

Qualification Pack



Test Engineer-Product/Vehicle

QP Code: ASC/Q8403

Version: 1.0

NSQF Level: 5

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Qualification Pack

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ASC/Q8403: Test Engineer-Product/Vehicle

Brief Job Description

This role is responsible for conducting various indoor tests on automobile aggregates like engines, transmission system, braking system, fuel handling system, electrical and electronic components, body frames etc. as well as testing of built up vehicle prototypes in a simulated laboratory environment and on road setup, ensuring proper setup of test apparatus, documenting test results and presenting first level analysis report to the test manager.

Personal Attributes

The individual should have passions for automobiles & driving and should be willing to work in a testing environment of long hours and doing repetitive work. The individual should possess coordination and interpersonal skills, demonstrate analytical reasoning, technology savvy, customer orientation, oral and written communication skills, good observations skills, ability to plan and prioritize work, quality consciousness, sensitivity to problem solving, quick decision making, safety orientation, dexterity and high precision.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [ASC/N0006: Maintain a safe and healthy working environment](#)
2. [ASC/N0022: Ensure implementation of 5S activities at the shop floor & the office area](#)
3. [ASC/N8405: Arrange for engine test apparatus and test the engine as per the internal process standards and external regulations](#)
4. [ASC/N8406: Conduct indoor tests in various System Evaluation Laboratories to test mechanical, metallurgical and operating performance of the aggregates](#)
5. [ASC/N8407: Conduct Vehicle Performance tests in a controlled internal/on road test setup](#)
6. [ASC/N8408: Testing vehicle dynamics and vehicle performance during outdoor testing of prototype vehicles](#)

Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Research & Development

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Occupation	Testing
Country	India
NSQF Level	5
Credits	NA
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3115.0202
Minimum Educational Qualification & Experience	B.E./B.Tech (Mechanical/Automobile/Electrical & Electronics/Instrumentation) with 2-3 years of experience Automotive testing
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	Latest automobile and aggregate testing methods Testing apparatus setup and instrumentation Automotive industry regulations and standards Problem Solving Techniques Quality Management Systems Stress management techniques Team management skills IT and ERP Awareness 5S and Safety aspects
Minimum Job Entry Age	18 Years
Last Reviewed On	30/12/2013
Next Review Date	31/03/2022
NSQF Approval Date	05/08/2015
Version	1.0
Reference code on NQR	2015/AUT/ASDC/01091
NQR Version	1.0

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ASC/N0006: Maintain a safe and healthy working environment

Description

This NOS 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 and training team members on health and safety related issues

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

Elements and Performance Criteria

Identify and report the risks identified

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

- 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

Create and sustain a Safe, clean and environment friendly work place

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

- PC5..** Follow the instructions given on the equipment manual describing the operating process of the equipments
- PC6..** Follow the Safety, Health and Environment related practices developed by the organization
- PC7.** Operate the machine using the recommended Personal Protective Equipments (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.
- PC11.** Inform appropriately the medical officer/ HR in case of self or an employees illness of contagious nature so that preventive actions can be planned for others

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

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- KU1.** relevant standards, procedures and policies related to Health, Safety and Environment followed in the company
- KU2.** basic knowledge of Safety procedures(fire fighting, first aid) within the organization
- KU3.** knowledge of various types of PPEs and their usage
- KU4.** basic knowledge of risks/hazards associated with each occupation in the organization
- KU5.** how to safely operate various tools and machines and risks associated with the tools/ equipment
- KU6.** knowledge of personal hygiene and how an individual can contribute towards creating a highly safe and clean working environment

Generic Skills (GS)

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

- GS1.** write basic level notes and observations
- GS2.** read safety instructions put up across the plant premises
- GS3.** read safety precautions mentioned in equipment manuals and panels to understand the potential risks associated
- GS4.** effectively communicate information to team members
- GS5.** inform employees in the plant and concerned functions about events, incidents & potential risks observed related to Safety, Health and Environment.
- GS6.** question operator/ supervisor in order to understand the safety related issues
- GS7.** attentively listen with full attention and comprehend the information given by the speaker during safety drills and training programs
- GS8.** use common sense and make judgments during day to day basis
- GS9.** use reasoning skills to identify and resolve basic problems
- GS10.** use common sense and make judgments during day to day basis
- GS11.** use reasoning skills to identify and resolve basic problems

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Identify and report the risks identified</i>	8	23	-	-
PC1.. Identify activities which can cause potential injury through sharp objects, burns, fall, electricity, gas leakages, radiation, poisonous fumes, chemicals ,loud noise	3	6	-	-
PC2. Inform the concerned authorities about the potential risks identified in the processes, workplace area/ layout, materials used etc	2	6	-	-
PC3. Inform the concerned authorities about machine breakdowns, damages which can potentially harm man/ machine during operations	2	6	-	-
PC4. Create awareness amongst other by sharing information on the identified risks	1	5	-	-
<i>Create and sustain a Safe, clean and environment friendly work place</i>	17	52	-	-
PC5.. Follow the instructions given on the equipment manual describing the operating process of the equipments	3	7	-	-
PC6.. Follow the Safety, Health and Environment related practices developed by the organization	3	8	-	-
PC7. Operate the machine using the recommended Personal Protective Equipments (PPE)	3	8	-	-
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	2	8	-	-
PC9. Maintain high standards of personal hygiene at the work place	2	7	-	-
PC10. Ensure that the waste disposal is done in the designated area and manner as per organization SOP.	3	8	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. Inform appropriately the medical officer/ HR in case of self or an employees illness of contagious nature so that preventive actions can be planned for others	1	6	-	-
NOS Total	25	75	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N0006
NOS Name	Maintain a safe and healthy working environment
Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Maintenance
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	15/09/2013
Next Review Date	31/03/2022
NSQC Clearance Date	20/07/2015

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ASC/N0022: Ensure implementation of 5S activities at the shop floor & the office area

Description

This NOS is about overseeing the implementation of all 5 S activities both at the shop floor and the office area by the team members and training the team in implementation of the 5S principles

Scope

The individual needs to

- Ensure sorting, streamlining/ organizing, storage and documentation, systematic cleaning, standardization and sustenance across the plant and office premises of the organization as given in the organization guidelines

Elements and Performance Criteria

Ensure proper sorting of items at the work place

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

- PC1..** ensure all recyclable materials are put in designated containers
- PC2.** ensure no tools, fixtures & jigs are lying on workstations unless in use and no un-necessary items is lying on workbenches or work surfaces unless in use
- PC3.** ensure that the operators and other team members are segregating the waste in hazardous/ non hazardous waste as per the sorting work instructions
- PC4.** ensure that all the operators are following the technique of waste disposal and waste storage in the designated bins
- PC5..** segregate the items which are labelled at red tag items for the process area and keep them in the correct places
- PC6..** 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
- PC7.** check for return of any type of extra material and tools to the designated sections and make sure that no additional material/ tool is lying near the work area
- PC8. .** oversee removal of unnecessary equipment, storage, furniture, unneeded inventory, supplies, parts and material
- PC9.** ensure that areas of material storage areas are not overflowing
- PC10.** ensure proper stacking and storage of 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

Ensure proper documentation and storage - streamlining & organizing the workplace

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

- PC11.** ensure that the team follows the given instructions and checks for labelling of fluids, oils lubricants, solvents, chemicals etc and proper storage of the same to avoid spillage, leakage, fire etc

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- PC12.** make sure that all material and tools are stored in the designated places and in the manner indicated in the 5s instructions
- PC13.** ensure that organizing the workplace takes place with due considerations to the principles of wasted motions, ergonomics, work & method study .

Ensure cleaning of self and the work place

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

- PC14.** ensure that the area has floors swept, machinery clean and is generally neat and tidy in case of cleaning, ensure that correct displays are maintained on the floor which indicate potential safety hazards
- PC15..** ensure workbenches and work surfaces are clean and in good condition
- PC16..** ensure adherence to the cleaning schedule for the lighting system to ensure proper illumination
- PC17..** ensure all recyclable materials are put in designated containers

Ensure standardization

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

- PC18.** ensure that daily cleaning standards and schedules to create a clean working environment are followed across the plant
- PC19..** ensure all recyclable materials are put in designated containers
- PC20. .** ensure logical and user friendly documentation and file management for all activities across the plant and create guidelines around standardization of processes
- PC21.** ensure timely creation and sharing of the 5s checklists
- PC22.** ensure that the 5s manual are available as per the timelines

Ensure sustenance

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

- PC23.** ensure team cooperation during the audit of 5 s activities
- PC24.** ensure that workmen are periodically trained to address challenges related to 5s
- PC25..** participate actively in employee work groups on 5s and encourage team members for active participation
- PC26..** oversee that the staff/operators are trained and fully understand 5s procedures
- PC27. .** ensure that all the guidelines for what to do and what not to do to build sustainability in 5s are mentioned in the 5s check lists/ work instructions and are easily searchable
- PC28.** ensure continuous training of the team members on 5s in order to increase their awareness and support implementation
- PC29.** ensure that all visual controls, notice boards, symbols etc at the manufacturing place are created, working and are put up as per the requirement

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant standards, procedures and policies related to 5S followed in the company
- KU2.** have basic knowledge of 5S procedures
- KU3.** know various types 5s practices followed in various areas

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- KU4.** understand the 5S checklists provided in the department/ team
- KU5.** have skills to identify useful & non useful items
- KU6.** have knowledge of labels , signs & colours used as indicators
- KU7.** Have knowledge on how to sort and store various types of tools,equipment, material etc
- KU8.** know , how to identify various types of waste products
- KU9.** understand the impact of waste/ dirt/ dust/unwantedsubstances on the process/ environment/ machinery/ humanbody
- KU10.** have knowledge of best and environment protective ways ofcleaning & waste disposal
- KU11.** understand the importance of standardization in processes
- KU12.** understand the importance of sustainability in 5S
- KU13.** have knowledge of TQM process
- KU14.** have knowledge of various materials and storage norms
- KU15.** understand visual controls, symbols, graphs etc

Generic Skills (GS)

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

- GS1.** write basic level notes and observations
- GS2.** note down observations (if any) related to the process
- GS3.** write information documents to internal departments/ internal teams
- GS4.** read 5S instructions put up across the plant premises
- GS5.** effectively communicate information to team members inform employees in the plant and concerned functions about 5S
- GS6.** question the process head in order to understand the 5S related issues
- GS7.** attentively listen with full attention and comprehend the information given by the speaker during 5S training programs
- GS8.** use common sense and make judgments during day to day basis
- GS9.** use reasoning skills to identify and resolve basic problems using 5S
- GS10.** persuade team members to follow 5 S
- GS11.** ensure that the team members understand the importance of using 5 S tool
- GS12.** use innovative skills to perform and manage 5 S activities at the work desk and the shop floor
- GS13.** exhibit inquisitive behaviour to seek feedback and question on the existing set patterns of work emerge, techniques in CA/CI around 5 S work practices
- GS14.** do what is right, not what is a popular practice
- GS15.** follow shop floor rules& regulations and avoid deviations
- GS16.** lead by example in the plant premises while performing activities related to 5S
- GS17.** ensure self-cleanliness on a daily basis
- GS18.** demonstrate the will to keep the work area in a clean and orderly manner
- GS19.** accept additional responsibility for self and the team
- GS20.** encourage self and other to take greater responsibilities for managing 5S

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- GS21.** identify obstacles and bottlenecks in the process and find basic level solutions for removing these obstacles
- GS22.** use previous experience in resolving problems and taking decisions
- GS23.** make timely and independent decisions on the line/ shift within the boundaries of the delegation matrix of the organization

