

HEAT VENTILATION & AIR CONDITIONING (HVAC)

Assessment Package

National Vocational
Certificate Level 2

Version 1 - March 2014

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ASSESSMENT MATERIAL EVIDENCE GUIDE	<h1>HEAT VENTILATION & AIR CONDITIONING</h1>																																														
Qualification Heat Ventilation & Air Conditioning Qualification Code: Level: 2 Credit: 80 Version: 1																																															
CONTENTS	1. Assessment Summary and Record 2. Candidate Assessment 3. Assessor Judgment Guide 4. List of required tools/equipment, material and context of assessment																																														
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1

ASSESSMENT SUMMARY & RECORD

ACTIVITY	METHOD				DESIRED OUTCOMES	RESULT	
	WRITTEN	ORAL	PORTFOLIO	OBSERVATION		COMPETENT	NOT YET COMPETENT
NATURE OF ACTIVITY					DESIRED OUTCOMES FOR SUCCESSFUL ASSESSMENT OF QUALIFICATION: HEAT VENTILATION & AIR CONDITIONING		
Practical Skill Demonstration				✓	<ul style="list-style-type: none"> • Initiate HVAC work • Install HVAC unit • Remove existing HVAC unit • Test HVAC unit performance • Conduct preventative maintenance on HVAC equipment • Repair refrigeration cycle 		
Knowledge Assessment	✓	✓			<ul style="list-style-type: none"> • Answer all questions your assessor may have during the practical assessment. 		
Other Requirements			✓		<ul style="list-style-type: none"> • Provide verified evidence of the competency of 'installing HVAC unit' • Provide verified evidence of the competency of 'removing existing HVAC unit' • Provide verified evidence of the competency of 'preventive maintenance on HVAC equipment' 		

2

CANDIDATE ASSESSMENT

Candidate's Name.....Father's Name

ALL WORK ASSESSED IN THIS COMPETENCY STANDARD MUST BE YOUR OWN WORK.

GUIDANCE TO CANDIDATE

To meet this standard you are required to complete the following tasks within **five hours** timeframe:

Complete any one task (given by the assessor) of the following four tasks:

- Replace the compressor of the outdoor unit of the domestic HVAC unit
- Repair leaked condenser of the outdoor unit of the domestic HVAC unit
- Replace the choked refrigerant control of the outdoor unit of the domestic HVAC unit
- Repair leaked evaporator of the indoor unit of the domestic HVAC unit

Complete any one task (given by the assessor) of the following two tasks:

- Test and verify the cooling system of the HVAC domestic unit
- Test and verify the heat pump system of the HVAC domestic unit

Important Note: The following general performance criteria will be followed and performed in all the tasks (where applicable) by the candidate in order to meet this standard.

- ✓ Follow health and safety procedure as per the requirements of given task
- ✓ Prepare work station as per the requirements of task
- ✓ Select tools/ equipment as per the requirements of task
- ✓ Report to supervisor in case of any contingency after taking necessary actions
- ✓ Complete the work by following sequence of operations
- ✓ Perform task(s) within standard timeframe

ACTIVITIES	CANDIDATE RESPONSE
<p>1. Complete practical task of 'Heat Ventilation & Air Conditioning' under observation by an assessor</p>	<p>During a practical assessment, under observation by an assessor, I will correctly:</p> <ul style="list-style-type: none"> • Replace the compressor of the outdoor unit of the domestic HVAC unit <ul style="list-style-type: none"> ✓ Select and wear personal protective clothing and equipment (PPE) before initiating HVAC work ✓ Select all the tools, equipment and consumables before initiating HVAC work ✓ Remove the outdoor unit of the domestic HVAC unit on the table or floor ✓ Open and remove all body parts of the outdoor unit ✓ Recover and store the refrigerant of the disable domestic HVAC unit ✓ Remove all electric connections and cut all the compressor pipes from the outdoor unit ✓ Remove the faulty compressor from the foundation of the outdoor unit ✓ Fit the new compressor on the foundation of the outdoor unit ✓ Gas weld all the compressor pipes of the outdoor unit ✓ Conduct leak test of the gas weld area ✓ Reconnect all the electric connections of the compressor of the outdoor unit • Repair leaked condenser of the outdoor unit of the domestic HVAC unit <ul style="list-style-type: none"> ✓ Cut all the condenser pipes from the outdoor unit ✓ Remove the leaked condenser from the foundation of the outdoor unit ✓ Gas weld the process tube to attach it with the leaked condenser ✓ Seal the second pipe of the leaked condenser ✓ Conduct leak test of the leaked condenser ✓ Mark the leakage area and purge the air pressure of the leaked condenser

- ✓ Clean the leakage area of the leaked condenser with the Emery cloth
- ✓ Gas weld the leakage are of the leaked condenser
- ✓ Inspect the gas weld area of the condenser
- ✓ Fit the condenser on the foundation of the outdoor unit
- ✓ Connect all the condenser pipes of the outdoor unit with the help of gas weld
- Replace the choked refrigerant control of the outdoor unit of the domestic HVAC unit
 - ✓ Remove the choked refrigerant control from the outdoor unit
 - ✓ Gas weld both sides of the new refrigerant control in the outdoor unit
 - ✓ Inspect the gas weld area of the refrigerant control
 - ✓ Reassemble all the body parts of the outdoor unit
 - ✓ Place back the outdoor unit of the domestic HVAC unit
- Repair leaked evaporator of the indoor unit of the domestic HVAC unit
 - ✓ Remove the indoor unit of the domestic HVAC unit on the table or floor
 - ✓ Open and remove all body parts of the indoor unit
 - ✓ Cut all the evaporator pipes from the indoor unit
 - ✓ Remove the leaked evaporator from the foundation of the indoor unit
 - ✓ Gas weld the process tube to attach it with the leaked evaporator
 - ✓ Seal the second pipe of the leaked evaporator
 - ✓ Conduct the leak test of the leaked evaporator
 - ✓ Mark the leakage area and purge the air pressure of the leaked evaporator
 - ✓ Clean the leakage area of the leaked evaporator with the Emery cloth
 - ✓ Gas weld the leakage are of the leaked evaporator
 - ✓ Inspect the gas weld area of the evaporator
 - ✓ Fit the evaporator on the foundation of the indoor unit
 - ✓ Connect all the evaporator pipes of the indoor unit with the help of gas weld
 - ✓ Fit the evaporator on the foundation of the indoor unit
 - ✓ Reassemble all the body parts of the indoor unit
 - ✓ Place back the indoor unit of the domestic HVAC unit
- Test and verify the cooling system of the domestic HVAC unit
 - ✓ Adjust the unit mode of operation to cooling system
 - ✓ Test the line voltage, Total current, Earth leakage breaker and Short circuit breaker of the unit in the running condition
 - ✓ Test the running gas pressure of the unit with the help of the Gauge manifold
 - ✓ Measure the CFM and temperature of the running unit with the help of Air Velocity meter and digital thermometer
 - ✓ Test the relative humidity of the conditioned air with the help of Hygrometer
 - ✓ Test the motor performance of the cooling coil
 - ✓ Perform the Compressor Efficiency Test for the suction pressure, discharge pressure, noise level and current
- Test and verify the heat pump system of the domestic HVAC unit
 - ✓ Adjust the unit mode of operation to heating system
 - ✓ Measure the fuel supply of the heating system
 - ✓ Adjust the neutral flame of the heating system
 - ✓ Measure the temperature of the combustion chamber
 - ✓ Test the relative humidity of the conditioned air with the help of Hygrometer
 - ✓ Measure and verify water supply to the heating system
 - ✓ Test the water flow switch of the heating system
 - ✓ Measure the CFM of the airflow at the fan outlet
 - ✓ Measure and verify the water temperature of the heating system
- General performance criteria:
 - ✓ Follow health and safety procedure as per the requirements of given task
 - ✓ Prepare work station as per the requirements of task
 - ✓ Select tools/ equipment as per the requirements of task
 - ✓ Report to supervisor in case of any contingency after taking necessary actions
 - ✓ Complete the work by following sequence of operations
 - ✓ Perform task(s) within standard timeframe

2. Other Requirements	<ul style="list-style-type: none"> • Provide verified evidence of the competency of 'installing HVAC unit' • Provide verified evidence of the competency of 'removing existing HVAC unit' • Provide verified evidence of the competency of 'preventive maintenance on HVAC equipment'
3. Answer any questions your assessor may have during the practical assessment	<p>My answers to questions are correct and demonstrate my understanding of the topics and their application.</p>

3

ASSESSOR JUDGEMENT GUIDE

Candidate's NameFather's Name.....

