

**T Level Technical  
Qualification in  
Building Services  
Engineering for  
Construction**

**Refrigeration  
Engineering**

**Guide standard exemplification material  
Threshold competence – Sample 2021**

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## Introduction

The sample assessment materials within this document refers to the refrigeration engineering sample occupational specialism assignment. The aim of these materials is to provide centres with examples of knowledge, skills and understanding that attest to minimal threshold competence. In this document all exemplar evidence attests as examples of minimal threshold competence. The examples provided do not reflect all evidence from the sample assignment as the focus of this material is the quality and standards that need to be achieved rather than the volume of exemplar evidence provided. However, the examples provided are representative of all tasks in the sample assignment. It is important to note that in live assessments a candidate's performance is very likely to exhibit a spikey profile and standard of performance will vary across tasks. Minimal threshold competence will be based on a synoptic mark across all tasks.

The materials in this GSEM are separated into three sections as described below. Materials are presented against a number of tasks from the assignment.

### Task

This section details the tasks that the candidate has been asked to carry out. What needs to be submitted for marking and any additional evidence required including any photographic evidence. Also referenced in this section are the assessment themes the candidates will be marked against when completing the tasks within it. In addition, candidate evidence that has been included or not been included in this GSEM has been identified within this section.

In this GSEM there is candidate evidence from:

- Task 1
- Task 2
- Task 3
- Task 4

### Candidate evidence

This section includes exemplars of candidates work, photographs of the work in production (or completed) and practical observation records of the assessment completed by centre assessors. This will be actual evidence that was captured as part of the assessment and then internally marked by the centre assessor.

### Commentary

This section includes detailed comments to demonstrate how the candidate evidence attests to the standard of minimal threshold competence by directly correlating to the grade descriptors for this occupational area. Centres can compare the evidence against the performance indicators in the marking grid descriptors within the assessor packs, to provide guidance on the standard of knowledge, skills and understanding that need to be met for minimal threshold competence.

It is important to note that the commentary section is not part of the evidence or assessment but are evaluative statements on how and why that piece of evidence meets a particular standard.

## Grade descriptors

**To achieve a pass (threshold competence) a candidate will be able to:**

Demonstrate an acceptable performance that meets the requirement of the brief and that is required to enter the industry to begin to work in the occupational area.

Demonstrate the adequate technical skills in cutting, bending, fixing pipework, and installing components that is in line with industry standards.

Interpret information, demonstrate planning, assess risk, and follow safe working methods when applying practical skills to an acceptable standard as recognised by industry.

Demonstrate basic knowledge and understanding of the principles and processes required for refrigeration engineering.

Work safely showing an understanding in the selection and use of tools and equipment and demonstrate a basic awareness of straightforward preparation and application processes.

Attempt some complex tasks and the level of performance mostly meets an acceptable level.

Identify routine causes of refrigeration faults and have some knowledge in how to rectify them.

Use industrial terminology most of the time that is accurate in both written and verbal contexts.

## **Task 1 – Design**

(Assessment themes: health and safety, design and planning)

For task 1 candidates need to produce the following pieces of evidence:

- Completed calculation showing all workings

Candidate evidence not included within this GSEM:

N/A

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## Candidate evidence

### Completed calculation showing all workings

HEAT LOADS WALLS ETC.

$$\text{WALLS } 17 \times 3.2 \times 0.19 \times 52 = 537$$

$$\text{FLOOR } 5 \times 3.5 \times 0.25 \times 35 = 153$$

$$\text{ROOF } 5 \times 3.5 \times 0.15 \times 52 = 136$$

$$\text{TOTAL} = 826$$

PROJECT LOAD

$$500 \times 3.2 \times 7 = 11200$$

$$500 \times 230 = 115000$$

$$500 \times 1.7 \times 18 = 15300$$

$$\text{TOTAL} = 141500$$

$$\text{Heat} = \frac{141500}{28800} = 5 \text{ kW}$$

OTHER LOADS

$$\text{DEFROST HEATER: } 5000 \times \frac{1}{24} = 208$$

$$\text{FLOOR HEATER: } 5 \times 3.5 \times 15 = 262$$

$$\text{LIGHTING: } 300 \times \frac{8}{24} = 100$$

$$\text{DOOR HEATER: } = 50$$

$$\text{FAN MOTOR: } 3 \times 550 \times \frac{23}{24} = 1580$$

$$\text{OCCUPATION: } 230 \times 2 \times \frac{4}{24} = 76$$

$$\text{TOTAL ROOM LOAD} = \underline{\underline{8}}$$

## Commentary

The candidate has completed the calculation to within an expected tolerance but not all working out is shown or level of detail provided. This results in design calculations not being as accurate as it could be. The candidate rounded up or down their answers at every stage of the calculation resulting in a final total which is not as accurate as it could be. This can lead to an approximation of the final duty.

