

**BANGLADESH TECHNICAL EDUCATION BOARD**



***Transport Equipment Sector  
Industry Skills Council  
Bangladesh***

**NATIONAL COMPETENCY STANDARDS**

**for**

**REFRIGERATION & AIR CONDITIONING**

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## INTRODUCTION

These Competency Standards were developed by the Technical Sub Committee (TSC ) that was established under **The Project for Enhancing the Vocational Training Program of TTC, Chittagong** which is implemented by KOICA (Korea International Cooperation Agency) funded by the Government of Korea. The rules of Skill Development Policy are maintained to develop the standards. The competency standards are the foundation on which new competency based curriculum will be developed that responds better to the needs of industry for skilled workers. The members of the TSC are primarily from industry but with representatives from TTC Chittagong. Persons who will successfully complete the new TVET programs based on these competency standards will receive a qualification in the new National Technical and Vocational Qualification Framework (NTVQF).

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Endorsed by

Industry Skills Council  
Date:

Bangladesh Technical Education Board (BTEB)  
Date:

**Course Structure  
for  
REFRIGERATION AND AIR CONDITIONING (NTVQF LEVEL 1)**

S. No.	Unit Code and Title		UoC Level	Nominal Duration (Hours)
<b>Generic (2 UoCs required)</b>				<b>70</b>
1	GN1001A1	Use basic mathematical concepts	1	40
2	GN1002A1	Apply OSH practices in the workplace	1	30
<b>Sector Specific (4 UoCs required)</b>				<b>120</b>
3	TRASS1006A1	Interpret technical drawing	1	40
4	TRASS1007A1	Work in the manufacturing Industry	1	20
5	TRASS1008A1	Use hand tools and power tools	1	40
6	TRASS1009A1	Use graduated measuring instruments	1	20
<b>Occupation Specific - Compulsory (5 UoCs required)</b>				<b>220</b>
7	TRARAC1011A1	Perform gas welding , brazing and soldering	1	30
8	TRARAC1012A1	Repair and maintain compressors	1	30
9	TRARAC1013A1	Service and repair refrigerators & Deep Freezers	1	50
10	TRARAC2014A1	Service and repair window and Split Type Air conditioners	1	50
11	TRARAC2015A1	Install window and split type air conditioners	1	60
<b>Total Nominal Learning Hours</b>				<b>410</b>

# GENERIC UNITS

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competency

<b>UNIT CODE AND TITLE</b>	<b>GN1001A1 - Use Basic Mathematical Concept</b>
<b>NOMINAL HOURS</b>	<b>40</b>
<b>UNIT DESCRIPTOR</b>	This requires the knowledge and skill to apply mathematical methods such as addition, subtraction, multiplication, division etc., in routine task of an organization.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the range of variables 2.1
1. Identify Calculation requirements in the workplace	<b>Calculation</b> requirements are identified from workplace information
2. Select appropriate mathematical methods for the calculation	2.1 Appropriate <b>method</b> is selected to carry out the calculation.
3. Use basic mathematical concepts to calculate workplace calculation.	3.1 Calculations are completed using appropriate method such as addition, subtraction, multiplication and division
<b>Range of Variables</b>	
<b>Variable</b>	<b>Range</b> (May include but not limited to):
1. Equipment and Tools	<input type="checkbox"/> Calculator <input type="checkbox"/> Computer with office software
2. Calculations	addition, subtraction, division, multiplication, ratio on any types of real values, such as whole number, fractional number, percentage, number with exponents
3. Application	<input type="checkbox"/> Measurement <input type="checkbox"/> Volume <input type="checkbox"/> Weight <input type="checkbox"/> Mass <input type="checkbox"/> Density <input type="checkbox"/> Percentage <input type="checkbox"/> Length / Breadth / Thickness <input type="checkbox"/> Capacity <input type="checkbox"/> Time <input type="checkbox"/> Temperature <input type="checkbox"/> Budget, Pay/ Wages, Leave entitlements <input type="checkbox"/> Material usage <input type="checkbox"/> Speed <input type="checkbox"/> Costing

4. Workplace Information	Project documents, graph, chart, tables, spread sheet, item price quotation, equipment manual
5. Budget	Budget of consumables, calculation for software components, hardware equipment's, maintenance budget of a set-up, cost estimation etc
6. Methods	Methods are basic mathematical function such as addition, subtraction, multiplication and division but not limited to these.

**EVIDENCE GUIDE**

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Added and subtracted different types of numbers</li> <li><input type="checkbox"/> Multiplied and divided different types of numbers</li> <li><input type="checkbox"/> Used Calculator</li> <li><input type="checkbox"/> Applied mathematical concept on: <ul style="list-style-type: none"> <li>➤ Volume</li> <li>➤ Weight</li> <li>➤ Mass</li> <li>➤ Density</li> <li>➤ Percentage</li> <li>➤ Length / Breadth / Thickness</li> <li>➤ Capacity</li> <li>➤ Time</li> <li>➤ Temperature</li> <li>➤ Budget, Pay/ Wages, Leave entitlements</li> <li>➤ Material usage</li> <li>➤ Speed</li> <li>➤ Costing</li> </ul> </li> </ul>
2. Underpinning Knowledge	<p>2.1 Calculation requirements in the workplace</p> <p>2.2 Select appropriate mathematical methods</p> <p>2.3 Equipment and Tools</p> <p>2.4 Mathematical language, symbols and terminology</p> <p>2.5 Application and units</p> <p>2.6 Workplace information</p> <p>2.7 Using arithmetic processes to find solutions to simple mathematical problems</p> <p>2.8 Interaction skills (i.e., teamwork, mentoring, leadership, networking, interpersonal skills, etc.)</p> <p>2.9 Job roles, responsibilities and compliances</p>
3. Underpinning Skills	<p>3.1 Ability to calculation requirements are identified from workplace information.</p> <p>3.2 Ability to select appropriate mathematical methods such as: basic mathematical concepts include (addition, subtraction, multiplication and division) etc.</p> <p>3.3 Ability to use technology such as: scientific calculators,</p>

	<p>spreadsheets and/or graphics calculators etc.</p> <p>3.4 Ability to use mathematical language, symbols and terminology</p> <p>3.5 Using different types of units such as ( Mass- kg, length-meter etc) and application may include but limited to ( Measurement, Volume, weight, density, percentage etc)</p> <p>3.6 Ability to include workplace information (project documents, graph, chart, tables, spread sheet, item price quotation, equipment manual)</p> <p>3.7 Ability to use arithmetic processes to find solutions to simple mathematical problems</p> <p>3.8 Work effectively with others</p> <ul style="list-style-type: none"> <li>- Provide leadership in a variety of situations.</li> <li>- Deal with individual and/or group conflict</li> </ul> <p>3.9 Ability to apply in the workplace.</p>
1. Required Attitude	<p>4.1 Commitment to occupational health and safety</p> <p>4.2 Environmental concerns</p> <p>4.3 Eagerness to learn</p> <p>4.4 Tidiness and timeliness</p> <p>4.5 Respect of peers and seniors in workplace</p>
2. Resource Implications	<p>The following resources must be provided:</p> <p>5.1 Work place</p> <p>5.2 Materials relevant to the proposed activity</p> <p>5.3 All tools, equipment, material and documentation required.</p> <p>5.4 Relevant specifications or work instructions</p>
6 .Methods of Assessment	<p>Competency must be assessed through:</p> <p>6.1 Oral Questioning</p> <p>6.2 Assignment</p> <p>6.3 Demonstration</p> <p>6.4 Written Exam.</p>
7 Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

**Accreditation Requirements**

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.

Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

**National Technical and Vocational Qualification Framework for Bangladesh**  
**Unit of Competency**

<b>UNIT CODE AND TITLE</b>	<b>GN1002A1 - Apply OSH practices in the workplace</b>
<b>NOMINAL HOURS</b>	<b>30</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the skills and knowledge required to identify and apply OSH in the workplace.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the range of variables 1.1
1. Identify, control and report OSH hazards	<p>Immediate work area is routinely checked for OSH hazards prior to commencing and during work.</p> <p>1.2 <b>Hazards</b> and unacceptable performance are identified and corrective action is taken within the level of responsibility.</p> <p>1.3 OSH hazards and incidents are reported to appropriate personnel according to workplace procedures.</p> <p>1.4 Safety Signs and symbols are identified and followed.</p>
2. Conduct work safety	<p>2.1 Apply OSH practices in the workplace.</p> <p>2.2 Appropriate <b>personal protective equipment</b> (PPE) is selected and worn.</p>
3. Follow emergency response procedures	<p>3.1 Emergency situations are identified and reported according to workplace reporting requirements.</p> <p>3.2 Emergency procedures are followed as appropriate to the nature of the emergency and according to workplace procedures.</p> <p>3.3 Workplace procedures for dealing with accidents, fires and emergencies are followed whenever necessary within scope of responsibilities.</p>
4. Maintain and improve health and safety in the work place	<p>4.1 Risks are identified and appropriate control measures are implemented in the work area.</p> <p>4.2 Recommendations arising from risk assessments are implemented with in level of responsibility.</p> <p>4.3 Opportunities for improving OSH performance are identified and raised with relevant personnel.</p> <p>4.4 Maintain safety records according to company policies.</p>

<b>Range of Variables</b>	
<b>Variable</b>	<b>Range (May include but not limited to):</b>
1. Work is carried out in accordance with company procedures, regulatory and licensing requirements.	<input type="checkbox"/> Legislative requirements and industrial awards and agreements. Legislative requirements of occupational health and safety Acts and regulations, including regulations and codes of practice relating to hazards present in the workplace. They also include general duty of care under occupational health and safety legislation and common law
2. Company procedures	<input type="checkbox"/> Job-related Standard Operating Procedures (SOPs) and OSH-specific procedures. Examples of OSH procedures include consultation and participation, emergency response, response to specific hazards, incident investigation, risk assessment, reporting arrangements and issue resolution procedures
3. Workplace information	<input type="checkbox"/> OSH system and related documentation including policies and procedures, Standard Operating Procedures (SOPs), information on hazards and the work process, hazard alerts, safety signs and symbols, labels, Material Safety Data Sheets (MSDSs) and manufacturers' advice.
4. Hazards	<input type="checkbox"/> OSH incidents include near misses, injuries, illnesses and property damage, noise, handling hazardous substances, other hazards <input type="checkbox"/> Working with and near moving equipment/load shifting equipment <input type="checkbox"/> Broken or damaged equipment or materials
5. Personal Protective equipment	<input type="checkbox"/> Goggles, ear muffs, ear plugs, Gloves, Clothing, Apron, Helmet, Boots
6. Equipment	<input type="checkbox"/> Production machinery <input type="checkbox"/> Safety equipment <input type="checkbox"/> Emergency equipment <input type="checkbox"/> Tools of the trade

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	Assessment requires evidence that the candidate: <ol style="list-style-type: none"> <li>1.1 Worn Personal Protective Equipment</li> <li>1.2 Identified hazards</li> <li>1.3 Took corrective action of different hazards</li> <li>1.4 Took corrective action for emergency procedure</li> <li>1.5 Reported Emergency situation to the supervisor/Manger</li> <li>1.6 Satisfied the requirements mentioned in the Performance Criteria and Range of Variables</li> </ol>
2. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1 OHS Workplace Policies and Procedures</li> <li>2.2 Work Safety Procedures</li> </ol>

	<ul style="list-style-type: none"> <li>2.3 Emergency Procedures</li> <li>2.4 Types of Hazards (Biological, Chemical and Physical) and Their Effects</li> <li>2.5 PPE types and uses</li> <li>2.6 Personal Hygiene Practices</li> <li>2.7 OHS Awareness</li> <li>2.8 Steps of Hazard Identification</li> <li>2.9 Principles of Hazards control</li> <li>2.10 Employer's Role</li> <li>2.11 Supervisor's Responsibilities</li> <li>2.12 Maintain Hazards inspection checklist</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Identifying OHS policies and procedures</li> <li>3.2 Following personal work safety practices</li> <li>3.3 Reporting hazards and risks</li> <li>3.4 Responding to emergency procedures</li> <li>3.5 Maintaining physical well-being in the workplace</li> <li>3.6 Identifying hazards</li> <li>3.7 Assessing associated risks</li> <li>3.8 Identify tools and equipment related to OSH.</li> <li>3.9 Use the appropriate PPE.</li> <li>3.10 Controlling hazard</li> <li>3.11 Emergency situation</li> <li>3.12 Fire and emergency procedures</li> <li>3.13 Improving OSH performance.</li> </ul>
4. Required Attitude	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Eagerness to learn</li> <li>4.4 Tidiness and timeliness</li> <li>4.5 Respect of peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1 Work place</li> <li>5.2 Tools and equipment appropriate to the work place</li> <li>5.3 Materials relevant to the proposed activity</li> <li>5.4 All tools, equipment, material and documentation required.</li> <li>5.5 Relevant specifications or work instructions.</li> </ul>
6 .Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>6.1 Oral Questioning</li> <li>6.2 Assignment</li> <li>6.3 Demonstration</li> <li>6.4 Written Exam.</li> </ul>
7 Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.

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**National Technical and Vocational Qualification Framework for Bangladesh  
Unit of Competency**

<b>UNIT CODE AND TITLE</b>	<b>GN2003A1: Use English in the workplace</b>
<b>NOMINAL HOURS</b>	<b>70</b>
<b>UNIT DESCRIPTOR</b>	This unit specifies the competency required to able to read, write and understand basic English in the workplace.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the range of variables
1. Read and understand workplace documents in English	1.1 Workplace a documents are read and understood. 1.2 Visual information is interpreted.
2. Write simple routine workplace documents in English	2.1 Simple <b><i>routine workplace</i></b> documents are prepared using key words, phrases, simple sentences and <b><i>visual aids</i></b> where appropriate. 2.2 Key information is written in the appropriate places in standard forms.
3. Listen to conversation in English	3.1 Active listening in English language is demonstrated to the required workplace standard.
4. Perform conversation in English	4.1 Conversation is performed in English with peers, customers and management to the required workplace standard
<b>Range of Variables</b>	
<b>Variable</b>	<b>Range</b> (May include but not limited to):
1. Routine and non-routine workplace documents required to be read and understood	<input type="checkbox"/> Schedules and itineraries <input type="checkbox"/> Agenda <input type="checkbox"/> Simple reports such as progress and incident reports <input type="checkbox"/> Job sheets <input type="checkbox"/> Operational manuals <input type="checkbox"/> Brochures and promotional material <input type="checkbox"/> Visual and graphic materials <input type="checkbox"/> Standards <input type="checkbox"/> OSH information
2. Visual information	<input type="checkbox"/> Signs <input type="checkbox"/> maps <input type="checkbox"/> diagrams <input type="checkbox"/> forms <input type="checkbox"/> labels <input type="checkbox"/> graphs <input type="checkbox"/> charts

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Spoke English with workplace fellows 1.2 Made reports of workplace documents in English .
2. Underpinning Knowledge	2.1 Read workplace documents in English 2.2 Write simple routine workplace documents in English 2.3 Listen to conversation in English 2.4 Perform conversation in English 2.5 Interaction skills (i.e., teamwork, interpersonal skills, etc.) 2.6 Job roles, responsibilities and compliances
3. Underpinning Skills	3.1 Ability to read and understand workplace documents in English by using appropriate vocabulary and grammar, standard spelling and punctuation. 3.2 Ability to write simple routine workplace documents in English such as: Schedules and agenda, job sheets, operational manuals and brochures and promotional material. 3.3 Ability in active listening in English language is demonstrated to the required workplace standard. 3.4 Ability to perform conversation in English with peers, customers and management to the required workplace standard. 3.5 Work effectively with others. a. listening and questioning skills b. ability to follow simple directions
4. Required Attitude	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect of peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Work place Procedure 5.2 Materials relevant to the proposed activity 5.3 All tools, equipment, material and documentation required. 5.4 Relevant specifications or work instructions
6. Methods of Assessment	Competency must be assessed through: 6.1 Oral Questioning 6.2 Assignment 6.3 Demonstration 6.4 Written Exam.
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.

### **Accreditation Requirements**

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## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competency

<b>UNIT CODE AND TITLE</b>	<b>GN2004A1 - Operate in a self-directed team</b>
<b>NOMINAL HOURS</b>	<b>30</b>
<b>UNIT DESCRIPTOR</b>	This unit specifies the skills, knowledge and attitude to communicate and work with in a team in an interactive work environment as per the workplace standard.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the range of variables
1. Identify team goals and processes	1.1 Team goals and processes are identified. 1.2 Roles and responsibilities of team members are identified 1.3 Relationships within team and with other work areas identified
2. Communicate and cooperate with team members	2.1 Effective interpersonal skills are used to interact with team members and to contribute to activities and objectives. 2.2 Formal and informal forms of communication are used effectively to support team achievement. 2.3 Diversity is respected and valued in team functioning. 2.4 Views and opinions of other team members are understood and reflected accurately. 2.5 Workplace terminology is used correctly to assist communication.
3. Work as a team member	3.1 Duties, responsibilities, authorities, objectives and task requirements are identified and clarified with team 3.2 Tasks are performed in accordance with organizational and team requirements, specifications and workplace procedures. 3.3 Team members support other members as required to ensure team achieves goals and requirements. 3.4 Agreed reporting lines are followed using standard operating procedure
4. Solve problems as a team member	4.1 Current and potential problems faced by team are identified. 4.2 Procedures for avoiding and managing problems are identified. 4.3 <b>Problems</b> are solved effectively and in a manner which supports the team

<b>Range of Variables</b>	
<b>Variable</b>	<b>Range (May include but not limited to):</b>
1. Team problem-solving activities including:	<input type="checkbox"/> Identifying the problem <input type="checkbox"/> Consider solutions <input type="checkbox"/> Action <input type="checkbox"/> Follow-up.
2. Collaborative decision-making processes:	<input type="checkbox"/> Consultation <input type="checkbox"/> Conciliation <input type="checkbox"/> Negotiation <input type="checkbox"/> Principles of equity and fairness.
3. An awareness of:	<input type="checkbox"/> Organization/company's code of conduct, complaints handling/grievance policies and procedures

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of Competency	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Work effectively within a team  1.2 Dealt with a range of communication/information at one time  1.3 Made constructive contributions in workplace issues  1.4 Sought workplace issues effectively  1.5 Responded to workplace issues promptly  1.6 Presented information clearly and effectively in written form  1.7 Used appropriate sources of information  1.8 Asked appropriate questions  1.9 Provided accurate information</p>
2. Underpinning knowledge	<p>2.1 Organization requirements for written and electronic communication methods  2.2 Effective verbal communication methods</p>
3. Underpinning Skills	<p>3.1 Organize information  3.2 Understand and convey intended meaning  3.3 Participate in variety of workplace discussions  3.4 Comply with organization requirements for the use of written and electronic communication methods</p>
4. Required Attitude	<p>4.1 Commitment to occupational health and safety  4.2 Environmental concerns  4.3 Eagerness to learn  4.4 Tidiness and timeliness  4.5 Respect for rights of peers and seniors in workplace</p>
5. Resource Implications	<p>The following resources must be provided:</p> <p>5.1 Work place  5.2 Materials relevant to the proposed activity  5.3 All tools, equipment, material and documentation required.. 5.4 Relevant specifications or work instructions</p>

6. Methods of Assessment	Competency must be assessed through: 6.1 Oral Questioning 6.2 Assignment 6.3 Demonstration 6.4 Written Exam.
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.

