Qualification Pack

Failure Analysis and Reliability Engineer

QP Code: ELE/Q0121

Version: 1.0

NSQF Level: 5

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Contents

ELE/Q0121: Failure Analysis and Reliability Engineer

Brief Job Description

A Failure Analysis and Reliability Engineer is responsible to prepare failure analysis flow & to rectify the failures. The individual is also responsible for verification and resolution by working together with several cross-functional teams for reliability flow, test requirements as per JEDEC standards.

Personal Attributes

The individual must have an aptitude for details along with analytical and problem-solving skills. The person should be able to work in co-ordination with others. The individual should be able to communicate appropriately, both verbally and in writing.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. ELE/N0160: Operate chemical-related process
2. ELE/N0161: Operate optical microscope and X-Ray Machine
3. ELE/N0162: Operate Scanning Electron Microscope (SEM), Confocal Scanning Electron Microscopy (CSEM) & Focused Ion Beam (FIB)
4. ELE/N0163: Understanding of full failure Analysis flow
5. ELE/N0164: Report Preparation & guidance to the Process Engineer
6. ELE/N0165: Reliability Flow & Testing
7. ELE/N9905: Work effectively at the workplace
8. ELE/N1002: Apply health and safety practices at the workplace

Qualification Pack (QP) Parameters

Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Production-S&C
Country	India

NSQF Level	5
Credits	NA
Aligned to NCO/ISCO/ISIC Code	NCO-2015/NIL
Minimum Educational Qualification & Experience	Diploma (after 10th (Electrical or Electronics Engineering) with 3 Years of Relevant experience OR Diploma after 12th (Electrical or Electronics Engineering) with 1 Year of Relevant experience) OR B.E./B.Tech (Degree in Electrical or Electronics Engineering) OR Certificate-NSQF (Level-4 in semiconductor domain) with 2 Years of experience relevant
Minimum Level of Education for Training in School	Not Applicable
Pre-Requisite License or Training	NA
Minimum Job Entry Age	20 Years
Last Reviewed On	31/03/2022
Next Review Date	31/07/2025
Deactivation Date	31/07/2024
NSQC Approval Date	31/03/2022
Version	1.0
Reference code on NQR	2022/EHW/ESSC/05629
NQR Version	1.0

ELE/N0160: Operate chemical-related process

Description

The OS unit is about operating chemical-related process.

Scope

The scope covers the following :

- X Section
- De-Cap
- Solder Mask Removal

Elements and Performance Criteria

X Section

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

PC1. understand the polishing machine

PC2. operate the polishing machine

PC3. verify the X Section procedure

PC4. verify the Chemical Slurry usage procedure

PC5. check Grinding Paper

PC6. determine the difference between dry and wet polish

De-Cap

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

PC7. operate the procedure of Manual De-Cap

PC8. operate the Laser De-Cap Machine

PC9. understand the chemical composition and create the recipe

PC10. verify document and guide operators for recipe use

PC11. check the procedure for Multi-Die De-Cap

PC12. monitor the procedure to avoid any mishappening (How to use Chemicals)

Solder Mask Removal

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

PC13. identify the chemical composition and temperature to remove the solder mask

PC14. ensure to generate recipes and usages flow documents

PC15. manage to guide the operator to use recipes

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. how to identify the die dimensions and back grinding processes

KU2. the importance of analyzing the die attach film/material properties and thickness requirements

KU3. how to evaluate the curing and attaching conditions of die-attach film/material

KU4. how to recognize the structure of stacking (die thickness and substrate thickness with die attach film/material thickness)

KU5. how to specify the bonding force, pick & place location, curing parameters inside the oven, etc.

KU6. the procedure of setting up all process parameters, such as bonding force, placements, attaching speed, adhesive thickness, wafer and substrate location moving speed, etc.

KU7. how to set to run dummy samples

KU8. the importance of taking measurements to ensure all dimensions are within specification

KU9. the importance of repeating the criteria until the specified criteria are met

KU10. how to turn major input parameters into Standard Operating Procedure (SOP)

KU11. the importance of preparing full SOP and releasing it to production, and considering the special requirements, if required

KU12. the importance of identifying the parameters for the new product verification process

KU13. how to prepare a copy of the old recipe to perform a similar program

KU14. the importance of identifying and making changes as per the product specification requirements

KU15. how to run dummy measurements, Calculate Process Capability (CPK), Process Performance (PPK), and other quality parameters

KU16. the importance and process of verifying the real product using various quality and reliability checks

KU17. the importance of preparing for mass production after all QCs are passed

KU18. how to use Automatic Computer-Aided Design (AUTO-CAD) software

KU19. the procedure of preparing process flow with clear specifications, such as temperature, speed, water flow, vacuumed, etc.

KU20. the importance of preparing the SOP with pictures, visuals, data charts to ensure it is more understandable to operators

KU21. the importance of identifying the training needs of operators on SOP flow

KU22. the process of preparing the travelling card with the defined process or program name/ code

KU23. the importance of ensuring the quality of all the travelling cards released to production

KU24. the importance of performing regular inspection of programs

KU25. the importance of performing regular inspection of data, such as yield, failure, etc.

KU26. the importance of preparing for emergencies

Generic Skills (GS)

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

GS1. maintain work-related notes and records

GS2. read the relevant literature to get the latest updates about the field of work

GS3. listen attentively to understand the information/ instructions being shared

GS4. communicate politely and professionally

GS5. plan and prioritize tasks to ensure timely completion

GS6. co-ordinate with the co-workers to achieve the work objectives

GS7. evaluate all possible solutions to a problem to select the best one

GS8. take quick decisions to deal with workplace emergencies/ accidents

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
X Section	**16**	**20**	**-**	**4**
PC1. understand the polishing machine	3	4	-	1
PC2. operate the polishing machine	3	4	-	1
PC3. verify the X Section procedure	3	3	-	1
PC4. verify the Chemical Slurry usage procedure	3	3	-	1
PC5. check Grinding Paper	2	3	-	-
PC6. determine the difference between dry and wet polish	2	3	-	-
De-Cap	**16**	**20**	**-**	**4**
PC7. operate the procedure of Manual De-Cap	3	4	-	1
PC8. operate the Laser De-Cap Machine	3	4	-	1
PC9. understand the chemical composition and create the recipe	3	3	-	1
PC10. verify document and guide operators for recipe use	3	3	-	1
PC11. check the procedure for Multi-Die De-Cap	2	3	-	-
PC12. monitor the procedure to avoid any mishappening (How to use Chemicals)	2	3	-	-
Solder Mask Removal	**8**	**10**	**-**	**2**
PC13. identify the chemical composition and temperature to remove the solder mask	3	4	-	1
PC14. ensure to generate recipes and usages flow documents	3	3	-	1
PC15. manage to guide the operator to use recipes	2	3	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N0160
NOS Name	Operate chemical-related process
Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Production-S&C
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	31/03/2022
Next Review Date	31/03/2025
NSQC Clearance Date	31/03/2022

ELE/N0161: Operate optical microscope and X-Ray Machine

Description

The OS unit is about operating optical microscope and X-Ray Machine.

