

-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

**Hanover House
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NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number-	4250612	-Session- 1992-93
-Superclass-	TH	

-Title-	INTRODUCTION TO DOMESTIC HEATING SYSTEMS
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-DESCRIPTION-

Purpose	This module is designed to introduce a candidate to central heating systems in general and to focus on the layouts and associated components of open-vented heating systems.
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It is aimed at those following a career in plumbing and receiving complementary industrial experience.

Preferred Entry Level	4250681 Plumbing: Hot Water Systems 1 (x 1/2) 4250112 Hot Water Systems and Water Heaters
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Outcomes	The candidate should: <ol style="list-style-type: none">1. identify a range of boilers;2. identify a range of heat emitters and associated controls;3. produce annotated diagrams of the layouts of combined central heating/hot water systems;4. describe the function of the main components and pipework in a domestic central heating system;5. outline the installation of an oil storage tank for a domestic heating system.
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Assessment Procedures	Acceptable performance in this module will be satisfactory achievement of all the Performance Criteria specified for each Outcome.
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The following abbreviations are used below:

PC Performance Criteria
IA Instrument of Assessment

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 IDENTIFY A RANGE OF BOILERS

- PCs
- (a) The identification of the type of boiler is correct in terms of the flue provision or flue type.
 - (b) The identification of the type of boiler is correct in terms of fuel burner or heat storage capability.
 - (c) The identification of the type of boiler is correct in terms of siting.

IA Objective Items

The candidate will be presented with an exercise consisting of objective items to test the recall of knowledge of the different features of a range of boilers.

The exercise will consist of 12 questions allocated as follows:

- (a) identification by flue provision or flue type; (4)
- (b) identification by fuel burner or heat storage capability; (4)
- (c) identification by siting. (4)

In Sections (a), (b) and (c) there should be one question on each of the following types of boilers:
solid fuel;
gas;
oil;
electricity.

The candidate should be provided with sectional drawings or any other suitable medium of each type of boiler.

Objective items could be either short answer questions, multiple choice questions, matching exercise, grid exercise or completion exercise.

Satisfactory achievement of the Outcome will be based on all Performance Criteria being met. This will be demonstrated by the candidate answering all the questions correctly.

OUTCOME 2 IDENTIFY A RANGE OF HEAT EMITTERS AND ASSOCIATED CONTROLS

- PCs
- (a) The identification of the heat emitter is correct in terms of type.
 - (b) The described method of operation of the heat emitter is correct in terms of heat transfer.
 - (c) The identification of the associated controls of heat emitters is correct in terms of type and function.

IA Objective Items

The candidate will be presented with an exercise consisting of objective items to test the recall of knowledge of a range of heat emitters and their associated controls.

The exercise will consist of 10 questions allocated as follows:

- (a) type of heat emitter; (3)
- (b) methods of operation; (3)
- (c) type and function of controls. (4)

Objective items could be either short answer questions, multiple choice questions, matching exercise, grid exercise or completion exercise.

Satisfactory achievement of the Outcome will be based on all Performance Criteria being met. This will be demonstrated by the candidate producing correct responses to all the questions.

OUTCOME 3 PRODUCE ANNOTATED DIAGRAMS OF THE LAYOUTS OF COMBINED CENTRAL HEATING/HOT WATER SYSTEMS

- PCs
- (a) The location of components is correct in accordance with system performance.
 - (b) The identification of components is clear and in accordance with acceptable terminology.
 - (c) The pipework layout is correct in terms of points of connection within the system.
 - (d) The pipework layout is correct in terms of minimum sizes of vent and cold feed.

IA Assignment

The candidate will be set an assignment consisting of 2 graphical exercises to test the application of knowledge required to produce annotated diagrams of the layout of combined central heating/hot water systems.

The candidate will be required to produce 2 diagrams of A4 size of the layouts of combined central heating/hot water systems as follows:

- (i) mini/micro bore system;
- (ii) small bore system.

One of the above systems should have gravity primaries and the other should have pumped primaries.

The candidate will also be required to annotate each diagram in accordance with Performance Criteria (a) to (d) above.

Satisfactory achievement of the Outcome will be based on the candidate producing an annotated diagram in accordance with all the Performance Criteria for each diagram.

