



HVAC Technician

QP Code: ELE/Q3112

Version: 2.0

NSQF Level: 4

Electronics Sector Skills Council of India || 155, 2nd Floor, ESC House Okhla Industrial Area-Phase 3
New Delhi- 110020 || email:sneh@essc-india.org

Contents

ELE/Q3112: HVAC Technician	3
<i>Brief Job Description</i>	3
Applicable National Occupational Standards (NOS)	3
<i>Compulsory NOS</i>	3
<i>Qualification Pack (QP) Parameters</i>	3
ELE/N3101: Engage with customer for service	5
ELE/N3140: Service, troubleshoot and repair a HVAC system (chillers)	9
ELE/N3141: Service, troubleshoot and repair packaged type HVAC ducted system	15
ELE/N9905: Work effectively at the workplace	21
ELE/N1002: Apply health and safety practices at the workplace	29
Assessment Guidelines and Weightage	36
<i>Assessment Guidelines</i>	36
<i>Assessment Weightage</i>	37
Acronyms	38
Glossary	39

ELE/Q3112: HVAC Technician

Brief Job Description

The individual in this job role maintains and repairs heating, air conditioning and ventilation systems in commercial and industrial areas. The individual engages with the client to understand the work requirement and follows organizational norms to complete the work.

Personal Attributes

The individual must be willing to work in the field and travel throughout the day from one location to another. The individual should have a patient, amenable demeanour and skills for interpersonal relationship building, critical thinking and punctuality

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [ELE/N3101: Engage with customer for service](#)
2. [ELE/N3140: Service, troubleshoot and repair a HVAC system \(chillers\)](#)
3. [ELE/N3141: Service, troubleshoot and repair packaged type HVAC ducted system](#)
4. [ELE/N9905: Work effectively at the workplace](#)
5. [ELE/N1002: Apply health and safety practices at the workplace](#)

Qualification Pack (QP) Parameters

Sector	Electronics
Sub-Sector	Consumer Electronics & IT Hardware
Occupation	After Sales Support
Country	India
NSQF Level	4
Credits	NA
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3122.5611

Minimum Educational Qualification & Experience	8th Class (+ ITI (2 years after 8th) with 2 years of relevant Experience) OR 10th Class (with 2 years of relevant Experience OR I.T.I (after 10th) OR 12th Class) OR Certificate (NSQF Level-3 in Safety Testing Technician RACWO with 2 years of relevant Experience)
Minimum Level of Education for Training in School	8th Class
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	27/01/2022
Next Review Date	02/06/2025
Deactivation Date	31/07/2024
NSQC Approval Date	27/01/2022
Version	2.0
Reference code on NQR	2022/EHW/ESSC/05133
NQR Version	1.0

Remarks:

NA

ELE/N3101: Engage with customer for service

Description

This NOS unit is about interacting with customer to understand their requirement with respect to problem in the appliance

Scope

The scope covers the following :

- Interact with customer
- Suggest possible solutions

Elements and Performance Criteria

Interacting with customer

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

- PC1.** analyse the details of customer complaint registered at customer care or installation schedule
- PC2.** connect with the customer to confirm problem telephonically and fix time for visit
- PC3.** collect appropriate tools, parts, relevant reference sheets, manuals and documents
- PC4.** visit the customer premises as per the scheduled date and time for service as per the requirement
- PC5.** check about warranty status of appliance and annual maintenance contract
- PC6.** gather detailed information pertaining to age of appliance, status of upkeep, symptoms and history of problems in the appliance
- PC7.** provide information to the customer about the warranty and problem in detail along with the precautions to be taken in order to avoid recurrence of problem

Suggest possible solutions

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

- PC8.** suggest possible solutions with the time required, costs involved and methodology for servicing
- PC9.** seek customer's approval on further action