INSTRUCTIONS FOR ASSESSOR

This section contains minimum evidence requirements. Oral questioning may be used to clarify candidate understanding of the topic and its application.

ACTIVITIES	MINIMUM EVIDENCE REQUIRED	YES	NO	ASSESSOR COMMENTS
1. Complete practical task of 'Heat Ventilation & Air Conditioning' under observation by an assessor	During a practical assessment, under observation by an assessor, the candidate correctly carried out the following tasks:			
Replace the compressor of the outdoor unit of the domestic HVAC unit	Selected and wore personal protective clothing and equipment (PPE) before initiating HVAC work			
	Selected all the tools, equipment and consumables before initiating HVAC work			
	Removed the outdoor unit of the domestic HVAC unit on the table or floor			
	Opened and removed all body parts of the outdoor unit			
	Recovered and stored the refrigerant of the disable domestic HVAC unit			
	Removed all electric connections and cut all the compressor pipes from the outdoor unit			
	Removed the faulty compressor from the foundation of the outdoor unit			
	Fitted the new compressor on the foundation of the outdoor unit			
	Gas welded all the compressor pipes of the outdoor unit			
	Conducted leak test of the gas weld area			
	Reconnected all the electric connections of the compressor of the outdoor unit			
Repair leaked condenser of the outdoor unit of the domestic HVAC unit	Cut all the condenser pipes from the outdoor unit			
	Removed the leaked condenser from the foundation of the outdoor unit			
	Gas welded the process tube to attach it with the leaked condenser			
	Sealed the second pipe of the leaked condenser			
	Conducted leak test of the leaked condenser			
	Marked the leakage area and purged the air pressure of the leaked condenser			
	Cleaned the leakage area of the leaked condenser with the Emery cloth			
	Gas welded the leakage are of the leaked condenser			
	Inspected the gas weld area of the condenser			
	Fit the condenser on the foundation of the outdoor unit			
	Connected all the condenser pipes of the outdoor unit with the help of gas weld			

Replace the choked refrigerant control of the outdoor unit of the domestic HVAC unit	Removed the choked refrigerant control from the outdoor unit			
	Gas welded both sides of the new refrigerant control in the outdoor unit			
	Inspected the gas weld area of the refrigerant control			
	Reassembled all the body parts of the outdoor unit			
	Placed back the outdoor unit of the domestic HVAC unit			
Repair leaked evaporator of the indoor unit of the domestic HVAC unit	Removed the indoor unit of the domestic HVAC unit on the table or floor			
	Opened and removed all body parts of the indoor unit			
	Cut all the evaporator pipes from the indoor unit			
	Removed the leaked evaporator from the foundation of the indoor unit			
	Gas welded the process tube to attach it with the leaked evaporator			
	Sealed the second pipe of the leaked evaporator			
	Conducted leak test of the leaked evaporator			
	Marked the leakage area and purged the air pressure of the leaked evaporator			
	Cleaned the leakage area of the leaked evaporator with the Emery cloth			
	Gas welded the leakage are of the leaked evaporator			
	Inspected the gas weld area of the evaporator			
	Fit the evaporator on the foundation of the indoor unit			
	Connected all the evaporator pipes of the indoor unit with the help of gas weld			
	Fit the evaporator on the foundation of the indoor unit			
	Reassembled all the body parts of the indoor unit			
Placed back the indoor unit of the domestic HVAC unit				
Test and verify the cooling system of the domestic HVAC unit	Adjusted the unit mode of operation to cooling system			
	Tested the line voltage, Total current, Earth leakage breaker and Short circuit breaker of the unit in the running condition			
	Tested the running gas pressure of the unit with the help of the Gauge manifold			
	Measured the CFM and temperature of the running unit with the help of Air Velocity meter and digital thermometer			
	Tested the relative humidity of the conditioned air with the help of Hygrometer			
	Tested the motor performance of the cooling coil			
	Performed the Compressor Efficiency Test for the suction pressure, discharge pressure, noise level and current			
Test and verify the heat pump system of the domestic HVAC unit	Adjusted the unit mode of operation to heating system			
	Measured the fuel supply of the heating system			
	Adjusted the neutral flame of the heating system			
	Measured the temperature of the combustion chamber			
	Tested the relative humidity of the conditioned air with the help of Hygrometer			

	Measured and verified water supply to the heating system			
	Tested the water flow switch of the heating system			
	Measured the CFM of the airflow at the fan outlet			
	Measured and verified the water temperature of the heating system			
General performance criteria	Followed health and safety procedure as per the requirements of given task			
	Prepared work station as per the requirements of task			
	Selected tools/ equipment as per the requirements of task			
	Reported to supervisor in case of any contingency after taking necessary actions			
	Completed the work by following sequence of operations			
	Performed task(s) within standard timeframe			
2. Other requirements	Provided verified evidence of the competency of 'installing HVAC unit'			
	Provided verified evidence of the competency of 'removing existing HVAC unit'			
	Provided verified evidence of the competency of 'preventive maintenance on HVAC equipment'			

<p>3. Answer any questions the assessor may have during the practical assessment</p>	<p>Candidate's answers to questions are correct and demonstrate understanding of the topics and their application.</p> <p>Assessor to document below all questions asked and candidate answers. Use extra sheets if required and attach.</p>			
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4

LIST OF TOOLS, EQUIPMENT, MATERIAL AND CONTEXT OF ASSESSMENT

INSTRUCTIONS	<p>This section contains information regarding;</p> <ul style="list-style-type: none"> Context of the assessment List of required tools and equipment. List of consumable items required during the service
1. Context of Assessment	This task will be performed in real time environment.

2. List of tools and equipment required (for five candidates)		
S. No	Items	Quantity
1	Personal protective equipment (PPE)	5
2	Complete tool kit	5
3	Testing equipment (complete range)	5
4	Compressor service valve ratchet wrenches	5
5	Clamp on meters	5
6	Aligning tools	5
7	Refrigerant recovery machine	1
8	Compressors	5
9	Gas welding sets	2
10	Inspection mirrors	5
11	Electronic leak detectors	5
12	Gauge manifolds	5
13	Air velocity meters	5
14	Hygrometers	5
15	Tachometers	5
16	dB meters	5
17	Thermometers	5
18	Sling psychrometers	5
19	Vibration testers	5
20	Fuel gauge	5
21	High temperature thermometers	5
22	Neutral flame testers	5
23	Water flow meters	5

3. List of consumable items required (for five candidates)		
S. No	Items	Quantity
1	Refrigerant R 22	1 cylinder
2	Mounting pads	5 sets
3	Electric cables (2 core)	1 coil
4	Insulating tapes	5
5	Masking tapes	5
6	Pipe insulation	5 lengths
7	Wrapping tapes	5
8	Cleaning brushes	5
9	Detergent powder	5 packs
10	WD40	5
11	Emery papers/sandpapers	5
12	Cotton gloves	5
13	Masks	5

14	Hair covering caps	5
15	Rug cloth	5 pieces
16	Silicone tubes	5
17	Nuts, bolts, washers (12 mm)	20 each
18	Thread seal tapes	5
19	Silver soldering rods	1 kg
20	Ignition lighters	5
21	Flux	5 packets
22	Brass rods	1 kg
23	sponges	5
24	Psychrometer charts	5
25	Sealing material (Plastic of Paris)	5 packs
26	Lubricant oil	5 cans



ASSESSMENT MATERIAL EVIDENCE GUIDE	<h1>INITIATE HVAC WORK</h1>																																														
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1

ASSESSMENT SUMMARY & RECORD

ACTIVITY	METHOD				DESIRED OUTCOMES	RESULT	
	WRITTEN	ORAL	PORTFOLIO	OBSERVATION		COMPETENT	NOT YET COMPETENT
NATURE OF ACTIVITY					DESIRED OUTCOMES FOR SUCCESSFUL ASSESSMENT OF COMPETENCY STANDARD: PREPARE TO CARRY OUT HVAC WORK		
Practical Skill Demonstration				✓	<ul style="list-style-type: none"> Prepare to carry out HVAC work 		
Knowledge Assessment	✓	✓			<ul style="list-style-type: none"> Answer all questions your assessor may have during the practical assessment. 		
Other Requirements					<ul style="list-style-type: none"> N/A 		

2

CANDIDATE ASSESSMENT

Candidate's Name..... Father's Name

ALL WORK ASSESSED IN THIS COMPETENCY STANDARD MUST BE YOUR OWN WORK.