Scope

The scope covers the following :

- Operate High-End Microscope
- Operate Low-End Microscope
- Operate X-Ray Machine

Elements and Performance Criteria

Operate High-End Microscope

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

PC1. understand Microscope and its accessories (Lenses etc)
PC2. operate Microscope
PC3. verify the measurements
PC4. analyze the data
PC5. verify the calibration process
PC6. check and Fix Minor Errors
PC7. verify and generate recipes/Programs to do automatic measurement

Operate Low-End Microscope

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

PC8. understand Microscope and its accessories (Lenses etc)
PC9. operate Microscope
PC10. verify the measurements
PC11. analyze the data
PC12. verify the calibration process
PC13. check and ix Minor Errors

Operate X-Ray Machine

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

PC14. understand X-Ray and its accessories (Lenses etc)
PC15. operate X-Ray Machine
PC16. inspects wires, metal layers, passive component issues, etc
PC17. analyze the data
PC18. verify the calibration process
PC19. check and ix minor errors
PC20. verify and generate recipes/Programs to do automatic measurement

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. how to identify the die dimensions and back grinding processes
KU2. the importance of analyzing the die attach film/material properties and thickness requirements
KU3. how to evaluate the curing and attaching conditions of die-attach film/material
KU4. how to recognize the structure of stacking (die thickness and substrate thickness with die attach film/material thickness)
KU5. how to specify the bonding force, pick & place location, curing parameters inside the oven, etc.
KU6. the procedure of setting up all process parameters, such as bonding force, placements, attaching speed, adhesive thickness, wafer and substrate location moving speed, etc.
KU7. how to set to run dummy samples
KU8. the importance of taking measurements to ensure all dimensions are within specification
KU9. the importance of repeating the criteria until the specified criteria are met
KU10. how to turn major input parameters into Standard Operating Procedure (SOP)
KU11. the importance of preparing full SOP and releasing it to production, and considering the special requirements, if required
KU12. the importance of identifying the parameters for the new product verification process
KU13. how to prepare a copy of the old recipe to perform a similar program
KU14. the importance of identifying and making changes as per the product specification requirements
KU15. how to run dummy measurements, Calculate Process Capability (CPK), Process Performance (PPK), and other quality parameters
KU16. the importance and process of verifying the real product using various quality and reliability checks
KU17. the importance of preparing for mass production after all QCs are passed
KU18. how to use Automatic Computer-Aided Design (AUTO-CAD) software
KU19. the procedure of preparing process flow with clear specifications, such as temperature, speed, water flow, vacuumed, etc.
KU20. the importance of preparing the SOP with pictures, visuals, data charts to ensure it is more understandable to operators
KU21. the importance of identifying the training needs of operators on SOP flow
KU22. the process of preparing the travelling card with the defined process or program name/ code
KU23. the importance of ensuring the quality of all the travelling cards released to production
KU24. the importance of performing regular inspection of programs
KU25. the importance of performing regular inspection of data, such as yield, failure, etc.
KU26. the importance of preparing for emergencies

Generic Skills (GS)

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

GS1. maintain work-related notes and records

GS2. read the relevant literature to get the latest updates about the field of work
GS3. listen attentively to understand the information/ instructions being shared
GS4. communicate politely and professionally
GS5. plan and prioritize tasks to ensure timely completion
GS6. co-ordinate with the co-workers to achieve the work objectives
GS7. evaluate all possible solutions to a problem to select the best one
GS8. take quick decisions to deal with workplace emergencies/ accidents

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Operate High-End Microscope	**16**	**20**	**-**	**4**
PC1. understand Microscope and its accessories (Lenses etc)	3	4	-	1
PC2. operate Microscope	3	4	-	1
PC3. verify the measurements	2	4	-	1
PC4. analyze the data	2	2	-	1
PC5. verify the calibration process	2	2	-	-
PC6. check and Fix Minor Errors	2	2	-	-
PC7. verify and generate recipes/Programs to do automatic measurement	2	2	-	-
Operate Low-End Microscope	**8**	**10**	**-**	**4**
PC8. understand Microscope and its accessories (Lenses etc)	2	2	-	1
PC9. operate Microscope	2	2	-	1
PC10. verify the measurements	1	2	-	1
PC11. analyze the data	1	2	-	1
PC12. verify the calibration process	1	1	-	-
PC13. check and ix Minor Errors	1	1	-	-
Operate X-Ray Machine	**16**	**20**	**-**	**2**
PC14. understand X-Ray and its accessories (Lenses etc)	3	4	-	1
PC15. operate X-Ray Machine	3	4	-	1
PC16. inspects wires, metal layers, passive component issues, etc	2	4	-	-
PC17. analyze the data	2	2	-	-
PC18. verify the calibration process	2	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC19. check and ix minor errors	2	2	-	-
PC20. verify and generate recipes/Programs to do automatic measurement	2	2	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N0161
NOS Name	Operate optical microscope and X-Ray Machine
Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Production-S&C
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	31/03/2022
Next Review Date	31/03/2025
NSQC Clearance Date	31/03/2022

ELE/N0162: Operate Scanning Electron Microscope (SEM), Confocal Scanning Electron Microscopy (CSEM) & Focused Ion Beam (FIB)

Description

The OS unit is about operating Scanning Electron Microscope (SEM), Confocal Scanning Electron Microscopy (CSEM) & Focused Ion Beam (FIB).

