**AC & Fridge Repair**

* Course Id : **MSME/AC**
* Candidate Eligibility : **Inter / ITI passed or its equivalent.**
* No. Of NOS (If QP) : **4**
* NSQF Level : **4**
* Cost Category : **2**
* Course Duration
	+ Theory duration : **120**
	+ Practical duration : **360**
	+ OJT duration : **120**

**Trainer Qualification Work Experience**

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| **Trainer Qualification** | **Work Experience** |
| * Minimum - Degree/Diploma in Mechanical Engineering
* Certified for Job Role: “NTC/ NAC in RAC Trade” with Minimum acceptance score of 60 %
* Recommended that the Trainer is certified for the Job Role: “NTC/ NAC in RAC Trade” with Minimum accepted score of 60%.
* Alternatively, must have successfully undergone a CGSC organized TOT workshop on “How to Trainer”.
 | * Minimum 3 to 4 years of industry experience in relevant job role and a Minimum of 3 to 4 years and Training experience in relevant job role.
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**CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE**

**Name and address of submitting body:**

**Tool Room & Training Centre, Patna**

**(An Extension Centre of Indo-Danish Tool Room, Jamshedpur)**

**Ministry of MSME, Govt. of India**

**Patliputra Industrial Estate**

**Patna-800013**

**(0612) 2270744**

**Name and contact details of individual dealing with the submission**

**Name : Shri. Ashutosh Kumar**

**Position in the organisation : General Manager (I/c)**

**Tel number(s) : (0612) 2270744**

**Mobile : 7260801191**

**E-mail address : trtcpatna14@gmail.com**

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| **Qualification Title**  | **AC & Fridge Repair** |
| **Qualification Code**  | **MSME/AC** |
| **Nature and purpose of the qualification**  | **Nature: A general qualification offered in a formal educational context.****Purpose: To get unemployed people into work.** |
| **Body/bodies which will award the qualification** | **Tool Room & Training Centre, Patna** **(Certificate Awarded by TRTC, Patna)** |
| **Body which will accredit providers to offer courses leading to the qualification** | **Tool Room & Training Centre, Patna** **(Certificate Awarded by TRTC, Patna)** |
| **Body/bodies which will carry out assessment of learners** | **Examination Cell of Tool Room & Training Centre, Patna**  |
| **Occupation(s) to which the qualification gives access** | **AC & Fridge Maintenance**  |
| **Licensing requirements** | **Not Applicable** |
| **Level of the qualification in the NSQF** | **Level 4** |
| **Anticipated volume of training/learning required to complete the qualification** | **600** |
| **Entry requirements and / or recommendations** | **Inter / ITI passed or its equivalent.****Age 15 years to 35 years** |
| **Progression from the qualification** | **Job Progression:****After completion of course and after 3 years of field experience the trainee can work as a AC & Fridge Repair Technician and after 5 years of experience, the person can work as a AC & Fridge Repair Inspector.** |
| **Planned arrangements for the Recognition of Prior learning (RPL)** | **Yes** |
| **International comparability where known** | **Existence of any official document suggesting the comparability of the qualification with the qualifications in other countries is not known.** |
| **Date of planned review of the qualification.** | **January 2020** |

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| **Formal structure of the qualification**  |
| **Title of component and identification code** | **Mandatory/ Optional** | **Estimated size (learning hours)** | **Theory hours** | **Practical hours** | **Level** |
| **1. Repair And Maintenance Of Window And Split A.C** | **Mandatory** | **120** | **30** | **90** | **4** |
| **2. Repair And Maintenance Of Cooler** | **Mandatory** | **120** | **30** | **90** | **4** |
| **3. Repair And Maintenance Of****Refrigerator** | **Mandatory** | **120** | **30** | **90** | **4** |
| **4. Refrigeration /Air****Conditioning (Electrical Control)** | **Mandatory** | **120** | **30** | **90** | **4** |
| **5. On Job Training** | **Mandatory** | **120** | **-** | **120** |  |
| **Total** | **600** | **120** | **480** |  |