Candidate has demonstrated a good level of knowledge and understanding for heat gains to a cold room and how this can impact on design and installation of a refrigeration system. All of the possible heat gains to a room have been considered in calculating the total heat gain and used the data provided to extract the required data to make the calculation.

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## Task 2 – Planning the installation

(Assessment themes: Design and planning, systems and components)

For task 2 candidates need to produce the following pieces of evidence:

- Risk assessment
- Method statement with justifications
- Installation drawing showing all location dimensions of indoor and outdoor units and pipe route
- Materials list
- Measurements and marking out of space allocation/ work area checked against the installation drawing

For illustration, the guided exemplification materials (GSEM) for Task 2 contain examples of candidate evidence for the following assessment requirements only:

- Risk assessment
- Method statement with justifications
- Installation drawing showing all location dimensions of indoor and outdoor units and pipe route
- Materials list

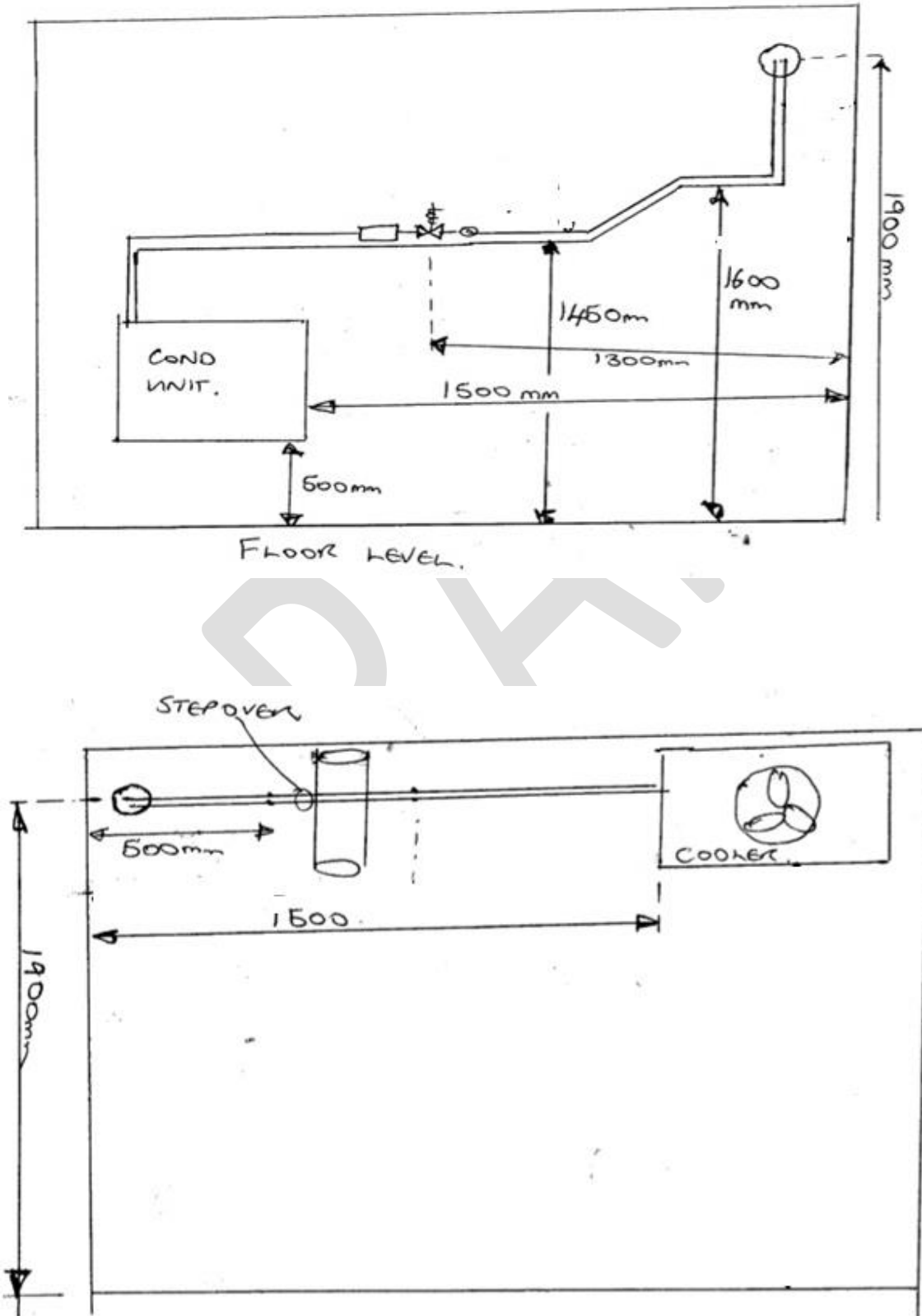
The following task 2 candidate assessment requirements have not been included as example candidate evidence for this version of the guided exemplification materials.