GUIDANCE TO CANDIDATE

To meet this standard you are required to complete the following tasks within **half an hour** timeframe:

Just imagine that you have to remove the indoor of domestic HVAC unit and you have to perform the following task to carry out this HVAC work.

- Select and perform maintenance on tools, equipment and consumables

Important Note: The following general performance criteria will be followed and performed in all the tasks (where applicable) by the candidate in order to meet this standard.

- ✓ Follow health and safety procedure as per the requirements of given task
- ✓ Prepare work station as per the requirements of task
- ✓ Select tools/ equipment as per the requirements of task
- ✓ Report to supervisor in case of any contingency after taking necessary actions
- ✓ Complete the work by following sequence of operations
- ✓ Perform task(s) within standard timeframe

ACTIVITIES	CANDIDATE RESPONSE
<p>1. Complete practical task of 'Initiating HVAC Work' under observation by an assessor</p>	<p>During a practical assessment, under observation by an assessor, I will correctly:</p> <ul style="list-style-type: none"> • Select and perform maintenance on tools, equipment and consumables <ul style="list-style-type: none"> ✓ Select and wear personal protective clothing and equipment (PPE) before initiating HVAC work ✓ Select all the tools, equipment and consumables before initiating HVAC work ✓ Service and replace the damaged tools, equipment and consumables before initiating HVAC work • General performance criteria: <ul style="list-style-type: none"> ✓ Follow health and safety procedure as per the requirements of given task ✓ Prepare work station as per the requirements of task ✓ Select tools/ equipment as per the requirements of task ✓ Report to supervisor in case of any contingency after taking necessary actions ✓ Complete the work by following sequence of operations ✓ Perform task(s) within standard timeframe
<p>2. Answer any questions your assessor may have during the practical assessment</p>	<p>My answers to questions are correct and demonstrate my understanding of the topics and their application.</p>

3

ASSESSOR JUDGEMENT GUIDE

Candidate's Name Father's Name.....

INSTRUCTIONS FOR ASSESSOR

This section contains minimum evidence requirements. Oral questioning may be used to clarify candidate understanding of the topic and its application.

ACTIVITIES	MINIMUM EVIDENCE REQUIRED	YES	NO	ASSESSOR COMMENTS
1. Complete practical task of 'Initiating HVAC Work' under observation by an assessor	During a practical assessment, under observation by an assessor, the candidate correctly carried out the following tasks:			
Select and perform maintenance on tools, equipment and consumables	Selected and wore personal protective clothing and equipment (PPE) before initiating HVAC work			
	Selected all the tools, equipment and consumables before initiating HVAC work			
	Serviced and replaced the damaged tools, equipment and consumables before initiating HVAC work			
General performance criteria	Followed health and safety procedure as per the requirements of given task			
	Prepared work station as per the requirements of task			
	Selected tools/ equipment as per the requirements of task			
	Reported to supervisor in case of any contingency after taking necessary actions			
	Completed the work by following sequence of operations			
	Performed task(s) within standard timeframe			

<p>2. Answer any questions the assessor may have during the practical assessment</p>	<p>Candidate's answers to questions are correct and demonstrate understanding of the topics and their application.</p> <p>Assessor to document below all questions asked and candidate answers. Use extra sheets if required and attach.</p>			
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4

LIST OF TOOLS, EQUIPMENT, MATERIAL AND CONTEXT OF ASSESSMENT

INSTRUCTIONS	<p>This section contains information regarding;</p> <ul style="list-style-type: none"> Context of the assessment List of required tools and equipment. List of consumable items required during the service
1. Context of Assessment	This task will be performed in real time environment.

2. List of tools and equipment required (for five candidates)		
S. No	Items	Quantity
1	Personal protective equipment (PPE)	5
2	Complete tool kit	5
3	Testing equipment (complete range)	5

3. List of consumable items required (for five candidates)		
S. No	Items	Quantity
1	Insulation tapes	5
2	WD40	5
3	Emery papers/sandpapers	5
4	Cotton gloves	5
5	Masks	5
6	Hair covering caps	5
7	Plastic of Paris	5 Kg
8	Rug cloth	5 pieces



ASSESSMENT MATERIAL	<h1>INSTALL HVAC UNIT</h1>																																													
EVIDENCE GUIDE																																														
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1

ASSESSMENT SUMMARY & RECORD

ACTIVITY	METHOD				DESIRED OUTCOMES	RESULT	
	WRITTEN	ORAL	PORTFOLIO	OBSERVATION		COMPETENT	NOT YET COMPETENT
NATURE OF ACTIVITY					DESIRED OUTCOMES FOR SUCCESSFUL ASSESSMENT OF COMPETENCY STANDARD: INSTALL AND VERIFY HVAC UNITS		
Practical Skill Demonstration				✓	<ul style="list-style-type: none"> Install the domestic HVAC Unit 		
Knowledge Assessment	✓	✓			<ul style="list-style-type: none"> Answer all questions your assessor may have during the practical assessment. 		
Other Requirements					<ul style="list-style-type: none"> N/A 		

2

CANDIDATE ASSESSMENT

Candidate's Name..... Father's Name

ALL WORK ASSESSED IN THIS COMPETENCY STANDARD MUST BE YOUR OWN WORK.

GUIDANCE TO CANDIDATE

To meet this standard you are required to complete the following tasks within **four hours** timeframe:

- Install domestic HVAC unit on the given iron stand/wall/roof/floor
- Measure the refrigerant running pressure in the installed HVAC unit

Important Note: The following general performance criteria will be followed and performed in all the tasks (where applicable) by the candidate in order to meet this standard.

- ✓ Follow health and safety procedure as per the requirements of given task
- ✓ Prepare work station as per the requirements of task
- ✓ Select tools/ equipment as per the requirements of task
- ✓ Report to supervisor in case of any contingency after taking necessary actions
- ✓ Complete the work by following sequence of operations
- ✓ Perform task(s) within standard timeframe

ACTIVITIES	CANDIDATE RESPONSE
<p>1. Complete practical task of 'Installing HVAC Unit' under observation by an assessor</p>	<p>During a practical assessment, under observation by an assessor, I will correctly:</p> <ul style="list-style-type: none"> • Install domestic HVAC unit on the given iron stand/wall/roof/floor <ul style="list-style-type: none"> ✓ Select and wear personal protective clothing and equipment (PPE) before initiating HVAC work ✓ Select all the tools, equipment and consumables before initiating HVAC work ✓ Mark the measurements of the installation area of the indoor and outdoor HVAC units ✓ Drill the marked area for the installation of HVAC unit ✓ Place and adjust the hanging plate for the indoor unit ✓ Hang the indoor unit on the hanging plate ✓ Install the wall brackets for the outdoor unit ✓ Connect the refrigerant piping between the indoor and outdoor units ✓ Install the control wiring from indoor unit to outdoor unit ✓ Wrap the refrigerant piping, control wiring and drain pipe of the unit ✓ Connect unit to the power supply • Measure the refrigerant running pressure in the installed HVAC unit <ul style="list-style-type: none"> ✓ Remove the dead cap on suction service valve ✓ Connect the low pressure gauge on suction service valve ✓ Connect common port of the gauge manifold to the refrigerant cylinder ✓ Purge the common port pipe with the refrigerant ✓ Charge the refrigerant to complete the running pressure • General performance criteria: <ul style="list-style-type: none"> ✓ Follow health and safety procedure as per the requirements of given task ✓ Prepare work station as per the requirements of task ✓ Select tools/ equipment as per the requirements of task ✓ Report to supervisor in case of any contingency after taking necessary actions ✓ Complete the work by following sequence of operations ✓ Perform task(s) within standard timeframe

2. Answer any questions your assessor may have during the practical assessment	My answers to questions are correct and demonstrate my understanding of the topics and their application.
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3

ASSESSOR JUDGEMENT GUIDE

Candidate's Name Father's Name.....

