# GENERAL INFORMATION FOR REPAIR AND MAINTENANCE OF CENTRAL AIR CONDITIONING PLANT ( Direct & Chiller ).

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|---|---|
| **Name of sector** | **Refrigeration & Air Conditioning** |
| **Name of Module** | **REPAIR AND MAINTENANCE OF CENTRAL AIR CONDITIONING PLANT** |
| **MES Code** | **REF 701** |
| **Competency as per N C O Code** | |
| **Duration of Course** | **500 Hrs** |
| **Entry qualification of trainee** | **VIII Std** |
| **Unit size ( No of trainees)** | **20** |
| **Power norms** | **02KW** |
| **Space Norms ( Workshop and Class room )** | **60 sq.m**<br>**( Minimum size of one side to be 04 m)** |
| **Instructors Qualification**<br><br>**Desirable** | Degree in Mechanical Engineering with one year Experience<br>**OR**<br>Diploma in Mechanical Engineering with two year Experience<br>**OR**<br>NTC/ NAC in RAC Trade with three years of Experience<br>Craft Instructor Certificate (CIC) |

**COURSE CONTENT FOR REPAIR AND MAINTENANCE OF CENTRAL AIR CONDITIONING PLANT**

**(Direct & Chiller)**

| Under pinning Knowledge ( Theory) | Practical Competencies |
|---|---|
| • Safety Precautions, study the function and working of Air Conditioning tools, | • Familiarization of Air conditioning tools, Instruments & Equipments. |

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|---|---|
| Instruments & Equipments.<br>• Study the construction and working of V.C. Cycle of Central A.C.<br>• Mechanical and electrical components used in central A.C and its description.<br>• Ducts, filters, AHU and its details.<br>• Study the current, voltage, resistance measuring.<br>• Study the open circuit, short circuit and earth testing.<br>• Study the different types of motors used in Central A.C.<br>• Study the different types of starters, OLP, thermostat, fan, Capacitors, oscillating motors in Central A.C.<br>• Study the trouble shooting in Central Air Conditioners.<br>• Refrigerant, gas charging, evacuation and leak test.<br>• Operation of Central Air Conditioning Plant. | • Tube cutting, bending, flaring, swaging, brazing, welding.<br>• Measuring Current, voltage, resistance, temperature and pressure.<br>• Check open circuit, short circuit and earth of three phase motors.<br>• Identify three phase motors and open type compressors<br>• Check relay, OLP, thermostat, motors, low pressure and high pressure cut out, Capacitors<br>• Check the wiring circuit of Central Air Conditioner<br>• Check the efficiency of Open type compressor.<br>• Dismantle and Assemble Open type Compressor.<br>• Identify the trouble and rectification<br>• Decaling water Cooled condenser.<br>• Flushing Condenser and Evaporator.<br>• Leak Testing, Evacuation, Gas Charging In Central A.C<br>• Servicing Central Air Conditioner<br>• Check the performance of Air conditioner.<br>• Operation of Central Air Conditioner |

LIST OF TOOLS, INSTRUMENTS, EQUIPMENTS AND FURNITURE

| | |
|---|---|
| 1, File | 5 no’s |
| 2,Hammer | 5 no’s |
| 3, screw driver | 5 no’s |
| 4,Combination pliers | 5 no’s |
| 5, Line tester | 5 no’s |
| 6,Soldering Iron | 5 no’s |