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** company's policies on code of conduct, organisation's culture, customer care, reporting structure and documentation policy
- KU2.** company's products and recurring problems reported in consumer appliances
- KU3.** precautions to be taken while handling field calls and dealing with customers
- KU4.** importance of personal grooming with proper etiquettes at the customer's premises
- KU5.** basic electrical, mechanical modules of various appliances and electronics involved in the type of appliance

KU6. models of different appliances, their common and distinguishing features, functionality of different features of appliances and new features

Generic Skills (GS)

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

- GS1.** complete required documentation
- GS2.** seek inputs and guidance from the supervisor
- GS3.** read and comprehend documents
- GS4.** communicate in local/regional/English language
- GS5.** comply with applicable standard operating procedures
- GS6.** communicate with all stakeholders to be able to work efficiently
- GS7.** interact with others in a polite and courteous manner
- GS8.** maintain proper etiquette while dealing with the customer

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Interacting with customer</i>	32	41	-	8
PC1. analyse the details of customer complaint registered at customer care or installation schedule	5	6	-	1
PC2. connect with the customer to confirm problem telephonically and fix time for visit	4	6	-	1
PC3. collect appropriate tools, parts, relevant reference sheets, manuals and documents	4	6	-	2
PC4. visit the customer premises as per the scheduled date and time for service as per the requirement	4	6	-	1
PC5. check about warranty status of appliance and annual maintenance contract	4	6	-	1
PC6. gather detailed information pertaining to age of appliance, status of upkeep, symptoms and history of problems in the appliance	5	6	-	1
PC7. provide information to the customer about the warranty and problem in detail along with the precautions to be taken in order to avoid recurrence of problem	6	5	-	1
<i>Suggest possible solutions</i>	8	9	-	2
PC8. suggest possible solutions with the time required, costs involved and methodology for servicing	4	5	-	1
PC9. seek customer's approval on further action	4	4	-	1
NOS Total	40	50	-	10

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N3101
NOS Name	Engage with customer for service
Sector	Electronics
Sub-Sector	Consumer Electronics & IT Hardware
Occupation	AFTER SALES SERVICE
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	27/01/2022
Next Review Date	27/01/2025
NSQC Clearance Date	27/01/2022

ELE/N3140: Service, troubleshoot and repair a HVAC system (chillers)

Description

This OS unit is about troubleshooting and repairing HVAC system (chillers) and using HVAC codes and standards to do technical calculations for optimum performance.

Scope

The scope covers the following :

- Perform maintenance of the system
- Troubleshoot and repair the system
- Check the performance after service and/or repair

Elements and Performance Criteria

Perform maintenance of the system

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

- PC1.** identify the process to clean the chiller, cooling tower, condenser, blower, filter, coils and pump valves, Lubricate fan, motor bearings, fan belt tension as per standards and standards operating procedures (SOPs)
- PC2.** collect appropriate tools and equipment for maintenance and service
- PC3.** perform checks such as water treatment check, proper creation of broken gasket, checks to detect any cracks or leaks and ensure proper insulation lining of water piping
- PC4.** ensure to tighten all screws and electrical connections fasteners to remove vibration
- PC5.** perform proper procedure to fix damper linkages, set screws, carry out blade adjustments and clean them while ensuring not to lubricate the nylon damper rod bushings

Troubleshoot and repair the system

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

- PC6.** perform basic troubleshooting of highside components such as chiller, cooling tower, compressor and pumps
- PC7.** identify issues and troubleshoot low-side components such as air handling unit (AHU), fan and filter
- PC8.** check electrical components such as electric circuit, earthing connection, fuses, electrical panels etc. for functioning and make cable connections
- PC9.** test the components to correct any noise or vibration in the HVAC system, inappropriate flow of air through the grills and diffusers, filters, contamination and confirm the indoor air quality and cooling temperature/pressure in refrigerant/water lines
- PC10.** use manometer to check pressure loss in filters, if any
- PC11.** perform appropriate steps to check fan coil unit (FCU), water valves and expansion valves, the motor conditions, overheat, noise, excessive vibration, slow run and failure to start, fix capacitor, relays etc. and leak detection test of refrigerants
- PC12.** repair faulty insulation, if any, in refrigerant lines and water pipes
- PC13.** use clamp meter to check current and voltage and correct in case of any issues