INSTRUCTIONS FOR ASSESSOR

This section contains minimum evidence requirements. Oral questioning may be used to clarify candidate understanding of the topic and its application.

ACTIVITIES	MINIMUM EVIDENCE REQUIRED	YES	NO	ASSESSOR COMMENTS
1. Complete practical task of 'Installing and verifying HVAC Unit' under observation by an assessor	During a practical assessment, under observation by an assessor, the candidate correctly carried out the following tasks:			
Install domestic HVAC unit on the given iron stand/wall/roof/floor	Selected and wore personal protective clothing and equipment (PPE) before initiating HVAC work			
	Selected all the tools, equipment and consumables before initiating HVAC work			
	Marked the measurements of the installation area of the indoor and outdoor HVAC units			
	Drilled the marked area for the installation of HVAC unit			
	Placed and adjusted the hanging plate for the indoor unit			
	Hanged the indoor unit on the hanging plate			
	Installed the wall brackets for the outdoor unit			
	Connected the refrigerant piping between the indoor and outdoor units			
	Installed the control wiring from indoor unit to outdoor unit			
	Wrapped the refrigerant piping, control wiring and drain pipe of the unit			
	Connected unit to the power supply			
Measure the refrigerant running pressure in the installed HVAC unit	Removed the dead cap on suction service valve			
	Connected the low pressure gauge on suction service valve			
	Connected common port of the gauge manifold to the refrigerant cylinder			
	Purged the common port pipe with the refrigerant			
	Charged the refrigerant to complete the running pressure			
General performance criteria	Followed health and safety procedure as per the requirements of given task			
	Prepared work station as per the requirements of task			
	Selected tools/ equipment as per the requirements of task			
	Reported to supervisor in case of any contingency after taking necessary actions			
	Completed the work by following sequence of operations			
	Performed task(s) within standard timeframe			

<p>2. Answer any questions the assessor may have during the practical assessment</p>	<p>Candidate's answers to questions are correct and demonstrate understanding of the topics and their application.</p> <p>Assessor to document below all questions asked and candidate answers. Use extra sheets if required and attach.</p>			
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4

LIST OF TOOLS, EQUIPMENT, MATERIAL AND CONTEXT OF ASSESSMENT

INSTRUCTIONS	<p>This section contains information regarding:</p> <ul style="list-style-type: none"> Context of the assessment List of required tools and equipment. List of consumable items required during the service
1. Context of Assessment	This task will be performed in real time environment.

2. List of tools and equipment required (for five candidates)		
S. No	Items	Quantity
1	Personal protective equipment (PPE)	5
2	Complete tool kit	5
3	Testing equipment (complete range)	5
4	Hand blowers	5
5	Silicone guns	5
6	Electric hand drill machines with drill bit set	5
7	Circuit breakers	5
8	Vacuum pumps	5
9	Electronic leak detectors	5
10	Velocity meters	5
11	Compressor service valve ratchet wrenches	5
12	Clamp on meters	5

3. List of consumable items required (for five candidates)		
S. No	Items	Quantity
1	Refrigerant R 22	1 cylinder
2	Copper pipe 3/8 inch	1 coil
3	Pipe insulation 3/8 inch	50 feet
4	Sealing material (Plastic of Paris)	5 packs
5	Mounting pads	5 sets
6	Pipe clamps	5 dozens
7	PVC drain pipe	50 feet
8	Electric cables (2 core)	1 coil
9	Cable clamps	5 dozens
10	Insulating tapes	5
11	Masking tapes	5
12	Copper pipe 5/8 inch	1 coil
13	Pipe insulation 5/8 inch	50 feet
14	Wrapping tapes	5
15	Cleaning brushes	5
16	Detergent powder	5 packs
17	WD40	5
18	Emery papers/sandpapers	5
19	Cotton gloves	5
20	Masks	5
21	Hair covering caps	5
22	Rug cloth	5 pieces
23	Silicone tubes	5
24	Rawlbolts	30 bolts

25	Nuts, bolts, washers (12 mm)	20 each
26	Rawplugs	5 packets
27	Cable ties	5 packets
28	Thread seal tapes	5



ASSESSMENT MATERIAL EVIDENCE GUIDE	<h1>REMOVE EXISTING HVAC UNIT</h1>
Qualification Heat Ventilation & Air Conditioning CS Code: Level: 2 Credit: 10 Version: 1	

CONTENTS	1. Assessment Summary and Record 2. Candidate Assessment 3. Assessor Judgment Guide 4. List of required tools/equipment, material and context of assessment
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ASSESSMENT AND ASSESSOR DETAILS	Competent <input type="checkbox"/> Not Yet Competent <input type="checkbox"/>																		
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ASSESSMENT SUMMARY & RECORD

ACTIVITY	METHOD				DESIRED OUTCOMES	RESULT	
	WRITTEN	ORAL	PORTFOLIO	OBSERVATION		COMPETENT	NOT YET COMPETENT
NATURE OF ACTIVITY					DESIRED OUTCOMES FOR SUCCESSFUL ASSESSMENT OF COMPETENCY STANDARD: REMOVE EXISTING HVAC UNIT		
Practical Skill Demonstration				✓	<ul style="list-style-type: none"> Remove the existing domestic HVAC unit 		
Knowledge Assessment	✓	✓			<ul style="list-style-type: none"> Answer all questions your assessor may have during the practical assessment. 		
Other Requirements					<ul style="list-style-type: none"> N/A 		

2

CANDIDATE ASSESSMENT

Candidate's Name..... Father's Name

ALL WORK ASSESSED IN THIS COMPETENCY STANDARD MUST BE YOUR OWN WORK.

GUIDANCE TO CANDIDATE

To meet this standard you are required to complete the following tasks within **one & a half hours** timeframe:

- Store the refrigerant of the domestic HVAC unit
- Remove the domestic HVAC unit from the iron stand/wall/roof/floor

Important Note: The following general performance criteria will be followed and performed in all the tasks (where applicable) by the candidate in order to meet this standard.

- ✓ Follow health and safety procedure as per the requirements of given task
- ✓ Prepare work station as per the requirements of task
- ✓ Select tools/ equipment as per the requirements of task
- ✓ Report to supervisor in case of any contingency after taking necessary actions
- ✓ Complete the work by following sequence of operations
- ✓ Perform task(s) within standard timeframe

ACTIVITIES	CANDIDATE RESPONSE
<p>1. Complete practical task of 'Removing Existing HVAC Unit' under observation by an assessor</p>	<p>During a practical assessment, under observation by an assessor, I will correctly:</p> <ul style="list-style-type: none"> • Store the refrigerant of the domestic HVAC unit <ul style="list-style-type: none"> ✓ Select and wear personal protective clothing and equipment (PPE) before initiating HVAC work ✓ Select all the tools, equipment and consumables before initiating HVAC work ✓ Turn on the HVAC unit in running condition ✓ Remove the dead cap from the suction service valve ✓ Connect the low pressure gauge on suction service valve ✓ Shut down the liquid service valve with the help of the Allen key ✓ Note the low pressure gauge until it reaches the evacuate reading ✓ Shut down the suction service valve with the help of the Allen key ✓ Shut down the HVAC unit ✓ Disconnect the low pressure gauge from the suction service valve ✓ Put the dead cap back on the suction service valve • Remove the domestic HVAC unit from the iron stand/wall/roof/floor <ul style="list-style-type: none"> ✓ Disconnect the power supply of the unit ✓ Unwrap the refrigerant piping, control wiring and drain pipe of the unit ✓ Uninstall the control wiring of the indoor and outdoor units ✓ Disconnect the refrigerant piping between indoor and outdoor units ✓ Remove the outdoor unit from the wall brackets ✓ Remove the wall brackets from the iron stand/wall/roof/floor ✓ Remove the indoor unit from the hanging plate ✓ Remove the hanging plate from the iron stand/wall/roof/floor • General performance criteria: <ul style="list-style-type: none"> ✓ Follow health and safety procedure as per the requirements of given task ✓ Prepare work station as per the requirements of task ✓ Select tools/ equipment as per the requirements of task ✓ Report to supervisor in case of any contingency after taking necessary actions ✓ Complete the work by following sequence of operations

	✓ Perform task(s) within standard timeframe
2. Answer any questions your assessor may have during the practical assessment	My answers to questions are correct and demonstrate my understanding of the topics and their application.

3

ASSESSOR JUDGEMENT GUIDE

Candidate's NameFather's Name.....