- Assessor observation of measurements and marking out of space allocation/ work area checked against the installation drawing



# Candidate Evidence

## Installation drawings



## Commentary

The candidate has demonstrated good knowledge and understanding through the completion of the drawing considering all the aspects of the design brief. They have correctly identified all the components and made a good attempt to draw pipe layout and pipe sizes.

The completed drawing does have minor inaccuracies. Some dimensions are missing, and the distance of the pipe clips are not clearly displayed but overall drawing is understandable and well presented.

Terminology is not always accurate such as the term cooler which should be labelled as evaporator. The lack of the consistent datum to measure from will mean that the candidate may have to make some adjustments to the installation whilst it is in progress, due to the inconsistencies introduced in the layout.

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## Candidate evidence

### Risk assessment

This risk assessment may be modified by adding items only

<b>Activity: Office installation</b> <b>Location: Office workshop</b>		<b>Date: 23/02/21</b> <b>Position: Candidate</b>						
<b>SEVERITY (S): Degree of harm which may be caused (including numbers affected)</b> <b>1 Minor Injury 2 Major Injury 3 Fatality</b>						<b>RISK RATING (RR):</b> <b>Severity x Likelihood</b>		
<b>LIKELIHOOD (L): Probability that event will occur</b> <b>1 Remote 2 Possible 3 Likely</b>						<b>1-3 Low</b> <b>4-6 Medium</b> <b>7-9 High</b>		
Item No:	Activity:	Hazard	Persons at Risk	Existing Controls (Mitigation)	S 1-3	L 1-3	RR	Are the Risks Controlled?
1	Pipe installation	Slip, Trips, Falls	Operator	Keep work area clean and tidy. Be mindful of other workers around work area	1	1	1	Yes
		Fall from height	Operator, other in work area	Maintain 3 points of contact, barriers, get someone to foot ladder before use and tie off top.	2	1	2	Yes
			Operator	Wear PPE				

		Cuts and grazes			1	1	1	Yes
2	Brazing, jointing pipework	Burns, Fire, Explosion	Operator, others in work area	<p>Wear PPE. Cool down hot joints or put-up warning signs.</p> <p>Remove or protect any flammable materials or surfaces. Have fire extinguisher. Fire watch for 1 hour</p> <p>Check brazing equipment before use.</p>	1	2	2	Yes
3	Manual handling	Muscle strain, crush injury	Operator, others in work area	Use correct lifting technique	1	1	1	Yes
4	Pressure testing	Explosion  Asphyxiation	Operator, others in work area	<p>Check equipment before use. Clear area, barrier off and put up warning signs.</p> <p>Work in well ventilated area only, check with tutor if working in a confined space.</p>	1	2	2	Yes
					1	1	1	Yes

5	Electrical work	Electric shock	Operator, others in work area	Isolate and lock off mains supply, Test supply is dead. Live testing must be supervised.	1	2	2	Yes
6	Commissioning	Asphyxiation Explosion Cold burns Electric shock	Operator, others in work area	Work in well ventilated area. Check operation and settings of all regulators and valves before start. Wear PPE All live testing to be supervised.	1	1	1	Yes

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## Commentary

The candidate has identified the major hazards and associated risks for each of the tasks.

The candidate has attempted to identify controls, but these are not always correct and lacks relevant detail for example, hazardous waste and only PPE has been considered. Probability of each of the hazards/ risks occurring has been attempted but not completed for all hazards. Hazard control methods have not been detailed and PPE is used in generalised form rather than specifying exactly what must be worn.

