Level 3 NVQ in Heating and Ventilating (Rectification of Systems) (6088)

National occupational standards and Assessment requirements

City & Guilds

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Level 3 NVQ in Heating and Ventilating

6088-07 Rectification of Systems

Introduction
This qualification has been produced from a set of Heating and Ventilating National Occupational Standards. They are based upon the Mechanical Engineering Services 2000 Standards. The qualification reflects the competencies required to work within the Service and Maintenance sector as a **Maintenance Engineer**.

The set of standards that define the level 3 Service and Maintenance NVQ are shown in the Heating and Ventilating Qualification Structure. This level 3 NVQ is called **'Rectification of Systems'**. It is achieved by completing the six Mandatory Units specified in the level 3 Service and Maintenance pathway within the H&V Qualification Structure.

Candidates will be expected to work primarily from maintenance schedules, maintenance specifications, installation drawings and data, and be able to work to established industry standards. They must also undertake, at a variety of work locations, a significant range of activities, some of which are detailed and non-routine. This could include taking responsibility for satisfying identified customer requirements.

The qualification involves:
- Effective customer liaison
- Planning and programming of work
- Organisation and allocation of resources
- Rectification, modification, testing, decommissioning and re-commissioning systems
- Fault location and diagnostic skills

Health and safety, working relationships, quality and environmental awareness are also included. They can be assessed from evidence produced whilst undertaking the technical units.
The difference between level 2 and level 3 qualifications lie principally in the depth of technical knowledge and the level of responsibility.

Level 2 Candidates need to demonstrate an understanding of component operation, how components relate to each other within systems and possess sound knowledge of system operating principles.

Level 3 Candidates require highly developed diagnostic skills, detailed knowledge of system operating principles and the ability to take responsibility for fault diagnosis, rectification and/or modification of entire systems.

The difference between level 2 and level 3 qualifications lie principally in the depth of technical knowledge and the level of responsibility.

Level 2 Candidates need to demonstrate a fundamental knowledge of how components relate to each other within the system.

Level 3 Candidates must demonstrate detailed knowledge of systems operating principles. They should also be capable of installing and modifying the components within an entire system.

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Section 1 – Scheme information

1.1 Scope of the awards

NVQs in Heating and Ventilating are work-based qualifications designed for those employed within the Heating and Ventilating sector and cover installation, service and maintenance, and ductwork. The main objective of the awards is to offer the opportunity to prove competence of industrial performance, knowledge and understanding, and recognise the ability of individuals working in the sector.
They are suitable for people involved in the industry sectors from trainees to senior operatives.

The NVQs in Heating and Ventilating are available at levels 2 and 3. There are four main pathways at level 2, and 3. The awards are made up of mandatory and optional units. The mandatory units cover those areas which have a common approach, such as health and safety and working relationships. The optional units offer a choice of activities that can be combined to meet the needs of organisations and candidates.

The level 3 award has been developed to cover those people who are:

- Senior operatives who are employed as team leaders and first line managers who are responsible for carrying out industry based activities
- People who through training and development are extending their competences to take on additional responsibilities in both technical and managerial areas.
- New employees who have undergone training and development and are now acquiring a more in depth knowledge and experience of the industry sectors.

1.2 Qualification Structure

The awards have been designed to allow progression through the various levels where appropriate. Thus candidates who have achieved units which are common to awards at differing levels can take these units forward for the purpose of certification. The certificate structure requires candidates to complete common mandatory units followed by a choice of pathways.

The certificate referred to in this guide is as follows

LEVEL 3 NVQ HEATING AND VENTILATING

Rectification of Systems

Mandatory Units

Unit 1	Maintain the safe working environment for HVACR activities
Unit 2	Maintain effective working relationships
Unit 3	Contribute to the improvement of business products and services for HVACR work activities
Unit 20	Plan to rectify/modify systems to meet customers requirements
Unit 21	De-commission, re-commission systems
Unit 22	Rectify system failure and modify systems

This qualification is achieved by gaining the **six Mandatory Units.**

LEVEL 3 RECTIFICATION OF SYSTEMS

Candidates need to demonstrate their competence and understanding across the following system types. At this level candidates will be able to deal with and rectify system problems across the range.

a. Heating

- HTHW, MTHW, LTHM (atmospheric/pressurised)

b. Ventilating

- supply/extract
- high velocity
- low velocity

c. Air Conditioning

- heat rejection
- chilled water
- condensed water
- air handling unit

(excluding primary coating equipment)

d. Water

- hot (direct/indirect, open to atmosphere/unvented)
- cold (potable water, boosted direct/indirect

e. Fuel

f. Electrics

- motors
- starters
- associated wiring

g. Controls

- system activators/sensors

Cross-reference grid of City & Guilds and ESTTL/Summitskills unit references

City & Guilds Unit Number	ESTTL / Summitskills Reference Number	Unit Title
001	1	Maintain the safe working environment for HVACR work activities
002	2	Maintain effective working relationships
003	3	Contribute to the improvement of business products and services for HVACR work activities
020	20	Plan to rectify/modify systems
021	21	De-commission and re-commission systems
022	22	Rectify system failure and modify systems

Combustion Units Evidence Indicators

308 Gas Systems
309 Oil Systems
310 Solid Fuel Systems
311 Steam Systems

All units 001-003 and 020-022 are required to achieve the award 6088-07-level 3 NVQ Heating and Ventilating (Rectification of Systems).

The combustion fuel evidence indicator must also be indicated when applying for a certificate: 308 or 309 or 310 or 311 or a combination of.

1.3 Heating & Ventilating Sector Progression Routes

ENTRANTS WITH PRIOR EXPERIENCE & QUALIFICATIONS

Occupational Roles	Relevant Qualifications	NQF Level
Director Owner/Proprietor	Doctorate/MPhil/Masters Higher Hons/Hons Degree Bachelors Degree/Certificate	5
Management Project Development MES Engineer Technician	Management N/SVQs Site Management N/SVQs Design S&M Managemnet Business Development	4
Supervisor/Team Leader Specialist Craftsperson Operative/Technician	Estimating N/SVQs Supervision N/SVQs Buying N/SVQ Advanced H & V MA/N/SVQ Information Technology N/SVQ Training and Development N/SVQ Health and Safety Certs	3
MES Operative Craftsperson	H & V FMA/N/SVQ Health and Safety Certs	2
Trainee Operative	Pre Level 2 courses Health and Safety	1

ENTRY LEVEL

Level 3 NVQ Heating and Ventilating

National Occupational Units

Heating and Ventilating

(Rectification of Systems)

001 Maintain the safe working environment for HVACR activities
002 Maintain effective working relationships
003 Contribute to the improvement of business products and Services for HVACR work activities
020 Plan to rectify/modify systems to meet customers requirements
021 Decommission, re-commission systems
022 Rectify system failure and modify systems

Unit content sequence order:

-Title
-Elements
-Unit commentary
-Performance criteria
-Range
-Performance evidence
-Knowledge statements
-Assessment Guidance

Note: ***This is what the candidate must do:***
Unit 001 **Maintain the safe working environment for HVACR work activities**
This involves being able to:

Element 1.1 Use safe procedures when working with others
Element 1.2 Use safe working practices

Unit Commentary

- This unit is the same across all HVACR Level 2 and 3 Units. Evidence gathering opportunities to satisfy the criteria will occur whilst working towards achievement of the technical units. Some safety critical aspects of the technical units may not be achievable through the workplace. For these situations, simulation in a realistic work environment is acceptable.

- The unit covers 'core' health and safety requirements. These requirements apply to Level 2 and 3. Health and safety differences specific to individual disciplines and levels are incorporated within the relevant technical units.

- This unit deals with the candidate's ability to work in a safe manner for the well being of themselves and others who may be affected by the actions or omissions of the candidate.

- Candidates must be capable of making a positive contribution to safety on an ongoing basis and be able to respond effectively in the event of an emergency situation arising.

- A knowledge of safety information, practice and procedures is required, as well as the ability to communicate relevant information to others, for example; colleagues, other workers, customers and occupants of buildings.

- Be able to operate safely within and monitor agreed safety related agreements regarding potential hazards, correct use of relevant personal protective equipment and observing and following the requirements of safety information.

- Limit injury to persons or damage to property in the event of an accident or emergency. This covers basic safety procedures and damage reporting requirements. Fire, explosion or toxic atmospheres within the workplace, requires candidates to demonstrate the effective summoning of appropriate emergency services and procedures to adopt in the event of such emergencies.

- There are many potential hazards within our industry. This unit is designed to ensure that candidates who meet its requirements are aware of the potential dangers, likely hazards and where to source; safety information, appropriate regulations and apply them to the workplace and the people who operate within it.

Unit 001 **Maintain the safe working environment for HVACR work activities**

Element 1.1 Use safe procedures when working with others

Performance criteria

The candidate must provide evidence to prove that they can:

1.1.1 **Comply with** health and safety legislation [(1)] **when working with** other persons[(2)]

1.1.2 **Take** precautionary actions [(3)] **to minimise the potential safety risk to persons in the** work location [(4)]

Candidates will be required to produce evidence for all range items.

