monitor the temperature of the furnace and the gas composition PC11. Once the cycle time is completed, ensure that the carburising valve of the furnace is closed

ASC/N3902: Operate different furnaces and conduct the heat treatment process

	PC12. Ensure that the material is carefully removed from the furnace and unload the material in the tray for the quenching process
Temper the charge in the tempering furnace	PC13. Once the loading is completed and the furnace thoroughly checked, close the door of the furnace PC14. Switch ON the furnace and ensure that the furnace temperature reaches the desired temperature as per the SOPs/ Work Instructions PC15. Maintain the furnace temperature and the furnace cycle time as per the process chart/ Work Instructions/ SOPs
Monitor the Heat Treatment process	PC16. Ensure constant monitoring of Temperature indicators, Flow meters, Heat Exchangers, Display Panels for process operations PC17. Periodically monitor the flame pipe, Gas outlets, water inlets and water outlets for proper operations PC18. Periodically monitor the Carbon Potential % during the Heat Treatment process PC19. Periodically take readings at various intervals (as per the Cycle Time) in the format as mentioned in the Work Instructions/ internal guidelines PC20. Periodically monitor the furnace of any vibrations during operations PC21. Inform the maintenance team of any issues observed in the furnace operations
Knowledge and Understanding (K)w.r.t. the scope	
Element	**Knowledge and Understanding**
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. relevant standards and procedures followed in the company KA2. different types of products manufactured by the company KA3. functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. different types of heat treatment processes and associated equipment KB2. different types of furnaces and process nuances for each type of heat treatment process KB3. basic knowledge of the metallurgical properties of the material KB4. relationship between various process parameters like furnace temperature, pressure, carbon potential, gas flow for endothermic process, Cycle time for heating during the heat treatment process KB5. how to read displays on the computer monitor and understand the information being displayed KB6. understand various alarms and signals in the furnace and the action required for each type of alarm KB7. methods for lifting and loading/unloading the metal components in the furnace

ASC/N3902: Operate different furnaces and conduct the heat treatment process

	KB8. basic troubleshooting techniques for the furnaces KB9. basic principles of geometry and drawing KB10. safety aspects associated with furnace operations and heat treatment process and use of relevant PPEs for each process
Skills (S)w.r.t. the scope	
Element	**Skills**
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand how to: SA1. document information from the sketches and engineering drawings SA2. prepare draft drawings for the final output product SA3. note down observations (if any) related to the heat treatment process SA4. write information documents to internal departments/ internal teams or enter the information in online ERP systems under guidance of the supervisor
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA5. read and interpret engineering drawing and sketches SA6. read and interpret symbols and measurements used in the drawings SA7. read equipment manuals and process documents to understand the equipment and processes better SA8. read internal information documents sent by internal teams
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA9. discuss task lists, schedules and activities with the supervisor SA10. effectively communicate with the team members SA11. question the supervisor in order to understand the nature of the problem and to clarify queries SA12. attentively listen with full attention and comprehend the information given by the speaker
B. Professional Skills	**Plan and Organize**
	The user/individual on the job needs to know and understand how to: SB1. plan and organize the work order and jobs received from the operator SB2. organize all process/ equipment manuals so that sorting/ accessing information is easy SB3. support the supervisor in scheduling tasks for helper and assistant operator
	Judgment and Critical Thinking
	The user/individual on the job needs to know and understand how to: SB4. use common sense and make judgments during day to day basis SB5. use reasoning skills to identify and resolve basic problems

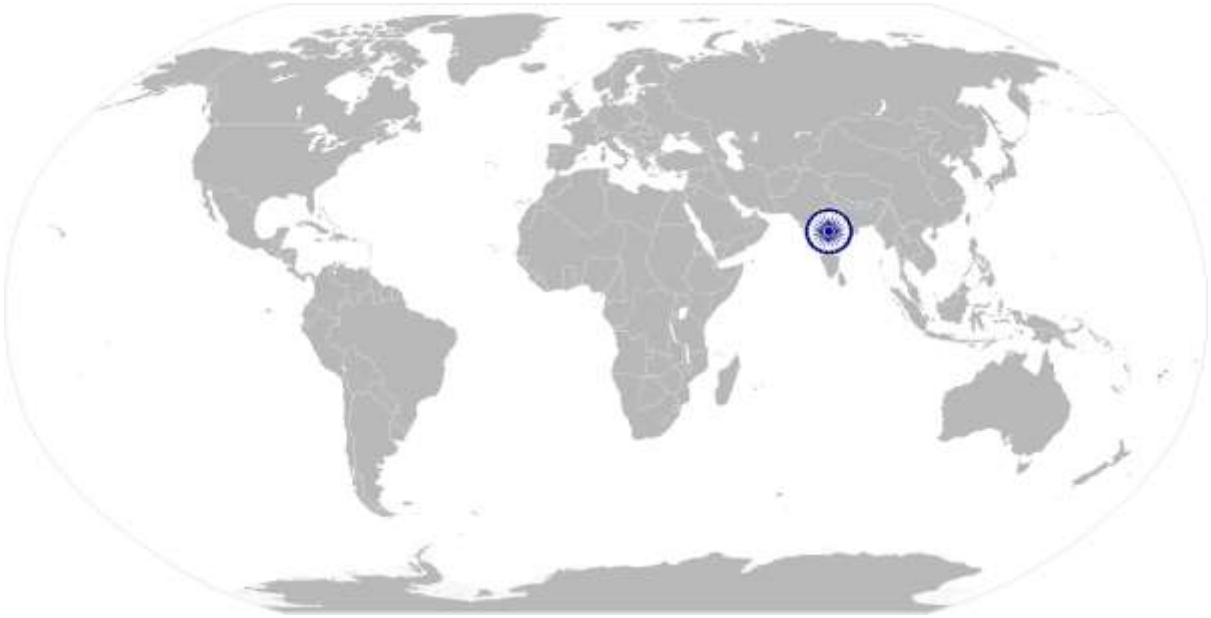
ASC/N3902: Operate different furnaces and conduct the heat treatment process

	SB6. use intuition to detect any potential problems which could arise during operations
	Desire to learn and take initiatives
	The user/individual on the job needs to know and understand how to: SB7. follow instructions and work on areas of improvement identified SB8. complete the assigned tasks with minimum supervision SB9. complete the job defined by the supervisor within timelines and quality norms
	Problem Solving and Decision making
	The user/individual on the job needs to know and understand how to: SB10. detect problems in day to day tasks SB11. support supervisor in using specific problem solving techniques and detailing out the problems SB12. discuss possible solution with the supervisor for problem solving SB13. make decisions in emergency conditions in case the supervisor is not available(as per the authority matrix defined by the organization)

NOS Version Control

NOS Code	**ASC/N3902**		
Credits(NSQF)	**TBD**	**Version number**	**1**
Industry	**Automotive**	**Drafted on**	**15/9/2013**
Industry Sub-sector	**Manufacturing**	**Last reviewed on**	**10/10/2013**
Occupation	**Heat Treatment**	**Next review date**	**10/10/2015**

National Occupational Standards



Overview

This unit is about cooling the charge components through the quenching process and remove impurities and any surface imperfections in the treated components

ASC/N3903: Conduct post heat treatment processes like Washing and Shot Blasting

National Occupational Standard

Unit Code	ASC/ N/3903
Unit Title (Task)	**Conduct post heat treatment processes like Washing and Shot Blasting**
Description	This NOS is about conducting post heat treatment processes like Quenching, Washing and Shot Blasting to cool down the charge material and also remove any impurities/ surface imperfections which are a result of the heat treatment process
Scope	The Heat Treatment operator will be responsible for • quenching the material which has been carburized • removing impurities using alkaline washing process • removing surface imperfections using shot blasting technique • loading and unloading of parts The job holder will cover all types of heat treatment processes like carburizing, nitriding, annealing, tempering and quenching of components. The role holder will interact with the machine shop, maintenance team and material management team
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Quench the Carburized material	PC1. Understand the quenching technique which is to be used – Free Quenching, Plug Quenching, Press Quenching as mentioned in the Work Instructions/ departmental SOP PC2. Arrange the carburized material in the jig tray of the quenching machine as per the Work Instructions/ SOP PC3. Check the physical properties of the oil which is used for the quenching process – oil viscosity, colour etc and compare with standard oil properties before the quenching process begins PC4. Inform the metallurgist about any changes in the oil properties PC5. Dip the hot metal components in the oil in quenching machine as per the process instructions/ work instructions PC6. Ensure that the quenching process is carried out as per the timelines and instructions given in the Work Instructions/ SOP PC7. Ensure that the agitator motor switched ON during free quenching and press quenching to ensure uniform flow of oil in the quenching tank PC8. In case water or any other coolant is used of the quenching process, ensure that the water flow uniformly across the carburised/ hardened surface PC9. Ensure that there is no leakage/ spillage of oil during the quenching process
Remove impurities from the hardened material using alkaline washing	PC10. Load the washing machine with chemicals for washing the heat treated components PC11. Ensure that the solvent (charge carrier) prepared for washing meets the composition criteria as prescribed in the Work Instructions/ SOP PC12. Load all the quenched parts in the washing machine along with