Scope

The scope covers the following :

- Operate Scanning Electron Microscope (SEM)
- Operate Confocal Scanning Acoustic Microscopy (CSAM)
- Operate Focused Ion Beam (FIB)

Elements and Performance Criteria

Operate Scanning Electron Microscope (SEM)

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

PC1. understand the SEM basic principles

PC2. check and verify the materials

PC3. install the samples

PC4. analyze sample and measurement

PC5. check the Energy Dispersive X-Ray Analysis (EDX)

PC6. prepare procedure and document

PC7. guide train operators & technicians

PC8. verify the calibration process

Operate Confocal Scanning Acoustic Microscopy (CSAM)

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

PC9. understand the CSAM Basic Principles (Sound Waves Reflections, Deflections, Transmissions, etc)

PC10. operate CSAM

PC11. analyze the reflected waves

PC12. analyze the data

PC13. verify the calibration process

PC14. check load and unload samples

Operate Focused Ion Beam (FIB)

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

PC15. understand the FIB basic principles

PC16. check and verify the materials

PC17. install the samples

PC18. analyze sample and measurement

PC19. check the Energy Dispersive X-Ray Analysis (EDX)

PC20. prepare procedure and document
PC21. guide Train Operators & Technicians
PC22. verify the calibration process

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. how to identify the die dimensions and back grinding processes
KU2. the importance of analyzing the die attach film/material properties and thickness requirements
KU3. how to evaluate the curing and attaching conditions of die-attach film/material
KU4. how to recognize the structure of stacking (die thickness and substrate thickness with die attach film/material thickness)
KU5. how to specify the bonding force, pick & place location, curing parameters inside the oven, etc.
KU6. the procedure of setting up all process parameters, such as bonding force, placements, attaching speed, adhesive thickness, wafer and substrate location moving speed, etc.
KU7. how to set to run dummy samples
KU8. the importance of taking measurements to ensure all dimensions are within specification
KU9. the importance of repeating the criteria until the specified criteria are met
KU10. how to turn major input parameters into Standard Operating Procedure (SOP)
KU11. the importance of preparing full SOP and releasing it to production, and considering the special requirements, if required
KU12. the importance of identifying the parameters for the new product verification process
KU13. how to prepare a copy of the old recipe to perform a similar program
KU14. the importance of identifying and making changes as per the product specification requirements
KU15. how to run dummy measurements, Calculate Process Capability (CPK), Process Performance (PPK), and other quality parameters
KU16. the importance and process of verifying the real product using various quality and reliability checks
KU17. the importance of preparing for mass production after all QCs are passed
KU18. how to use Automatic Computer-Aided Design (AUTO-CAD) software
KU19. the procedure of preparing process flow with clear specifications, such as temperature, speed, water flow, vacuumed, etc.
KU20. the importance of preparing the SOP with pictures, visuals, data charts to ensure it is more understandable to operators
KU21. the importance of identifying the training needs of operators on SOP flow
KU22. the process of preparing the travelling card with the defined process or program name/ code
KU23. the importance of ensuring the quality of all the travelling cards released to production
KU24. the importance of performing regular inspection of programs
KU25. the importance of performing regular inspection of data, such as yield, failure, etc.
KU26. the importance of preparing for emergencies

Generic Skills (GS)

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

GS1. maintain work-related notes and records
GS2. read the relevant literature to get the latest updates about the field of work
GS3. listen attentively to understand the information/ instructions being shared
GS4. communicate politely and professionally
GS5. plan and prioritize tasks to ensure timely completion
GS6. co-ordinate with the co-workers to achieve the work objectives
GS7. evaluate all possible solutions to a problem to select the best one
GS8. take quick decisions to deal with workplace emergencies/ accidents

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Operate Scanning Electron Microscope (SEM)	**16**	**18**	**-**	**4**
PC1. understand the SEM basic principles	2	3	-	1
PC2. check and verify the materials	2	3	-	1
PC3. install the samples	2	2	-	1
PC4. analyze sample and measurement	2	2	-	1
PC5. check the Energy Dispersive X-Ray Analysis (EDX)	2	2	-	-
PC6. prepare procedure and document	2	2	-	-
PC7. guide train operators & technicians	2	2	-	-
PC8. verify the calibration process	2	2	-	-
Operate Confocal Scanning Acoustic Microscopy (CSAM)	**8**	**14**	**-**	**2**
PC9. understand the CSAM Basic Principles (Sound Waves Reflections, Deflections, Transmissions, etc)	2	3	-	1
PC10. operate CSAM	2	3	-	1
PC11. analyze the reflected waves	1	2	-	-
PC12. analyze the data	1	2	-	-
PC13. verify the calibration process	1	2	-	-
PC14. check load and unload samples	1	2	-	-
Operate Focused Ion Beam (FIB)	**16**	**18**	**-**	**4**
PC15. understand the FIB basic principles	2	3	-	1
PC16. check and verify the materials	2	3	-	1
PC17. install the samples	2	2	-	1
PC18. analyze sample and measurement	2	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC19. check the Energy Dispersive X-Ray Analysis (EDX)	2	2	-	-
PC20. prepare procedure and document	2	2	-	-
PC21. guide Train Operators & Technicians	2	2	-	-
PC22. verify the calibration process	2	2	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N0162
NOS Name	Operate Scanning Electron Microscope (SEM), Confocal Scanning Electron Microscopy (CSEM) & Focused Ion Beam (FIB)
Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Production-S&C
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	31/03/2022
Next Review Date	31/03/2025
NSQC Clearance Date	31/03/2022

ELE/N0163: Understanding of full failure Analysis flow

Description

The OS unit is about understanding of full failure analysis flow.