PC14. identify faulty electrical components such as capacitor, relay, motor and cables, condenser, evaporator, filter and expansion valve and replace these

PC15. record and report the repair work done

Check the performance after service and/or repair

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

PC16. check the performance of the HVAC system as per standards and the current range of the supply to the electrical systems is in optimum range

PC17. test the airflow through the ducts using an anemometer, level of humidity, cooling and heating temperature range as per requirement

PC18. record dry and wet bulb temperature at each cooling/heating region

PC19. check the efficiency of the system and record performance parameters of the system

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. companys policies on: incentives, delivery standards, personnel management and call closure

KU2. companys after sales support policy

KU3. importance of the individuals role in the workflow

KU4. reporting structure

KU5. companys policy on products warranty and other terms and conditions

KU6. basic electrical & electronics theory

KU7. the ohms law and components of an electrical circuit such as resistor, inductor & capacitor

KU8. series & parallel circuit used in hvac

KU9. electrical work, power and efficiency

KU10. SFU,MCB,MCCB,ACB, earthing and neutral connections

KU11. electrical wiring: single line diagram, star-delta, VFD and dol connections

KU12. basic electrical motor theory, types of electric motors used in hvac (single phase & three phase squirrel cage induction) and their application

KU13. the basic measurements: length, area, volume, circumference, diameter of circle, circle area, weight, angles, pressure, temperature cfm, fpm etc.

KU14. method of selection and maintenance of various tools used during the service and repair work

KU15. types & uses of measuring instruments in hvac such as clamp meter, multimeter, anemometer, sling psychrometers, etc.

KU16. method of using different gauges to check the pressure level: types of pressure gauges, gauge manifold, high pressure gauges, low pressure gauges, compound gauges and calibration of gauges

KU17. fundamentals of refrigeration & air conditioning and vapour compression cycle

KU18. various systems of units used in HVAC

KU19. basic components of refrigeration cycle: compressor, condenser, refrigerant control and evaporator

KU20. terms of heat: sensible heat, latent heat, specific heat and modes of heat transfer

- KU21.** study & use of psychrometric charts (dry bulb, wet bulb, dew point temperature, relative humidity, enthalpy etc.)
- KU22.** the gas laws and other related laws of thermodynamics and their importance in refrigeration
- KU23.** use of temperature scales, instruments and measurements, saturation temperature and conversion of temperatures (C to F) & (F to C)
- KU24.** factors affecting heating/cooling load calculations in a given environment
- KU25.** principle and working of variable refrigerant volume (VRV) and variable Refrigerant Flow (VRF) Systems
- KU26.** terms related to hvac systems such as TR, COP and EER
- KU27.** refrigeration & electrical symbols for compressor, condenser, refrigerant control valves, evaporators, switch, gear, lamp. fuses etc.
- KU28.** refrigeration cycle, electrical single line diagram, electrical / mechanical accessories & line diagrams
- KU29.** basic components of a refrigeration cycle: compressor, condenser, refrigerant control and evaporator
- KU30.** condenser and its types: air cooled condenser, water cool condenser and evaporative condenser
- KU31.** evaporator and its types according to construction, temperature, flow and uses
- KU32.** basic working of a hvac system and its types
- KU33.** types of chiller, cooling tower, AHU and pumps

Generic Skills (GS)

