

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

**Air Conditioning  
Engineering**

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

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## Introduction

The sample assessment materials within this document refers to the air conditioning 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 exemplar 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.

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## 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

For illustration, the guided exemplification materials (GSEM) for Task 1 contain examples of candidate evidence for the following assessment requirements only:

- Completed calculation showing all workings

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## Candidate evidence

### Completed calculation showing all workings

HEAT INCREASE WORKS

$$\begin{aligned} \text{INSIDE} &= 41.6 \times 1.7 \times 3 = 212 \\ \text{OUTSIDE} &= 8 \times 0.52 \times 10 = 41 \\ \text{FLOORS} &= 2 \times 20 \times 2.25 \times 3 = 270 \\ \text{INFIL} &= \frac{1}{3} \times 1 \times 61 \times 10 = 213 \\ \text{WINDOW} &= 8 \times 4.8 \times 10 = 384 \\ \text{SOLAR} &= 8 \times 389 + 180 = 4552 \\ \text{OCCUPY} &= 3 \times 130 = 390 \\ \text{LAPTOP} &= 3 \times 500 = 1500 \\ \text{PRINTER} &= 1 \times 750 = 750 \\ \text{LIGHTS} &= 20 \times 50 = 1000 \\ \text{TOTAL} &= \frac{9312}{1000} \\ &= \underline{9.3 \text{ kW}} \end{aligned}$$

## Commentary

The candidate has completed the calculation to within an expected tolerance but there are gaps in the working out and the level of detail provided is brief, which results in some minor inaccuracies in design calculations. The candidate rounded up their answers at every stage of the calculation resulting in a final total which could lead to an estimation of cooling duty that is not as accurate as it could be.