Scope

The scope covers the following :

- Electrical Failure Analysis
- Non-Destructive Failure Analysis
- Operate Focused Ion Beam (FIB)

Elements and Performance Criteria

Electrical Failure Analysis

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

PC1. manage electrical tools such as Prober, Small Tester, Multimeters

PC2. identify product testing pad

PC3. identify the failure

PC4. review the internal structure of products

PC5. check the flow and make the document

PC6. guide train operators & technicians

Non-Destructive Failure Analysis

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

PC7. check the procedures

PC8. monitor non-destructive failure and analyze the tools

PC9. prepare standard operating procedures & Documents

PC10. manage all safety rules and make documents

PC11. prepare a presentation in such a way that helps process engineers to optimize the process to reduce failures

PC12. perform all the steps with efficiency & accuracy

Operate Focused Ion Beam (FIB)

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

PC13. check the procedures

PC14. monitor non-destructive failure and analyze the tools

PC15. prepare standard operating procedures & Documents

PC16. manage all safety rules and make documents

PC17. prepare a presentation in such a way that helps process engineers to optimize the process to reduce failures

PC18. perform all the steps with efficiency & accuracy

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the importance of defining all die dimensions, stacking combination, and wire bonding parameters
KU2. how to define sample size for each lot to measure all dimensions
KU3. the importance of preparing the measurement techniques in the SOP for operators
KU4. the importance of analyzing the collected data and performing statistical analysis to determine if it is within the specification before releasing the lot to the next step
KU5. how to identify the consumables pack specifications
KU6. the importance of regularly inspecting for each consumable
KU7. how to identify any failure at die attach
KU8. the importance of ensuring wire bond passes through failure analysis
KU9. the importance of checking the root cause of each failure
KU10. the importance of defining the short term and long-term actions or failures to reduce the failure rate
KU11. how to prepare an 8D report
KU12. the importance of preparing the yield data collection for each product
KU13. how to analyze the yield
KU14. the importance of analyzing data using statistical methods
KU15. the importance of recording all failures along with actions to avoid future failure
KU16. the importance of performing Research and Development (R&D) and preparing strategies for further improvements
KU17. the working principle of machines to improve UPH
KU18. how to develop the design of experiments (DOE) expertise
KU19. the process of running statistical tools, such as the Joint Manpower Program (JMP)
KU20. the importance of regularly interacting with customers, suppliers, and internal teams
KU21. the process generating designs using Auto-CAD

Generic Skills (GS)

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

GS1. write work-related notes and maintain relevant records
GS2. read the relevant literature to get the latest updates about the field of work
GS3. listen attentively to understand the information/ instructions being shared by the speaker
GS4. communicate politely and professionally
GS5. plan and prioritize tasks to ensure timely completion
GS6. evaluate all possible solutions to a problem to select the best one
GS7. co-ordinate with the co-workers to achieve work objectives
GS8. identify possible disruptions to work and take appropriate preventive measures
GS9. take quick decisions to deal with workplace emergencies/ accidents

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Electrical Failure Analysis	**16**	**18**	**-**	**4**
PC1. manage electrical tools such as Prober, Small Tester, Multimeters	3	4	-	1
PC2. identify product testing pad	3	4	-	1
PC3. identify the failure	3	3	-	1
PC4. review the internal structure of products	3	3	-	1
PC5. check the flow and make the document	2	2	-	-
PC6. guide train operators & technicians	2	2	-	-
Non-Destructive Failure Analysis	**12**	**16**	**-**	**3**
PC7. check the procedures	2	3	-	1
PC8. monitor non-destructive failure and analyze the tools	2	3	-	1
PC9. prepare standard operating procedures & Documents	2	3	-	1
PC10. manage all safety rules and make documents	2	3	-	-
PC11. prepare a presentation in such a way that helps process engineers to optimize the process to reduce failures	2	2	-	-
PC12. perform all the steps with efficiency & accuracy	2	2	-	-
Operate Focused Ion Beam (FIB)	**12**	**16**	**-**	**3**
PC13. check the procedures	2	3	-	1
PC14. monitor non-destructive failure and analyze the tools	2	3	-	1
PC15. prepare standard operating procedures & Documents	2	3	-	1
PC16. manage all safety rules and make documents	2	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC17. prepare a presentation in such a way that helps process engineers to optimize the process to reduce failures	2	2	-	-
PC18. perform all the steps with efficiency & accuracy	2	2	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N0163
NOS Name	Understanding of full failure Analysis flow
Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Production-S&C
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	31/03/2022
Next Review Date	31/03/2025
NSQC Clearance Date	31/03/2022

ELE/N0164: Report Preparation & guidance to the Process Engineer

Description

The OS unit is about preparing reports and support engineer during work.

Scope

The scope covers the following :

- Report Preparation and Guidance to Process Engineer

Elements and Performance Criteria

Report Preparation and Guidance to Process Engineer

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

PC1. check the chip packaging and process flow
PC2. analyze the definitions of failure categories
PC3. analyze physical failure and electrical failure
PC4. check all failures based on defined categories
PC5. identify each failure related to the process with accuracy
PC6. generate a well-defined failure analysis report
PC7. prepare & present the report to all process engineers and explain the failures
PC8. check the improvements that need to be made and guide process engineers
PC9. review each failure mode and allows them to decide that the failure is not a physical failure

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. how to prepare the File Allocation Table (FAT) report
KU2. how to identify all specifications as per the organizational standards
KU3. the importance of ensuring the functioning of the main controller and the main panel as per the requirements given to the manufacturer
KU4. the importance of ensuring all equipment consumable specifications, dimensions and other parameters are clearly defined by the process and equipment engineer
KU5. the importance and process of preparing the equipment and process parameters
KU6. the importance of defining and preparing sample size required to buy off machines as per the specifications and CPK Requirements
KU7. the importance of preparing a comprehensive report to avoid any future issues
KU8. the importance of recording all approvals in the appropriate formats as per the organizational standards
KU9. the importance of ensuring the functioning of the main controller and the main panel as per requirements given to the manufacturer

KU10. the importance of preparing the equipment consumables according to the specifications, dimensions and other parameters defined by the process and equipment engineer

KU11. how to prepare the sample size required to buy off machines and the importance of ensuring it is defined clearly according to the specifications and CPK requirements

KU12. the importance of using low cost and highly reliable raw material and consumables

KU13. how to verify new material to design DOE

KU14. the process of collecting the quality and reliability data for each characterization, feasibility, and building the qualification

KU15. how to generate the Process Change Notification (PCN)

KU16. the process of transitioning from low volume mass production to high volume mass production

KU17. the characterization phase, feasibility phase, customer sampling phase, and qualification phase is required

Generic Skills (GS)

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

GS1. write work-related notes and maintain relevant records

GS2. read the relevant literature to get the latest updates about the field of work