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

- GS1.** read product and module serial numbers and interpret details such as make, date and availability
- GS2.** note problems and the details of the work done on the job sheet
- GS3.** seek inputs and assess the problems
- GS4.** communicate in local language
- GS5.** communicate with the clients to put them at ease
- GS6.** educate and inform the clients about contractual issues such as warranty, cost of service and module replacement
- GS7.** educate on precautions to be taken post repairs to avoid recurrence of the problems
- GS8.** prioritize the work according to the work requirement
- GS9.** organize the work area and tools
- GS10.** significance of etiquette to be followed at the clients premises such as maintaining appropriate physical distance with the client during conversation and not entering bedroom without permission
- GS11.** importance of personal grooming
- GS12.** importance of being patient and courteous with all types of clients
- GS13.** value of being polite and courteous under all circumstances
- GS14.** importance of maintaining clean surface/work area

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Perform maintenance of the system</i>	15	18	-	4
PC1. identify the process to clean the chiller, cooling tower, condenser, blower, filter, coils and pump valves, Lubricate fan, motor bearings, fan belt tension as per standards and standards operating procedures (SOPs)	3	4	-	1
PC2. collect appropriate tools and equipment for maintenance and service	3	4	-	1
PC3. perform checks such as water treatment check, proper creation of broken gasket, checks to detect any cracks or leaks and ensure proper insulation lining of water piping	3	4	-	1
PC4. ensure to tighten all screws and electrical connections fasteners to remove vibration	3	3	-	1
PC5. perform proper procedure to fix damper linkages, set screws, carry out blade adjustments and clean them while ensuring not to lubricate the nylon damper rod bushings	3	3	-	-
<i>Troubleshoot and repair the system</i>	15	20	-	4
PC6. perform basic troubleshooting of highside components such as chiller, cooling tower, compressor and pumps	1	2	-	1
PC7. identify issues and troubleshoot low-side components such as air handling unit (AHU), fan and filter	1	2	-	-
PC8. check electrical components such as electric circuit, earthing connection, fuses, electrical panels etc. for functioning and make cable connections	1	2	-	1
PC9. test the components to correct any noise or vibration in the HVAC system, inappropriate flow of air through the grills and diffusers, filters, contamination and confirm the indoor air quality and cooling temperature/pressure in refrigerant/water lines	2	2	-	1
PC10. use manometer to check pressure loss in filters, if any	2	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. perform appropriate steps to check fan coil unit (FCU), water valves and expansion valves, the motor conditions, overheat, noise, excessive vibration, slow run and failure to start, fix capacitor, relays etc. and leak detection test of refrigerants	1	2	-	-
PC12. repair faulty insulation, if any, in refrigerant lines and water pipes	2	2	-	-
PC13. use clamp meter to check current and voltage and correct in case of any issues	2	2	-	-
PC14. identify faulty electrical components such as capacitor, relay, motor and cables, condenser, evaporator, filter and expansion valve and replace these	2	2	-	-
PC15. record and report the repair work done	1	2	-	-
<i>Check the performance after service and/or repair</i>	10	12	-	2
PC16. check the performance of the HVAC system as per standards and the current range of the supply to the electrical systems is in optimum range	2	3	-	1
PC17. test the airflow through the ducts using an anemometer, level of humidity, cooling and heating temperature range as per requirement	2	3	-	1
PC18. record dry and wet bulb temperature at each cooling/heating region	3	3	-	-
PC19. check the efficiency of the system and record performance parameters of the system	3	3	-	-
NOS Total	40	50	-	10

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N3140
NOS Name	Service, troubleshoot and repair a HVAC system (chillers)
Sector	Electronics
Sub-Sector	Consumer Electronics & IT Hardware
Occupation	After Sales Support
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	27/01/2022
Next Review Date	27/06/2025
NSQC Clearance Date	27/01/2022

ELE/N3141: Service, troubleshoot and repair packaged type HVAC ducted system

Description

This OS unit is about performing service, repair and performance check of a packaged type HVAC ducted system at a site.