INSTRUCTIONS FOR ASSESSOR

This section contains minimum evidence requirements. Oral questioning may be used to clarify candidate understanding of the topic and its application.

ACTIVITIES	MINIMUM EVIDENCE REQUIRED	YES	NO	ASSESSOR COMMENTS
1. Complete practical task of 'Removing Existing HVAC Unit' under observation by an assessor	During a practical assessment, under observation by an assessor, the candidate correctly carried out the following tasks:			
Store the refrigerant of the domestic HVAC unit	Select and wear personal protective clothing and equipment (PPE) before initiating HVAC work			
	Select all the tools, equipment and consumables before initiating HVAC work			
	Turn on the HVAC unit in running condition			
	Remove the dead cap from the suction service valve			
	Connect the low pressure gauge on suction service valve			
	Shut down the liquid service valve with the help of the Allen key			
	Note the low pressure gauge until it reaches the evacuate reading			
	Shut down the suction service valve with the help of the Allen key			
	Shut down the HVAC unit			
	Disconnect the low pressure gauge from the suction service valve			
	Put the dead cap back on the suction service valve			
Remove the domestic HVAC unit from the iron stand/wall/roof/floor	Disconnect the power supply of the unit			
	Unwrap the refrigerant piping, control wiring and drain pipe of the unit			
	Uninstall the control wiring of the indoor and outdoor units			
	Disconnect the refrigerant piping between indoor and outdoor units			
	Remove the outdoor unit from the wall brackets			
	Remove the wall brackets from the iron stand/wall/roof/floor			
	Remove the indoor unit from the hanging plate			
	Remove the hanging plate from the iron stand/wall/roof/floor			
General performance criteria	Followed health and safety procedure as per the requirements of given task			
	Prepared work station as per the requirements of task			
	Selected tools/ equipment as per the requirements of task			
	Reported to supervisor in case of any contingency after taking necessary actions			

	Completed the work by following sequence of operations			
	Performed task(s) within standard timeframe			

<p>2. Answer any questions the assessor may have during the practical assessment</p>	<p>Candidate's answers to questions are correct and demonstrate understanding of the topics and their application.</p> <p>Assessor to document below all questions asked and candidate answers. Use extra sheets if required and attach.</p>			
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4

LIST OF TOOLS, EQUIPMENT, MATERIAL AND CONTEXT OF ASSESSMENT

INSTRUCTIONS	<p>This section contains information regarding;</p> <ul style="list-style-type: none"> Context of the assessment List of required tools and equipment. List of consumable items required during the service
1. Context of Assessment	This task will be performed in real time environment.

2. List of tools and equipment required (for five candidates)		
S. No	Items	Quantity
1	Personal protective equipment (PPE)	5
2	Complete tool kit	5
3	Testing equipment (complete range)	5
4	Compressor service valve ratchet wrench	5
5	Clamp on meters	5
6	Electronic leak detectors	5

3. List of consumable items required (for five candidates)		
S. No	Items	Quantity
1	Sealing material (Plastic of Paris)	5 packs
2	Insulating tapes	5
3	Masking tapes	5
4	Cleaning brushes	5
5	Detergent powder	5 packs
6	WD40	5
7	Emery papers/sandpapers	5
8	Cotton gloves	5
9	Masks	5
10	Hair covering caps	5
11	Rug cloth	5 pieces



ASSESSMENT MATERIAL

EVIDENCE GUIDE

Qualification
Heat Ventilation & Air Conditioning
CS Code:
Level: 2
Credit: 14
Version: 1

REPAIR REFRIGERATION CYCLE

CONTENTS

1. Assessment Summary and Record
2. Candidate Assessment
3. Assessor Judgment Guide
4. List of required tools/equipment, material and context of assessment

ASSESSMENT AND ASSESSOR DETAILS

Competent	<input type="checkbox"/>	Not Yet Competent	<input type="checkbox"/>																			
Assessment	<input type="checkbox"/>	Re-Assessment	<input type="checkbox"/>																			
Assessor's Name _____		Assessor's Code _____																				
Assessor's Signature _____		Date																				
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		DD	MM																			
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CANDIDATE DETAILS

Candidate's Name

First Name
Last Name

Father's Name _____

Institute Name and District _____

CNIC/BFORM #

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Registration Number issued by Assessment Body _____

Gender

Male Female Transgender

Candidate's Consent

Candidate's Signature _____

I agree to the time and date of the assessment and am aware of the requirements of the assessment. I fully understand my rights of appeal.

ASSESSMENT RESULTS SUMMARY FORM

You can use this coversheet as an *Assessment Results Summary Form*. Simply post a photocopy of this completed coversheet to NAVTTC

NAVTTTC OFFICE ONLY

1. DATE FORM RECEIVED:	2. DATE ENTERED INTO DATABASE:																
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DD MM YYYY	DD MM YYYY																

1

ASSESSMENT SUMMARY & RECORD

ACTIVITY	METHOD				DESIRED OUTCOMES	RESULT	
	WRITTEN	ORAL	PORTFOLIO	OBSERVATION		COMPETENT	NOT YET COMPETENT
NATURE OF ACTIVITY					DESIRED OUTCOMES FOR SUCCESSFUL ASSESSMENT OF COMPETENCY STANDARD: REPAIR REFRIGERATION CYCLE		
Practical Skill Demonstration				✓	<ul style="list-style-type: none"> Repair the refrigeration cycle of the domestic HVAC unit 		
Knowledge Assessment	✓	✓			<ul style="list-style-type: none"> Answer all questions your assessor may have during the practical assessment. 		
Other Requirements					<ul style="list-style-type: none"> N/A 		

2

CANDIDATE ASSESSMENT

Candidate's Name.....Father's Name

ALL WORK ASSESSED IN THIS COMPETENCY STANDARD MUST BE YOUR OWN WORK.

GUIDANCE TO CANDIDATE

To meet this standard you are required to complete any one (given by the assessor) of the following tasks within **three and a half hours** timeframe:

- Replace the compressor of the outdoor unit of the domestic HVAC unit
- Repair leaked condenser of the outdoor unit of the domestic HVAC unit
- Replace the choked refrigerant control of the outdoor unit of the domestic HVAC unit
- Repair leaked evaporator of the indoor unit of the domestic HVAC unit

Important Note: The following general performance criteria will be followed and performed in all the tasks (where applicable) by the candidate in order to meet this standard.

- ✓ Follow health and safety procedure as per the requirements of given task
- ✓ Prepare work station as per the requirements of task
- ✓ Select tools/ equipment as per the requirements of task
- ✓ Report to supervisor in case of any contingency after taking necessary actions
- ✓ Complete the work by following sequence of operations
- ✓ Perform task(s) within standard timeframe

ACTIVITIES	CANDIDATE RESPONSE
<p>1. Complete practical task of 'Repairing Refrigeration Cycle' under observation by an assessor</p>	<p>During a practical assessment, under observation by an assessor, I will correctly:</p> <ul style="list-style-type: none"> • Replace the compressor of the outdoor unit of the domestic HVAC unit <ul style="list-style-type: none"> ✓ Select and wear personal protective clothing and equipment (PPE) before initiating HVAC work ✓ Select all the tools, equipment and consumables before initiating HVAC work ✓ Remove the outdoor unit of the domestic HVAC unit on the table or floor ✓ Open and remove all body parts of the outdoor unit ✓ Recover and store the refrigerant of the disable domestic HVAC unit ✓ Remove all electric connections and cut all the compressor pipes from the outdoor unit ✓ Remove the faulty compressor from the foundation of the outdoor unit ✓ Fit the new compressor on the foundation of the outdoor unit ✓ Gas weld all the compressor pipes of the outdoor unit ✓ Conduct leak test of the gas weld area ✓ Reconnect all the electric connections of the compressor of the outdoor unit • Repair leaked condenser of the outdoor unit of the domestic HVAC unit <ul style="list-style-type: none"> ✓ Cut all the condenser pipes from the outdoor unit ✓ Remove the leaked condenser from the foundation of the outdoor unit ✓ Gas weld the process tube to attach it with the leaked condenser ✓ Seal the second pipe of the leaked condenser ✓ Conduct the leak test of the leaked condenser ✓ Mark the leakage area and purge the air pressure of the leaked condenser ✓ Clean the leakage area of the leaked condenser with the Emery cloth ✓ Gas weld the leakage are of the leaked condenser ✓ Inspect the gas weld area of the condenser ✓ Fit the condenser on the foundation of the outdoor unit ✓ Connect all the condenser pipes of the outdoor unit with the help of gas weld • Replace the choked refrigerant control of the outdoor unit of the domestic HVAC unit <ul style="list-style-type: none"> ✓ Remove the choked refrigerant control from the outdoor unit