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## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competency

<b>UNIT CODE AND TITLE</b>	<b>GN2005A1 - Present and apply workplace information</b>
<b>NOMINAL HOURS</b>	<b>30</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the skills, knowledge and attitude to communicate and deliver up-to-date information to all in an interactive work environment as per workplace standard.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b>
	<i>Italicized</i> terms are elaborated in the range of variables
1. Identify information requirements	1.1 Information requirements in the workplace are identified
2. Process Data	2.1 Data is collected and correlated as per prescribed method. 2.2 Relevant data is used as references in accordance with the objectives of the program. 2.3 Information is applied according to the requirements.
3. Analysis, interpret and organize information	3.1 Collected information is <b>analyzed</b> , interpret and organize as required for workplace.
4. Apply and present workplace information	4.1 Findings and recommendations are summarized and presented in a user-friendly manner. 4.2 Draft report/forms are prepared based on standard format. 4.3 Graphs and other visual presentations are prepared to highlight analysis/interpretation of information. 4.4 <b>Reports/forms</b> are submitted and distributed to relevant departments/wings/persons
<b>Range of Variables</b>	
<b>Variable</b>	<b>Range</b> (May include but not limited to):
1. Source of information	Source of information Daily job instructions, specifications, standard operating procedures, charts, lists, documents, computer data, drawings, sketches, tables, technical manuals and/or charts, Surveys, Interviews, Front-end analysis, Functional analysis
2. Forms	Forms may include but not limited to: Questionnaires, Profile, Accident/incident report form, work order, purchase order
3. Methodologies	Qualitative, Quantitative
4. Statistical analysis	Average(mean, median, mode), percentage, frequency distribution

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Collected up-to-date information 1.2 Analysed collected information 1.3 Submitted report to relevant department
2. Underpinning Knowledge	2.1 Identify information 2.2 Identify data 2.3 Workplace standard
3. Underpinning Skills	3.1 Information collect 3.2 Data collect 3.3 Demonstrate / interpreting and following data sheet, instruction 3.4 Perform the task 3.5 Keeping record and report
4. Required Attitude	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect of peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Work place 5.2 Materials relevant to the proposed activity 5.3 All tools, equipment, material and documentation required.. 5.4 Relevant specifications or work instructions
6. Methods of Assessment	Competency must be assessed through: 6.1 Oral Questioning 6.2 Assignment 6.3 Demonstration 6.4 Written Exam.
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

# **SECTOR SPECIFIC UNITS**

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competency

<b>UNIT CODE AND TITLE</b>	TRASS1006A1 -Interpret technical drawing
<b>NOMINAL HOURS</b>	40
<b>UNIT DESCRIPTOR</b>	This unit covers the skills and knowledge required to interpret technical drawing.
<b>ELEMENTS</b>	<b>PERFORMANCE CRITERIA</b> <i>Bold &amp; Italic</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Safe work practices observed and personal proactive equipment (PPE) worn as required for the work performed.
2. Select technical drawing	2.1 <b>Drawing</b> is selected and checked to ensure that it conforms to the job requirements. 2.2 Drawing is validated.
3. Interpret technical drawing	3.1 Drawing components, assemblies are identified. 3.2 Dimensions are identified according to job requirement 3.3 Clearances/tolerances are checked work place standard. 3.4 <b>Instructions</b> are identified and followed accurately. 3.5 Material specification are identified. 3.6 Symbols in drawing are interpreted.
<b>Range of Variables</b>	
<b>Variable</b>	<b>Range</b> ( May include but not limited to):
1. Drawing	Technical drawing, sketch
2. Instructions	Note, Instruction, special instruction, precaution

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Identified dimension according to job requirement.</li> <li>1.2 Maintained clearances and tolerances according to workplace requirement</li> <li>1.3 Interpreted drawing symbols.</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 OSH</li> <li>2.2 Workplace standard</li> <li>2.3 Sequence of drawing</li> <li>2.4 Methods of checking</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Practicing workplace safety</li> <li>3.2 Reading / interpreting information on the drawing, following data sheet, instruction and manuals, technical drawing</li> <li>3.3 Performing measurement, calculation</li> <li>3.4 Interpreting drawing</li> <li>3.5 Perform checking</li> <li>3.6 Keeping record</li> </ul>
4. Required Attitude	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Eagerness to learn</li> <li>4.4 Tidiness and timeliness</li> <li>4.5 Respect of peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1 Work place</li> <li>5.2 Materials relevant to the proposed activity</li> <li>5.3 All tools, equipment, material and documentation required..</li> <li>5.4 Relevant specifications or work instructions</li> </ul>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>6.1 Observation</li> <li>6.2 Demonstration</li> <li>6.3 Oral Questioning/interview</li> </ul>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

**Accreditation Requirements**

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## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competency

<b>UNIT CODE AND TITLE</b>	<b>TRASS1007A1-Work in the manufacturing Industry (Include OSH)</b>
<b>NOMINAL HOUR</b>	<b>20</b>
<b>UNIT DESCRIPTOR</b>	This unit specifies the knowledge and skills required to identify roles and responsibilities and work in the manufacturing industry.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the range of variables
1. Identify job roles and responsibilities in the manufacturing industry	1.1 Job roles and responsibilities in the manufacturing industry are identified. 1.2 Relationship within the manufacturing industry employees are identified.
2. Identify and observe OSH in the manufacturing industry.	2.1 <b>OSH</b> in the manufacturing industry is identify and observed. 2.2 Safe work practices are followed when using equipment in the work environment.
3. Plan work activities	3.1 Common goals, objectives and tasks are identified and clarified with appropriate persons. 3.2 Individual tasks are determined and agreed on according to workplace environment.
4. Work with others	4.1 <b>Effective interpersonal skills</b> are applied to interact with others and to contribute to activities and objectives. 4.2 Assigned tasks are performed in accordance with job requirements, specifications and workplace environment. 4.3 Work <b>requirements</b> are confirmed with colleagues.

### Range of variables

<b>Variables</b>	<b>Range</b> (May include but not limited to):
1. OSH( Occupation safety and Health)	Personal protective equipment (PPE) Helmet, Eye shield, gloves, goggles, safety shoes, full sleeve apron, first aid kits
2. Hazards	Mechanical hazards, electrical hazards, fire hazard and other work place hazards etc
3. Effective interpersonal skills	Basic listening and speaking skills, use terminology and jargon, communicating and receiving feedback, interpretation of instructions, basic principles of effective communication.
4. Requirements	Requirements as directed in verbal modes or written in specification or procedures.

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Followed job role accordance with industries requirement.</li> <li>1.2 Developed relationship with industries fellow</li> <li>1.3 Identified different types of Hazards</li> <li>1.4 Used PPE</li> <li>1.5 Applied effective interpersonal skills to achieve the goals of industry.</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 Key duties/responsibilities of Manufacturing technician</li> <li>2.2 Responsibilities of Supervisors</li> <li>2.3 Responsibilities of Employers</li> <li>2.4 Responsibilities of Workers</li> <li>2.5 Common Hazards</li> <li>2.6 Ways to reduce the risk</li> <li>2.7 Common goals of the manufacturing Industry</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Improve Employee Employer Relationships</li> <li>3.2 Create a Positive Relationship with Employees</li> <li>3.3 Observe OHS in manufacturing industry</li> <li>3.4 Identifying OHS policies and procedures</li> <li>3.5 Following personal work safety practices</li> <li>3.6 Reporting hazards and risks</li> <li>3.7 Responding to emergency procedures</li> <li>3.8 Maintaining physical well-being in the workplace</li> </ul>
4. Required Attitude	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Eagerness to learn</li> <li>4.4 Tidiness and timeliness</li> <li>4.5 Respect for rights of peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1 Workplace</li> <li>5.2 Tools and equipment appropriate to workplace</li> <li>5.3 Materials relevant to the proposed activity</li> <li>5.4 Equipment and outfits appropriate in applying safety measures</li> <li>5.5 OHS Policies and Procedures</li> </ul>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>6.1 Written Exam.</li> <li>6.2 Demonstration</li> <li>6.3 Oral Questioning/interview</li> </ul>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competency

<b>UNIT CODE AND TITLE</b>	<b>TRASS1008A1-Use Hand &amp; Power Tools</b>
<b>NOMINAL HOURS</b>	<b>40</b>
<b>UNIT DESCRIPTOR</b>	This unit covers using a range of manual tools, hand held power tools and fixed power tools for hand held operations for a variety of general engineering applications.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the range of variables 1.1
1. Use Manual tools	<i><b>Manual tools</b></i> hammer, different type of wrenches, files, chisel, vices etc. are identified and use as per the work procedure
2. Use power tools	<p>2.1 <i><b>Power tools</b></i> are identified and selected conforming to the task requirements.</p> <p>2.2 Power tools are used for a specific sequence of operations which may include <i><b>clamping</b></i>, alignment and adjustment to Produce desired outcomes conforming to <i><b>job specifications</b></i></p> <p>2.3 All safety requirements are complied before, during and after use.</p> <p>2.4 Unsafe or faulty tools are identified and marked for repair /reject before , during and after use according to current procedures.</p> <p>2.5 <i><b>Operational maintenance</b></i> of tools, including hand sharpening, is undertaken according to standard procedures.</p> <p>2.6 Power tools are stored safely in appropriate location according to standard workshop procedures and manufacturers' recommendations.</p>

#### Range of Variables

Variable	Range (May include but not limited to):
1. PPE	<ul style="list-style-type: none"> <li>▪ Safety Shoes</li> <li>▪ Goggles</li> <li>▪ Hand Gloves</li> <li>▪ Apron</li> </ul>
2. Manual Tools	Hammer, different type of wrenches, files, chisel, hacksaw etc.
3. Power tools	Electric or pneumatic/hydraulic drills, grinders, nibblers, pedestal drills and pedestal grinders.
4. Clamping	Multi grips, vices, jigs and fixtures, clamps etc.
5. Job specifications	Finish size or shape etc.
6. Operational maintenance	Hand sharpening, cleaning, lubricating, tightening. Simple tools repairs and adjustments using engineering principles, tools, equipment and procedures to statutory and regulatory requirements.

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> <li>1.1 Followed proper using procedure of manual tools such as hammer, file, wrenches, pliers, screwdrivers, etc.</li> <li>1.2 Used hand tools as per workplace requirement</li> <li>1.3 Maintained safety precaution for using hand &amp; power tools.</li> <li>1.4 Maintained operation procedure of power tools.</li> <li>1.5 Used power tools as per workplace requirement</li> </ol>
2. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1 Classification of tool</li> <li>2.2 Safely use Hand tool &amp; Power tools</li> <li>2.3 Types of Hand &amp; Power tools</li> <li>2.4 Working Principles of Hands &amp; Power tools: <ul style="list-style-type: none"> <li>➤ Hammers</li> <li>➤ Punches</li> <li>➤ Chisels</li> <li>➤ Wrenches</li> <li>➤ Pliers</li> <li>➤ Hand drill</li> <li>➤ Disc grinder</li> <li>➤ Pedestal drill</li> <li>➤ Powered screw driver</li> </ul> </li> <li>2.5 Preventive Maintenance</li> <li>2.6 Methods and Techniques</li> <li>2.7 Storage Procedures</li> </ol>
3. Underpinning Skills	<ol style="list-style-type: none"> <li>3.1 Identifying Appropriate Tools</li> <li>3.2 Using hand &amp; Power tools safely</li> <li>3.3 Performing Preventive Maintenance</li> <li>3.4 Practicing OHS</li> <li>3.5 Storing tools and equipment</li> </ol>
4. Required Attitude	<ol style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Eagerness to learn</li> <li>4.4 Tidiness and timeliness</li> <li>4.5 Respect of peers and seniors in workplace</li> </ol>
5. Resource Implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> <li>5.1 Workplace</li> <li>5.2 Tools and equipment appropriate to maintain workplace</li> <li>5.3 Materials relevant to the proposed activity</li> <li>5.4 Relevant drawings, manuals, codes, standards and reference material</li> </ol>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ol style="list-style-type: none"> <li>6.1 Written Exam.</li> <li>6.2 Demonstration</li> <li>6.3 Oral Questioning/interview</li> </ol>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

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## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competency

<b>UNIT CODE AND TITLE</b>	<b>TRASS1009A1 - Use Graduated Measuring Instrument</b>
<b>NOMINAL HOURS</b>	<b>20</b>
<b>UNIT DESCRIPTOR</b>	This unit specifies the competency required to use graduated measuring instruments and associated minor calculations
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the range of variables 1.
1. Follow OSH practices	1 Safe work practices observed and personal proactive equipment (PPE) worn as required for the work performed.
2. Select the job to be measured	2.1. Selected job is identified.
3. Select measuring device	3.1 Measuring equipment is selected according to job requirements. 3.2 Tolerance and/or clearance limit are identified according to job requirements.
4. Take measurement	4.1. <i><b>Measurement</b></i> is taken accurately 4.2. Measurement is checked against job requirement.
5. Measurements are recorded and communicated	5.1. Measurements are recoded on form/drawing/sketches. 5.2. Recorded measurements are interpreted and communicated to authority.
6. Clean and store measuring instruments.	6.1 Measuring instruments are cleaned and stored safe place as per instruction manuals

#### Range of Variables

<b>Variable</b>	<b>Range</b> (May include but not limited to):
1. Documents may include	Drawings, sketches, technical manuals, specifications, written instructions
2. Basic calculations	Addition, Subtraction, multiplication, division, fractions and decimals. Calculations may be done using calculator.
3. Routine adjustments	Calibration, simple zeroing, scale adjustment
4. Measurements	Measuring length, angle, diameter, clearances
5. Job samples may include	Machined parts, prepared work piece, work sample etc

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Followed OSH Practices</li> <li>1.2 Identified the proper graduated measuring instrument.</li> <li>1.3 Taken Measurement accurately</li> <li>1.4 Record measurement .</li> <li>1.5 Interpreted Written Inspection.</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 Relevant OSH</li> <li>2.2 Principles of using different graduated measuring Instruments</li> <li>2.3 Workplace standard</li> <li>2.4 Sequence of using the instruments</li> <li>2.5 Maintaining rules of instruments</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Practice workplace safety</li> <li>3.2 Use PPE</li> <li>3.3 Use of instruments</li> <li>3.4 Demonstrate / interpreting and following data sheet, instruction and manuals, technical drawing</li> <li>3.5 Performing measurement</li> <li>3.6 Checking for conformance to specification</li> <li>3.7 Keeping record and report</li> </ul>
4. Required Attitude	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Eagerness to learn</li> <li>4.4 Tidiness and timeliness</li> <li>4.5 Respect of peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1 Workplace</li> <li>5.2 Materials relevant to the proposed activity</li> <li>5.3 Measuring instruments .</li> <li>5.4 Relevant drawings, manuals, codes, standards and reference material</li> </ul>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>6.1 Written Exam.</li> <li>6.2 Demonstration</li> <li>6.3 Oral Questioning/interview</li> </ul>
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competency - Transport

<b>UNIT CODE AND TITLE</b>	<b>TRASS2010A1 - Apply quality systems and procedures</b>
<b>NOMINAL HOURS</b>	<b>30</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skills and attitude required for working within quality improvement systems and applying established quality procedures to his own work within a manufacturing environment.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b>
	<i><b>Bold &amp; Italic</b></i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Safe work practices observed and personal protective Equipment (PPE) worn as required for the work performed.
2. Work within a quality system	2.1 Instructions and procedures are followed strictly and duties are performed in accordance with demand of <i><b>quality system</b></i> . 2.2 Conformance to specifications is ensured. 2.3 Defects are detected and reported to authority according to standard operating procedures. 2.4 Customer's satisfaction is ensured in performing an operation or quality of product or services.
3. Apply and monitor a quality system improvement	3.1 Performance measurement systems are identified. 3.2 Performance is assessed at regular interval. 3.3 Specifications and standard operating procedures are established and identified. 3.4 Defects are detected and reported according to standard operating procedures. 3.5 Process improvement procedures are participated in. 3.6 The improvement of internal / external customer / supplier relationships is participated in. 3.7 Performance of operation or quality of product or service is monitored to ensure customer satisfaction.
4. Take responsibility for his/her own quality	4.1 Concept of supplying product or service to meet the <i><b>customer's requirements</b></i> is understood and accordingly applied. 4.2 Responsibility is taken for quality of own work.
5. Apply standard procedures for each job	5.1 <i><b>Quality</b></i> system procedures for each job are followed. 5.2 Conformance to specification is ensured in every case at all situations.

## Range of Variables

Variable	Range (May include but not limited to):
1. Quality improvement system	A system comprising some or all of the following elements: <ul style="list-style-type: none"> <li><input type="checkbox"/> Quality inspection</li> <li><input type="checkbox"/> Quality control</li> <li><input type="checkbox"/> Quality improvement</li> <li><input type="checkbox"/> Total quality control</li> <li><input type="checkbox"/> Quality assurance</li> </ul>
2. Customer	Person or organization receiving the product or service
3. Quality	Consistently meeting customer's requirements.

EVIDENCE GUIDE	
1. Critical aspects of competency	Assessment requires evidence that the candidate: <ol style="list-style-type: none"> <li>1.1 Used personal protective equipment.</li> <li>1.2 Maintained proper specification and standard of product.</li> <li>1.3 Checked product for quality assurance as per drawing &amp; specification.</li> <li>1.4 Detected defects and take corrective and/or quality improvement actions.</li> <li>1.5 Ensured customer satisfaction.</li> </ol>
2. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1 The reasons why good quality should be maintained and poor quality should be eliminated</li> <li>2.2 Meaning of the key terms - quality, quality assurance, quality control, quality inspection, quality improvement and total quality control</li> <li>2.3 Process and procedures for improving and maintaining quality - Defects and procedures for addressing defects</li> <li>2.4 Record keeping within the quality improvement system in workplace</li> <li>2.5 Factors, which affect the successful implementation of the quality systems and procedures</li> </ol>
3. Underpinning Skills	<ol style="list-style-type: none"> <li>3.1 Identifying the role of self and others within the quality improvement system</li> <li>3.2 Following instructions, job sheets, and standard operating procedures and actively participate in the implementation of a quality improvement system</li> <li>3.3 Identifying product and process specifications and tolerance limits</li> <li>3.4 Detecting defects, take corrective and/or quality improvement actions</li> <li>3.5 Keeping records in accordance with standard operating procedures.</li> <li>3.6 Identifying customer requirements and always meet those requirements</li> </ol>

4.Required Attitude	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect of peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Workplace 5.2 Tools and equipment appropriate to maintain workplace 5.3 Materials relevant to the proposed activity 5.4 Relevant drawings, manuals, codes, standards and reference material
6 .Methods of Assessment	Competency must be assessed through: 6.1 Written Exam. 6.2 Demonstration 6.3 Oral Questioning/interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

# **OCCUPATION SPECIFIC UNITS**

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competency - Transport

<b>UNIT CODE AND TITLE</b>	TRARAC1011A1 <b>Perform Gas Welding , Brazing and soldering</b>
<b>NOMINAL HOURS</b>	30
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skills and attitudes, required to Gas welding and brazing including preparation, cleaning and storing equipment.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the Range of Variables
1. Prepare for Gas welding, brazing and soldering	1.1 Safe work practices are observed and personal proactive equipment ( <b>PPE</b> ) worn as required for the work to be performed. 1.2 <b>Necessary tools and equipment</b> are identified in line with job requirements 1.3 Necessary <b>materials</b> are selected as per job requirement 1.4 Materials are cleaned and assembled for welding.as per work standard.
2. Perform gas welding	2.1 Equipment is set up and adjusted according to standard operating procedures. 2.2 Gas welding is performed according to job requirements. 2.3 Welds are cleaned in accordance with standard operating procedures. 2.4 Weld is checked for quality and any defects are identified and corrective action is taken to standard operating procedures.
3. Performed brazing and/or soldering	3.1 Heating equipment is assembled and set up in accordance with standard operating procedures. 3.2 Heating equipment is tested by undertaking and verifying test run. 3.3 Brazing and/or soldering are performed in accordance with <b>standard procedure</b> 3.4 Joints are inspected according to required standard.
4. Clean and store equipment	4.1 Waste materials are disposed of in accordance with workplace procedures. 4.2 Unused materials are returned to storage area as per company standard. 4.3 Tools and equipment used are cleaned and stored as per company standard.

