



Automotive Material Testing Incharge

QP Code: ASC/Q6504

Version: 2.0

NSQF Level: 6

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

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ASC/Q6504: Automotive Material Testing Incharge

Brief Job Description

Individuals at this job is responsible for metallurgical testing, physical & chemical testing, and failure analysis of materials for fabrication of parts and other components that finally go into the manufacturing of different products.

Personal Attributes

The person should be willing to work in a laboratory environment for long hours. The individual should possess strong decision-making skills. The individual should also be able to demonstrate skills for mathematical reasoning, critical thinking, technology design, and comprehension.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [ASC/N9810: Manage work and resources \(Manufacturing\)](#)
2. [ASC/N9812: Interact effectively with team, customers and others](#)
3. [ASC/N6503: Perform testing and validation of materials](#)
4. [ASC/N6504: Develop alternate material for improving the product quality](#)
5. [ASC/N6811: Select and operate 3D Printing machine for product generation](#)

Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Testing and Validation
Country	India
NSQF Level	6
Aligned to NCO/ISCO/ISIC Code	NCO-2015/1223.0102

Minimum Educational Qualification & Experience	<p>3 years Diploma (Mechanical/Automobile/ Electrical / Electronics) from recognized regulatory body with 3 years of relevant experience after class 12th</p> <p>OR</p> <p>B.E./B.Tech (Mechanical/Automobile / Electrical/ Electronics Engineering) with 1 Year of relevant experience,</p> <p>OR</p> <p>M.E./M.Tech (Mechanical/Automobile / Electrical/ Electronics Engineering)</p>
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	23 Years
Last Reviewed On	30/09/2021
Next Review Date	30/09/2024
NSQC Approval Date	30/09/2021
Version	2.0

ASC/N9810: Manage work and resources (Manufacturing)

Description

This NOS unit is about implementing safety, planning work, adopting sustainable practices for optimising the use of resources.

Scope

The scope covers the following :

- Maintain safe and secure working environment
- Maintain Health and Hygiene
- Effective waste management practices
- Material/energy conservation practices

Elements and Performance Criteria

Maintain safe and secure working environment

To be competent, the user/individual on the job must be able to:

- PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace
- PC2. implement safe working practices for dealing with hazards to ensure safety of self and others
- PC3. conduct regular checks of the machines with support of the maintenance team to identify potential hazards
- PC4. ensure that all the tools/equipment/fasteners/spare parts are arranged as per specifications/utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions
- PC5. organise safety drills or training sessions to create awareness amongst others on the identified risks and safety practices
- PC6. fill daily check sheet to report improvements done and risks identified
- PC7. ensure that relevant safety boards/signs are placed on the shop floor for the safety of self and others
- PC8. report any identified breaches in health, safety and security policies and procedures to the designated person

Maintain Health and Hygiene

To be competent, the user/individual on the job must be able to:

- PC9. ensure workplace, equipment, restrooms etc. are sanitized regularly
- PC10. ensure team is aware about hygiene and sanitation regulations and following them on the shop floor
- PC11. ensure availability of running water, hand wash and alcohol-based sanitizers at the workplace
- PC12. report advanced hygiene and sanitation issues to appropriate authority
- PC13. follow stress and anxiety management techniques and support employees to cope with stress, anxiety etc
- PC14. wear and dispose PPEs regularly and appropriately

Effective waste management practices

To be competent, the user/individual on the job must be able to:

PC15. ensure recyclable, non-recyclable and hazardous wastes are segregated as per SOP

PC16. ensure proper mechanism is followed while collecting and disposing of non-recyclable, recyclable and reusable waste

Material/energy conservation practices

To be competent, the user/individual on the job must be able to:

PC17. ensure malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment are resolved effectively

PC18. prepare and analyze material and energy audit reports to decipher excessive consumption of material and water

PC19. identify possibilities of using renewable energy and environment friendly fuels

PC20. identify processes where material and energy/electricity utilization can be optimized

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation procedures for health, safety and security, individual role and responsibilities in this context

KU2. the organisation's emergency procedures for different emergency situations and the importance of following the same

KU3. evacuation procedures for workers and visitors

KU4. how and when to report hazards as well as the limits of responsibility for dealing with hazards

KU5. potential hazards, risks and threats based on the nature of work

KU6. various types of fire extinguisher

KU7. various types of safety signs and their meaning

KU8. appropriate first aid treatment relevant to different condition e.g. bleeding, minor burns, eye injuries etc.