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| 7, Bench vice | 2 no’s |
| 8,Hack saw | 5 no’s |
| 9, Pipe wrench | 5 no’s |
| 10,Snip | 5 no’s |
| 12, Tube cutter | 5 no’s |
| 13, Tube Bender | 5 no’s |
| 14, Swaging tool | 5 no’s |
| 15, Pinching tool | 5 no’s |
| 16,Flaring tool | 5 no’s |
| 17,Gauge manifold set | 2 no’s |
| 18, Compound gauge | 2 no’s |
| 19, Pressure Gauge | 2 no’s |
| 20, Volt meter | 5 no’s |
| 21, Ammeter | 2 no’s |
| 22, Multi meter | 2 no’s |
| 23, Tong tester | 2nos |
| 24, Halide torch | 1 no’s |
| 25, Thermometer | 2 no’s |
| 26,Double end spanner set | 2 no’s |
| 27, Ring spanner set | 2 no’s |
| 28, Box spanner set | 1 no’s |
| 30, Adjustable spanner | 5 no’s |
| 31, Nitrogen Cylinder | 1 no’s |
| 32, Gas cylinder | 2nos |
| 33,Vacuum pump | 1 no’s |
| 34, Gas welding machine | 1 no’s |
| 35, Brazing Kit | 2 no’s |
| 36,Grinding machine | 1 no’s |
| 37, drilling machine | 1nos |
| 38, Sling psychrometer | 1no |
| 39, Work Bench | 1no |
| 40,Central Air Conditioning plant , 10 Ton Capacity. | 1 Plant. |
| | |

**REDESIGNED MODULES FOR THE SECTOR**

**OF**

# REFRIGERATION/ AIR CONDITIONING / VENTILATION MECHANIC (ELECTRICAL CONTROLS)

**UNDER**
**MODULAR EMPLOYABLE SKILLS (MES)**

**Redesigned in – 2014**

***By***

Government of India
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
Directorate General of Employment & Training
Ministry of Labour & Employment (DGET)
EN – 81, SECTOR – V, SALT LAKE CITY,
Kolkata – 700 091.

## Preface

**The redesigned modules of Construction sector of one modules with following details :**

| Module No | Module Name | Competency as NCO CODE | Space Norms | Power Norms | Unit Size | Instructors Qualification |
|---|---|---|---|---|---|---|
| REF101 | Refrigeration / Air Conditioning / Ventilation Mechanic (Electrical Control) | | 60 sq.m ( Minimum size of one side to be 04 m) | 02 KW | 20 | As per general information of each module |

## GENERAL INFORMATION FOR REFRIGERATION / AIRCONDITIONING / VENTILATION MECHANIC ( ELECTRICAL CONTROLS)

| | |
|---|---|
| Name of sector | Refrigeration & Air Conditioning |
| Name of Module | Refrigeration /Air conditioning /Ventilation Mechanic (electrical Control) |

| | |
|---|---|
| **MES Code** | **REF 702** |
| **Competency as per N C O Code** | |
| **Duration of Course** | **500 Hrs** |
| **Entry qualification of trainee** | **VIII Std pass +ELE 701** |
| **Unit size ( No of trainees)** | **20** |
| **Power norms** | **02KW** |
| **Space Norms ( Workshop and Class room )** | **60 sq.m**<br>**( Minimum size of one side to be 04 m)** |
| **Instructors Qualification** | **Degree in Mechanical Engineering with one year Experience**<br>**OR**<br>**Diploma in Mechanical Engineering with two year Experience**<br>**OR**<br>**NTC/ NAC in RAC Trade with three years of Experience** |
| **Desirable** | **CITC** |