## Candidate evidence

### Method statement

Method statement of the installation

- 1) Ensure you have the correct PPE
- 2) Draw the component and pipework layout in pencil on the work surface to the correct measurements
- 3) Collect all pipework, fittings, and necessary tools
- 4) Measure from the wall and floor for the evaporator and condensing unit brackets and fix in position
- 5) Fit pipe clips to the correct measurement's and according to the specification
- 6) Measure, cut and bend the copper pipe.
- 7) Install the pipework and add the fittings
- 8) Tighten and double check fittings
- 9) Clean then braze pipework and fittings together
- 10) Pressure test.
- 11) Install drain connections as per the drawing
- 12) Carry out the installation of the wiring after confirming with assessor it is okay to proceed

## Commentary

The candidate demonstrates a good understanding of correct sequencing in relation to the given tasks, marking out tasks, collecting materials and installing components before clipping out. Although all key steps have been covered, there is no reasoning provided into the consequences of each step and where one task may impact on another both in terms of sequence of the installation or how one task may interrupt the flow of the next.

The methods given follow the logical stages of the installation, cutting and bending before brazing and pressure testing.

The methods are brief but accurate with no reasoning or justification given to support the method statement.

## Candidate Evidence

### Materials list

Equipment/Materials	Quantity
Pencil	1
1m long Spirit level	1
Tape measure	1
Large and small pipe cutters	1
5/8" and 3/8" Pipe benders	1
Philips screwdriver	1
Adjustable spanner	2
5/8" and 3/8" soft-rolled Pipe	6 metres each
Flare nuts	20
Abrasive cloth	1
Copper brazing rods	2
Heat proof mat	1
Oxy-Acetylene equipment	1
CO <sub>2</sub> fire extinguisher	1
Battery drill	1
5/8" and 3/8" pipe insulation	6 metres
5/8" and 3/8" pipe clips	10
3/8" Solenoid valve	1
3/8" Filter Drier	1
3/8" Sight glass	1
Screws and washers	20
Brackets	2 sets
Indoor unit	1
Outdoor unit	1
Plastic trunking	
<b>PPE</b>	
Overalls	
Steel toe capped boots	
Goggles	
Gloves	

### Commentary

The candidate has good knowledge and understanding of the basic resources, components, and PPE, with accurate quantities to carry out the tasks and meet the assignment brief requirements.

The candidate demonstrates a good understanding of health and safety and listed the PPE required to carry out the tasks safely, as well as including heat proof mats which demonstrates consideration to customer property.

However, there are some gaps in preparation where types and sizes of components and materials have not been considered. Examples include flare nuts, screws, washers, condensate pump and plastic trunking. This will result in time and material wastage due to the lack of detail in this part of the planning.

## Task 3 – Install and commission

(Assessment themes: Health and safety, systems and components, inspection and testing, reports and information, handover and communication)

For task 3 candidates need to produce the following pieces of evidence:

- Pressure test certificate
- Commissioning checklist
- Assessor observations:
  - Safe isolation process
  - Installation of systems and components
  - Commission and handover system

For illustration, the guided exemplification materials (GSEM) for Task 3 contain examples of candidate evidence for the following assessment requirements only:

- Pressure test certificate
- Assessor observations:
  - Safe isolation process
  - Installation of systems and components
  - Commission and handover system

The following task 3 candidate assessment requirements have not been included as example candidate evidence for this version of the guided standard exemplification materials

- Commissioning checklist
- Commissioning photographic evidence

### Photographic evidence required:

#### Installation

- Photograph of the offset conforming to the 150mm dimension. – demonstrates that the candidate can bend pipe accurately to a tolerance. **(photograph 1)**
- Photograph showing the offset around the soil pipe obstruction – demonstrates the candidate's pipework skills forming bend around the soil pipe. The photo demonstrates how the pipework visibly varies in distance from the soil pipe. **(photograph 2)**
- Photograph of installed components where the condensing and cooling unit match the installation drawing. This photo demonstrates the candidate's ability to install components to a +/- 5mm tolerance. **(photograph 3 and 4)**
- Four to six photographs of each brazed joint – Demonstrates how well the joint is finished. This photo demonstrates some excessive solder and scorch marks on the wall surfaces. **(photograph 5,6,7,8)**
- Two photos one each side of the wall showing finished pipework (without insulation). This demonstrates the aesthetics of the completed installation. Visible signs of pipework damage that are not straight or horizontal/vertical and bends that are not properly formed. None of which stops the system operating correctly. **(photograph 3 and 4)**



## Commissioning

- Evacuation and use of vacuum gauge.
- Weighing in the refrigerant charge.
- Visual inspection of system and pipework and measurement of temperature.