## RANGE OF VARIABLES

VARIABLES	RANGE (May include but are not limited to):
1. PPE	1.1 Hand gloves. 1.2 Safety goggles. 1.3 Safety Shoes. 1.4 Apron/Boiler shoot 1.5 Helmet
2.Tools	2.1 Chipping hammer 2.2 Ballpeen hammer 2.3 Sledge hammer 2.4 pliers 2.5 wire brush 2.6 weld gauge 2.7 grinder 2.8 Hand shear 2.9 Soldering bit
3. Equipment	3.1 Gas welding set 3.2 Heating equipment 3.3 Soldering equipment
4. Material	4.1 Mild steel, carbon steel, copper tube 4.2 Oxygen, acetylene and fuel gas, fluxes (resin or powder), 4.3 All types of filler materials and brazing grades
5. Standard procedure	5.1 Brazing and/or soldering material is applied correctly and in appropriate quantities to meet job specifications. 5.2 Materials are preheated. 5.3 Material temperature is annealed using correct and appropriate techniques.

EVIDENCE GUIDE	
1. Critical aspects of competency	Assessment requires evidence that the candidate: <ul style="list-style-type: none"> <li>1.1 Applied safety rules and procedures</li> <li>1.2 Used equipment properly</li> <li>1.3 Adjusted equipment</li> <li>1.4 Performed gas welding the task</li> <li>1.5 Performed brazing and/soldering</li> <li>1.6 Followed 5S of house keeping</li> </ul>

2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 Identify tools</li> <li>2.2 Identify equipment</li> <li>2.3 Preheating procedure</li> <li>2.4 Procedure for work inspection</li> <li>2.5 Sequence of work</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Using equipment</li> <li>3.2 Adjusting of equipment</li> <li>3.3 Interpreting and information on standard operating procedures</li> <li>3.4 Using techniques to perform gas welding</li> <li>3.5 Using techniques to perform brazing and/soldering</li> <li>3.6 Applying methods to Perform testing</li> <li>3.7 Cleaning and storing equipment</li> </ul>
4. Required Attitude	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Tidiness and timeliness</li> <li>4.4 Respect of peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1 Workplace</li> <li>5.2 Tools, equipment and facilities appropriate to processes or activity</li> <li>5.3 Materials relevant to the proposed activity</li> <li>5.4 Relevant drawings, manuals, and reference material</li> </ul>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>6.1 Written test.</li> <li>6.2 Demonstration</li> <li>6.3 Oral Questioning/Interview</li> </ul>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>
<p><b>Accreditation Requirements</b>  Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.  Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competency - Transport

<b>UNIT CODE AND TITLE</b>	<b>TRARAC1012A1      Repair and Maintain      Compressor</b>
<b>NOMINAL HOURS</b>	<b>30</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skills and attitudes required to Repair and maintain compressor including diagnosing faults, Reassembling, testing and preparing reports.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the Range of Variables
1. Prepare for repairing and maintaining compressor	<p>1.1 Safe work practices are observed and personal proactive equipment (<b><i>PPE</i></b>) is worn as required for the work to be performed.</p> <p>1.2 <b><i>Service manuals</i></b> and <b><i>service information</i></b> required for repair/maintenance are acquired as per standard procedure. 1.3 Workplace is set/prepared for repairing compressor in line with the company requirements.</p> <p>1.4 <b><i>Necessary tools, equipment</i></b> and test instruments are prepared in line with job requirements</p> <p>1.5 Necessary <b><i>materials</i></b> are selected as per job requirement</p>
2. Diagnose faults	<p>2.1 Systematic <b><i>pre-testing procedure</i></b> is observed in accordance with manufacturer's instructions.</p> <p>2.2 System defects/Fault symptoms are identified using appropriate tools and equipment and in accordance with safety procedures 2.3 Refrigerant is recovered as per work place procedure</p> <p>2.4 Winding is checked and isolated using specified testing procedures</p> <p>2.5 Control settings/adjustments are checked in conformity with service-manual specifications.</p> <p>2.6 Results of diagnosis and testing are documented as per workplace procedure.</p>
3. Repair and maintain product	<p>3.1 Defective parts/components are replaced with identical or recommended appropriate equivalent ratings</p> <p>3.2 Compressor Casing and service line are welded as per work requirement</p>

	<p>3.3 Repaired or replaced parts/components are mounted in accordance with the current industry standards.</p> <p>3.4 Control settings/adjustments are performed as per requirement</p> <p>3.5 Care and precaution in handling the unit is observed as per procedures</p> <p>3.6 Cleaning of unit is performed in accordance with standard procedures</p>
4. Test attached and repaired product	<p>4.1 Repaired Compressor is checked accordance with standard procedure.</p> <p>4.2 Repaired units are assembled and attached to the system in accordance with system requirement.</p> <p>4.3 Attached units are subjected to final <b>testing</b> and cleaning in conformity with manufacturer's specifications</p> <p>4.4 Waste materials are disposed in accordance with <b>environmental requirements.</b></p>

#### RANGE OF VARIABLES

VARIABLES	RANGE (May include but are not limited to):																
1. PPE	<p>1.1 Hand gloves.</p> <p>1.2 Safety goggles.</p> <p>1.3 Safety Shoes.</p> <p>1.4 Apron/Boiler shoot</p>																
2.Tools	<table> <tr> <td>2.1 Pliers</td> <td>2.9 C Clamp</td> </tr> <tr> <td>2.2 Screwdriver</td> <td>2.10 Hammer</td> </tr> <tr> <td>2.3 Hacksaw</td> <td>2.11 Steel wire brush</td> </tr> <tr> <td>2.4 Wrenches</td> <td>2.12 Tube cutter</td> </tr> <tr> <td>2.5 Wire stripper/crimper</td> <td>2.13 Tube bender</td> </tr> <tr> <td>2.6 Swaging tools,</td> <td>2.14 Block vice</td> </tr> <tr> <td>2.7 Flaring tools</td> <td>2.15 Reamer</td> </tr> <tr> <td>2.8 Bench Vice</td> <td>2.16 Ellen key set</td> </tr> </table>	2.1 Pliers	2.9 C Clamp	2.2 Screwdriver	2.10 Hammer	2.3 Hacksaw	2.11 Steel wire brush	2.4 Wrenches	2.12 Tube cutter	2.5 Wire stripper/crimper	2.13 Tube bender	2.6 Swaging tools,	2.14 Block vice	2.7 Flaring tools	2.15 Reamer	2.8 Bench Vice	2.16 Ellen key set
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3. Equipment	<p>3.1 Multimeter</p> <p>3.2 Clamp on meter</p> <p>3.3 Compressor (semi sealed and open type)</p> <p>3.4 Gas welding equipment</p> <p>3.5 Gauge manifold set</p> <p>3.6 Recovery unit</p>																

4. Material	4.1 Filler rod 4.2 Welding flux 4.3 lubricating oil 4.4 Refrigerants
5. Service manuals	5.1 Service manual/schematic diagram/parts list 5.2 Operating instructions/User's/Owner's manual 6.1
6. Service Information	Job Report Sheets 6.2 Customer index 6.3 Service flowchart 6.4 Stock and inventory record 6.5 Suppliers information
7. Pre-testing procedures	7.1 Visual inspection of the unit without operating the unit 7.2 Customer complaint 7.3 Operate the unit according to manual to confirm defects
8. Test & Checking	8.1 Visual inspection of the unit without operating the unit 8.2 Insulation 8.3 Resistance 8.4 Mechanical 8.5 Continuity 8.6 Pumping test 8.7 Current drawn while running. 8.8 Current drawn on starting
9. Environmental Requirements	9.1 Proper disposal of refrigerant and components shall be based on existing requirements of the law and chemical waste management 9.2 Non-biodegradable parts or materials shall be packed and labeled properly for disposal and stored in designated place.

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Applied safety rules and procedures</li> <li>1.2 Identified faults and defects in accordance with testing procedures</li> <li>1.3 Repaired or replaced parts/components of compressor</li> <li>1.4 Restored unit to normal operating condition</li> <li>1.5 Disposed waste materials</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 Types and function of compressor</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Testing and repairing procedures</li> <li>2.4 Type of refrigerants and their applications.</li> <li>2.5 Types and application of refrigerant lubricants</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Interpret manufacturer's manuals, specifications .</li> <li>3.2 Checking power supply</li> <li>3.3 Performing continuity test.</li> <li>3.4 Measurement of electrical quantities (volt, ampere, resistance and capacitance etc.)</li> <li>3.5 Cutting, bending, reaming, swaging of tubes</li> <li>3.6 Welding and brazing</li> <li>3.7 Flashing system</li> <li>3.8 Pump testing, evacuating of refrigeration systems</li> <li>3.9 Detection and repair of leakage</li> </ul>
4. Required Attitude	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Eagerness to learn</li> <li>4.4 Tidiness and timeliness</li> <li>4.5 Respect of peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1 Workplace</li> <li>5.2 Tools, equipment and facilities appropriate to processes or activity</li> <li>5.3 Materials relevant to the proposed activity</li> <li>5.4 Equipment and outfits appropriate in applying safety measures</li> <li>5.5 Relevant drawings, manuals, and reference material</li> </ul>

6. Methods of Assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT TITLE</b>	<b>TRARAC1013A1 Service and repair Refrigerators &amp; Deep Freezers</b>
<b>NOMINAL HOURS</b>	<b>50</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skill and attitude required to repair refrigerators, Deep Freezers using specified tools, testing & measuring instruments.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the Range of Variables
1. Prepare for Repairing	<p>1.1 Safe work practices observed and personal proactive equipment (<i><b>PPE</b></i>) is worn as required for the work to be performed.</p> <p>1.2 Work instructions are interpreted to determine job requirements</p> <p>1.3 Necessary <i><b>Tools and equipment</b></i> are selected in accordance with job requirements</p> <p>1.4 Repairing instruments are calibrated as per work requirement</p> <p>1.5 Necessary <i><b>materials</b></i> are selected as per job requirement.</p>
2. Check and Test refrigerators, deep freezers	<p>2.1 Refrigerators &amp; deep freezers are checked to identify fault according to standard procedures.</p> <p>2.2 All <i><b>components, of the electrical</b></i> / electronic circuit are checked according to standard procedures</p> <p>2.3 Body ,cabinet and mounts are checked and restored to the required condition</p> <p>2.4 leaks testing is performed to identity leakage of the unit as per standard procedure.</p>
3. Repair refrigerators, deep freezers	<p>3.1 System is evacuated using vacuum pump, recovered refrigerant stored in recovery unit.</p> <p>3.2 Gas is charged by weight using specified equipment according to specifications</p> <p>3.3 Door heaters, thermostat, door gasket checked and serviced / replaced where necessary, to ensure proper functioning</p> <p>3.4 Interior cooler space checked, cleaned and ensured dust / debris free</p> <p>3.5 Unit operated and <i><b>checked</b></i> to ensure satisfactory performance according to manufactures specifications</p>

4. Clean and store tools and equipment	<p>4.1 Tools and equipment are maintained and cleaned as per instruction manual</p> <p>4.2 Work place is cleaned in accordance with environmental requirement</p> <p>4.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures</p>
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**RANGE OF VARIABLES**

VARIABLE	RANGE (May include but are not limited to):																
1. PPE	<p>1.1 Hand gloves..</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 helmet</p>																
2.Tools	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">1.1 Pliers</td> <td style="width: 50%;">2.9 C Clamp</td> </tr> <tr> <td>1.2 Screwdriver</td> <td>2.10 Hammer</td> </tr> <tr> <td>1.1 Hacksaw</td> <td>2.11 Steel wire brush</td> </tr> <tr> <td>1.2 Wrenches</td> <td>2.12 Tube cutter</td> </tr> <tr> <td>1.3 Wire stripper/crimper</td> <td>2.13 Tube bender</td> </tr> <tr> <td>1.4 Swaging tools,</td> <td>2.14 Block vice</td> </tr> <tr> <td>1.5 Flaring tools</td> <td>2.15 Reamer</td> </tr> <tr> <td>1.6 Bench Vice</td> <td>2.16 Ellen key set</td> </tr> </table>	1.1 Pliers	2.9 C Clamp	1.2 Screwdriver	2.10 Hammer	1.1 Hacksaw	2.11 Steel wire brush	1.2 Wrenches	2.12 Tube cutter	1.3 Wire stripper/crimper	2.13 Tube bender	1.4 Swaging tools,	2.14 Block vice	1.5 Flaring tools	2.15 Reamer	1.6 Bench Vice	2.16 Ellen key set
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3. Equipment	<p>3.1 Special Refrigeration &amp; air conditioning equipment</p> <p>3.2 Gas welding equipment</p> <p>3.3 Multimeter</p> <p>3.4 Clamp on meter</p> <p>3.5 Leak detector</p> <p>3.6 Charging station</p> <p>3.7 Weight scale</p> <p>3.8 Two stage vacuum pump</p> <p>3.9 Dry nitrogen cylinder with two stage regulator</p> <p>3.10 Digital temperature meter</p>																
4. Materials	<p>4.1 Refrigerants</p> <p>4.2 Dry nitrogen</p> <p>4.3 Charging nipple</p> <p>4.4 Copper tube</p> <p>4.5 Filler rod</p> <p>4.6 Welding flux</p> <p>4.7 Filter drier/Strainer</p> <p>4.8 Capillary tube</p> <p>4.9 Lubricating oil</p> <p>4.10 Copper and brass fittings</p>																

5 . Components of Electrical Circuit	<ul style="list-style-type: none"> <li>5.1 Compressor motor</li> <li>5.2 Overload protector</li> <li>5.3 Starting relays</li> <li>5.4 Thermostat</li> <li>5.5 Low and high Pressure cutout</li> <li>5.6 Heaters</li> <li>5.7 Defrosting system components</li> <li>5.8 Timers and other related electrical components found in refrigeration electrical systems.</li> </ul>
6. Components of unit	<ul style="list-style-type: none"> <li>6.1 Compressor motor</li> <li>6.2 Electrical controls</li> <li>6.3 Compressor motor and relay</li> <li>6.4 Fan motors</li> <li>6.5 Refrigerant circuit</li> <li>6.6 Evaporator</li> <li>6.7 Condenser</li> <li>6.8 Expansion device (refrigerant flow controller), filter / drier, pipes and fittings, moisture indicators and other accessories.</li> </ul>
7.Test & Checking	<ul style="list-style-type: none"> <li>7.1 Insulation</li> <li>7.2 Resistance</li> <li>7.3 Mechanical</li> <li>7.4 Continuity</li> <li>7.5 Timing Sequence</li> <li>7.6 Leak</li> <li>7.7 The pressures in the refrigerator and deep freezer circuit (suction &amp; discharge)</li> <li>7.8</li> <li>7.9 The temperature at specified places, including ambient</li> <li>7.10 Temperature.</li> <li>7.11 Current drawn while running.</li> <li>7.12 Current drawn on starting</li> </ul>
8.Performance test	<ul style="list-style-type: none"> <li>8.1 Suction pressure</li> <li>8.2 Cabinet temperature</li> <li>8.3 Ampere drop after 30 minutes</li> </ul>

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> <li>1.1 Applied safety rules and procedures</li> <li>1.2 Ensured satisfactory performance of the of the system</li> <li>1.3 Selected appropriate processes, tools, materials and equipment based on job requirements</li> <li>1.4 Checked Refrigerators &amp; deep freezers to identify fault</li> <li>1.5 Evacuated system using vacuum pump,</li> <li>1.6 Recovered refrigerant stored in recovery unit</li> <li>1.7 Charged gas is by weight using</li> <li>1.8 Demonstrated compliance with safety regulations applicable to worksite operation</li> </ol>
2. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1 Refrigeration cycle</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Fault finding procedures</li> <li>2.4 Evacuation procedure</li> <li>2.5 Method of charging of Refrigerants</li> <li>2.6 Procedure of testing performance</li> </ol>
3. Underpinning Skills	<ol style="list-style-type: none"> <li>3.1 Checking power supply and electrical/electronic circuits</li> <li>3.2 Measuring Voltage and Current using electrical test</li> <li>3.3 Handling tools &amp; equipment</li> <li>3.4 Cutting, bending, swaging and flaring of tubes</li> <li>3.5 Welding and brazing</li> <li>3.6 Selection correct type of refrigerant</li> <li>3.7 Evacuating &amp; charging of refrigeration systems</li> <li>3.8 Detection and repair of leaks</li> <li>3.9 Charging of refrigerants and commissioning of Refrigerator &amp; deep freezer</li> <li>3.10 Performance testing and adjustments in refrigerators &amp; deep freezers,</li> </ol>
4. Required Attitude	<ol style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Eagerness to learn</li> <li>4.4 Tidiness and timeliness</li> <li>4.5 Respect for rights of peers and seniors in workplace</li> </ol>
5. Resource Implications	<p>The following resources MUST be provided:</p> <ol style="list-style-type: none"> <li>5.1 Workplace</li> <li>5.2 Tools, equipment and facilities appropriate to processes or activity</li> <li>5.3 Materials relevant to the proposed activity</li> <li>5.4 Relevant drawings, manuals, codes, standards and reference material</li> </ol>

6. Methods of Assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT CODE AND TITLE</b>	<b>TRARAC1014A1 Service Window &amp; Split type Air Conditioners</b>
<b>NOMINAL HOURS</b>	<b>50</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skill and attitude required to repair Window and split type Air Conditioners using specified tools, test & measuring instruments. It includes preparing unit, tools and workplace, checking and identifying defects and repairing.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the Range of Variables
1. Prepare unit, tools and workplace.	1.1 Safe work practices are observed and personal proactive equipment ( <b><i>PPE</i></b> ) is worn as required for the work to be performed. 1.2 Work instructions are interpreted to determine job requirements 1.3 Necessary <b><i>Tools and equipment</i></b> are selected in accordance with job requirements 1.4 Measuring and Repairing instruments are calibrated as per work requirement 1.5 Necessary <b><i>materials</i></b> are selected as per job requirement.
2. Check and identify defects	2.1 Systematic <b><i>pre-testing procedure</i></b> is observed in accordance with manufacturer's instructions. 2.2 All components of the Air-flow system checked according to manufactures specifications to ensure correct performance 2.3 System pressure tested with dry nitrogen using specified equipment following safety procedures. 2.4 Motor terminals are checked using specified testing procedures 2.5 Control settings/adjustments are checked in conformity with service-manual specifications. 2.6 All <b><i>components</i></b> of refrigeration and <b><i>electrical</i></b> / electronic circuit are checked according to standard procedures 2.7 System defects/fault symptoms are identified and documented using appropriate tools and equipment
3. Repair window type & split type Air Conditioners	3.1 Defective parts/ <b><i>components</i></b> are replaced with identical or recommended appropriate equivalent ratings 3.2 Control settings/adjustments are performed in conformity with service-manual specifications 3.3 System is evacuated using vacuum pump and recovered refrigerant stored in recovery unit according to manufacturer's