	<ul style="list-style-type: none"> ✓ Gas weld both sides of the new refrigerant control in the outdoor unit ✓ Inspect the gas weld area of the refrigerant control ✓ Reassemble all the body parts of the outdoor unit ✓ Place back the outdoor unit of the domestic HVAC unit • Repair leaked evaporator of the indoor unit of the domestic HVAC unit <ul style="list-style-type: none"> ✓ Remove the indoor unit of the domestic HVAC unit on the table or floor ✓ Open and remove all body parts of the indoor unit ✓ Cut all the evaporator pipes from the indoor unit ✓ Remove the leaked evaporator from the foundation of the indoor unit ✓ Gas weld the process tube to attach it with the leaked evaporator ✓ Seal the second pipe of the leaked evaporator ✓ Conduct the leak test of the leaked evaporator ✓ Mark the leakage area and purge the air pressure of the leaked evaporator ✓ Clean the leakage area of the leaked evaporator with the Emery cloth ✓ Gas weld the leakage are of the leaked evaporator ✓ Inspect the gas weld area of the evaporator ✓ Fit the evaporator on the foundation of the indoor unit ✓ Connect all the evaporator pipes of the indoor unit with the help of gas weld ✓ Fit the evaporator on the foundation of the indoor unit ✓ Reassemble all the body parts of the indoor unit ✓ Place back the indoor unit of the domestic HVAC unit • General performance criteria: <ul style="list-style-type: none"> ✓ Follow health and safety procedure as per the requirements of given task ✓ Prepare work station as per the requirements of task ✓ Select tools/ equipment as per the requirements of task ✓ Report to supervisor in case of any contingency after taking necessary actions ✓ Complete the work by following sequence of operations ✓ Perform task(s) within standard timeframe
<p>2. Answer any questions your assessor may have during the practical assessment</p>	<p>My answers to questions are correct and demonstrate my understanding of the topics and their application.</p>

3

ASSESSOR JUDGEMENT GUIDE

Candidate's NameFather's Name.....

INSTRUCTIONS FOR ASSESSOR

This section contains minimum evidence requirements. Oral questioning may be used to clarify candidate understanding of the topic and its application.

ACTIVITIES	MINIMUM EVIDENCE REQUIRED	YES	NO	ASSESSOR COMMENTS
1. Complete practical task of 'Repairing Refrigeration Cycle' under observation by an assessor	During a practical assessment, under observation by an assessor, the candidate correctly carried out the following tasks:			
Replace the compressor of the outdoor unit of the domestic HVAC unit	Selected and wore personal protective clothing and equipment (PPE) before initiating HVAC work			
	Selected all the tools, equipment and consumables before initiating HVAC work			
	Removed the outdoor unit of the domestic HVAC unit on the table or floor			
	Opened and removed all body parts of the outdoor unit			
	Recovered and stored the refrigerant of the disable domestic HVAC unit			
	Removed all electric connections and cut all the compressor pipes from the outdoor unit			
	Removed the faulty compressor from the foundation of the outdoor unit			
	Fit the new compressor on the foundation of the outdoor unit			
	Gas welded all the compressor pipes of the outdoor unit			
	Conducted leak test of the gas weld area			
	Reconnected all the electric connections of the compressor of the outdoor unit			
Repair leaked condenser of the outdoor unit of the domestic HVAC unit	Cut all the condenser pipes from the outdoor unit			
	Removed the leaked condenser from the foundation of the outdoor unit			
	Gas welded the process tube to attach it with the leaked condenser			
	Sealed the second pipe of the leaked condenser			
	Conducted the leak test of the leaked condenser			
	Marked the leakage area and purged the air pressure of the leaked condenser			
	Cleaned the leakage area of the leaked condenser with the Emery cloth			
	Gas welded the leakage are of the leaked condenser			
	Inspected the gas weld area of the condenser			
	Fit the condenser on the foundation of the outdoor unit			
	Connected all the condenser pipes of the outdoor unit with the help of gas weld			

Replace the choked refrigerant control of the outdoor unit of the domestic HVAC unit	Removed the choked refrigerant control from the outdoor unit			
	Gas welded both sides of the new refrigerant control in the outdoor unit			
	Inspected the gas weld area of the refrigerant control			
	Reassembled all the body parts of the outdoor unit			
	Placed back the outdoor unit of the domestic HVAC unit			
Repair leaked evaporator of the indoor unit of the domestic HVAC unit	Removed the indoor unit of the domestic HVAC unit on the table or floor			
	Opened and removed all body parts of the indoor unit			
	Cut all the evaporator pipes from the indoor unit			
	Removed the leaked evaporator from the foundation of the indoor unit			
	Gas welded the process tube to attach it with the leaked evaporator			
	Sealed the second pipe of the leaked evaporator			
	Conducted the leak test of the leaked evaporator			
	Marked the leakage area and purged the air pressure of the leaked evaporator			
	Cleaned the leakage area of the leaked evaporator with the Emery cloth			
	Gas welded the leakage are of the leaked evaporator			
	Inspected the gas weld area of the evaporator			
	Fit the evaporator on the foundation of the indoor unit			
	Connected all the evaporator pipes of the indoor unit with the help of gas weld			
	Fit the evaporator on the foundation of the indoor unit			
	Reassembled all the body parts of the indoor unit			
Placed back the indoor unit of the domestic HVAC unit				
General performance criteria	Followed health and safety procedure as per the requirements of given task			
	Prepared work station as per the requirements of task			
	Selected tools/ equipment as per the requirements of task			
	Reported to supervisor in case of any contingency after taking necessary actions			
	Completed the work by following sequence of operations			
	Performed task(s) within standard timeframe			

<p>2. Answer any questions the assessor may have during the practical assessment</p>	<p>Candidate's answers to questions are correct and demonstrate understanding of the topics and their application.</p> <p>Assessor to document below all questions asked and candidate answers. Use extra sheets if required and attach.</p>			
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4

LIST OF TOOLS, EQUIPMENT, MATERIAL AND CONTEXT OF ASSESSMENT

INSTRUCTIONS	<p>This section contains information regarding;</p> <ul style="list-style-type: none"> Context of the assessment List of required tools and equipment. List of consumable items required during the service
1. Context of Assessment	This task will be performed in real time environment.

2. List of tools and equipment required (for five candidates)		
S. No	Items	Quantity
1	Personal protective equipment (PPE)	5
2	Complete tool kit	5
3	Testing equipment (complete range)	5
4	Compressor service valve ratchet wrenches	5
5	Clamp on meters	5
6	Aligning tools	5
7	Refrigerant recovery machine	1
8	Compressors	5
9	Gas welding sets	2
10	Inspection mirrors	5
11	Electronic leak detectors	5

3. List of consumable items required (for five candidates)		
S. No	Items	Quantity
1	Refrigerant R 22	1 cylinder
2	Mounting pads	5 sets
3	Electric cables (2 core)	1 coil
4	Insulating tapes	5
5	Masking tapes	5
6	Pipe insulation	5 lengths
7	Wrapping tapes	5
8	Cleaning brushes	5
9	Detergent powder	5 packs
10	WD40	5
11	Emery papers/sandpapers	5
12	Cotton gloves	5
13	Masks	5
14	Hair covering caps	5
15	Rug cloth	5 pieces
16	Silicone tubes	5
17	Nuts, bolts, washers (12 mm)	20 each
18	Thread seal tapes	5
19	Silver soldering rods	1 kg
20	Ignition lighters	5
21	Flux	5 packets
22	Brass rods	1 kg
23	sponges	5



ASSESSMENT MATERIAL EVIDENCE GUIDE	<h1>TEST HVAC UNIT PERFORMANCE</h1>
Qualification Heat Ventilation & Air Conditioning CS Code: Level: 2 Credit: 10 Version: 1	

CONTENTS	1. Assessment Summary and Record 2. Candidate Assessment 3. Assessor Judgment Guide 4. List of required tools/equipment, material and context of assessment
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ASSESSMENT AND ASSESSOR DETAILS	Competent <input type="checkbox"/> Not Yet Competent <input type="checkbox"/>																		
	Assessment <input type="checkbox"/> Re-Assessment <input type="checkbox"/>																		
	Assessor's Name _____ Assessor's Code _____ Assessor's Signature _____ Date <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> <tr> <td style="text-align: center;">DD</td> <td style="text-align: center;">MM</td> <td colspan="6"></td> <td style="text-align: center;">YYYY</td> </tr> </table>											DD	MM						
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CANDIDATE DETAILS	Candidate's Name _____ <small style="display: flex; justify-content: space-between; width: 100%;">First Name Last Name</small>																				
	Father's Name _____																				
	Institute Name and District _____																				
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	Registration Number issued by Assessment Body _____																				
	Gender Male <input type="checkbox"/> Female <input type="checkbox"/> Transgender <input type="checkbox"/>																				
Candidate's Consent Candidate's Signature _____																					

I agree to the time and date of the assessment and am aware of the requirements of the assessment. I fully understand my rights of appeal.