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## Candidate evidence

### Practical Observation Form – Safe isolation

<b>Assessment ID</b>	<b>Qualification number</b>
8710-358	8710-38
<b>Candidate name</b>	<b>Candidate number</b>
Candidate A	12345
<b>Centre name</b>	<b>Assessment theme</b>
City & Guilds	Health and safety, systems and components
<b>Task</b>	<b>Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.</b>
Safe isolation	<p>Candidate took their time in starting the task and was correct in performing the process. It was clear that there was a lack of awareness from the candidate about managing their time effectively throughout the process.</p> <p>Candidate correctly sourced all the equipment needed and gained permission to proceed from the assessor.</p> <p>The candidate correctly checked the testing equipment and confirmed operation and continued to isolate supply correctly.</p> <p>Tests to prove supply was DEAD had been carried out with accuracy and confirmed the installation was safe.</p> <p>Candidate correctly identified signage and placed notices to advise the system was isolated and tested.</p>

<b>Assessor signature</b>	<b>Date</b>
A, Assessor	23/2/21

## Commentary

The safe isolation process was correct in method.

The candidate used mostly correct terminology with some inaccuracies, the use of the term test lamp instead of approved voltage indicator. This did not impact on the safety of the candidate or others.

## Candidate evidence

### Practical Observation Form – Installation of components

Assessment ID	Qualification number
8710-358	8710-38
Candidate name	Candidate number
Candidate A	12345
Centre name	Assessment theme
City & Guilds	Health and safety, systems and components, inspecting and testing systems and components
Task	Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.
Installation of components	<p>The candidate followed the correct and logical process for marking out.</p> <p>Health and safety procedures were followed throughout, but some reminders were needed such as always wearing a high visibility vest.</p> <p>Candidate has ensured all H&amp;S and site preparation works are in place before starting task by putting dust sheets on floor, storing tools and materials in safe location. However, maintenance of workspace during the task was minimal with some tools left out and not stored correctly after use.</p> <p>Candidate prepared the workspace using a suitable clipping distancing to support the installation of pipework. This was installed with 300mm spaces with attention to aesthetics and ensuring pipework is parallel and secured.</p> <p>Condensing unit was installed at a suitable height for correct operation however when measured was not completely accurate but within 5mm of tolerance.</p> <p>Candidate made some errors with the pulling of bends, these were correct but resulted in some wasted materials and inaccuracies from original design. Most tolerances met, but minor inaccuracies in the dimensions of the bends and offsets, but to a tolerance of 5mm. Overall aesthetics of the installation has not been affected.</p>

<b>Task</b>	<b>Notes</b> – <i>detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.</i>
	<p>Candidate has effectively marked out and measured pipework to suitable lengths to carry out the installation, with some wastage of materials. The forming of bends was carried out twice due to inaccuracy on first attempt which resulted in some material wastage.</p> <p>There were some minor scorch marks on the wall surface where it had not been adequately protected.</p> <p>Candidate pressure tested the system with minimal guidance on the process for calculating strength and tightness pressure. Candidate had to be reminded to wear goggles when pressure and leak testing the pipework.</p> <p>Overnight there was a small drop in pressure due to a leaking fitting which had not been tested properly before which resulted in the pressure test having to be repeated and causing a delay in progress.</p>

<b>Assessor signature</b>	<b>Date</b>
A. Assessor	22/2/21

## Photograph evidence

Photo: 1



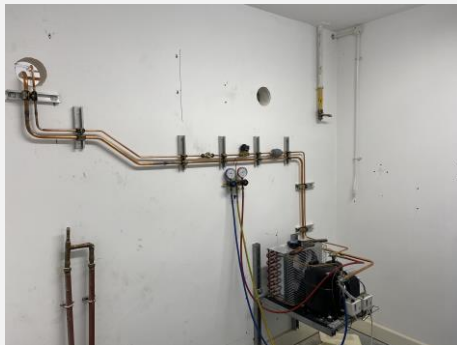
**(Photograph 1)** The offset conforming to the 150mm dimension. – demonstrates that the candidate can bend pipe accurately to a tolerance +/- 5mm.

Photo:2



**(Photograph 2)** Demonstrates the candidate's pipework skills forming bend around the soil pipe. The photo demonstrates how the pipework visibly varies in distance from the soil pipe.

Photo: 3



**(Photograph 3 and 4)** Installed components where the condensing unit and evaporator match the installation drawing. These photos demonstrate the candidate's ability to install components to a +/- 5mm tolerance. This demonstrates the aesthetics of the completed installation.

Photo: 4



Photo:5



**(Photograph 5,6,7,8)** Demonstrates how well the joint is finished. These photographs in the main, demonstrate excessive solder in and around the joint and scorch marks are present on the wall surfaces.