**ASSESSMENT**

**Body/Bodies which will carry out assessment:**

Examination cell - *Tool Room & Training Centre, Patna*

**How will RPL assessment be managed and who will carry it out?**

*YES. Learners who have met the requirements of any Unit Standard that forms part of this qualification may apply for recognition of prior learning to the relevant Education body. The applicant must be assessed against the specific outcomes and with the assessment criteria for the relevant Unit Standards.*

**Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, reliable and fair and show that these are in line with the requirements of the NSQF.**

**1. ASSESSMENT GUIDELINE:**

 - Criteria for assessment based on each learning outcomes, will be assigned marks proportional to its importance.

 - The assessment for the theory & practical part is based on knowledge bank of questions created by trainers and approved by Examination cell (TRTC, Patna)

 - For each Individual batch, Examination cell will create unique question papers for theory part as well as practical for each candidate at each examination.

 - To pass the Qualification, every trainee should score a minimum of 40% in each Theory and 50% in each Practical subject.

 - Assessment comprises the following components:

>Job carried out in labs/workshop

>Record book/ daily diary

>Answer sheet of assessment

>Viva –voce

>Progress chart

>Attendance and punctuality

**2. ASSESSORS:**

TRTC Patna faculty teaching the Advanced Programming and Operation with CAD/CAM course, also assesses the students as per guidelines set by Examination cell of TRTC. Faculties are trained from time to time to upgrade their skills on various aspects such as conduction of assessments, teaching methodology etc.

**3. ELIGIBILITY TO APPEAR IN THE EXAM:**

Minimum 70% attendance is compulsory for the students to appear for the assessments.

**4. MARKING SCHEME:**

**Semester-I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Method of Assessments** | **Weightage** | **Evaluator** |
| **1** | Practical test | 25 | **Trainer + Moderator (Head of Dept)+ Examiner nominated by Examination cell (TRTC)** |
| **2** | Written test (Trade Theory) | 15 |
| **3** | Repair And Maintenance Of Window And Split A.C | 10 |
| **4** | Repair And Maintenance Of Cooler | 10 |
| **5** | Repair And Maintenance OfRefrigerator | 15 |
| **6** | Internal assessment | 25 |
| **Total** | **100** |  |

**5. PASSING MARKS:**

Passing criteria is based on marks obtain in attendance record, term works , assignments, practical’s performance, viva or oral exam, module test, class test, practical exam and final exam

Minimum Marks to pass practical exam – 60%

Minimum Marks to pass theory exam – 40%

Grade Equivalents:-

>85% Ex

>65% & <85% A

>50% & <65% B

>35% & <50% C

<35% D

**6. RESULTS AND CERTIFICATION:**

The assessment results are backed by evidences collected by assessors. Successful trainees are awarded the certificates by TRTC, Patna.

**ASSESSMENT EVIDENCE**

ASSESSMENT EVIDENCE

Assessment evidence comprises the following components document in the form of records:

Job carried out in labs/workshop

Record book/ daily diary

Answer sheet of assessment

Viva –voce

Progress chart

Attendance and punctuality

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| --- | --- |
| **Title of Component** | **AC & Fridge Repair** |
| **Sr.no** | **Outcomes to be assessed** | **Assessment criteria for the outcome** |
| 1 | Follow work ethics and identify necessary  | 1. Competent to understand the requirement and physically fit to carry out the work
2. Ensuring appropriate tools are in working condition and available
3. Prohibiting consumption of alcohol and tobacco in any form, at workplace
4. Behave respectfully with co-workers and use appropriate language for inter-personal communication.
5. Use public conveniences (toilets) only.
 |
| 2 | Perform task with due consideration to safety rules in coordination with team and following government regulations  | 1. Check for all the personal protection equipments before entering into the workplace
2. Conduct appropriate discussions within the team
3. Be aware of the working environment and promptly act during emergencies.
4. Present facts and situations and use appropriate inspection for work and safety.
5. Helping the co-workers at the time of need at workplace
6. Maintaining good working relationship
 |
| 3 | Apply professional knowledge & technical knowledge while performing the task | 1. Understand the importance of AC & Fridge Repair.
2. Displaying skills of Inspection
3. Taking decisions at the workplace with due recognition and understanding of government set norms.
4. Showcasing sensitivity towards the precision machines and conventional machines and their maintenance.
 |
| 4 | Should be able to work effectively in team to deliver desired results at workplace | 1. Gather a team
2. Divide work amongst the team members
 |
| 5 | Maintain regularity at the workplace. | 1. Maintaining regularity at the workplace
2. Maintaining decorum of the workplace
3. Open to learning and engaged in discussions
4. Execute the assigned task with in time frame
 |
| 6 | Able to work observing personal health, safety & environmental protocol at Workshop | 1. Know how of safety precautions
2. Know how to give first aid
3. Should know do’s and don’t’s on the work site
4. Should know about personal protection equipment
 |
| **Specific assessable outcome** |
| [**S. no**](http://S.no) | **Assessable outcomes** | **Assessment criteria** |
| 1 | AC Capability  | 1. Displaying skills for reading and interpreting information that can be extracted from drawings, specifications, schedule and method statements.
2. Demonstrating skills while cleaning surfaces, measuring, assembling, dismantling, cleaning.
3. Apply safe work practices, follow procedures, report problems and rectify them
4. Minimise damage and maintain clean work place
5. Use appropriate tools and equipments
6. Exercising safe practices while machine handling by wearing gloves.
7. Uses personal protective equipments and access equipment safety to carry out the activity in accordance with legislation and organisational requirement.
 |
| 2 | Fridge Capability  | 1. Displaying skills for reading and interpreting information that can be extracted from drawings, specifications, schedule and method statements.
2. Demonstrating skills while cleaning surfaces, measuring, assembling, dismantling, cleaning.
3. Apply safe work practices, follow procedures, report problems and rectify them.
4. Minimise damage and maintain clean work place
5. Use appropriate tools and equipments
6. Exercising safe practices while machine handling by wearing gloves.
7. Uses personal protective equipments and access equipment safety to carry out the activity in accordance with legislation and organisational requirement.
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|  | **Means of assessment** Skill performance is assessed by conductingi) Assignment for each semesterii) Written test for each semesteriii) Final exam after completion of both the semestersiv) Practical exam for each semesterv) Final practical exam after completion of both the semestersvi) Viva / Oral Exam |
|  | **Pass/Fail**Passing criteria is based on marks obtain in attendance record, term works , assignments, practical’s performance, viva or oral exam, module test, practical exam and final exam i) Minimum Marks to pass practical exam – 60%ii)Minimum Marks to pass theory exam – 40% |