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Ensure proper sorting of items at the work place</i>	10	25	-	-
PC1.. ensure all recyclable materials are put in designated containers	1	2.5	-	-
PC2. ensure no tools, fixtures & jigs are lying on workstations unless in use and no un-necessary items is lying on workbenches or work surfaces unless in use	1	2.5	-	-
PC3. ensure that the operators and other team members are segregating the waste in hazardous/ non hazardous waste as per the sorting work instructions	1	2.5	-	-
PC4. ensure that all the operators are following the technique of waste disposal and waste storage in the designated bins	1	2.5	-	-
PC5.. segregate the items which are labelled at red tag items for the process area and keep them in the correct places	1	2.5	-	-
PC6.. 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	1	2.5	-	-
PC7. check for return of any type of extra material and tools to the designated sections and make sure that no additional material/ tool is lying near the work area	1	2.5	-	-
PC8. . oversee removal of unnecessary equipment, storage, furniture, unneeded inventory, supplies, parts and material	1	2.5	-	-
PC9. ensure that areas of material storage areas are not overflowing	1	2.5	-	-
PC10. ensure proper stacking and storage of 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	1	2.5	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Ensure proper documentation and storage - streamlining & organizing the workplace</i>	3	7.5	-	-
PC11. ensure that the team follows the given instructions and checks for labelling of fluids, oils lubricants, solvents, chemicals etc and proper storage of the same to avoid spillage, leakage, fire etc	1	2.5	-	-
PC12. make sure that all material and tools are stored in the designated places and in the manner indicated in the 5s instructions	1	2.5	-	-
PC13. ensure that organizing the workplace takes place with due considerations to the principles of wasted motions, ergonomics, work & method study .	1	2.5	-	-
<i>Ensure cleaning of self and the work place</i>	4	10	-	-
PC14. ensure that the area has floors swept, machinery clean and is generally neat and tidy in case of cleaning, ensure that correct displays are maintained on the floor which indicate potential safety hazards	1	2.5	-	-
PC15.. ensure workbenches and work surfaces are clean and in good condition	1	2.5	-	-
PC16.. ensure adherence to the cleaning schedule for the lighting system to ensure proper illumination	1	2.5	-	-
PC17.. ensure all recyclable materials are put in designated containers	1	2.5	-	-
<i>Ensure standardization</i>	5	12.5	-	-
PC18. ensure that daily cleaning standards and schedules to create a clean working environment are followed across the plant	1	2.5	-	-
PC19.. ensure all recyclable materials are put in designated containers	1	2.5	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC20. . ensure logical and user friendly documentation and file management for all activities across the plant and create guidelines around standardization of processes	1	2.5	-	-
PC21. ensure timely creation and sharing of the 5s checklists	1	2.5	-	-
PC22. ensure that the 5s manual are available as per the timelines	1	2.5	-	-
<i>Ensure sustenance</i>	7	16	-	-
PC23. ensure team cooperation during the audit of 5 s activities	1	2.5	-	-
PC24. ensure that workmen are periodically trained to address challenges related to 5s	1	2.5	-	-
PC25.. participate actively in employee work groups on 5s and encourage team members for active participation	1	2	-	-
PC26.. oversee that the staff/operators are trained and fully understand 5s procedures	1	2	-	-
PC27. . ensure that all the guidelines for what to do and what not to do to build sustainability in 5s are mentioned in the 5s check lists/ work instructions and are easily searchable	1	2.5	-	-
PC28. ensure continuous training of the team members on 5s in order to increase their awareness and support implementation	1	2	-	-
PC29. ensure that all visual controls, notice boards, symbols etc at the manufacturing place are created, working and are put up as per the requirement	1	2.5	-	-
NOS Total	29	71	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N0022
NOS Name	Ensure implementation of 5S activities at the shop floor & the office area
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	15/03/2014
Next Review Date	31/03/2022
NSQC Clearance Date	NA

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ASC/N8405: Arrange for engine test apparatus and test the engine as per the internal process standards and external regulations

Description

This NOS is about arranging the testing apparatus, conducting mechanical testing the prototype engine using the dynamometer test, emission test and other techniques for testing the performance of the engine

Scope

The role holder will be responsible for:

- Understanding the testing requirement and the process
- Conducting dynamometer testing, swirl testing and emissions testing on the engine This NOS will be applicable to all types of automobiles i.e. 2 wheelers, 3 wheelers , 4 wheelers and heavy vehicles

Elements and Performance Criteria

Understanding the testing requirement and the process

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

- PC1..** ensure that the team members understand and follow all the does and donts of the testing process as defined in sops/ work instructions or defined by supervisors/ master technicians
- PC2..** understand the engine testing requirements (based on the type of engine to be tested) as mentioned in the testing instructions sheets/ work instructions/ testing control plan
- PC3..** understand the testing methodology, equipment and process required as per the process manuals/ work instructions/standard operating procedures
- PC4..** ensure that the correct testing document containing the specified setup drawing, testing schedules, testing parameters, test specifications and test outcome ranges are mentioned
- PC5..** ensure all tools and equipment required for testing are present near the engine testing platform/test bench/ test chamber/ dynamometer
- PC6..** ensure that the testing platform/ test bench/ test chamber/dynamometer is clean and free of any external factors which may impact the test results

Conduct the dynamometer test for the engine

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

- PC7..** prepare the dynamometer test platform and the prototype engine for testing
- PC8..** ensure that the engine is mounted on the testing bench/ testing platform and is securely clamped
- PC9..** connect the engine to the dynamometer as per the instructions mentioned in the testing instruction manual/ work instructions/ control plan
- PC10..** ensure that all the dynamometer test auxiliaries like starters, air intake fans, exhaust systems, air and oil filters, wire connections, instrumentation connections, fuel supply connections etc. are connected as per the testing instructions/ standard operating procedures
- PC11..** ensure that the connections checklist is cross checked to complete the test setup

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- PC12..** ensure that the specified modules are selected from the test computer controls in order to execute the test and record the observations
- PC13..** ensure that the engine is filled with the specified quantity of oil and fuel as mentioned in the instruction manual before starting the testing
- PC14..** start the engine, ensure that it starts within the correct time period. keep the engine in the start mode and then turn it off. ensure that the engine start and turn off time is as per the test performance range
- PC15..** start the engine again and carry out the remaining tests
- PC16..** ensure that the start sequence of the engine is as per the specifications given in testing manual
- PC17..** increase throttle (power) application on the engine to observe performance on different stages of throttle and output of the engine
- PC18..** ensure completion of the full throttle performance (ftp) / part throttle performance (ptp) test to understand the engine performance under different loading conditions
- PC19..** record the observations of stationary power, torque output and roll of the engine and conduct first level performance analysis
- PC20..** check the flow of air, oil, fuel through the engine as per the required performance standards mentioned in the testing manual
- PC21..** check for any leakages in air, oil and fuel, temperature and pressure of the fuel and oil in the engine combustion chamber using the test instrumentation and observation displays on the computer controlled dynamometer test apparatus
- PC22..** check the fuel and oil flow during various stages of power application as per the testing checklist
- PC23..** check the engine piston displacement, fuel injection system and the ignition system parameters as per the testing checklist
- PC24..** check the physical components of the engine like filters, pumps, gaskets etc. to determine any kind of leakage and physical damage/ deformations
- PC25..** shut down the engine after running it for the prescribed time limit
- PC26..** again restart the engine after the pre decided time interval (10 15 minutes) to repeat the tests and record observations
- PC27..** shut down the engine and remove the engine accessories like pumps and filters to check for any impurities and contaminations
- PC28..** ensure safe demounting of engine and accessories from the dynamometer test platform

Conduct emission testing for the engines

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

- PC29..** ensure proper connections of the engine and engine accessories to the dynamometer testing platform
- PC30..** addition to the dynamometer, connect the engine exhaust to the exhaust gas analysis system and the data acquisition system and data loggers for recording and analysing the gas and smoke exhaust
- PC31..** run the engine at different power levels and note the observations on the exhaust gas analysis system
- PC32..** observe the displays on the gas analyser/ infrared analysers/ gas chromatograph to measure the exhaust levels of Hydrocarbons (HC), Carbon Monoxide (CO), Carbon Dioxide (CO₂), Nitrogen Oxide(NO) and Nitrogen Dioxide/ Trioxide (NO_x)

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- PC33..** compare the levels of hc and gases with the standards/ environmental regulations for the type of the engine and vehicle
- PC34..** for diesel engines conduct the dilution tunnel test for measuring the particulate matter in diesel engines
- PC35..** ensure the dilution tunnel test apparatus is connected to the engine and the test procedure is as per the testing process manual
- PC36..** ensure the measurement of fuel combustion rate and analysis of fuel combustion process to meet the required air/ fuel ratio as specified in the testing instructions/ testing manual

Conduct the Swirl Test on the engine

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

- PC37..** prepare the test apparatus for the swirl test as per the testing procedure established for the particular engine
- PC38..** ensure connection of surge tank, pressure monitoring devices, swirl meters and the required valves as per the procedure given in the testing manual/ testing instructions
- PC39..** conduct swirl test on diesel engines. ensure measurement by mean flow coefficients and mean swirl values for the input port of the engine
- PC40..** calculate the mean flow coefficients at the output port of the engine
- PC41..** ensure first level comparison of the swirl test results with the cfd test conducted using paddle wheel methodology
- PC42..** record observations of any deviations from the standard values and inform the concerned teams

Analysis of test results

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

- PC43..** collate all the test results in the required formats as prepared by the core r&d team
- PC44..** compare the test results with the standard values recommended by the cross functional engine design team and highlight any deviations
- PC45..** compare the test results with the regulatory norms especially on emissions and ensure that the engine design team is informed of the results in order to take corrective steps
- PC46..** compare the test results with benchmarked values for engine performance, emissions, fuel consumption
- PC47..** ensure plotting of power curves and torque curves to analyze engine performance

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.** new products manufactured by the company
- KU3.** internal product standards finalized within the organization
- KU4.** functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
- KU5.** quality norms and standards prescribed in the Quality Manual by the organization
- KU6.** 5S and Safety norms practiced in the organization
- KU7.** the working of the internal combustion engine (Petrol/ Diesel)/ CNG engines

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- KU8.** different parts of the engine and related accessories injection, ignition, piston, cylinder block, inlet & outlet valve
- KU9.** fundamentals of instrumentation and usage of flow meters for checking fuel and lubrication flow, smoke meters, power transducers, temperature sensors, particle sensors
- KU10.** process for setting up of test benches, test platforms and test apparatus
- KU11.** different parameters used to evaluate the performance of the engine
- KU12.** various national and international regulations, norms and standards on vehicles and engine performance regulations related to emissions (gases & smoke), engine output, Bharat Stage norms for 2 wheeler, 3 wheeler and 4 wheelers
- KU13.** various defects related to engines and potential impact on the working of the final vehicle
- KU14.** relationship of engine performance with other operating parameters in an automobile
- KU15.** different instruments and tools used for engine testing dynamometer (fixed and chassis dynamometer), eddy current dynamometers, swirl testing equipment
- KU16.** different instruments used for emissions analysis like gas analyser, chromatographs
- KU17.** basic working of Data Acquisition Systems and Data Loggers
- KU18.** analytical tools like Histogram analysis, Pareto Analysis, Why Why analysis, Process Mapping, Ishikawa (Fishbone) analysis
- KU19.** basic laws of physics, chemistry, metallurgy & mathematics
- KU20.** basic laws of geometry and product design
- KU21.** the methods of using instruments like Vernier callipers, micrometres, rulers and other inspection tools
- KU22.** how to read and interpret sketches and engineering drawings
- KU23.** potential health and safety hazards and related safety precautions

Generic Skills (GS)