# Course content for Module Refrigeration /Air conditioning /Ventilation Mechanic (electrical Control)

| **Under pinning Knowledge ( Theory)** | **Practical Competencies** |
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| • Safety Precautions, study the function and working of refrigeration tools, Instruments & Equipments.<br>• Introduction to electric controls used in Refrigeration / Air Conditioning / Ventilation.<br>• Study the electric circuit systems in Refrigerator.<br>• Study the function, working, application of relays, OLP, thermostat, Door switch.<br>• Study the electrical controls used in refrigerator.<br>• No Frost Refrigerator Electrical control systems.<br>• Common faults and remedies occur in No Frost Refrigerator Electrical control systems.<br>• Testing procedure of relay, OLP, thermostat, Door switch, Defrost heater, timer, Bimetal thermo.<br>• Study the electric circuit systems of Bottle Cooler.<br>• Study the function, working, application of relays, OLP, thermostat, capacitors used in Bottle Cooler..<br>• Study the electrical controls used in Bottle Cooler.<br>• Electrical control systems in Bottle Cooler.<br>• Common faults and remedies occur in Bottle Cooler Electrical control systems.<br>• Study the electric circuit systems of Deep Freezer.<br>• Study the function, working, application of relays, OLP, thermostat, capacitors used in Bottle Cooler..<br>• Study the electrical controls used in Deep Freezer.<br>• Electrical control systems in Deep Freezer. | • Familiarization of refrigeration tools, Instruments & Equipments.<br>• Familiarize electrical controls used in refrigerator.<br>• Identify electrical circuits used in refrigerator.<br>• Trace the faults in refrigerator electrical controls.<br>• Test and replace electrical controls such as relay, OLP, thermostat, Door switch.<br>• Familiarize electrical controls used in No Frost Double Door refrigerator.<br>• Identify electrical circuits used in No Frost Double Door refrigerator.<br>• Trace the electrical controls faults in No Frost Double Door refrigerator.<br>.<br>• Test and replace electrical controls such as relay, OLP, thermostat, Door switch, Defrost heater, timer, Bimetal thermo.<br>• Familiarize electrical controls used in Bottle cooler.<br>• Identify electrical circuits in Bottle cooler.<br>• Trace the faults in Bottle cooler.<br>• Test and replace electrical controls such as relay, OLP, thermostat in Bottle cooler.<br>• Familiarize electrical controls used in Deep Freezer..<br>• Identify electrical circuits in Deep freezer.<br>• Trace the electrical controls faults in Deep Freezer.<br>• Test and replace electrical controls used in Deep Freezer.<br>• Familiarize electrical controls used in Window Air Conditioner.<br>• Identify electrical circuits in Window Air Conditioner.<br>• Trace the electrical controls faults in Window Air Conditioner.<br>• Test and replace electrical controls used in Window Air Conditioner.<br>• Familiarize electrical controls used in Split Air Conditioner.<br>• Identify electrical circuits in Split Air |

| | |
|---|---|
| • Common faults and remedies occur in Deep Freezer.<br>• Electrical Controls used in Window A.C<br>• Function, Construction, working of Selector switch, capacitors, OLP, Heaters, Oscillating motors, Thermostat , Relays used in Window A.C<br>• Study the electrical controls used in Split Air Conditioner.<br>• Faults and Remedies in Split A.C Electrical Controls.<br>• Study the construction and working of electrical controls used in Split Air conditioner.<br>• Package Air Conditioner Electrical Controls.<br>• Central Air Conditioning Plant electrical controls such as Low pressure Cut Out, H P Cut Outs, Oil pressure cut outs, Solenoid Valve, Starters, Electronic control expansion valves, its working & function. | Conditioner.<br>• Trace the electrical controls faults in Split Air Conditioner.<br>• Test and replace electrical controls used in Split Air Conditioner.<br>• Familiarize electrical controls used in Package Air Conditioner.<br>• Identify electrical circuits in Package Air Conditioner.<br>• Trace the electrical controls faults in Package Air Conditioner.<br>• Test and replace electrical controls used in Package Air Conditioner.<br>• Familiarize electrical controls used in Central Air Conditioning Plant.<br>• Identify electrical circuits in Central Air Conditioning Plant.<br>• Trace the electrical controls faults in Central Air Conditioning Plant.<br>• Test and replace electrical controls used in Central Air Conditioning Plant. |

## LIST OF TOOLS, INSTRUMENTS, EQUIPMENTS AND FURNITURE

| Sl.No | Name of Tools / Instruments / Equipment | Quantity |
|---|---|---|
| 1, | File 200 mm | 5 NOs |
| 2, | Hammer 200 gm | 5 NOs |
| 3, | screw driver 200 mm | 5 NOs |
| 4, | Combination pliers 200 mm | 5 NOs |
| 5, | Line tester 240 v | 5 NOs |
| 6, | Soldering Iron 100 w | 5 NOs |
| 7, | Bench vice 150 mm | 5 NOs |