Range

1. **Health and Safety Legislation**

   a. Health and Safety At Work, etc. Act
   b. Construction (Health, Safety and Welfare) Regulations 1961
   c. Construction (Lifting Operations) Regulations 1961
   d. Electricity At Work Regulations 1989
   e. Control of Substances Hazardous to Health Regulations (COSHH)
   f. Manual Handling Regulations 1992
   g. Employer's responsibility under Health and Safety At Work Act
   h. Employee's responsibility under Health and Safety At Work Act
   i. How safety regulations affect your work
   j. General safety measures
      - Site inspections
      - Risk assessments
      - Danger of slips, trips or falls
      - Danger of falling objects

2. **Other Persons**

   a. Customers
   b. Colleagues – own trade
   c. Colleagues – other trades
   d. Site officials
      - Site management
      - Statutory inspections
   e. Visitors
      - Authorised
      - Unauthorised
      -

3. **Precautionary Actions**

   a. Provision of PPE
   b. Safety signs and notices
   c. Follow accident prevention methods
   d. Protection of workforce and public
   e. Working on drains and sanitary appliances
   f. Working with LPG and welding equipment
   g. Personal hygiene
   h. First aid facilities
   i. Fire fighting equipment
   j. Access route and equipment
   k. Manual handling and lifting
   l. Actions in an emergency

4. Working Location

a. New buildings
b. Occupied buildings
c. Service and maintenance workplaces
d. Working at heights
e. Excavations and confined spaces
f. Scaffolding
g. Vehicles

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:	
1. Follow current regulations, recommendations and guidelines for health and safety protection of self and others. (PC 1.1.1)	(Range All)
2. Check the work location layout and structure is safe for work to proceed (PC 1.1.1, 1.1.2)	(Range 1, 2, 3)
3. Alert visitors to potential hazards (PC 1.1.2)	(Range 3, 4)
4. Respond promptly and appropriately to accidents involving injury to others (PC 1.1.2)	(Range 3, 4)
5. Summon emergency services (PC 1.1.2)	(Range 3, 4)
6. Take the appropriate actions in the event of: - fire - emergency working (PC 1.1.2)	(Range 3, 4)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range.

Knowledge Statements

The candidate must provide evidence that they know:	
1. The general responsibilities of the employer and employee for ensuring safety in the work place (PC 1.1.1)	(Range 1, 2)
2. The requirements of safety legislation for the range of work operations (PC 1.1.1)	(Range 1)
3. The potential hazards or risks associated with the range of work locations in which work on systems is undertaken, and the measures to be taken to reduce risk. (PC 1.1.2)	(Range 3, 4)
4. General measures to be taken to create safety awareness, company on-site policies, applying and supervising site safety practices, including measures to report potential safety hazards (PC 1.1.1, 1.1.2)	(Range All)
5. Accident reporting procedures - Basic first aid procedures (PC 1.1.1, 1.1.2)	(Range: All)
6. The procedures for summoning the different emergency services. The information required by the emergency services to permit them to respond promptly. (PC 1.1.2)	(Range 3, 4)
7. The range of fire extinguishers used for different types of fire and how to extinguish small fires in a safe manner. (PC 1.1.2)	(Range 3, 4)
8 Typical evacuation procedures for work locations in which system installation or maintenance work is to be carried out. (PC 1.1.2)	(Range 3, 4)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: a. Comply with Health and Safety requirements at all times. b. Take the appropriate precautionary actions to ensure safe working c. Act appropriately in the event of an emergency. d. Undertake the correct procedures for basic first aid and reporting of accidents. e. Demonstrate in a simulated situation the ability to: i) select fire extinguishing equipment appropriate to a specified fire source ii) correctly apply fire fighting equipment 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Unit 001 **Maintain the safe working environment for HVACR work activities**

Element 1.2 Use Safe Working Practices

Performance Criteria

<u>The candidate must provide evidence to prove that they can:</u>

1.2.1 **Work to the procedures laid down in** risk assessments [(1)]

1.2.2 **Take remedial action(s) where work methods do not comply with** risk assessment [(1)] **requirements**

1.2.3 **Use** tools and equipment [(2)] **in a manner which complies with health and safety requirements**

1.2.4 **Maintain** tools and equipment [(2)] **to a standard which meets health and safety requirements**

1.2.5 **Demonstrate work processes which comply with health and** risk assessment [(1)] **safety requirements**

1.2.6 **Handle** potentially hazardous materials [(3)] **in a manner, which complies with health and safety requirements**

1.2.7 **Take** precautionary actions [(4)] **during work activities to ensure the safety of** customer's property [(5)]

1.2.8 **Comply with** hazard warning and prohibition notices [(6)]

Candidates will be required to produce evidence for all range items.

Range

1. Risk Assessments

a. Identifying risks
b. Risk factors
c. Risk exposure
d. Safeguard hardware
e. Control measures
f. Assessment forms
g. Risk assessment associated with:
   - Work locations
   - Tools and equipment
   - Hazardous materials
   - Hazardous processes

2. Tools and Equipment

a. Hand tools
b. Power operated tools
c. Test equipment
d. Access equipment
e. Personal protective equipment
f. Plant
g. Lifting devices
h. Movable equipment

3. Potentially Hazardous Materials

a. Compressed gasses
b. Cleaning agents
c. Solvents
d. Asbestos based products
e. By-products from working processes
f. Electricity

4. Precautionary Actions

a. Use of PPE
b. Safety signs and notices
c. Follow accident prevention methods
d. Protection of others
e. Personal hygiene
f. Location of first aid facilities
g. Location of fire fighting equipment
h. Access routes and equipment

i. Manual handling and lifting

5. Customer's Property

a. External building surfaces
b. Internal building surfaces
c. Building contents

6. Hazardous Warning and Prohibition Notices

a. Fire fighting signs
b. Rescue equipment signs
c. Emergency exit signs
d. Prohibition signs
e. Warning signs
f. Mandatory signs
g. Safe condition signs

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:
1. Use approved, safe methods and techniques when lifting heavy or bulky items (PC 1.2.6) (Range 3) 2. Identify damage to property and minimise the risk of further damage (PC 1.2.7) (Range 4,5) 3. Use safe working procedures to safeguard persons and property in the workplace, including working to procedures laid down in risk assessments. (PC All) (Range All) 4. Monitor safety procedures and take remedial action where potential hazards are identified (PC 1.2.2) (Range All)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range.

Knowledge Statements

The candidate must provide evidence that they know:	
1.	How to work to, or produce general risk assessments and how to apply them in the workplace (PC 1.2.1) (Range 1)
2.	Safe practices when carrying out work on systems and components (PC All (Range All)
3.	The range of tools and equipment for installation or maintenance work, their safe use, maintenance requirements and selection of appropriate safety equipment (PC 1.2.3, 1.2.4) (Range 2)
4.	The range of tools and equipment whose use is controlled by legislation (PC 1.2.3, 1.2.4) (Range 2)
5.	The range of potential hazardous materials used for system installation or maintenance work. (PC 1.2.6) (Range 3)
6.	The methods of identifying potentially hazardous materials and level of risk, including asbestos (PC 1.2.1, 1.2.6) (Range 1,3)
7.	Safety precautions including the use of personal protective equipment (PC All) (Range All)
8.	The legislation or recommendations governing the safe use or disposal of hazardous materials. (PC 1.2.6) (Range 3)
9.	The methods of protecting customer's property within the types of locations in which system installation or maintenance work is carried out (PC 1.2.7) (Range 4, 5)
10.	How to liaise with the customer, pre-work inspection, reporting existing damage or identifying damage arising from work operations (PC 1.2.7) (Range 4, 5)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. All performance evidence must be of a commercially acceptable standard. 2. Candidates must follow correct procedures to: a. make safe the range of hazards listed b. conform to company and customer safety requirements 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Note: ***This is what the candidate must do:***

Unit 002 **Maintain effective working relationships**

This involves being able to:

Element 2.1 Establish, maintain and develop effective working relationships with others

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Unit Commentary

- This unit is the same across all Level 2 disciplines. Evidence gathering opportunities to satisfy the criteria will occur whilst working towards the achievement of the technical units

- The unit covers 'core' working relationships. The requirements apply across all the Occupational Standards at Level 2 disciplines. Differences in levels of responsibility within working relationship specific to individual Occupational Standards are incorporated within the relevant technical units.

- This unit deals with the candidate's ability to work in harmony with other people for the benefit of themselves and their employer/employee' organisation.

- Candidates must be capable of starting off and developing effective work relationships. They must know the most effective means of doing so and also understand why this is important to themselves and their employer.

- In the case of 'other persons', candidates should be capable of obtaining sufficient details before commencing work to provide a sound basis to establish and develop good customer relations. Candidates should also be able to provide relevant information, respond positively and promptly, know how to deal with different types of customer and realise why the individual has such an important role to play in the success of an organisation.

- When dealing with site visitors, it is vital that candidates know the range of possible visitors they can expect to encounter and the way in which they should be treated. The ability to confirm identification, and the reason why this should be done as well as the ability to deal with requests for information in the correct manner.