GS3. listen attentively to understand the information/ instructions being shared by the speaker

GS4. communicate politely and professionally

GS5. plan and prioritize tasks to ensure timely completion

GS6. evaluate all possible solutions to a problem to select the best one

GS7. co-ordinate with the co-workers to achieve work objectives

GS8. identify possible disruptions to work and take appropriate preventive measures

GS9. take quick decisions to deal with workplace emergencies/ accidents

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Report Preparation and Guidance to Process Engineer	**40**	**50**	**-**	**10**
PC1. check the chip packaging and process flow	5	6	-	2
PC2. analyze the definitions of failure categories	5	6	-	1
PC3. analyze physical failure and electrical failure	5	6	-	1
PC4. check all failures based on defined categories	5	6	-	1
PC5. identify each failure related to the process with accuracy	4	6	-	1
PC6. generate a well-defined failure analysis report	4	5	-	1
PC7. prepare & present the report to all process engineers and explain the failures	4	5	-	1
PC8. check the improvements that need to be made and guide process engineers	4	5	-	1
PC9. review each failure mode and allows them to decide that the failure is not a physical failure	4	5	-	1
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N0164
NOS Name	Report Preparation & guidance to the Process Engineer
Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Production-S&C
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	31/03/2022
Next Review Date	31/03/2025
NSQC Clearance Date	31/03/2022

ELE/N0165: Reliability Flow & Testing

Description

The OS unit is about testing and identifing reliability flow.

Scope

The scope covers the following :

- Reliability Test Requirement
- Reliability Test Equipment Operation
- Reliability Procedure and flow

Elements and Performance Criteria

Reliability Test Requirement

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

PC1. identify the customer’s reliability requirements
PC2. verify internal reliability requirements based on customers’ requirements
PC3. prepare a sample for reliability
PC4. prepare test after each checkpoint
PC5. verify PFA if necessary and maintain reliability
PC6. verify DPPM and life of the product
PC7. identify early and mature failures

Reliability Test Equipment Operation

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

PC8. identify reliability tools required for products
PC9. check the basic operation procedure
PC10. identify loading and unloading samples
PC11. perform basic programming
PC12. identify failures
PC13. perform testing equipment required to verify the failures
PC14. identify reliability conditions such as temperature, humidity, shock required for tastings
PC15. check all safety rules and guidelines inside the lab
PC16. guide the reliability team to define reliability specifications

Reliability Procedure and flow

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

PC17. identify international reliability standards such as JEDEC
PC18. identify reliability specifications using JEDEC Standards
PC19. prepare reliability documents with flow and specifications required to test
PC20. check which reliability test is required for which product
PC21. test the reliability flow and start the procedure for new products

PC22. understand the PCN's & ECN's reliability requirements
PC23. prepare a report and get approvals

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the use of Auto CAD and other equivalent design tools
KU2. the wafer structure and processing, and wire material properties
KU3. the importance of determining the customer requirements and collecting data from competitors' specs
KU4. how to perform reverse analysis to get the die to attach and wire bonding specifications
KU5. the importance of identifying the critical and normal dimension requirements as per the customer requirements
KU6. the importance and process of defining the dimension specifications to meet the customer requirements
KU7. the Joint Electron Device Engineering Council (JEDEC) standard
KU8. the customer bonding diagram
KU9. the importance of specifying the wire bonding material that fulfils the bonding drawing and electrical, mechanical, and thermal specifications
KU10. how to perform drawing activities bonding drawing
KU11. how to verify the die-attach staking structure
KU12. how to verify rubber tip for die attach and capillary for wire bonding drawing
KU13. how to identify magazine drawing and cassette drawing

Generic Skills (GS)

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

GS1. write work-related notes and maintain relevant records
GS2. read the relevant literature to get the latest updates about the field of work
GS3. listen attentively to understand the information/ instructions being shared by the speaker
GS4. communicate politely and professionally
GS5. plan and prioritize tasks to ensure timely completion
GS6. evaluate all possible solutions to a problem to select the best one
GS7. co-ordinate with the co-workers to achieve work objectives
GS8. identify possible disruptions to work and take appropriate preventive measures
GS9. take quick decisions to deal with workplace emergencies/ accidents

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Reliability Test Requirement	**12**	**16**	**-**	**2**
PC1. identify the customer's reliability requirements	2	3	-	1
PC2. verify internal reliability requirements based on customers' requirements	2	3	-	1
PC3. prepare a sample for reliability	2	2	-	-
PC4. prepare test after each checkpoint	2	2	-	-
PC5. verify PFA if necessary and maintain reliability	2	2	-	-
PC6. verify DPPM and life of the product	1	2	-	-
PC7. identify early and mature failures	1	2	-	-
Reliability Test Equipment Operation	**16**	**18**	**-**	**4**
PC8. identify reliability tools required for products	2	2	-	1
PC9. check the basic operation procedure	2	2	-	1
PC10. identify loading and unloading samples	2	2	-	1
PC11. perform basic programming	2	2	-	1
PC12. identify failures	2	2	-	-
PC13. perform testing equipment required to verify the failures	2	2	-	-
PC14. identify reliability conditions such as temperature, humidity, shock required for tastings	2	2	-	-
PC15. check all safety rules and guidelines inside the lab	1	2	-	-
PC16. guide the reliability team to define reliability specifications	1	2	-	-
Reliability Procedure and flow	**12**	**16**	**-**	**4**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC17. identify international reliability standards such as JEDEC	2	3	-	1
PC18. identify reliability specifications using JEDEC Standards	2	3	-	1
PC19. prepare reliability documents with flow and specifications required to test	2	2	-	1
PC20. check which reliability test is required for which product	2	2	-	1
PC21. test the reliability flow and start the procedure for new products	2	2	-	-
PC22. understand the PCN's & ECN's reliability requirements	1	2	-	-
PC23. prepare a report and get approvals	1	2	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N0165
NOS Name	Reliability Flow & Testing
Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Production-S&C
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	31/03/2022
Next Review Date	31/03/2025
NSQC Clearance Date	31/03/2022

ELE/N9905: Work effectively at the workplace

Description

This unit is about the communicating and managing work effectively at the workplace as well as taking measures to enhance own competence and working in a disciplined and ethical manner.