| | | |
|---|---|---|
| 8, | Hack saw 300 mm | 5 NOs |
| 9, | Pipe wrench 250 mm | 5 NOs |
| 10 | Snip 200 mm | 5 NOs |
| 12, | Tube cutter 4 -12 m m | 5 NOs |
| 13, | Tube Bender | 1 set |
| 14, | Swaging tool | 2 set |
| 15, | Pinching tool | 5 NOs |
| 16, | Flaring tool | 5 NOs |
| 17, | Gauge manifold set | 2 NOs |
| 18, | Compound gauge | 2 NOs |
| 19, | Pressure Gauge | 2 NOs |
| 20, | Volt meter | 5 NOs |
| 21, | Ammeter | 2 NOs |
| 22, | Multi meter | 2 NOs |
| 23, | Tong tester | 2 NOs |
| 24, | Halide torch | 1 NOs |
| 25, | Thermometer | 2 NOs |
| 26, | Double end spanner set | 2 NOs |
| 27, | Ring spanner set | 2 NOs |
| 28, | Box spanner set | 1 NOs |
| 30, | Adjustable spanner | 5 NOs |
| 31, | Crimping Tool | 2 NOs |
| 32, | Megger | 1 NOs |
| 33, | Long Nose Plier | 5 NOs |
| 34, | Line Tester | 5 NOs |
| 35, | Brazing Kit | 2 NOs |
| 36, | Grinding machine | 1 NOs |
| 37, | drilling machine | 1 NOs |
| 38, | Refrigerator Single Door 165 L | 1 NOs |
| 39, | Refrigerator Double Door ( frost Free) 185 L | 1 NOs |
| 40, | Bottle Cooler 200 L | 1 NOs |
| 41 | Deep Freezer 200 L | 1 NOs |
| 42 | Window AC 1 Ton | 1 NOs |
| 43 | Split AC 1.5 Ton | 1 NOs |
| 44 | Electrical Controls of Package AC | 1 Set |
| 45 | Electrical Controls Systems of Central AC | 1 Set |
| 46, | Steel Locker | 2 NOs |
| 47, | Work Table | 2 NOs |

# GENERAL INFORMATION FOR REPAIR AND MAINTENANCE OF REFRIGERATOR

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|---|---|
| **Name of sector** | **Refrigeration & Air Conditioning** |
| **Name of Module** | **REPAIR AND MAINTENANCE OF REFRIGERATOR** |
| **MES Code** | **REF703** |
| **Competency as per N C O Code** | |
| **Duration of Course** | **500 Hrs** |
| **Entry qualification of trainee** | **VIII Std** |
| **Unit size ( No of trainees)** | **20** |
| **Power norms** | **02KW** |
| **Space Norms ( Workshop and Class room )** | **60 sq.m**<br>**( Minimum size of one side to be 04 m)** |
| **Instructors Qualification** | Degree in Mechanical Engineering with one year Experience<br>**OR**<br>Diploma in Mechanical Engineering with two year Experience<br>**OR**<br>NTC/ NAC in RAC Trade with three years of Experience |
| **Desirable** | **CITC** |

## COURSE CONTENT FOR REPAIR AND MAINTENANCE OF REFRIGERATOR

| Under pinning Knowledge ( Theory) | Practical Competencies |
|---|---|
| • Safety Precautions, study the function and working of refrigeration tools, Instruments & Equipments. | • Familiarization of refrigeration tools, Instruments & Equipments. |

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|---|---|
| • Study the construction and working of V.C. Cycle of refrigerator.<br>• Study the current, voltage, resistance measuring.<br>• Study the open circuit, short circuit and earth testing.<br>• Study the different types of motors used in refrigerator.<br>• Study the different types of relays, OLP, thermostat, heaters, fan, timer used in refrigerator.<br>• Study compressor, condenser, capillary tube, drier, and evaporator.<br>• Refrigerant used in refrigerator<br>• Study the trouble shooting in refrigerator.<br>• Study the types of refrigerator.<br>• Study the specification of refrigerator<br>• Faults and remedies of refrigerator.<br>• Care and maintenance of refrigerator. | • Tube cutting, bending, flaring, swaging, brazing, welding.<br>• Measuring Current, voltage and resistance.<br>• Check open circuit, short circuit and earth of hermetic compressor.<br>• Identify starting , running, common terminal<br>• Check relay, OLP, thermostat, door switch, refrigerator Bulb.<br>• Check the wiring circuit of refrigerator.<br>• Check the efficiency of hermetic compressor.<br>• Dismantle and Assemble hermetic Compressor.<br>• Identify the trouble and rectification<br>• De scaling refrigerator condenser.<br>• Flushing Condenser and Evaporator.<br>• Leak Testing, Evacuation, Gas Charging In Refrigerator.<br>• Servicing the refrigerator.<br>• Check the performance of refrigerator.<br>• Installation of Refrigerator. |