	<p>specifications</p> <p>3.4 Gas is recharged using specified type of gas by recharging equipment to required specification following safety practices</p> <p>3.5 Cleaning of unit is performed in accordance with standard procedures</p> <p>3.6 Unit is operated and <b>checked</b> to ensure satisfactory performance according to manufactures specifications</p> <p>3.7 Report on repair is prepared in line with enterprise procedures</p>
4. Clean and store of tools and equipment	<p>4.1 Tools and equipment are maintained and cleaned as per instruction manual</p> <p>4.2 Work place is cleaned in accordance with environmental requirement</p> <p>4.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures.</p>

**RANGE OF VARIABLES**

<b>VARIABLE</b>	<b>RANGE (May include but are not limited to):</b>
1. PPE	<p>1.1 Hand gloves</p> <p>1.2 Safety Shoes</p> <p>1.3 Apron</p> <p>1.4 Safety Goggles</p> <p>1.5 Helmet</p>
2. Tools	<p>2.1 Pliers</p> <p>2.2 Screwdriver</p> <p>2.3 Hacksaw</p> <p>2.4 Wrenches</p> <p>2.5 Wire stripper/crimper</p> <p>2.6 Swaging tools,</p> <p>2.7 Flaring tools</p> <p>2.8 Bench Vice</p> <p>2.9 C Clamp</p> <p>2.10 Hammer</p> <p>2.11 Steel wire brush</p> <p>2.12 Tube cutter</p> <p>2.13 Tube bender</p> <p>2.14 Block vice</p> <p>2.15 Reamer</p> <p>2.16 Ellen key set</p>

<p>3. Equipment</p>	<p>3.1 Multimeter  3.2 Clamp on meter  3.3 Capacitor tester  3.4 Leak detectors  3.5 Magger  3.6 Gas welding equipment  3.7 Gauge manifold  3.8 Two stage Vacuum pump</p>
<p>4. Materials</p>	<p>4.1 Charging nipple  4.2 refrigeration fittings  4.3 Refrigerants  4.4 Copper tube  4.5 Welding filler rod  4.6 Welding flux  4.7 Strainer  4.8 Capillary tube  4.9 Lubricating oil.  4.10 Copper and brass fittings</p>
<p>5. Components of Electrical Circuit</p>	<p>5.1 Compressor motor  5.2 Overload protector  5.3 Starting relays  5.4 Thermostat switch  5.5 Heaters  5.6 Timers and other related electrical components found in refrigeration electrical systems</p>
<p>6. Components of refrigeration system</p>	<p>6.1 Temperature control  6.2 Compressor motor and relays  6.3 Fan motors  6.4 Refrigerant circuit  6.5 Evaporator  6.6 Condenser,  6.7 Metering device (refrigerant flow controller), filter / drier, pipes and fittings.</p>
<p>7. Test &amp; Checking</p>	<p>7.1 Insulation  7.2 Resistance  7.3 Mechanical  7.4 Continuity  7.5 Leak  7.6 suction &amp; discharge pressure  7.7 water temperature</p>

	7.8 Current drawn while running. 7.9 Current drawn on starting
8. Evacuation	8.1 Minimum of 30 minutes, steady vacuum of 29 in. Hg (mercury) unless otherwise specified by the compressor and manufacturer
9. Remove mineral oil	9.1 Removing and draining components 9.2 Flushing using R-141

EVIDENCE GUIDE	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Applied safety rules and procedures</li> <li>1.2 All <b>components</b> of air conditioning and <b>electrical</b>/ electronic circuit are checked according to standard procedures</li> <li>1.3 System is evacuated and recovered refrigerant stored in recovery unit</li> <li>1.4 Performed refrigerant charging in accordance with the manual</li> <li>1.5 Completed repair work as to specifications</li> <li>1.6 Repaired unit is tested before reinstallation</li> <li>1.7 Cleaned workplace and stored tools and equipment in safe location</li> </ul>
1. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 Types of electrical controls</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Fault finding procedures</li> <li>2.4 Evacuation procedure</li> <li>2.5 Vapor compression Refrigeration cycle</li> <li>2.6 Refrigerants used in window and split air conditioner</li> </ul>
2. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Checking power supply and electrical/electronic circuits and correct faults.</li> <li>3.2 Using testing &amp; measuring instruments.</li> <li>3.3 Proper Handling tools &amp; equipment.</li> <li>3.4 Cutting, bending, swaging and flaring of tubes.</li> <li>3.5 Welding and brazing.</li> <li>3.6 Selection correct type of refrigerant.</li> <li>3.7 Detection and repair of leaks.</li> <li>3.8 Evacuating and charging of refrigerants</li> <li>3.9 Performance testing and adjustments in Window &amp; Split type air conditioners</li> </ul>

3. Required Attitude	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect of peers and seniors in workplace
4. Resource Implications	The following resources must be provided: 5.1 Workplace 5.2 Tools, equipment and facilities appropriate to processes or activity 5.3 Materials relevant to the proposed activity 5.4 Relevant drawings, manuals, codes, standards and reference material
5. Methods of Assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
6. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.

### Accreditation Requirements

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## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT CODE AND TITLE</b>	<b>TRARAC1015A1 Install window and split type air conditioners</b>
<b>NOMINAL HOURS</b>	<b>60</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skill and attitude required to install different types and sizes of window and split type Air Conditioners using specified tools & material. It includes preparation for installation, performing cavity works, installing window and split type air conditioners, set refrigerant line and electrical connection.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i>Bold &amp; Italic</i> terms are elaborated in the Range of Variables
1. Prepare for installation	1.1 Appropriate <b>PPE</b> is selected and used in line with job requirements 1.2 <b>Work instructions</b> are interpreted to determine job requirements 1.3 <b>Tools and equipment</b> are selected in line with job requirements 1.4 <b>Associated materials of</b> are selected in accordance with job requirements 1.5 <b>Unit</b> and components are prepared based on work procedures
2. Perform cavity work	2.1 Dimensions of cavity are determined based on work instructions/ plans 2.2 Cavity area is prepared in line with work instructions/plans 2.3 Boring/cutting is performed based on cavity dimensions 2.4 Cavity sides are finished, leveled, plumbed and aligned in line with work instructions and job requirements 2.5 Dimensions of cavity are checked to ensure that gaps on all sides, except base are less than 3mm 2.6 Work place is cleaned and kept in safe state in line with work instructions
3. Install window type air-conditioning unit	3.1 <b>Electrical cabling</b> and wiring devices of correct load carrying capacity are selected and safely installed in accordance with manufacturer's instructions 3.2 Unit is <b>positioned and leveled</b> according to manufacturer's instructions 3.3 <b>Sealant</b> is installed to ensure an air tight seal around the unit in as per manufacturer's instructions 3.4 <b>Condensation drain</b> is installed to ensure free drainage of condenser and to avoid water spillage. 3.5 Safe manual handling techniques are employed in accordance with

	<p>enterprise OHS procedures</p> <p>3.6 Work site is cleaned and kept in safe state in accordance with work instructions</p> <p>3.7 Unit is operated and tested to ensure satisfactory performance according to manufactures specifications</p>
4. Mount split type air conditioner	<p>4.1 Location where air conditioner is to be installed is marked and prepared appropriate for cooling / client's requirements</p> <p>4.2 Supporting structures to hold air conditioner fixed according to manufacturer's specifications</p> <p>4.3 Condensing unit/out door unit is fixed according to manufacturer's instruction</p> <p>4.4 Evaporator/in door unit is fixed according to instruction manual</p>
5. Set refrigerant line and make electrical connection	<p>5.1 Refrigerant lines are connected to condensing/outdoor unit and evaporator/indoor unit with extensions if required.</p> <p>5.2 Refrigerant lines are purged/vacuum as necessary.</p> <p>5.3 Vacuum pressure is tested and charged refrigerant in accordance with instruction manual</p> <p>5.4 Refrigerant lines insulated as per requirement.</p> <p>5.5 Electrical wiring to both units is installed and connected in accordance with cooling capacity of unit</p> <p>5.6 System switched on, according to instructional manual and performance of air conditioner checked</p> <p>5.7 Unusual noises, vibrations etc. checked and defects rectified, as necessary</p>
6. Clean and store of tools and equipment	<p>6.1 Tools and equipment cleaned as per instruction manual</p> <p>6.2 Work place is cleaned in accordance with environmental requirement</p> <p>6.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures</p>

## RANGE OF VARIABLES

VARIABLE	RANGE (may include but are not limited to):
1. PPE	<p>1.1 Hand gloves..</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safey goggles</p> <p>1.5 Helmet</p> <p>1.6 Safety Rope and belts</p> <p>1.7 Mask</p>
2. Work instructions	<p>2.1 Manufacturer's recommendations/specifications</p> <p>2.2 Installation drawings</p> <p>2.3 Blueprints</p> <p>2.4 Components instructions</p>
3. Tools	<p>3.1 Measuring tools</p> <p>3.15 Wrenches</p>

	3.2 Spirit level/water level 3.3 Plumb bob 3.4 Water hose 3.5 Screw driver 3.6 Chisel 3.7 Hammer (claw and ball peen) 3.8 Hacksaw 3.9 Electric drill 3.10 Masonry tools (e.g. trowel, spade, level, etc.) 3.11 Ladders and scaffolding 3.12 Pliers 3.13 Screwdriver 3.14 Hacksaw	3.16 Wire stripper/crimper 3.17 Swaging tools, 3.18 Flaring tools 3.19 Bench Vice 3.20 C Clamp 3.21 Hammer 3.22 Steel wire brush 3.23 Tube cutter 3.24 Tube bender 3.25 Block vice 3.26 Reamer 3.27 Ellen key set
4. Equipment	4.1 Multimeter 4.2 Clamp on meter 4.3 Leak detector 4.4 Magger 4.5 Charging station 4.6 Weight scale 4.7 Two stage Vacuum Pump	
5. Materials	5.1 Rawal bolt 5.2 Drill bits 5.3 Filler rod. 5.4 Welding flux 5.5 Electrical cable 5.6 Rawal plugs 5.7 Circuit breaker 5.8 Switch 5.9 Masonry materials (e.g. cement, sand, etc.) 5.10 Refrigerants and dry nitrogen	5.11 Steel bracket 5.12 Insulation Tape 5.13 Pipe insulation 5.14 Copper tube 5.15 PVC pipe 5.16 Clamp 5.17 Copper and brass fittings 5.18 Plastic tubing/clamp 5.19 Srews
6. Positioning and levelling	7.1 Slope backwards 2-4 degrees 7.2 Distance between wall and condenser 30cm ~2m	
7. Sealant	8.1 Rubber 8.2 Foam 8.3 Plastic 8.4 Silicone	

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Applied safety rules and procedures in the work place</li> <li>1.2 Prepared cavity for installation of unit</li> <li>1.3 Positioned/levelled air-conditioning unit</li> <li>1.4 Completed installation according to specifications</li> <li>1.5 Cleaned worksite and kept in safe state</li> <li>1.6 Performed Electrical wiring as per capacity of units.</li> <li>1.7 Evacuated system using vacuum pump,</li> <li>1.8 Charged gas is by weight using</li> <li>1.9 Ensured satisfactory performance of the of the system</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 Refrigeration cycle</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Types of tools, testing &amp; measuring instruments used in installation</li> <li>2.4 Refrigerants and their applications.</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Preparing materials</li> <li>3.2 Cutting, bending, swaging and flaring of tubes.</li> <li>3.3 Performing masonry, carpentry and plumbing work</li> <li>3.4 Apply Installing techniques of window-type and split type air-conditioning unit</li> <li>3.5 Testing power supply</li> <li>3.6 Connecting power circuit</li> <li>3.7 Selection correct type of refrigerant.</li> <li>3.8 Evacuating &amp; charging of refrigeration systems</li> <li>3.9 Testing Performance of the unit</li> </ul>
4. Required Attitude	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Tidiness and timeliness</li> <li>4.4 Respect of peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1 Work place</li> <li>5.2 Tools and equipment appropriate to installation</li> <li>5.3 Materials relevant to the proposed activity/task</li> <li>5.4 Drawings and specifications relevant to the task</li> <li>5.5 Relevant manuals, codes, standards and reference material.</li> </ul>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>6.1 Written test.</li> <li>6.2 Demonstration</li> <li>6.3 Oral Questioning/Interview</li> </ul>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

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**National Technical and Vocational Qualification Framework for Bangladesh**  
**Unit of Competence**

<b>UNIT CODE AND TITLE</b>	<b>TRARAC2016A1      Service and Maintain Ice cream maker</b>
<b>NOMINAL HOURS</b>	<b>40</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skills and attitudes required to service and maintain Ice cream maker which includes diagnosing faults, reassembling, testing and preparing reports.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic terms</b></i> are elaborated in the Range of Variables
1. Prepare unit, tools and workplace.	<p>1.1 Safe work practices are observed and personal proactive equipment (<i><b>PPE</b></i>) is worn as required for the work to be performed.</p> <p>1.2 <i><b>Service manuals</b></i> and <i><b>service information</b></i> required for repair/maintenance are acquired as per standard procedure.</p> <p>1.3 Necessary <i><b>Tools and equipment</b></i> are selected in accordance with job requirements</p> <p>1.4 Repairing instruments are calibrated as per instructions</p> <p>1.5 Necessary <i><b>materials</b></i> are selected as per in line with work requirement.</p>
2. Diagnose faults	<p>2.1 Complete check-up of Ice cream maker is conducted and defects are identified, verified and documented against customer description</p> <p>2.2 System defects/Fault symptoms are identified using appropriate tools and equipment</p> <p>2.3 Motor terminals are checked using specified testing procedures</p> <p>2.4 Leaks testing is performed to identify leakage of the unit as per standard procedure.</p> <p>2.5 All <i><b>components, of the electrical</b></i> / electronic circuit are checked according to standard procedures</p>
3. Service Ice cream maker	<p>3.1 Defective parts/components are replaced with identical or recommended appropriate equivalent ratings</p> <p>3.2 Repaired or replaced parts/components are mounted and assembled in accordance with the current industry standards.</p> <p>3.3 System evacuated using vacuum pump, recovered refrigerant stored in recovery unit</p> <p>3.4 Gas is charged by weight using specified equipment according to specifications</p>

	3.5 Unit is operated and <b>checked</b> to ensure satisfactory performance according to manufactures specifications
4. Routine maintenance , clean and store	<p>4.1 Unsafe or faulty tools are identified and marked for repair /reject before during and after use according to current procedures.</p> <p>4.2 Tools and equipment are maintained and cleaned as per instruction manual</p> <p>4.3 Work place is cleaned in accordance with environmental requirement</p> <p>4.4 Tools and equipment are stored safely in appropriate location according to standard workshop procedures</p>

### RANGE OF VARIABLES

VARIABLE	RANGE (May include but are not limited to):																
1. PPE	<p>1.1 Hand gloves</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety Goggles</p> <p>1.5 Helmet</p>																
2. Service manuals	<p>2.1 Service manual/schematic diagram/parts list</p> <p>2.2 Operating instructions/User's/Owner's manual</p>																
3. Service Information	<p>3.1 Job Report Sheets</p> <p>3.2 Customer index</p> <p>3.3 Service flowchart</p> <p>3.4 Stock and inventory record</p> <p>3.5 Supplier Index</p>																
4. Tools	<table border="0"> <tr> <td>1.3 Pliers</td> <td>2.15 C Clamp</td> </tr> <tr> <td>1.4 Screwdriver</td> <td>2.16 Hammer</td> </tr> <tr> <td>1.7 Hacksaw</td> <td>2.17 Steel wire brush</td> </tr> <tr> <td>1.8 Wrenches</td> <td>2.18 Tube cutter</td> </tr> <tr> <td>1.9 Wire stripper/crimper</td> <td>2.19 Tube bender</td> </tr> <tr> <td>1.10 Swaging tools,</td> <td>2.20 Block vice</td> </tr> <tr> <td>1.11 Flaring tools</td> <td>2.21 Reamer</td> </tr> <tr> <td>1.12 Bench Vice</td> <td>2.22 Ellen key set</td> </tr> </table>	1.3 Pliers	2.15 C Clamp	1.4 Screwdriver	2.16 Hammer	1.7 Hacksaw	2.17 Steel wire brush	1.8 Wrenches	2.18 Tube cutter	1.9 Wire stripper/crimper	2.19 Tube bender	1.10 Swaging tools,	2.20 Block vice	1.11 Flaring tools	2.21 Reamer	1.12 Bench Vice	2.22 Ellen key set
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5. Equipment	<p>5.1 Gas welding equipment</p> <p>5.2 Multimeter</p> <p>5.3 Clamp-on meter</p> <p>5.4 Capacitor tester</p> <p>5.5 Leak detector</p> <p>5.6 Gage manifold with hose pipe</p> <p>5.7 Charging station</p> <p>5.8 Weighing scale</p> <p>5.9 Two stage Vacuum pump</p>																

6. Materials	6.1 Refrigerants and dry nitrogen 6.2 Charging nipple 6.3 Refrigerant [hydro carbon, Ammonia and water] 6.4 Copper tube 6.5 Filler rod 6.6 Welding flux 6.7 Filter drier/Strainer 6.8 Capillary tube 6.9 Lubricating oil 6.10 Copper and brass fittings
7. Components of Electrical Circuit	7.1 Compressor motor, 7.2 Overload protector, 7.3 Starting relays, 7.4 Thermostat switch, 7.5 Pressure units, 7.6 Heaters, 7.7 Timers and other related electrical components found in refrigeration electrical systems
8. Components of refrigeration system	8.1 Electrical controls 8.2 Fan motors 8.3 Refrigerant circuit 8.4 Evaporator 8.5 Condenser 8.6 Metering device (refrigerant flow controller), filter / drier, pipes and fittings, moisture indicators and other accessories.
9. Test & Checking	9.1 Insulation 9.2 Resistance 9.3 Mechanical 9.4 Continuity 9.5 Timing Sequence 9.6 Leak 9.7 The pressures in the refrigerator and deep freezer circuit (suction & discharge) 9.8 The temperature at specified places, including ambient Temperature 9.9 Current drawn while running. 9.10 Current drawn on starting

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> <li>1.1 Prepared the unit and required materials, tools equipment and workplace.</li> <li>1.2 Applied safety rules and procedures</li> <li>1.3 Selected appropriate processes, tools, materials and equipment based on job requirements</li> <li>1.4 Identified faults and defects in accordance with standard testing procedures and documented the problem</li> <li>1.5 Evacuated system using vacuum pump,</li> <li>1.6 Recovered refrigerant and stored in recovery unit</li> <li>1.7 Charged gas by using weight scale</li> <li>1.8 Operated the unit and checked to ensure satisfactory performance</li> </ol>
2. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1 Refrigeration cycle</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Fault finding procedures</li> <li>2.4 Evacuation procedure</li> <li>2.5 Method of charging of Refrigerants</li> <li>2.6 Procedure of testing performance</li> </ol>
3. Underpinning Skills	<ol style="list-style-type: none"> <li>3.1 Checking power supply and electrical/electronic circuits and correct faults</li> <li>3.2 Measuring electrical quantities using electrical test</li> <li>3.3 Cutting, bending, swaging and flaring of tubes</li> <li>3.4 Welding and brazing</li> <li>3.5 Selection correct type of refrigerant</li> <li>3.6 Evacuating &amp; charging of refrigeration systems</li> <li>3.7 Detection and repair leaks</li> <li>3.8 Charging of refrigerants and commissioning of Ice cream maker</li> <li>3.9 Testing performance and adjusting controlling components of Ice cream maker</li> </ol>
4. Required Attitude	<ol style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Tidiness and timeliness</li> <li>4.4 Respect for rights of peers and seniors in workplace</li> </ol>
5. Resource Implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> <li>5.1 Workplace</li> <li>5.2 Tools, equipment and facilities appropriate to processes or activity</li> <li>5.3 Materials relevant to the proposed activity</li> <li>5.4 Equipment and outfits appropriate in applying safety measures.</li> <li>5.5 Relevant drawings, manuals, codes, standards and reference material</li> </ol>