KU9. relevant standards, procedures and policies related to 5S followed in the company

KU10. the various materials used and their storage norms

KU11. importance of efficient utilisation of material and water

KU12. basics of electricity and prevalent energy efficient devices

KU13. common practices of conserving electricity

KU14. common sources and ways to minimize pollution

KU15. categorisation of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics

KU16. waste management techniques

KU17. significance of greening

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. read safety instructions/guidelines
- GS2. modify work practices to improve them
- GS3. work with supervisors/team members to carry out work related tasks
- GS4. complete tasks efficiently and accurately within stipulated time
- GS5. inform/report to concerned person in case of any problem
- GS6. make timely decisions for efficient utilization of resources
- GS7. write reports such as accident report, in at least English/regional language

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Maintain safe and secure working environment</i>	20	13	-	8
PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace	4	2	-	2
PC2. implement safe working practices for dealing with hazards to ensure safety of self and others	3	1	-	2
PC3. conduct regular checks of the machines with support of the maintenance team to identify potential hazards	2	2	-	1
PC4. ensure that all the tools/equipment/fasteners/spare parts are arranged as per specifications/utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions	3	2	-	1
PC5. organise safety drills or training sessions to create awareness amongst others on the identified risks and safety practices	2	-	-	-
PC6. fill daily check sheet to report improvements done and risks identified	2	2	-	-
PC7. ensure that relevant safety boards/signs are placed on the shop floor for the safety of self and others	2	2	-	1
PC8. report any identified breaches in health, safety and security policies and procedures to the designated person	2	2	-	1
<i>Maintain Health and Hygiene</i>	13	7	-	5
PC9. ensure workplace, equipment, restrooms etc. are sanitized regularly	3	2	-	1
PC10. ensure team is aware about hygiene and sanitation regulations and following them on the shop floor	2	1	-	-
PC11. ensure availability of running water, hand wash and alcohol-based sanitizers at the workplace	2	2	-	1
PC12. report advanced hygiene and sanitation issues to appropriate authority	1	1	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. follow stress and anxiety management techniques and support employees to cope with stress, anxiety etc	2	1	-	1
PC14. wear and dispose PPEs regularly and appropriately	3	-	-	1
<i>Effective waste management practices</i>	6	4	-	1
PC15. ensure recyclable, non-recyclable and hazardous wastes are segregated as per SOP	3	2	-	-
PC16. ensure proper mechanism is followed while collecting and disposing of non-recyclable, recyclable and reusable waste	3	2	-	1
<i>Material/energy conservation practices</i>	11	6	-	6
PC17. ensure malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment are resolved effectively	2	2	-	1
PC18. prepare and analyze material and energy audit reports to decipher excessive consumption of material and water	3	2	-	1
PC19. identify possibilities of using renewable energy and environment friendly fuels	3	1	-	2
PC20. identify processes where material and energy/electricity utilization can be optimized	3	1	-	2
NOS Total	50	30	-	20

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9810
NOS Name	Manage work and resources (Manufacturing)
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
NSQC Clearance Date	30/09/2021

ASC/N9812: Interact effectively with team, customers and others

Description

This unit is about communicating with team members, superior and others.