OUTCOME 4**DESCRIBE THE FUNCTION OF THE MAIN COMPONENTS AND PIPEWORK IN A DOMESTIC CENTRAL HEATING SYSTEM**

PCs

- (a) The described functions of the components are correct in terms of heating of water in the system.
- (b) The described functions of the components and pipework are correct in terms of distribution of heated water throughout the system.
- (c) The described functions of the components are correct in terms of heat transfer from the system to building.
- (d) The described functions of the components and pipework are correct in terms of provision for water expansion in the system.
- (e) The described function of components and pipework are correct in terms of air release from the system.

IA Structured Question

The candidate will be presented with an exercise consisting of one structured question to test comprehension of the function of the main components and pipework in a domestic central heating system.

The candidate should be provided with a diagram of a domestic central heating system which includes the main components and pipework.

The question should be based on the Performance Criteria, structured on the above diagram and be subdivided into 5 parts as follows:

- (i) heating of water;
- (ii) distribution of heated water;
- (iii) heat transfer;
- (iv) provision for water expansion;
- (v) air release.

Satisfactory achievement of the Outcome will be based on the Performance Criteria being met. This will be demonstrated by the candidate producing a correct response to each part of the structured question.

OUTCOME 5

OUTLINE THE INSTALLATION OF AN OIL STORAGE TANK FOR A DOMESTIC HEATING SYSTEM

PCs

- (a) The indicated position of components is correct.
- (b) The outline of the provision for connections to the oil storage tank is correct in terms of the function and location of:
 - (i) fill-point;
 - (ii) vent;
 - (iii) drain;
 - (iv) contents gauge.
- (c) The outline of the method of connection of the oil pipeline from the storage tank to the boiler is correct in terms of the function and location of:
 - (i) isolating valves;
 - (ii) oil filters;
 - (iii) fire-valves.

IA Structured Question

The candidate will be presented with an exercise consisting of one structured question to test the knowledge required to provide oil storage for a domestic heating system.

The candidate will be provided with an A4 size drawing detailing an oil storage tank installation complete with pipeline connecting it to a boiler.

The candidate will be required to indicate the position of, and explain the function of the following components: fill-point, vent, drain, contents gauge, isolating valves, oil filter and fire-valves.

Fittings should not be shown on the storage tank or pipeline.

Satisfactory achievement of the Outcome will be based on all the Performance Criteria being met.

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

CONTENT/CONTEXT

Corresponding to Outcomes 1-5:

1. Boilers to include the following types: back boilers, freestanding, wall-mounted, low water content, fan-assisted flue, combination, condensing.

Boilers suitable for use with electricity and the following fuels: domestic fuel oils, solid fuels, natural and liquefied petroleum gases.
2. Column and panel radiators; the effect of convection fans on heat emission. Natural and fan assisted convectors. Flow and return connection points to emitters. Function and location of wheel-head, lockshield, twin entry/exit and thermostatic valves and air release devices.
3. Advantages and disadvantages of types of systems with inputs up to 45 kW.
Hot water circuits to include gravity primaries and pumped primaries.
Central heating systems to include one pipe, two pipe systems and mini/micro bore systems.
Purpose and location of a by-pass in a fully pumped system.
Pipe sizes - pumped primaries, gravity primaries, cold feed, vent, bypass.
Terminology and location of the components.
4. The functional requirements of the boiler; pump; radiators/convectors; feed and expansion cistern; flow and return pipework; feed and vent pipes; manual and automatic air release valves; heat exchangers within the indirect cylinders.
5. Oil storage tanks, materials, capacities and methods of support.
Purpose and size of connections to include fill point, vent, drain, contents measurement, oil pipeline, types of materials and fittings used for vent, drain, contents measurement, oil pipeline connections.

Oil pipelines, materials, methods of protection, means of isolation, filtration and fire valves.

SUGGESTED LEARNING AND TEACHING APPROACHES

The achievement of this module may be assisted by tutorials and group discussions but it would also be desirable for candidates to have access to a full-scale working system and a variety of heating components such as boilers, burners, heat emitters and associated controls.

Comparison of various pipework systems by OHP with, if available, the use of an OHP animator, will assist in explaining system operation.

Video tapes produced by manufacturers regarding domestic systems should prove useful to consolidate and to introduce Outcome 3 and Outcome 4.

Incomplete sketches, candidate-centred activities, survey of existing systems and minor practical activities for investigative purposes may be adopted. Trade literature can be usefully used to illustrate the variety of equipment identified in Outcome 1, 2, 4 and 5, Manufacturers' catalogues.

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