

Domain**AIR CONDITIONING AND
REFRIGERATION****Title: Maintain domestic air-conditioning
and refrigeration systems****Level: 3****Credits: 11****Purpose**

This unit standard specifies the competencies required to maintain domestic air conditioning and refrigeration systems. It includes plan and prepare for work; inspect air-conditioning and refrigeration system operation; maintain the integrity of mechanical components; clean air-conditioner and refrigeration components; repair of air conditioner and refrigeration systems; and perform housekeeping.

This unit standard is intended for those who works as air conditioning and refrigeration artisans.

Special Notes

1. Entry information:

Prerequisite
 - *Unit 1157 - Demonstrate basic knowledge of workplace health and safety.*
2. Assessment evidence may be collected from a real workplace or a simulated workplace or an appropriate simulated realistic environment in which air conditioning and refrigeration operations are carried out.
3. To demonstrate competence, at minimum evidence is required for conducting maintenance on two (2) air- conditioning system and two (2) refrigeration systems.
4. Maintenance on Air-conditioning and refrigeration system:
 - Domestic systems: fridges, water dispenser, wine cooler, air-conditioner, portable coolers and chest freezers.
 - Commercial systems: beverage cooler, cold room, freezer room, ice machine, ice cream machine, air-conditioner, heat pump, refrigerated drawers and de-humidify.
 - Industrial systems: chillers, package unit, cold store, VRV cooling system, air dryer, ice plant and blast freezer.
5. All inspection, operation and maintenance procedures associated with the use of tools and equipment shall comply with manufacturers' specifications and/or company's guidelines and instructions.

6. Glossary of terms:
 - “*Specifications*” refers to any, or all of the following: manufacturers’ specifications and recommendations, workplace specific requirements.
 - “*Service*” refers to testing, cleaning and including repairing of faulty components of the air conditioner.
 - “*Maintenance*” refers to preserving a condition. To the routing task and activities carried to ensure that proper functioning reliability and longevity of air-conditioning and refrigeration system.
 - “*Lubrication*” refers to the control of friction and wear by the introduction of friction reducing film between moving surface in contact.
 - “*Barrier*” refers to physical or mechanical obstruction that prevent the transfer of heat or refrigerant between different section of components.
7. Regulations, legislation and standard relevant to this unit standard include the following:
 - Labour Act, No. 11, 2007
 - Occupational Health and Safety Regulations No. 18, 1997 and all subsequent amendments.
 - Import and Export control act, 1994.
 - NAMS 5149-3: 2021 (ISO 5149-3: 2014)
 - NAMS 5149-4: 2021 (ISO 5149-4: 2014)
 - ISO 17584: 2022
 - SANS 10147: 2014
8. Performance of all elements in this unit standard must comply with industry standards.
9. This unit standard applies to single-phase and three-phase air conditioning and refrigeration systems.

Quality Assurance Requirements

This unit standard and others within this subfield may be awarded by institutions which meet the accreditation requirements set by the Namibia Qualifications Authority and the Namibia Training Authority and which comply with the national assessment and moderation requirements. Details of specific accreditation requirements and the national assessment arrangements are available from the Namibia Qualifications Authority and the Namibia Training Authority. All approved unit standards, qualifications and national assessment arrangements are available on the Namibia Training Authority website www.nta.com.na.

Elements and Performance Criteria

Element 1: Plan and prepare for work

Range

Tools and equipment may include but not limited to screw drivers, bucket of water, blower, hosepipe, ladder, manifold gauges, adjustable wrenches, cleaning brush, socket set, allen keys, set of spanners, pliers, oxy-acetylene gas welding set, vacuum pump, leak detecting

equipment, multimeter, torque wrench, refrigerant scale, thermometer, recovering unit, and dial gauge.

Materials may include but not limited to refrigerant, coil cleaner, cleaning cloth, water, compressor oil, and vacuum oil.

Performance Criteria

- 1.1 Work instructions including job cards, specifications and operational details are interpreted and confirmed.
- 1.2 Workplace inspection is carried out in line with safety standards.
- 1.3 Safety requirements are applied in line with safety and workplace policies.
- 1.4 Tools and equipment are selected in line with the job requirements.
- 1.5 Material required are selected and obtained in line job specifications.
- 1.6 Calibration requirements for tools, instruments and equipment are carried out in line with job requirements.
- 1.7 Environmental protection requirements are outlined and followed in line with environmental legislative requirements.