Photo:6



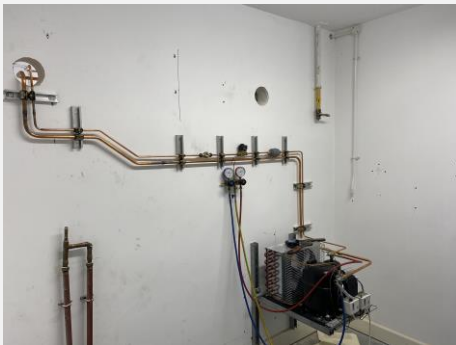
Photo:7



**Photo:8**



**Photo:9**



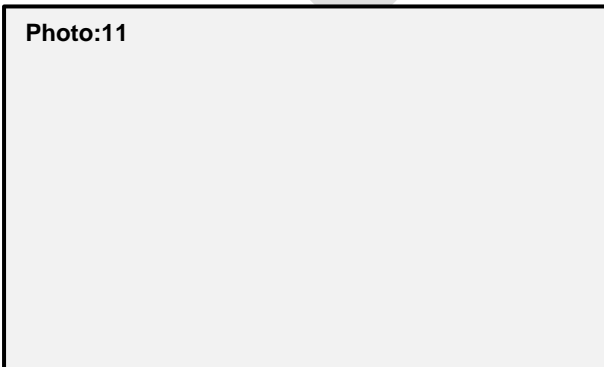
**(Photograph 9 & 10)**

Two photos one each side of the wall showing finished pipework (without insulation). This demonstrates the aesthetics of the completed installation. There are visible signs of pipework damage. Pipe are runs not perfectly vertical or horizontal and pipe bends are visibly poorly executed.

**Photo:10**

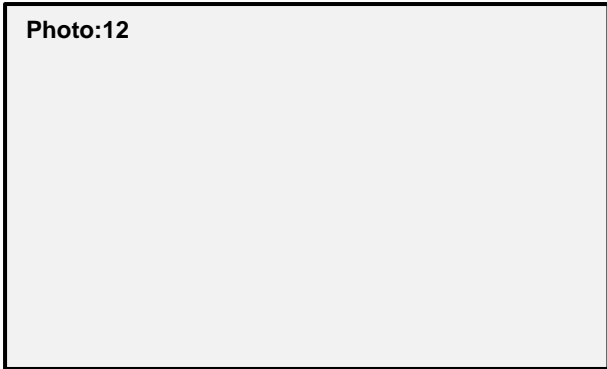


**Photo:11**



**(Photograph 11)** Vacuum pump and Torr gauge fitted. Connections incorrect with Torr gauge connected at vacuum pump

Photo:12



**(Photograph 12)** Correct refrigerant not evident in photograph and scales and gauge line connection obstructing the workspace.

**(Photograph 13)** pipework leading up to and including the evaporator. Temperature probes and instrument incorrectly installed and showing unacceptable readings.

Photo:13

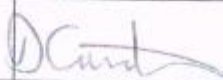





## Candidate evidence

### Pressure test certificate

#### Evidence Recording Template - Certificate of Pressure Testing

<b>CERTIFICATION OF PRESSURE TESTING</b> <b>(IN ACCORDANCE WITH BS EN 378)</b>						
Name of client	ANY COLLEGE				Job No.	REF. ASSESSMENT
Site address	ANY STREET ANY TOWN				Date of Test.	22/2/21.
Contact detail	Tel.	01234 56789		email	ACONTEXT@COLLEGE.AC.UK	
System/component under test.	REFRIG. SYSTEM.					
TEST DETAIL						
Strength Test Ps x .....43	START PRESSURE	START TEMP	DURATION	FINAL PRESSURE	FINAL TEMP	RESULT
	35	20°C	15min	35	20°C	OK
Tightness Test Ps x .....1	START PRESSURE	START TEMP	DURATION	FINAL PRESSURE	FINAL TEMP	RESULT
	24	20°C	1 hr	24	20°C	OK
Details of person carrying out the test						
Name			Signature		Date	
A CANDIDATE					22/2/21	
Details of person who witnessed the above test						
Name	Status	Signature		Date		
AN ASSESSOR	ASSESSOR			22/2/21.		

## Commentary

Candidate follows correct process for the installation of system. The candidate demonstrates an ability to sequence tasks logically as set out in the method statement which includes the use of health and safety, marking and cutting materials, brazing and jointing pipework, pressure testing, charging and commissioning. On occasions working with some tools and components the activity required more than one attempt. This was the case in pipe bending where some inaccuracies needed to be corrected.