- Colleagues may include line managers, peers, customers and fellow workers. Occupants of premises where work is being undertaken are also included and the candidate should understand why good relations with colleagues are important to both the customer and to their employer. Candidates are required to provide information and some support to new colleagues and those who experience work difficulties.

Unit 002 **Maintain effective working relationships**

Element 2.1 Establish, maintain and develop effective working relationships with others

Performance criteria

<u>The candidate must provide evidence to prove that they can:</u>

2.1.1 Identify other persons [(1)] **within the work location that are essential to the development of an effective working relationship.**

2.1.2 Respond effectively to requests for job information [(2)] **from others in the workplace.**

2.1.3 Use a range of methods of communication [(3)] **to pass** job information [(2)] **to others in the workplace**

2.1.4 Develop and maintain effective working relationships with other persons [(1)] **in the workplace.**

Candidates will be required to produce evidence for all range items.

Range

1. Other Persons

a. Customers
b. Any worker within work location
c. Visitors to work location
d. Colleagues

2. Job Information

a. Specifications
b. Drawings
c. Statutory regulations and recommendations
d. Instructions – verbal or written

3. Methods of Communication

a. Oral
b. Written
c. Information Communication Technology

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:
1. Obtain and record details of customer, customer's representative or co-contractor. (PC 2.1.1) (Range 1) 2. Treat other persons within the work location in a manner conducive to the establishment of good relationships. (PC 2.1.4) (Range 1) 3. Provide information through a range of methods to meet the requirements of others in the workplace. (PC 2.1.2, 2.1.3) (Range All) 4. Respond promptly and willingly to reasonable requests from other persons within the work location. (PC 2.1.2, 2.1.4) (Range 1)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range.

Knowledge Statements

The candidate must provide evidence that they know:		
1.	The range of other persons encountered within the work location with whom it may be necessary to establish working relationships. (PC 2.1.1)	(Range 1)
2.	The types of management structures within different organisations employing MES labour, and the roles and responsibilities of the different individuals within these structures. (PC 2.1.1)	(Range 1)
3.	What other persons expect from a good working relationship. (PC 2.1.4)	(Range 1)
4.	The types of job information that may be requested by others in the workplace, e.g.: sources of information, methods of accessing information and possible restrictions on passing information to others. (PC 2.1.2, 2.1.3)	(Range 2, 3)
5.	The methods of communication used for the range of job or company information best suited to its purpose. (PC 2.1.3)	(Range 2, 3)
6.	How to use the key principles of good communication in work situations, including methods of confirming that the communication has been understood. (PC 2.1.3)	(Range 2, 3)
7.	The actions that are necessary to begin, develop and maintain good working relationships. (PC 2.1.4)	(Range 1)
8.	The principles of good working relationships and reasons why working relationships may break down. (PC 2.1.4)	(Range 1)
9.	The actions to take to restore working relationships where a breakdown occurs. (PC 2 .1.4)	(Range 1)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. All performance evidence must be of a commercially acceptable standard. 2. Candidates must undertake across the listed range: a. negotiation, discussion and explanation b. face-to-face and telephone conversation c. provision of effective written communication 3. Candidates must: a. ascertain visitors authority using the range of visitor details and information listed b. provide appropriate and relevant information to requests, in line with organisational procedures

Note: ***This is what the candidate must do:***

Unit 003 **Contribute to the improvement of business products and services for HVACR work activities**

This involves being able to:

Element 3.1 Promote the image of the business to others
Element 3.2 Identify and recommend opportunities for improving customer care
Element 3.3 Demonstrate environmental awareness within the workplace

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Unit Commentary

- This unit is the same across all Level 2 disciplines. Evidence gathering opportunities to satisfy the criteria will occur whilst working towards achievement of the technical units.

- The unit covers the 'core' requirements of business improvement that apply to all the Occupational disciplines at Levels 2. Quality improvement differences specific to individual Occupational Standards and levels are incorporated within the relevant technical units.

- This unit deals with the candidate's ability to present a positive image of the organisation and industry and be able to identify and make recommendations regarding improvements to; products, services and procedures.

- It is important to present the organisation and industry's image by being positive about the work carried out and that personal presentation and general manner gives a good impression to customers and co-contractors.

- Candidates are required to consider the methods they use when undertaking work activities and seek to improve the quality of products, services and organisational procedures. They are also expected to feed back recommendations to relevant persons and be aware of customer expectations regarding the service they, and their organisation provide.

- A prime requirement of this unit is the demonstration of environmental awareness in the workplace. Working methods that make effective and economical use of materials and energy and the ability to work with hazardous materials, employing sound work practices are essential to safeguarding the environment.

Unit 003 **Contribute to the improvement of business products and services for HVACR work activities**

Element 3.1 Promote the image of the business to others

Performance Criteria

<u>The candidate must provide evidence to prove that they can:</u>

3.1.1 Ensure personal presentation provides a positive image of the business to other persons [(2)]**.**

3.1.2 Ensure that the job information [(1)] **provided meets the needs of** other persons [(2)] **in the workplace.**

3.1.3 Present job information [(1)] **in ways, which encourage a positive image of the business.**

3.1.4 Recognise and act on opportunities for promoting the services of the business to other persons [(2)]**.**

Candidates will be required to produce evidence for all range items.

Range

1. Job Information

a. Specifications
b. Drawings
c. Statutory regulations and recommendations
d. Instructions – verbal or written

2. Other Persons

a. Customers
c. Any worker within work location
d. Work location visitors
e. Colleagues

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:
1. Promote industry/organisation in a positive way. (PC All) (Range All)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range.

Knowledge Statements

The candidate must provide evidence that they know:
1. The importance of correct personal presentation, e.g.: clothing worn and manner. (PC 3.1.1, 3.1.4) (Range All)
2. The type of actions that will promote the business that are within the candidate's daily routine (PC 3.1.2, 3.1.3, 3.1.4) (Range 1, 2)
3. The types of action that produce positive and negative responses (PC 3.1.2, 3.1.3) (Range 1, 2)
4. The range of promotional information appropriate to different work situations and how to ensure the information provided is appropriate to its intended use. (PC 3.1.2) (Range 1, 2)
5. The methods of presenting information that are appropriate to the situation or the person requesting the information. (PC 3.1.4) (Range 1)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: a. Present verbal and written information to personnel within the range b. Demonstrate the desired standard of personal presentation 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Unit 003 **Contribute to the improvement of business products and services for HVACR work activities**

Element 3.2 Identify and recommend opportunities for improving customer care

Performance Criteria

<u>The candidate must provide evidence to prove that they can:</u>

3.2.1 Identify opportunities for improving customer care and enhancing business procedures [(2)]**.**

3.2.2 Take actions to rectify problems with business procedures [(2)]**.**

3.2.3 Take actions to address customer complaints on system or component [(1)] **operation.**

3.2.4 Report to job supervisor or line manager potential opportunities for improving business procedures [(2)]**.**

Candidates will be required to produce evidence for all range items.

Range

1. Systems or Components

a. Systems
b. Appliances
c. Materials
d. Controls

2. **Business Procedures**

a. Customer service
b. Internal and external communication
c. Business administration
d. Efficient use of resources

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:
1. Identify source of customer expectation shortcomings and product variance, formulate and produce a solution. (PC All) (Range All)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range.

Knowledge Statements

The candidate must provide evidence that they know:
1. The typical formal and informal approaches to ensuring good customer service. (PC 3.2.1) (Range 2)
2. The typical details contained in written statements of customer service policy. (PC 3.2.1) (Range 2)
3. The work actions necessary to support the business's customer service policy. (PC 3.2.2) (Range 2)
4. The checks to be carried out during work activities to ensure customer satisfaction with the service provided, and the measures to be taken where deficiencies in customer service are identified. (PC 3.2.2, 3.2.3) (Range 1, 2)
5. The actions necessary to record and report any deficiencies in the performance of systems or components. (PC 3.2.4) (Range 2)
6. The methods of dealing with customer complaints arising from dissatisfaction with work standards or attitude of the workforce. (PC 3.2.1, 3.2.2, 3.2.3, 3.2.4) (Range 1, 2)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: a. Identify shortcomings and present solutions to rectify them to personnel listed b. Provide verbal and written communications regarding customer services expectations 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Unit 003 **Contribute to the improvement of business products and services for HVACR work activities**

Element 3.3 Demonstrate environmental awareness within the workplace

Performance Criteria

The candidate must provide evidence to prove that they can:

3.3.1 **Apply environmentally friendly work procedures when working on** systems or components [(1)]

3.3.2 **Refer to immediate job supervisor or line manager** systems or component [(1)] **factors that may damage the environment.**

3.3.3 **Ensure that customers are advised of all** systems or component [(1)] **operating procedures that are intended to protect the environment.**

Candidates will be required to produce evidence for all range items.

Range

1. Systems or Components

a. Systems
b. Appliances
c. Materials
d. Controls

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:
1. Undertake work in a manner which takes account of: Effective and economic use of materials Working methods which are not harmful to the environment Minimising wastage of materials and environmental damage Observing principles of energy efficiency (PC All) (Range All)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range.