Scope

The scope covers the following :

- Perform service repair of duct system
- Perform service repair of packaged type HVAC system
- Check performance of ducts and packaged system repaired

Elements and Performance Criteria

Perform service repair of duct system

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

- PC1.** identify any fault in beam clamp, conduit, dampers, pipe hanger, duct hanger and the refrigeration system
- PC2.** check bend, kink or crack in ducts
- PC3.** inspect return air, supply air and duct sizes
- PC4.** check the fan, blower and motors
- PC5.** perform cleaning of ducts by robotic/manual methods
- PC6.** descale water cooled condensers
- PC7.** check the drains of ahu and fcu
- PC8.** fix air leaks in ducts
- PC9.** tighten all insulation and acoustic seals
- PC10.** replace leaking dampers on ventilation system
- PC11.** use proper tools and equipment and maintain safety while working

Perform service repair of packaged type HVAC system

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

- PC12.** check, clean and tighten electrical terminals, thermostat and fuses
- PC13.** check voltage balance
- PC14.** check and clean cooling tower
- PC15.** check and clean coils of evaporator and air cooled condenser
- PC16.** inspect and fix belts, pulleys, bearings, and lubricate motors and bearings
- PC17.** lubricate motor bearings
- PC18.** clean or replace air filters
- PC19.** check and fix refrigerant pressure and leaks
- PC20.** check the refrigerant gas level and charge the gas
- PC21.** check and replace compressor and metering devices

- PC22.** adjust the controls of the system as per requirement
- PC23.** use proper tools while doing repair
- PC24.** maintain safety while handling refrigerants
- PC25.** complete maintenance checklist and report

Check performance of ducts and packaged system required

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

- PC26.** check cooling efficiency and heating efficiency
- PC27.** check the air flow with anemometer
- PC28.** check the static pressure
- PC29.** check the refrigerant charge
- PC30.** check the eer of the system
- PC31.** check the temperature drop across the coils
- PC32.** check the parameters as per the requirements

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** companys policies on: incentives, delivery standards and personnel management
- KU2.** companys occupational safety and health policy
- KU3.** companys emergency evacuation procedure and companys medical policy
- KU4.** right control methods (temperature & pressure)
- KU5.** types of duct systems and their components
- KU6.** selection process of suitable duct system for the site
- KU7.** types of packaged type hvac ducted systems and its components
- KU8.** types of compressors and their parts: reciprocating compressor and scroll compressor
- KU9.** metering devices: thermostatic and electronic expansion valve
- KU10.** liquid line driers and air filters
- KU11.** refrigerants and their types & properties: r-32, r-410a, r-134a, r-22, r- 290, r-600a, r-407a
- KU12.** ODP and GWP of different types of refrigerant gas
- KU13.** types of refrigerant control: thermostatic expansion valve, capillary tubes and expansion valves
- KU14.** safety standards while dealing with refrigerant gases
- KU15.** emergency procedure in case of gas leak or fire

Generic Skills (GS)

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

- GS1.** read product and module serial numbers and interpret details such as make, date and availability
- GS2.** note problems and the details of the work done on the job sheet
- GS3.** seek inputs and assess the problems

- GS4.** communicate in local language
- GS5.** communicate with the clients to put them at ease
- GS6.** educate and inform the clients about contractual issues such as warranty, cost of service and module replacement
- GS7.** educate on precautions to be taken post repairs to avoid recurrence of the problems
- GS8.** significance of using safety materials such as gloves, etc.
- GS9.** how to use safety equipment such as fire extinguisher during fire accidents
- GS10.** decide on the spot on whether interaction of the client with the supervisor is necessary or not
- GS11.** decide when to call customer care and close the call after work is done to the clients satisfaction and the documentation is complete
- GS12.** prioritize the work according to the work requirement
- GS13.** organize the work area and tools