Scope

The scope covers the following :

- Communicate effectively with team members
- Interact with superiors
- Respect gender and ability differences

Elements and Performance Criteria

Communicate effectively with team members

To be competent, the user/individual on the job must be able to:

- PC1. implement ways to share information with team members in line with organisational requirements
- PC2. ensure that work requirements are clearly communicated to the team members through all means including face-to-face, telephonic and written
- PC3. manage and co-ordinate with team members to integrate work as per requirements
- PC4. work in a way that show respect for all team members and customers
- PC5. carry out commitments made to team members and let them know in good time if there is any discrepancy with reasons
- PC6. resolve conflicts within the team members at work to achieve smooth workflow
- PC7. guide the team members to follow the organisation's policies and procedures
- PC8. ensure team goals are given preference over individual goals
- PC9. respect personal space of colleagues and customers

Interact with superiors

To be competent, the user/individual on the job must be able to:

- PC10. report progress on job allocated and team performance to the superiors
- PC11. escalate problems to superiors that cannot be handled
- PC12. train the team members to report completed work and receive feedback on work done
- PC13. encourage team members to rectify errors as per feedback and minimize mistakes in future

Respect gender and ability differences

To be competent, the user/individual on the job must be able to:

- PC14. ensure team shows sensitivity towards all genders and PwD
- PC15. adjust communication styles to reflect gender sensitivity and sensitivity towards person with disability
- PC16. help PwD team members to overcome the challenges, if asked

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. the importance of effective communication and establishing good working relationships with team members and superiors
- KU2. different methods of communication as per the circumstances
- KU3. gender based concepts, issues and legislation
- KU4. organisation standards and guidelines to be followed for PwD
- KU5. rights and duties at workplace with respect to PwD
- KU6. organisation policies and procedures pertaining to written and verbal communication

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. read safety instructions/guidelines
- GS2. modify work practices to improve them
- GS3. work with supervisors/team members to carry out work related tasks
- GS4. complete tasks efficiently and accurately within stipulated time
- GS5. make timely decisions for efficient utilization of resources
- GS6. read instructions/guidelines/procedures
- GS7. write in English/any one language

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Communicate effectively with team members</i>	20	14	-	8
PC1. implement ways to share information with team members in line with organisational requirements	2	2	-	-
PC2. ensure that work requirements are clearly communicated to the team members through all means including face-to-face, telephonic and written	2	2	-	2
PC3. manage and co-ordinate with team members to integrate work as per requirements	2	1	-	2
PC4. work in a way that show respect for all team members and customers	3	1	-	2
PC5. carry out commitments made to team members and let them know in good time if there is any discrepancy with reasons	2	2	-	-
PC6. resolve conflicts within the team members at work to achieve smooth workflow	3	2	-	-
PC7. guide the team members to follow the organisation's policies and procedures	2	1	-	-
PC8. ensure team goals are given preference over individual goals	2	1	-	-
PC9. respect personal space of colleagues and customers	2	2	-	2
<i>Interact with superiors</i>	18	10	-	7
PC10. report progress on job allocated and team performance to the superiors	4	3	-	2
PC11. escalate problems to superiors that cannot be handled	4	2	-	1
PC12. train the team members to report completed work and receive feedback on work done	5	2	-	2
PC13. encourage team members to rectify errors as per feedback and minimize mistakes in future	5	3	-	2

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Respect gender and ability differences</i>	12	6	-	5
PC14. ensure team shows sensitivity towards all genders and PwD	4	2	-	2
PC15. adjust communication styles to reflect gender sensitivity and sensitivity towards person with disability	4	2	-	2
PC16. help PwD team members to overcome the challenges, if asked	4	2	-	1
NOS Total	50	30	-	20

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9812
NOS Name	Interact effectively with team, customers and others
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
NSQC Clearance Date	30/09/2021

ASC/N6503: Perform testing and validation of materials

Description

This NOS unit is about Performing Metallurgical and chemical testing and validation of materials.

Scope

The scope covers the following :

- Metallurgical and chemical testing
- Testing and documentation of material
- Resource management and New Technology

Elements and Performance Criteria

Metallurgical and chemical testing

To be competent, the user/individual on the job must be able to:

- PC1. manage laboratory for performing testing and validation activities for materials of construction for various parts/components that are fitted into the final product like engine, chassis, forging and machining, suspension, brakes etc.
- PC2. ensure that the laboratory is well equipped to perform testing of materials like material confirmation, microstructure analysis, surface/material defects, hardness, tensile strength etc.
- PC3. ensure that the sample of each part/component has been prepared based on the process requirements
- PC4. monitor the procedures for performing tests being done by associates and ensure strict compliance to HSE (Health, safety, and environment) requirements
- PC5. discuss with each associate the test findings and ensure its documentation & communication
- PC6. coordinate with the process owner and establish traceability up to the validation samples so that results can be co-related
- PC7. ensure that the testing and validation results are being documented as per the ISO/IEC17025/NABL requirements
- PC8. recognize the non-conforming material, quarantine it and participate to perform failure analysis of the material in its manufacturing process

Failure analysis

To be competent, the user/individual on the job must be able to:

- PC9. ensure that the data pertaining to the suspected material for field failures has been collected properly for further analysis
- PC10. ensure that the associates are having all the process documents pertaining to the suspected material like PFMEAs, Failure reports, Material inspection reports etc.
- PC11. select the method of failure analysis; Destructive Testing or Non-Destructive Testing (NDT), based on the criticality and failure occurrence of the suspected failed part/component
- PC12. ensure the cutting of a section of the suspected part and perform the testing like corrosion analysis, stress analysis etc. In case of destructive testing

- PC13. ensure usage of techniques like electromagnetic radiation, spectroscopy, sound etc. for examining the suspected material, in case of NDT,
- PC14. analyze, validate and ensure the documentation of the results. In both cases of testing
- PC15. discuss the findings with R&D department and seek their inputs
- PC16. inform the concerned process department and ensure that in case of rejection, the complete batch of the rejected material part is quarantined/ recalled
- PC17. coordinate with concerned team and decide the most conforming material for the part in discussions with Sourcing and R&D. In case of rejection
- PC18. ensure the approval of material of sample part based on validation and generate a process change note (PCN) in SAP/ERP for implementation of the new material part

Resource management and new technology

To be competent, the user/individual on the job must be able to:

- PC19. coordinate with HR department to recruit sufficient number of staff for carrying out the various activities in material lab department
- PC20. ensure that the new join is trained by the existing staff members in an efficient manner
- PC21. coordinate with QA/ senior management for requirement of new testing equipment's
- PC22. ensure the procurement of new equipment's as per the requirement and monitor the working, calibration and maintenance of existing equipment's
- PC23. coordinate with new developments in evaluation techniques, materials etc. and factor these at appropriate stages viz new developments, recruitments

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. company manufacturing processes & the equipment in use.
- KU2. type of systems used in the process
- KU3. eligible vendor database for the process and automation systems
- KU4. protocol & standards for new system installation of the company
- KU5. raw materials being used for manufacturing of each product
- KU6. physical, chemical and metallurgical properties of each material
- KU7. the various materials used and their storage norms
- KU8. problem solving techniques -TOPS 8D, 7 QC tools etc.
- KU9. PLC, SCADA & electrical elements operation and testing
- KU10. trouble shooting & fault finding for all the systems
- KU11. testing and validation techniques used
- KU12. Failure analysis techniques used for examining materials samples
- KU13. ISO/IEC17025/, NABL system requirements.

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. read the information displayed at the workplace

- GS2. recognise a workplace problem and take suitable action
- GS3. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently
- GS4. communicate effectively at the workplace
- GS5. attentively listen and comprehend the information given by the process managers
- GS6. write observations and any work related information in English/regional language
- GS6. complete assigned tasks in a timely and efficient manner