Knowledge Statements

The candidate must provide evidence that they know:
1. The potential implications for the environment of the work procedures used in installing or maintaining systems or components. (PC 3.3.1) (Range All) 2. Alternative 'low risk' materials, products and procedures. (PC 3.3.1) (Range All) 3. Prefabrication, installation and maintenance methods that reduce material wastage. (PC 3.3.1) (Range All) 4. The importance of reporting hazards that may damage the environment that can arise from work procedures and of confirming that appropriate action has taken place. (PC 3.3.2) (Range All) 5. The range of information that needs to be passed to the customer to ensure the correct and economic use of energy dependant systems. (PC 3.3.3) (Range All) 6. The general advice that can be given to customers on methods of reducing waste of resources and effective savings. (PC 3.3.3) (Range All) 7. The disposal methods to be used for waste materials. (PC 3.3.1) (Range All)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. All performance evidence must be of a commercially acceptable standard. 2. Candidates must demonstrate planning and execution of work in line with good environmental practices. 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Note: ***This is what the candidate must do:***

Unit 020 **Plan to rectify/modify systems to meet customer's requirements**

This involves being able to:

Element 20.1 Identify and establish rectification/modification requirements
Element 20.2 Plan and allocate resources to meet rectification/modification requirements
Element 20.3 Produce and monitor work programmes for system rectifications and modifications

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Unit Commentary

- This unit measures the candidate's ability to identify and establish customer requirements, to allow options for system rectifications or modifications to be decided upon.

- Emphasis is placed upon the candidate using technical expertise to best effect at the work location when dealing with a variety of customer types, in order to gain a clear understanding of what the customer requires. The candidate will also be required to explain clearly and accurately the requirements and implications of undertaking the work before obtaining customer instructions to proceed and advising their own organisation.

- Candidates are required to plan resource requirements to undertake the work as agreed, to include labour, materials, tools, plant, plus any other items required.

- Candidates must be capable of reporting the plan to resource work required, through their own organisation's procedures.

- Candidates are required to demonstrate their ability to prepare and agree programmes with the customer in order to carry out rectification and, or modification to systems with the minimum of disruption to their business. Knowledge of method statements is required when dealing with the customer.

- Candidates need to be able to relate the work that needs to be done and build it into a work programme. They will be expected to decide the requirements for:

  ✓ Components, including type and numbers
  ✓ Materials, type and quantity
  ✓ Labour resource

  They will be expected to modify programmes in line with the customer's requirements and be able to accommodate within the plan the appropriate action to take if deviations or variations occur with regard to manufacturer's tolerances.

Unit 020 Plan to rectify/modify systems to meet customer's requirements

Element 20.1 Identify and establish rectification/modification requirements

Performance Criteria

<u>The candidate must provide evidence to prove that they can:</u>

20.1.1 Identify and record customer job requirements [(1)]**.**

20.1.2 Determine symptoms of system faults [(2)] **and/or modification requirements from the customer.**

20.1.3 Identify likely causes of system faults [(2)]**.**

20.1.4 Obtain and record information on work location structures and features [(3)]**.**

20.1.5 Identify any areas of the proposed activities where compliance with industry requirements [(4)] **is necessary.**

20.1.6 Use a range of methods of presentation [(5)] **to explain options to the customer which meet identified requirements.**

20.1.7 Obtain customer agreement [(6)] **to the proposals.**

Candidates will be required to produce evidence for all range items.

Range

1. Customer Job Requirements

a. Relative to rectification and modification of the following systems:
- Heating
- Ventilating
- Air conditioning
- Water
- Fuel
- Electrics/controls

2. System Faults

k. Symptoms
l. Fault location methods

3. Work Location Structures and Features

a. Structures intended use
b. Method of construction and materials used
c. Rectification/modification requirements
d. Availability of input services

4. Industry Requirements

a. Statutory regulations and recommendations
b. Specifications
c. Company procedures
d. Codes of practice
e. In accordance with industry's expectations of a systems rectification engineer

5. Methods of Presentation

a. Oral
b. Written
c. Visual
d. Use of Information and Communication Technology (ICT)

6. Forms of Agreement

a. Verbal
b. Written
c. Standard company issue

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:		
5.	Clearly identify and establish customer needs to assist with identification of the problem which exists within the system. (PC 20.1.1, 20.1.2)	(Range 1, 2)
6.	Locate the cause of the fault within the system and verify it is rectifiable. (PC 20.1.3)	(Range 2)
7.	Form options to present to the customer to carry out rectification and, or modification work. (PC 20.1.6)	(Range 1, 5)
8.	Explain clearly and accurately to the customer the main considerations from option(s) arrived at. (PC 20.1.4, 20.1.5, 20.1.6)	(Range 3, 4, 5)
9.	Ensure selected option is achievable in line with industry requirements. (PC 20.1.6)	(Range 4)
10.	Obtain customers' instructions to proceed with work and notify relevant persons in accordance with established procedures. (PC 20.1.1, 20.1.4, 20.1.7)	(Range 1, 3, 6)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Knowledge Statements

The candidate must provide evidence that they know:		
1.	How to obtain information from the customer. (PC 20.1.1, 20.1.2)	(Range 1, 2)
2.	How to carry out and record site survey findings. (PC 20.1.4)	(Range 3)
3.	The range of documentation detailing industry requirements. (PC 20.1.5)	(Range 4)
4.	How to identify possible rectification/modification options which meet the following: • Customer requirements • Site structures and features requirements • Industry requirements (PC 20.1.1, 20.1.2, 20.1.4, 20.1.5)	(Range 1, 2, 3, 4)
5.	How to obtain agreement from the customer to progress selected proposal(s) (PC 20.1.7)	(Range 6)
6.	The various methods of presenting information. (PC 20.1.6)	(Range 5)
7.	Appropriate industry requirements relevant to rectification and modification of systems. (PC 20.1.5)	(Range 4)
8.	How systems and their components function. (PC 20.1.1, 20.1.2, 20.1.3, 20.1.4)	(Range 1, 2)
9.	Safety requirements and methods to employ relating to fault diagnosis and the working environment. (PC 20.1.3, 20.1.4, 20.1.5)	(Range 2, 3,)
10.	The importance of ensuring that the agreed option is compatible with work location type, conditions and features. (PC 20.1.4)	(Range 3)
11.	The relevance of manufacturers warranties when deciding upon work options. (PC 20.1.4, 20.1.5, 20.1.6)	(Range 3, 4, 5)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. A proportion may be produced in a realistic working environment. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: c. Discuss the requirements and implications of modifications to two different systems, with two different types of customer listed within the range. d. Produce records of customer instructions and comments identified relating to work to be undertaken within two different types of premises listed within the range. e. Demonstrate the ability to carry out the range of fault location methods listed within the range upon a minimum of two different system types specified. 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Unit 020 **Plan to rectify/modify systems to meet customer's requirements**

Element 20.2 Plan and allocate resources to meet rectification/modification requirements

Performance Criteria

The candidate must provide evidence to prove that they can:

20.2.1 Confirm that the allocation of resources [(1)] **meets customer requirements and organisation objectives.**

20.2.2 Confirm resources [(1)] **required to meet the work schedule are available.**

20.2.3 Report any deficiencies in the availability of resources [(1)] **to meet** industry requirements [(2)] **and modification requirements from the customer.**

20.2.4 Ensure that planned resources [(1)] **conform to** industry requirements [(2)]**.**

20.2.5 Present proposed plan to other persons [(3)]**.**

20.2.6 Identify and comply with specific customer requirements [(4)]**.**

Candidates will be required to produce evidence for all range items.

Range

1. Resources

a. Labour
b. Materials
c. Equipment

2. Industry Requirements

a. Statutory regulations and recommendations
b. Specifications
c. Company procedures
d. In accordance with industry's expectations of a systems rectification engineer

3. Other Persons

a. Customer
b. Other workers

4. Specific Customer Requirements

a. Access to work location
b. Availability of personnel
c. Different types of customer

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:		
1.	Investigate and ensure availability of components, human resource and equipment balanced against overall company workload and customer requirements. (PC 20.2.1, 20.2.2, 20.2.3, 20.2.4)	(Range 1, 2)
1	Advise customer of resource availability, timing for undertaking work and where appropriate, any deficiencies identified. (PC 20.2.1, 20.2.3)	(Range 1, 3)
2	Plan resources to meet customers specific requirements for rectification and, or modification works. (PC 20.2.2, 20.2.6)	(Range 1, 4)
3	Report resource plans following organisational procedures. (PC 20.2.4, 20.2.5)	(Range 2)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Knowledge Statements

The candidate must provide evidence that they know:		
1.	Why allocation of resources must be balanced against own organisations overall workload. (PC 20.2.1, 20.2.2, 20.2.3)	(Range 1, 2)
2.	Own organisation's procedures and objectives. (PC 20.2.2, 20.2.4, 20.2.5)	(Range 1, 2, 3)
3.	How to deal with different types of customer. (PC 20.2.6)	(Range 4)
4.	Statutory regulations applicable. (PC 20.2.4)	(Range 2)
5.	Alternative types of resource available to meet component, human resource and equipment requirements. (PC 20.2.3)	(Range 1, 2)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. A proportion may be produced in a realistic working environment. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: a. Produce typical resource plans. b. Ensure resource availability meets work schedule requirements in relation to the range of resources specified. c. Check resources against the range of legislation listed to ensure they conform to standards specified. 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Unit 020 **Plan to rectify/modify systems to meet customer's requirements**

Element 20.3 Produce and monitor work programmes for system rectification and modification

Performance Criteria

The candidate must provide evidence to prove that they can:

20.3.1 Produce details of resource requirements [(1)] **for work on system.**

20.3.2 Produce work programmes [(2)] **which make the best use of resources within the** contract conditions [(3)]**.**

20.3.3 Schedule any inspection or approval requirements [(4)] **by third party organisations within the work programme.**

20.3.4 Monitor the progress of jobs against the work programme [(2)]**.**

20.3.5 Negotiate revisions to work programmes [(2)] **where modifications and deviations prove necessary.**

20.3.6 Confirm that work programmes [(2)] **take account of commissioning equipment.**

20.3.7 Agree work programmes [(2)] **with** customers [(5)]**.**

Candidates will be required to produce evidence for all range items.