## LIST OF TOOLS , INSTRUMENTS , EQUIPMENTS AND FURNITURE

| | | |
|---|---|---|
| 1, | File | 5 no's |
| 2, | Hammer | 5 no's |
| 3, | screw driver | 5 no's |
| 4, | Combination pliers | 5 no's |
| 5, | Line tester | 5 no's |
| 6, | Soldering Iron | 5 no's |
| 7, | Bench vice | 2 no's |
| 8, | Hack saw | 5 no's |
| 9, | Pipe wrench | 5 no's |
| 10 | Snip | 5 no's |
| 12, | Tube cutter | 5 no's |

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|---|---|---|
| 13, | Tube Bender | 5 no’s |
| 14, | Swaging tool | 5 no’s |
| 15, | Pinching tool | 5 no’s |
| 16, | Flaring tool | 5 no’s |
| 17, | Gauge manifold set | 2 no’s |
| 18, | Compound gauge | 2 no’s |
| 19, | Pressure Gauge | 2 no’s |
| 20, | Volt meter | 5 no’s |
| 21, | Ammeter | 2 no’s |
| 22, | Multi meter | 2 no’s |
| 23, | Tong tester | 2nos |
| 24, | Halide torch | 1 no’s |
| 25, | Thermometer | 2 no’s |
| 26, | Double end spanner set | 2 no’s |
| 27, | Ring spanner set | 2 no’s |
| 28, | Box spanner set | 1 no’s |
| 30, | Adjustable spanner | 5 no’s |
| 31, | Nitrogen Cylinder | 1 no’s |
| 32, | Gas cylinder | 2nos |
| 33, | Vacuum pump | 1 no’s |
| 34, | Gas welding machine | 1 no’s |
| 35, | Brazing Kit | 2 no’s |
| 36, | Grinding machine | 1 no’s |
| 37, | drilling machine | 1nos |
| 38, | Refrigerator Single Door | 1 no’s |
| 39, | Refrigerator Double Door ( frost Free) | 1 no’s |
| 40, | Steel Locker | 2 no’s |
| 41, | Work Table | 2 no’s |

# GENERAL INFORMATION FOR REPAIR AND MAINTENANCE OF AUTOMOBILE AIR CONDITIONING

| | |
|---|---|
| **Name of sector** | **Refrigeration & Air Conditioning** |
| **Name of Module** | **REPAIR AND MAINTENANCE OF AUTOMOBILE AIR CONDITIONING** |
| **MES Code** | **REF 704** |
| **Competency as per N C O Code** | |
| **Duration of Course** | **500 Hrs** |
| **Entry qualification of trainee** | **VIII Std** |
| **Unit size ( No of trainees)** | **20** |
| **Power norms** | **02 KW** |
| **Space Norms ( Workshop and Class room )** | **60 sq.m**<br>**( Minimum size of one side to be 04 m)** |
| **Instructors Qualification**<br><br>**Desirable** | Degree in Mechanical Engineering with one year Experience<br>**OR**<br>Diploma in Mechanical Engineering with two year Experience<br>**OR**<br>NTC/ NAC in RAC Trade with three years of Experience<br>Craft Instructor Certificate (CIC) |

**COURSE CONTENT FOR REPAIR AND MAINTENANCE OF AUTOMOBILE AIR CONDITIONING**

| Under pinning Knowledge ( Theory) | Practical Competencies |
|---|---|
| • Safety Precautions, study the function and working of Air Conditioning tools, Instruments & Equipments.<br>• Study the construction and working of Car A.C Cycle.<br>• Study the different types of compressors | • Familiarization of Air conditioning tools, Instruments & Equipments.<br>• Tube cutting, bending, flaring, swaging, brazing, welding.<br>• Measuring temperature and pressure in Car AC. |