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Metallurgical and chemical testing</i>	9	12	-	9
PC1. manage laboratory for performing testing and validation activities for materials of construction for various parts/components that are fitted into the final product like engine, chassis, forging and machining, suspension, brakes etc.	1	1	-	2
PC2. ensure that the laboratory is well equipped to perform testing of materials like material confirmation, microstructure analysis, surface/material defects, hardness, tensile strength etc.	1	1	-	-
PC3. ensure that the sample of each part/component has been prepared based on the process requirements	1	6	-	2
PC4. monitor the procedures for performing tests being done by associates and ensure strict compliance to HSE (Health, safety, and environment) requirements	1	1	-	2
PC5. discuss with each associate the test findings and ensure its documentation & communication	1	1	-	2
PC6. coordinate with the process owner and establish traceability up to the validation samples so that results can be co-related	1	2	-	1
PC7. ensure that the testing and validation results are being documented as per the ISO/IEC17025/NABL requirements	1	-	-	-
PC8. recognize the non-conforming material, quarantine it and participate to perform failure analysis of the material in its manufacturing process	2	-	-	-
<i>Failure analysis</i>	17	22	-	9
PC9. ensure that the data pertaining to the suspected material for field failures has been collected properly for further analysis	2	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. ensure that the associates are having all the process documents pertaining to the suspected material like PFMEAs, Failure reports, Material inspection reports etc.	2	2	-	-
PC11. select the method of failure analysis; Destructive Testing or Non-Destructive Testing (NDT), based on the criticality and failure occurrence of the suspected failed part/component	1	2	-	-
PC12. ensure the cutting of a section of the suspected part and perform the testing like corrosion analysis, stress analysis etc. In case of destructive testing	1	3	-	2
PC13. ensure usage of techniques like electromagnetic radiation, spectroscopy, sound etc. for examining the suspected material, in case of NDT,	1	3	-	2
PC14. analyze, validate and ensure the documentation of the results. In both cases of testing	1	3	-	3
PC15. discuss the findings with R&D department and seek their inputs	2	2	-	-
PC16. inform the concerned process department and ensure that in case of rejection, the complete batch of the rejected material part is quarantined/ recalled	2	2	-	-
PC17. coordinate with concerned team and decide the most conforming material for the part in discussions with Sourcing and R&D. In case of rejection	2	2	-	-
PC18. ensure the approval of material of sample part based on validation and generate a process change note (PCN) in SAP/ERP for implementation of the new material part	3	1	-	2
<i>Resource management and new technology</i>	14	6	-	2
PC19. coordinate with HR department to recruit sufficient number of staff for carrying out the various activities in material lab department	3	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC20. ensure that the new join is trained by the existing staff members in an efficient manner	3	1	-	-
PC21. coordinate with QA/ senior management for requirement of new testing equipment's	3	1	-	1
PC22. ensure the procurement of new equipment's as per the requirement and monitor the working, calibration and maintenance of existing equipment's	2	1	-	1
PC23. coordinate with new developments in evaluation techniques, materials etc. and factor these at appropriate stages viz new developments, recruitments	3	1	-	-
NOS Total	40	40	-	20

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N6503
NOS Name	Perform testing and validation of materials
Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Testing and Validation
NSQF Level	6
Credits	TBD
Version	2.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
NSQC Clearance Date	30/09/2021

ASC/N6504: Develop alternate material for improving the product quality

Description

This NOS is about developing alternate material for enhancing the performance of the product in terms of quality, durability and cost effectiveness.

Scope

The scope covers the following :

- analyzing the customer requirements
- Development and validation

Elements and Performance Criteria

Analysis of customer requirements

To be competent, the user/individual on the job must be able to:

- PC1. ensure the collection of data pertaining to the field failures of various parts/components due to material, NPD- customer requirements, SOR etc. from marketing and R&D department
- PC2. note down the failure data and identify the part, type of material failed and frequency of failure
- PC3. prepare the list of non-conforming parts based on analysis of failure data and select the most frequent and high-cost value part
- PC4. prepare a database of the most conforming material for the part keeping in view the customer requirements
- PC5. compare the identified materials with respect to physical, chemical properties, unit cost, performance improvement, availability etc. and select the most viable material for the part
- PC6. prepare the drawings/ specifications of the part again in coordination with design team, considering the results on the new material

Development and validation

To be competent, the user/individual on the job must be able to:

- PC7. coordinate with suppliers and convene a meeting with the part supplier
- PC8. share with the supplier the new drawing of the part in SAP/ERP/PLM and communicate the requirements
- PC9. discuss the inputs from supplier if required, and finalize the drawings of the new material part
- PC10. discuss with the supplier, the cost implications and accordingly finalize the commercial terms
- PC11. ensure a schedule for new material development and ensure its strict adherence
- PC12. coordinate with Sourcing department and ensure the development of the sample part with the new material
- PC13. perform the various tests in coordination with concerned team as per the standard operating procedures complying to the HSE requirements
- PC14. examine and validate the results obtained and in coordination with supplier ensure the resolution of the discrepancies