ASSESSMENT RESULTS SUMMARY FORM	You can use this coversheet as an <i>Assessment Results Summary Form</i> . Simply post a photocopy of this completed coversheet to NAVTTC
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1

ASSESSMENT SUMMARY & RECORD

ACTIVITY	METHOD				DESIRED OUTCOMES	RESULT	
	WRITTEN	ORAL	PORTFOLIO	OBSERVATION		COMPETENT	NOT YET COMPETENT
NATURE OF ACTIVITY					DESIRED OUTCOMES FOR SUCCESSFUL ASSESSMENT OF COMPETENCY STANDARD: TEST HVAC UNIT PERFORMANCE		
Practical Skill Demonstration				✓	<ul style="list-style-type: none"> Test and verify HVAC unit performance 		
Knowledge Assessment	✓	✓			<ul style="list-style-type: none"> Answer all questions your assessor may have during the practical assessment. 		
Other Requirements					<ul style="list-style-type: none"> N/A 		

2

CANDIDATE ASSESSMENT

Candidate's Name.....Father's Name

ALL WORK ASSESSED IN THIS COMPETENCY STANDARD MUST BE YOUR OWN WORK.

GUIDANCE TO CANDIDATE

To meet this standard you are required to complete the following tasks within **three hours** timeframe:

- Test and verify the cooling system of the domestic HVAC unit
- Test and verify the heat pump system of the domestic HVAC unit

Important Note: The following general performance criteria will be followed and performed in all the tasks (where applicable) by the candidate in order to meet this standard.

- ✓ Follow health and safety procedure as per the requirements of given task
- ✓ Prepare work station as per the requirements of task
- ✓ Select tools/ equipment as per the requirements of task
- ✓ Report to supervisor in case of any contingency after taking necessary actions
- ✓ Complete the work by following sequence of operations
- ✓ Perform task(s) within standard timeframe

ACTIVITIES	CANDIDATE RESPONSE
<p>1. Complete practical task of 'Testing HVAC Unit Performance' under observation by an assessor</p>	<p>During a practical assessment, under observation by an assessor, I will correctly:</p> <ul style="list-style-type: none"> • Test and verify the cooling system of the domestic HVAC unit <ul style="list-style-type: none"> ✓ Select and wear personal protective clothing and equipment (PPE) before initiating HVAC work ✓ Select all the tools, equipment and consumables before initiating HVAC work ✓ Adjust the unit mode of operation to the cooling system ✓ Test the line voltage, Total current, Earth leakage breaker and Short circuit breaker of the unit in the running condition ✓ Test the running gas pressure of the unit with the help of the Gauge manifold ✓ Measure the CFM and temperature of the running unit with the help of Air Velocity meter and digital thermometer ✓ Test the relative humidity of the conditioned air with the help of Hygrometer ✓ Test the motor performance of the cooling coil ✓ Perform the Compressor Efficiency Test for the suction pressure, discharge pressure, noise level and current • Test and verify the heat pump system of the domestic HVAC unit <ul style="list-style-type: none"> ✓ Adjust the unit mode of operation to the heating system ✓ Measure the fuel supply of the heating system ✓ Adjust the neutral flame of the heating system ✓ Measure the temperature of the combustion chamber ✓ Test the relative humidity of the conditioned air with the help of Hygrometer ✓ Measure and verify water supply to the heating system ✓ Test the water flow switch of the heating system ✓ Measure the CFM of the airflow at the fan outlet ✓ Measure and verify the water temperature of the heating system • General performance criteria: <ul style="list-style-type: none"> ✓ Follow health and safety procedure as per the requirements of given task ✓ Prepare work station as per the requirements of task ✓ Select tools/ equipment as per the requirements of task ✓ Report to supervisor in case of any contingency after taking necessary actions ✓ Complete the work by following sequence of operations

	✓ Perform task(s) within standard timeframe
2. Answer any questions your assessor may have during the practical assessment	My answers to questions are correct and demonstrate my understanding of the topics and their application.

3

ASSESSOR JUDGEMENT GUIDE

Candidate's Name Father's Name.....

INSTRUCTIONS FOR ASSESSOR

This section contains minimum evidence requirements. Oral questioning may be used to clarify candidate understanding of the topic and its application.

ACTIVITIES	MINIMUM EVIDENCE REQUIRED	YES	NO	ASSESSOR COMMENTS
1. Complete practical task of 'Testing HVAC Unit Performance' under observation by an assessor	During a practical assessment, under observation by an assessor, the candidate correctly carried out the following tasks:			
Test and verify the cooling system of the domestic HVAC unit	Selected and wore personal protective clothing and equipment (PPE) before initiating HVAC work			
	Selected all the tools, equipment and consumables before initiating HVAC work			
	Adjusted the unit mode of operation to the cooling system			
	Tested the line voltage, Total current, Earth leakage breaker and Short circuit breaker of the unit in the running condition			
	Tested the running gas pressure of the unit with the help of the Gauge manifold			
	Measured the CFM and temperature of the running unit with the help of Air Velocity meter and digital thermometer			
	Tested the relative humidity of the conditioned air with the help of Hygrometer			
	Tested the motor performance of the cooling coil			
Test and verify the heat pump system of the domestic HVAC unit	Adjusted the unit mode of operation to the heating system			
	Measured the fuel supply of the heating system			
	Adjusted the neutral flame of the heating system			
	Measured the temperature of the combustion chamber			
	Tested the relative humidity of the conditioned air with the help of Hygrometer			
	Measured and verified water supply to the heating system			
	Tested the water flow switch of the heating system			
	Measured the CFM of the airflow at the fan outlet			
General performance criteria	Followed health and safety procedure as per the requirements of given task			
	Prepared work station as per the requirements of task			
	Selected tools/ equipment as per the requirements of task			
	Reported to supervisor in case of any contingency after taking necessary actions			
	Completed the work by following sequence of operations			
	Performed task(s) within standard timeframe			

<p>2. Answer any questions the assessor may have during the practical assessment</p>	<p>Candidate's answers to questions are correct and demonstrate understanding of the topics and their application.</p> <p>Assessor to document below all questions asked and candidate answers. Use extra sheets if required and attach.</p>			
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4

LIST OF TOOLS, EQUIPMENT, MATERIAL AND CONTEXT OF ASSESSMENT

INSTRUCTIONS	<p>This section contains information regarding;</p> <ul style="list-style-type: none"> • Context of the assessment • List of required tools and equipment. • List of consumable items required during the service
1. Context of Assessment	This task will be performed in real time environment.