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

## 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:

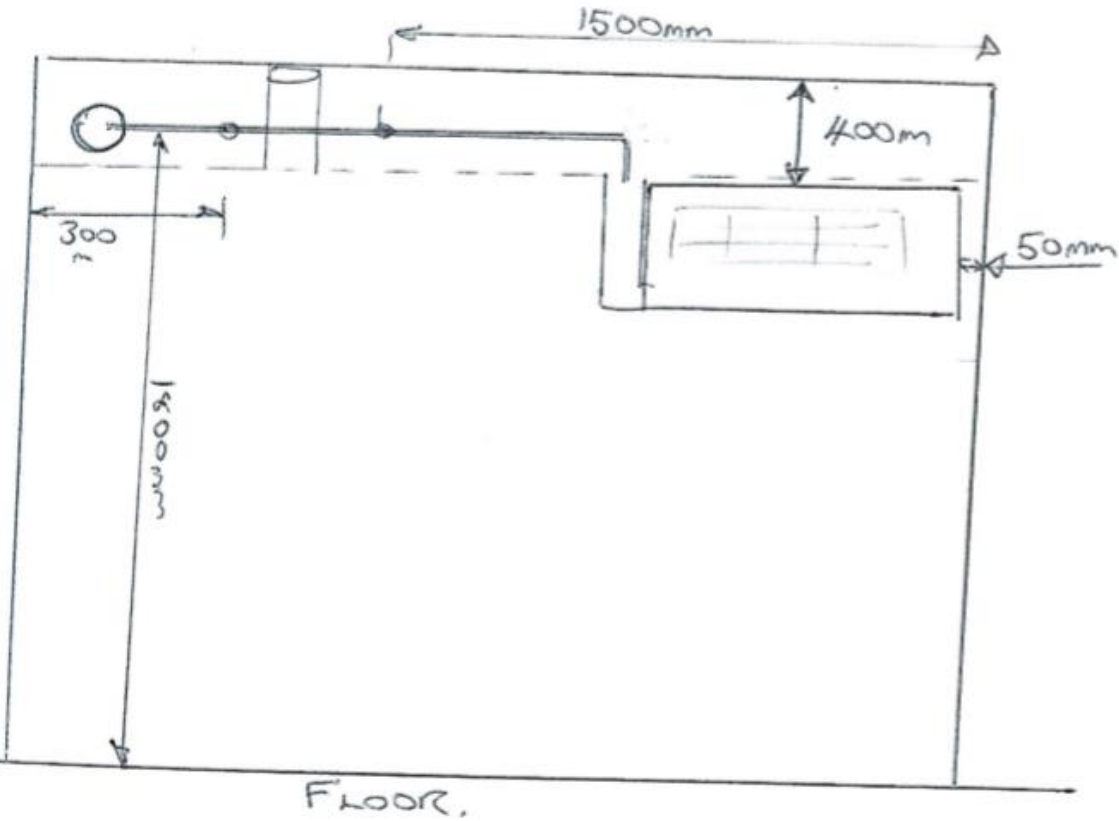
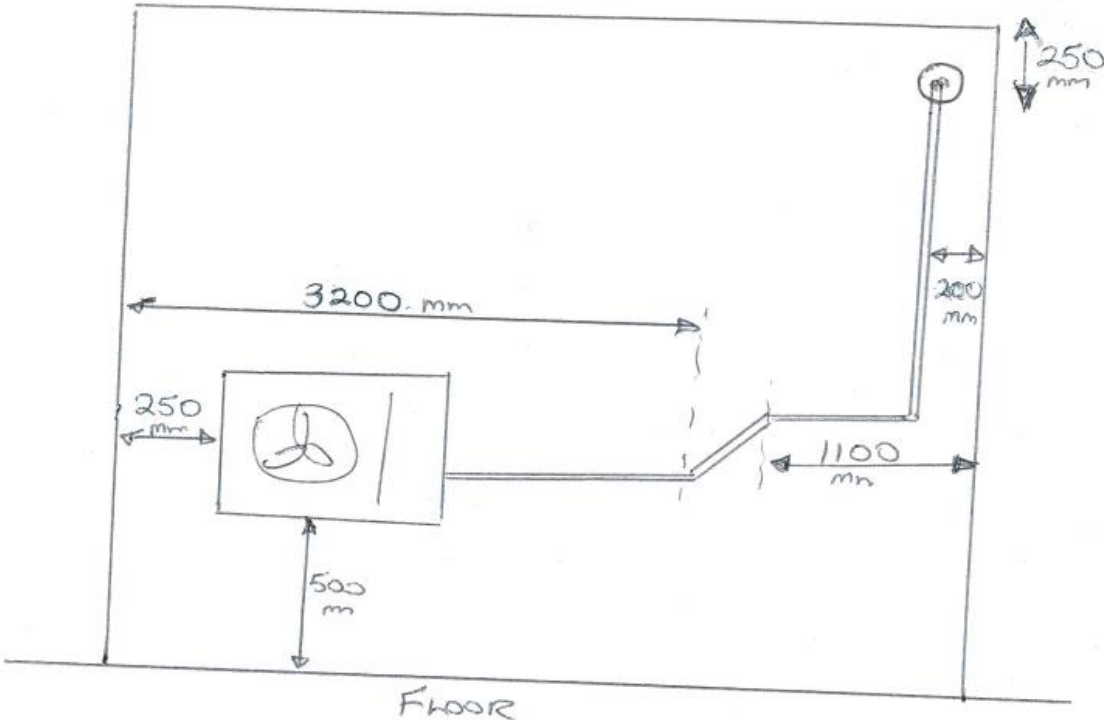
- Risk assessment
- Method statement with justifications
- Installation drawing showing all location dimensions of indoor and outdoor units and pipe route
- Materials list

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 drawing





## Commentary

The candidate has completed the drawing considering all aspects of the design brief. They have correctly identified all the components and made a good attempt to draw pipe layout and pipe sizes. However, the candidate has not used datum lines to reference the measurement from, resulting in confusion when the component positions were marked out ready for installation. However, the drawing itself does meet the assignment brief.