Scope

The scope covers the following :

- Communicate effectively at the workplace
- Work effectively
- Maintain and enhance professional competence
- Work in a disciplined and ethical manner
- Uphold social diversity at the workplace

Elements and Performance Criteria

Communicate effectively at the workplace

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

PC1. exchange information and instruction with colleagues, and seek clarifications and feedback as necessary

PC2. assist colleagues where required

PC3. follow business communication etiquette in all interactions and communicative formats (online, digital, and in-person)

PC4. document and share all relevant information with stakeholders in agreed formats and as per agreed timelines

Work effectively

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

PC5. identify and obtain clarity regarding organisational, team and own goals and targets

PC6. prioritise and plan work in order to achieve goals and targets

PC7. monitor own and team performance as per agreed plan

PC8. complete duties accurately, systematically and within required timeframes

PC9. express emotions appropriately at the workplace and manage own response to heightened emotions

PC10. maintain orderliness and cleanliness in the work area

Maintain and enhance professional competence

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

PC11. identify own strengths and weaknesses in relation to goals and targets

PC12. adapt self, service, or product to meet success criteria

PC13. seek and select opportunities for continuous professional development

PC14. formulate a professional development plan to enhance capabilities

PC15. build or contribute to the organizational knowledge base of cases, clients, issues, solutions, and innovations

PC16. examine developments and trends in field of work and their potential impact on work

PC17. take feedback from peers, supervisors and clients to improve own performance and practices

Work in a disciplined and ethical manner

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

PC18. perform tasks as per workplace standards, organisational policies and legislative requirements

PC19. display appropriate professional appearance at the workplace and adhere to the organisational dress code

PC20. demonstrate responsible and disciplined behaviour at the workplace such as punctuality; completing tasks as per given time and standards; demonstrating professional behaviour at all times, adopting environment- friendly practices, etc.

PC21. identify the cause of conflict and options for resolution with peers or escalate grievances and problems to appropriate authority as per procedure for conflict resolution

PC22. protect the rights of the client and organisation when delivering services

PC23. ensure services are delivered equally to all clients regardless of personal and cultural beliefs

PC24. operate within an agreed ethical code of practice and report unethical conduct to the appropriate authorities

PC25. follow organisational guidelines and legal requirements on disclosure and confidentiality

Uphold social diversity at the workplace

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

PC26. recognize and evaluate biased practices against underrepresented groups like women and persons with disabilities, in workplace systems and processes

PC27. identify and report discrimination and harassment based on gender, disability, or cultural difference at the workplace

PC28. use inclusive or neutral language and gestures in all interactions

PC29. respect the personal and professional space of others

PC30. access grievance redressal mechanisms as per legislations

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation's policies on dress code, workplace timings, workplace behaviour, performance management, incentives, delivery standards, information security, etc.

KU2. organizational hierarchy and escalation matrix

KU3. importance of the individual's role in the workflow

KU4. organisational norms on health, safety and sustainability

KU5. work area inspection procedures and practices

KU6. professional etiquette and grooming

KU7. communication etiquette across communicative mediums (online, digital, and in-person) including strategies/methods for sharing information, documentation, and providing and receiving feedback

KU8. importance of self-evaluations and developing a continuous learning and professional development plan

KU9. developments and trends impacting professional practice

KU10. importance of taking and using feedback from colleagues and clients to identify and introduce improvements in work performance

KU11. professional ethics and workplace norms on reporting and/or penalizing unethical behaviour and practices.

KU12. guidelines and legal requirements on disclosure, confidentiality, and conflicts of interest

KU13. strategies for collaboration with colleagues and clients.

KU14. professional responses and strategies against inappropriate language or behaviour toward self and others

KU15. Implicit bias (based on gender, disability, class, caste, colour, race, culture, religion, etc.) and its consequences in the workplace

KU16. organizational guidelines, prevalent legislations and accessibility norms and processes to support PwDs at the workplace

KU17. strategies for time, effort and resource allocation towards the goals.

KU18. basic concepts of work productivity including waste reduction, efficient material usage and optimization of time

Generic Skills (GS)

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

GS1. complete documentation and forms such as work orders, invoices maintenance records activity logs, attendance sheets as per organizational format in English and/or local language

GS2. write basic accident or incident report accurately in an appropriate format

GS3. read warnings, instructions and other text material on product labels, components, etc. and relevant signages, warnings, labels or descriptions on equipment, etc. while carrying out work activities

GS4. convey and share technical information clearly using appropriate language

GS5. clarify task-related information

GS6. liaise with authorities and supervisors as per organizational protocol

GS7. listen, speak, and write in an inclusive, respectful manner in line with organizational protocol

GS8. seek clarification from immediate supervisor or responsible authority or exercise most appropriate solutions to safety breaches at work

GS9. report to the supervisor and when to deal with a colleague depending on the type of concern

GS10. deliver product to next work process on time

GS11. improve work process and report potential areas of delays and disruptions

GS12. communicate problems appropriately to others

GS13. identify symptoms of the fault to the cause of the problem and resolve, otherwise seek assistance and support from other sources to solve the problem

GS14. anticipate and avoid hazards that may occur during repairs because of tools, materials used or repair processes

GS15. complete tasks efficiently and accurately within stipulated time

GS16. appreciate and respect social diversity in all professional settings

GS17. develop awareness and accountability for perspectives on gender, disabilities, and socio-cultural issues leading to discrimination, bias, or harassment at the workplace

GS18. maintain positive and effective relationships with colleagues and customers