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

- GS1.** document information from the manuals, discussion notes, process charts etc.
- GS2.** create small notes/ work documents/ diagrams for operators and helpers to help them understand the process
- GS3.** write inter departmental notes/ memos or make suitable entries in the online system
- GS4.** use emails and other business correspondence methods (internal memos, circular etc.) for communicating with other team members/ vendors/ suppliers etc.
- GS5.** read equipment manuals and process documents to understand the equipment and processes better
- GS6.** read internal information memos send by internal customers (other functions within the organization)
- GS7.** discuss task lists, schedules, and work-loads with the operative team members
- GS8.** answer the queries raised by the operative team as well as intercompany departments
- GS9.** effectively communicate with the operators and helpers and make them aware of work expectations, targets, policies, processes etc.
- GS10.** attentively listen with full attention the queries and grievances raised by the operative team and comprehend the information given by the speaker

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- GS11.** break the problem into smaller issues and tasks to arrive at a solution
- GS12.** understand inter process relationship and establish relationship between various parts of the problem
- GS13.** leverage experience to find effective solutions to problems
- GS14.** use basic analytical tools to arrive at solutions
- GS15.** plan, organize and prioritize the work order and jobs received from the manager
- GS16.** manage the schedule plan for the operators and helpers on the line/shift
- GS17.** validate all process/ equipment manuals so that the final process selected is correct
- GS18.** organize information, tools, manuals etc. so that sorting becomes easy
- GS19.** reorganize resources on the line/ shift in case of change of plans
- GS20.** use common sense and make judgments during day to day basis
- GS21.** use reasoning skills to identify and resolve problems
- GS22.** use intuition to detect any potential problems which could arise during operations
- GS23.** accept additional responsibility for self and the team
- GS24.** encourage self and other to take greater responsibilities
- GS25.** ensure that the work allocated to the team is completed as per timelines and quality norms
- GS26.** identify obstacles and bottlenecks in the process and on own find basic level solutions for removing these obstacles
- GS27.** identify faulty/ flawed part and processes by comparing new designed pieces with the work standard
- GS28.** link the fault observed with the overall impact on the performance of the component/ automobile
- GS29.** support and contribute in monitoring and delivering high quality output from self and others
- GS30.** train team members on maintaining quality standards set by the organization
- GS31.** gather information skilfully from multiple sources
- GS32.** analyse information in depth and identifies the problem in a timely manner
- GS33.** develop alternate solutions and resolves problems in early stages
- GS34.** Work tireless in spite of repeat activities in a diligent manner to resolve problems on a day to day basis
- GS35.** use previous experience in resolving problems and taking decisions
- GS36.** make timely and independent decisions within the boundaries of the delegation matrix of the organization
- GS37.** clearly establish a goal for self or others to accomplish
- GS38.** without instructions from the manager, self-manage the work
- GS39.** Take additional responsibilities to make sure that the work is completed on time
- GS40.** identify the needs of the customer
- GS41.** ensure that the product designed meets the expectation of the customer
- GS42.** understands importance of customer feedback and drives customer focus
- GS43.** familiarise with leading practices available in the market
- GS44.** think independently on new approaches to manufacturing process, material management, data management and team management

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- GS45.** represent any new ideas/ approaches on process improvement and productivity improvement to the seniors in the team
- GS46.** contribute to building a positive team spirit
- GS47.** identify individual strengths & maximize team performance
- GS48.** exhibit objectivity & openness to others views
- GS49.** collaborate with stakeholders to achieve the desired state of final result

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Understanding the testing requirement and the process</i>	4	6	-	-
PC1.. ensure that the team members understand and follow all the does and donts of the testing process as defined in sops/ work instructions or defined by supervisors/ master technicians	0.5	1	-	-
PC2.. understand the engine testing requirements (based on the type of engine to be tested) as mentioned in the testing instructions sheets/ work instructions/ testing control plan	1	1	-	-
PC3.. understand the testing methodology, equipment and process required as per the process manuals/ work instructions/standard operating procedures	1	1	-	-
PC4.. ensure that the correct testing document containing the specified setup drawing, testing schedules, testing parameters, test specifications and test outcome ranges are mentioned	0.5	1	-	-
PC5.. ensure all tools and equipment required for testing are present near the engine testing platform/test bench/ test chamber/ dynamometer	0.5	1	-	-
PC6.. ensure that the testing platform/ test bench/ test chamber/dynamometer is clean and free of any external factors which may impact the test results	0.5	1	-	-
<i>Conduct the dynamometer test for the engine</i>	16	28	-	-
PC7.. prepare the dynamometer test platform and the prototype engine for testing	1	1	-	-
PC8.. ensure that the engine is mounted on the testing bench/ testing platform and is securely clamped	0.5	1	-	-
PC9.. connect the engine to the dynamometer as per the instructions mentioned in the testing instruction manual/ work instructions/ control plan	1	1	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10.. ensure that all the dynamometer test auxiliaries like starters, air intake fans, exhaust systems, air and oil filters, wire connections, instrumentation connections, fuel supply connections etc. are connected as per the testing instructions/ standard operating procedures	0.5	1	-	-
PC11.. ensure that the connections checklist is cross checked to complete the test setup	0.5	1	-	-
PC12.. ensure that the specified modules are selected from the test computer controls in order to execute the test and record the observations	0.5	1	-	-
PC13.. ensure that the engine is filled with the specified quantity of oil and fuel as mentioned in the instruction manual before starting the testing	0.5	1	-	-
PC14.. start the engine, ensure that it starts within the correct time period. keep the engine in the start mode and then turn it off. ensure that the engine start and turn off time is as per the test performance range	0.5	1	-	-
PC15.. start the engine again and carry out the remaining tests	0.5	1	-	-
PC16.. ensure that the start sequence of the engine is as per the specifications given in testing manual	0.5	1	-	-
PC17.. increase throttle (power) application on the engine to observe performance on different stages of throttle and output of the engine	1	1	-	-
PC18.. ensure completion of the full throttle performance (ftp) / part throttle performance (ptp) test to understand the engine performance under different loading conditions	1	1	-	-
PC19.. record the observations of stationary power, torque output and roll of the engine and conduct first level performance analysis	1	1	-	-
PC20.. check the flow of air, oil, fuel through the engine as per the required performance standards mentioned in the testing manual	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21.. check for any leakages in air, oil and fuel, temperature and pressure of the fuel and oil in the engine combustion chamber using the test instrumentation and observation displays on the computer controlled dynamometer test apparatus	1	2	-	-
PC22.. check the fuel and oil flow during various stages of power application as per the testing checklist	1	2	-	-
PC23.. check the engine piston displacement, fuel injection system and the ignition system parameters as per the testing checklist	1	2	-	-
PC24.. check the physical components of the engine like filters, pumps, gaskets etc. to determine any kind of leakage and physical damage/ deformations	1	2	-	-
PC25.. shut down the engine after running it for the prescribed time limit	0.5	2	-	-
PC26.. again restart the engine after the pre decided time interval (10 15 minutes) to repeat the tests and record observations	0.5	1	-	-
PC27.. shut down the engine and remove the engine accessories like pumps and filters to check for any impurities and contaminations	0.5	1	-	-
PC28.. ensure safe demounting of engine and accessories from the dynamometer test platform	0.5	1	-	-
<i>Conduct emission testing for the engines</i>	6.5	11	-	-
PC29.. ensure proper connections of the engine and engine accessories to the dynamometer testing platform	0.5	1	-	-
PC30.. addition to the dynamometer, connect the engine exhaust to the exhaust gas analysis system and the data acquisition system and data loggers for recording and analysing the gas and smoke exhaust	1	2	-	-
PC31.. run the engine at different power levels and note the observations on the exhaust gas analysis system	1	1	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC32.. observe the displays on the gas analyser/ infrared analysers/ gas chromatograph to measure the exhaust levels of Hydrocarbons (HC), Carbon Monoxide (CO), Carbon Dioxide (CO ₂), Nitrogen Oxide(NO) and Nitrogen Dioxide/ Trioxide (NO _x)	1	2	-	-
PC33.. compare the levels of hc and gases with the standards/ environmental regulations for the type of the engine and vehicle	1	1	-	-
PC34.. for diesel engines conduct the dilution tunnel test for measuring the particulate matter in diesel engines	1	2	-	-
PC35.. ensure the dilution tunnel test apparatus is connected to the engine and the test procedure is as per the testing process manual	0.5	1	-	-
PC36.. ensure the measurement of fuel combustion rate and analysis of fuel combustion process to meet the required air/ fuel ratio as specified in the testing instructions/ testing manual	0.5	1	-	-
<i>Conduct the Swirl Test on the engine</i>	4.5	10	-	-
PC37.. prepare the test apparatus for the swirl test as per the testing procedure established for the particular engine	0.5	1	-	-
PC38.. ensure connection of surge tank, pressure monitoring devices, swirl meters and the required valves as per the procedure given in the testing manual/ testing instructions	0.5	1	-	-
PC39.. conduct swirl test on diesel engines. ensure measurement by mean flow coefficients and mean swirl values for the input port of the engine	1	2	-	-
PC40.. calculate the mean flow coefficients at the output port of the engine	1	2	-	-
PC41.. ensure first level comparison of the swirl test results with the cfd test conducted using paddle wheel methodology	1	2	-	-
PC42.. record observations of any deviations from the standard values and inform the concerned teams	0.5	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Analysis of test results</i>	4	10	-	-
PC43.. collate all the test results in the required formats as prepared by the core r&d team	0.5	2	-	-
PC44.. compare the test results with the standard values recommended by the cross functional engine design team and highlight any deviations	1	2	-	-
PC45.. compare the test results with the regulatory norms especially on emissions and ensure that the engine design team is informed of the results in order to take corrective steps	1	2	-	-
PC46.. compare the test results with benchmarked values for engine performance, emissions, fuel consumption	1	2	-	-
PC47.. ensure plotting of power curves and torque curves to analyze engine performance	0.5	2	-	-
NOS Total	35	65	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8405
NOS Name	Arrange for engine test apparatus and test the engine as per the internal process standards and external regulations
Sector	Automotive
Sub-Sector	Manufacturing and R&D
Occupation	Testing
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2013
Next Review Date	31/03/2022
NSQC Clearance Date	NA

Qualification Pack

ASC/N8406: Conduct indoor tests in various System Evaluation Laboratories to test mechanical, metallurgical and operating performance of the aggregates

Description

This NOS is about conducting various indoor tests in different System Evaluation Laboratories to test the mechanical, metallurgical and operating performance parameters of the individual aggregates, collate the test results and analyse the same

Scope

The role holder will be responsible for:

- understanding the testing requirement and the process
- measuring the Noise, Vibrations and Harshness of the engine and aggregates
- measurement of fatigues levels and testing of material strength This NOS will be applicable to all types of automobiles i.e. 2 wheelers, 3 wheelers , 4 wheelers and heavy vehicles

Elements and Performance Criteria

Understanding the testing requirement and the process

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

- PC1..** understand the component testing requirements (based on the type of component to be tested) as mentioned in the testing instructions sheets/ work instructions/ testing control plan
- PC2..** understand the testing methodology, equipment and process required as per the process manuals/ work instructions/standard operating procedures
- PC3..** ensure that the correct testing document containing the specified setup drawing, testing schedules, testing parameters, test specifications and test outcome ranges are mentioned
- PC4..** ensure all tools and equipment required for testing are present near the testing platform/test bench/ test chamber
- PC5..** ensure that the testing platform/ test bench/ test chamber is clean and free of any external impurities which may impact the test results

Measurement of Noise, Vibration and Harshness (NVH) at the Noise and Acoustic Testing Laboratory

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

- PC6..** ensure that the engine and component semi anechoic chamber is clean and free from any dust and external impurities
- PC7..** ensure that the semi anechoic chamber has all the required equipment and tools for conduction the noise, vibration and harshness test of the engine and other components
- PC8..** connect the engine with the dynamometer as per the instructions mentioned in the testing instruction manual/ work instructions/ control plan