Element 2: Inspect air-conditioning and refrigeration system operation

Range

Tools and equipment may include but not limited to service hand tools, and anemometer.

Inspection methods are to include but not limited to visual, hearing, touching, smelling, and functional assessment in line with manufacturer's specifications.

Systems components may include but not limited to evaporator and condenser fan; compressor; solenoid valve; thermostat; pressure switch; sight glass; defrost timer; delay timer; heating elements; drain element; door heater; oil filter; filter dryer; thermometer; suction accumulator; manometers; liquid receiver; expansion valve; drain trays; heat exchanger; and drains.

Performance Criteria

- 2.1 Components are visually inspected in line with job specifications.
- 2.2 Procedures required for testing air conditioner functions and efficiency are followed in line with job specifications.
- 2.3 Inspections are carried out in line with job specifications.

- 2.4 Tests are conducted in line with industry requirements.
- 2.5 Fault(s) are identified and reported in line with job specifications.
- 2.6 Procedures required for maintaining heat exchangers and air distribution systems are followed in accordance with job specifications.
- 2.7 Components are inspected and airflow is tested in line with job specifications.

Element 3: Maintain the integrity of mechanical components

Range

Maintenance may include but not limited to mechanical components, thermal insulation, heat transfer component, defrosting evaporator (water, electrical and hot gas defrosting methods), and condensate drainage.

Insulation materials may include but not limited to armour flux, strip curtains, cold room panels, mineral wool, silicon, ducting tape, foam, polystyrene, polyurethane, and ducting wrap.

Components may include but not limited to ducting hangers; fans; pumps and compressors; and expansion valve.

Barriers may include but not limited to thermal insulation, vapour barrier, air barrier and structural barrier.

Mechanical components may include but not limited to cold room doors; door hinges; door release mechanisms; bi-flow relief ports and/or curtains; and beverage cooler doors.

Performance Criteria

- 3.1 Insulators and barriers are inspected in line with job specifications.
- 3.2 Mechanical components are inspected in line with job specifications.
- 3.3 Maintenance is carried out in line with job specifications.

Element 4: Clean Air Conditioner and refrigeration components

Range

Air-conditioner components may include but not limited to filters, condenser coil, drain pipe, evaporator coil, fan drum, casing, louver, drain pan and grill.

Cleaning equipment and materials may include but are not limited to air blower, cleaning brush, cleaning cloth, solvent such as sippy water and coil cleaner.

Performance Criteria

- 4.1 Procedures required for cleaning components are in line with job specifications.
- 4.2 Power source is isolated in line with job specifications.
- 4.3 Cleaning methods are Performed in line with job specifications.

Element 5: Repair of air conditioner and refrigeration systems

Range

Repair methods may include but not limited to disassembling and assembling of components; and replacements.

Lubrication may include but not limited to oil, and grease.

Tools may include but are not limited to grease gun, and servicing tools.

Lubrication methods includes but not limited to splash, and forced feed.

Oil properties may include but not limited to low pour point, low wax content, de electric strength, low viscosity, thermal stability, corrosion resistance, chemical compatibility, and anti-wear properties.

Grease properties may include but not limited to consistency, water resistance, wear resistance, dropping point, water wash out, load carrying capacity, and viscosity.

Performance Criteria

- 5.1 Procedures required for repairing are identified in line with job specifications.
- 5.2 Safety procedures are adhered to in line with job specifications.
- 5.3 Repairing is carried out in line with the industrial standards.
- 5.4 Components are tagged and stored in line with the job specifications.
- 5.5 Components are replaced in line with job specifications.
- 5.6 Procedures required for maintaining efficiency of lubrication are followed in line with job specifications.
- 5.7 Components are inspected and adjusted in line with manufactures specifications.
- 5.8 Oil and grease properties are explained in line with Manufacturer specifications.
- 5.9 Oil and grease condition are tested in line with manufacturer specifications.

5.10 Lubrication methods are explained in line with the job specifications.

Element 6: Perform housekeeping

Range

Housekeeping may include but not limited to work completion; cleaning; arranging; and storing of tools and equipment.

Performance Criteria

- 6.1 Work area is cleared of waste, cleaned, restored and secured in line with job specifications.
- 6.2 Reusable material is collected and stored in line with job specifications.
- 6.3 Equipment used are cleaned, checked, maintained and stored in line with job specifications/work instructions.

Registration Data

Subfield:	Mechanical Engineering
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