**Course Curriculum**

**Syllabus content with time structure**

**For the course of AC & Fridge Repair**

**Duration: 600 hrs.**

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| **Session Name: Repair And Maintenance Of Window And Split A.C** |
| **Practical competencies****(includes demonstration and activity)** | **Underpinning Knowledge** | Duration (in hours) |
| **Demonstration (30 hours)** | **Activity (90 hours)** |  | **Practical** | **Theory** |
| **Window And Split A.C Theory** |  | Study the construction and working of V.C. Cycle of Window and Split A.C.Study the current, voltage, resistance measuring.Study the open circuit, short circuit and earth testing.Study the compressor, condenser, capillary tube, drier, and evaporatorused in window and split A.C.Study the different types of motors used in Air Conditioners.Study the different types of relays, OLP, thermostat, fan, Capacitors, oscillatingmotors in window and split A.C.Study the trouble shooting in AirConditioners.Care and maintenance of air conditioner.Wiring Circuit of Air conditioner.Installation method of Air conditioner. | **90** | **30** |
|  | **Window And Split A.C practical** | Familiarization of air conditioning tools, Instruments & Equipments.Tube cutting, bending, flaring, swaging, brazing, welding.Measuring Current, voltage, resistance,temperature and pressure.Check open circuit, short circuit and earth ofhermetic compressor.Identify starting , running, common terminalCheck relay, OLP, thermostat, Capacitors Fanmotors, and Oscillating motors.Check the wiring circuit of window AC andSplit A.C.Check the efficiency of hermetic compressor.Dismantle and Assemble hermeticCompressor.Identify the trouble and rectificationDecaling condenser coil, evaporator andfilter.Flushing Condenser and Evaporator.Leak Testing, Evacuation, Gas Charging In Window and Split A.C.Servicing the window and Split A.C.Check the performance of Air conditionerInstallation of Window and Split A.C. |  |  |

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| **Session Name: Repair And Maintenance Of Cooler** |
| **Practical competencies****(includes demonstration and activity)** | **Underpinning Knowledge** | Duration (in hours) |
| **Demonstration (30 hours)** | **Activity (90 hours)** |  | **Practical** | **Theory** |
| **Repair And Maintenance Of Cooler**  |  | Safety Precautions, study the function and working of refrigeration tools,Instruments & Equipments.Study the construction and working ofV.C. Cycle of coolers.Study the current, voltage, resistance measuring.Study the open circuit, short circuit and earth testing.Study the different types of motors used in Coolers.Study the compressor, condenser,capillary tube, drier, and evaporatorused in coolers.Study the different types of relays, OLP,thermostat, heaters, fan, timer used inCoolers.Study the trouble shooting in Coolers.Refrigerant used in coolers.Study the trouble shooting in coolers.Study the types of coolers.Study the specification of coolersFaults and remedies of coolers.Care and maintenance of coolers | **90** | **30** |
|  | **Repair And Maintenance Of Cooler** | Familiarization of refrigeration tools, Instruments & Equipments.Tube cutting, bending, flaring, swaging, brazing, welding.Measuring Current, voltage, resistance, temperature and pressure.Check open circuit, short circuit and earth of hermetic compressor.Identify starting , running, common terminalCheck relay, OLP, thermostat, door switch,refrigerator Bulb.Check the wiring circuit of water, Bottle, Visicooler and deep Freezer.Check the efficiency of hermetic compressor.Dismantle and Assemble hermeticCompressor.Identify the trouble and rectificationDecaling condenser.Flushing Condenser and Evaporator.Leak Testing, Evacuation, Gas Charging InCoolers.Servicing the water, Bottle& Deep Freezer.Check the performance of Coolers .Installation of Coolers. |  |  |

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| **Session Name: Repair And Maintenance Of Refrigerator** |
| **Practical competencies****(includes demonstration and activity)** | **Underpinning Knowledge** | Duration (in hours) |
| **Demonstration (30 hours)** | **Activity 90 hours)** |  | **Practical** | **Theory** |
| **Repair And Maintenance Of Refrigerator** |  | Safety Precautions, study the function and working of refrigeration tools, Instruments & Equipments.Study the construction and working of V.C. Cycle of refrigerator.Study the current, voltage, resistance measuring.Study the open circuit, short circuit and earth testing.Study the different types of motors used in refrigerator.Study the different types of relays, OLP, thermostat, heaters, fan, timer used inrefrigerator.Study compressor, condenser, capillarytube, drier, and evaporator.Refrigerant used in refrigerator Study the trouble shooting in refrigerator.Study the types of refrigerator.Study the specification of refrigeratorFaults and remedies of refrigerator.Care and maintenance of refrigerator. | 90 | 30 |
|  | **Repair And Maintenance Of Refrigerator** | Familiarization of refrigeration tools, Instruments & Equipments.Tube cutting, bending, flaring, swaging, brazing, welding.Measuring Current, voltage and resistance.Check open circuit, short circuit and earth ofhermetic compressor.Identify starting , running, common terminalCheck relay, OLP, thermostat, door switch,refrigerator Bulb.Check the wiring circuit of refrigerator.Check the efficiency of hermetic compressor.Dismantle and Assemble hermetic Compressor.Identify the trouble and rectificationDe scaling refrigerator condenser.Flushing Condenser and Evaporator.Leak Testing, Evacuation, Gas Charging InRefrigerator.Servicing the refrigerator.Check the performance of refrigerator.Installation of Refrigerator |  |  |

