

## 1. Module details

**Module name** System Control

**Module duration** One Module (36-40 hrs)

**Module code** NR12.1

**Discipline code** 0703320

## 2. Module purpose

To provide the participants with the knowledge and skills of electrical controls used on refrigeration and air conditioning systems

## 3. Prerequisites

NR08.1 Appliance Motors and Circuits

## 4. Relationship to competency standards

NES106e, NES206e, NES301e, NES402e, NES501e, NES505

## 5. Learning Outcomes

- 1 Read / construct electrical wiring diagrams with safety / cycling controls included
- 2 Identify types and test function of controls used on basic power and control circuits
3. Identify types of 3 phase motor starters found in the refrigeration / air conditioning industry
4. Install / remove controls from operating systems showing due care to electrical safety and refrigerant conservation
5. Identify use of timers in control / power circuits
6. Per-determine settings to achieve conditions of comfort, product storage, or safety.
7. Commission controls to achieve desired conditions of comfort, product storage or safety.

## 6. Content

### 1. Standard symbols used in electrical circuits.

- circuit exercises
- manufacturer's wiring diagrams
- control terminology

### 2. Components of basic control circuits

- relays (starting)
- relays (control)
- thermostats
- pressure controls
- contactors
- test equipment
- safety instruction

**3 Three phase motor starting methods. (Power and control circuits)**

- D.O.L.
- primary resistance
- star delta
- auto transformer
- part winding
- solid state (soft starting)

**4. Operating refrigeration/air conditioning plants**

- safety Instruction
- ozone conservation instruction
- components for removal/installation

**5. Use/application of timers**

- defrosting
- plant cycling
- starts, limiting
- transition

**6. Methods for anticipating control settings**

- design conditions-comfort/storage
- ambient conditions
- pressure/temperature relationships

**7. On-the-job operation - controls**

**7. Assessment strategy**

**Assessment methods**

Short answer questions, practical exercises

**Conditions of assessment**

**8. Learning outcome details**

**Learning outcome 1**

**Assessment criteria**

- 1.1 Given lists of safety and cycling controls and cycle operation required produce schematic wiring diagrams using standard symbols.
- 1.2 Given manufacturer's wiring diagrams, extract information and describe operational sequence.

**Learning outcome 2**

**Assessment criteria**

- 2.1 Determine which controls are suited to given theory/practical situations
- 2.2 Test controls used in power or control circuits for function and set point.
- 2.3 Use test equipment to determine set points of pressure and temperature.
- 2.4 Observe required standards of safety whilst carrying out (a), (b)& (c).

**Learning outcome 3**

**Assessment criteria**

- 3.1 Identify characteristics, applications and limitations of the following starting methods;
  - D.O.L.
  - Primary resistance
  - Star delta
  - Auto transformer
  - Part winding
  - Solid state (soft starting)
- 3.2 Trace out both power and control circuits of starting methods
- 3.3 Fault find and rectify both power and control circuits of three
- 3.4 Construct wiring diagrams of power and control Circuits used in three phase starting

**Learning outcome 4**

**Assessment criteria**

- 4.1 Identify requirements of safety and/or refrigerant conservation required when removing controls from operating systems.
- 4.2 Install/remove controls from operating systems showing regard to electrical integrity and ozone conservation.

**Learning outcome 5**

<b>Assessment criteria</b>	5.1 Describe uses and types of timers used in domestic and commercial systems for defrosting purposes
<b>Learning outcome 6</b>	
<b>Assessment criteria</b>	<p>6.1 Anticipate control settings to achieve temperatures commensurate with human comfort.</p> <p>6.2 Anticipate control settings to achieve humidity conditions commensurate with human comfort</p> <p>6.3 Anticipate control settings to achieve temperatures required to store foodstuffs in required states and over required periods.</p> <p>6.4 Utilise pressure/temperature charts in anticipating settings required for a pressure control to achieve control of temperature in a refrigerated space.</p> <p>6.5 Utilise pressure/temperature charts in anticipating settings required for a pressure control to prevent a system from operating outside of limits deemed safe due to pressure or temperature.</p>
<b>Learning outcome 7</b>	
<b>Assessment criteria</b>	<p>7.1 Set controls to set points provided by instructor/s within required parameters.</p> <p>7.2 Set controls to achieve conditions of comfort, storage and/or safety.</p>
<b>9. Delivery of the module</b>	
<b>Delivery strategy</b>	Short answer questions, practical exercises
<b>Resource requirements</b>	
<b>Occupational health and safety requirements</b>	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.