ASC/N3903: Conduct post heat treatment processes like Washing and Shot Blasting

	the washing charge carrier PC13. Switch on the washing machine and ensure that the water circulation pump and the charge carrier circulation pump are in ON position PC14. Rotate the charge carrier in the machine and ensure that the quenched components are properly washed and traces of oil are removed from the components PC15. Ensure removal of charge carrier by flushing plain water on the components PC16. Close the pump for chemical circulation and water circulation PC17. Carefully remove the material from the washing machine and unload the material in the tray for the shot blasting process
Remove surface imperfections using Shot Blasting technique	PC18. Clean the shot blasting machine using Air pressure blast to remove any dust particles and any unwanted material PC19. Load the components and the shots in the chamber of the shot blasting machine PC20. Ensure that the door of the shot blasting machine is tightly closed PC21. Switch ON the Shot Blasting machine and ensure that all auxiliary motors are in the ON position PC22. Keep the machine in the moving position till the cycle time prescribed in the Work Instructions/ SOP manual PC23. Switch OFF the machine and inspect the parts. Turn the parts into the opposite side. Ensure that all the parts in the current position are completely turned in the opposite direction PC24. Keep the machine moving till the prescribed cycle time is achieved. Ensure that the cycle time get completed for both the cycles. PC25. Open the Shot Blasting machine and carefully remove the components from the machine and load them into the designated trolley PC26. Ensure that the machine is again cleaned using an Air Blasting machine
Inspect the final product and maintain records of production & rejection	PC27. Check the hardness of the components using the hardness testing machines and ensure that the component pieces meet the conformance standards as specified in the Work Instructions/ SOPs PC28. Measure the specifications of the finished product using devices like micrometer, vernier calipers, gauges, rulers and any other inspection equipment and compare with the parameters given in the work order PC29. Check the completed pieces for any deformation, change in colour, cracks, rough surfaces in the final product PC30. Inspect the dimensions of the work pieces – spline fit, face parallelism, face tapering etc. as per the product requirement and departmental SOPs/ Work Instructions PC31. Note down the observations of the basic inspection process and

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	identify pieces which are OK and also not meeting the specified standards PC32. Separate the defective pieces into two categories – pieces which can be repaired/ modified and pieces which are beyond repair PC33. Discard the pieces which are beyond repair and repair the ones which need minor modifications/ rework PC34. Record all observations in the log book as per the internal guidelines and processes PC35. Maintain records of production and rejected material as per the internal guidelines
Unload the Finished Goods	PC36. Clamp the product and lift the output object using suitable equipment like hoist, lifts, crane etc. PC37. Ensure that there is no damage to the lifted work pieces PC38. Carry the output product to the designated area using hangars, conveyor belts, cranes, forklifts etc.
Store the finished goods	PC39. Post inspection process, tag the right quality pieces for future identification PC40. Carry the tagged pieces to the storage areas using manual/ automatic means PC41. Keep a record of the finished goods along with the storage identification numbers for easy sorting
Knowledge and Understanding (K)w.r.t. the scope	
Element	**Knowledge and Understanding**
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. relevant standards and procedures followed in the company KA2. different types of products manufactured by the company KA3. functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. different types of heat treatment processes, quenching and associateequipment KB2. different types of furnaces and process nuances for each type of heat treatment process KB3. operating norms for shot blasting machines and quenching machines KB4. basic knowledge of the metallurgical properties of the material relationship between various process parameters like furnace temperature, pressure, carbon potential, gas flow for endothermic process, Cycle time for heating during the heat treatment process KB5. how to read displays on the computer monitor and understand the information being displayed KB6. understand various alarms and signals in the furnace and the action required for each type of alarm KB7. methods for lifting and loading/unloading the metal

ASC/N3903: Conduct post heat treatment processes like Washing and Shot Blasting

	components in the furnace KB8. basic troubleshooting techniques for the furnaces and quenching machines KB9. the Quality Management System followed in the organization KB10. basic principles of geometry and drawing KB11. safety aspects associated with furnace operations and heat treatment process and use of relevant PPEs for each process
Skills (S)w.r.t. the scope	
Element	**Skills**
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand how to: SA1. document information from the sketches and engineering drawings SA2. note measurements, equipment panel readings for various process parameters in the required reporting formats
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA3. read and interpret engineering drawing and sketches SA4. read equipment manuals and process documents to understand the equipment and processes better SA5. read internal information documents send by internal customers (other functions within the organization)the equipment in the plant area SA6. read parameter reading on various types of monitoring panels
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA7. discuss task lists, schedules and activities with the operator and supervisor SA8. effectively communicate with the team members Question the operator/ supervisor in order to understand the nature of the problem and to clarify queries SA9. attentively listen with full attention and comprehend the information given by the speaker
B. Professional Skills	**Plan and Organize**
	The user/individual on the job needs to know and understand how to: SB1. plan and organize the jobs received from theOperator SB2. organize all process/ equipment manuals so that sorting/ accessing information is easy
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB3. visualize the final job product after understanding the given drawing/ sketches SB4. co relate the type of job output required with themethodology

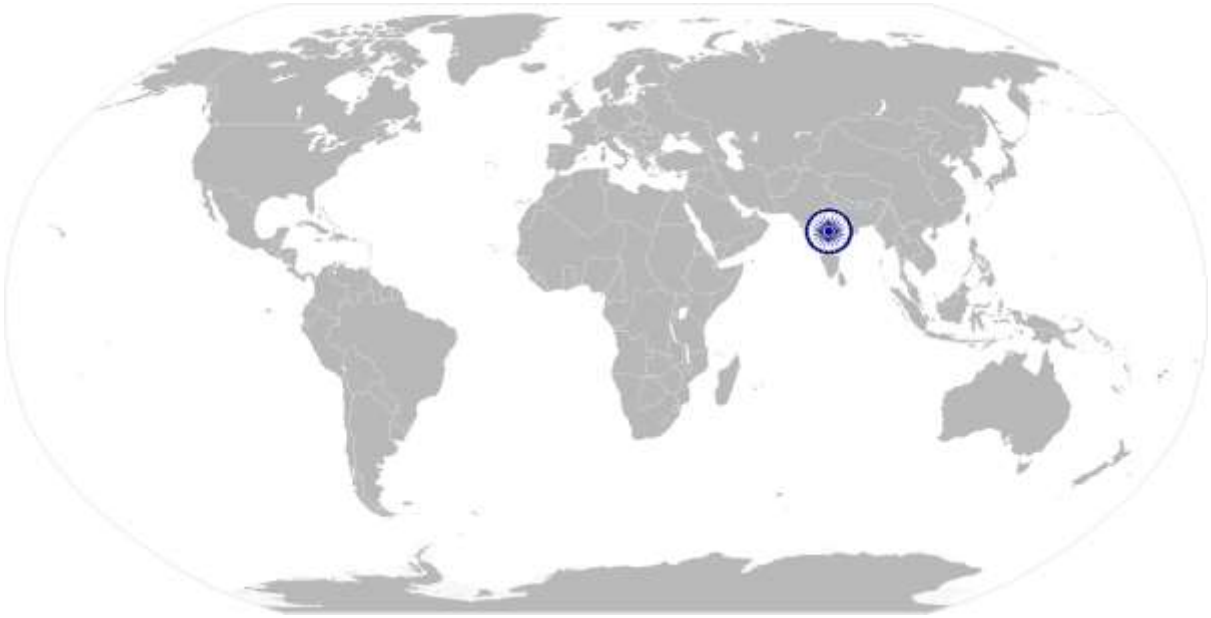
ASC/N3903: Conduct post heat treatment processes like Washing and Shot Blasting

	to be used
	Problem Solvingand Decision making
	The user/individual on the job needs to know and understand how to: SB5. detect problems in day to day tasks SB6. support supervisor in using specific problem solving techniques and detailing out the problems SB7. discuss possible solution with the supervisor for problem solving SB8. make decisions in emergency conditions in case the supervisor is not available(as per the authority matrix defined by the organization)
	Critical Thinking and Judgment
	The user/individual on the job needs to know and understand how to: SB9. use common sense and make judgments during day to day basis SB10. use reasoning skills to identify and resolve basic problems