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| **Session Name: Refrigeration /Air Conditioning (Electrical Control)** |
| **Practical competencies****(includes demonstration and activity)** | **Underpinning Knowledge** | Duration (in hours) |
| **Demonstration (30 hours)** | **Activity (90 hours)** |  | **Practical** | **Theory** |
| **Refrigeration /Air Conditioning (Electrical Control)** |  | Safety Precautions, study the function and working of refrigeration tools, Instruments & Equipments.Introduction to electric controls used inRefrigeration / Air Conditioning.Study the electric circuit systems in Refrigerator.Study the function, working, application of relays, OLP, thermostat, Door switch.Study the electrical controls used in refrigerator.No Frost Refrigerator Electrical controlsystems.Common faults and remedies occur inNo Frost Refrigerator Electrical control systems.Testing procedure of relay, OLP, thermostat, Door switch, Defrost heater, timer, Bimetal thermo.Study the electric circuit systems ofBottle Cooler.Study the function, working, applicationof relays, OLP, thermostat, capacitorsused in Bottle Cooler..Study the electrical controls used inBottle Cooler.Electrical control systems in BottleCooler.Common faults and remedies occur inBottle Cooler Electrical control systems.Study the electric circuit systems ofDeep Freezer.Study the function, working, applicationof relays, OLP, thermostat, capacitors used in Bottle Cooler.Study the electrical controls used in Deep Freezer.Electrical control systems in Deep Freezer.Electrical Controls used in Window A.CFunction, Construction, working ofSelector switch, capacitors, OLP,Heaters, Oscillating motors, Thermostat , Relays used in Window A.CStudy the electrical controls used in Split Air Conditioner.Faults and Remedies in Split A.C Electrical Controls.Study the construction and working of electrical controls used in Split Air conditioner.Package Air Conditioner Electrical Controls.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. | 90 | 30 |
|  | **Refrigeration /Air Conditioning (Electrical Control)** | Familiarization of refrigeration tools, Instruments & Equipments.Familiarize electrical controls used in refrigerator.Identify electrical circuits used in refrigerator.Trace the faults in refrigerator electrical controls.Test and replace electrical controls such as relay, OLP, thermostat, Door switch.Familiarize electrical controls used in NoFrost Double Door refrigerator.Identify electrical circuits used in No FrostDouble Door refrigerator.Trace the electrical controls faults in No Frost Double Door refrigerator.Test and replace electrical controls such asrelay, OLP, thermostat, Door switch, Defrost heater, timer, Bimetal thermoFamiliarize electrical controls used in Bottle cooler.Identify electrical circuits in Bottle cooler.Trace the faults in Bottle cooler.Test and replace electrical controls such asrelay, OLP, thermostat in Bottle cooler.Familiarize electrical controls used in DeepFreezer.Identify electrical circuits in Deep freezer.Trace the electrical controls faults in DeepFreezer.Test and replace electrical controls used inDeep Freezer.Familiarize electrical controls used inWindow Air Conditioner.Identify electrical circuits in Window AirConditioner.Trace the electrical controls faults in Window Air Conditioner. Test and replace electrical controls used in Window Air Conditioner.Familiarize electrical controls used in Split Air Conditioner.Identify electrical circuits in Split Air Conditioner. |  |  |

