



**Note:** The Outcomes and PCs are mandatory and cannot be altered. The IA may be altered by arrangement with SQA. (Where a range of performance is indicated, this should be regarded as an extension of the PCs and is therefore mandatory.)

**OUTCOME 1****SELECT AND LOCATE COMBINED CENTRAL HEATING/HOT WATER CONTROLS FOR A GIVEN SITUATION**

## PCs

- (a) The selected controls are compatible and appropriate to the given system.
- (b) The location of the controls is appropriate to the given system and ensures system performance and operation.
- (c) The location of the controls is correct in terms of regulating room temperature.
- (d) The location of the controls is correct in terms of regulating domestic hot water temperature.

## IA Assignment

The student will be set an assignment to test the application of knowledge required to select and locate combined central heating/hot water controls for a given situation.

The student will be provided with a drawing of a fully pumped central heating system within a domestic dwelling, together with a description of the functions required to be fulfilled by the controls to be selected. The description should elicit selection of the following controls:

- (i) programmer;
- (ii) room thermostat and/or thermostatic radiator valves;
- (iii) cylinder thermostat;
- (iv) 2 or 3 port motorised valves.

Using the given information the student will be required to select and locate controls in accordance with performance criteria (a) to (d) above.

Satisfactory achievement of the Outcome will be demonstrated by the student achieving all of the performance criteria.

**OUTCOME 2                    OUTLINE THE COMMISSIONING AND MAINTENANCE PROCEDURES FOR A RANGE OF DOMESTIC HEATING SYSTEMS**

- PCs
- (a) The described procedures involved in commissioning the system are in accordance with the appropriate regulations in terms of filling.
  - (b) The described procedures involved in commissioning the system are in accordance with the appropriate regulations in terms of firing .
  - (c) The described procedures involved in commissioning the system are in accordance with the appropriate regulations in terms of testing.
  - (d) The described procedures involved in maintaining the system are correct in terms of economy and safe use and are in accordance with the appropriate regulations.

**IA    Restricted Response Questions**

The student will be presented with an exercise consisting of restricted response questions to test comprehension of the procedures for commissioning and maintenance of domestic heating systems.

The exercise will consist of 6 questions allocated as follows:

**A    commissioning:**

- |       |         |   |
|-------|---------|---|
| (i)   | filling | 1 |
| (ii)  | firing  | 2 |
| (iii) | testing | 2 |

**B    maintenance schedule    1**

Questions should be restricted to oil, electric or solid fuel systems.

Satisfactory achievement of the Outcome will be based on the performance criteria being met. This will be demonstrated by the student producing 6 correct responses.

**OUTCOME 3                    DIAGNOSE FAULTS IN A RANGE OF HEATING SYSTEMS AND RECOMMEND REMEDIAL ACTION**

- PCs
- (a) The outline of the procedures involved in locating faults is appropriate to the specified system.
  - (b) The method specified to rectify the identified fault is appropriate to the given symptoms.

- (c) The method specified to rectify the identified fault is economical in terms of cost and labour and in accordance with the appropriate regulations.

IA Restricted Response

The student will be presented with an exercise consisting of restricted response questions to test comprehension of the procedures involved in diagnosing and rectifying faults in a range of heating systems.

The exercise will consist of 7 questions allocated as follows:

(i)	noise or cold spots	1
(ii)	circulator failure	1
(iii)	thermostat failure	1
(iv)	non-ignition (oil)	1
(v)	inadequate fuel combustion (solid fuel)	1
(vi)	water leakage	1
(vii)	others	1

Satisfactory achievement of the Outcome will be based on all performance criteria being met. This will be demonstrated by the student producing 5 correct responses.

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**The following sections of the descriptor are offered as guidance. They are not mandatory.**

Safety regulations and safe working practices and procedures should be observed at all times.

### CONTENT/CONTEXT

Corresponding to Outcome 1-3:

1. Electrical and non-electrical (mechanical) control systems ie room, cylinder, boiler frost and pipe thermostats. Motorised and thermostatic valves. Programmers and time switches.

Functions and operation of controls.  
Compatibility of control systems.

Factors affecting location of electrical and mechanical controls.  
Advantages and disadvantages of controls and control systems.

2. Filling, venting, testing and flushing of systems. Setting up and firing of boiler. Checking operation of controls and valves. Checking heat flow; operating temperatures; balancing of systems; use of combustion efficiency equipment (oil, electric and solid fuel boilers only). Use of manufacturers' instructions.

Typical maintenance intervals, maintenance procedures for systems and controls, solid fuel, electric and oil boilers, maintenance schedules, manufacturers' maintenance instructions, maintenance contracts.

3. Installation and design faults. Faults caused by natural deterioration (wear and tear) i.e. trapped air; overpumping; faulty thermostats, valves, circulators, programmers etc.

Simple boiler failures (solid fuel, electric and oil boilers). Ignition failure, photocell failure. Simple electric faults. Corrosion; electrolytic action on pipework, fittings components. Corrosion inhibitors.

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### SUGGESTED LEARNING AND TEACHING APPROACHES

It would be useful to teach this module in conjunction with Module No 64164 - Preparation and Assembly of Electrical Systems.

Samples of control devices and their installation instructions should be available for inspection and access to fully operational central heating systems is considered necessary to demonstrate operation of controls, components, typical commissioning and maintenance procedures.

The use of Codes of Practice, manufacturers' installation and maintenance instructions should be encouraged.

Case studies may provide an effective method of introducing and generating student centred activities on system faults.

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