NOS Version Control

NOS Code	**ASC/N/3903**		
Credits(NSQF)	**TBD**	**Version number**	**1**
Industry	**Automotive**	**Drafted on**	**15/9/2013**
Industry Sub-sector	**Manufacturing**	**Last reviewed on**	**10/10/2013**
Occupation	**Heat Treatment**	**Next review date**	**10/10/2015**

National Occupational Standards



Overview

This unit is about conducting the Induction hardening of machine components within shafts, connecting rods, struts and shockers

National Occupational Standard

ASC/ N3904: Conduct Induction Hardening Process for small machine components

Unit Code	ASC/N3904
Unit Title (Task)	**Conduct Induction Hardening process for small machine components**
Description	This NOS is about conducting the Induction Hardening process for small components like struts, connecting rods, shockers, monitoring the process parameters and conducting quality check on the final output product
Scope	The Heat Treatment operator will be responsible for • conducting the induction hardening process • monitoring the process parameters The job holder will cover all types of heat treatment processes like carburizing, nitriding, annealing, tempering and quenching of components. The role holder will interact with the machine shop, maintenance team and material management team
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Pre Induction Hardening process	PC1. Understand the work order (work output) required from the process and discuss the same with the supervisor/ metallurgist PC2. Refer all sketches/ work orders/ process related documents to understand dimensions and properties of the required work output PC3. Ensure that the correct values of voltage, current and frequency are chosen as per the process requirement and as per the Work Instructions/ SOPs
Induction Hardening Process	PC4. Ensure alignment of the work parts to the axis of the induction coil PC5. Ensure that the work part does not touch the surface of the induction coil PC6. Move the component part through the induction field and keep it under the field for the time specified in the SOPs PC7. Ensure flow of coolant/ cooling water/ quenching oil on the part to dissipate the heat and harden the component material PC8. In case cooling water is used for the purpose of cooling, ensure that the chiller machine is ON PC9. Monitor the panels for various process parameters like voltage, current, frequency and adjust the same as per process requirement
Post Induction Hardening Process	PC10. Check the hardness of the treated parts as per the given instructions in the SOP/ Work Instruction PC11. Measure the specifications of the finished product using devices like micrometer, vernier calipers, gauges, rulers, weighing scales and any other inspection equipment and compare with the parameters given in the work order PC12. Check the completed work pieces for any deformation, change in colour, cracks, rough surfaces PC13. Separate the defective pieces into two categories – pieces which

ASC/ N3904: Conduct Induction Hardening Process for small machine components

	can be repaired/ modified and pieces which are beyond repair PC14. Discard the pieces which are beyond repair and repair the ones which need minor modifications/ rework PC15. Record all observations in the log book as per the internal guidelines and processes
Knowledge and Understanding (K)w.r.t. the scope	
Element	**Knowledge and Understanding**
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. relevant standards and procedures followed in the company KA2. different types of products manufactured by the company KA3. functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. basic knowledge of the metallurgical properties of the material relationship between various process parameters like induction coil temperature, Magnetic induction, pressure, Cycle time for heating during the hardening process KB2. how to read displays on the computer monitor and understand the information being displayed KB3. understand various alarms and signals in the furnace and the action required for each type of alarm KB4. methods for lifting and loading/unloading the metal components in the furnace KB5. basic troubleshooting techniques for the furnaces and quenching machines KB6. understanding of the Quality Management Systems of the organization KB7. basic principles of geometric and drawing KB8. safety aspects associated with furnace operations and heat treatment process and use of relevant PPEs for each process
Skills (S)w.r.t. the scope	
Element	**Skills**
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand how to: SA1. document information from the sketches and engineering drawings SA2. note measurements, equipment panel readings for various process parameters in the required reporting formats
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA1. read process and equipment manuals to understand the working of the equipment SA2. read measuring instruments reading to identify any deviations

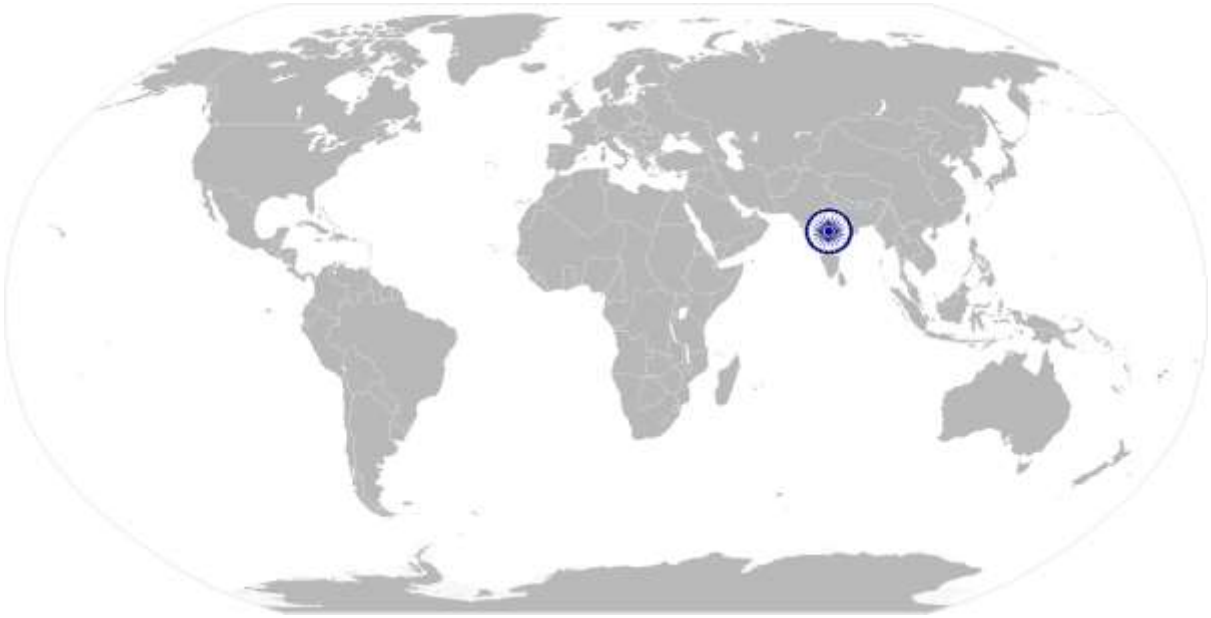
ASC/ N3904: Conduct Induction Hardening Process for small machine components

	from the dimensions given in the product engineering drawing
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA3. discuss task lists and job requirements with co-workers SA4. effectively communicate information to team members SA5. question supervisor in order to understand the nature of the problem SA6. attentively listen with full attention and comprehend the information given by the speaker
B. Professional Skills	**Plan and Organize**
	The user/individual on the job needs to know and understand how to: SB1. plan and organize the work order and jobs received from the supervisor SB2. organize all process/ equipment manuals so that sorting/ accessing information is easy
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB3. visualize the final job product after understanding the given drawing/ sketches SB4. co relate the type of job output required with the methodology to be used
	Critical Thinking and Judgment
	The user/individual on the job needs to know and understand how to: SB5. use common sense and make judgments during day to day basis SB6. use reasoning skills to identify and resolve basic problems

NOS Version Control

NOS Code	**ASC/N3904**		
Credits(NSQF)	**TBD**	**Version number**	**1**
Industry	**Automotive**	**Drafted on**	**15/9/2013**
Industry Sub-sector	**Manufacturing**	**Last reviewed on**	**10/10/2013**
Occupations	**Heat Treatment**	**Next review date**	**10/10/2015**

National Occupational Standards



Overview

This unit is about cleaning and maintaining the equipment on a regular basis to prevent any breakdown or improper quality of work output.