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

<b>Activity: Air conditioning project</b> <b>Location: Centre A</b>		<b>Date: 31/01/21</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): Severity x Likelihood</b>  <b>1-2 Low</b> <b>3-5 Medium</b> <b>6-9 High</b>					
<b>LIKELIHOOD (L): Probability that event will occur</b> <b>1 Remote   2 Possible   3 Likely</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
		Cuts and grazes	Operator	Wear PPE	1	1	1	Yes

2	Brazing, jointing pipework	Burns	Operator, other in work area	Wear PPE. Cool down hot joints or put up warning signs.	1	2	2	Yes
		Fire	Operator, other in work area.	Remove or protect any flammable materials or surfaces. Have fire extinguisher. Fire watch for 1 hour	1	2	2	Yes
		Explosion	Operator, other in work area.	Check brazing equipment before use.	2	1	2	Yes
3	Manual Handling	Muscles Strain crush injury	Operator, other in work area.	Use correct lifting technique	1	1	1	Yes
4	Pressure Testing	Explosion	Operator, other in work area.	Check equipment before use. Clear area, barrier off and put up warning signs.	1	2	2	Yes
		Asphyxiation	Operator, other in work area.	Work in well ventilated area only, check with tutor if working in a confined space.	1	1	1	Yes
5	Electrical work	Electric shock	Operator, other 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	Operator, other in work area.	Work in well ventilated area.	1	1	1	Yes
		Explosion		Check operation and settings of all regulators and valves before start.				
		Cold burns		Wear PPE				
		Electric shock		All live testing to be supervised.				

## 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, 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.

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## 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 the sequencing of activities in relation to the given tasks, marking out tasks, collecting materials and installing components before clipping out.

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 and does not demonstrate any understanding on why the sequence is presented in this way. It is not clear if choices have been made to impact on safety, aesthetics, or time.

## Candidate evidence

### Materials list

Equipment/Materials	Quantity
Pencil	1
Spirit level	1
Tape measure	1
Pipe cutter	1
Pipe benders	1
Philips screwdriver	1
Adjustable spanners	2
3/8" and 1/4" Pipe	6 metres each
Flare nuts	20
Abrasive	1
Copper brazing rods	2
Heat proof mat	1
Oxy-Acetylene equipment	1
Battery drill	1
1/4 and 3/8" lagging	6 metres
1/4" and 3/8" pipe clips	10
Screws and washers	20
Brackets	2 sets
Indoor unit	1
Outdoor unit	1
In line condensate pump	1
Plastic trunking	2m
<b>PPE</b>	
Overalls	
Steel toe capped boots	
Goggles	
Gloves	

### Commentary

The candidate has identified 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.

There are some gaps in preparation where types and sizes of components and materials have not been considered, for example, 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 1a and 1b)**
- 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)**
- 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, 4a and 4b)**
- 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)**

#### Commissioning

- Evacuation and use of vacuum gauge. (not included in this GSEM)
- Weighing in the refrigerant charge. (not included in this GSEM)
- Visual inspection of system and pipework and measurement of temperature. (not included in this GSEM)

## Candidate evidence

### Practical Observation Form – Safe isolation process

<b>Assessment ID</b>	<b>Qualification number</b>
8710-351	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

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

<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>
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	22/2/21

### Commentary

Candidate carried out all necessary steps in the safe isolation process. The safe isolation process was correct in method.



## Candidate evidence

### Practical Observation Form – Installation of systems and components

<b>Assessment ID</b>	<b>Qualification number</b>
8710-351	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>
Installation of systems and 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 keeping wearing a high visibility vest at all times.</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> <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>

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.
	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.

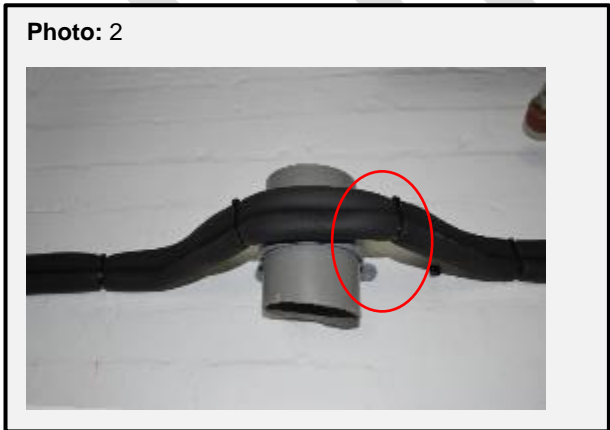
<b>Assessor signature</b>	<b>Date</b>
A. Assessor	22/2/2021

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# Photographic evidence



(Photograph 1a and 1b) This photo demonstrates the candidate being able to work to +/- 5mm tolerance. Shows offset conforming to the 150mm dimension. – demonstrates that the candidate can bend pipe accurately to a tolerance.