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|---|---|
| used in Car A.C.<br>• Study the Magnetic clutch working,<br>• Freewheeling, thermostat, fan, heater of Car A.C.<br>• Condenser, Drier, Liquid Receiver, expansion valve, evaporator, solenoid valve used in car AC<br>• Electrical components and its description.<br>• Study the trouble shooting in Car Air Conditioners.<br>• Refrigerant used in Car A.C<br>• Care and maintenance of Car AC | • Check circuit and rectify the defects.<br>• Check the working of compressor<br>• Check thermostat, fan, switch, heater, magnetic clutch<br>• Check the wiring circuit of Car Air Conditioner<br>• Check the efficiency of compressor.<br>• Dismantle and Assemble Compressor.<br>• Servicing air filter, condenser.<br>• Flushing Condenser and Evaporator.<br>• Leak Testing, Evacuation, Gas Charging in Car A.C<br>• Servicing Car Air Conditioner<br>• Check the performance of Air conditioner.<br>• Installation of Car Air Conditioner |

LIST OF TOOLS, INSTRUMENTS, EQUIPMENTS AND FURNITURE

| | |
|---|---|
| 1, File | 5 no’s |
| 2,Hammer | 5 no’s |
| 3, screw driver | 5 no’s |
| 4,Combination plier | 5 no’s |
| 5, Line tester | 5 no’s |
| 6,Soldering Iron | 5 no’s |
| 7, Bench vice | 2 no’s |
| 8,Hack saw | 5 no’s |
| 9, Pipe wrench | 5 no’s |
| 10,Snip | 5 no’s |
| 12, Tube cutter | 5 no’s |
| 13, Tube Bender | 5 no’s |
| 14, Swaging tool | 5 no’s |
| 15, Pinching tool | 5 no’s |
| 16,Flaring tool | 5 no’s |
| 17,Gauge manifold set | 2 no’s |
| 18, Compound gauge | 2 no’s |
| 19, Pressure Gauge | 2 no’s |
| 20, Volt meter | 5 no’s |
| 21, Ammeter | 2 no’s |

| | |
|---|---|
| 22, Multi meter | 2 no’s |
| 23, Tong tester | 2nos |
| 24, Halide torch | 1 no’s |
| 25, Thermometer | 2 no’s |
| 26,Double end spanner set | 2 no’s |
| 27, Ring spanner set | 2 no’s |
| 28, Box spanner set | 1 no’s |
| 30, Adjustable spanner | 5 no’s |
| 31, Nitrogen Cylinder | 1 no’s |
| 32, Gas cylinder | 2nos |
| 33,Vacuum pump | 1 no’s |
| 34, Gas welding machine | 1 no’s |
| 35, Brazing Kit | 2 no’s |
| 36,Grinding machine | 1 no’s |
| 37, drilling machine | 1nos |
| 38, Sling psychrometer | 1no |
| 39, Work Bench | 1no |
| 40,Vehicle with A.C | 1 no. |

# GENERAL INFORMATION FOR REPAIR AND MAINTENANCE OF COOLERS

| | |
|---|---|
| **Name of sector** | **Refrigeration & Air Conditioning** |
| **Name of Module** | **REPAIR AND MAINTENANCE OF COOLERS** |
| **MES Code** | **REF705** |
| **Competency as per N C O Code** | |
| **Duration of Course** | **500 Hrs** |
| **Entry qualification of trainee** | **VIII Std** |
| **Unit size ( No of trainees)** | **20** |
| **Power norms** | **02KW** |
| **Space Norms ( Workshop and Class room )** | **60 sq.m**<br>**( Minimum size of one side to be 04 m)** |
| **Instructors Qualification** | Degree in Mechanical Engineering with one year Experience<br>**OR**<br>Diploma in Mechanical Engineering with two year Experience<br>**OR**<br>NTC/ NAC in RAC Trade with three years of Experience |
| **Desirable** | CITC |