National Occupational Standard

ASC/ N0008: Conduct regular cleaning and maintenance of the equipment

Unit Code	ASC/N0008
Unit Title (Task)	**Conduct regular cleaning and maintenance of the equipment**
Description	This NOS is about systematically arranging the equipment in proper area, cleaning the process equipment & auxiliaries on a regular basis and doing basic level maintenance of the equipment, recording any problems related to equipment working
Scope	The operator will be responsible for • cleaning the equipment and the work area • conducting regular preventive maintenance • storing all tools and apparatus in the right place
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Storing equipment in proper condition	PC1. Arrange all equipment in a proper order as indicated in the equipment manual PC2. Store equipment auxiliaries and spare parts in proper designated areas PC3. Clearly tag process related equipment parts/ spare parts as per part number or serial number so that sorting of equipment becomes easy PC4. Cover equipment so that there is limited dust collection and moisture contact
Regular cleaning of the equipment and work area	PC5. Regularly clean the equipment and process auxiliaries to remove any dust, moisture, waste material which would have got collected on the equipment PC6. Regularly open the equipment and clean the internal parts of the equipment PC7. Regularly clean the working area under the process and create a healthy, clean and safe working environment
Conduct regular preventive maintenance of equipment	PC8. Check the working of all bearing, rollers, shafts etc. and oil all moving parts of the equipment on a periodic basis PC9. Check the working of non-moving parts and periodically conduct preventive maintenance to prevent machine failure PC10. Periodically check the equipment calibration and report any errors to the maintenance teams for rectification
Recording observations and preparing MIS	PC11. Prepare periodic log sheets of equipment maintenance dates, maintenance schedules and maintenance activity conducted on the equipment
Knowledge and Understanding (K) w.r.t. the scope	
Element	**Knowledge and Understanding**
A. Organizational Context (Knowledge of the	The user/individual on the job needs to know and understand: KA1. relevant standards and procedures followed in the company for the process of maintenance and equipment storage KA2. functional processes like Procurement, Store

ASC/ N0008: Conduct regular cleaning and maintenance of the equipment

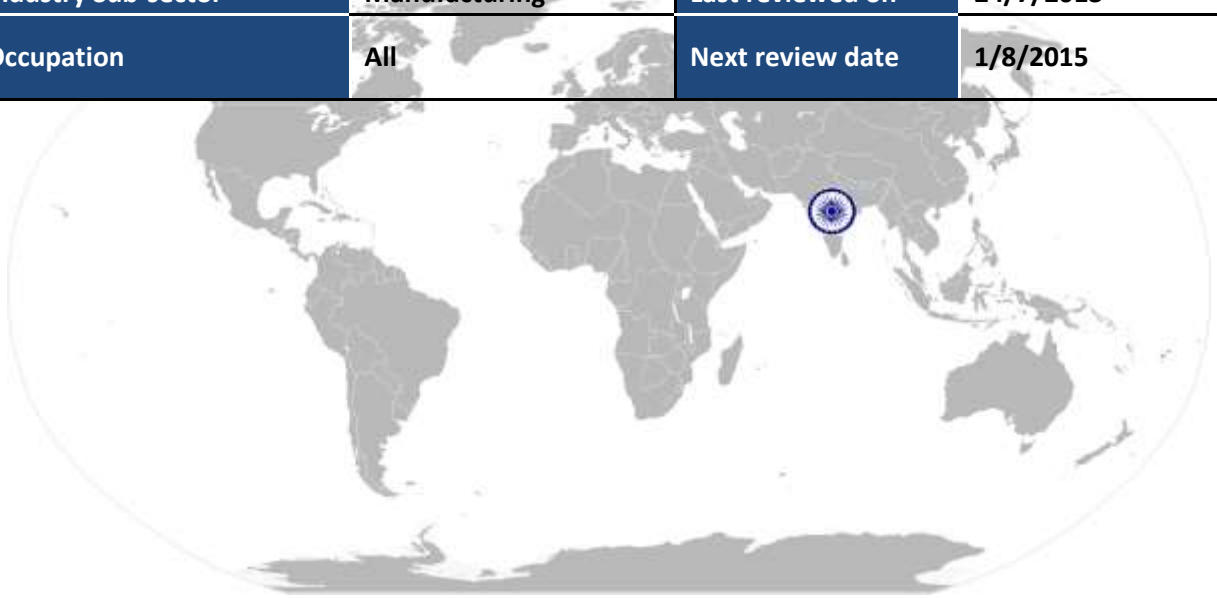
company / organization and its processes)	management, inventory management, quality management and key contact points for query resolution
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. basic level maintenance and cleaning techniques KB2. various solvents, chemicals, lubricants etc used during the maintenance processes KB3. procedure for arranging the equipment and spare parts in the prescribed manner including tagging and numbering of machine parts & spares KB4. Safety precautions to be taken during cleaning and maintenance activities
Skills (S)w.r.t. the scope	
Element	**Skills**
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand how to: SA1. note equipment part codes, name tags etc. in the prescribed formats and records for the same SA2. note observations related to equipment performance, breakdown, cleaning and maintenance schedules etc. in the prescribed MIS format
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA3. read equipment manuals and process documents to understand the equipment and processes better SA4. read instructions especially safety instructions related to equipment cleaning and maintenance
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA5. discuss task lists and job requirements with co-workers SA6. effectively communicate information to team members SA7. listen and analyse any noise and vibrations in the equipment and report the same to the maintenance team for preventive action SA8. attentively listen with full attention and comprehend the information given by the speaker
B. Professional Skills	**Plan and Organize**
	The user/individual on the job needs to know and understand how to: SB1. plan and organize the work order and jobs received from the supervisor SB2. organize all process/ equipment manuals so that sorting/ accessing information is easy as per the part/ machine number in the specified format in the designated area

ASC/ N0008: Conduct regular cleaning and maintenance of the equipment

	Critical Thinking and Judgment
	The user/individual on the job needs to know and understand how to: SB3. use common sense and make judgments during day to day basis SB4. use reasoning skills to identify and resolve basic problems

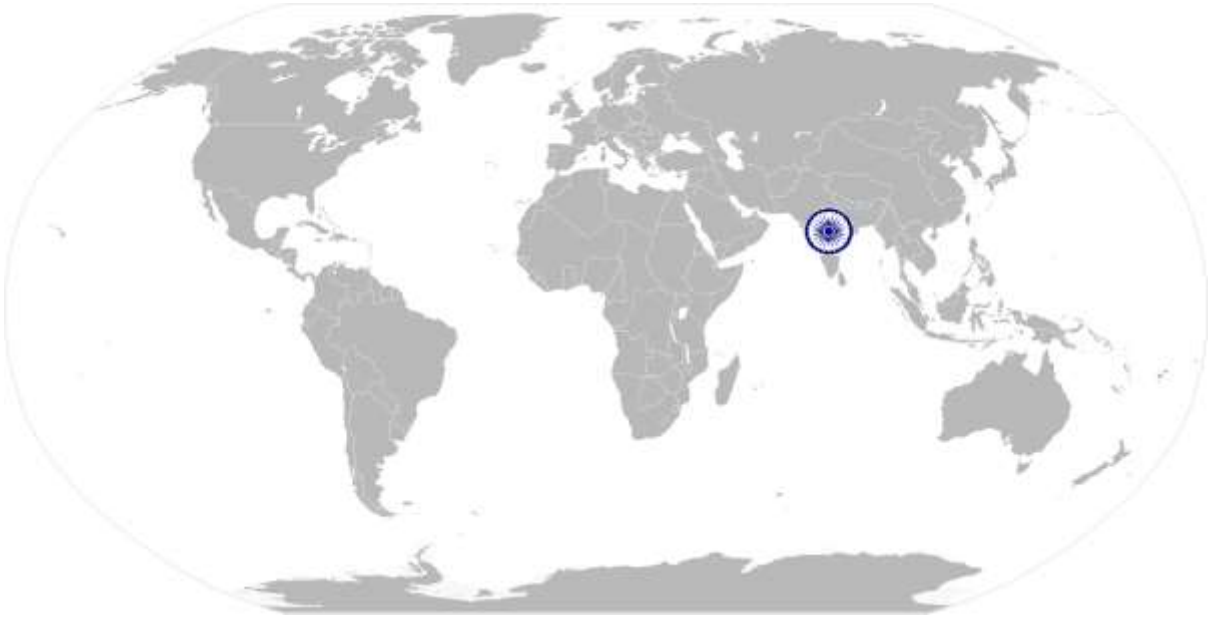
NOS Version Control

NOS Code	**ASC/N0008**		
Credits(NSQF)	**TBD**	**Version number**	**1**
Industry	**Automotive**	**Drafted on**	**15/7/2013**
Industry Sub-sector	**Manufacturing**	**Last reviewed on**	**24/7/2013**
Occupation	**All**	**Next review date**	**1/8/2015**