6. Methods of Assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.

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## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT CODE AND TITLE</b>	<b>TRARAC2017A1 Repair and maintain flakers ice maker</b>
<b>NOMINAL HOURS</b>	<b>40</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skills and attitudes required to Repair and maintain flakers Ice maker which includes diagnosing faults, reassembling, testing and preparing reports.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b>
	<b><i>Bold and Italic</i></b> terms are elaborated in the Range of Variables
1. Prepare unit, tools and workplace.	<p>1.1 Safe work practices are observed and personal proactive equipment <b>(PPE)</b> is worn as required for the work to be performed.</p> <p>1.2 Work instructions are interpreted to determine job requirements</p> <p>1.3 Necessary <b>Tools and equipment</b> are selected in accordance with job requirements</p> <p>1.4 Measuring and Repairing instruments are calibrated as per work requirement</p> <p>1.5 Necessary <b>materials</b> are selected as per job requirement.</p>
2. Diagnose faults	<p>2.1 Systematic <b>pre-testing procedure</b> is observed in accordance with manufacturer's instructions.</p> <p>2.2 Motor terminals are checked using specified testing procedures</p> <p>2.3 Leaks testing is performed to identify leakage of the unit as per standard procedure.</p> <p>2.4 Control settings/adjustments are checked in conformity with service-manual specifications.</p> <p>2.5 All <b>components, of the electrical</b> / electronic circuit are checked according to standard procedures</p> <p>2.6 System defects/Fault symptoms are identified and documented using appropriate tools and equipment</p>
3. Check and repair Augur unit	<p>3.1 Motor terminals are checked using specified testing procedures</p> <p>3.2 All components of the electrical control circuit are checked according to standard procedures</p> <p>3.3 Sharpness of cutting blade, bush and bearing are checked appropriate to operation</p>

	<p>3.4 Defective parts/<b>components</b> are replaced with identical or recommended appropriate equivalent ratings</p> <p>3.5 Repaired or replaced parts/components are mounted and assembled in accordance with the current industry standards.</p>
<p>4. Repair flakers Ice maker</p>	<p>4.1 Defective parts/<b>components</b> are replaced with identical or recommended appropriate equivalent ratings</p> <p>4.2 Repaired or replaced parts/components are mounted and assembled in accordance with the current industry standards.</p> <p>4.3 Control settings/adjustments are performed in conformity with service-manual specifications</p> <p>4.4 System evacuated using vacuum pump, recovered refrigerant stored in recovery unit.</p> <p>4.5 Gas is charged by weight using specified equipment according to specifications</p> <p>4.6 Cleaning of unit is performed in accordance with standard procedures</p> <p>4.7 Unit is operated and <b>checked</b> to ensure satisfactory performance according to manufactures specifications</p>
<p>5. Maintain , clean and store of tools and equipment</p>	<p>5.1 Unsafe or faulty tools are identified and marked for repair /reject before , during and after use according to current procedures.</p> <p>5.2 Tools and equipment are maintained and cleaned as per instruction manual</p> <p>5.3 Work place is cleaned in accordance with environmental requirement</p> <p>5.4 Tools and equipment are stored safely in appropriate location according to standard workshop procedures</p>

## RANGE OF VARIABLES

VARIABLES	RANGE (May include but are not limited to):																
1. PPE	1.1 Hand gloves.. 1.2 Safety Shoes. 1.3 Apron 1.4 Safety Goggles 1.5 Helmet																
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6. Materials	6.1 Refrigerants and dry nitrogen 6.2 Charging nipple 6.3 Refrigerant [hydro carbon, Ammonia and water] 6.4 Copper tube 6.5 Filler rod 6.6 Welding flux 6.7 Filter drier/Strainer 6.8 Capillary tube 6.9 Lubricating oil 6.10 Copper and brass fittings																

7. Components of Electrical Circuit	<ul style="list-style-type: none"> <li>7.1 Compressor motor,</li> <li>7.2 Overload protector,</li> <li>7.3 Starting relays,</li> <li>7.4 Thermostat switch,</li> <li>7.5 Pressure units,</li> <li>7.6 Heaters,</li> <li>7.7 Timers and other related electrical components found in refrigeration electrical systems</li> </ul>		
8. Components of refrigeration	<ul style="list-style-type: none"> <li>8.1 Electrical controls</li> <li>8.2 Fan motors</li> <li>8.3 Refrigerant circuit</li> <li>8.4 Evaporator</li> <li>8.5 Condenser</li> <li>8.6 Metering device (refrigerant flow controller), filter / drier, pipe and fittings, moisture indicators and other accessories.</li> <li>8.7 Auger unit</li> </ul>		
9. Test & Checking	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li>9.1 Insulation</li> <li>9.2 Resistance</li> <li>9.3 Mechanical (Vapour compression cycle)</li> <li>9.4 Continuity</li> <li>9.5 Timing Sequence</li> <li>9.6 Leak</li> </ul> </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li>9.7 Auger sharpness</li> <li>9.8 Water supply</li> <li>9.9 suction &amp; discharge pressure</li> <li>9.10 The temperature at specified places.</li> <li>9.11 Current drawn on starting and on running.</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li>9.1 Insulation</li> <li>9.2 Resistance</li> <li>9.3 Mechanical (Vapour compression cycle)</li> <li>9.4 Continuity</li> <li>9.5 Timing Sequence</li> <li>9.6 Leak</li> </ul>	<ul style="list-style-type: none"> <li>9.7 Auger sharpness</li> <li>9.8 Water supply</li> <li>9.9 suction &amp; discharge pressure</li> <li>9.10 The temperature at specified places.</li> <li>9.11 Current drawn on starting and on running.</li> </ul>
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<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Prepared the unit and required materials, tools equipment and workplace.</li> <li>1.2 Applied safety rules and procedure</li> <li>1.1 Diagnosed faults of flakers Ice maker and Augur unit</li> <li>1.2 Replaced defective parts/components with identical or recommended equivalent ratings</li> <li>1.3 Repaired and serviced flakers Ice maker and Augur unit</li> <li>1.4 Operated and checked Unit to ensure satisfactory performance</li> <li>1.5 Maintained, cleaned and stored of tools and equipment</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 Principles of Ice making</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Type of refrigerants their properties and applications.</li> <li>2.4 Evacuation procedure</li> <li>2.5 Method of charging of Refrigerants</li> </ul>

<p>3. Underpinning Skills</p>	<p>3.1 Interpretation of sketches and manuals.  3.2 Measuring voltage and current using electrical test.  3.3 Checking power supply and correct faults  3.4 Handling tools &amp; equipment.  3.5 Cutting, bending, swaging and flaring of tubes.  3.6 Welding and brazing.  3.7 Selection correct type of refrigerant.  3.8 Evacuating &amp; charging of refrigerant.  3.9 Detection and repair of leaks.  3.10 Commissioning of Flaker Ice cream maker</p>
<p>4. Required Attitude</p>	<p>4.1 Commitment to occupational health and safety  4.2 Environmental concerns  4.3 Eagerness to learn  4.4 Tidiness and timeliness  4.5 Respect of peers and seniors in workplace</p>
<p>5. Resource Implications</p>	<p>The following resources must be provided:  5.1 Workplace and work place Procedure  5.2 Tools, equipment and facilities appropriate to processes or activity  5.3 Materials relevant to the proposed activity  5.4 Equipment and outfits appropriate in applying safety measures  5.5 Relevant drawings, manuals, codes, standards and reference material</p>
<p>6. Methods of Assessment</p>	<p>Competency must be assessed through:  6.1 Written test.  6.2 Demonstration  6.3 Oral Questioning/Interview</p>
<p>7. Context for Assessment</p>	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

**Accreditation Requirements**

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Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

**National Technical and Vocational Qualification Framework for Bangladesh  
Unit of Competence**

<b>UNIT CODE AND TITLE</b>	<b>TRARAC2018A1 Repair and Maintain soft drink cooler</b>
<b>NOMINAL HOURS</b>	<b>30</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skills and attitudes required to Repair and maintain soft drink cooler which include diagnosing faults, repairing and replacing components, testing and preparing reports.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the Range of Variables
1. Prepare unit, tools and workplace.	<p>1.1 Safe work practices are observed and personal protective equipment (<b>PPE</b>) is worn as required for the work to be performed.</p> <p>1.2 Work instructions are interpreted to determine job requirements</p> <p>1.3 Necessary <b>Tools and equipment</b> are selected in accordance with job requirements</p> <p>1.4 Measuring and Repairing instruments are calibrated as per work requirement</p> <p>1.5 Necessary <b>materials</b> are selected as per job requirement.</p>
2. Diagnose faults	<p>2.1 Systematic <b>pre-testing procedure</b> is observed in accordance with manufacturer's instructions.</p> <p>2.2 All <b>components</b> of the refrigerant circuit checked according to manufacturer's specifications</p> <p>2.3 Motor terminals are checked using specified testing procedures</p> <p>2.4 Leaks testing is performed to identify leakage of the unit as per standard procedure.</p> <p>2.5 Control settings/adjustments are checked in conformity with service-manual specifications.</p> <p>2.6 All <b>components, of the electrical /</b> electronic circuit are checked according to standard procedures</p> <p>2.7 System defects/Fault symptoms are identified and documented using appropriate tools and equipment</p>
3. Repair flakers Ice maker	<p>3.1 Defective parts/components are replaced with identical or recommended appropriate equivalent ratings</p> <p>3.2 Repaired or replaced parts/components are mounted and assembled in accordance with the current industry standards.</p> <p>3.3 Control settings/adjustments are performed in conformity with service-manual specifications</p>

	<p>3.4 System evacuated using vacuum pump, recovered refrigerant stored in recovery unit</p> <p>3.5 Gas is charged by weight using specified equipment according to specifications</p> <p>3.6 Cleaning of unit is performed in accordance with standard procedures</p> <p>3.7 Unit is operated and <b>checked</b> to ensure satisfactory performance according to manufactures specifications</p>
4. Maintain , clean and store of tools and equipment	<p>4.1 Unsafe or faulty tools are identified and marked for repair /reject before , during and after use according to current procedures.</p> <p>4.2 Tools and equipment are maintained and cleaned as per instruction manual</p> <p>4.3 Work place is cleaned in accordance with environmental requirement</p> <p>4.4 Tools and equipment are stored safely in appropriate location according to standard workshop procedures</p>

RANGE OF VARIABLES	
VARIABLES	RANGE (May include but are not limited to):
1. PPE	<p>1.1 Hand gloves..</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety Goggles</p> <p>1.5 Helmet</p>
2. Service manuals	<p>2.1 Service manual/schematic diagram/parts list</p> <p>2.2 Operating instructions/User's/Owner's manual</p>
3. Service Information	<p>3.1 Job Report Sheets</p> <p>3.2 Customer index</p> <p>3.3 Service flowchart</p> <p>3.4 Stock and inventory record</p> <p>3.5 Requisition slips (for acquisition of parts)</p> <p>3.6 Supplier Index</p>
4. Tools	<p>4.1 Pliers</p> <p>4.2 Screwdriver</p> <p>4.3 Hacksaw</p> <p>4.4 Wrenches</p> <p>4.5 Wire stripper/crimper</p> <p>4.6 Swaging tools,</p> <p>4.7 Flaring tools</p> <p>4.8 Bench Vice</p> <p>4.9 C Clamp</p> <p>4.10 Hammer</p> <p>4.11 Steel wire brush</p> <p>4.12 Tube cutter</p> <p>4.13 Tube bender</p> <p>4.14 Block vice</p> <p>4.15 Reamer</p> <p>4.16 Ellen key set</p>
5. Equipment	<p>5.1 Gas welding equipment</p> <p>5.2 Multimeter</p> <p>5.3 Clamp on meter</p> <p>5.4 Leak detector</p>

	<ul style="list-style-type: none"> <li>5.5 Charging station</li> <li>5.6 Weighing scale</li> <li>5.7 Two stage vacuum pump</li> </ul>
6. Materials	<ul style="list-style-type: none"> <li>6.1 Refrigerants and dry nitrogen</li> <li>6.2 Charging nipple</li> <li>6.3 Refrigerant</li> <li>6.4 Copper tube</li> <li>6.5 Welding filler rod</li> <li>6.6 Welding flux</li> <li>6.7 Filter drier/Strainer</li> <li>6.8 Capillary tube</li> <li>6.9 Lubricating oil</li> <li>6.10 Copper and brass fittings</li> </ul>
7. Pre-testing procedures	<ul style="list-style-type: none"> <li>7.1 Visual inspection of the unit with power off</li> <li>7.2 Interview of customer re history of unit</li> <li>7.3 Operate the unit according to manual to confirm defects</li> </ul>
8. Components of Electrical Circuit	<ul style="list-style-type: none"> <li>8.1 Compressor motor,</li> <li>8.2 Overload protector,</li> <li>8.3 Starting relays,</li> <li>8.4 Thermostat switch,</li> <li>8.5 Heaters,</li> <li>8.6 Timers and other related electrical components found in refrigeration electrical systems</li> </ul>
9. Components	<ul style="list-style-type: none"> <li>9.1 Electrical controls</li> <li>9.2 Compressor motor and relays</li> <li>9.3 Fan motors</li> <li>9.4 Refrigerant circuit</li> <li>9.5 Evaporator</li> <li>9.6 Condenser</li> <li>9.7 Metering device (refrigerant flow controller), filter / drier, pipes and fittings, moisture indicators and other accessories.</li> </ul>
10. Test & Checking	<ul style="list-style-type: none"> <li>10.1 Resistance</li> <li>10.2 Mechanical</li> <li>10.3 Continuity</li> <li>10.4 Timing Sequence</li> <li>10.5 Leak</li> <li>10.6 The pressures in the refrigerant circuit (suction &amp; discharge)</li> <li>10.7 The temperature at specified places, including ambient temperature</li> <li>10.8 Current drawn while running.</li> <li>10.9 Current drawn on starting</li> </ul>

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Applied safety rules and procedures</li> <li>1.2 Selected appropriate processes, tools, materials and equipment</li> <li>1.3 Checked to identify fault</li> <li>1.4 Evacuated system using vacuum pump,</li> <li>1.5 Recovered refrigerant stored in recovery unit</li> <li>1.6 Charged gas is by weight using</li> <li>1.7 Repaired and serviced soft drink cooler</li> <li>1.8 Ensured satisfactory performance of the of the system</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 Refrigeration cycle</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Types of tools, testing &amp; measuring instruments.</li> <li>2.4 Type of refrigerants their properties and applications.</li> <li>2.5 Refrigerant recovery and recycling procedures.</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Interpretation of sketches and manuals.</li> <li>3.2 Checking power supply and correct faults</li> <li>3.3 Measuring voltage and current using electrical test.</li> <li>3.4 Handling tools &amp; equipment.</li> <li>3.5 Cutting, bending, swaging and flaring of tubes.</li> <li>3.6 Welding and brazing.</li> <li>3.7 Selection correct type of refrigerant.</li> <li>3.8 Pressure testing, evacuating &amp; charging of refrigeration systems</li> <li>3.9 Detection and repair of leaks.</li> <li>3.10 Commissioning of soft drink cooler</li> </ul>
4. Required Attitude	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Eagerness to learn</li> <li>4.4 Tidiness and timeliness</li> <li>4.5 Respect of peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> <li>5.1 Workplace</li> <li>5.2 Tools, equipment and facilities appropriate to processes or activity</li> <li>5.3 Materials relevant to the proposed activity</li> <li>5.4 Relevant drawings, manuals, codes, standards and reference material</li> </ul>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>6.1 Written test.</li> <li>6.2 Demonstration</li> <li>6.3 Oral Questioning/Interview</li> </ul>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

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## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT TITLE</b>	<b>TRARAC2019A1 Repair and service display units and bottle cooler</b>
<b>NOMINAL HOURS</b>	<b>30</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skill and attitude required to repair display units and bottle cooler using specified tools, testing & measuring instruments. It include identifying faults, repairing and replacing components, testing and preparing reports
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the Range of Variables
1. Prepare for Repairing	<p>1.1 Safe work practices are observed and personal proactive equipment (<b>PPE</b>) is worn as required for the work to be performed.</p> <p>1.2 Work instructions are interpreted to determine job requirements</p> <p>1.3 Necessary <b>Tools and equipment</b> are selected in accordance with job requirements</p> <p>1.4 Measuring and repairing instruments are calibrated as per work requirement</p> <p>1.5 Necessary <b>materials</b> are selected as per job requirement.</p>
2. Check and Test display units and bottle cooler	<p>2.1 Systematic <b>pre-testing procedure</b> is observed in accordance with manufacturer's instructions.</p> <p>2.2 Motor terminals are checked using specified testing procedures</p> <p>2.3 Body / cabinet / mounts checked and restored to the required condition</p> <p>2.4 System pressure and gas leaks tested using specified test instruments</p> <p>2.5 Control settings/adjustments are checked in conformity with service-manual specifications.</p> <p>2.6 All <b>components</b>, of refrigerant and <b>electrical</b> / electronic circuit are checked according to standard procedures</p> <p>2.7 System defects/Fault symptoms are identified and documented using appropriate tools and equipment</p>
3. Repair display units and bottle cooler	<p>3.1 Thermostat, door gasket is serviced / replaced where necessary, to ensure proper functioning</p> <p>3.2 Defective parts/<b>components</b> are replaced with identical or recommended appropriate equivalent ratings</p> <p>3.3 Control settings/adjustments are performed in conformity with service-manual specifications</p> <p>3.4 System is evacuated using vacuum pump, recovered refrigerant stored in recovery unit using specified equipment according to specifications</p> <p>3.5 Gas is charged by weight using specified equipment according to</p>

	<p>specifications</p> <p>3.6 Cleaning of unit is performed in accordance with standard procedures</p> <p>3.7 Unit is operated and <b>checked</b> to ensure satisfactory performance according to manufactures specifications</p>
4. Clean and store of tools and equipment	<p>4.1 Tools and equipment are maintained and cleaned as per instruction manual</p> <p>4.2 Work place is cleaned in accordance with environmental requirement</p> <p>4.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures</p>

#### RANGE OF VARIABLES

VARIABLE	RANGE (May include but are not limited to):
1. PPE	<p>1.1 Hand gloves</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety Goggles</p> <p>1.5 Helmet</p>
2. Tools	<p>2.1 Pliers</p> <p>2.2 Screwdriver</p> <p>2.3 Hacksaw</p> <p>2.4 Wrenches</p> <p>2.5 Wire stripper/crimper</p> <p>2.6 Swaging tools,</p> <p>2.7 Flaring tools</p> <p>2.8 Bench Vice</p> <p>2.9 C Clamp</p> <p>2.10 Hammer</p> <p>2.11 Steel wire brush</p> <p>2.12 Tube cutter</p> <p>2.13 Tube bender</p> <p>2.14 Block vice</p> <p>2.15 Reamer</p> <p>2.16 Ellen key set</p>
3. Equipment	<p>3.1 Multimeter</p> <p>3.2 Clamp on meter</p> <p>3.3 leak detector</p> <p>3.4 Gas welding equipment</p> <p>3.5 Leak detector</p> <p>3.6 Charging station</p> <p>3.7 Two stage vacuum pump</p> <p>3.8 Digital temperature meter</p> <p>3.9 Digital weighing scale</p>
4. Material	<p>4.1 Fittings use in refrigeration system ( elbow Copper T socket, brass union, reducing unit, brass T,)</p> <p>4.2 Refrigerant</p> <p>4.3 Copper tube</p> <p>4.4 Welding filler rod</p> <p>4.5 Welding flux</p> <p>4.6 Filter drier/Strainer</p> <p>4.7 Capillary tube</p> <p>4.8 Lubricating oil</p>

5. Components of Electrical Circuit	5.1 Compressor motor 5.2 Overload protector 5.3 Starting relays 5.4 Thermostat switch 5.5 Heaters 5.6 Timers and other related electrical components found in refrigeration electrical systems
6. Components of refrigeration	6.1 Compressor motor 6.2 Fan motors. 6.3 Refrigerant circuit. 6.4 Evaporator 6.5 Condenser, 6.6 Metering device (refrigerant flow controller), filter / drier, pipes and fittings.
7. Test & Checking	7.1 Insulation 7.2 Resistance 7.3 Mechanical 7.4 Continuity 7.5 Leak 7.6 suction & discharge pressure 7.7 water temperature 7.8 Current drawn while running. 7.9 Current drawn on starting

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	Assessment requires evidence that the candidate: <ol style="list-style-type: none"> <li>1.1 Applied safety rules and procedures</li> <li>1.2 Selected appropriate processes, tools, materials and equipment based on job requirements</li> <li>1.3 Checked to identify fault</li> <li>1.4 Evacuated system using vacuum pump,</li> <li>1.5 Recovered refrigerant stored in recovery unit</li> <li>1.6 Charged gas is by weighing scale.</li> <li>1.7 Repaired and serviced soft drink cooler</li> <li>1.8 Ensured satisfactory performance of the of the system</li> </ol>
2. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1 Refrigeration cycle</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Types of tools, testing &amp; measuring instruments</li> <li>2.4 Type of refrigerants and their applications..</li> <li>2.5 Refrigerant recovery and recycling.</li> </ol>

3. Underpinning Skills	3.1 Interpretation of sketches and manuals. 3.2 Checking power supply and correct fault. 3.3 Measuring voltage and current using electrical test. 3.4 Handling tools & equipment safely 3.5 Cutting, bending, swaging and flaring of tubes. 3.6 Welding and brazing. 3.7 Selection correct type of refrigerant. 3.8 Evacuating & charging of refrigeration systems 3.9 Detection and repairing of leaks. 3.10 Commissioning of display unit and bottle cooler.
4. Required Attitude	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect of peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Workplace 5.2 Tools, equipment and facilities appropriate to processes or activity 5.3 Materials relevant to the proposed activity 5.4 Equipment and outfits appropriate in applying safety measures 5.5 Relevant drawings, manuals, codes, standards and reference material
6. Methods of Assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.