Throughout the installation the candidate mostly worked to a +/- 5mm tolerance.

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## Candidate evidence

### Practical observation – Commissioning and handover to customer

<b>Assessment ID</b>	<b>Qualification number</b>
8710-358	8710-38
<b>Candidate name</b>	<b>Candidate number</b>
Candidate A	12345
<b>Centre name</b>	<b>Assessment theme</b>
City & Guilds	Handover and communication Systems and components
<b>Assessment theme</b>	<b>Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.</b>
Commissioning and handover to customer	<p><b>Commissioning checks</b> Candidate did not follow correct process for commissioning tests. Candidate became confused when trying to measure the pressures and temperatures. Visual inspection is not completed which results in a small water leak from the condensate drain connection. Candidate rectifies leak successfully. Commissioning checks and test are completed.</p> <p><b>Handover to customer</b> Candidate has arms folded and does not make eye contact. Candidate explains the operating principles of the cold room system and how to adjust the temperature setting. Candidate provides some detail of maintenance requirements e.g., cleaning processes but misses information about limitation of the system e.g. minimum operating temperature, cooling capacity. Candidate refers to manufactures instructions at some stages of the task.</p>
<b>Assessor signature</b>	<b>Date</b>
A. Assessor	26.2.2021

### **Commentary**

The candidate has demonstrated the basic knowledge required to ensure commissioning tests are completed however the tests and checks do not follow a logical sequence. Some results may be inaccurate due to time between readings or poor placement of probes.

The demonstration of the system to the customer was accurate but brief. No explanation of the maintenance requirements was offered. Customer care skills were limited with minimal eye contact and interaction.

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## Task 4 – Service and maintenance

(Assessment themes: Health and safety, working with faults, systems and components, reports and information)

For task 4 candidates need to produce the following pieces of evidence:

- Maintenance report
- Pressure test certificate
- F-Gas log sheet
- Waste transfer note
- Assessor observations
  - Fault diagnosis
  - Decommissioning
  - Safe isolation
  - Fault rectification

For illustration, the guided exemplification materials (GSEM) for Task 3 contain examples of candidate evidence for the following assessment requirements only:

- Maintenance report
- Assessor observations
  - Fault diagnosis
  - Decommissioning
  - Fault rectification

The following task 4 candidate assessment requirements have not been included as example candidate evidence for this version of the guided standard exemplification materials

- Pressure test certificate
- F-Gas log sheet.
- Waste transfer note
- Assessor observation of the safe isolation process

### Photographic evidence

Compressor Change (a photograph for each of the below)

- Disassembly of condensing unit demonstrating any damage, or no damage caused **(photograph 14)**
- Un-brazing and removal of compressor demonstrating damage, or no damage **(photograph 15)**
- Refitting and brazing of compressor showing damage, or no damage **(photograph 16)**
- Set up of pressure testing equipment and gauge reading **(photograph 17)**
- Leak testing to show correct safety procedures Inc. PPE and correct fluid/device. **(photograph 18)**
- Evacuation to 2 Torr – set up of equipment and gauge reading **(photograph 19)**
- Charging of system – set up of equipment **(photograph 20)**
- Final reassembly of condensing unit **(photograph 21)**

Maintenance (a photograph for each of the below)

- Clean of coils (use of spray washer) **(photograph 22)**
- Leak testing of system **(photograph 23)**
- Run and testing of temperatures and air flow **(photograph 24)**

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## Candidate evidence

### Maintenance report

#### Description of fault diagnosis

I used the meters to check the resistances and found Comp A had an earth fault, Comp B had a winding fault and Comp C had no fault at all.

#### Possible solutions

Change compressor

#### Actions taken to rectify fault

To repair the fault, I carried out the following sequence

- Isolate electrics
- Recover refrigerant
- Unbrazed old compressor
- Braze in new compressor
- Leak test
- Vac the system
- Recharge the system
- Recommission.

## Commentary

Candidate demonstrates a good understanding of the maintenance requirements in relation to the task and gives a brief description of the fault.

The planned process is accurate but does not demonstrate any reasoning for the method taken to rectify the fault or how they would go about carrying out the repair.