1. Resource Requirements

a. Human resources
b. Materials
d. Plant and equipment
e. Tools

2. Work Programmes

a. Work sequences
b. Work plans

3. Contract Conditions

a. Standard form of contract
b. Other industry documents

4. Inspection or Approval Requirements

a. Statutory regulations and recommendations affecting the work undertaken
b. Safety legislation affecting the work undertaken.

5. Customers

a. Client
b. Other workers

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:		
1.	Quantify components, tools, plant and equipment, materials and human resources requirements. (PC 20.3.1)	(Range 1)
2.	Prepare programmes incorporating essential items for rectification and/or modification of systems in accordance with contract conditions. (PC 20.3.2)	(Range 2, 3)
3.	Ensure programmes make best use of resources available, including commissioning equipment. (PC 20.3.2, 20.3.6)	(Range 2, 3)
4.	Schedule any inspections or approvals required. (PC 20.3.3)	(Range 4)
5.	Modify programmes where deviations and/or variations occur and agree these with the customer. (PC 20.3.4, 20.3.5)	(Range All)
6.	Deal with different types of customer. (PC 20.3.7)	(Range 5)
7.	Agree programmes of work with the customer. (PC 20.3.7)	(Range 2, 5)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Knowledge Statements

The candidate must provide evidence that they know:	
1. How to determine the following for specific jobs: • Materials • Labour requirements • Plant and equipment requirements (PC 20.3.1)	(Range 1)
2. How to produce and understand basic work programmes, including method statements, in order to identify key stages in job progress. (PC 20.3.2)	(Range 2, 3)
3. How to develop work programmes which meet the requirements of customer and/or main contractor work programmes. (PC 20.3.2, 20.3.3, 20.3.7)	(Range 2, 3, 4, 5)
4. How to schedule inspection or approval site visits into work programmes. (PC 20.3.3)	(Range 4)
5. Typical situations in which the work programme may have to be adjusted and how to obtain approval to adjust the work programme. (PC 20.3.4, 20.3.5)	(Range 2)
6. Components that require commissioning by the manufacturer. (PC 20.3.1, 20.3.3, 20,3,6)	(Range 1, 2, 4)
7. Consequences of using incompatible components. (PC 20.3.1, 20.3.2)	(Range 1, 2, 3)
8. Works that require inspection. (PC 20.3.3)	(Range 4)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. A proportion may be produced in a realistic working environment. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: a. Produce typical work programmes b. Demonstrate inclusion of all programme features listed within the range in programmes produced covering two system types. 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Unit 021 De-commission and re-commission systems
This involves being able to:

Element 21.1 De-commission systems for restorative and modification actions
Element 21.2 Re-commission systems to achieve optimum system performance

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Unit Commentary

- Candidate must demonstrate a sound knowledge and understanding of systems operating principles.

- This unit measures the candidate's ability to prepare and agree with the customer a plan to de-commission and re-commission systems in order to carry out restoration, modifications and/or achieve optimum system performance.

- Candidates must be able to complete and progress the full documentation required by the appropriate persons.

- Candidate must demonstrate a sound knowledge and understanding of systems operating principles.

- De-commissioning and re-commissioning is much more complex, comprehensive and demanding for this Level 3 award than the similar, though limited routine maintenance requirements of de-activation and re-activation within the Service and Maintenance level 2 award.

- De-commissioning activity will require candidates to demonstrate an ability to prepare to shut down systems or zones within systems, including liaison with the necessary persons. They need to be able to locate and safely isolate the systems from the mains supplies and other energy sources, be capable of emptying system contents and chemically cleansing and flushing contaminated systems.

- Re-commissioning requires candidates to ensure system condition and status is appropriate for re-commissioning activity to commence. This will include clean flushing, charging, purging and chemically dosing. Systems must be re-charged in a logical sequence, static testing completed, mains supplies and energy sources restored and the system brought into operation in a logical sequence.

- Optimum system performance must be achieved by initiating full operation of systems. Performance should be monitored by applying the appropriate tests in line with the appropriate regulations and recommendations to ensure that the performance meets the design requirements that apply.

Unit 021 **De-commission and re-commission systems**

Element 21.1 De-commission systems for restorative and modification actions

Performance Criteria

<u>The candidate must provide evidence to prove that they can:</u>

21.1.1 Liase with other persons [(1)] **at appropriate points within the de-commissioning process to minimise disturbance to work routines.**

21.1.2 Check that conditions within the systems and components [(2)] **will permit safe de-commissioning.**

21.1.3 De-commission systems and components [(2)] **using tests and procedures, which comply with** industry requirements [(3)]**.**

21.1.4 Take precautionary actions [(4)] **to ensure that de-commissioned** systems and components [(2)] **do not prove a safety hazard.**

21.1.5 Check that the de-commissioned systems and components [(2)] **is left safe, in line with** industry requirements [(3)]**.**

Candidates will be required to produce evidence for all range items.

Range

1. Other Persons

a. Customers
b. Other workers

2. Systems and Components

e. Systems
(See full system category listing)
- Heating
- Ventilating
- Air Conditioning
- Water
- Fuel
- Electrics/controls

f. Components for Systems Within the Range
(Principal components)
- Boilers
- Pumps (centrifugal/induction
- Fans (centrifugal/axial)
- Air handling plants
- Heat emitters/exchangers
- Pressurisation units
- Pipework systems (or parts thereof)
- Electrics/controls (actuators/sensors)

7. Industry Requirements

a. Statutory regulations and recommendations
b. Safety legislation governing activities in the workplace
c. Work sequences
d. Co-ordination with the work of others
e. Work practices and de-commissioning techniques for systems or components
f. Company procedures
g. Tests:
- Electrical/mechanical
- Pressure, temperature, leakage, i.e
  i. Air
  ii. Water
  iii. Gas
  iv. Oil

h. Records and information:
   - Health and safety
   i. Verbal
   ii. Written reports

i. Factors affecting the de-commissioning process:
   i. Type of supplies
   ii. Type of system contents
   iii. Type of premises

j. In accordance with industry's expectations of a systems rectification engineer

8. **Precautionary Actions**

a. Liaison with other persons
b. Safe working practice
c. System isolation and labelling

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:		
11.	Make preparation for de-commissioning systems. (PC 21.1.1, 21.1.2)	(Range 1, 2, 3)
12.	Liaise with relevant persons and reach agreement on work aspects involved in de-commissioning. (PC 21.1.1, 21.1.3, 21.1.4)	(Range 1, 2, 3, 4)
13.	Establish a safe working environment when de-commissioning systems. (PC 21.1.2, 21.1.3, 21.1.4, 21.1.5)	(Range All)
14.	Locate and safely isolate mains supplies and energy sources ensuring supply cannot be inadvertently restored. (PC 21.1.2, 21.1.3, 21.1.4)	(Range All)
15.	Safely empty system contents using approved methods. (PC 21.1.3)	(Range 2, 3)
16.	Remove system contaminants from contaminated systems using correct chemicals. (PC 21.1.3)	(Range 2, 3)
17.	Chemically cleanse contaminated systems and flush out cleansing agents. (PC 21.1.3)	(Range 2, 3)
18.	Leave de-commissioned systems safe by blanking off and, or labelling, to prevent unauthorised system activation. (PC 21.1.5)	(Range 2, 3)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Knowledge Statements