- PC15. prepare the document of results for the validation and share it with the R&D department and senior management, participate in decision making process
- PC16. coordinate in the documentation/ release process with the Design team with appropriate inputs
- PC17. examine the new material performance by regularly discovering the performance of the part during process and field by capturing the data from concerned departments

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. product portfolio and product mix of organization
- KU2. the manufacturing processes of organization
- KU3. vendor database for all the materials sourced by organization
- KU4. protocol for communication regarding new materials development among the various departments of the organization
- KU5. raw materials being used for manufacturing of each product
- KU6. physical and chemical properties of each material
- KU7. storage conditions required for each material
- KU8. database for information about materials used
- KU9. testing and validation techniques used
- KU10. failure analysis techniques used for examining materials samples
- KU11. ISO/IEC17025/, NABL system requirements

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. understand the data pertaining to the customer requirements
- GS2. interpret the analysis reports for capturing information about the nonconforming parts
- GS3. document all the testing and validation activities findings pertaining to new material development in form of MS Word documents , MS Excel spreadsheets etc
- GS4. communicate with the concerned departments for gathering part/component failure data
- GS5. follow up with team members for monitoring the progress of activities
- GS6. conduct meetings with R&D head/top management in case of any issues pertaining to results obtained
- GS7. ensure that the corrective actions are implemented at both department and vendors end for resolution of non-conformities pertaining to new material sample part validation
- GS8. communicate with the R&D department for discussion the findings of sample part validation
- GS9. coordinate with various departments and ensure requisite data availability for field failures, customer complaints, warranty issues pertaining to failed material part etc
- GS10. distribute workload among team members to ensure timely completion of new material development activity
- GS11. share operation knowledge with colleagues

- GS12. identify the best alternate material for a frequently failing part/component
- GS13. resolve the discrepancies arising in new material sample part
- GS14. identify problems (technical and non-technical), disruptions and delays
- GS15. use escalation procedures
- GS16. Keep abreast of special events such as holidays/ work calendars / maintenance shutdowns of suppliers& organization and plan accordingly so that the final schedules are adhered to

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Analysis of customer requirements</i>	12	14	-	16
PC1. ensure the collection of data pertaining to the field failures of various parts/components due to material, NPD- customer requirements, SOR etc. from marketing and R&D department	2	2	-	1
PC2. note down the failure data and identify the part, type of material failed and frequency of failure	2	2	-	5
PC3. prepare the list of non-conforming parts based on analysis of failure data and select the most frequent and high-cost value part	2	2	-	-
PC4. prepare a database of the most conforming material for the part keeping in view the customer requirements	3	2	-	5
PC5. compare the identified materials with respect to physical, chemical properties, unit cost, performance improvement, availability etc. and select the most viable material for the part	2	4	-	-
PC6. prepare the drawings/ specifications of the part again in coordination with design team, considering the results on the new material	1	2	-	5
<i>Development and validation</i>	28	26	-	4
PC7. coordinate with suppliers and convene a meeting with the part supplier	3	2	-	-
PC8. share with the supplier the new drawing of the part in SAP/ERP/PLM and communicate the requirements	3	2	-	-
PC9. discuss the inputs from supplier if required, and finalize the drawings of the new material part	3	2	-	-
PC10. discuss with the supplier, the cost implications and accordingly finalize the commercial terms	3	4	-	-
PC11. ensure a schedule for new material development and ensure its strict adherence	3	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. coordinate with Sourcing department and ensure the development of the sample part with the new material	3	2	-	-
PC13. perform the various tests in coordination with concerned team as per the standard operating procedures complying to the HSE requirements	2	2	-	-
PC14. examine and validate the results obtained and in coordination with supplier ensure the resolution of the discrepancies	2	2	-	-
PC15. prepare the document of results for the validation and share it with the R&D department and senior management, participate in decision making process	2	4	-	4
PC16. coordinate in the documentation/ release process with the Design team with appropriate inputs	2	2	-	-
PC17. examine the new material performance by regularly discovering the performance of the part during process and field by capturing the data from concerned departments	2	2	-	-
NOS Total	40	40	-	20

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N6504
NOS Name	Develop alternate material for improving the product quality
Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Testing and Validation
NSQF Level	6
Credits	TBD
Version	2.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
NSQC Clearance Date	30/09/2021

ASC/N6811: Select and operate 3D Printing machine for product generation

Description

This NOS describes the process of selecting the 3D printing machine for product generation and performing the postprocessing of the fabricated product.