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- PC9..** ensure that all the dynamometer test auxiliaries like starters, air intake fans, exhaust systems, air and oil filters, wire connections, instrumentation connections, fuel supply connections etc. are connected as per the testing instructions/ standard operating procedures
- PC10..** ensure that the fitter connects all the data logging devices/ sound absorption devices& microphones as mentioned in the work instructions/ standard operating principle manual
- PC11..** ensure that the connections checklist is cross checked to complete the test setup
- PC12..** ensure proper connections of the sound meter, vibration meters and other data acquisition system for recording noise and vibrations present during the engine run process
- PC13..** switch on the dynamometer and apply various levels of throttle
- PC14..** ensure that any unwanted noises like squeaks, rattles and other engine noises are captured during the test and recorded
- PC15..** ensure that the various noise and vibration producing components like gear box, transmission shafts, wheels, silencer, exhaust pipes, radiators, compressors etc. are connected to the acoustic holography equipment, sound level meters and vibration meters to measure the noise and vibration levels of these components during the engine run on no load/ on load and full load conditions
- PC16..** ensure that other than the noise and vibration produced, the acoustic testing equipment also captures the sound absorption potential and damping potential of the components (and material used in the components)
- PC17..** ensure that other than the engine operation noise and vibrations, noise related to intake and exhaust are also correctly captured.
- PC18..** correctly connect test component and the acoustic meters and ensure measurement of source sound and capability of the material to absorb the noise by testing the components in the reverberation room
- PC19..** conduct advanced modal analysis (using electromagnetic shakers), operational modal analysis, transfer path analysis, frequency analysis, sound quality analysis and sensitivity analysis and represent findings to the testing manager
- PC20..** conduct damping ratio analysis, sound intensity mapping and noise contribution analysis for all tested components
- PC21..** ensuring recording and reporting procedures and systems are in place at the time of conducting the nvh tests
- PC22..** ensure correctness in data capturing and data recording for all sources of noise
- PC23..** collate all the test results in the required formats as prepared by the core r&d team
- PC24..** compare the test results with the standard values recommended by the cross functional design team and highlight any deviations
- PC25..** compare the test results with the regulatory norms especially central motor vehicle regulations on nvh and ensure that the engine design team is informed of the results in order to take corrective steps
- PC26..** compare the test results with benchmarked values for noise, vibration and harshness and with the previous test results
- PC27..** ensure regular cleaning and maintenance of fatigue lab equipment like fatigue testing machines, servo hydraulic actuators, material testing machine, impact testing machine, bending machines, torsional machines
- PC28..** ensure development of the test bogey for conducting the structural durability tests/ fatigue test/ stress test to be conducted in the structure durability laboratory

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- PC29..** ensure design and fabrication of the fixtures for conducting the durability tests
- PC30..** ensure test setup for components undergoing repeated vibrations and subjecting to frequent stresses like fuel tank, fuel system, crankshaft, connecting rods, suspension, powertrain and axle system
- PC31..** ensure proper connection of instruments like strain gauge, load cell and other servo hydraulics machines to induce and measure stress levels on the components
- PC32..** ensure that the laboratory fitter is making the required connections with stress inducing equipment and data logger/ data acquisition system as mentioned in the standard operating procedure manual/ work instructions
- PC33..** make sure that the correct testing parameters are selected and accordingly test positions are defined for the process

Measurement of Fatigue levels and structural dynamics in the Stress/ Fatigue testing laboratory

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

- PC34..** conduct performance and durability tests on various types of suspension springs like coil spring, leaf spring and various shock absorbers . ensure measurement and recording of key data points like application of force, test cycle, deformation etc.
- PC35..** conduct resonance testing for critical automotive components like chassis frame, cross member, gears, transmission rods, crankshafts etc. to detect cracks, breaks and related metallurgical damage and also ensure durability of these components under repeated high stress environment
- PC36..** conduct strength test for various automobile components like door frames, door latches, windows, clutch pedals, brake shoe & pedal, accelerator pedals, steering wheel & column etc.
- PC37..** conduct measurement of bending strength of the crankshafts, transmission rods, gear teeth by conducting the bending and distortion strength test rig
- PC38..** setup the strain and shearing test apparatus for testing of brake lines. conduct testing of brake discs, brake lining, brake calipers and brake systems
- PC39..** conduct durability and strength tests for belts, straps and buckles of the safety system
- PC40..** in case of durability tests done under different controlled environment conditions, ensure that the dust shower apparatus, mist chamber, environment chamber and water spray booth are regularly cleaned and maintained
- PC41..** ensure setting up of dust shower, mist chamber, environment chamber and water shower apparatus and selection of spray parameters like test cycle time, velocity and angle of spray, temperature and humidity inside the test chamber
- PC42..** collate all the test results in the required formats as prepared by the core r&d team
- PC43..** compare the test results with the standard values recommended by the cross functional conceptualization and design team and highlight any deviations
- PC44..** compare the test results with the regulatory norms on vehicle structures, metallurgical strength parameters, life cycle durability and ensure that the design and prototyping team is informed of the results in order to take corrective steps
- PC45..** compare the test results with benchmarked values for stress, fatigues and durability tests and the previous tests conducted. compare test results for performance before and after the durability test cycles and highlight deviations if any.
- PC46..** conduct first level fmea and root cause analysis post comparison of test results. ensure that the first level analysis is timely shared with the testing manager

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- PC47..** ensure selection of specified type of material testing process as indicated in the testing manual/ work instructions
- PC48..** connect the component under test to the respective material testing
- PC49..** device as per the standard operating procedures
- PC50..** ensure testing of all metallic & non metallic components, fluids, oils and lubes used in the components and automobiles
- PC51..** ensure testing of components as per the national and international standards defined for automobile industry performance

Testing of materials used in components and vehicle manufacturing

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

- PC52..** conduct component surface analysis and component failure analysis using spectroscopy technique
- PC53..** ensure loading of the test component in the universal testing machine (utm) as per the instructions defined in the testing manual/ sop manual
- PC54..** conduct the tensile and compression tests on the components as per the process mentioned in work instructions/ control plan
- PC55..** analyze various stress related parameters like elasticity, poisson ratio (stress/ strain), stress strain curves and share first level results with the test manager
- PC56..** conduct spectrometer test and viscosity test on polymer products, oils and lubricants as per the test instructions given in the sop manual
- verify the hardness of various material using the rockwell hardness test as per the test instructions given in the sop manual

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant manufacturing and testing standards and procedures followed in the company
- KU2.** new products manufactured by the company
- KU3.** internal product standards finalized within the organization
- KU4.** functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
- KU5.** quality norms and standards prescribed in the Quality Manual by the organization
- KU6.** 5S and Safety norms practiced in the organization
- KU7.** the working of various automobile components
- KU8.** fundamentals of testing instruments like UTMs, hardness testing machines spectrometers, spectroscopes, microstructure analysers, refractometers, PH meters, Humidity Analysers, fatigue testing machines and impact testing machines
- KU9.** fundamentals of servo hydraulics, acoustics holography, sound meters, vibration meters
- KU10.** working of load cells and strain gauges and connecting them for test process
- KU11.** fundamental structure and working of anechoic chambers and reverberation chambers
- KU12.** fundamentals of instrumentation and usage of flow meters for checking fuel and lubrication flow, smoke meters, power transducers, temperature sensors, particle sensors process for setting up of test

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- KU13.** benches, test platforms and test apparatus various types of tests used to evaluate the design and performance of various automotive components different parameters used to evaluate the performance of the components
- KU14.** various national and international regulations, norms and standards on vehicles and engine performance regulations related to noise, vibrations, durability, reliability factors for 2 wheeler, 3 wheeler and 4 wheelers under normal and difficult environmental conditions
- KU15.** various defects related to reliability and durability of the component and impact of the defect on the final component and vehicle performance
- KU16.** basic working of Data Acquisition Systems and Data Loggers analytical tools like Histogram analysis, Pareto Analysis, Why Why analysis, Process Mapping, Ishikawa (Fishbone) analysis
- KU17.** basic laws of physics, chemistry. metallurgy and mathematics
- KU18.** basic laws of geometry and product design
- KU19.** the methods of using instruments like Vernier callipers, micrometres, rulers and other inspection tools
- KU20.** how to read and interpret sketches and engineering drawings
- KU21.** potential health and safety hazards and related safety precautions

Generic Skills (GS)

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

- GS1.** document information from the manuals, discussion notes, process charts etc.
- GS2.** create small notes/ work documents/ diagrams for operators and helpers to help them understand the process
- GS3.** write inter departmental notes/ memos or make suitable entries in the online system
- GS4.** read equipment manuals and process documents to understand the equipment and processes better
- GS5.** read internal information memos send by internal customers (other functions within the organization)
- GS6.** discuss task lists, schedules, and work-loads with the operative team members
- GS7.** answer the queries raised by the operative team as well as intercompany departments
- GS8.** effectively communicate with the operators and helpers and make them aware of work expectations, targets, policies, processes etc.
- GS9.** attentively listen with full attention the queries and grievances raised by the operative team and comprehend the information given by the speaker
- GS10.** communicate effectively to the team members
- GS11.** identify conflicts in the team and try to resolve them at the earliest
- GS12.** interact and engage with the team members on a day to day basis
- GS13.** counsel and coach the operators and help them resolve issues
- GS14.** timely highlight to the management about any good work/ achievement by the operators and helpers
- GS15.** break the problem into smaller issues and tasks to arrive at a solution
- GS16.** understand inter process relationship and establish relationship between various parts of the problem