The candidate must provide evidence that they know:		
1.	The importance of confirming the system design, specification, functions and the effects of suspending the operation of the system. (PC 21.1.1)	(Range 1)
12.	The need to liase with others whose procedures or routines may be affected by the suspension of the system operation. (PC 21.1.1)	(Range 1)
13.	The potential hazards that could arise from de-commissioning activities and the checks to be carried out before de-commissioning takes place. (PC 21.1.2, 21.1.4)	(Range 2, 4)
14.	De-commissioning procedures for temporary and permanent de-commissioning of systems, including organisational requirements. (PC 21.1.3)	(Range 2, 3)
5.	The precautions to ensure that de-commissioned systems do not prove a safety hazard – measures to prevent systems being brought into operation – safety and warning notices. (PC 21.1.4)	(Range 2, 4)
6.	How to safely collect and dispose of system contents that may be hazardous to health or harmful to the environment. (PC 21.1.3, 21.1.4)	(Range 2, 3, 4)
7.	How to complete systems de-commissioning records. (PC All)	(Range All)
8.	System contents requiring recovery for re-use or safe disposal. (PC 21.1.3)	(Range 2, 4)
9.	Working principles of systems listed within the range (PC 21.1.3)	(Range 2, 3)
10.	The operating principles of gas, oil and solid fuel boilers and the differences between them when de-commissioning systems. (PC 21.1.3)	(Range 2, 4)
11.	What action to take when normal emptying or shut off mechanisms do not operate. (PC 21.1.4, 21.1.5)	(Range 2, 4)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. A proportion may be produced in a realistic working environment. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: f. Carry out effective de-commissioning activities in a safe manner across the listed range of systems as follows: • Heating - one category from the range of systems listed • Hot Water Systems – one category from the range of systems listed • Cold Water Systems – one category from the range of systems listed • Air Conditioning – one category from the range of systems listed • Electrics/Controls – one from each of the categories listed g. Provide evidence from one or more of the main fuel supply systems (gas, oil, solid fuel), depending upon the work experience available. Where the evidence is based upon gas, it must comply with the requirements of relevant sections of the gas ACOP and nationally accredited scheme for the accreditation of gas operatives. 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Unit 021 **Plan to rectify/modify systems**

Element 21.2 Re-commission systems to achieve optimum system performance

Performance Criteria

<u>The candidate must provide evidence to prove that they can:</u>

21.2.1 Confirm that the surroundings and requirements for the re-commissioning of water systems meet industry requirements [(1)]**.**

21.2.2 Check that the system cleanliness, additives and charging comply with industry requirements [(1)]**.**

21.2.3 Check systems and components [(2)] **for soundness using procedures that comply with** industry requirements [(1)]**.**

21.2.4 Carry out re-commissioning tests and checks [(3)] **in accordance with** industry requirements [(1)]**.**

21.2.5 Monitor system operation over a period of time to ensure it complies with industry requirements [(1)]**.**

21.2.6 Calibrate and adjust instrumentation and controls to comply with industry requirements [(1)]**.**

21.2.7 Lubricate systems and components [(2)] **in accordance with** industry requirements [(1)]**.**

21.2.8 Identify faults using re-commissioning tests and checks [(3)] **and take appropriate action to rectify system performance.**

21.2.9 Ensure that the necessary information [(4)] **on the re-commissioning of** systems and components [(2)] **is available.**

21.2.10 Confirm that the customer is advised of handover procedures [(5)]

Candidates will be required to produce evidence for all range items.

Range

1. Industry Requirements

a. Statutory regulations and recommendations
b. Safety legislation governing activities in the workplace
h. Work sequences
i. Co-ordination with the work of others
j. Work practices and techniques for re-commissioning systems or components
k. Company procedures
l. Factors affecting the re-commissioning process
m. Manufacturers recommendations
n. In accordance with industry's expectations of a systems rectification engineer

2. Systems and Components

a. Systems
(See full system category listing)
- Heating
- Ventilating
- Air Conditioning
- Water
- Fuel
- Electrics/controls

b. Components for Systems Within the Range
(Principal components)
- Boilers
- Pumps (centrifugal/induction
- Fans (centrifugal/axial)
- Air handling plants
- Heat emitters/exchangers
- Pressurisation units
- Pipework systems (or parts thereof)
- Electrics/controls (actuators/sensors)

3. Re-commissioning Tests and Checks

c. Pressure
d. Temperature
e. Humidity
f. Leaks
g. Voltage
h. Resistance
i. Loop impedance
j. Amperage
k. Rotational speed – direction
l. Polarity
m. Safe isolation
n. Continuity and insulation

4. Information

f. Maintenance specifications
g. Installation specifications
h. Maintenance schedules
i. Manufacturers information

5. Handover Procedures

a. Written confirmation of handover
   - Contract procedures
   - Company procedures

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:		
1.	Clean flush, charge, purge and where appropriate, chemically dose systems ready for use. (PC 21.2.1, 21.2.2, 21.2.4)	(Range All)
2.	Ensure systems are charged with the appropriate agents. (PC 21.2.2)	(Range 1, 2)
3.	Re-charge systems in a logical sequence to release air correctly. (PC 21.2.2, 21.2.4)	(Range All)
4.	Undertake pressure tests to ensure systems are leak free. (PC 21.2.3, 21.2.4)	(Range All)
12.	Lubricate system components. (PC 21.2.7)	(Range 1, 2)
13.	Confirm static testing of systems has been completed. (PC 21.2.3)	(Range 1, 2)
14.	Bring systems into operation following recognised procedures. (PC 21.2.4, 21.2.5, 21.2.6)	(Range 1, 2, 3)
15.	Initiate full dynamic system operation and monitor performance against desired standards. (PC 21.2.4, 21.2.5, 21.2.6)	(Range 1, 2, 3)
16.	Calibrate and adjust instrumentation and controls to meet manufacturers tolerance recommendations. (PC 21.2.5, 21.2.6)	(Range 1, 2)
17.	Take necessary remedial actions where systems fail to meet required performance standards. (PC 21.2.8)	(Range 1, 2)
18.	Obtain customer acceptance of re-commissioned systems. (PC 21.2.9, 21.2.10)	(Range 2, 4, 5)
19.	Complete and submit full documentation to appropriate persons. (PC 21.2.9, 21.2.10)	(Range 2, 4, 5)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

KNOWLEDGE STATEMENTS

The candidate must provide evidence that they know:		
1.	The climatic circumstances under which the system should not be re-commissioned. (PC 21.2.1)	(Range 1, 2)
2.	Systems types likely to become contaminated. (PC 21.2.2)	(Range 1, 2)
3.	Good practice for clean flushing, purging, charging and chemical dosing, and reasons for doing so. (PC 21.2.2)	(Range 1)
4.	Different, acceptable types of lubricants to use. (PC 21.2.7)	(Range 1, 2)
5.	Working principles of systems and principal components within the range. (PC 21.2.4, 21.2.5, 21.2.6)	(Range 1, 2, 3)
6.	The operating principles of gas, oil and solid fuel boilers and the differences between them when re-commissioning systems. (PC 21.2.4, 21.2.5, 21.2.6, 21.2.8)	(Range 1, 2, 3)
7.	Instruments, controls and their application, operation and interpretation. (PC 21.2.4, 21.2.5, 21.2.6)	(Range 1, 2, 3)
8.	Testing requirements. (PC 21.2.3, 21.2.4, 21.2.5, 21.2.6)	(Range 1, 2, 3)
9.	Importance of compliance with manufacturers' instructions, statutory requirements and safety regulations. (PC 21.2.6, 21.2.8)	(Range 1, 4)
10	Reasons for ensuring re-commissioned systems are safe for electrical connection. (PC 21.2.4)	(Range 1, 2, 3)
11.	Fail safe devices and how to ensure these are ready for operation. (PC 21.2.8)	(Range 1, 2, 3)
12.	The actions to take where re-commissioning checks and tests reveal system or component defects. (PC 21.2.4)	(Range 1, 3)
13.	How to complete re-commissioning documentation confirming the safe re-commissioning of systems and components. (PC All)	(Range All)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. A proportion may be produced in a realistic working environment. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: a. Carry out effective re-commissioning activities in a safe manner across the listed range of systems as follows: • Heating - one category from the range of systems listed • Hot Water Systems – one category from the range of systems listed • Cold Water Systems – one category from the range of systems listed • Air Conditioning – one category from the range of systems listed • Electrics/Controls – one from each of the categories listed b. Provide evidence from one or more of the main fuel supply systems (gas, oil, solid fuel), depending upon the work experience available. Where the evidence is based upon gas, it must comply with the requirements of relevant sections of the gas ACOP and nationally accredited scheme for the accreditation of gas operatives. 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Note: ***This is what the candidate must do:***

Unit 022 **Rectify system failure and modify systems**

This involves being able to:

Element 22.1 Diagnose the cause and rectify faults in systems and components.
Element 22.2 Prepare the work location for rectification, modification and re-commissioning.
Element 22.3 Rectify and modify systems.

