

-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

**Hanover House
24 Douglas Street
GLASGOW G2 7NQ**

NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number-	4250681	-Session-	1991-92
-Superclass-	TH		

-Title-	PLUMBING : HOT WATER SYSTEMS 1 (x¹/₂)
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-DESCRIPTION-

Purpose	This module is designed to introduce the student to cistern-fed hot water supply systems and to develop knowledge and understanding of direct hot water supply. It covers the operating principles of hot water systems: including the function of components and valves, pipework, materials, direct systems layout, installation requirements and insulation.
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It is aimed at those following a career in plumbing and receiving complementary industrial experience.

Preferred Entry Level	No formal entrance requirements
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Outcomes	The student should: <ol style="list-style-type: none">1. outline the layout for a cistern-fed direct system of hot water supply;2. describe the functions of the mains components, pipes and valves for cistern-fed direct systems of hot water supply;3. outline the factors that affect gravity (primary and secondary) circulations.
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Assessment Procedures	Acceptable performance in the 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 OUTLINE THE LAYOUT FOR A CISTERN-FED DIRECT SYSTEM OF HOT WATER SUPPLY

- PCs
- (a) The pipework layouts drawn are correct in terms of connection to components and appliances and are in accordance with appropriate regulations.
 - (b) The location of the components, pipework and valves is correct in terms of the system performance and in accordance with appropriate regulations.
 - (c) The identification of the components, the pipework and the valves is clear and in accordance with accepted terminology.

IA Assignment

The student will be set an assignment consisting of 1 graphical exercise to test the knowledge required to outline the layout for a cistern-fed direct system of hot water supply.

The student will be provided with an elevational drawing of A4 size of the outline of a domestic building with the position of sanitary appliances, washing machine, and water heating apparatus (boiler or gas circulator) indicated.

The student will be required to complete and annotate the drawing to show the location of HW storage cylinder, cold water cistern, pipework layout and valves appropriate to the situation given.

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

OUTCOME 2 DESCRIBE THE FUNCTIONS OF THE MAIN COMPONENTS, PIPES AND VALVES FOR CISTERN-FED DIRECT SYSTEMS OF HOT WATER SUPPLY

- PCs (a) Described functions of components, pipework and valves are correct in terms of:
- (i) provision for expansion of water;
 - (ii) temperature control;
 - (iii) efficient heating of water;
 - (iv) water storage and distribution;
 - (v) water flow control.

IA Structured Questions

The student will be presented with an exercise consisting of structured questions to test comprehension of the functions of the main components and pipework for cistern-fed direct systems of hot water supply.

The student will be provided with a diagram of a cistern-fed direct hot water supply system which includes the main components and pipework, and will be required to answer five questions based on the Performance Criteria, and structured on the above diagram. One question will be allocated to each of the following:

- (i) means of coping with expansion of water;
- (ii) controlling of water temperature;
- (iii) heating of water;
- (iv) hot water storage and distribution;
- (v) control of water flow.

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

OUTCOME 3 OUTLINE THE FACTORS THAT AFFECT GRAVITY (PRIMARY AND SECONDARY) CIRCULATIONS

- PCs (a) The outlined factors are correct in terms of:
- (i) the temperature (density) difference;
 - (ii) the relationship between the heat source, hot water storage vessel and the circulation pipework;
 - (iii) minimising frictional resistance through pipework;
 - (iv) the pipework gradients.

IA Objective Items

The student will be presented with an exercise consisting of objective items to test the recall of knowledge of the factors affecting gravity (primary and secondary) circulations.

The exercise will consist of 5 questions allocated as follows:

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| (a) | the temperatures or densities of water | - 1 |
| (b) | relationship between heat source, hot water storage vessel and circulation pipework | - 2 |
| (c) | minimising of frictional resistance through pipework | - 1 |
| (d) | grading of pipework | - 1 |

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

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

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

CONTENT/CONTEXT

Corresponding to Outcomes 1-3:

1. Pipework layouts and the respective connecting points between cisterns, cylinders, boilers and terminal fittings. Typical pipe diameters and type of connecting fittings. Terminology relating to pipework, components and fittings. Location and relationship of components and valves. Types of materials used for components, pipework and fittings. Typical insulating materials and their applications. Direct pattern and combination type cylinders and tanks. Gas circulators, immersion heaters, boilers.
 2. Cold-feed, open-vent, primary and secondary circulation and distribution pipework. Cold-feed cistern, direct hot water cylinders, boilers and thermostats, and other heat sources. Valves suitable for use as servicing valves; drain valves and terminal fittings.
 3. Flow and return temperatures, density of water at different temperatures, convection currents, circulating head, pipework lengths, diameters, radii of bends, effect of fittings (frictional resistances), pipework gradients.
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SUGGESTED LEARNING AND TEACHING APPROACHES

This module will be essentially classroom-based. Access to a full size working system is desirable. Sufficient time should be allocated to enable students to carry out guided experiments related to gravity circulation. Video tapes on heat transfer are recommended and an overhead projector could be used to illustrate flow directions and pipe layouts.

Students should be encouraged to refer to British Standard Codes of Practice, bye-laws and manufacturers' literature.

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