**COURSE CONTENT FOR REPAIR AND MAINTENANCE OF COOLER**

| Under pinning Knowledge ( Theory) | Practical Competencies |
|---|---|
| • Safety Precautions, study the function and working of refrigeration tools, Instruments & Equipments.<br>• Study the construction and working of V.C. Cycle of coolers.<br>• Study the current, voltage, resistance measuring.<br>• Study the open circuit, short circuit and earth testing. | • Familiarization of refrigeration tools, Instruments & Equipments.<br>• Tube cutting, bending, flaring, swaging, brazing, welding.<br>• Measuring Current, voltage, resistance, temperature and pressure.<br>• Check open circuit, short circuit and earth of hermetic compressor.<br>• Identify starting , running, common terminal |

| | |
|---|---|
| • Study the different types of motors used in Coolers.<br>• Study the compressor, condenser, capillary tube, drier, and evaporator used in coolers.<br>• Study the different types of relays, OLP, thermostat, heaters, fan, timer used in Coolers.<br>• Study the trouble shooting in Coolers.<br>• Refrigerant used in coolers.<br>• Study the trouble shooting in coolers.<br>• Study the types of coolers.<br>• Study the specification of coolers<br>• Faults and remedies of coolers.<br>• Care and maintenance of coolers | • Check relay, OLP, thermostat, door switch, refrigerator Bulb.<br>• Check the wiring circuit of water, Bottle, Visi cooler and deep Freezer.<br>• Check the efficiency of hermetic compressor.<br>• Dismantle and Assemble hermetic Compressor.<br>• Identify the trouble and rectification<br>• Decaling condenser.<br>• Flushing Condenser and Evaporator.<br>• Leak Testing, Evacuation, Gas Charging In Coolers.<br>• Servicing the water, Bottle& Deep Freezer.<br>• Check the performance of Coolers .<br>• Installation of Coolers. |

LIST OF TOOLS, INSTRUMENTS, EQUIPMENTS AND FURNITURE

| | |
|---|---|
| 1, File | 5 no’s |
| 2,Hammer | 5 no’s |
| 3, screw driver | 5 no’s |
| 4,Combination plier | 5 no’s |
| 5, Line tester | 5 no’s |
| 6,Soldering Iron | 5 no’s |
| 7, Bench vice | 2 no’s |
| 8,Hack saw | 5 no’s |
| 9, Pipe wrench | 5 no’s |
| 10,Snip | 5 no’s |
| 12, Tube cutter | 5 no’s |
| 13, Tube Bender | 5 no’s |
| 14, Swaging tool | 5 no’s |
| 15, Pinching tool | 5 no’s |
| 16,Flaring tool | 5 no’s |
| 17,Gauge manifold set | 2 no’s |
| 18, Compound gauge | 2 no’s |
| 19, Pressure Gauge | 2 no’s |
| 20, Volt meter | 5 no’s |
| 21, Ammeter | 2 no’s |

| | |
|---|---|
| 22, Multi meter | 2 no’s |
| 23, Tong tester | 2nos |
| 24, Halide torch | 1 no’s |
| 25, Thermometer | 2 no’s |
| 26,Double end spanner set | 2 no’s |
| 27, Ring spanner set | 2 no’s |
| 28, Box spanner set | 1 no’s |
| 30, Adjustable spanner | 5 no’s |
| 31, Nitrogen Cylinder | 1 no’s |
| 32, Gas cylinder | 2nos |
| 33,Vacuum pump | 1 no’s |
| 34, Gas welding machine | 1 no’s |
| 35, Brazing Kit | 2 no’s |
| 36,Grinding machine | 1 no’s |
| 37, drilling machine | 1nos |
| 38,Water cooler | 1no |
| 39,Bottle Cooler | 1no |
| 40,Vici Cooler | 1no |
| 41, Deep Freezer | 1no |

# GENERAL INFORMATION FOR REPAIR AND MAINTENANCE OF WINDOW AND SPLIT A.C

| | |
|---|---|
| **Name of sector** | **Refrigeration & Air Conditioning** |
| **Name of Module** | **REPAIR AND MAINTENANCE OF WINDOW & SPLIT A.C** |
| **MES Code** | **REF706** |
| **Competency as per N C O Code** | |
| **Duration of Course** | **500 Hrs** |
| **Entry qualification of trainee** | **VIII Std** |
| **Unit size ( No of trainees)** | **20** |
| **Power norms** | **02 KW** |
| **Space Norms ( Workshop and Class room )** | **60 sq.m**<br>**( Minimum size of one side to be 04 m)** |
| **Instructors Qualification**<br><br>**Desirable** | Degree in Mechanical Engineering with one year Experience<br>**OR**<br>Diploma in Mechanical Engineering with two year Experience<br>**OR**<br>NTC/ NAC in RAC Trade with three years of Experience<br>Craft Instructor Certificate (CIC) |