ASC/ N0006: Maintain a safe and healthy working environment

National Occupational Standards



Overview

This unit is about establishing a Safe, Healthy and Environment friendly workplace

National Occupational Standard

ASC/ N0006: Maintain a safe and healthy working environment

Unit Code	ASC/N0006
Unit Title (Task)	**Maintain a safe and healthy working environment**
Description	ThisNOS is about creating a Safe and Healthy work place, adhering to the safety guidelines in the working area, following practices which are not impacting the environment in a negative manner
Scope	The role holder will be responsible for • identifying and reporting of risks • creating and sustaining a safe, clean and environment friendly work place This NOS will be applicable to all Automotive sector manufacturing job roles
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Identify and report the risks identified	PC1. Identify activities which can cause potential injury through sharp objects, burns, fall, electricity, gas leakages, radiation, poisonous fumes, chemicals ,loud noise PC2. Identify areas in the plant which are potentially hazardous/ unhygienic in nature PC3. Conduct regular checks with support of the maintenance team on machine health to identify potential hazards due to wear and tear of machine PC4. Inform the concerned authorities about the potential risks identified in the processes, workplace area/ layout, materials used etc. PC5. Inform the concerned authorities about machine breakdowns, damages which can potentially harm man/ machine during operations PC6. Create awareness amongst other by sharing information on the identified risks
Create and sustain a Safe, clean and environment friendly work place	PC7. Support the Safety team and the supervisor in creating the risk mitigation plan PC8. Follow the instructions given on the equipment manual describing the operating process of the equipment PC9. Follow the Safety, Health and Environment related practices developed by the organization PC10. Operate the machine using the recommended Personal Protective Equipment (PPE) and ensure team members also use the related PPEs at the workplace PC11. Maintain a clean and safe working environment near the work place and ensure there is no spillage of chemicals, production waste, oil, solvents etc. PC12. Attend all safety and fire drills to be self aware of safety hazards and preventive techniques PC13. Maintain high standards of personal hygiene at the work place

ASC/ N0006: Maintain a safe and healthy working environment

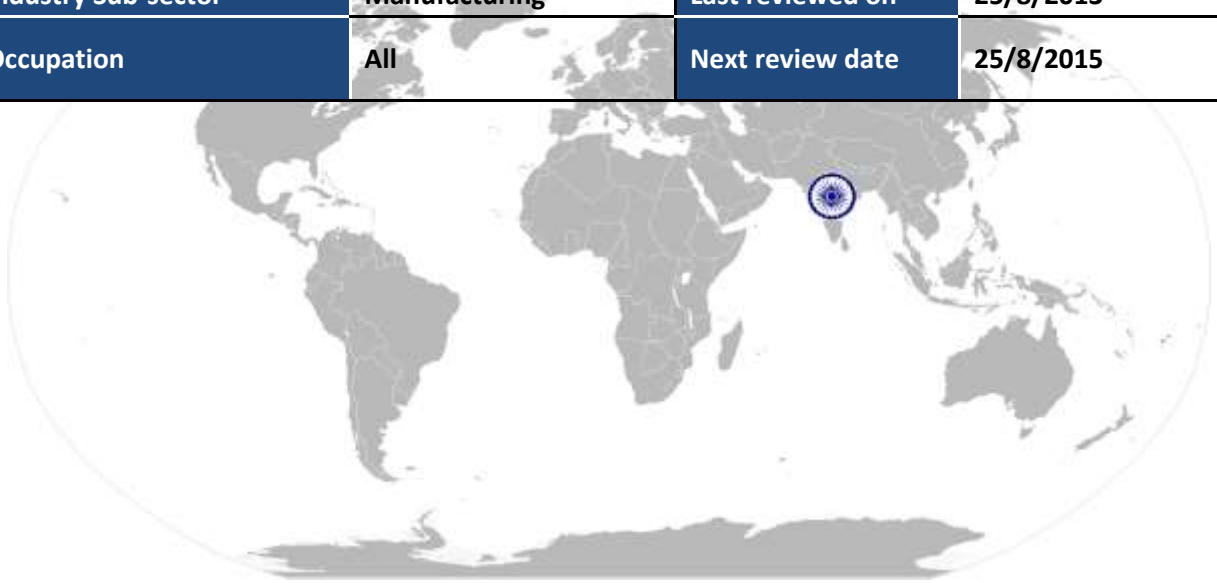
	PC14. Ensure that the waste disposal is done in the designated area and manner as per organization SOP. PC15. Inform appropriately the medical officer/ HR in case of self or an employee's illness of contagious nature so that preventive actions can be planned for others
Knowledge and Understanding (K)w.r.t. the scope	
Element	**Knowledge and Understanding**
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. relevant standards, procedures and policies related to Health, Safety and Environment followed in the company KA2. emergency handling procedures & hierarchy for escalation
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. basic knowledge of Safety procedures(fire fighting, first aid) within the organization KB2. basic knowledge of various types of PPEs and their usage KB3. basic knowledge of risks/hazards associated with each occupation in the organization KB4. knowledge of personal hygiene and how an individual an contribute towards creating a highly safe and clean working environment
Skills (S)w.r.t. the scope	
Element	**Skills**
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand how to: SA1. write basic level notes and observations
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA2. read safety instructions put up across the plant premises SA3. read safety precautions mentioned in equipment manuals and panels to understand the potential risks associated
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA4. effectively communicate information to team members SA5. informemployees in the plant and concerned functions about events, incidents & potential risks observed related to Safety, Health and Environment. SA6. question operator/ supervisor in order to understand the safety related issues SA7. attentively listen with full attention and comprehend the information given by the speaker during safety drills and training programs

