

NATIONAL METAL AND ENGINEERING CURRICULUM

MODULE: COOLROOMS/FREEZER ROOMS (NR19)

PURPOSE: This module aims to provide the student with the knowledge and skills to install, service and maintain coolrooms and freezer rooms.

NOMINAL DURATION: One module

This module is designed on the assumption that most of the students will achieve the competencies specified in 35 to 40 hours.

The length of time taken to complete a module will vary depending on factors such as teaching method used, knowledge and skills at entry and individual students ability.

PREREQUISITES: System Control (NR12)
Installation (NR11)

LEARNING OUTCOMES: On completion of this module the student will be able to:

1. Describe commercial food storage conditions for correct food preservation including temperature ranges and relative humidities for various products.
2. Identify the types of coolrooms and freezer rooms currently used and describe building construction procedures and techniques employed.
3. Read and interpret engineering drawings, layouts and specifications used in the installation of coolroom/freezer rooms, with reference to SAA Codes.
4. Describe and adjust components of coolrooms and freezer rooms including defrosting arrangements.
5. Identify and adjust system and defrost controls with reference to control circuit diagrams, to give required storage conditions.
6. Establish the correct methods for commissioning, servicing and maintaining coolrooms and freezer rooms.

STUDENTS SHOULD BE MADE AWARE OF OCCUPATIONAL HEALTH AND SAFETY ISSUES IN ALL SITUATIONS AND BE EXPECTED TO DEMONSTRATE SAFE WORKING PRACTICES AT ALL TIMES.

OUTLINE OF CONTENT:

This module contains:

- 1. Food spoilage**
 - . effects of storage conditions
 - . controlled atmosphere
 - . relative humidity
 - . evaporator temperature difference

- 2. Types and construction**
 - . pre-fabricated and permanent type walk-in coolrooms and freezer rooms
 - . construction
 - . insulation
 - . vapour barrier
 - . frost heave
 - . interior fittings

- 3. Layouts and installation**
 - . location of equipment
 - . equipment site arrangements and building services
 - . access and obstructions
 - . power supply and electrical services
 - . arrangement of piping

- 4. Components and features**
 - . refrigerant controls
 - . evaporators
 - . solenoid valves
 - . crankcase pressure regulators
 - . defrosting method and mullions
 - . drain facilities and heaters
 - . pressured relief valves
 - . door hardware
 - . lighting and germicidal lamps

- 5. System and Defrost Controls**
 - . operating conditions
 - . thermostat and pressure controls
 - . defrost timers and controllers
 - . overloads and safety control
 - . electrical control circuits

- 6. Commission, Service and Maintain**
 - . check and adjust control devices
 - . determine operating conditions
 - . leak testing
 - . normal and abnormal operation
 - . basic servicing techniques

* Details of above Outline topics are available in APPENDIX 1

ON THE JOB TRAINING:

For consolidation, the material in this module should be linked with and complemented by relevant on-the-job skill practice or other equivalent experience.

PERFORMANCE CRITERIA:

The criteria for each learning outcome should be:

Learning Outcome 1

Assessment:

Short answer tests

Performance:

1. Describe the factors contributing to deterioration and spoilage of food.
2. Determine the effects of incorrect storage conditions on various foods.
3. Describe the use of controlled atmosphere storage methods.
4. Explain the effects of humidity on the controlled storage space, and determine methods to control relative humidity including evaporator temperature difference.

Learning Outcome 2

Assessment:

Short answer tests

Performance:

1. Identify walk-in coolrooms and freezer rooms of the pre-fabricated and permanent types.
2. Describe various methods of construction.
3. Identify types of insulation and describe comparative insulating qualities.
4. Describe the importance of Vapour Barriers including the effects of damaging the vapour barrier.
5. Determine the cause, effect and methods of preventing frost heave.
6. Describe the use of shelving and fittings with reference to SAA Codes.

Learning Outcome 3

Assessment:

Short answer tests

Performance:

1. Identify correct room and equipment locations for various installations.
2. Determine site arrangements, including building services arrangements.
3. Identify access and obstruction characteristics.
4. Determine electrical services arrangements from site drawings.
5. Describe correct refrigerant piping layouts.

Learning Outcome 4

Assessment:

**Short answer tests
Practical tests**

Performance:

1. Identify the types of refrigerant controls.
2. Describe the positioning of evaporators.
3. Identify the use of solenoid valves.
4. Adjust the operation of crankcase pressure regulators on freezer rooms.
5. Describe defrosting methods employed on rooms including door heating.
6. Identify drain facilities and heaters required.
7. Describe the purpose of pressure relief valves.
8. Identify the safety requirements of door hardware.
9. Identify the lighting requirements and explain the use of germicidal lamps.

Learning Outcome 5

Assessment:

**Short answer tests
Practical tests**

Performance:

1. Determine operating conditions including the effects of coolroom temperature on relative humidity.
2. Identify and adjust thermostats and pressure controls.
3. Identify and adjust defrost timers and controllers.
4. Describe the use of overloads and safety controls.
5. Analyse electrical control circuits of the various rooms and explain the sequence of operation.

Learning Outcome 6

Assessment:

Practical tests

Performance:

1. Check and adjust control devices.
2. Determine room temperatures and humidity conditions are correct.
3. Use appropriate leak detection equipment.
4. Recognise normal and abnormal operation of equipment and components.
5. Apply basic servicing and maintenance techniques.

APPENDIX 1.

Suggested Module Content:

ADDITIONAL INFORMATION

Learning Outcome 1

- 1. Describe the meaning of the terms relative humidity, dry bulb temperature, wet bulb temperature and establish the relationship between them by analysing a psychrometric chart.**
- 2. Use a sling psychrometer to obtain a refrigerators relative humidity and perform limited relative humidity adjustments to storage conditions.**
- 3. Determine the effects on storage conditions of:**
 - changing the condensing pressure**
 - changing the evaporator air flow**
 - reducing the coil surface.**

Learning Outcome 5

- 1. Establish the correct methods for maintaining commercial coolrooms and freezer rooms including:**
 - checking and replacing driers**
 - adjusting belts and pulleys**
 - checking relays and electrical controls**
 - leak testing**
 - pressure test, dehydrate and charge a system**
- 2. Employ systematic procedures in the detection, identification and rectification of problems in the refrigeration cycle and electrical circuits of coolrooms and freezer rooms, including:**
 - undercharged/restricted/overcharge systems**
 - air in the system**
 - refrigerant control malfunctions**
 - incorrectly set fan delays**
 - failed door/drain heaters**
 - cyclic defrost set on incorrect pressure/temperature**
 - room hardware, door and relief system maladjustment**

ADDITIONAL INFORMATION: MODULE (NR19)

1. SUGGESTED TEACHING/LEARNING STRATEGIES

1. Establish a data file for commercial food storage conditions consisting of:
 - commercial storage temperature ranges for various products
 - approximate relative humidity related to commercial storage conditions for various products.
 - design temperature difference related to relative humidity.

2. Operate and fault-find a coolroom or freezer room and its defrost system using any available reference material to establish the correct operating condition.

3. Use pressure/enthalpy diagrams to demonstrate how changes in the operating conditions effect the system performance such as:
 - head and suction pressure variations
 - effects of sub-cooling and superheating
 - shortage of refrigerant

Select the refrigeration pressure/temperature check points, take readings and interpret the data after transferring it to a pressure/enthalpy chart.

4. Students should visit actual installations of various coolrooms and freezer rooms in a variety of applications.

2. SUGGESTED MINIMUM RESOURCES

3. SUGGESTED ON-JOB TRAINING - FOR MAXIMUM SKILL ACQUISITION