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## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT CODE AND TITLE</b>	<b>TRARAC2020A1 Service and Install Display Freezer Units</b>
<b>NOMINAL HOURS</b>	<b>30</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skill and attitude required to service and install different types and sizes of display freezer units using specified tools, testing & measuring instruments. It includes identifying faults, repairing and replacing components, testing and preparing reports
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b>
	<b><i>Bold &amp; Italic terms</i></b> are elaborated in the Range of Variables
1. Prepare to service and Install freezer unit	<p>1.1 Safe work practices observed and personal proactive equipment (<b><i>PPE</i></b>) is worn as required for the work to be performed.</p> <p>1.2 Work instructions are interpreted to determine job requirements</p> <p>1.3 Necessary <b><i>Tools and equipment</i></b> are selected in accordance with job requirements</p> <p>1.4 Necessary <b><i>materials</i></b> are selected as per job requirement.</p> <p>1.5 Installation space/cabinet is inspected to determine the feasibility of installing a freezer unit.</p>
2. Install freezer unit	<p>2.1 Freezer unit including refrigeration piping installed according to drawing.</p> <p>2.2 Electrical circuits for the freezer unit installed and connected to the respective power systems as necessary following standard practices and safety procedures</p> <p>2.3 Freezer unit operated and tested for proper functioning as specified in the installation manual</p> <p>2.4 Necessary readings / data pertaining to the performance of the unit recorded</p>
3. Check the different components to identify faults.	<p>3.1 Continuity of the compressor is checked to identify defects in accordance with specified standard procedures.</p> <p>3.2 All <b><i>components, of the electrical</i></b> circuit are checked according to standard procedures</p> <p>3.3 oil level, RPM, pressure of compressor are checked according to specifications and manufactures instructions.</p> <p>3.4 leaks <b><i>testing</i></b> is performed to identify leakage of the unit using specified test equipment.</p> <p>3.5 Condenser and Evaporator checked visually and pressure tested for</p>

	<p>leaks /clogs</p> <p>3.6 Expansion valve, Cooling / blower fans, drier/filter/receiver are checked according to manufacturers specifications</p> <p>3.7 Faults are identified on the basis of checking.</p>
4. Service / repair refrigerant system of the freezer unit	<p>4.1 Cooling / blower fans serviced / or replaced as necessary according to manufacturer's instructions,</p> <p>4.2 Filter/receiver/driers are replaced as necessary according to manufacturers specifications</p> <p>4.3 Leaks is repaired and pressure tested after repair of leaks</p> <p>4.4 Sight glass, oil separator, gas accumulator are replaced as necessary</p> <p>4.5 System evacuated using dry nitrogen and vacuum pump and tested according to specifications</p> <p>4.6 Refrigerant in the system recovered using specified recovery equipment.</p> <p>4.7 System gas is charged with specified refrigerant using gas-charging equipment according to manufacturers specifications</p>
5. Repair electrical / electronic control system	<p>5.1 Internal and external electrical / electronic control systems repaired where necessary according to manufacturer's instructions</p> <p>5.2 Unit is tested for specified performance against manufacturer's specifications</p> <p>5.3 Work place is cleaned in accordance with environmental requirement.</p> <p>5.4 Tools and equipment are stored safely in appropriate location according to standard workshop procedures</p>

#### RANGE OF VARIABLES

VARIABLE	RANGE (may include but are not limited to):
1. PPE	<p>1.1 Hand gloves..</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety goggles</p> <p>1.5 Helmet</p>
2. Work instructions	<p>2.1 Manufacturer's recommendations/specifications</p> <p>2.2 Installation drawings</p> <p>2.3 Blueprints</p> <p>2.4 Components instructions</p>

<p>3. Tools</p>	<p>3.1 Pliers 3.2 Screwdriver 3.3 Hacksaw 3.4 Measuring tools 3.5 Spirit level 3.6 Screw driver, flat and philip 3.7 Electric drill 3.8 Cross cut/Rip saw 3.9 Masonry tools (e.g. trowel, spade, level, etc.) 3.10 Wrenches 3.11 Wire stripper/crimper</p>	<p>3.12 Swaging tools, 3.13 Flaring tools 3.14 Bench Vice 3.15 C Clamp 3.16 Hammer 3.17 Steel wire brush 3.18 Tube cutter 3.19 Tube bender 3.20 Block vice 3.21 Reamer 3.22 Ellen key set</p>
<p>4. Equipment</p>	<p>4.1 Pressure test pump 4.2 Gas welding equipment 4.3 Clamp on ammeter 4.4 Electric leak detector 4.5 Magger 4.6 Charging station</p>	<p>4.7 Multimeter 4.8 Leak detector 4.9 Gas welding equipment 4.10 Two stage vacuum pump 4.11 Digital temperature meter 4.12 Digital weighing sca</p>
<p>5. Materials</p>	<p>5.1 Fittings ( elbow Copper T socket, brass union, reducing unit, brass T,) 5.2 Filler rod 5.3 Electrical cable/conduction 5.4 Circuit breaker/switch</p>	<p>5.5 Refrigerants and dry nitrogen 5.6 Support structure materials 5.7 Insultion materials 5.8 Copper tube 5.9 Plastic tubing/clamp</p>
<p>6. Components, of the electrical circuit</p>	<p>6.1 Compressor motor 6.2 Overload protector 6.3 Starting relays 6.4 Thermostat switch 6.5 Heaters 6.6 Timers and other related electrical components found in refrigeration electrical systems</p>	
<p>7. Testing</p>	<p>7.1 Temperature 7.2 Insulation resistance 7.3 Mechanical (Gas Welding) 7.4 Continuity 7.5 Timing Sequence 7.6 Leak</p>	

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> <li>1.1 Applied safety rules and procedures in the work place</li> <li>1.2 Selected tools, materials and equipment based on job requirements.</li> <li>1.3 Performed leak test as per standard procedures.</li> <li>1.4 Installed Evaporator unit and other refrigeration equipment including refrigeration piping.</li> <li>1.5 Installed electrical circuits for the freezer unit and connected to the respective power systems.</li> <li>1.6 Checked continuity of the compressor is to identify defects</li> <li>1.7 Checked oil level, RPM, pressure of compressor</li> <li>1.8 Checked expansion valve, Cooling / blower fans, drier/filter/receiver</li> <li>1.9 Repaired/ serviced refrigerant system of the freezer unit</li> <li>1.10 Repaired electrical / electronic control system</li> <li>1.11 Operated and tested Freezer unit for proper functioning as specified in the installation manual</li> </ol>
2. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1 Calculation of capacity of the freezer units required for freezer trucks</li> <li>2.2 Methods of fastening</li> <li>2.3 Refrigeration cycle</li> <li>2.4 Single and 3 phase electrical power supply system</li> <li>2.5 Types of tools, testing &amp; measuring instruments used in installation</li> <li>2.6 Type of refrigerants their properties and applications.</li> </ol>
3. Underpinning Skills	<ol style="list-style-type: none"> <li>3.1 Interpretation of sketches and manuals.</li> <li>3.2 Proper handling of tools/equipment</li> <li>3.3 Apply technique to install &amp; service of display freezer units</li> <li>3.4 Testing power supply</li> <li>3.5 Connecting power circuit</li> <li>3.6 Welding and brazing.</li> <li>3.7 Selection correct type of refrigerant.</li> <li>3.8 Evacuating &amp; charging of refrigerant</li> <li>3.9 Using the techniques of commissioning of display freezer units</li> </ol>
4. Required Attitude	<ol style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Tidiness and timeliness</li> <li>4.4 Respect of peers and seniors in workplace</li> </ol>
5. Resource Implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> <li>5.1 Work place</li> <li>5.2 Tools and equipment appropriate to installation</li> <li>5.3 Materials relevant to the proposed activity/task</li> <li>5.4 Drawings and specifications relevant to the task</li> <li>5.5 Relevant manuals, codes, standards and reference material.</li> </ol>

6. Methods of Assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT CODE AND TITLE</b>	TRARAC2021A1 <b>Repair and Maintain Humidifier and De-humidifier</b>
<b>NOMINAL HOURS</b>	<b>30</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skills and attitudes required to Repair and maintain Humidifier & Dehumidifier. It includes identifying faults, repairing and replacing components, testing and preparing reports.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the Range of Variables
1. Prepare for repairing	<p>1.1 Safe work practices observed and personal proactive equipment (<b>PPE</b>) is worn as required for the work to be performed.</p> <p>1.2 <b>Work instructions</b> are interpreted to determine job requirements</p> <p>1.3 Necessary <b>Tools and equipment</b> are selected in accordance with job requirements</p> <p>1.4 Repairing instruments are calibrated as per work requirement</p> <p>1.5 Necessary <b>materials</b> are selected as per job requirement.</p>
2. Check and Identify faults	<p>2.1 Systematic <b>pre-testing procedure</b> is observed in accordance with manufacturer's instructions.</p> <p>2.2 System defects/Fault symptoms are identified using appropriate tools and equipment .</p> <p>2.3 Continuity of motor is checked and isolated using specified testing procedures</p> <p>2.4 Control settings/adjustments are checked in conformity with service-manual specifications.</p> <p>2.5 All <b>components, of the electrical</b> / electronic circuit are checked according to standard procedures</p> <p>2.6 Leaks testing are performed to identity leakage of the unit as per standard procedure.</p> <p>2.7 Faults are identified based on checking.</p>
3 Maintain/Repair Humidifier and Dehumidifier	<p>3.1 Defective parts/<b>components</b> are replaced with identical or recommended appropriate to equivalent ratings</p> <p>3.2 Control settings/adjustments are performed in conformity with service-manual specifications .</p> <p>3.3 Dehumidifier is evacuated using vacuum pump and recovered refrigerant stored in recovery unit</p> <p>3.4 Gas is charged by weight using specified equipment according to specifications</p>

	3.5 Unit operated and <b>checked</b> to ensure satisfactory performance according to manufactures specifications
4. Clean and store tools and equipment.	<p>4.1 Tools, equipment and repaired units are cleaned in conformity with manufacturer's specifications</p> <p>4.2 Work place is cleaned in accordance with environmental requirement</p> <p>4.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures</p>

**RANGE OF VARIABLES**

<b>VARIABLE</b>	<b>RANGE</b> (may include but are not limited to):														
1. PPE	<p>1.1 Hand gloves..</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety goggles</p> <p>1.5 Helmet</p>														
2. Work instructions	<p>2.1 Manufacturer's recommendations/specifications</p> <p>2.2 Installation drawings</p> <p>2.3 Blueprints</p> <p>2.4 Components instructions</p>														
3. Tools	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">3.1 Pliers</td> <td style="width: 50%;">3.7 Hammer</td> </tr> <tr> <td>3.2 Screwdriver</td> <td>3.8 Tube cutter</td> </tr> <tr> <td>3.3 Wrenches</td> <td>3.9 Tube bender</td> </tr> <tr> <td>3.4 Wire stripper/crimper</td> <td>3.10 Block vice</td> </tr> <tr> <td>3.5 Swaging tools,</td> <td></td> </tr> <tr> <td>3.6 Flaring tools</td> <td>3.11 Reamer</td> </tr> <tr> <td></td> <td>3.12 Ellen key set</td> </tr> </table>	3.1 Pliers	3.7 Hammer	3.2 Screwdriver	3.8 Tube cutter	3.3 Wrenches	3.9 Tube bender	3.4 Wire stripper/crimper	3.10 Block vice	3.5 Swaging tools,		3.6 Flaring tools	3.11 Reamer		3.12 Ellen key set
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3.6 Flaring tools	3.11 Reamer														
	3.12 Ellen key set														
4. Equipment	<p>4.1 Multimeter</p> <p>4.2 Gas welding equipment</p> <p>4.3 Clamp on meter</p> <p>4.4 Leak detector</p> <p>4.5 Charging station</p> <p>4.6 Weighing scale</p> <p>4.7 Two stage vacuum pump</p> <p>4.8 Dry nitrogen cylinder with two stage regulator</p> <p>4.9 Digital temperature meter</p> <p>4.10 Psychrometer/Hygrometer</p> <p>4.11 Heater</p>														

5. Materials	5.1 Fittings ( elbow Copper T socket, brass union, reducing unit, brass T, 5.2 Refrigerants 5.3 Dry nitrogen 5.4 Charging nipple 5.5 Copper tube 5.6 Filler rod 5.7 Welding flux 5.8 Filter drier/Strainer 5.9 Capillary tube 5.10 Lubricating oil 5.11 Insulation materials 5.12 Copper tube
6. Pre-testing procedures	6.1 visual inspection of the unit with power off 6.2 Interview of customer re-history of unit 6.3 Operate the unit according to manual to confirm defects
7. Components of Electrical Circuit	7.1 Compressor motor 7.2 Overload protector 7.3 Starting relays 7.4 Thermostat switch 7.5 Heaters 7.6 Timers and other related electrical components. 7.7 Fan motors 7.8 Refrigerant flow controller 7.9 Filter/Drier
8. Test & Checking	8.1 Insulation resistance 8.2 Continuity 8.3 Timing Sequence 8.4 Leak 8.5 Motor Terminal 8.6 Current drawn while running 8.7 Current drawn on starting

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	Assessment requires evidence that the candidate: <ol style="list-style-type: none"> <li>1.1 Applied safety rules and procedures</li> <li>1.2 Prepared the unit and required materials, tools equipment</li> <li>1.3 Identified faults and defects in accordance with testing procedures and documented the programs</li> <li>1.4 Repaired Humidifier and Dehumidifier as per diagnosed faults.</li> </ol>

2. Underpinning Knowledge	2.1 Refrigeration cycle 2.2 Single and 3 phase electrical power supply system 2.3 Types of tools, testing & measuring instruments used in Humidifier & Dehumidifier 2.4 Type of refrigerants their properties and applications.
3. Underpinning Skills	3.1 Checking power supply and electrical/electronic circuits 3.2 Measuring Voltage and Current using electrical test equipment 3.3 Cutting, bending, swaging and flaring of tubes 3.4 Welding and brazing 3.5 Evacuating & charging of Humidifier & Dehumidifier 3.6 Detection and repair of gas leaks 3.7 Applying techniques of testing performance and making adjustments in Humidifier & Dehumidifier
4. Required Attitude	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Tidiness and timeliness 4.4 Respect of peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Work place 5.2 Tools and equipment appropriate to installation 5.3 Materials relevant to the proposed activity/task 5.4 Drawings and specifications relevant to the task 5.5 Relevant manuals, codes, standards and reference material.
6. Methods of Assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.

**Accreditation Requirements**

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.