**COURSE CONTENTS FOR REPAIR AND MAINTENANCE OF WINDOW AND SPLIT A.C**

| Under pinning Knowledge ( Theory) | Practical Competencies |
|---|---|
| • Safety Precautions, study the function and working of Air conditioning tools, Instruments & Equipments. | • Familiarization of air conditioning tools, Instruments & Equipments. |

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|---|---|
| • Study the construction and working of V.C. Cycle of Window and Split A.C.<br>• Study the current, voltage, resistance measuring.<br>• Study the open circuit, short circuit and earth testing.<br>• Study the compressor, condenser, capillary tube, drier, and evaporator used in window and split A.C.<br>• Study the different types of motors used in Air Conditioners.<br>• Study the different types of relays, OLP, thermostat, fan, Capacitors, oscillating motors in window and split A.C.<br>• Study the trouble shooting in Air Conditioners.<br>• Care and maintenance of air conditioner.<br>• Wiring Circuit of Air conditioner.<br>• Installation method of Air conditioner. | • Tube cutting, bending, flaring, swaging, brazing, welding.<br>• Measuring Current, voltage, resistance, temperature and pressure.<br>• Check open circuit, short circuit and earth of hermetic compressor.<br>• Identify starting , running, common terminal<br>• Check relay, OLP, thermostat, Capacitors Fan motors, and Oscillating motors.<br>• Check the wiring circuit of window AC and Split A.C.<br>• Check the efficiency of hermetic compressor.<br>• Dismantle and Assemble hermetic Compressor.<br>• Identify the trouble and rectification<br>• Decaling condenser coil, evaporator and filter.<br>• Flushing Condenser and Evaporator.<br>• Leak Testing, Evacuation, Gas Charging In Window and Split A.C.<br>• Servicing the window and Split A.C.<br>• Check the performance of Air conditioner.<br>• Installation of Window and Split A.C. |

LIST OF TOOLS , INSTRUMENTS , EQUIPMENTS AND FURNITURE

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|---|---|
| 1, File | 5 no’s |
| 2,Hammer | 5 no’s |
| 3, screw driver | 5 no’s |
| 4,Combination plier | 5 no’s |
| 5, Line tester | 5 no’s |

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| 6,Soldering Iron | 5 no’s |
| 7, Bench vice | 2 no’s |
| 8,Hack saw | 5 no’s |
| 9, Pipe wrench | 5 no’s |
| 10,Snip | 5 no’s |
| 12, Tube cutter | 5 no’s |
| 13, Tube Bender | 5 no’s |
| 14, Swaging tool | 5 no’s |
| 15, Pinching tool | 5 no’s |
| 16,Flaring tool | 5 no’s |
| 17,Gauge manifold set | 2 no’s |
| 18, Compound gauge | 2 no’s |
| 19, Pressure Gauge | 2 no’s |
| 20, Volt meter | 5 no’s |
| 21, Ammeter | 2 no’s |
| 22, Multi meter | 2 no’s |
| 23, Tong tester | 2nos |
| 24, Halide torch | 1 no’s |
| 25, Thermometer | 2 no’s |
| 26,Double end spanner set | 2 no’s |
| 27, Ring spanner set | 2 no’s |
| 28, Box spanner set | 1 no’s |
| 30, Adjustable spanner | 5 no’s |
| 31, Nitrogen Cylinder | 1 no’s |
| 32, Gas cylinder | 2nos |
| 33,Vacuum pump | 1 no’s |
| 34, Gas welding machine | 1 no’s |
| 35, Brazing Kit | 2 no’s |
| 36,Grinding machine | 1 no’s |
| 37, drilling machine | 1nos |
| 38, Sling psychrometer | 1no |
| 39, Work Bench | 1no |
| 40,Window A.C | 1no |
| 41,Split A.C | 1no |