ASC/ N0006: Maintain a safe and healthy working environment

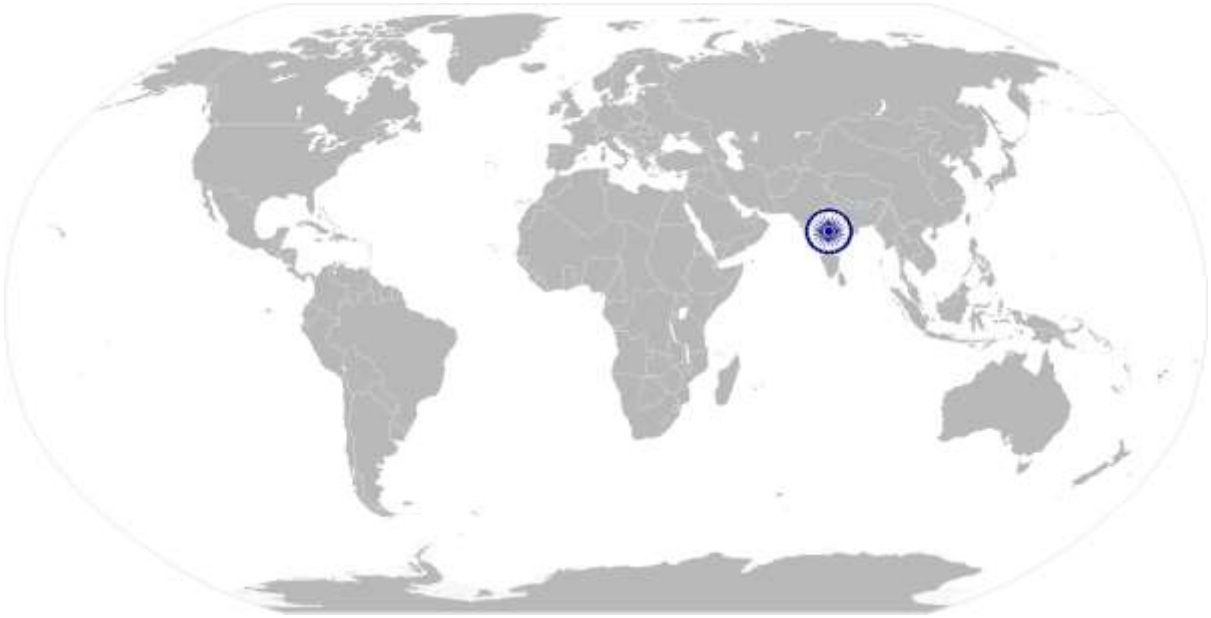
B. Professional Skills	**Judgmental Thinking**
	The user/individual on the job needs to know and understand how to: SB1. use common sense and make judgments during day to day basis SB2. use reasoning skills to identify and resolve basic problems

NOS Version Control

NOS Code	**ASC/N0006**		
Credits(NSQF)	**TBD**	**Version number**	**1**
Industry	**Automotive**	**Drafted on**	**15/8/2013**
Industry Sub-sector	**Manufacturing**	**Last reviewed on**	**25/8/2013**
Occupation	**All**	**Next review date**	**25/8/2015**



National Occupational Standard



Overview

This unit is about the understanding all principles of 5S and follow the given guidelines to ensure a clean and efficient working environment in the organization

National Occupational Standard

ASC/N0021: Maintaining 5S at the work premises

Unit Code	ASC/N0021
Unit Title (Task)	**Maintaining 5S in the work premises**
Description	This NOS is about ensuring all 5 S activities both at the shop floor and the office area to facilitate increase in work productivity
Scope	The individual needs to • Ensure sorting, streamlining & organizing, storage and documentation, cleaning, standardization and sustenance across the plant and office premises of the organization
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Ensure sorting	PC1. Follow the sorting process and check that the tools, fixtures & jigs that are lying on workstations are the ones in use and un-necessary items are not cluttering the workbenches or work surfaces. PC2. Ensure segregation of waste in hazardous/ non Hazardous waste as per the sorting work instructions PC3. Follow the technique of waste disposal and waste storage in the proper bins as per SOP PC4. Segregate the items which are labelled as red tag items for the process area and keep them in the correct places PC5. Sort the tools/ equipment/ fasteners/ spare parts as per specifications/ utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/ work instructions PC6. Ensure that areas of material storage areas are not overflowing PC7. Properly stack the various types of boxes and containers as per the size/ utility to avoid any fall of items/ breakage and also enable easy sorting when required PC8. Return the extra material and tools to the designated sections and make sure that no additional material/ tool is lying near the work area PC9. Follow the floor markings/ area markings used for demarcating the various sections in the plant as per the prescribed instructions and standards
Ensure proper documentation and storage (organizing , streamlining)	PC10. Follow the proper labeling mechanism of instruments/ boxes/ containers and maintaining reference files/ documents with the codes and the lists PC11. Check that the items in the respective areas have been identified as broken or damaged PC12. Follow the given instructions and check for labelling of fluids, oils. lubricants, solvents, chemicals etc. and proper storage of the same to avoid spillage, leakage, fire etc. PC13. Make sure that all material and tools are stored in the designated places and in the manner indicated in the 5S instructions

ASC/N0021: Maintaining 5S at the work premises

Ensure cleaning of self and the work place	PC14. Check whether safety glasses are clean and in good condition PC15. Keep all outside surfaces of recycling containers are clean PC16. Ensure that the area has floors swept, machinery clean and generally clean. In case of cleaning, ensure that proper displays are maintained on the floor which indicate potential safety hazards PC17. Check whether all hoses, cabling & wires are clean, in good condition and clamped to avoid any mishap or mix up PC18. Ensure workbenches and work surfaces are clean and in good condition PC19. Follow the cleaning schedule for the lighting system to ensure proper illumination PC20. Store the cleaning material and equipment in the correct location and in good condition PC21. Ensure self-cleanliness - clean uniform, clean shoes, clean gloves, clean helmets, personal hygiene
Ensure sustenance	PC1. Follow the daily cleaning standards and schedules to create a clean working environment PC2. Attend all training programs for employees on 5 S PC3. Support the team during the audit of 5 S PC4. Participate actively in employee work groups on 5S and encourage team members for active participation PC5. Follow the guidelines for What to do and What not to do to build sustainability in 5S as mentioned in the 5S check lists/ work instructions
Knowledge and Understanding (K) w.r.t. the scope	
Element	**Knowledge and Understanding**
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA3. relevant standards, procedures and policies related to 5S followed in the company
B. Technical Knowledge	The user/individual on the job needs to : KB5. have basic knowledge of 5S procedures KB6. know various types 5s practices followed in various areas KB7. understand the 5S checklists provided in the department/ team KB8. have skills to identify useful & non useful items KB9. have knowledge of labels , signs & colours used as indicators KB10. Have knowledge on how to sort and store various types of tools, equipment, material etc. KB11. know , how to identify various types of waste products KB12. understand the impact of waste/ dirt/ dust/unwanted substances on the process/ environment/ machinery/ human body KB13. have knowledge of best ways of cleaning & waste disposal

ASC/N0021: Maintaining 5S at the work premises

	KB14. understand the importance of standardization in processes KB15. understand the importance of sustainability in 5S KB16. have knowledge of TQM process KB17. have knowledge of various materials and storage norms KB18. understand visual controls, symbols, graphs etc.
Skills (S)w.r.t. the scope	
Element	**Skills**
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand how to: SA8. write basic level notes and observations SA9. note down observations (if any) related to the process SA10. write information documents to internal departments/ internal teams
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA11. read 5S instructions put up across the plant premises
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA12. effectively communicate information to team members inform employees in the plant and concerned functions about 5S SA13. question the process head in order to understand the 5S related issues SA14. attentively listen with full attention and comprehend the information given by the speaker during 5S training programs
B. Professional Skills	**Judgmental Thinking**
	The user/individual on the job needs to know and understand how to: SB3. use common sense and make judgments during day to day basis SB4. use reasoning skills to identify and resolve basic problems using 5S
	Persuasion
	The user/ individual on the jobs needs to know and understand how to: SB5. persuade co team members to follow 5 S SB6. ensure that the co team members understand the importance of using 5 S tool
	Creativity
	The user/individual on the job needs to know and understand how to : SB7. use innovative skills to perform and manage 5 S activities at the work desk and the shop floor SB8. exhibit inquisitive behaviour to seek feedback and question on the existing set patterns of work
	Self –Discipline

ASC/N0021: Maintaining 5S at the work premises

	The user/individual on the job needs to know and understand how to: SB9. do what is right, not what is a popular practices SB10. follow shop floor rules& regulations and avoid deviations; make 5S an integral way of life SB11. ensure self-cleanliness on a daily basis SB12. demonstrate the will to keep the work area in a clean and orderly manner

NOS Version Control

NOS Code	**ASC/N0021**		
Credits(NSQF)	**TBD**	**Version number**	**1**
Industry	**Automotive**	**Drafted on**	**1/03/2014**
Industry Sub-sector	**Manufacturing/ R&D**	**Last reviewed on**	**15/03/2014**
Occupation	**All**	**Next review date**	**15/03/2016**

Criteria for assessment of Trainees

JOB ROLE	Heat Treatment Technician L4
Qualification Pack	ASC/Q 3901
No. Of NOS	4 Role specific ,3 generic