(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, 4a and 4b). 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. 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- shows final installation of outdoor condensing unit and associated pipework.

Photograph 4a and 4b – shows final installation of indoor evaporating unit and associated pipework.

**Photo:4a**



**Photo:4b**



**Photo: 5**



(Photograph 5,6,7,8)

Demonstrates how well the joint is finished. This photo demonstrates some excessive solder and scorch marks on the wall surfaces.

**Photo:6**



**Photo:7**





**Photo:8**



## 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.	AC ASSESSMENT	
Site address	ANY STREET ANY TOWN			Date of Test.	22/2/21.	
Contact detail	Tel.	01234 56789		email	ACOLLEGE@COLLEGE.AC.UK	
System/component under test.	AC RIG.					
TEST DETAIL						
Strength Test Ps x .....43	START PRESSURE	START TEMP	DURATION	FINAL PRESSURE	FINAL TEMP	RESULT
	49 B	20°C	15min	49 B	20°C	OK
Tightness Test Ps x .....1	START PRESSURE	START TEMP	DURATION	FINAL PRESSURE	FINAL TEMP	RESULT
	34 B	20°C	1 HR	34 B	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

The candidate demonstrates that they can take accurate measurements from an allocated space/ work area in line with their installation diagram.

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 could mostly work to a +/- 5mm tolerance

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## Candidate evidence

### Practical Observation Form – Commission and handover system

<b>Assessment ID</b>		<b>Qualification number</b>
8710-351		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, Inspecting and testing systems and components
<b>Task</b>	<p><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.</p>	
Commission and handover system	<p><b>Commissioning checks</b></p> <p>Candidate did not follow correct process for commissioning tests.</p> <p>Candidate became confused when trying to measure the pressures and temperatures.</p> <p>Visual inspection is not completed which results in a small water leak from the condensate drain connection. Candidate rectifies leak successfully.</p> <p>Commissioning checks and test are completed.</p> <p><b>Handover to customer</b></p> <p>Candidate has arms folded and does not make eye contact.</p> <p>Candidate explains the operating principles of the cold room system and how to adjust the temperature setting.</p> <p>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.</p> <p>Candidate refers to manufactures instructions at some stages of the task.</p>	

<b>Assessor signature</b>	<b>Date</b>
A. Assessor	23/02/21



## Commentary

Commissioning tests are completed however the tests and checks do not follow a logical sequence.

Reference is made to manufacturer's guidance at some stages during the task. Handover and demonstration of the system with the customer were accurate but lacked some detail e.g. maintenance requirements. 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 4 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 9)**
- Un-brazing and removal of compressor demonstrating damage, or no damage **(photograph 10)**
- Refitting and brazing of compressor showing damage, or no damage **(photograph 11)**
- Set up of pressure testing equipment and gauge reading **(photograph 12)**
- Leak testing to show correct safety procedures Inc. PPE and correct fluid/device. **(photograph 13)**
- Evacuation to 2 Torr – set up of equipment and gauge reading **(photograph 14)**
- Charging of system – set up of equipment **(photograph 15)**
- Final reassembly of condensing unit **(photograph 16)**

Maintenance (a photograph for each of the below)

- Removal and cleaning of air filter **(photograph 17)**
- Clean of coils (use of spray washer) **(photograph 18)**
- Leak testing of system **(photograph 19)**
- Run and testing of temperatures and air flow **(photograph 20)**

## 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

The maintenance report completed is brief, and in a bullet pointed format.

The candidate demonstrates good understanding of the maintenance requirements, for the given task, and provides a brief but accurate description of the fault diagnosis process.

The candidate identifies a brief but accurate 8 step process/ sequence to rectify the fault, which shows a good knowledge and understanding of how to repair and rectify the fault.

No reasoning has been given to support the methods selected to rectify the fault.