2. List of tools and equipment required(for five candidates)		
S. No	Items	Quantity
1	Personal protective equipment (PPE)	5
2	Complete tool kit	5
3	Testing equipment (complete range)	5
4	Clamp on meters	5
5	Gauge manifolds	5
6	Air velocity meters	5
7	Hygrometers	5
8	Tachometers	5
9	dB meters	5
10	Thermometers	5
11	Sling psychrometers	5
12	Alignment tools	5
13	Vibration testers	5
14	Fuel gauge	5
15	High temperature thermometers	5
16	Neutral flame testers	5
17	Water flow meters	5

3. List of consumable items required (for five candidates)		
S. No	Items	Quantity
1	Psychrometer charts	5
2	Sealing material (Plastic of Paris)	5 packs
3	Mounting pads	5 sets
4	Insulating tapes	5
5	Masking tapes	5
6	Cleaning brushes	5
7	Detergent powder	5 packs
8	WD40	5
9	Emery papers/sandpapers	5
10	Cotton gloves	5
11	Masks	5
12	Hair covering caps	5
13	Rug cloth	5 pieces
14	Silicone tubes	5
15	Thread seal tapes	5
16	Lubricant oil	5 cans
17	Ignition lighters	5



ASSESSMENT MATERIAL

EVIDENCE GUIDE

Qualification
Heat Ventilation & Air Conditioning
CS Code:
Level: 2
Credit: 14
Version: 1

CONDUCT PREVENTIVE MAINTENANCE ON HVAC EQUIPMENT

CONTENTS

1. Assessment Summary and Record
2. Candidate Assessment
3. Assessor Judgment Guide
4. List of required tools/equipment, material and context of assessment

ASSESSMENT AND ASSESSOR DETAILS

Competent	<input type="checkbox"/>	Not Yet Competent	<input type="checkbox"/>																				
Assessment	<input type="checkbox"/>	Re-Assessment	<input type="checkbox"/>																				
Assessor's Name		Assessor's Code																					
Assessor's Signature		Date																					
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		DD	MM																				
		YYYY																					

CANDIDATE DETAILS

Candidate's Name First Name Last Name

Father's Name

Institute Name and District

CNIC/BFORM #

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Registration Number issued by Assessment Body

Gender Male Female Transgender

Candidate's Consent I agree to the time and date of the assessment and am aware of the requirements of the assessment. I fully understand my rights of appeal.

Candidate's Signature

ASSESSMENT RESULTS SUMMARY FORM

You can use this coversheet as an *Assessment Results Summary Form*. Simply post a photocopy of this completed coversheet to NAVTTC

NAVTTTC OFFICE ONLY

1. DATE FORM RECEIVED:	2. DATE ENTERED INTO DATABASE:																				
<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>											<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>										
DD MM YYYY	DD MM YYYY																				

1

ASSESSMENT SUMMARY & RECORD

ACTIVITY	METHOD				DESIRED OUTCOMES	RESULT	
	WRITTEN	ORAL	PORTFOLIO	OBSERVATION		COMPETENT	NOT YET COMPETENT
NATURE OF ACTIVITY					DESIRED OUTCOMES FOR SUCCESSFUL ASSESSMENT OF COMPETENCY STANDARD: CONDUCT PREVENTIVE MAINTENANCE ON HVAC EQUIPMENT		
Practical Skill Demonstration				✓	<ul style="list-style-type: none"> Conduct preventive maintenance of the cooling and heating system of the domestic HVAC unit 		
Knowledge Assessment	✓	✓			<ul style="list-style-type: none"> Answer all questions your assessor may have during the practical assessment. 		
Other Requirements					<ul style="list-style-type: none"> N/A 		

2

CANDIDATE ASSESSMENT

Candidate's Name.....Father's Name

ALL WORK ASSESSED IN THIS COMPETENCY STANDARD MUST BE YOUR OWN WORK.

GUIDANCE TO CANDIDATE

To meet this standard you are required to complete the following tasks within **four hours** timeframe:

- Conduct preventive maintenance of the cooling and heating system of the domestic HVAC unit

Important Note: The following general performance criteria will be followed and performed in all the tasks (where applicable) by the candidate in order to meet this standard.

- ✓ Follow health and safety procedure as per the requirements of given task
- ✓ Prepare work station as per the requirements of task
- ✓ Select tools/ equipment as per the requirements of task
- ✓ Report to supervisor in case of any contingency after taking necessary actions
- ✓ Complete the work by following sequence of operations
- ✓ Perform task(s) within standard timeframe

ACTIVITIES	CANDIDATE RESPONSE
<p>1. Complete practical task of 'Conducting Preventive Maintenance on HVAC Equipment' under observation by an assessor</p>	<p>During a practical assessment, under observation by an assessor, I will correctly:</p> <ul style="list-style-type: none"> • Conduct preventive maintenance of the cooling and heating system of the domestic HVAC unit <ul style="list-style-type: none"> ✓ Select and wear personal protective clothing and equipment (PPE) before initiating HVAC work ✓ Select all the tools, equipment and consumables before initiating HVAC work ✓ Inspect the cooling and heating components of the unit ✓ Clean evaporator cooling coil, condenser coil and drain pipe of the unit ✓ Dismantle and remove burners and carbon fire nozzle ✓ Dismantle blower assembly and lubricate all moving parts ✓ Clean air filters of the domestic HVAC unit ✓ Test and replace the V-type motor belt of the unit ✓ Test the alignment and tension of the V-type motor belt of the unit • General performance criteria: <ul style="list-style-type: none"> ✓ Follow health and safety procedure as per the requirements of given task ✓ Prepare work station as per the requirements of task ✓ Select tools/ equipment as per the requirements of task ✓ Report to supervisor in case of any contingency after taking necessary actions ✓ Complete the work by following sequence of operations ✓ Perform task(s) within standard timeframe
<p>2. Answer any questions your assessor may have during the practical assessment</p>	<p>My answers to questions are correct and demonstrate my understanding of the topics and their application.</p>

3

ASSESSOR JUDGEMENT GUIDE

Candidate's Name Father's Name.....

INSTRUCTIONS FOR ASSESSOR

This section contains minimum evidence requirements. Oral questioning may be used to clarify candidate understanding of the topic and its application.

ACTIVITIES	MINIMUM EVIDENCE REQUIRED	YES	NO	ASSESSOR COMMENTS
1. Complete practical task of 'Conducting Preventive Maintenance on HVAC Equipment' under observation by an assessor	During a practical assessment, under observation by an assessor, the candidate correctly carried out the following tasks:			
Conduct preventive maintenance of the cooling and heating system of the domestic HVAC unit	Selected and wore personal protective clothing and equipment (PPE) before initiating HVAC work			
	Selected all the tools, equipment and consumables before initiating HVAC work			
	Inspected the cooling and heating components of the unit			
	Cleaned evaporator cooling coil, condenser coil and drain pipe of the unit			
	Dismantled and removed burners and carbon fire nozzle			
	Dismantled blower assembly and lubricated all moving parts			
	Cleaned air filters of the domestic HVAC unit			
	Tested and replaced the V-type motor belt of the unit			
	Tested the alignment and tension of the V-type motor belt of the unit			
General performance criteria	Followed health and safety procedure as per the requirements of given task			
	Prepared work station as per the requirements of task			
	Selected tools/ equipment as per the requirements of task			
	Reported to supervisor in case of any contingency after taking necessary actions			
	Completed the work by following sequence of operations			
	Performed task(s) within standard timeframe			

<p>2. Answer any questions the assessor may have during the practical assessment</p>	<p>Candidate's answers to questions are correct and demonstrate understanding of the topics and their application.</p> <p>Assessor to document below all questions asked and candidate answers. Use extra sheets if required and attach.</p>			
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4

LIST OF TOOLS, EQUIPMENT, MATERIAL AND CONTEXT OF ASSESSMENT


INSTRUCTIONS	<p>This section contains information regarding;</p> <ul style="list-style-type: none"> Context of the assessment List of required tools and equipment. List of consumable items required during the service
1. Context of Assessment	This task will be performed in real time environment.


2. List of tools and equipment required (for five candidates)		
S. No	Items	Quantity
1	Personal protective equipment (PPE)	5
2	Complete tool kit	5
3	Testing equipment (complete range)	5
4	Hand blowers	5
5	Greece guns	5
6	Silicone guns	5
7	Rivet guns	5

3. List of consumable items required (for five candidates)		
S. No	Items	Quantity
1	Cleaning brushes	5
2	Lubricating oil	5 cans
3	Detergent powder	5 packs
4	Motor belts	5
5	Insulation tapes	5
6	WD40	5
7	Emery papers/sandpapers	5
8	Cotton gloves	5
9	Masks	5
10	Hair covering caps	5
11	Plastic of Paris	5 kg
12	Rug cloth	5 pieces
13	Kerosene oil	5 litres
14	Greece	1 kg
15	Silicone tubes	5
16	Synthetic thinner	1 litre
17	Blend rivets	1 packet
18	Nuts, bolts, washers (different standard sizes)	As per requirement

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