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## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT TITLE</b>	<b>TRARAC3022A1 Service and maintain water coolers</b>
<b>NOMINAL HOURS</b>	<b>20</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skill and attitude required to service and maintain water using specified tools, testing & measuring instruments. It includes identifying faults, repairing or servicing components, testing and preparing reports.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold and Italic</b></i> terms are elaborated in the Range of Variables
1. Prepare for Repairing	<p>1.1 Safe work practices observed and personal proactive equipment (<b>PPE</b>) is worn as required for the work to be performed.</p> <p>1.2 <b>Work instructions</b> are interpreted to determine job requirements</p> <p>1.3 Necessary <b>Tools and equipment</b> are selected in accordance with job requirements</p> <p>1.4 Repairing instruments are calibrated as per work requirement</p> <p>1.5 Necessary <b>materials</b> are selected as per job requirement.</p>
2 Check and Test water coolers	<p>2.1 Water cooler is checked to identify fault according to standard procedures.</p> <p>2.2 All <b>components of the electrical</b> / electronic circuit are checked according to standard procedures</p> <p>2.3 Continuity of compressor motor is checked and isolated using specified testing procedures</p> <p>2.4 Body ,cabinet and mounts are checked and restored to the required condition</p> <p>2.5 leaks testing is performed to identify leakage of the unit as per standard procedure.</p> <p>2.6 All <b>components</b> of the refrigerant circuit checked according to manufactures specifications.</p> <p>2.7 Faults are identified based on checking</p>
3 Repair/service water coolers	<p>3.1 System is evacuated using vacuum pump, recovered refrigerant stored in recovery unit</p> <p>3.2 Gas is charged by weight using specified equipment according to specifications</p> <p>3.3 Thermostat is checked and serviced / replaced where necessary, to ensure proper functioning</p> <p>3.4 Interior cooler space is cleaned and ensured dust / debris free</p>

	3.5 Unit is operated and <b>checked</b> to ensure satisfactory performance according to manufactures specifications
6. Perform routine maintenance , clean and store tools and equipment	4.1 Tools and equipment are maintained and cleaned as per instruction manual 4.2 Work place is cleaned in accordance with environmental requirement 4.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures

### Range of Variables

VARIABLE	RANGE (may include but are not limited to):
1. PPE	1.1 Hand gloves.. 1.2 Safety Shoes. 1.3 Apron 1.4 Safety goggles 1.5 Helmet
2. Work instructions	2.1 Manufacturer's recommendations/specifications 2.2 Installation drawings 2.3 Blueprints 2.4 Components instructions
3. Tools	3.1 Pliers 3.2 Screwdriver 3.3 Hacksaw 3.4 Wrenches 3.5 Wire stripper/crimper 3.6 Swaging tools, 3.7 Flaring tools 3.8 <b>Bench Vice</b> 3.9 C Clamp 3.10 Hammer 3.11 Steel wire brush 3.12 Tube cutter 3.13 Tube bender 3.14 Block vice 3.15 Reamer 3.16 Ellen key set
4. Equipment	4.1 Gas welding equipment 4.2 Multimeter 4.3 Clamp on meter 4.4 Leak detector 4.5 Magger 4.6 Charging station 4.7 Weighing scale 4.8 Two stage vacuum Pump 4.9 Gage manifold hose pipe 4.10 Digital temperature meter

5. Materials	5.1 Fittings ( elbow Copper T socket, brass union, reducing unit, brass T,) 5.2 Refrigerants 5.3 Dry nitrogen 5.4 Charging nipple 5.5 Copper tube 5.6 Filler rod 5.7 Welding flux 5.8 Filter drier/Strainer 5.9 Capillary tube 5.10 Lubricating oil
6. Components of Electrical Circuit	6.1 Compressor motor 6.2 Overload protector 6.3 Starting relays 6.4 Thermostat 6.5 Low and high Pressure cutout 6.6 Heaters 6.7 Timers
7. Test & Checking	7.1 Insulation resistance 7.2 Mechanical (Gas Welding) 7.3 Continuity 7.4 Timing Sequence 7.5 Leak 7.6 Motor Terminal 7.7 Current drawn while running 7.8 Current drawn on starting

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	Assessment requires evidence that the candidate: <ul style="list-style-type: none"> <li>1.1 Applied safety rules and procedures.</li> <li>1.2 Prepared the units and required materials, tools and equipment properly.</li> <li>1.3 Checked and Identified faults and defects.</li> <li>1.4 Serviced and maintain water coolers as per identified faults.</li> <li>1.5 Operated units and checked to ensure satisfactory performance</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 Refrigeration cycle</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Types of tools, testing &amp; measuring instruments used in water coolers</li> <li>2.4 Type of refrigerants and their application</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Interpretation of measurements, manufacturer's manuals, specifications.</li> <li>3.2 Checking power supply and electrical/electronic circuits</li> <li>3.3 Measuring voltage and current using electrical test equipment</li> </ul>

	3.4 Cutting, bending, swaging and flaring of tubes 3.5 Welding and brazing 3.6 Selection of correct type of refrigerant 3.7 Evacuating & charging of refrigeration systems 3.8 Detection and repair of gas leaks 3.9 Charging of refrigerants and commissioning of water coolers.
4. Required Attitude	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Tidiness and timeliness 4.4 Respect of peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Work place 5.2 Tools and equipment appropriate to installation 5.3 Materials relevant to the proposed activity/task 5.4 Drawings and specifications relevant to the task 5.5 Relevant manuals, codes, standards and reference material.
6. Methods of Assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
<b>Accreditation Requirements</b> Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT TITLE</b>	<b>TRARAC3023A1 Service and maintain mobile refrigeration plant.</b>
<b>NOMINAL HOURS</b>	<b>70</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the competencies required to service and maintain water coolers and mobile refrigeration plants using specified tools, testing & measuring instruments.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold and Italic</b></i> terms are elaborated in the Range of Variables
1. Prepare for Repairing	<p>1.1 Safe work practices observed and personal proactive equipment (<b>PPE</b>) is worn as required for the work to be performed.</p> <p>1.2 <b>Work instructions</b> are interpreted to determine job requirements</p> <p>1.3 Necessary <b>Tools and equipment</b> are selected in accordance with job requirements</p> <p>1.4 Repairing instruments are calibrated as per work requirement</p> <p>1.5 Necessary <b>materials</b> are selected as per job requirement.</p>
2 Check and Test Mobile refrigeration plants	<p>2.1 Mobile refrigeration plant is checked to identify fault according to standard procedures.</p> <p>2.2 All <b>components, of the electrical</b> / electronic circuit are checked according to standard procedures</p> <p>2.3 Continuity of compressor motor is checked and isolated using specified testing procedures</p> <p>2.4 Body ,cabinet and mounts are checked and restored to the required condition</p> <p>2.5 Leaks testing are performed to identify leakage of the unit as per standard procedure.</p> <p>2.6 All <b>components</b> of the refrigerant circuit checked according to manufactures specifications</p> <p>2.7 Faults are identified based on checking and testing.</p>
3 Repair mobile refrigeration plants	<p>3.1 System is evacuated using vacuum pump, recovered refrigerant stored in recovery unit</p> <p>3.2 Gas is charged by weight using specified equipment according to specifications</p> <p>3.3 Door heaters, thermostat, door gasket are checked and serviced/replaced where necessary , to ensure proper functioning</p> <p>3.4 Unit is operated and checked to ensure satisfactory performance according to manufactures specifications</p>

4. Clean and store tools and equipment	<p>4.1 Tools and equipment are maintained and cleaned as per instruction manual</p> <p>4.2 Work place is cleaned in accordance with environmental requirement</p> <p>4.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures</p>
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**Range of Variables**

VARIABLE	RANGE (may include but are not limited to):																
1. PPE	<p>1.1 Hand gloves..</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety goggles</p> <p>1.5 Helmet</p>																
2. Work instructions	<p>2.1 Manufacturer's recommendations/specifications</p> <p>2.2 Installation drawings</p> <p>2.3 Blueprints</p> <p>2.4 Components instructions</p>																
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4. Equipment	<p>4.1 Gas welding equipment</p> <p>4.2 Multimeter</p> <p>4.3 Clamp on meter</p> <p>4.4 Leak detector</p> <p>4.5 Magger</p> <p>4.6 Charging station</p> <p>4.7 Weighing scale</p> <p>4.8 Two stage vacuum Pump</p> <p>4.9 Gage manifold hose pipe</p> <p>4.10 Digital temperature meter</p>																
5. Materials	<p>5.1 Fittings ( elbow Copper T socket, brass union, reducing unit, brass T,)</p> <p>5.2 Refrigerants</p> <p>5.3 Dry nitrogen</p>																

	<p>5.4 Charging nipple</p> <p>5.5 Copper tube</p> <p>5.6 Filler rod</p> <p>5.7 Welding flux</p> <p>5.8 Filter drier/Strainer</p> <p>5.9 Capillary tube</p> <p>5.10 Lubricating oil</p>
6. Components of Electrical Circuit	<p>6.1 Compressor motor</p> <p>6.2 Overload protector</p> <p>6.3 Starting relays</p> <p>6.4 Thermostat</p> <p>6.5 Low and high Pressure cutout</p> <p>6.6 Heaters</p> <p>6.7 Timers</p>
7. Test & Checking	<p>7.1 Insulation resistance</p> <p>7.2 Mechanical (Gas Welding)</p> <p>7.3 Continuity</p> <p>7.4 Timing Sequence</p> <p>7.5 Leak</p> <p>7.6 Motor Terminal</p> <p>7.7 Current drawn while running</p> <p>7.8 Current drawn on starting</p>

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Applied safety rules and procedures.</p> <p>1.2 Prepared the units and required materials, tools and equipment properly.</p> <p>1.3 Checked and Identified faults and defects.</p> <p>1.4 Serviced and maintain water coolers as per identified faults.</p> <p>1.5 Operated units and checked to ensure satisfactory performance</p>
2. Underpinning Knowledge	<p>2.1 Refrigeration cycle</p> <p>2.2 Single and 3 phase electrical power supply system</p> <p>2.3 Types of tools, testing &amp; measuring instruments used in Mobile refrigeration plant.</p> <p>2.4 Type of refrigerants and their application</p>
3. Underpinning Skills	<p>3.1 Interpretation of measurements, manufacturer's manuals, specifications.</p> <p>3.2 Checking power supply and electrical/electronic circuits</p> <p>3.3 Measuring voltage and current using electrical test equipment</p> <p>3.4 Cutting, bending, swaging and flaring of tubes</p> <p>3.5 Welding and brazing</p>

	<p>3.6 Selection of correct type of refrigerant</p> <p>3.7 Evacuating &amp; charging of refrigeration systems</p> <p>3.8 Detection and repair of gas leaks</p> <p>3.9 Charging of refrigerants and commissioning of mobile refrigeration plant.</p>
4. Required Attitude	<p>4.1 Commitment to occupational health and safety</p> <p>4.2 Environmental concerns</p> <p>4.3 Tidiness and timeliness</p> <p>4.4 Respect of peers and seniors in workplace</p>
5. Resource Implications	<p>The following resources must be provided:</p> <p>5.1 Work place</p> <p>5.2 Tools and equipment appropriate to installation</p> <p>5.3 Materials relevant to the proposed activity/task</p> <p>5.4 Drawings and specifications relevant to the task</p> <p>5.5 Relevant manuals, codes, standards and reference material.</p>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <p>6.1 Written test.</p> <p>6.2 Demonstration</p> <p>6.3 Oral Questioning/Interview</p>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT TITLE AND CODE</b>	<b>TRARAC3023A1</b> Operate and Maintain Water chiller unit
<b>NOMINAL HOURS</b>	<b>50</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skill and attitude required to operate and maintain water chiller unit using specified tools, testing & measuring instruments.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold and Italic</b></i> terms are elaborated in the Range of Variables
1. Prepare for operation and maintenance	<p>1.1 Safe work practices are observed and personal proactive equipment (<b>PPE</b>) is worn as required for the work to be performed.</p> <p>1.2 Necessary <b>Tools and equipment</b> are selected in accordance with job requirements</p> <p>1.3 Necessary <b>materials</b> are selected as per job requirement.</p> <p>1.4 Electrical source of supply is checked and the requirements are verified.</p> <p>1.5 Availability of continuous supply of good quality water is checked and ensured.</p>
2 Check the different components	<p>2.1 Operational manual and other operational guide lines for operating plant is interpreted and steps to be followed are identified</p> <p>2.2 Air purge valve and water level of expansion tank checked as per manufacturer's instruction</p> <p>2.3 Starting of cooling tower fans is checked and correct operation ensured as per operation manual.</p> <p>2.4 Performance of chilled water pump is checked according to manufacturer's specification</p> <p>2.5 <b>Test and checking</b> of other component is carried out as per recommendation of instruction manual.</p>
3. Carryout maintenance and servicing of chiller unit	<p>3.1 <b>Air side equipment</b> is activated and necessary maintenance is carried out</p> <p>3.2 Servicing of condenser chilled water pumps is carried out in accordance with manufacturer's instructions.</p> <p>3.3 Maintenance of the <b>components</b> of water chiller unit is done, as necessary according to operation manual.</p>
4 Start & operate the chiller unit	<p>4.1 Instructions on starting operations and other operational guide lines are interpreted.</p> <p>4.2 Steps outlined in manufacturer's guidelines for starting &amp; operating unit, are followed as specified.</p>

	<p>4.3 Condenser fans, is checked to ensure proper performance</p> <p>4.4 Unusual noises in condenser fans checked and faults cleared if necessary.</p> <p>4.5 Main plant started, readings taken at regulator intervals and recorded in log sheets as per operation manual</p> <p>4.6 Temperature readings is taken at <b><i>all places of chiller unit</i></b> is recorded</p>
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**RANGE OF VARIABLES**

VARIABLE	RANGE (may include but are not limited to):																				
1. PPE	<p>1.1 Hand gloves..</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety goggles</p> <p>1.5 Helmet</p>																				
2. Tools	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">2.1 Pliers</td> <td style="width: 50%;">2.9 C Clamp</td> </tr> <tr> <td>2.2 Screwdriver</td> <td>2.10 Hammer</td> </tr> <tr> <td>2.3 Hacksaw</td> <td>2.11 Steel wire brush</td> </tr> <tr> <td>2.4 Wrenches</td> <td>2.12 Tube cutter</td> </tr> <tr> <td>2.5 Wire stripper/crimper</td> <td>2.13 Tube bender</td> </tr> <tr> <td>2.6 Swaging tools,</td> <td>2.14 Block vice</td> </tr> <tr> <td>2.7 Flaring tools</td> <td>2.15 Reamer</td> </tr> <tr> <td>2.8 Bench Vice</td> <td>2.16 Ellen key set</td> </tr> </table>	2.1 Pliers	2.9 C Clamp	2.2 Screwdriver	2.10 Hammer	2.3 Hacksaw	2.11 Steel wire brush	2.4 Wrenches	2.12 Tube cutter	2.5 Wire stripper/crimper	2.13 Tube bender	2.6 Swaging tools,	2.14 Block vice	2.7 Flaring tools	2.15 Reamer	2.8 Bench Vice	2.16 Ellen key set				
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4. Materials	4.1 Filler rod 4.2 Electrical cable 4.3 Circuit breaker/switch 4.4 Insulation materials 4.5 Copper tube 4.6 Plastic tubing 4.7 Refrigerants	4.8 Dry nitrogen 4.9 Charging nipple 4.10 Welding flux 4.11 Filter drier/Strainer 4.12 Capillary tube 4.13 Lubricating oil 4.14 Copper and brass fittings
5. Air side equipment	5.1 Duct 5.2 Grill 5.3 Damper 5.4 Defuser 5.5 Filter 5.6 Resister 5.7 Fan unit	
6. Components	6.1 Compressor motor 6.2 Pressure units 6.3 Timers 6.4 Electrical controls 6.5 Fan motors 6.6 Water pum 6.7 Evaporator	6.8 Condenser (water cooled) 6.9 Refrigerant flow controller 6.10 Filter/Drier 6.11 Pipe and fittings. 6.12 Cooling tower. 6.13 Air handling unit 6.14 Motor Starter
7. All places of air conditioned	7.1 Deischarge line 7.2 Condensing unit 7.3 Cooling unit 7.4 Suction line	
8. Test & Checking	8.1 Insulation resistance 8.2 Continuity 8.3 Timing Sequence 8.4 Leak 8.5 Motor Terminal 8.6 Current drawn while running 8.7 Current drawn on starting 8.8 Humidity and air flow	

<b>EVIDENCE GUIDE</b>	
1.Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> <li>1.1 Applied safety rules and procedures.</li> <li>1.2 Prepared the units and required materials, tools and equipment properly to operate and maintain Chiller unit.</li> <li>1.3 Checked and Identified faults and defects in accordance with testing procedures.</li> <li>1.4 Checked and ensured electrical power supply and availability of continuous supply of good quality water.</li> <li>1.5 Serviced components for proper operation.</li> <li>1.6 Operated units and checked to ensure satisfactory performance</li> </ol>
5. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1 Refrigeration cycle</li> <li>2.2 Basic principles of electrical/electronic Single and 3 phase electrical power supply</li> <li>2.3 Types of tools, testing &amp; measuring instruments used in chiller unit</li> <li>2.4 Type of refrigerants and their applications</li> <li>2.5 Testing procedure of water for PH value and hardness</li> </ol>
3. Underpinning Skills	<ol style="list-style-type: none"> <li>3.1 Interpretation of manufacturer manuals and specifications.</li> <li>3.2 Checking power supply and electrical/electronic circuits.</li> <li>3.3 Measuring voltage and current using electrical test equipment</li> <li>3.4 Cutting, bending, swaging and flaring of tubes</li> <li>3.5 Welding and brazing</li> <li>3.6 Selection of correct type of refrigerant</li> <li>3.7 Evacuating &amp; charging of refrigeration systems</li> <li>3.8 Detection and repair of gas leaks</li> <li>3.9 Commissioning of Chiller unit</li> <li>3.10 Servicing the necessary components for proper operation.</li> <li>3.11 Applying performance testing techniques and making adjustments chiller unit.</li> </ol>
4.Required Attitude	<ol style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Tidiness and timeliness</li> <li>4.4 Respect of peers and seniors in workplace</li> </ol>
5. Resource Implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> <li>5.1 Work place</li> <li>5.2 Tools and equipment appropriate to installation</li> <li>5.3 Materials relevant to the proposed activity/task</li> <li>5.4 Drawings and specifications relevant to the task</li> <li>5.5 Relevant manuals, codes, standards and reference material.</li> </ol>

6. Methods of Assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT CODE AND TITLE</b>	<b>TRARAC3025A1 Perform Refrigerant Recovery, Re-Cycling and Retrofitting</b>
<b>NOMINAL HOURS</b>	<b>30</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skills and attitudes required to recover and recycle refrigerants in air-conditioning and refrigeration systems. This includes evaluation of unit for recovery/recycling, setting-up of equipment and performing recovery, recycling and retrofitting operations.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold and Italic</b></i> terms are elaborated in the Range of Variables
1 Prepare for recovery and recycling	<p>1.1 Safe work practices are observed and personal proactive equipment (<b><i>PPE</i></b>) is worn as required for the work to be performed.</p> <p>1.2 Work instructions are interpreted to determine job requirements</p> <p>1.3 Necessary <b><i>Tools and equipment</i></b> are selected and gathered in accordance with job requirements</p> <p>1.4 Equipment, instruments and tools are checked for serviceability</p> <p>1.5 Equipment, instruments, tools and accessories are set-up according to manufacturer's recommendations</p>
2 Assess unit for recovery and recycling	<p>2.1 Unit is assessed based on job requirements</p> <p>2.2 Appropriateness of unit for refrigerant recovery and recycling is determined according to the requirements and manufacturer's specifications</p>
3 Perform refrigerant recovery and recycling	<p>3.1 <b><i>Optimum recovery</i></b> of refrigerant is determined in line with the Clean Air Act.</p> <p>3.2 Refrigerants recovery and recycling is performed according to <b><i>manufacturer's recommendations</i></b> and Clean Air Act. 3.3 Recovered refrigerant in the tank is identified and labeled prior to recycling</p> <p>3.4 <b><i>Contaminants</i></b> are removed from the system as per standard procedures</p> <p>3.5 Recovery and recycling machine is operated and maintained in accordance with manufacturer's recommendations</p>

4 Flash for retrofitting	<p>4.1 Baseline data is recorded based on original and current system performance.</p> <p>4.2 CFC Refrigerant charge is Isolated from the system by using a pump/recovery machine based on standard procedure</p> <p>4.3 Compressor lubricant is drained and selected a polyol ester lubricant as per compressor manufacturer’s suggestion.</p> <p>4.4 Gasket and seal of compressor is changed and recharged the same volume of HFC-compatible lubricant as the volume drained.</p> <p>4.5 System is charged with original CFC refrigerant and the compressor is run based on standard procedure.</p> <p>4.6 <b>Flashing</b> the System is continued until the residual mineral oil or Alkyl benzene content is below 5%</p>
5. Retrofit refrigerant	<p>5.1 Expansion device is checked and adjusted as necessary.</p> <p>5.2 Filter drier is replaced with new filter drier approved for use with the newly charged alternative Genetron Refrigerant</p> <p>5.3 The system is reconnected and evacuated as per standard procedure.</p> <p>5.4 System is recharged with the alternative Genetron Refrigerant following the <b>standard guide lines</b>.</p> <p>5.5 System operation is checked and <b>adjusted charges</b> to achieve desired operating condition.</p>

<b>VARIABLE</b>	<b>RANGE</b> (may include but are not limited to):
1. PPE	<p>1.1 Hand gloves..</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p>
2. Tools	<p>2.1 Pliers</p> <p>2.2 Screwdriver</p> <p>2.3 Hacksaw</p> <p>2.4 Wrenches</p> <p>2.5 Wire stripper/crimper</p> <p>2.6 Swaging tools,</p> <p>2.7 Flaring tools</p> <p>2.8 C Clamp</p> <p>2.9 Hammer</p> <p>2.10 Steel wire brush</p> <p>2.11 Tube cutter</p> <p>2.12 Tube bender</p> <p>2.13 Block vice</p> <p>2.14 Reamer</p> <p>2.15 Ellen key set</p>
3. Equipment	<p>3.1 Multimeter</p> <p>3.2 Clamp on meter</p> <p>3.3 Weighing scale</p> <p>3.4 System analyzer</p> <p>3.5 Recovery machine</p>