## Candidate evidence

### Practical Observation Form – Fault diagnosis

<b>Assessment ID</b>	<b>Qualification number</b>
8710-351	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
<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>
Fault diagnosis and customer discussion	<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. After candidate realized his 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.</p>
Decommissioning	<p>Candidate follows a logical sequence for decommissioning. 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>

<b>Assessment theme</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>
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 unbrazed, remove and replace the defective compressor.</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>

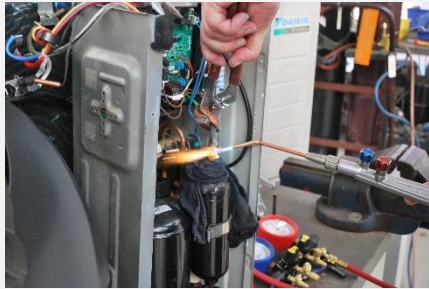
<b>Assessor signature</b>	<b>Date</b>
A. Assessor	22/2/21

**Photograph 9.**



Disassembly of condensing unit demonstrating showing the existing state of the system prior to removal of the compressor.

**Photograph 10:**

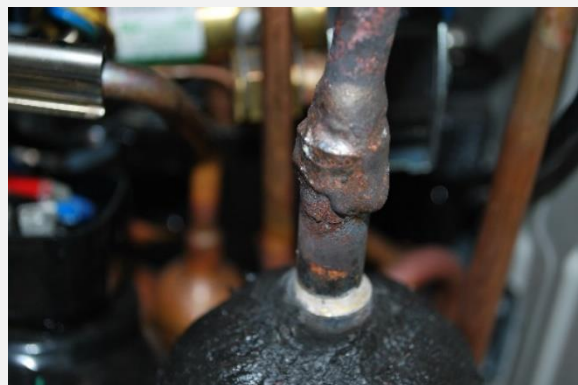


Un-brazing and removal of compressor demonstrating lack of protection to the surrounding area where the torch is.

**Photograph 11:**



Refitting and brazing of compressor showing lack of protection to surrounding fittings and casing resulting in a burn mark on the casing.

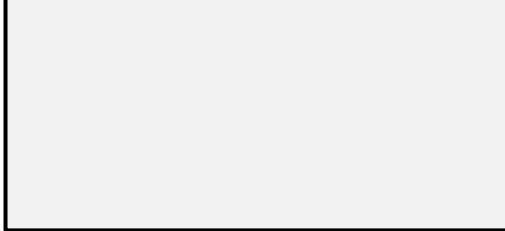


**Photograph 12:**



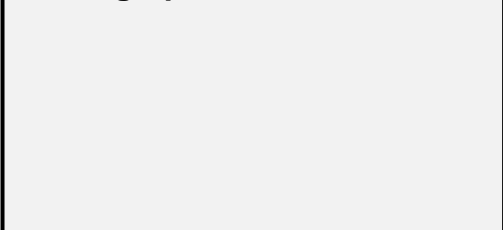
Set up of pressure testing equipment and gauge reading showing that barriers had not been erected around the test area.

**Photograph 13:**



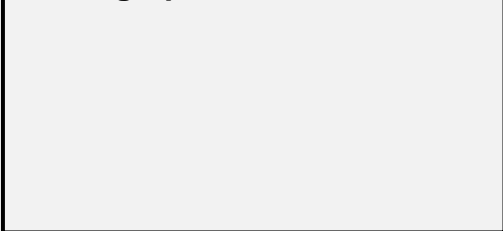
Leak testing to show correct safety procedures Inc. PPE and correct fluid/device. But excess leak test fluid has not been cleaned properly off the pipework and fittings

**Photograph 14:**



Evacuation to 2 Torr – set up of equipment and gauge reading – candidate used 1/4" hose instead of 3/8" hose resulting in a slow vacuum pull down.

**Photograph 15:**



Charging of system – set up of equipment – demonstrates candidate's competence but use of shorter hoses would have reduced loss of refrigerant.

**Photograph 16:**



Final reassembly of condensing unit. Some screws are missing and a new burn mark is seen on the casing.

**Photograph 17:**

Removal and cleaning of air filter showing lack of protection to customers property – no dust sheets used.

**Photograph 18:**

Clean of coils (use of spray washer) – shows lack of protection to surrounding area from overspray.

**Photograph 19:**

Leak testing of system – overspray and excess leak test fluid not properly cleaned up.

**Photograph 20:**

Run and testing of temperatures and air flows. - shows candidate using pipe sensor to measure air temperature.

## 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.



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