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- GS17.** leverage experience to find effective solutions to problems
- GS18.** use basic analytical tools to arrive at solutions
- GS19.** plan, organize and prioritize the work order and jobs received from the production manager
- GS20.** manage the schedule plan for the operators and helpers
- GS21.** validate all process/ equipment manuals so that the final process selected is correct
- GS22.** organize information, tools, manuals etc. on the shop floor so that sorting becomes easy
- GS23.** reorganize resources on the line/ shift in case of change of plans
- GS24.** use common sense and make judgments during day to day basis
- GS25.** use reasoning skills to identify and resolve problems
- GS26.** use intuition to detect any potential problems which could arise during operations
- GS27.** accept additional responsibility for self and the team
- GS28.** encourage self and other to take greater responsibilities
- GS29.** ensure that the work allocated to the team is completed as per timelines and quality norms
- GS30.** identify obstacles and bottlenecks in the process and on own find basic level solutions for removing these obstacles
- GS31.** motivate and provide support for the team
- GS32.** encourage collaboration between team members
- GS33.** resolve team issues and grievances to manage conflicts within the team
- GS34.** create an environment of approachability, trust and openness within the team
- GS35.** ensure role clarity for all operators and helpers on the line/ shift
- GS36.** escalate any team related issues to the concerned person at the right time
- GS37.** identify faulty / flawed part and processes by comparing new designed pieces with the work standard
- GS38.** link the fault observed with the overall impact on the performance of the component/ automobile
- GS39.** support and contribute in monitoring and delivering high quality output from self and others
- GS40.** train team members on maintaining quality standards set by the organization
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- GS52.** represent any new ideas/ approaches on process improvement and productivity improvement to the seniors in the team
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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Understanding the testing requirement and the process</i>	4	4	-	-
PC1.. understand the component testing requirements (based on the type of component to be tested) as mentioned in the testing instructions sheets/ work instructions/ testing control plan	1	1	-	-
PC2.. understand the testing methodology, equipment and process required as per the process manuals/ work instructions/standard operating procedures	1	1	-	-
PC3.. ensure that the correct testing document containing the specified setup drawing, testing schedules, testing parameters, test specifications and test outcome ranges are mentioned	1	1	-	-
PC4.. ensure all tools and equipment required for testing are present near the testing platform/test bench/ test chamber	0.5	0.5	-	-
PC5.. ensure that the testing platform/ test bench/ test chamber is clean and free of any external impurities which may impact the test results	0.5	0.5	-	-
<i>Measurement of Noise, Vibration and Harshness (NVH) at the Noise and Acoustic Testing Laboratory</i>	14	32	-	-
PC6.. ensure that the engine and component semi anechoic chamber is clean and free from any dust and external impurities	0.5	0.5	-	-
PC7.. ensure that the semi anechoic chamber has all the required equipment and tools for conduction the noise, vibration and harshness test of the engine and other components	0.5	1	-	-
PC8.. connect the engine with the dynamometer as per the instructions mentioned in the testing instruction manual/ work instructions/ control plan	0.5	1.5	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9.. ensure that all the dynamometer test auxiliaries like starters, air intake fans, exhaust systems, air and oil filters, wire connections, instrumentation connections, fuel supply connections etc. are connected as per the testing instructions/ standard operating procedures	0.5	1	-	-
PC10.. ensure that the fitter connects all the data logging devices/ sound absorption devices& microphones as mentioned in the work instructions/ standard operating principle manual	0.5	1	-	-
PC11.. ensure that the connections checklist is cross checked to complete the test setup	0.5	1	-	-
PC12.. ensure proper connections of the sound meter, vibration meters and other data acquisition system for recording noise and vibrations present during the engine run process	0.5	1	-	-
PC13.. switch on the dynamometer and apply various levels of throttle	0.5	1	-	-
PC14.. ensure that any unwanted noises like squeaks, rattles and other engine noises are captured during the test and recorded	0.5	1	-	-
PC15.. ensure that the various noise and vibration producing components like gear box, transmission shafts, wheels, silencer, exhaust pipes, radiators, compressors etc. are connected to the acoustic holography equipment, sound level meters and vibration meters to measure the noise and vibration levels of these components during the engine run on no load/ on load and full load conditions	0.5	1	-	-
PC16.. ensure that other than the noise and vibration produced, the acoustic testing equipment also captures the sound absorption potential and damping potential of the components (and material used in the components)	0.5	1	-	-
PC17.. ensure that other than the engine operation noise and vibrations, noise related to intake and exhaust are also correctly captured.	0.5	1	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC18.. correctly connect test component and the acoustic meters and ensure measurement of source sound and capability of the material to absorb the noise by testing the components in the reverberation room	0.5	1.5	-	-
PC19.. conduct advanced modal analysis (using electromagnetic shakers), operational modal analysis, transfer path analysis, frequency analysis, sound quality analysis and sensitivity analysis and represent findings to the testing manager	0.5	2	-	-
PC20.. conduct damping ratio analysis, sound intensity mapping and noise contribution analysis for all tested components	0.5	2	-	-
PC21.. ensuring recording and reporting procedures and systems are in place at the time of conducting the nvh tests	0.5	1	-	-
PC22.. ensure correctness in data capturing and data recording for all sources of noise	0.5	1	-	-
PC23.. collate all the test results in the required formats as prepared by the core r&d team	0.5	1	-	-
PC24.. compare the test results with the standard values recommended by the cross functional design team and highlight any deviations	0.5	1.5	-	-
PC25.. compare the test results with the regulatory norms especially central motor vehicle regulations on nvh and ensure that the engine design team is informed of the results in order to take corrective steps	0.5	1.5	-	-
PC26.. compare the test results with benchmarked values for noise, vibration and harshness and with the previous test results	0.5	1.5	-	-
PC27.. ensure regular cleaning and maintenance of fatigue lab equipment like fatigue testing machines, servo hydraulic actuators, material testing machine, impact testing machine, bending machines, torsional machines	0.5	1	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC28.. ensure development of the test bogey for conducting the structural durability tests/ fatigue test/ stress test to be conducted in the structure durability laboratory	0.5	1	-	-
PC29.. ensure design and fabrication of the fixtures for conducting the durability tests	0.5	1	-	-
PC30.. ensure test setup for components undergoing repeated vibrations and subjecting to frequent stresses like fuel tank, fuel system, crankshaft, connecting rods, suspension, powertrain and axle system	0.5	1	-	-
PC31.. ensure proper connection of instruments like strain gauge, load cell and other servo hydraulics machines to induce and measure stress levels on the components	0.5	1	-	-
PC32.. ensure that the laboratory fitter is making the required connections with stress inducing equipment and data logger/ data acquisition system as mentioned in the standard operating procedure manual/ work instructions	0.5	1	-	-
PC33.. make sure that the correct testing parameters are selected and accordingly test positions are defined for the process	0.5	1	-	-
<i>Measurement of Fatigue levels and structural dynamics in the Stress/ Fatigue testing laboratory</i>	9	24.5	-	-
PC34.. conduct performance and durability tests on various types of suspension springs like coil spring, leaf spring and various shock absorbers . ensure measurement and recording of key data points like application of force, test cycle, deformation etc.	0.5	2	-	-
PC35.. conduct resonance testing for critical automotive components like chassis frame, cross member, gears, transmission rods, crankshafts etc. to detect cracks, breaks and related metallurgical damage and also ensure durability of these components under repeated high stress environment	0.5	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC36.. conduct strength test for various automobile components like door frames, door latches, windows, clutch pedals, brake shoe & pedal, accelerator pedals, steering wheel & column etc.	0.5	2	-	-
PC37.. conduct measurement of bending strength of the crankshafts, transmission rods, gear teeth by conducting the bending and distortion strength test rig	0.5	2	-	-
PC38.. setup the strain and shearing test apparatus for testing of brake lines. conduct testing of brake discs, brake lining, brake calipers and brake systems	0.5	1	-	-
PC39.. conduct durability and strength tests for belts, straps and buckles of the safety system	0.5	2	-	-
PC40.. in case of durability tests done under different controlled environment conditions, ensure that the dust shower apparatus, mist chamber, environment chamber and water spray booth are regularly cleaned and maintained	0.5	1	-	-
PC41.. ensure setting up of dust shower, mist chamber, environment chamber and water shower apparatus and selection of spray parameters like test cycle time, velocity and angle of spray, temperature and humidity inside the test chamber	0.5	1	-	-
PC42.. collate all the test results in the required formats as prepared by the core r&d team	0.5	1	-	-
PC43.. compare the test results with the standard values recommended by the cross functional conceptualization and design team and highlight any deviations	0.5	1.5	-	-
PC44.. compare the test results with the regulatory norms on vehicle structures, metallurgical strength parameters, life cycle durability and ensure that the design and prototyping team is informed of the results in order to take corrective steps	0.5	1.5	-	-
PC45.. compare the test results with benchmarked values for stress, fatigues and durability tests and the previous tests conducted. compare test results for performance before and after the durability test cycles and highlight deviations if any.	0.5	1.5	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC46.. conduct first level fmea and root cause analysis post comparison of test results. ensure that the first level analysis is timely shared with the testing manager	0.5	2	-	-
PC47.. ensure selection of specified type of material testing process as indicated in the testing manual/ work instructions	0.5	1	-	-
PC48.. connect the component under test to the respective material testing	0.5	0.5	-	-
PC49.. device as per the standard operating procedures	0.5	0.5	-	-
PC50.. ensure testing of all metallic & non metallic components, fluids, oils and lubes used in the components and automobiles	0.5	1	-	-
PC51.. ensure testing of components as per the national and international standards defined for automobile industry performance	0.5	1	-	-
<i>Testing of materials used in components and vehicle manufacturing</i>	3	9.5	-	-
PC52.. conduct component surface analysis and component failure analysis using spectroscopy technique	0.5	2	-	-
PC53.. ensure loading of the test component in the universal testing machine (utm) as per the instructions defined in the testing manual/ sop manual	0.5	1	-	-
PC54.. conduct the tensile and compression tests on the components as per the process mentioned in work instructions/ control plan	0.5	2	-	-
PC55.. analyze various stress related parameters like elasticity, poisson ratio (stress/ strain), stress strain curves and share first level results with the test manager	0.5	1.5	-	-
PC56.. conduct spectrometer test and viscosity test on polymer products, oils and lubricants as per the test instructions given in the sop manual	0.5	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
. verify the hardness of various material using the rockwell hardness test as per the test instructions given in the sop manual	0.5	1	-	-
NOS Total	30	70	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8406
NOS Name	Conduct indoor tests in various System Evaluation Laboratories to test mechanical, metallurgical and operating performance of the aggregates
Sector	Automotive
Sub-Sector	Manufacturing and R&D
Occupation	Testing
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2013
Next Review Date	31/03/2022
NSQC Clearance Date	NA

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ASC/N8407: Conduct Vehicle Performance tests in a controlled internal/on road test setup

Description

Conduct vehicle performance tests in controlled internal laboratory/ on road testing to ensure that the prototype performance matches the criteria finalized during the conceptualization and design phase of vehicle development

Scope

The role holder will be responsible for:

- understanding the testing requirement and the process
- measuring the transmission power using the chassis dynamometer test
- conducting the safety, homologation and environment test
- measure noise and vibration levels of a running vehicle This NOS will be applicable to all types of automobiles i.e. 2 wheelers, 3 wheelers , 4 wheelers and heavy vehicles

Elements and Performance Criteria

Understanding the testing requirement and the process

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

- PC1..** understand the vehicle testing requirements (based on the type of vehicle to be tested) as mentioned in the testing instructions sheets/ work instructions/ testing control plan
- PC2..** understand the testing methodology, equipment and process required as per the process manuals/ work instructions/standard operating procedures
- PC3..** ensure that the testing document contains the specified setup drawing, testing schedules, testing parameters, test specifications and test outcome ranges are mentioned
- PC4..** ensure all tools and equipment required for testing are present near the testing area

Measure the transmission power from the engines to the power train using chassis dynamometer test

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

- PC5..** park the automobile under test in the vehicle testing cell and connect the assembled engine to the chassis dynamometer as per the instructions mentioned in the testing instruction manual/ work instructions/ control plan
- PC6..** ensure that the dynamometer drive rolls are correctly aligned with the vehicles tires
- PC7..** ensure that all the dynamometer data acquisition systems is connected auxiliaries like starters, air intake fans, exhaust systems, air and oil filters, wire connections, instrumentation connections, fuel supply connections etc. are connected as per the testing instructions/ standard operating procedures
- PC8..** check the completion of safety precautions especially fire fighting safety measures before initiating the dynamometer test as per the safety checklist provided by the safety team
- PC9..** check the connections of the air intake fan, heat exchanged fan, exhaust air fan as per the testing manual/ standard operating procedures

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- PC10..** measure the tire pressure, engine temperature, coolant temperature before starting the dynamometer. ensure that the tire distortion due to drive roll pressure is recorded by the system
 - PC11..** start the dynamometer at the defined gear levels and the required engine throttle levels as defined in the testing procedure manual/ testing instructions
 - PC12..** ensure correct measurement of engine air flow, intake air flow, heat exchanger air flow, engine temperature, coolant temperature, fuel flow etc. through the data logging units connected to the computer
 - PC13..** ensure measurement and calculation of air fuel ratio, engine rpm, roll speed, engine load, air flow, engine temperature and pressure
 - PC14..** change the gears as per the cycle time mentioned in the testing instruction manual
 - PC15..** conduct the first level analysis of power (in hp) vs. engine speed in rpm) to validate engine performance against the recommended values by the product conceptualization team
 - PC16..** connect the engine exhaust to the exhaust gas analysis system and the data acquisition system and data loggers for recording and analysing the gas and smoke exhaust
 - PC17..** run the engine at different power levels and note the observations on the exhaust gas analysis system
 - PC18..** observe the displays on the gas analyser/ infrared analysers/ gas chromatograph to measure the exhaust levels of hydrocarbons (hc), carbon monoxide (co), carbon dioxide (co₂), nitrogen oxide(no) and nitrogen dioxide/ trioxide (nox)
 - PC19..** compare the levels of hc and gases with the standards/ environmental regulations for the type of the engine and vehicle exhaust
 - PC20..** compare the test results with the regulatory norms especially on emissions and ensure that the engine design team is informed of the results in order to take corrective steps
 - PC21..** compare the test results with benchmarked values for engine performance, emissions, fuel consumption
 - PC22..** ensure plotting of power curves and torque curves to analyse engine performance
- Conduct safety and homologation tests as per the regulations*
- To be competent, the user/individual on the job must be able to:
- PC23..** ensure that the specification document is received from the prototyping and homologation team with the project cross functional team structure
 - PC24..** check the version of the information document and also the approval stages from with the information document has passed
 - PC25..** understand the type of regulations existing in the automotive space with respect to the vehicle/ aggregate under test
 - PC26..** verify the required parameters as per the type of vehicle under test and the mandatory regulatory norms as per the checklist provided by the cross functional team
 - PC27..** ensure that vehicle usage type and the geography in which the vehicle is to be deployed is given in the information document
 - PC28..** setup the test bench/ test platforms as per the homologation tests to be conducted
 - PC29..** conduct the required homologation tests on road and lab tests as per the regulation checklist of the given geography
 - PC30..** evaluate engine performance, emissions, vehicle safety, vehicle specifications, vehicle type and weight, load capacity, dimensions, vehicle running stability, braking specifications, mileage and other parameters as per the governing standards of the type/ geography