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Communicate effectively at the workplace	**5**	**13**	**-**	**-**
PC1. exchange information and instruction with colleagues, and seek clarifications and feedback as necessary	1	3	-	-
PC2. assist colleagues where required	1	3	-	-
PC3. follow business communication etiquette in all interactions and communicative formats (online, digital, and in-person)	1	4	-	-
PC4. document and share all relevant information with stakeholders in agreed formats and as per agreed timelines	2	3	-	-
Work effectively	**6**	**13**	**-**	**-**
PC5. identify and obtain clarity regarding organisational, team and own goals and targets	1	2	-	-
PC6. prioritise and plan work in order to achieve goals and targets	1	2	-	-
PC7. monitor own and team performance as per agreed plan	1	2	-	-
PC8. complete duties accurately, systematically and within required timeframes	1	2	-	-
PC9. express emotions appropriately at the workplace and manage own response to heightened emotions	1	2	-	-
PC10. maintain orderliness and cleanliness in the work area	1	3	-	-
Maintain and enhance professional competence	**8**	**7**	**-**	**-**
PC11. identify own strengths and weaknesses in relation to goals and targets	1	1	-	-
PC12. adapt self, service, or product to meet success criteria	1	1	-	-
PC13. seek and select opportunities for continuous professional development	1	1	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. formulate a professional development plan to enhance capabilities	2	1	-	-
PC15. build or contribute to the organizational knowledge base of cases, clients, issues, solutions, and innovations	1	1	-	-
PC16. examine developments and trends in field of work and their potential impact on work	1	1	-	-
PC17. take feedback from peers, supervisors and clients to improve own performance and practices	1	1	-	-
Work in a disciplined and ethical manner	**11**	**16**	**-**	**-**
PC18. perform tasks as per workplace standards, organisational policies and legislative requirements	2	2	-	-
PC19. display appropriate professional appearance at the workplace and adhere to the organisational dress code	1	2	-	-
PC20. demonstrate responsible and disciplined behaviour at the workplace such as punctuality; completing tasks as per given time and standards; demonstrating professional behaviour at all times, adopting environment- friendly practices, etc.	1	2	-	-
PC21. identify the cause of conflict and options for resolution with peers or escalate grievances and problems to appropriate authority as per procedure for conflict resolution	2	2	-	-
PC22. protect the rights of the client and organisation when delivering services	1	2	-	-
PC23. ensure services are delivered equally to all clients regardless of personal and cultural beliefs	1	2	-	-
PC24. operate within an agreed ethical code of practice and report unethical conduct to the appropriate authorities	2	2	-	-
PC25. follow organisational guidelines and legal requirements on disclosure and confidentiality	1	2	-	-
Uphold social diversity at the workplace	**10**	**11**	**-**	**-**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC26. recognize and evaluate biased practices against underrepresented groups like women and persons with disabilities, in workplace systems and processes	2	2	-	-
PC27. identify and report discrimination and harassment based on gender, disability, or cultural difference at the workplace	2	2	-	-
PC28. use inclusive or neutral language and gestures in all interactions	2	2	-	-
PC29. respect the personal and professional space of others	2	2	-	-
PC30. access grievance redressal mechanisms as per legislations	2	3	-	-
NOS Total	**40**	**60**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N9905
NOS Name	Work effectively at the workplace
Sector	Electronics
Sub-Sector	Generic
Occupation	Generic - Organizational Behaviour
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	24/02/2022
Next Review Date	30/12/2026
NSQC Clearance Date	30/12/2021

ELE/N1002: Apply health and safety practices at the workplace

Description

This OS unit is about knowledge and practices relating to health, safety and security that candidates need to use in the workplace.

Scope

The scope covers the following :

- Deal with workplace hazards
- Apply fire safety practices
- Follow emergencies, rescue and first-aid procedures
- Effective waste management/recycling practices

Elements and Performance Criteria

Deal with workplace hazards

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

PC1. identify job-site hazards and possible causes of accident in the workplace

PC2. perform work complying to organizational safe working practices and observing hazard signs displayed on containers, equipment and in various work areas such as inside buildings, in open areas and public spaces, etc.

PC3. use appropriate personal protective equipment (PPE) for specific tasks and work conditions, contaminant (concentration w.r.t air) requirements and severity of hazard while conforming to the Indian/International standards

PC4. follow standard safety procedures while handling tool/ ,equipment, hazardous substances and while working in hazardous environments

PC5. dispose electronic waste (such as toxins; metals such as lead, cadmium, barium; flame retardant plastics, welding slag etc.) as per industry approved techniques

PC6. avoid damage of components due to negligence in electrostatic discharge (ESD) procedures

PC7. locate general health and safety equipment in the workplace such as fire extinguishers; first aid equipment; safety instruments, clothing and installations (fire exits, exhaust fans)

PC8. maintain appropriate posture while handling heavy objects

PC9. apply good housekeeping practices at all times

Apply fire safety practices

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

PC10. take preventive measures to prevent fire hazards

PC11. • use appropriate fire extinguishers for different types of fires
• Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no l

PC12. exhibit rescue and first-aid techniques in case of fire or electrocution

Follow emergencies, rescue and first-aid procedures

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

PC13. administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning etc.

PC14. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock,

PC15. participate regularly in emergency procedures such as raising alarm, safe/efficient, evacuation, correct means of taking shelter and escaping, correct assembly point, roll call, correct return to work

PC16. use correct method to move injured people and others during an emergency

Effective waste management/recycling practices

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

PC17. identify recyclable and non-recyclable, and hazardous waste generated

PC18. segregate waste into different categories

PC19. ensure disposal of non-recyclable waste appropriately

PC20. deposit non-recyclable and reusable material at identified location

PC21. follow processes specified for disposal of hazardous waste

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. importance of working in clean and safe work environment following safety practices and procedures

KU2. health and safety roles and responsibilities of relevant personnel within and outside the organisation

KU3. key internal and external sources of health and safety information

KU4. basic knowledge of electronic devices and related health risks

KU5. meaning of hazards and risks

KU6. various types of health and safety hazards commonly present in the work environment such as physical hazards, electrical hazards, chemical hazards, fire hazards, equipment related hazards, health hazards, etc.