	<ul style="list-style-type: none"> <li>3.6 Vacuum Pump</li> <li>3.7 Recycling machine</li> <li>3.8 Refrigerant Cylinder/Receiver</li> <li>3.9 Gauge Manifold with hose pipe</li> <li>3.10 Thermostate</li> <li>3.11 Current coil Relay</li> </ul>
4. Optimum Recovery	4.1 Pressure reading of 29.92 inch Hg/760mm Hg.
5. Manufacturer's a. recommendations	<ul style="list-style-type: none"> <li>5.1 Equipment operator's manual</li> <li>5.2 Equipment service manual</li> <li>5.3 Nameplate data</li> </ul>
6. Contaminants	<ul style="list-style-type: none"> <li>6.1 Acid</li> <li>6.2 Moisture</li> <li>6.3 Foreign particles e.g. chips, burr</li> <li>6.4 Non-condensable gases</li> </ul>
7. Flashing	<p>Flashing consists of repetition of the following process:</p> <ul style="list-style-type: none"> <li>7.1 Drain the Lubricant</li> <li>7.2 Measure Existing Lubricant</li> <li>7.3 Recharge Compressor with Replacement Lubricant</li> <li>7.4 Reinstall the Compressor</li> <li>7.5 Recharge the CFC Refrigerant</li> <li>7.6 Run the Compressor</li> </ul>
8. Standard guidelines	<ul style="list-style-type: none"> <li>8.1 For Genetron 404A, remove liquid only from cylinder</li> <li>8.2 Initial charge 75 percent by weight of the original CFC refrigerant charge</li> <li>8.3 Record amount of refrigerant charged</li> </ul>
9. Adjustment of charges	<ul style="list-style-type: none"> <li>9.1 Adjust charge to achieve desired operating conditions.</li> <li>9.2 If low, charge in increments of 5 percent of original CFC refrigerant charge. For Genetron 404A, liquid charge only.</li> <li>9.3 Record the amount of refrigerant added.</li> </ul>

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> <li>1.1 Applied safety rules and procedures.</li> <li>1.2 Prepared components and required tools and equipment properly.</li> <li>1.3 Performed refrigerant recycling, complying with manufacturer's recommendations.</li> <li>1.4 Achieved optimum refrigerant recovery</li> <li>1.5 Took necessary action to rectify fault</li> <li>1.6 Performed retrofitting</li> </ol>
2. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1 Recovery/recycling procedures and standards</li> <li>2.2 Ozone-layer depletion and its effects</li> <li>2.3 Clean Air Act (Green House Effect from CFC)</li> <li>2.4 Recovery/recycling equipment specifications, parts and uses</li> <li>2.5 Refrigerant identifier instrument, specification, parts and uses</li> </ol>
3. Underpinning Skills	<ol style="list-style-type: none"> <li>3.1 Installing and operating recovery and recycling machine</li> <li>3.2 Interpreting manufacturer and equipment data</li> <li>3.3 Applying safety precautions in handling refrigerants</li> <li>3.4 Maintaining techniques of using recovery/recycling machine</li> <li>3.5 Using of refrigerant identifier</li> <li>3.6 Apply the process of retrofitting of refrigerant.</li> </ol>
4. Required Attitude	<ol style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Tidiness and timeliness</li> <li>4.4 Respect for rights of peers and seniors in workplace</li> </ol>
5. Resource Implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> <li>5.1 Work place</li> <li>5.2 Tools and equipment appropriate to installation</li> <li>5.3 Materials relevant to the proposed activity/task</li> <li>5.4 Drawings and specifications relevant to the task</li> <li>5.5 Relevant manuals, codes, standards and reference material.</li> <li>5.6 Air-conditioning/refrigeration unit</li> </ol>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ol style="list-style-type: none"> <li>6.1 Written test.</li> <li>6.2 Demonstration</li> <li>6.3 Oral Questioning/Interview</li> </ol>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

**National Technical and Vocational Qualification Framework for Bangladesh**  
**Unit of Competence**

<b>UNIT TITLE</b>	<b>TRARAC3026A1 Repair and install prefabricated Cold Room and Freezer Rooms</b>
<b>NOMINAL HOURS</b>	<b>80</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skill and attitude require to repair and install prefabricated cold room and freezer room.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <i><b>Bold &amp; Italic</b></i> terms are elaborated in the Range of Variables
1. Identify the selected design of cold room /freezer room	<p>1.1 Client's requirements is identified, noted and location of installation is inspected</p> <p><b>1.2</b> Specifications of selected system is checked to ensure matching with selected design of the <i><b>unit</b></i></p> <p>1.3 Necessary <i><b>Tools, equipment, instruments and material</b></i> are selected required for the work</p>
2. Install cold room/ freezer room	<p>2.1 Safe work practices are observed and personal proactive equipment (<i><b>PPE</b></i>) is worn as required for the work to be performed.</p> <p>2.2 <i><b>Components</b></i> of the system are selected according to requirements for the installation</p> <p>2.3 Floor is prepared and leveled to install cold room/ freezer room according to lay out plans.</p> <p>2.4 Cold room / freezer room is installed according to following manufacturers specification</p> <p>2.5 Refrigeration equipment including piping &amp; electrical items are installed according to specification.</p> <p>2.6 System is <i><b>checked and tested</b></i> before commissioning, as per specifications and manufacturer's instructions.</p> <p>2.7 Commissioning data indicating system pressures, electrical data, humidity &amp; temperatures of outside and inside cold room, are recorded and filed for future use.</p>

<p>3. Prepare to repair cold room / freezer room</p>	<p>3.1 Cold room / freezer room checked and extent of repair / or maintenance ascertained and recorded</p> <p>3.2 Equipment , material and accessories are selected as required for the job</p> <p>3.3 All components of the electrical / electronic circuits checked according to standard practice and manufacturers specifications.</p> <p>3.4 All electro - mechanical safety cut outs checked and performance ensured according to manufacturer's specifications</p> <p>3.5 Drive belts are checked for correct performance according to manufacturer's specifications</p> <p>3.6 All components of the refrigeration circuit are checked and defects are identified for repairing according to manufacturers specifications</p> <p>3.7 Body mounts checked and restored to the required condition</p> <p>3.8 System pressure and gas leaks are tested using specified test instrument</p>
<p>4. Maintain / repair cold room / freezer room</p>	<p>4.1 System evacuated using vacuum pump and gas recharged by weight using specified equipment according to specifications</p> <p>4.2 Door heaters, door gaskets and thermostat are serviced / or repaired where necessary to ensure proper functioning</p> <p>4.3 Interior cooler space is checked and cleaned to ensure dust / debris free</p> <p>4.4 In case of ice plants, water source is checked and serviced according to specifications</p> <p>4.5 Plant is operated, checked and tested to ensure satisfactory performance according to manufacturer's specifications</p> <p>4.6 Recorded readings / data is obtained during operation of the plant and checked against manufacturers specifications</p>

### Range of Variable

VARIABLE	RANGE (may include but are not limited to):														
<p>1. PPE</p>	<p>1.1 Hand gloves..</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety goggles</p> <p>1.5 Helmet</p>														
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	2.8 Bench Vice 2.9 Measuring tools 2.10 Spirit level	2.18 Ellen key set 2.19 Masonry tools (e.g. trowel, spade, level, etc.)
3. Equipment	3.1 Electric hand drill 3.2 Gas welding equipment 3.3 Multimeter 3.4 Clamp on ammeter 3.5 Leak detector 3.6 Magger 3.7 Gage manifold with hose pipe	3.8 Charging station 3.9 Weighing scale 3.10 Tow state vacuum pump 3.11 Psychrometer/ Hygrometer 3.12 Air side equipment (duct, filter, grill, damper, defuzer, register, fan unit)
4. Materials	4.1 Drill bits 4.2 Fitting and mounting bolt 4.3 Filler rod 4.4 Electrical cable 4.5 Rawal plugs 4.6 Circuit breaker/switch 4.7 Masonry materials (e.g. cement, sand, etc.) 4.8 Refrigerants 4.9 Support structure materials	4.10 Copper tube 4.11 Plastic tubing/clamp 4.12 Dry nitrogen 4.13 Charging nipple 4.14 Welding flux 4.15 Filter drier/Strainer 4.16 Capillary tube 4.17 Lubricating oil 4.18 Copper and brass fittings 4.19 Insulation materials
5. Components of Electrical Circuit	5.1 Compressor motor 5.2 Thermal Relays 5.3 Thermostat switch 5.4 Heaters 5.5 Timers 5.6 Electrical controls accessories 5.7 Fan 5.8 Refrigerant flow controller	
6. Test & Checking	6.1 Insulation resistance 6.2 Mechanical (Gas Welding) 6.3 Continuity 6.4 Timing Sequence 6.5 Leak 6.6 Motor Terminal 6.7 Current drawn while running 6.8 Current drawn on starting 6.9 Temperature Test 6.10 Brine test	

<b>EVIDENCE GUIDE</b>	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Applied safety rules and procedures.</li> <li>1.2 Prepared the components and required materials, tools, equipment and location for installation.</li> <li>1.3 Identified the selected design of cold room /freezer room for installation.</li> <li>1.4 Used correct tools, testing &amp; measuring instruments</li> <li>1.5 Prepared and leveled the location to install</li> <li>1.6 Installed cold room/ freezer room with different fittings</li> <li>1.7 Checked and prepared to maintain / repair cold room / freezer room</li> <li><b>1.8</b> Operated the plant and checked for satisfactory performance.</li> </ul>
2. Underpinning knowledge	<ul style="list-style-type: none"> <li>2.1 Refrigeration cycle</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Fault finding procedures</li> <li>2.4 Type of refrigerants and their applications</li> <li>2.5 Procedure of testing performances</li> <li>2.6 Testing procedures &amp; adjustments in central air conditioning systems</li> <li>2.7 Method of de-frosting</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Interpretation of manufacturer's manuals and specifications</li> <li>3.2 Selection of refrigerants according to the type of system</li> <li>3.3 Charging refrigerants using specified equipment</li> <li>3.4 Cutting, bending &amp; joining refrigerant lines using correct tools</li> <li>3.5 Swaging and flaring of tubes</li> <li>3.6 Welding &amp; brazing</li> <li>3.7 Preparing and leveling the location for installing</li> <li>3.8 Installing cold room/ freezer room with different fittings</li> <li>3.9 Pressure testing and evacuating &amp; charging of refrigeration systems</li> <li>3.10 Detection and repair of gas leaks</li> <li>3.11 Checking and repairing de-frosting system</li> </ul>
4. Required Attitude	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Environmental concerns</li> <li>4.3 Tidiness and timeliness</li> <li>4.4 Respect of peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1 Work place</li> <li>5.2 Tools and equipment appropriate to workplace</li> <li>5.3 Materials relevant to the proposed activity/task</li> <li>5.4 Drawings and specifications relevant to the task</li> <li>5.5 Relevant manuals, codes, standards and reference material.</li> </ul>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>6.1 Written test.</li> <li>6.2 Demonstration</li> <li>6.3 Oral Questioning/Interview</li> </ul>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

**Accreditation Requirements**

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), the national quality assurance body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any national qualification.

Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

## National Technical and Vocational Qualification Framework for Bangladesh

### Unit of Competence

<b>UNIT TITLE &amp; CODE</b>	<b>TRARAC3027A1</b> Prepare estimate for repair, installations and maintenance of refrigeration and Air conditioning systems.
<b>NOMINAL HOURS</b>	<b>20</b>
<b>UNIT DESCRIPTOR</b>	This unit covers the knowledge, skill and attitude required to prepare fair and competitive estimates to install, repair /or maintain Refrigeration & Air Conditioning units / systems, in accordance with company/enterprise Procedures.
<b>ELEMENTS OF COMPETENCY</b>	<b>PERFORMANCE CRITERIA</b> <b><i>Bold &amp; Italic</i></b> terms are elaborated in the Range of Variables 1.1
1. Prepare estimate For repair & maintenance of refrigeration / air conditioning Systems	<p>Records on requirements of <b><i>tools/equipment, material</i></b> and estimated labour hours for job is referred to prepare estimate</p> <p>1.2 Replacement parts and components for repair/ maintenance of system are listed out</p> <p>1.3 Cost of materials, parts and components to be replaced and consumed is estimated based on market price.</p> <p>1.4 Cost of labour is worked out in accordance with job requirement</p> <p>1.5 Cost of transport of service personnel is worked out</p> <p>1.6 Overall overhead costs and taxes are estimated</p> <p>1.7 <b><i>Total estimate</i></b> including a profit margin is worked out</p>
2. Prepare estimate For installation of air conditioning systems	<p>2.1 Power requirement of <b><i>air conditioner unit</i></b>, availability and adequacy of supply power is checked</p> <p>2.2 Measurements of space to be air conditioned and its volume is calculated and noted down</p> <p>2.3 Cost of labour necessary to install and cost of transport for service personnel, material, parts and components are worked out based on work requirement.</p> <p>2.4 Overall overhead costs including taxes and labour costs worked out</p> <p>2.5 Total estimate for installation of air conditioning system worked out</p>
3. Prepare estimate for new installation of Refrigeration systems	<p>3.1 Power requirement of refrigeration unit, and availability and adequacy of power supply is checked</p> <p>3.2 Correct type of refrigeration system/or unit are selected to suit customer's requirements</p> <p>3.3 Cost of labour necessary to install refrigeration equipment is worked out</p> <p>3.4 Cost of transport , material, parts &amp; components are worked based on</p>

	<p>work requirement</p> <p>3.5 Overhead costs including taxes is worked out</p> <p>3.6 Total estimate for installation of refrigeration system / unit including a profit margin are worked out</p>
4. Prepare an estimate of relocation of Refrigeration / or Air Conditioning Systems	<p>4.1 <b>System / Unit</b> is checked and its new location is identified</p> <p>4.2 Power requirement of refrigeration unit / Air conditioner, and availability and adequacy of supply power are checked as per capacity of the units.</p> <p>4.3 Refrigerant tubing, other parts &amp; components necessary for relocation of system / or unit are listed out and estimated in accordance with market price</p> <p>4.4 Cost of blanking of existing location, recovery of gas pumped out is estimated</p> <p>4.5 Cost of labor, transport and materials is worked out as per work requirement.</p> <p>4.6 Total estimate including a profit margin is worked out</p> <p>4.7 Estimate is submitted to relevant authority / or client and approval obtained</p>

### Range of Variables

VARIABLE	RANGE (may include but are not limited to):
1. Tools	<p>1.1 Pliers</p> <p>1.2 Screwdriver</p> <p>1.3 Hacksaw</p> <p>1.4 Wrenches</p> <p>1.5 Wire stripper/crimper</p> <p>1.6 Swaging tools,</p> <p>1.7 Flaring tools</p> <p>1.8 Bench Vice</p> <p>1.9 C Clamp</p> <p>1.10 Hammer</p> <p>1.11 Steel wire brush</p> <p>1.12 Tube cutter</p> <p>1.13 Tube bender</p> <p>1.14 Block vice</p> <p>1.15 Reamer</p> <p>1.16 Allen key set</p>
2. Equipment	<p>2.1 Testing &amp; measuring instruments</p> <p>2.2 Personal safety equipment</p> <p>2.3 Gas welding equipment</p> <p>2.4 Multimeter</p> <p>2.5 Clamp on ammeter</p> <p>2.6 Leak detector</p> <p>2.7 Dry nitrogen cylinder with two stage regulator</p> <p>2.8 Mallet</p> <p>2.9 Charging station</p> <p>2.10 Weighing scale</p> <p>2.11 Measuring equipment</p> <p>2.12 Two stage vacuum Pump</p> <p>2.13 Psychrometer/ Hygrometer</p> <p>2.14 Digital temperature meter</p>

3. Materials	<table border="0"> <tr> <td>3.1 Expansion bolt</td> <td>3.12 Masonry materials (e.g. cement, sand, etc.)</td> </tr> <tr> <td>3.2 Drill bits</td> <td></td> </tr> <tr> <td>3.3 Welding rod</td> <td>3.13 Refrigerants and dry nitrogen</td> </tr> <tr> <td>3.4 Electrical cable</td> <td></td> </tr> <tr> <td>3.5 Rawal plugs</td> <td>3.14 Support structure materials</td> </tr> <tr> <td>3.6 Circuit breaker/switch</td> <td></td> </tr> <tr> <td>3.7 Plastic tubing/clamp</td> <td>3.15 Insultion materials</td> </tr> <tr> <td>3.8 Filler rod</td> <td>3.16 Copper tube</td> </tr> <tr> <td>3.9 Welding flux</td> <td>3.17 VC pipe/clamp</td> </tr> <tr> <td>3.10 Filter drier/Strainer</td> <td>3.18 Lubricating oil</td> </tr> <tr> <td>3.11 Capillary tube</td> <td>3.19 Copper and brass fittings</td> </tr> </table>	3.1 Expansion bolt	3.12 Masonry materials (e.g. cement, sand, etc.)	3.2 Drill bits		3.3 Welding rod	3.13 Refrigerants and dry nitrogen	3.4 Electrical cable		3.5 Rawal plugs	3.14 Support structure materials	3.6 Circuit breaker/switch		3.7 Plastic tubing/clamp	3.15 Insultion materials	3.8 Filler rod	3.16 Copper tube	3.9 Welding flux	3.17 VC pipe/clamp	3.10 Filter drier/Strainer	3.18 Lubricating oil	3.11 Capillary tube	3.19 Copper and brass fittings
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## EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <table border="0"> <tr> <td>1.1 listed out replacement parts and components</td> </tr> <tr> <td>1.2 Estimated cost of labour, transport of service personnel, material, parts &amp; components overhead, taxes and profit margin</td> </tr> <tr> <td>1.3 Prepared estimate for new installation of air conditioning systems</td> </tr> <tr> <td>1.4 Prepared estimate for new installation of Refrigeration systems</td> </tr> <tr> <td>1.5 Prepared an estimate of relocation of Refrigeration / or Air Conditioning Systems</td> </tr> </table>	1.1 listed out replacement parts and components	1.2 Estimated cost of labour, transport of service personnel, material, parts & components overhead, taxes and profit margin	1.3 Prepared estimate for new installation of air conditioning systems	1.4 Prepared estimate for new installation of Refrigeration systems	1.5 Prepared an estimate of relocation of Refrigeration / or Air Conditioning Systems
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<b>3. Underpinning Skills</b>	3.1 interpretation of manufacturer’s manuals, drawings, sketches pertaining to installation/repair/servicing of refrigerators and air conditioners 3.2 Calculating areas & volumes 3.3 Using techniques to estimate supplies and fittings 3.4 Preparing estimate labour cost 3.5 Preparing estimate for transport cost 3.6 Preparing an estimate consumable materials 3.7 Estimating total cost with profit margin
<b>4. Required Attitude</b>	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Tidiness and timeliness 4.4 Respect of peers and seniors in workplace
<b>5. Resource Implications</b>	The following resources must be provided: 5.1 Work place location & procedure 5.2 Tools and equipment appropriate to workplace 5.3 Materials relevant to the proposed activity/task 5.4 Drawings and specifications relevant to the task 5.5 Relevant manuals, codes, standards and reference material.
<b>6. Methods of Assessment</b>	Competency must be assessed through: 6.1 Written test. 6.2 Assignment 6.3 Oral Questioning/Interview
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