Unit Commentary

- This unit measures the candidate's ability to locate system faults by following logical diagnostic sequences and using appropriate fault finding equipment and methods.
- Candidates must demonstrate a sound knowledge and understanding of system operating principles and the main types of modifications and rectification activities applicable.
- Systems are required to be rectified and, or modified using diagnostic skills to restore specified operational performance.
- Electrical safety aspects are very important, as are relevant electric tests.
- Compliance with relevant recommendations and regulations must be demonstrated whilst undertaking diagnostic tasks.
- Candidates are required to plan for the system rectification, modification and, or re-commissioning to be undertaken. This will involve preparing the work location by checking access, safety and workplace condition requirements.
- Mains supplies and energy sources must be traced, located and identified and electrical connections must be safely isolated and disconnected at the appropriate stage in the process.
- Candidates must demonstrate a sound knowledge and understanding of system operating principles and the main types of modifications and rectification activities applicable.
- Candidates must be able to undertake the required rectification or modification safely to meet the relevant recommendations, regulations and standards. Relevant documentation is to be completed and made available in line with company procedures if applicable.
- For de-commissioning, candidates are required to make arrangements with users of the work location and ensure their safety throughout the process.
- It is important that candidates are aware of the effect isolating part of a system has to the full system status.

Unit 022 **Rectify system failure and modify systems**

Element 22.1 Diagnose the cause and rectify faults in systems and components

Performance Criteria

The candidate must provide evidence to prove that they can:

22.1.1 Locate faults [(1)] **in** systems and components [(2)] **using procedures that comply with** industry requirements [(3)]**.**

22.1.2 Liase with other persons [(4)] **to agree fault rectification procedures, which will minimise disruption to work routines.**

22.1.3 Rectify faults [(1)] **in systems to restore the** systems and components [(2)] **function to performance specification.**

22.1.4 Take precautionary actions [(5)] **to prevent the unauthorised use of unsafe** systems and components [(2)]

22.1.5 Record and report results of diagnostics in accordance with industry requirements [(3)]

Candidates will be required to produce evidence for all range items.

Range

1. Faults

a. Mechanical
b. Electrical
c. Electronic (substitution and sub-assembly)

2. Systems and Components

g. Systems
(See full system category listing)
- Heating
- Ventilating
- Air Conditioning
- Water
- Fuel
- Electrics/controls

h. Components for Systems Within the Range
(Principal components)
- Boilers
- Pumps (centrifugal/induction
- Fans (centrifugal/axial)
- Air handling plants
- Heat emitters/exchangers
- Pressurisation units
- Pipework systems (or parts thereof)
- Electrics/controls (actuators/sensors)

9. Industry Requirements

a. Statutory regulations, recommendations and system documentation
b. Work sequences for maintenance activity
   i. Visual inspection
   ii. Unusual/unacceptable noise
   iii. Indication of: hot, cold, vibration by touch
   iv. Faults determined by odour
   v. Use and interpretation of instrument information

c. Tests for Systems and Components:
   i. Pressure
   ii. Temperature
   iii. Leakage
   iv. Humidity
   v. Voltage
   vi. Resistance
   vii. Loop impedance
   viii. Amperage
   ix. Rotational speed – direction
   x. Polarity
   xi. Safe isolation
   xii. Continuity and insulation
d. Performance Tests
   i. Mechanical
   ii. Electrical
e. Maintenance Practices and Procedures
f. Co-ordination with other trades/customers
g. Company procedures
h. In accordance with industry's expectations of a systems rectification engineer

10. Other Persons

a. Customers
b. Other workers

11. Precautionary Actions

a. Liaise with other persons
b. Safe working practices
c. System isolation and labelling

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:		
19.	Respond promptly to reported faults. (PC 22.1.1, 22.1.2)	(Range 1, 2, 3, 4)
20.	Establish a safe working environment. (PC 22.1.1, 22.1.4)	(Range 1, 2, 3, 5)
21.	Locate, diagnose and identify system faults using safe diagnostic methods or test procedures, and select and use appropriate diagnostic equipment. (PC 22.1.1, 22.1.3, 22.1.4)	(Range 1, 2, 3, 5)
22.	Evaluate rectification requirements, agree work programmes and report actions to customers.. (PC 22.1.2, 22.1.5)	(Range 3, 4)
23.	Comply with the requirements of legislation and good practice whilst engaged in fault diagnosis activity. (PC 22.1.1, 22.1.5)	(Range 1, 2, 3)
24.	Use relevant system information to help locate faults. (PC 22.1.1)	(Range 1, 2, 3)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Knowledge Statements

The candidate must provide evidence that they know:	
1. How to interpret information on system or component performance, including advice from users, visual inspections, checks or diagnostic tests to locate faults. (PC All)	(Range All)
2. The work procedures for the diagnosis and rectification of faults in systems or components, which will ensure minimum disruption to customers and routines. (PC 22.1.1, 22.1.2)	(Range 1, 2, 3, 4)
3. How to liase with others to ensure co-operation in the fault rectification process. (PC 22.1.2)	(Range 1, 2, 3, 4)
4. The work action and sequences required to diagnose and rectify faults in systems and components, including safety requirements. (PC 22.1.3)	(Range 1, 2)
5. The measures to ensure that systems do not present a safety hazard to potential users, or the workforce, when carrying out rectification procedures. (PC 22.1.4)	(Range 2, 5)
6. The actions to be taken when the system or component cannot be restored to full performance. (PC All)	(Range All)
7. How to isolate unsafe systems and components. (PC All)	(Range All)
8. Working principles of systems within the range. (PC 22.1.1)	(Range 1, 2, 3)
9. The operating principles of gas, oil burners, and solid fuel and electric boilers and differences between them when diagnosing and identifying system faults. (PC 22.1.1)	(Range 1, 2, 3)
10. Organisational procedures and recording requirements. (PC 22.1.1, 22.1.2, 22.1.5)	(Range 1, 2, 3, 4)
11. How to produce and make available comprehensive reports upon fault diagnosis outcomes. (PC 22.1.5)	(Range 1, 3)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. A proportion may be produced in a realistic working environment. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: o. Demonstrate effective fault diagnosis technique by undertaking the relevant work methods and procedures and the diagnostic test for systems listed within the range. p. Identify faults within the range of systems as below: • Heating - one category from the range listed covering mechanical and electrical faults • Ventilating – one category from the range of systems listed covering mechanical and electrical faults • Air Conditioning - one category from the range of systems listed covering mechanical and electrical faults • Water – one category from the range of systems listed covering mechanical and electrical faults q. Provide evidence from one or more of the main fuel supply systems (gas, oil, solid fuel), depending upon the work experience available. Where the evidence is based upon gas, it must comply with the requirements of relevant sections of the gas ACOP and nationally accredited scheme for the accreditation of gas operatives. 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Unit 022 **Rectify system failure and modify systems**

Element 22.2 Prepare the work location for rectification, modification and re-commissioning

Performance Criteria

The candidate must provide evidence to prove that they can:

22.2.1 Ensure that safety provisions [(1)] **within the immediate work location conform to the requirements of health and safety legislation.**

22.2.2 Ensure that access provision [(2)] **to and from the immediate work location complies with health and safety requirements for the safe movement of the workforce, members of the public and materials.**

22.2.3 Report any pre-maintenance damage or defects to existing building fabric [(4)] **within the** customers' property [(3)] **to the job supervisor or line manager.**

22.2.4 Protect customers' property [(2)] **and the** building fabric [(4)] **against possible damage being caused during the work process.**

22.2.5 Check that supply services [(5)] **to the system components are suited to their intended purpose.**

22.2.6 Confirm that the customer has job information [(6)] **on all key aspects of the work process.**

22.2.7 Confirm that all materials, tools and equipment [(7)] **necessary for the work process will be available as required.**

22.2.8 Arrange safe storage provision for materials, tools and equipment [(7)]**, which meet industry requirements.**

22.2.9 Carry out preparatory work [(8)] **to meet the work requirements of** systems and components [(9)]**.**

Candidates will be required to produce evidence for all range items.

Range

1. Safety Provisions

a. Personal protection equipment
b. Fire fighting equipment
c. First aid
r. Accident prevention methods
s. Tools and equipment
t. Risk assessment
u. Permit to work

2. Access Provision

a. Ladders
b. Scaffold – fixed and mobile
c. Walkways
d. Mechanical access equipment

3. Customer's Property

a. Domestic
b. Industrial/Commercial

4. Building Fabric

a. Walls
b. Floors
c. Fitting, fixings, finishes
d. Roofs

5. Supply Services

a. Existing systems
b. Fuel, water, electricity and drainage
c. Temporary or permanent supplies for tools and equipment

6. Job Information

a. Specifications
b. Drawings
c. Statutory regulations and recommendations
d. Instructions – verbal or written

7. Materials, Tools and Equipment

a. Materials, replacement components and consumables
b. Hand tools and powered tools
d. Access equipment

e. Protective clothing
f. Safety equipment

8. Preparatory Work

a. Relevant to the work activity

9. Systems and Components

a. Systems
- Heating
- Ventilating
- Air conditioning
- Water
- Fuel
- Electrics/controls

b. Components for Systems Within the Range (Principal components)
- Boilers
- Pumps (centrifugal/induction)
- Fans (centrifugal/axial)
- Air handling plants
- Heat emitters/exchangers
- Pressurisation units
- Pipework systems (or parts thereof)
- Electrics/controls (actuators/sensors)