KU7. methods of accident prevention

KU8. importance of using protective clothing/equipment while working

KU9. general principles for identifying and controlling health and safety risks

KU10. main hazards and preventive as well as control measures while working with different types of equipment

KU11. importance of carrying out electrical and non-electrical isolation to prevent hazards from loss of machine/system/process control

KU12. main hazards and preventive as well as control measures when working with electrical systems or using electrical equipment

KU13. forms and classifications of hazardous substances

KU14. safe working practices while working at various hazardous sites

KU15. prevention and control measures to reduce risks from exposure to hazardous substances

KU16. health effects associated with exposure to noise and vibration and the appropriate control measures

KU17. precautionary activities to prevent the fire accident
KU18. various causes of fire such as heating of metal, spontaneous ignition, sparking, electrical eating, loose fires (smoking, welding, etc.) chemical fires etc.
KU19. techniques of using the different fire extinguishers
KU20. different methods and material to extinguish fires
KU21. different materials used for extinguishing fire such as sand, water, foam, CO2, dry powder
KU22. rescue techniques used during a fire hazard
KU23. various types of safety signs and their meaning
KU24. basic first aid treatment relevant to the common work place injuries e.g. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries
KU25. contents of written accident report
KU26. potential injuries and ill health associated with incorrect handing of tools and equipment
KU27. safe lifting and carrying practices
KU28. potential impact to a person who is moved incorrectly
KU29. personal safety, health and dignity issues relating to the movement of a person by others
KU30. ESD measures and 5S
KU31. efficient utilization and management of material and water
KU32. ways to recognize common electrical problems and practices of conserving electricity
KU33. usage of different colours of dustbins, categorization of waste into dry, wet, recyclable, nonrecyclable and items of single-use plastics
KU34. organization's procedure for minimizing waste
KU35. waste management and methods of waste disposal
KU36. common sources of pollution and ways to minimize it
KU37. names, contact information and location of people responsible for health and safety in the workplace
KU38. location of documents and equipment for health and safety compliance/practices in the workplace
KU39. safety notices, signs and instructions at workplace

Generic Skills (GS)

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

GS1. interpret general health and safety guidelines labels, charts, signages
GS2. read operation manuals
GS3. write health and safety compliance report
GS4. write an accident/incident report in local language or English
GS5. provide an emergency or safety incident brief to seniors or relevant authorities in a calm, clear and to-the-point manner
GS6. communicate general health and safety guidelines to colleagues/co-workers
GS7. communicate appropriately with co-workers in order to clarify instructions and other issues
GS8. act in case of any potential hazards observed in the work place

GS9. plan and organize their own work schedule, work area, tools, equipment in compliance with organizational policies for health, safety and security

GS10. take adequate measures to ensure the safety of clients and visitors at the workplace

GS11. identify immediate or temporary solutions to resolve delays

GS12. evaluate the work area for health and safety risks or hazards

GS13. use cause and effect relations to anticipate potential issues, problems and their solution in the work area related to safety

GS14. recognise emergency and potential emergency situations

GS15. protect self and others from a health and safety risk or hazard

GS16. communicate and collaborate to incorporate sustainable practices (greening) in workplace processes

GS17. record data on waste disposal at workplace

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Deal with workplace hazards	**20**	**31**	**-**	**-**
PC1. identify job-site hazards and possible causes of accident in the workplace	2	3	-	-
PC2. perform work complying to organizational safe working practices and observing hazard signs displayed on containers, equipment and in various work areas such as inside buildings, in open areas and public spaces, etc.	3	4	-	-
PC3. use appropriate personal protective equipment (PPE) for specific tasks and work conditions, contaminant (concentration w.r.t air) requirements and severity of hazard while conforming to the Indian/International standards	3	4	-	-
PC4. follow standard safety procedures while handling tool/ ,equipment, hazardous substances and while working in hazardous environments	3	4	-	-
PC5. dispose electronic waste (such as toxins; metals such as lead, cadmium, barium; flame retardant plastics, welding slag etc.) as per industry approved techniques	2	4	-	-
PC6. avoid damage of components due to negligence in electrostatic discharge (ESD) procedures	2	3	-	-
PC7. locate general health and safety equipment in the workplace such as fire extinguishers; first aid equipment; safety instruments, clothing and installations (fire exits, exhaust fans)	2	3	-	-
PC8. maintain appropriate posture while handling heavy objects	1	3	-	-
PC9. apply good housekeeping practices at all times	2	3	-	-
Apply fire safety practices	**4**	**9**	**-**	**-**
PC10. take preventive measures to prevent fire hazards	2	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. • use appropriate fire extinguishers for different types of fires • Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no l	1	3	-	-
PC12. exhibit rescue and first-aid techniques in case of fire or electrocution	1	3	-	-
Follow emergencies, rescue and first-aid procedures	**6**	**13**	**-**	**-**
PC13. administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning etc.	1	3	-	-
PC14. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock,	1	2	-	-
PC15. participate regularly in emergency procedures such as raising alarm, safe/efficient, evacuation, correct means of taking shelter and escaping, correct assembly point, roll call, correct return to work	2	4	-	-
PC16. use correct method to move injured people and others during an emergency	2	4	-	-
Effective waste management/recycling practices	**5**	**12**	**-**	**-**
PC17. identify recyclable and non-recyclable, and hazardous waste generated	1	3	-	-
PC18. segregate waste into different categories	1	2	-	-
PC19. ensure disposal of non-recyclable waste appropriately	1	2	-	-
PC20. deposit non-recyclable and reusable material at identified location	1	3	-	-
PC21. follow processes specified for disposal of hazardous waste	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS Total	**35**	**65**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N1002
NOS Name	Apply health and safety practices at the workplace
Sector	Electronics
Sub-Sector	Generic
Occupation	Generic - Health Safety
NSQF Level	4
Credits	TBD
Version	3.0
Last Reviewed Date	24/02/2022
Next Review Date	24/02/2025
NSQC Clearance Date	24/02/2022

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.

2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.

3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below.)

4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on these criteria.

5. To pass the Qualification Pack, every trainee should score a minimum of 70% in every NOS.

6. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to

successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ELE/N0160.Operate chemical-related process	40	50	-	10	100	15
ELE/N0161.Operate optical microscope and X-Ray Machine	40	50	-	10	100	15
ELE/N0162.Operate Scanning Electron Microscope (SEM), Confocal Scanning Electron Microscopy (CSEM) & Focused Ion Beam (FIB)	40	50	-	10	100	15
ELE/N0163.Understanding of full failure Analysis flow	40	50	-	10	100	15
ELE/N0164.Report Preparation & guidance to the Process Engineer	40	50	-	10	100	15
ELE/N0165.Reliability Flow & Testing	40	50	-	10	100	15
ELE/N9905.Work effectively at the workplace	40	60	-	-	100	5
ELE/N1002.Apply health and safety practices at the workplace	35	65	-	-	100	5
Total	**315**	**425**	**-**	**60**	**800**	**100**

Acronyms

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

Glossary

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

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