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|  **Session Name: On Job Training** |
| **Practical competencies****(includes demonstration and activity)** | **Underpinning Knowledge** | Duration (in hours) |
| **Demonstration (0 hours)** | **Activity (120 hours)** |  | **Practical** | **Theory** |
|  | **On Job Training** | Repair And Maintenance Of Window And Split A.CRepair And Maintenance Of CoolerRepair And Maintenance Of RefrigeratorRefrigeration /AirConditioning (Electrical Control) | **120** | **0** |

**External assessments**

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| --- | --- | --- |
| **Comp. NO.** | **ASSESSABLE OUTCOME** | **ASSESSMENT RESULT** |
| **GENERIC** |
| 1 | Follow work ethics and identify necessary materials and tools | 5 |
| 2 | Perform task with due consideration to safety rules in coordination with team and following government regulations  | 5 |
| 3 | Apply professional knowledge & technical knowledge while performing the task | 5 |
| 4 | Should be able to work effectively in team to deliver desired results at workplace | 5 |
| 5 | Maintain regularity at the workplace. | 5 |
| 6 | Able to work observing personal health, safety & environmental protocol at Workshop | 5 |
| SPECIFIC |
| 1 | **Repair And Maintenance Of Window And Split A.C** | 20 |
| 2 | **Repair And Maintenance Of Cooler** | 20 |
| 3 | **Repair And Maintenance Of****Refrigerator** | 20 |
| 4 | **Refrigeration /Air****Conditioning (Electrical Control)** | 10 |
|  | **External Assessment Result** | **100** |

**EXAMINATION**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl.No.** | **COURSE CODE** | **COURSE NAME** | **Examination Scheme** | **Total Marks** |
| **Theory** | **Practice** |
| **Sessional** | **Semester Exam** | **Sessional** | **Semester Exam** |
| **Max. Marks** | **Min. to Pass** | **Max. Marks** | **Min. to Pass** | **Max. Marks** | **Min. to Pass** | **Max. Marks** | **Min. to Pass** |
| 1. | AC -01 | Repair And Maintenance Of Window And Split A.C-Theory | 10 | 4 | 30 | 12 | - | - | - | - | 40 |
| 2. | AC -02 | Repair And Maintenance Of Window And Split A.C-Practical | - | - | - | - | 20 | 12 | 40 | 24 | 60 |
| 3. | AC -03 | Repair And Maintenance Of Cooler -Theory | 10 | 4 | 30 | 12 | - | - | - | - | 40 |
| 4. | AC -04 | Repair And Maintenance Of Cooler - Practical | - | - | - | - | 20 | 12 | 40 | 24 | 60 |
| 5. | AC -05 | Repair And Maintenance OfRefrigerator-Theory | 10 | 4 | 30 | 12 | - | - | - | - | 40 |
| 6. | AC -06 | Repair And Maintenance OfRefrigerator- Practical | - | - | - | - | 20 | 12 | 40 | 24 | 60 |
| 7. | AC -07 | Refrigeration /AirConditioning (Electrical Control) -Theory | 10 | 4 | 30 | 12 | - | - | - | - | 40 |
| 8. | AC -08 | Refrigeration /AirConditioning (Electrical Control) - Practical | - | - | - | - | 20 | 12 | 40 | 24 | 60 |
| 9. | AC -09 | On Job Training | - | - | - | - | 40 | 24 | 60 | 36 | 100 |

**Evidence of level**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **LEVEL** | **Process required** | **Professional knowledge** | **Professional skill** | **Core skill** | **Responsibility** |
| 4 | Work in familiar, predictable, routine, situation of clear choice. | Factual knowledge of field of knowledge or study. | Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts. | Language to communicate written or oral, with required clarity, skill to basic arithmetic and algebraic principles, basic understanding of social political and natural environment. | Responsibility for own work and learning. |
| Level-4 | Level-4 | Level-4 | Level-4 | Level-4 |