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- PC31..** evaluate the test results , compare them with internal and external benchmarks & regulatory requirements like bharat stage norms, automobile industry standards (ais), central motor vehicle regulations, central motor vehicle
- PC32..** check the endurance and durability of the vehicle doors and latches using plc based test systems
- PC33..** test the operations of the lighting systems such as lamps, head lights and fog lamps using the lamp focus test and lamp brightness test as per the safety norms prescribed by the organization
- PC34..** test the operations of the signalling systems like reflectors and indicators including brightness, visibility, blinking speeds etc. as per the checklist provided for signal testing
- PC35..** conduct bumper durability test using front and side moving block and record observations
- PC36..** setup the component impact testing rig as per the safety test requirements mentioned in the testing manual
- PC37..** conduct the drop test, head impact test and the side impact test on vehicle body, impact test on doors, windows, steering columns and engine to validate the effect of any external impact on the overall performance of the vehicle
- PC38..** check the brake system performance by conducting performance /durability tests & measurements/observations on brake lining, brake shoes, braking fluid and friction material as per the instructions and conditions given in the test manual/ work instructions

Conduct environment testing to ensure all weather worthiness of the vehicle

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

- PC39..** setup the vehicle under testing for different controlled environment conditions
- PC40..** ensure that the dust shower chamber, mist chamber,environment chamber and water spray booth are regularly cleaned and maintained within the respective test chambers
- PC41..** ensure setting up of dust shower, mist chamber and water shower apparatus and selection of spray parameters like test cycle time, velocity and angle of spray, temperature and humidity inside the test chamber
- PC42..** check for any leakages of dust, mist and water inside the vehicle to determine any structural flaws with the test vehicle
- PC43..** check the working of safety measures like windshield wiper movement, rear view and side view mirror visibility while performing the dust, mist and water shower test
- PC44..** check the durability of the wind shield and side view mirror glass to detect any flaws like cracks, dust/ water accumulation on the glass etc.
- PC45..** setup the thermal test chamber to conduct the hot weather and cold weather test on the engine performance
- PC46..** collate all the test results in the required formats as prepared by the core r&d team
- PC47..** compare the test results with the standard values recommended by the cross functional conceptualization and design team and highlight any deviations

Conduct suitable tests to detect Noise, Vibrations and Harshness (NVH) in a running vehicle

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

- PC48..** setup the nvh testing pass by noise test apparatus on the test track for testing the nvh functionality of the vehicle under test

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- PC49..** ensure the microphone is placed as the specified distance and right angle as prescribed in the testing manual to measure pass by noise, engine vibration noise, air conditioning noise, intake/ exhaust noise, transmission vibrations, chassis vibrations, suspension vibrations for 2 wheelers, 4 wheelers and heavy vehicles
- PC50..** ensure that the data loggers, sound meters, vibration detectors are placed at the correct places to successfully capture any types of squeaks, rattles coming from the test vehicle
- PC51..** measure the noise levels for various loading conditions of the vehicle and note down the test results
- PC52..** measure the cabin noise in case of heavy vehicles and passenger compartment noise for cars and buses
- PC53..** compare the test results with the norms prescribed in the motor vehicle regulations such as central motor vehicle regulations, motor vehicle act as applicable
- PC54..** conduct a first level analysis of the nvh test results and present the report to the testing manager for detailed analysis

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant manufacturing and testing standards and procedures followed in the company
- KU2.** new products manufactured by the company
- KU3.** internal product standards finalized within the organization
- KU4.** functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
- KU5.** quality norms and standards prescribed in the Quality Manual by the organization
- KU6.** 5S and Safety norms practiced in the organization
- KU7.** the working of various automobile components
- KU8.** general working of automobiles and linkage& impact of one parameter to another
- KU9.** fundamentals of testing instruments like UTMs, hardness testing machines spectrometers, spectroscopes, microstructure analysers, refractrometers, PH meters, Humidity Analysers, fatigue testing machines and impact testing machines
- KU10.** fundamentals of servo hydraulics, acoustics holography, sound meters, vibration meters
- KU11.** working of load cells and strain gauges and connecting them for test process
- KU12.** the process of using chassis dynamometers and understanding the results
- KU13.** fundamentals of impact testing and drop testing machine
- KU14.** fundamentals of instrumentation and usage of flow meters for checking fuel and lubrication flow, smoke meters, power transducers, temperature sensors, particle sensors process for setting up of test
- KU15.** benches, test platforms and test apparatus various types of tests used to evaluate the design and performance of various automotive components different parameters used to evaluate the performance of the components
- KU16.** various national and international regulations, norms and standards on

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- KU17.** vehicles and engine performance regulations related to noise, vibrations, durability, reliability factors for 2 wheeler, 3 wheeler and 4 wheelers under normal and difficult environmental conditions
- KU18.** various defects related to reliability and durability of the component and impact of the defect on the final component and vehicle performance
- KU19.** basic working of Data Acquisition Systems and Data Loggers
- KU20.** impact of environmental parameters like rain, mist, dust, sunlight, snow on overall vehicle and aggregate performance
- KU21.** probable sources of vehicle noise and possible impacts
- KU22.** analytical tools like Histogram analysis, Pareto Analysis, Why Why analysis, Process Mapping, Ishikawa (Fishbone) analysis
- KU23.** basic human anatomy and impact of vehicle performance on human body
- KU24.** basic laws of physics, chemistry. metallurgy and mathematics
- KU25.** basic laws of geometry and product design
- KU26.** the methods of using instruments like Vernier callipers, micrometres, rulers and other inspection tools
- KU27.** how to read and interpret sketches and engineering drawings
- KU28.** potential health and safety hazards and related safety precautions

Generic Skills (GS)

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

- GS1.** document information from the manuals, discussion notes, process charts etc.
- GS2.** create small notes/ work documents/ diagrams for operators and helpers to help them understand the process
- GS3.** write inter departmental notes/ memos or make suitable entries in the online system
- GS4.** use emails and other business correspondence methods (internal memos, circular etc.) for communicating with other team members/vendors/ suppliers etc.
- GS5.** read equipment manuals and process documents to understand the equipment and processes better
- GS6.** read internal information memos send by internal customers (other functions within the organization)
- GS7.** discuss task lists, schedules, and work-loads with the operative team members
- GS8.** answer the queries raised by the operative team as well as intercompany departments
- GS9.** effectively communicate with the operators and helpers and make them aware of work expectations, targets, policies, processes etc.
- GS10.** attentively listen with full attention the queries and grievances raised by the operative team and comprehend the information given by the speaker
- GS11.** communicate effectively to the team members
- GS12.** identify conflicts in the team and try to resolve them at the earliest
- GS13.** interact and engage with the team members on a day to day basis
- GS14.** counsel and coach the operators and help them resolve issues

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- GS15.** timely highlight to the management about any good work/ achievement by the operators and helpers
- GS16.** break the problem into smaller issues and tasks to arrive at a solution
- GS17.** understand inter process relationship and establish relationship between various parts of the problem
- GS18.** leverage experience to find effective solutions to problems
- GS19.** use basic analytical tools to arrive at solutions
- GS20.** plan, organize and prioritize the work order and jobs received from the manager
- GS21.** manage the schedule plan for the operators and helpers
- GS22.** validate all process/ equipment manuals so that the final process selected is correct
- GS23.** organize information, tools, manuals etc. on the shop floor so that sorting becomes easy
- GS24.** reorganize resources on the line/ shift in case of change of plans
- GS25.** use common sense and make judgments during day to day basis
- GS26.** use reasoning skills to identify and resolve problems
- GS27.** use intuition to detect any potential problems which could arise during operations
- GS28.** accept additional responsibility for self and the team
- GS29.** encourage self and other to take greater responsibilities
- GS30.** ensure that the work allocated to the team is completed as per timelines and quality norms
- GS31.** identify obstacles and bottlenecks in the process and on own find basic level solutions for removing these obstacles
- GS32.** motivate and provide support for the team on the shop floor
- GS33.** encourage collaboration between team members
- GS34.** resolve team issues and grievances to manage conflicts within the team
- GS35.** create an environment of approachability, trust and openness within the team
- GS36.** ensure role clarity for all operators and helpers on the line/ shift
- GS37.** escalate any team related issues to the concerned person at the right time
- GS38.** identify defective parts in the manufacturing line by comparing
- GS39.** manufactured pieces with the work standard
- GS40.** link the defect observed with the overall impact on the performance of the component/ automobile
- GS41.** support and contribute in monitoring and delivering high quality output from self and others
- GS42.** train team members on maintaining quality standards set by the organization
- GS43.** gather information skilfully from multiple sources
- GS44.** analyse information in depth and identifies the problem in a timely manner
- GS45.** develop alternate solutions and resolves problems in early stages
- GS46.** work tireless in spite of repeat activities in a diligent manner to resolve problems on a day to day basis
- GS47.** use previous experience in resolving problems and taking decisions
- GS48.** make timely and independent decisions on the line/ shift within the boundaries of the delegation matrix of the organization
- GS49.** clearly establish a goal for self or others to accomplish

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- GS50.** without instructions from the manager, self-manage the work
- GS51.** take additional responsibilities to make sure that the work is completed on time
- GS52.** familiarise with leading practices available in the market
- GS53.** think independently on new approaches to manufacturing process, material management, data management and team management
- GS54.** represent any new ideas/ approaches on process improvement and productivity improvement to the seniors in the team
- GS55.** exhibit objectivity & openness to others views
- GS56.** collaborate with stakeholders to achieve the desired state of final result