Scope

The scope covers the following :

- Select 3D Printing machine
- Select and upload code files into system memory
- Pre-processing settings of the machine
- Operate and perform post-printing operations
- Inspection & storage of parts

Elements and Performance Criteria

Select 3D Printing machine

To be competent, the user/individual on the job must be able to:

- PC1. identify the 3D Printing technology such as Fused Deposition Modelling, StereoLithography etc.
- PC2. identify and select the raw material to print the automotive components as per product specifications
- PC3. determine the part orientation and support structure requirement from Computer Aided Design (CAD) data
- PC4. determine the machine specifications such as build speed, extrusion speed, nozzle temperature required as per process application
- PC5. determine the parameters such as room temperature range, air cleanliness for operating the machine
- PC6. select the suitable 3D printing machine as per defined parameters

Select and upload code files into system memory

To be competent, the user/individual on the job must be able to:

- PC7. select the standard tessellation language (.stl) code file needed for machine operation
- PC8. delete unwanted code files & upload new code files into the machine memory
- PC9. select any pre-stored program from machine memory
- PC10. connect the data storage devices with the machine
- PC11. check the number of automotive parts to be manufactured for each design file
- PC12. coordinate with designer to rectify any errors which are generated in the file uploading process or error observed during the running of process

Pre-processing settings of machine

To be competent, the user/individual on the job must be able to:

- PC13. perform daily check of machine's critical components

- PC14. perform the pre-setting of 3D printing machine before the start of operation
- PC15. prepare the machine for operation by cleaning it as per the recommended process
- PC16. calculate the volume of material needed to generate the part as per the code provided
- PC17. load adequate consumable material into the machine for non-stop working of the machine
- PC18. pre-heat the bed of the machine to adequate temperature as per process specifications
- PC19. set the laser or nozzles temperature to defined values as per process specification

Operate and perform post-printing operations

To be competent, the user/individual on the job must be able to:

- PC20. operate the machine, identify and rectify process errors if any
- PC21. use emergency stop button in case of any unwanted situation
- PC22. remove the part from machine without damaging its structure.
- PC23. identify & carefully remove the support structures present in the fabricated part
- PC24. clean the part for improving the surface finish

Inspection & storage of parts produced

To be competent, the user/individual on the job must be able to:

- PC25. inspect the part as per the drawing/process and if non-conforming, take action for rework or rejection
- PC26. store & preserve the automotive parts manufactured

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. relevant manufacturing standards and procedures followed in the company
- KU2. organization methodology/procedures used for automotive product design
- KU3. all the symbols and notifications being displayed by the 3D Printing machine and their corresponding meaning
- KU4. functionality of different buttons and switches available on the machine dashboard
- KU5. how to upload and remove code files from the machine memory
- KU6. preservation of critical electronic parts/equipments from moisture/heat/environmental external conditions as specified in the process
- KU7. how to maintain the log book for produced parts
- KU8. error detection and rectification at various stages of part generation
- KU9. types of 3D Printing techniques
- KU10. recommended process for cleaning machine
- KU11. post-processing techniques
- KU12. types of materials available for fabrication in various 3D printing technique
- KU13. various inspection methods for inspecting the quality of product
- KU14. optimum temperature range, air cleanliness and humidity required for the machine
- KU15. types of files such as .stl, code file, etc generated in the various steps of the process
- KU16. techniques of fabricating a component with 3D Printing