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Perform service repair of duct system</i>	15	20	-	-
PC1. identify any fault in beam clamp, conduit, dampers, pipe hanger, duct hanger and the refrigeration system	2	2	-	-
PC2. check bend, kink or crack in ducts	1	2	-	-
PC3. inspect return air, supply air and duct sizes	2	1	-	-
PC4. check the fan, blower and motors	1	2	-	-
PC5. perform cleaning of ducts by robotic/manual methods	2	1	-	-
PC6. descale water cooled condensers	1	2	-	-
PC7. check the drains of ahu and fcu	1	2	-	-
PC8. fix air leaks in ducts	1	2	-	-
PC9. tighten all insulation and acoustic seals	1	2	-	-
PC10. replace leaking dampers on ventilation system	1	2	-	-
PC11. use proper tools and equipment and maintain safety while working	2	2	-	-
<i>Perform service repair of packaged type HVAC system</i>	17	26	-	-
PC12. check, clean and tighten electrical terminals, thermostat and fuses	1	2	-	-
PC13. check voltage balance	2	1	-	-
PC14. check and clean cooling tower	1	2	-	-
PC15. check and clean coils of evaporator and air cooled condenser	1	2	-	-
PC16. inspect and fix belts, pulleys, bearings, and lubricate motors and bearings	2	2	-	-
PC17. lubricate motor bearings	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC18. clean or replace air filters	1	2	-	-
PC19. check and fix refrigerant pressure and leaks	1	2	-	-
PC20. check the refrigerant gas level and charge the gas	1	2	-	-
PC21. check and replace compressor and metering devices	1	2	-	-
PC22. adjust the controls of the system as per requirement	2	1	-	-
PC23. use proper tools while doing repair	1	2	-	-
PC24. maintain safety while handling refrigerants	1	2	-	-
PC25. complete maintenance checklist and report	1	2	-	-
<i>Check performance of ducts and packaged system required</i>	8	14	-	-
PC26. check cooling efficiency and heating efficiency	1	2	-	-
PC27. check the air flow with anemometer	1	2	-	-
PC28. check the static pressure	1	2	-	-
PC29. check the refrigerant charge	1	2	-	-
PC30. check the eer of the system	1	2	-	-
PC31. check the temperature drop across the coils	1	2	-	-
PC32. check the parameters as per the requirements	2	2	-	-
NOS Total	40	60	-	-

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N3141
NOS Name	Service, troubleshoot and repair packaged type HVAC ducted system
Sector	Electronics
Sub-Sector	Consumer Electronics & IT Hardware
Occupation	After Sales Support
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	27/01/2022
Next Review Date	27/06/2025
NSQC Clearance Date	27/01/2022

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



Qualification Pack



GS18. maintain positive and effective relationships with colleagues and customers

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Communicate effectively at the workplace</i>	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	-	-
<i>Work effectively</i>	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	-	-
<i>Maintain and enhance professional competence</i>	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	-	-
<i>Work in a disciplined and ethical manner</i>	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	-	-
<i>Uphold social diversity at the workplace</i>	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 I
- 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 handling 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
<i>Deal with workplace hazards</i>	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	-	-
<i>Apply fire safety practices</i>	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. <ul style="list-style-type: none"> • 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 I 	1	3	-	-
PC12. exhibit rescue and first-aid techniques in case of fire or electrocution	1	3	-	-
<i>Follow emergencies, rescue and first-aid procedures</i>	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	-	-
<i>Effective waste management/recycling practices</i>	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. 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 centre (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criterion.
6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

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

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ELE/N3101.Engage with customer for service	40	50	-	10	100	30
ELE/N3140.Service, troubleshoot and repair a HVAC system (chillers)	40	50	-	10	100	25
ELE/N3141.Service, troubleshoot and repair packaged type HVAC ducted system	40	60	-	-	100	25
ELE/N9905.Work effectively at the workplace	40	60	-	-	100	10
ELE/N1002.Apply health and safety practices at the workplace	35	65	-	-	100	10
Total	195	285	-	20	500	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.