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Understanding the testing requirement and the process</i>	4	4	-	-
PC1.. understand the vehicle testing requirements (based on the type of vehicle to be tested) as mentioned in the testing instructions sheets/ work instructions/ testing control plan	1	1	-	-
PC2.. understand the testing methodology, equipment and process required as per the process manuals/ work instructions/standard operating procedures	1	1	-	-
PC3.. ensure that the testing document contains the specified setup drawing, testing schedules, testing parameters, test specifications and test outcome ranges are mentioned	1	1	-	-
PC4.. ensure all tools and equipment required for testing are present near the testing area	1	1	-	-
<i>Measure the transmission power from the engines to the power train using chassis dynamometer test</i>	10	22	-	-
PC5.. park the automobile under test in the vehicle testing cell and connect the assembled engine to the chassis dynamometer as per the instructions mentioned in the testing instruction manual/ work instructions/ control plan	1	1	-	-
PC6.. ensure that the dynamometer drive rolls are correctly aligned with the vehicles tires	1	1	-	-
PC7.. ensure that all the dynamometer data acquisition systems is connected auxiliaries like starters, air intake fans, exhaust systems, air and oil filters, wire connections, instrumentation connections, fuel supply connections etc. are connected as per the testing instructions/ standard operating procedures	0.5	1	-	-
PC8.. check the completion of safety precautions especially fire fighting safety measures before initiating the dynamometer test as per the safety checklist provided by the safety team	0.5	1	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9.. check the connections of the air intake fan, heat exchanged fan, exhaust air fan as per the testing manual/ standard operating procedures	0.5	1	-	-
PC10.. measure the tire pressure, engine temperature, coolant temperature before starting the dynamometer. ensure that the tire distortion due to drive roll pressure is recorded by the system	0.5	1	-	-
PC11.. start the dynamometer at the defined gear levels and the required engine throttle levels as defined in the testing procedure manual/ testing instructions	0.5	1	-	-
PC12.. ensure correct measurement of engine air flow, intake air flow, heat exchanger air flow, engine temperature, coolant temperature, fuel flow etc. through the data logging units connected to the computer	0.5	1	-	-
PC13.. ensure measurement and calculation of air fuel ratio, engine rpm, roll speed, engine load, air flow, engine temperature and pressure	0.5	1	-	-
PC14.. change the gears as per the cycle time mentioned in the testing instruction manual	0.5	1	-	-
PC15.. conduct the first level analysis of power (in hp) vs. engine speed in rpm) to validate engine performance against the recommended values by the product conceptualization team	0.5	2	-	-
PC16.. connect the engine exhaust to the exhaust gas analysis system and the data acquisition system and data loggers for recording and analysing the gas and smoke exhaust	0.5	1	-	-
PC17.. run the engine at different power levels and note the observations on the exhaust gas analysis system	0.5	1	-	-
PC18.. observe the displays on the gas analyser/ infrared analysers/ gas chromatograph to measure the exhaust levels of hydrocarbons (hc), carbon monoxide (co), carbon dioxide (co2), nitrogen oxide(no) and nitrogen dioxide/ trioxide (nox)	0.5	1	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC19.. compare the levels of hc and gases with the standards/ environmental regulations for the type of the engine and vehicle exhaust	0.5	2	-	-
PC20.. compare the test results with the regulatory norms especially on emissions and ensure that the engine design team is informed of the results in order to take corrective steps	0.5	1	-	-
PC21.. compare the test results with benchmarked values for engine performance, emissions, fuel consumption	0.5	2	-	-
PC22.. ensure plotting of power curves and torque curves to analyse engine performance	0.5	2	-	-
<i>Conduct safety and homologation tests as per the regulations</i>	8	24	-	-
PC23.. ensure that the specification document is received from the prototyping and homologation team with the project cross functional team structure	0.5	0.5	-	-
PC24.. check the version of the information document and also the approval stages from with the information document has passed	0.5	0.5	-	-
PC25.. understand the type of regulations existing in the automotive space with respect to the vehicle/ aggregate under test	0.5	1	-	-
PC26.. verify the required parameters as per the type of vehicle under test and the mandatory regulatory norms as per the checklist provided by the cross functional team	0.5	1	-	-
PC27.. ensure that vehicle usage type and the geography in which the vehicle is to be deployed is given in the information document	0.5	1	-	-
PC28.. setup the test bench/ test platforms as per the homologation tests to be conducted	0.5	1	-	-
PC29.. conduct the required homologation tests on road and lab tests as per the regulation checklist of the given geography	0.5	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC30.. evaluate engine performance, emissions, vehicle safety, vehicle specifications, vehicle type and weight, load capacity, dimensions, vehicle running stability, braking specifications, mileage and other parameters as per the governing standards of the type/ geography	0.5	2	-	-
PC31.. evaluate the test results , compare them with internal and external benchmarks & regulatory requirements like bharat stage norms, automobile industry standards (ais), central motor vehicle regulations, central motor vehicle	0.5	2	-	-
PC32.. check the endurance and durability of the vehicle doors and latches using plc based test systems	0.5	2	-	-
PC33.. test the operations of the lighting systems such as lamps, head lights and fog lamps using the lamp focus test and lamp brightness test as per the safety norms prescribed by the organization	0.5	2	-	-
PC34.. test the operations of the signalling systems like reflectors and indicators including brightness, visibility, blinking speeds etc. as per the checklist provided for signal testing	0.5	2	-	-
PC35.. conduct bumper durability test using front and side moving block and record observations	0.5	2	-	-
PC36.. setup the component impact testing rig as per the safety test requirements mentioned in the testing manual	0.5	1	-	-
PC37.. conduct the drop test, head impact test and the side impact test on vehicle body, impact test on doors, windows, steering columns and engine to validate the effect of any external impact on the overall performance of the vehicle	0.5	2	-	-
PC38.. check the brake system performance by conducting performance /durability tests & measurements/observations on brake lining, brake shoes, braking fluid and friction material as per the instructions and conditions given in the test manual/ work instructions	0.5	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Conduct environment testing to ensure all weather worthiness of the vehicle</i>	4.5	11	-	-
PC39.. setup the vehicle under testing for different controlled environment conditions	0.5	1	-	-
PC40.. ensure that the dust shower chamber, mist chamber,environment chamber and water spray booth are regularly cleaned and maintained within the respective test chambers	0.5	1	-	-
PC41.. ensure setting up of dust shower, mist chamber and water shower apparatus and selection of spray parameters like test cycle time, velocity and angle of spray, temperature and humidity inside the test chamber	0.5	2	-	-
PC42.. check for any leakages of dust, mist and water inside the vehicle to determine any structural flaws with the test vehicle	0.5	1	-	-
PC43.. check the working of safety measures like windshield wiper movement, rear view and side view mirror visibility while performing the dust, mist and water shower test	0.5	1	-	-
PC44.. check the durability of the wind shield and side view mirror glass to detect any flaws like cracks, dust/ water accumulation on the glass etc.	0.5	1	-	-
PC45.. setup the thermal test chamber to conduct the hot weather and cold weather test on the engine performance	0.5	1	-	-
PC46.. collate all the test results in the required formats as prepared by the core r&d team	0.5	1	-	-
PC47.. compare the test results with the standard values recommended by the cross functional conceptualization and design team and highlight any deviations	0.5	2	-	-
<i>Conduct suitable tests to detect Noise, Vibrations and Harshness (NVH) in a running vehicle</i>	3.5	9	-	-
PC48.. setup the nvh testing pass by noise test apparatus on the test track for testing the nvh functionality of the vehicle under test	0.5	1	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC49.. ensure the microphone is placed as the specified distance and right angle as prescribed in the testing manual to measure pass by noise, engine vibration noise, air conditioning noise, intake/ exhaust noise, transmission vibrations, chassis vibrations, suspension vibrations for 2 wheelers, 4 wheelers and heavy vehicles	0.5	2	-	-
PC50.. ensure that the data loggers, sound meters, vibration detectors are placed at the correct places to successfully capture any types of squeaks, rattles coming from the test vehicle	0.5	1	-	-
PC51.. measure the noise levels for various loading conditions of the vehicle and note down the test results	0.5	1	-	-
PC52.. measure the cabin noise in case of heavy vehicles and passenger compartment noise for cars and buses	0.5	1	-	-
PC53.. compare the test results with the norms prescribed in the motor vehicle regulations such as central motor vehicle regulations, motor vehicle act as applicable	0.5	1	-	-
PC54.. conduct a first level analysis of the nvh test results and present the report to the testing manager for detailed analysis	0.5	2	-	-
NOS Total	30	70	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8407
NOS Name	Conduct Vehicle Performance tests in a controlled internal/on road test setup
Sector	Automotive
Sub-Sector	Manufacturing and R&D
Occupation	Testing
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2013
Next Review Date	31/03/2022
NSQC Clearance Date	NA

Qualification Pack

ASC/N8408: Testing vehicle dynamics and vehicle performance during outdoor testing of prototype vehicles

Description

This NOS is about conducting various types of external on road test to validate the vehicle performance and vehicle dynamics using different endurance, stress tests, hardship tests and environmental stress test to ensure that the performance meet the set standards

Scope

The role holder will be responsible for:

- understanding the testing requirement and the process
- conducting out door testing of vehicles
- recording observations from test drivers and data loggers This NOS will be applicable to all types of automobiles i.e. 2 wheelers, 3 wheelers , 4 wheelers and heavy vehicles

Elements and Performance Criteria

Conduct Out Door Testing of vehicles to ensure durability, reliability and high performance

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

- PC1..** understand the vehicle specifications of the test vehicle and the test specifications
- PC2..** confirm with the test manager, the test procedure to be applied for conducting the various types of outdoor testing of vehicles
- PC3..** confirm with the test manager, the various data points which need to be captured and analysed during the running test of the vehicle
- PC4..** ensure that the right instruments as mentioned in the testing manual are used to capture the vehicle performance data
- PC5..** ensure that the test driver has the complete briefing of the various types of tests to be performed on a running vehicle
- PC6..** ensure complete testing of vehicle manoeuvrability, durability, vehicle performance, structural durability, ride comfort, nvh and vehicle safety
- PC7..** ensure that the drivers have a clear understanding of each type of parameter to be tested on a running vehicle
- PC8..** check the connections of the various data capturing meters and instrumentation such as load cells, pneumatic/ plc testing gauges, strain gauges, displacement transducers, accelerometers, gps data collection devices and data loggers to capture the data points during the vehicle running condition
- PC9..** confirm that all the safety features required for the vehicle under running condition are working and are checked as per the vehicle safety check list provided
- PC10..** ensure that the fitter checks of fuel level, oil/ lubricant level, cooling water level, tyre pressure etc. are checked before starting the on road testing of the vehicle prototype
- PC11..** ensure that any type of system warning indicators showing system failures, loose connections, malfunctioning etc. are addressed before starting the various types of road tests

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- PC12..** ensure that the test drivers completes all the tests to be performed to test the performance of the vehicle under stress conditions
- PC13..** ensure that the test driver as well as the data logging system captures vehicle performance parameters like torque, braking, vibrations, pickup, overall vehicle handling, driver comfort etc. on various torture tracks like rough stone track, corrugated tracks, bumpy tracks, potholed tracks, sand & mud tracks etc.
- PC14..** ensure that the test driver as well as the data logging system captures vehicle performance parameters like torque, braking, vibration, acceleration/ deceleration, driver comfort, tyre grip etc. on paved road tracks with different loading conditions
- PC15..** ensure that the test driver as well as the data logging system captures vehicle performance parameters like torque, vibrations, pickup, water seepage, ease of tyre movement, engine stalling etc. during the water trough wading test and ensure that the various levels of water depth/ vehicle depth in water are recorded
- PC16..** ensure that the vehicle performance is measured at various slope levels by performing the vehicle gradient test. ensure that the performance is captured by the data loggers at all incline slope angles
- PC17..** ensure that the test driver and the data loggers are capturing the parameters during the running of vehicles on steering pads, flat straight roads and serpentine tracks to collect data for analysing manoeuvrability, steering comfort, braking power, acceleration/ deceleration, pass by noise, vibrations, tyre grip, turning radius durability, reliability and vehicle handling ability at different loading conditions
- PC18..** ensure that the test driver completes the 80 km/hour speed braking test, low speed braking test and short distance breaking test to validate the braking distance, vehicle performance, driver comfort, durability and vehicle stability during various braking conditions under various environment conditions like dry roads, wet roads, muddy tracks etc. as well as setting conditions viz. one circuit, half worn condition, brake fluid levels as specified.
- PC19..** ensure that the driver and the data logging systems capture relevant data such as driving comfort, vehicle milage, engine performance etc. during long distance endurance testing of vehicles on cross country drives
- PC20..** ensure that all types of noise and vibrations in the running vehicle are captured by the data logging system and the test drivers especially engine noise & vibration, cabin noise, noise & vibration due gear changing/ transmission, noise from intake and exhaust system during different running on road tests
- PC21..** check the completion of other vehicle performance tests like tilting test, crash test and aerodynamic test by ensuring correct fitment of data logging devices and required drive testing/ stationary testing as per the instruction mentioned in the testing procedure manual
- PC22..** ensure individual and collective meetings with the test drives to take inputs on their overall vehicle driving experience and experience related to various tests performed
- PC23..** analyse all the information collected by the various data logging devices and compare the same with the regulatory norms and internal/ external benchmarks
- PC24..** ensure timely preparation of the first level test report and share the same with the test manager