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. read equipment manuals and process documents
- GS2. attentively listen and comprehend the information given by the process managers
- GS3. communicate effectively at the workplace
- GS4. write observations and any work related information in English/regional language
- GS5. recognise a workplace problem and take suitable action
- GS6. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently
- GS7. complete assigned tasks in a timely and efficient manner

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Select 3D Printing machine</i>	6	2	-	2
PC1. identify the 3D Printing technology such as Fused Deposition Modelling, StereoLithography etc.	1	1	-	1
PC2. identify and select the raw material to print the automotive components as per product specifications	1	1	-	1
PC3. determine the part orientation and support structure requirement from Computer Aided Design (CAD) data	1	-	-	-
PC4. determine the machine specifications such as build speed, extrusion speed, nozzle temperature required as per process application	1	-	-	-
PC5. determine the parameters such as room temperature range, air cleanliness for operating the machine	1	-	-	-
PC6. select the suitable 3D printing machine as per defined parameters	1	-	-	-
<i>Select and upload code files into system memory</i>	6	11	-	4
PC7. select the standard tessellation language (.stl) code file needed for machine operation	1	2	-	1
PC8. delete unwanted code files & upload new code files into the machine memory	1	3	-	1
PC9. select any pre-stored program from machine memory	1	2	-	1
PC10. connect the data storage devices with the machine	1	2	-	-
PC11. check the number of automotive parts to be manufactured for each design file	2	-	-	-
PC12. coordinate with designer to rectify any errors which are generated in the file uploading process or error observed during the running of process	-	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Pre-processing settings of machine</i>	16	14	-	7
PC13. perform daily check of machine's critical components	-	2	-	-
PC14. perform the pre-setting of 3D printing machine before the start of operation	2	2	-	1
PC15. prepare the machine for operation by cleaning it as per the recommended process	2	2	-	1
PC16. calculate the volume of material needed to generate the part as per the code provided	8	-	-	2
PC17. load adequate consumable material into the machine for non-stop working of the machine	2	4	-	1
PC18. pre-heat the bed of the machine to adequate temperature as per process specifications	2	2	-	1
PC19. set the laser or nozzles temperature to defined values as per process specification	-	2	-	1
<i>Operate and perform post-printing operations</i>	8	11	-	4
PC20. operate the machine, identify and rectify process errors if any	-	2	-	1
PC21. use emergency stop button in case of any unwanted situation	-	2	-	1
PC22. remove the part from machine without damaging its structure.	4	3	-	1
PC23. identify & carefully remove the support structures present in the fabricated part	2	2	-	-
PC24. clean the part for improving the surface finish	2	2	-	1
<i>Inspection & storage of parts produced</i>	4	2	-	3
PC25. inspect the part as per the drawing/process and if non-conforming, take action for rework or rejection	2	1	-	2
PC26. store & preserve the automotive parts manufactured	2	1	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS Total	40	40	-	20

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N6811
NOS Name	Select and operate 3D Printing machine for product generation
Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Plant and Equipment Maintenance
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
NSQC Clearance Date	30/09/2021

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training centre based on these criteria.
5. In case of successfully passing only certain number of NOSs, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.
6. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack

Minimum Aggregate Passing % at QP Level : 70

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N9810.Manage work and resources (Manufacturing)	50	30	-	20	100	15
ASC/N9812.Interact effectively with team, customers and others	50	30	-	20	100	10
ASC/N6503.Perform testing and validation of materials	40	40	-	20	100	25
ASC/N6504.Develop alternate material for improving the product quality	40	40	-	20	100	25
ASC/N6811.Select and operate 3D Printing machine for product generation	40	40	-	20	100	25
Total	220	180	-	100	500	100

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
HSE	Health Safety and Environment
ISO	International Organization for Standardization
NABL	National Accreditation Board for Testing and Calibration Laboratories
PFMEA	Process Failure Mode Effects Analysis
NDT	Non-Destructive Testing
PCN	Process Change Note
CFT	Complement Fixation Test

Glossary

Sector	Sector is a conglomeration of different business operations having similar business 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.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a 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 quality of performance required.
Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.

Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today’s world. These skills are typically needed in any work environment in today’s world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.