NOS Title/ NOS Elements	NOS & Performance Criterion Description	Marks allocation	
ASC/N 3901	**Understand the job requirements & the related processes**	**Viva**	**Practical**
Understand the work order and the process requirements	PC1. Understand the work order (work output) required from the process and discuss the same with the supervisor/ metallurgist PC2. Clearly understanding the does and don'ts of the manufacturing process as defined in SOPs/ Work Instructions or defined by supervisors PC3. Refer all sketches/ work orders/ process related documents to understand dimensions and properties of the required work output PC4. Understand the process requirements in terms of temperature of the furnace, pressure, cycle time for various temperature levels & time durations during the heat treatment operations as mentioned in the Work Instruction/ SOP/ Control Diagrams	20	20
Arrange for the components to be heat treated as well as the combustion material as per the process requirement	PC5. Understand the right heat treatment procedure and process to be adopted for completing the work order from the supervisor by referring the Work Instruction document/ SOP manual PC6. Note down the various heat treatment parameters like temperature, pressure, cycle time, gas flow, coolant/ water flow before starting the heat treatment process PC7. Understand the material required and the equipment availability for executing the activity PC8. Ensure that the required material is procured from the store before starting the heat treatment process	15	30
Clean the furnace and the components before executing the heat treatment process	PC9. Ensure that the internal part of the furnace used for Carburizing, Tempering, Annealing etc. process is cleaned before the starting of the process PC10. Ensure that there are not traces of oil, grease, dirt in the Heat Treatment process at the start PC11. Clean the area around the furnace for any oil, grease, combustible substances etc. so as to prevent any accident in the furnace surrounding PC12. Clean the components which will required to be treated so as to remove traces of greases, oil, dirt etc.	10	10
Applying anti carburizing paste on surface which is not to be hardened	PC13. Wash the components which need to be heat treated using an organic solvent. PC14. Ensure that all the oil which is present in the		

	components is removed PC15. Uniformly apply anti carburizing paste on the area which is not to be carburized PC16. Ensure that the applied paste dries within the timelines mentioned in the work instructions PC17. Ensure that the components are picked up and placed in the proper trolley and are ready to be heat treated	10	30
Check furnace auxiliaries for operations	PC18. Ensure that the gas flow and water flow valves are operating without any hindrances and the pipes carrying gas and water are free from any roadblocks PC19. Ensure that the furnace cover can be opened and closed whenever required PC20. Ensure that the furnace loading and unloading mechanism is in order and working properly	5	10
Escalations of queries on the given job	PC21. Refer the queries to supervisor/ metallurgist if they cannot be resolved by the operator PC22. Confirm self - understanding to the supervisor/ metallurgist once the query is resolved so that all doubts & queries can be resolved before the actual process execution	10	-
	Sub total	**70**	**100**
ASC/N3902	**Operate different furnaces & conduct heat treatment process**	**Viva**	**Practical**
Load the Charge into the Furnace	PC1. Open the furnace cover and check the furnace internally for any impurities/ material from the previous heat treatment process PC2. Ensure that the furnace checking is done using a torch and not using any combustible material like match stick, fire etc. PC3. Once the furnace is inspected, load the furnace with the Charge material (Components to be heat treated) using hoists, conveyors etc.	10	20
Carburise the charge loaded in the furnace	PC4. Once the loading is completed and the furnace thoroughly checked, close the door of the furnace PC5. Select the right program from the list for the carburizing process/ tempering process as per the instructions given in the SOP manual/ Work Instructions PC6. Switch ON the furnace and ensure that the furnace temperature reaches the desired temperature as per the SOPs/ Work Instructions. PC7. Ensure that the cycle time for furnace temperature is maintained throughout the process. The cycle time for each process is as mentioned in the process Work Instructions PC8. Ensure that the furnace fan operations is in the ON mode and air circulation is as per requirement PC9. Once the temperature in the furnace reaches the desired value, switch ON the Carburising Valve and ensure the flow	10	20

	of the carburizing fluid within the furnace PC10. Regularly monitor the temperature of the furnace and the gas composition PC11. Once the cycle time is completed, ensure that the carburising valve of the furnace is closed PC12. Ensure that the material is carefully removed from the furnace and unload the material in the tray for the quenching process		
Temper the charge in the tempering furnace	PC13. Once the loading is completed and the furnace thoroughly checked, close the door of the furnace PC14. Switch ON the furnace and ensure that the furnace temperature reaches the desired temperature as per the SOPs/ Work Instructions PC15. Maintain the furnace temperature and the furnace cycle time as per the process chart/ Work Instructions/ SOPs	10	30
Monitor the Heat Treatment process	PC16. Ensure constant monitoring of Temperature indicators, Flow meters, Heat Exchangers, Display Panels for process operations PC17. Periodically monitor the flame pipe, Gas outlets, water inlets and water outlets for proper operations PC18. Periodically monitor the Carbon Potential % during the Heat Treatment process PC19. Periodically take readings at various intervals (as per the Cycle Time) in the format as mentioned in the Work Instructions/ internal guidelines PC20. Periodically monitor the furnace of any vibrations during operations PC21. Inform the maintenance team of any issues observed in the furnace operations	30	50
	subtotal	**60**	**120**
ASC/N3903	**Conduct post heat treatment processes such as washing shot blasting etc.**	**viva**	**Practical**
Quench the Carburized material	PC1. Understand the quenching technique which is to be used – Free Quenching, Plug Quenching, Press Quenching as mentioned in the Work Instructions/ departmental SOP PC2. Arrange the carburized material in the jig tray of the quenching machine as per the Work Instructions/ SOP PC3. Check the physical properties of the oil which is used for the quenching process – oil viscosity, colour etc. and compare with standard oil properties before the quenching process begins PC4. Inform the metallurgist about any changes in the oil properties PC5. Dip the hot metal components in the oil in quenching machine as per the process instructions/ work instructions PC6. Ensure that the quenching process is carried out as per	10	30

	the timelines and instructions given in the Work Instructions/ SOP PC7. Ensure that the agitator motor switched ON during free quenching and press quenching to ensure uniform flow of oil in the quenching tank PC8. In case water or any other coolant is used of the quenching process, ensure that the water flow uniformly across the carburised/ hardened surface PC9. Ensure that there is no leakage/ spillage of oil during the quenching process	10	20
Remove impurities from the hardened material using alkaline washing	PC10. Load the washing machine with chemicals for washing the heat treated components PC11. Ensure that the solvent (charge carrier) prepared for washing meets the composition criteria as prescribed in the Work Instructions/ SOP PC12. Load all the quenched parts in the washing machine along with the washing charge carrier PC13. Switch on the washing machine and ensure that the water circulation pump and the charge carrier circulation pump are in ON position PC14. Rotate the charge carrier in the machine and ensure that the quenched components are properly washed and traces of oil are removed from the components PC15. Ensure removal of charge carrier by flushing plain water on the components PC16. Close the pump for chemical circulation and water circulation PC17. Carefully remove the material from the washing machine and unload the material in the tray for the shot blasting process	20	30
Remove surface imperfections using Shot Blasting technique	PC18. Clean the shot blasting machine using Air pressure blast to remove any dust particles and any unwanted material PC19. Load the components and the shots in the chamber of the shot blasting machine PC20. Ensure that the door of the shot blasting machine is tightly closed PC21. Switch ON the Shot Blasting machine and ensure that all auxiliary motors are in the ON position PC22. Keep the machine in the moving position till the cycle time prescribed in the Work Instructions/ SOP manual PC23. Switch OFF the machine and inspect the parts. Turn the parts into the opposite side. Ensure that all the parts in the current position are completely turned in the opposite direction PC24. Keep the machine moving till the prescribed cycle time is achieved. Ensure that the cycle time get completed for both the cycles.	10	20