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

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- KU1.** relevant manufacturing and testing standards and procedures followed in the company
- KU2.** new products manufactured by the company
- KU3.** internal product standards finalized within the organization
- KU4.** functional processes like Procurement, Store management, inventory management, quality management and key contact points for query resolution
- KU5.** quality norms and standards prescribed in the Quality Manual by the organization
- KU6.** 5S and Safety norms practiced in the organization
- KU7.** the working of various automobile components
- KU8.** general working of automobiles and linkage & impact of one parameter to another
- KU9.** fundamentals of servo hydraulics, acoustics holography, sound meters, vibration meters
- KU10.** working of load cells and strain gauges and connecting them for test process
- KU11.** basic road driving skills and fundamentals of vehicle movement in various conditions
- KU12.** impact of various types of roads, gradient, sand etc. on the performance of the vehicle
- KU13.** impact of wind, water flow, hot & cold conditions, pressure on the performance of the vehicle
- KU14.** fundamentals of instrumentation and usage of flow meters for checking fuel and lubrication flow, smoke meters, power transducers, temperature sensors, particle sensors process for setting up of test
- KU15.** benches, test platforms and test apparatus various types of tests used to evaluate the design and performance of various automotive components different parameters used to evaluate the performance of the components
- KU16.** various national and international regulations, norms and standards on vehicles and engine performance regulations related to noise, vibrations, durability, reliability factors for 2 wheeler, 3 wheeler and 4 wheelers under normal and difficult environmental conditions
- KU17.** various driving rules and difference from country to country
- KU18.** various defects related to reliability and durability of the component and impact of the defect on the final component and vehicle performance
- KU19.** basic working of Data Acquisition Systems and Data Loggers
- KU20.** impact of environmental parameters like rain, mist, dust, sunlight, snow on overall vehicle and aggregate performance
- KU21.** probable sources of vehicle noise and possible impacts
- KU22.** analytical tools like Histogram analysis, Pareto Analysis, Why Why analysis, Process Mapping, Ishikawa (Fishbone) analysis
- KU23.** basic human anatomy and impact of vehicle performance on human body
- KU24.** basic laws of physics, chemistry. metallurgy and mathematics
- KU25.** basic laws of geometry and product design
- KU26.** the methods of using instruments like Vernier callipers, micrometres, rulers and other inspection tools
- KU27.** how to read and interpret sketches and engineering drawings
- KU28.** potential health and safety hazards and related safety precautions during driving
- KU29.** first aid methods at the time of accidents during road testing

Generic Skills (GS)

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

- GS1.** document information from the manuals, discussion notes, process charts etc.
- GS2.** create small notes/ work documents/ diagrams for operators and helpers to help them understand the process
- GS3.** write inter departmental notes/ memos or make suitable entries in the online system
- GS4.** use emails and other business correspondence methods (internal memos, circular etc.) for communicating with other team members/ vendors/ suppliers etc.
- GS5.** read equipment manuals and process documents to understand the equipment and processes better
- GS6.** read internal information memos send by internal customers (other functions within the organization)
- GS7.** discuss task lists, schedules, and work-loads with the operative team members
- GS8.** answer the queries raised by the operative team as well as intercompany departments
- GS9.** effectively communicate with the operators and helpers and make the
- GS10.** aware of work expectations, targets, policies, processes etc.
- GS11.** attentively listen with full attention the queries and grievances raised by the operative team and comprehend the information given by the speaker
- GS12.** familiarise with leading practices available in the market
- GS13.** think independently on new approaches to manufacturing process, material management, data management and team management
- GS14.** represent any new ideas/ approaches on process improvement and productivity improvement to the seniors in the team
- GS15.** communicate effectively to the team members
- GS16.** identify conflicts in the team and try to resolve them at the earliest
- GS17.** interact and engage with the team members on a day to day basis
- GS18.** counsel and coach the operators and help them resolve issues
- GS19.** timely highlight to the management about any good work/ achievement by the operators and helpers
- GS20.** break the problem into smaller issues and tasks to arrive at a solution
- GS21.** understand inter process relationship and establish relationship between various parts of the problem
- GS22.** leverage experience to find effective solutions to problems
- GS23.** use basic analytical tools to arrive at solutions
- GS24.** use common sense and make judgments during day to day basis
- GS25.** use reasoning skills to identify and resolve problems
- GS26.** use intuition to detect any potential problems which could arise during operations
- GS27.** accept additional responsibility for self and the team
- GS28.** encourage self and other to take greater responsibilities
- GS29.** ensure that the work allocated to the team is completed as per timelines and quality norms
- GS30.** identify obstacles and bottlenecks in the process and on own find basic level solutions for removing these obstacles

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- GS31.** motivate and provide support for the team on the shop floor
- GS32.** encourage collaboration between team members
- GS33.** resolve team issues and grievances to manage conflicts within the team
- GS34.** create an environment of approachability, trust and openness within the team
- GS35.** ensure role clarity for all operators and helpers on the line/ shift
- GS36.** escalate any team related issues to the concerned person at the right time
- GS37.** gather information skilfully from multiple sources
- GS38.** analyse information in depth and identifies the problem in a timely manner
- GS39.** develop alternate solutions and resolves problems in early stages
- GS40.** work tireless in spite of repeat activities in a diligent manner to resolve problems on a day to day basis
- GS41.** use previous experience in resolving problems and taking decisions
- GS42.** make timely and independent decisions on the line/ shift within the boundaries of the delegation matrix of the organization
- GS43.** exhibit objectivity & openness to others views
- GS44.** collaborate with stakeholders to achieve the desired state of final result

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Conduct Out Door Testing of vehicles to ensure durability, reliability and high performance</i>	30	70	-	-
PC1.. understand the vehicle specifications of the test vehicle and the test specifications	2	2	-	-
PC2.. confirm with the test manager, the test procedure to be applied for conducting the various types of outdoor testing of vehicles	1	2	-	-
PC3.. confirm with the test manager, the various data points which need to be captured and analysed during the running test of the vehicle	1	2	-	-
PC4.. ensure that the right instruments as mentioned in the testing manual are used to capture the vehicle performance data	1	2	-	-
PC5.. ensure that the test driver has the complete briefing of the various types of tests to be performed on a running vehicle	1	2	-	-
PC6.. ensure complete testing of vehicle manoeuvrability, durability, vehicle performance, structural durability, ride comfort, nvh and vehicle safety	1	3	-	-
PC7.. ensure that the drivers have a clear understanding of each type of parameter to be tested on a running vehicle	1	3	-	-
PC8.. check the connections of the various data capturing meters and instrumentation such as load cells, pneumatic/ plc testing gauges, strain gauges, displacement transducers, accelerometers, gps data collection devices and data loggers to capture the data points during the vehicle running condition	1	4	-	-
PC9.. confirm that all the safety features required for the vehicle under running condition are working and are checked as per the vehicle safety check list provided	1	4	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10.. ensure that the fitter checks of fuel level, oil/ lubricant level, cooling water level, tyre pressure etc. are checked before starting the on road testing of the vehicle prototype	1	3	-	-
PC11.. ensure that any type of system warning indicators showing system failures, loose connections, malfunctioning etc. are addressed before starting the various types of road tests	1	4	-	-
PC12.. ensure that the test drivers completes all the tests to be performed to test the performance of the vehicle under stress conditions	1	3	-	-
PC13.. ensure that the test driver as well as the data logging system captures vehicle performance parameters like torque, braking, vibrations, pickup, overall vehicle handling, driver comfort etc. on various torture tracks like rough stone track, corrugated tracks, bumpy tracks, potholed tracks, sand & mud tracks etc.	2	3	-	-
PC14.. ensure that the test driver as well as the data logging system captures vehicle performance parameters like torque, braking, vibration, acceleration/ deceleration, driver comfort, tyre grip etc. on paved road tracks with different loading conditions	2	3	-	-
PC15.. ensure that the test driver as well as the data logging system captures vehicle performance parameters like torque, vibrations, pickup, water seepage, ease of tyre movement, engine stalling etc. during the water trough wading test and ensure that the various levels of water depth/ vehicle depth in water are recorded	2	3	-	-
PC16.. ensure that the vehicle performance is measured at various slope levels by performing the vehicle gradient test. ensure that the performance is captured by the data loggers at all incline slope angles	1	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC17.. ensure that the test driver and the data loggers are capturing the parameters during the running of vehicles on steering pads, flat straight roads and serpentine tracks to collect data for analysing manoeuvrability, steering comfort, braking power, acceleration/ deceleration, pass by noise, vibrations, tyre grip, turning radius durability, reliability and vehicle handling ability at different loading conditions	2	3	-	-
PC18.. ensure that the test driver completes the 80 km/hour speed braking test, low speed braking test and short distance breaking test to validate the braking distance, vehicle performance, driver comfort, durability and vehicle stability during various braking conditions under various environment conditions like dry roads, wet roads, muddy tracks etc. as well as setting conditions viz. one circuit, half worn condition, brake fluid levels as specified.	1	3	-	-
PC19.. ensure that the driver and the data logging systems capture relevant data such as driving comfort, vehicle milage, engine performance etc. during long distance endurance testing of vehicles on cross country drives	1	3	-	-
PC20.. ensure that all types of noise and vibrations in the running vehicle are captured by the data logging system and the test drivers especially engine noise & vibration, cabin noise, noise & vibration due gear changing/ transmission, noise from intake and exhaust system during different running on road tests	1	3	-	-
PC21.. check the completion of other vehicle performance tests like tilting test, crash test and aerodynamic test by ensuring correct fitment of data logging devices and required drive testing/ stationary testing as per the instruction mentioned in the testing procedure manual	1	4	-	-
PC22.. ensure individual and collective meetings with the test drives to take inputs on their overall vehicle driving experience and experience related to various tests performed	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23.. analyse all the information collected by the various data logging devices and compare the same with the regulatory norms and internal/ external benchmarks	2	4	-	-
PC24.. ensure timely preparation of the first level test report and share the same with the test manager	1	2	-	-
NOS Total	30	70	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8408
NOS Name	Testing vehicle dynamics and vehicle performance during outdoor testing of prototype vehicles
Sector	Automotive
Sub-Sector	Manufacturing and R&D
Occupation	Testing
NSQF Level	6
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2013
Next Review Date	31/03/2022
NSQC Clearance Date	NA

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Element/ Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each Element/ PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.
6. To pass the Qualification Pack assessment, every trainee should score the Recommended Pass % aggregate for the QP.

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7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 75

(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/N0006.Maintain a safe and healthy working environment	25	75	-	-	100	15
ASC/N0022.Ensure implementation of 5S activities at the shop floor & the office area	29	71	-	-	100	15
ASC/N8405.Arrange for engine test apparatus and test the engine as per the internal process standards and external regulations	35	65	-	-	100	20
ASC/N8406.Conduct indoor tests in various System Evaluation Laboratories to test mechanical, metallurgical and operating performance of the aggregates	30	70	-	-	100	20
ASC/N8407.Conduct Vehicle Performance tests in a controlled internal/on road test setup	30	70	-	-	100	15
ASC/N8408.Testing vehicle dynamics and vehicle performance during outdoor testing of prototype vehicles	30	70	-	-	100	15
Total	179	421	-	-	600	100

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Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

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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.

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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.