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:		
1.	Check and confirm the safety of the work location. (PC 22.2.1)	(Range 1, 6)
2.	Check the appropriate arrangements are in place for the movement and storage of materials, tools and equipment. (PC 22.2.2)	(Range 2)
3.	Confirm that all necessary input services to which the components will be connected are available and of the correct type. (PC 22.2.5)	(Range 5, 6, 8, 9)
4.	Access the suitability of the electrical supply (temporary or permanent) for the tools and equipment to be used in carrying out the work. (PC 22.2.5)	(Range 5, 6, 8, 9)
5.	Confirm that the electrical supply is suitable for the systems requirements. (PC 22.2.5)	(Range 5, 6, 8, 9)
6.	Ensure that all materials, tools and equipment to carry out the work are available on site at the appropriate time. (PC 22.2.7)	(Range 7)
7.	Confirm arrangements for the safe storage of tools and equipment. (PC 22.2.4)	(Range 7)
8.	Confirm that the necessary safety and access provisions are taken account of in work activities arising from risk assessment or where a permit to work may be required. (PC 22.2.1, 2.2.2)	(Range 1, 2, 6)
9.	Ensure minimum disturbance or damage to the customer's property. (PC 22.2.3, 22.2.4)	(Range 3, 4, 8)
10.	Explain to customers deadlines, potential disruptions and negotiate alterations best suited to them within constraints previously agreed. (PC 22.2.6)	(Range 6)
11.	Ensure that preparatory work, relevant to the work activity, meets the installation requirements of systems and components. (PC 22.2.9)	(Range 8, 9

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Knowledge Statements

The candidate must provide evidence that they know:	
1. The source of information on the preparatory work necessary for the system or component rectification. (PC 22.2.2, 22.2.9)	(Range 3, 4, 8, 9)
2. Regulations and recommendations on maintenance work governing safety in the workplace. General responsibilities of the operative for their own safety and that of others (PC 22.2.1)	(Range 1)
3. The equipment necessary to provide safe access to work at heights, or in confined spaces. (PC 22.2.2)	(Range 2)
4. How to protect customer's property or the building fabric prior to the work commencing. (PC 22.2.3, 22.2.4)	(Range 3, 4)
5. The input services or supplies required for new systems or components, or for extending systems or adding components to existing systems. How to confirm that input services are adequate. (PC 22.2.5)	(Range 5)
6. The person to which deficiencies in input services should be reported and procedures for isolating input services. (PC 22.2.5)	(Range 5)
7. How to ensure that the customer is fully briefed on all aspects of the rectification programme. (PC 22.2.6)	(Range 6)
8. The tools, equipment, materials and components required for the system rectification, order and supply advice, delivery, checking and storage procedures. (PC 22.2.7)	(Range 7)
9. The actions to be taken should materials not be available at site to commence the rectification activity. (PC 22.2.8)	(Range 7)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. A proportion may be produced in a realistic working environment. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: a. Prepare a minimum of three of the types of premises from the listed range, incorporating factors affecting the work process in readiness for work activity. b. Trace, locate, identify and isolate electrical supplies. c. Provide evidence from one or more of the main fuel supply systems (gas, oil, solid fuel), depending on the work experience available. Where the evidence is based on gas, it must comply with the requirements of relevant sections of the gas ACOP and nationally accredited scheme of the certification of gas operatives. 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

Unit 022 **Rectify system failure and modify systems**

Element 22.3 Rectify and modify systems

Performance Criteria

<u>The candidate must provide evidence to prove that they can:</u>

22.3.1 Carry out rectifying and/or modifying actions [(1)] **to minimise risk to individuals and the environment.**

22.3.2 Carry out rectifying and/or modifying actions [(1)] **to minimise system downtime.**

22.3.3 Carry out rectifying and/or modifying actions [(1)] **in agreement with the** customer [(2)]**.**

22.3.4 Isolate systems or partial systems from supply services [(3)] **in accordance with** industry requirements [(4)]**.**

22.3.5 Carry out rectifying and modifying actions [(1)] **appropriate to the** systems and components [(5)].

22.3.6 Rectify effective system performance to industry requirements [(4)]**.**

22.3.7 Implement rectification and/or modifying actions [(1)] **that maintains the overall specified system performance.**

22.3.8 Complete documentation that is complete, accurate, legible and made available to the customer [(2)]**.**

Candidates will be required to produce evidence for all range items.

1. Rectifying and/or Modifying Actions

a. Re-routing of pipework
b. Relocation of individual components
c. Substitution of components with those of equal technical capability
d. Rectify component faults

2. Customer

a. Authorised persons
b. Client
c. Other workers

3. Supply Services

a. Water
b. Gas
c. Electricity
d. Oil
e. Drainage
f. Solid fuel

4. Industry Requirements

a. Statutory regulations, recommendations and system documentation
b. Work sequences for maintenance
c. Co-ordination with other trades/customers
d. Maintenance practice and procedures
e. Company procedures
f. In accordance with industry's expectations of a systems rectification engineer

5. Systems and Components

a. Systems
- Heating
- Ventilating
- Air Conditioning
- Water
- Fuel
- Electrics/controls

b. Components for Systems Within the Range
(Principal components)

- Boilers
- Pumps (centrifugal/induction)
- Fans (centrifugal/axial)
- Air handling plants
- Heat emitters/exchangers
- Pressurisation units
- Pipework systems (or parts thereof)
- Electrics/controls (actuators/sensors)

Performance Evidence

Candidates must produce sufficient evidence to demonstrate consistency in their ability to:
1. Maintain a safe working environment and ensure the protection of persons and property whilst undertaking work. (PC 22.3.1) (Range 1)
2. Safely isolate mains supplies, energy sources and electrical connections then drain systems, or partial systems in an appropriate manner. (PC 22.3.4, 22.3.5) (Range 1, 2, 3, 4)
3. Ensure that systems are brought to a stage which allows rectification and, or modification work to proceed safely, and avoids damage. (PC 22.3.2, 22.3.3, 22.3.4, 22.3.5, 22.3.6) (Range 1, 2, 3, 4, 5)
4. Ensure that substitute components/principal components are of equal technical capability, and connected to supplies correctly. (PC 22.3.5, 22.3.6, 22.3.7) (Range 1, 4, 5)
5. Repair and/or adjust faulty components/principal components to restore system performance to specification. (PC 22.3.6, 22.3.7) (Range 1, 4)
6. Test for leakage and electrical integrity. (PC 22.3.6, 22.3.7) (Range 1, 4)
7. Ensure the rectification work has not adversely affected overall system performance. (PC 22.3.6, 22.3.7, 22.3.8) (Range 1, 2, 4)
8. Ensure modifications maintain specified system performance. (PC 22.3.6, 22.3.7) (Range 1, 4)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Knowledge Statements

The candidate must provide evidence that they know:	
1. The importance of minimising risks to individuals and the environment. (PC 22.3.1)	(Range 1)
2. How to carry out work efficiently, logically and in line with customer requirements. (PC 22.3.1, 22.3.2, 22.3.3)	(Range 1, 2)
3. Why relaying information to the customer and gaining agreement is important. (PC 22.3.3, 22.3.8)	(Range 1, 2)
4. Correct methods and procedures for isolating mains supplies, energy sources and electrical connections. (PC 22.3.4)	(Range 3, 4)
5. Correct methods and procedures for emptying systems or parts of systems. (PC 22.3.4, 22.3.5)	(Range 1, 3, 4, 5)
6. Working principles of systems within the range. (PC 22.3.4, 22.3.5, 22.3.6, 22.3.7)	(Range 1, 3, 4, 5)
7. The operating principles of gas, oil and solid fuel boilers and their differences in relation to rectifying and modifying systems. (PC 22.3.4, 22.3.5, 22.3.6, 22.3.7)	(Range 1, 3, 4, 5)
8. How to compare technical performance of replacement components to faulty components/principal components. (PC 22.3.6, 22.3.7)	(Range 1, 4)
9. Correct installation requirements and procedures for components/principal components of systems, implications of incorrect fixing and different methods of fixing and connecting. (PC 22.3.4, 22.3.5, 22.3.6, 22.3.7)	(Range 1, 3, 4, 5)
10. How to ascertain components/principal components are electrically safe. (PC 22.3.6, 22.3.7)	(Range 1, 4)
11. How to ensure that overall system performance is not impaired following rectification and/or modification works. (PC 22.3.6, 22.3.7)	(Range 1, 4)

Note: Numbers in brackets allow you to refer back to the relevant performance criteria and range

Assessment Guidance

To assist in assessment of candidates
1. Performance evidence should be generated from the workplace. A proportion may be produced in a realistic working environment. All performance evidence must be of a commercially acceptable standard. 2. Candidates must: a. Undertake rectification activity in a safe manner across one each of the listed range of systems categories as follows: • Ventilation • Air conditioning • Fuel b. Undertake modification activity in a safe manner across one each of the listed range of system categories as follows: • Heating • Water • Fuel c. Provide evidence from one or more of the main fuel supply systems (gas, oil, sold fuel), depending upon the work experience available. Where the evidence is based on gas, it must comply with the requirements of relevant sections of the gas ACOP and nationally accredited scheme of the certification of gas operatives. 3. In addition, candidates must possess sufficient knowledge and understanding across all range and satisfy all performance criteria.

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