	PC25. Open the Shot Blasting machine and carefully remove the components from the machine and load them into the designated trolley PC26. Ensure that the machine is again cleaned using an Air Blasting machine		
Inspect the final product and maintain records of production & rejection	PC27. Check the hardness of the components using the hardness testing machines and ensure that the component pieces meet the conformance standards as specified in the Work Instructions/ SOPs PC28. Measure the specifications of the finished product using devices like micrometer, vernier calipers, gauges, rulers and any other inspection equipment and compare with the parameters given in the work order PC29. Check the completed pieces for any deformation, change in colour, cracks, rough surfaces in the final product PC30. Inspect the dimensions of the work pieces – spline fit, face parallelism, face tapering etc. as per the product requirement and departmental SOPs/ Work Instructions PC31. Note down the observations of the basic inspection process and identify pieces which are OK and also not meeting the specified standards PC32. Separate the defective pieces into two categories – pieces which can be repaired/ modified and pieces which are beyond repair PC33. Discard the pieces which are beyond repair and repair the ones which need minor modifications/ rework PC34. Record all observations in the log book as per the internal guidelines and processes PC35. Maintain records of production and rejected material as per the internal guidelines	10	20
Unload the Finished Goods	PC36. Clamp the product and lift the output object using suitable equipment like hoist, lifts, crane etc. PC37. Ensure that there is no damage to the lifted work pieces PC38. Carry the output product to the designated area using hangars, conveyor belts, cranes, forklifts etc.		10
Store the finished goods	PC39. Post inspection process, tag the right quality pieces for future identification PC40. Carry the tagged pieces to the storage areas using manual/ automatic means PC41. Keep a record of the finished goods along with the storage identification numbers for easy sorting	10	10
	subtotal	**70**	**140**
ASC/N 3904	**Conduct Induction Hardening treatment**	**Viva**	**Practical**
Pre Induction Hardening	PC1. Understand the work order (work output) required from		

process	the process and discuss the same with the supervisor/ metallurgist PC2. Refer all sketches/ work orders/ process related documents to understand dimensions and properties of the required work output PC3. Ensure that the correct values of voltage, current and frequency are chosen as per the process requirement and as per the Work Instructions/ SOPs	20	25
Induction Hardening Process	PC4. Ensure alignment of the work parts to the axis of the induction coil PC5. Ensure that the work part does not touch the surface of the induction coil PC6. Move the component part through the induction field and keep it under the field for the time specified in the SOPs PC7. Ensure flow of coolant/ cooling water/ quenching oil on the part to dissipate the heat and harden the component material PC8. In case cooling water is used for the purpose of cooling, ensure that the chiller machine is ON PC9. Monitor the panels for various process parameters like voltage, current, frequency and adjust the same as per process requirement	10	15
Post Induction Hardening Process	PC10. Check the hardness of the treated parts as per the given instructions in the SOP/ Work Instruction PC11. Measure the specifications of the finished product using devices like micrometer, vernier calipers, gauges, rulers, weighing scales and any other inspection equipment and compare with the parameters given in the work order PC12. Check the completed work pieces for any deformation, change in colour, cracks, rough surfaces PC13. Separate the defective pieces into two categories – pieces which can be repaired/ modified and pieces which are beyond repair PC14. Discard the pieces which are beyond repair and repair the ones which need minor modifications/ rework PC15. Record all observations in the log book as per the internal guidelines and processes	10	20
	subtotal	**40**	**60**
ASC/N0008	**Carry out routine cleaning and maintenance activity**	**Viva**	**Practical**
Storing equipment in proper condition	PC1. Arrange all equipment in a proper order as indicated in the equipment manual PC2. Store equipment auxiliaries and spare parts in proper designated areas PC3. Clearly tag process related equipment parts/ spare parts	15	25

	as per part number or serial number so that sorting of equipment becomes easy PC4. Cover equipment so that there is limited dust collection and moisture contact		
Regular cleaning of the equipment and work area	PC5. Regularly clean the equipment and process auxiliaries to remove any dust, moisture, waste material which would have got collected on the equipment PC6. Regularly open the equipment and clean the internal parts of the equipment PC7. Regularly clean the working area under the process and create a healthy, clean and safe working environment	0	25
Conduct regular preventive maintenance of equipment	PC8. Check the working of all bearing, rollers, shafts etc. and oil all moving parts of the equipment on a periodic basis PC9. Check the working of non-moving parts and periodically conduct preventive maintenance to prevent machine failure PC10. Periodically check the equipment calibration and report any errors to the maintenance teams for rectification	15	20
Recording observations and preparing MIS	PC11. Prepare periodic log sheets of equipment maintenance dates, maintenance schedules and maintenance activity conducted on the equipment	10	10
	Subtotal	**40**	**80**
ASC/N 0006	**Maintain safe , healthy environment friendly workplace**	**Viva**	**Practical**
Identify and report the risks identified	PC1. Identify activities which can cause potential injury through sharp objects, burns, fall, electricity, gas leakages, radiation, poisonous fumes, chemicals ,loud noise PC2. Inform the concerned authorities about the potential risks identified in the processes, workplace area/ layout, materials used etc. PC3. Inform the concerned authorities about machine breakdowns, damages which can potentially harm man/ machine during operations PC4. Create awareness amongst other by sharing information on the identified risks	20	40
Create and sustain a Safe, clean and environment friendly work place	PC5. Follow the instructions given on the equipment manual describing the operating process of the equipment PC6. Follow the Safety, Health and Environment related practices developed by the organization PC7. Operate the machine using the recommended Personal Protective Equipment (PPE) PC8. Maintain a clean and safe working environment near the work place and ensure there is no spillage of chemicals, production waste, oil, solvents etc. PC9. Maintain high standards of personal hygiene at the work place PC10. Ensure that the waste disposal is done in the designated area and manner as per organization SOP.	50	40

	PC11. Inform appropriately the medical officer/ HR in case of self or an employee's illness of contagious nature so that preventive actions can be planned for others		
	subtotal	70	80
ASC / N 0021	**Maintain 5 S activities at the workplace**	**Viva**	**practical**
Ensure sorting	PC1. Follow the sorting process and check that the tools, fixtures & jigs that are lying on workstations are the ones in use and un-necessary items are not cluttering the workbenches or work surfaces. PC2. Ensure segregation of waste in hazardous/ non Hazardous waste as per the sorting work instructions PC3. Follow the technique of waste disposal and waste storage in the proper bins as per SOP PC4. Segregate the items which are labelled as red tag items for the process area and keep them in the correct places PC5. Sort the tools/ equipment/ fasteners/ spare parts as per specifications/ utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/ work instructions PC6. Ensure that areas of material storage areas are not overflowing PC7. Properly stack the various types of boxes and containers as per the size/ utility to avoid any fall of items/ breakage and also enable easy sorting when required PC8. Return the extra material and tools to the designated sections and make sure that no additional material/ tool is lying near the work area PC9. Follow the floor markings/ area markings used for demarcating the various sections in the plant as per the prescribed instructions and standards	10 10	20 20
Ensure proper documentation and storage (organizing , streamlining)	PC10. Follow the proper labeling mechanism of instruments/ boxes/ containers and maintaining reference files/ documents with the codes and the lists PC11. Check that the items in the respective areas have been identified as broken or damaged PC12. Follow the given instructions and check for labelling of fluids, oils. lubricants, solvents, chemicals etc. and proper storage of the same to avoid spillage, leakage, fire etc. PC13. Make sure that all material and tools are stored in the designated places and in the manner indicated in the 5S instructions	10	20
Ensure cleaning of self and the work place	PC14. Check whether safety glasses are clean and in good condition PC15. Keep all outside surfaces of recycling containers are clean PC16. Ensure that the area has floors swept, machinery clean and generally clean. In case of cleaning, ensure that proper displays are maintained on the floor which indicate potential safety hazards		

	PC17. Check whether all hoses, cabling & wires are clean, in good condition and clamped to avoid any mishap or mix up PC18. Ensure workbenches and work surfaces are clean and in good condition PC19. Follow the cleaning schedule for the lighting system to ensure proper illumination PC20. Store the cleaning material and equipment in the correct location and in good condition PC21. Ensure self-cleanliness - clean uniform, clean shoes, clean gloves, clean helmets, personal hygiene	10	40
Ensure sustenance	PC22. Follow the daily cleaning standards and schedules to create a clean working environment PC23. Attend all training programs for employees on 5 S PC24. Support the team during the audit of 5 S PC25. Participate actively in employee work groups on 5S and encourage team members for active participation PC26. Follow the guidelines for What to do and What not to do to build sustainability in 5S as mentioned in the 5S check lists/ work instructions	10	20
	Sub total	**50**	**120**
	Total	**400**	**700**