## Candidate evidence

### Practical Observation Form – Fault diagnosis, decommissioning and fault rectification.

<b>Assessment ID</b>	<b>Qualification number</b>
8710-358	8710-38
<b>Candidate name</b>	<b>Candidate number</b>
Candidate A	12345
<b>Centre name</b>	<b>Assessment themes</b>
City & Guilds	Health and safety, working with faults, systems and components

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	<b>Notes</b> – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.
Fault diagnosis	<p>Candidate shows some nerves at the beginning of the customer discussion, with an initial lack of eye contact and inappropriate body language. Candidate has their arms folded and misses some opportunities to put the customer at ease.</p> <p>The candidate asked various questions to gain an insight into the fault and some of these were irrelevant to the task.</p> <p>The candidate initially used the wrong instrument to (multimeter) to check for the earth fault so that fault was missed.</p> <p>After candidate realised the mistake, he used the Meggar correctly to identify the earth fault.</p> <p>As a result, the candidate used guesswork/trial and error rather than systematic fault analysis to test the compressors. [RB1]</p>
Decommissioning	<p>Candidate follows a logical sequence for decommissioning.</p> <p>Candidate removed the refrigerant in vapour form only which led to a delay in completion.</p> <p>Candidate correctly identified some of the components that could not be reused and disposed of them in the correct recycling bins. Candidate did miss opportunities to recycle clips and screws that had fallen on the floor and swept them into the general waste.</p> <p>Candidate attempts to make good the working area with the use of appropriate fillers, but the area is not sanded back completely resulting in a poor-quality finish.</p>



Task	<b>Notes</b> – <i>detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.</i>
Fault rectification	<p>Candidate considers health and safety preparations, using dust sheets, removing combustible material where required from the area.</p> <p>Candidate follows a logical sequence, safely removing the refrigerant the system and storing it into the correct recovery cylinder, prior to selecting the correct tools to unbraid, remove and replace the defective compressor. However, some components are left in the work space.</p> <p>There was some heat damage to the pipe insulation which had not been adequately protected which had to be replaced after the compressor was replaced.</p> <p>When unbrazing the compressor it was found that not all the refrigerant had been removed so there was a small release of noxious gas, but fortunately the candidate had allowed for adequate ventilation before brazing.</p> <p>The candidate completed the repair efficiently with only minor mistakes but did not carry out a visual inspection of the brazes before pressure testing. This resulted in a large release of OFN which would have been avoided if visually spotted the bad braze joint first.</p> <p>System recharge and gauge removal resulted in a small loss of refrigerant as the manifold and lines had not been drained down and isolated properly.</p>

<b>Assessor signature</b>	<b>Date</b>
A. Assessor	26.02.21

**Photo:14.**

Disassembly takes place with no reference to manufacturer's instructions. Some minor damage is caused during disassembly. Components left directly in the work area.

**Photo:15.**

Clearly shows all pipe connections to the compressor are heat damaged with some collateral heat and / or mechanical damage to the compressor housing area and associated wiring.

**Photo:16.**

Clearly shows compressor re-installed with evidence of heat and /or mechanical damage to pipework, wiring, controls or casing.

**Photo:17.**

Clearly shows nitrogen cylinder, regulator and line connection to the condensing unit. Line shown to be taut and across working area. Nitrogen cylinder clearly an obstruction to efficient work.

**Photo:18.**

A photo showing a leak test procedure. Evidence of excess leak test fluid over most joints and not wiped off.

**Photo:19**

A Torr gauge is fitted to the vacuum pump side of the system potentially offering a false reading.

**Photo:20.**

Shows charging of system. Cylinder on scales is in the direct working area and potentially being bumped. Gauge manifold set at its gauge line length limits and directly in way of the job at hand.

**Photo:21.**

Reassembly of the condensing unit has been completed with visible damage, dirty marks and missing fasteners.

**Photo:22.**

A photo showing the cleaning of an evaporator coil using an approved spray. Unit is not safely isolated during the procedure; excess fluid is observed on the exterior of the evaporator casing.

**Photo:23.**

A photo showing a leak test procedure. Evidence of excess leak test fluid over most joints and not wiped off.

**Photo:24.**

Probes are clearly poorly located giving false readings.

## Commentary

Candidate lacked some confidence when carrying out discussion with customer, asking some irrelevant questions to begin with, not making eye contact and standing with arms folded.

Candidate follows correct process for the decommissioning and demonstrates an ability to sequence tasks logically. Process for safe disposal of waste was carried out but showed little consideration to customer property and not all components were recycled correctly.

Candidate followed current F Gas legislation for decommissioning and commissioning of the system.

Condition of the equipment before and after the repair shows minimal superficial damage to some components.

The fault diagnosis and fault repair tasks followed a methodical order, but reassurance was needed with some aspects and made some minor mistakes that did not impact the finished product.

DRAFT

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