

# Unit 007/207    Understand and apply domestic hot water system installation and maintenance techniques

**Level:**                2  
**Credit value:**      8  
**UAN:**                F/602/2884

## Unit aim

This combination unit provides learning in the installation, maintenance, decommissioning and soundness testing of a basic range of hot water system/component types in dwellings and industrial/commercial properties (of similar size and scope to domestic dwellings) The unit covers systems in building up to 3 storeys in height with pipework up to 28mm diameter.

## Learning outcomes

There are **eleven** learning outcomes to this unit. The learner will:

1. Know the types of hot water system and their layout requirements
2. Know the site preparation techniques for hot water systems and components
3. Be able to apply site preparation techniques for hot water systems and components
4. Know the installation requirements of hot water systems and components
5. Be able to install hot water systems and components
6. Know the service and maintenance requirements of hot water systems and components
7. Be able to service and maintain hot water systems and components
8. Know the decommissioning requirements of hot water systems and components
9. Be able to decommission hot water systems and components
10. Know the inspection and soundness testing requirements of hot water systems and components
11. Be able to inspect and soundness test hot water systems and components

## Guided learning hours

It is recommended that **62** hours should be allocated for this unit, although patterns of delivery are likely to vary.

## Details of the relationship between the unit and relevant national standards

This unit is linked to the following SummitSkills National Occupational Standards (NOS) for the Mechanical Services Industry:

- SummitSkills NOS M7, M10, M12, M13, M25.

## Support of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills.

## Assessment

This unit will be assessed by

- A GOLLA on-line knowledge assessment and externally set assignments. See **Appendix 2** for list of approved materials for use in open book examination.

## **Unit 007/207    Understand and apply domestic hot water system installation and maintenance techniques**

Outcome 1        Know the types of hot water system and their layout requirements

### **Assessment Criteria**

The learner can:

1. Identify the type of hot water system from layout diagrams:
  - Direct system:
    - Conventional boiler (small hot water only boiler).
    - Immersion heater including low energy tariff types.
  - Indirect system:
    - Fed by combined hot water and heating boiler.
  - Single point of use vented heaters.
  - Instantaneous hot water heaters:
    - Multipoint heaters.
    - Combination boilers.
2. State the factors that need to be considered when the type of hot water system is selected for use in a building:
  - Quantity and usage of hot water required.
  - Distance of outlet from hot water source.
  - Need for a secondary recirculation system.
3. Identify the working principles of hot water system components:
  - Stop valves.
  - Fullway gate valves.
  - Servicing valves.
  - Drain valves.
  - Float operated valves.
  - Terminal fittings:
    - Bib taps.
    - Pillar taps.
    - Mixer taps.
    - Ceramic disc taps.
  - Showers:
    - Gravity mixer.
    - Mains fed mixer.
    - Electric instantaneous.
  - Thermostatic mixing valves.
  - Backflow prevention devices:
    - Simple air gaps.
    - Single check valves.
  - Feed and expansion cisterns.
  - Cold water feed cisterns.
  - Directly heated storage cylinders.
  - Indirectly heated storage cylinders:

- Single feed.
  - Double feed.
  - Combination.
  - Instantaneous water heaters:
    - Mains fed multipoint heaters.
    - Mains fed combination boilers.
    - Single point of use vented heaters.
4. State the typical pipe sizes used in centralised open vented hot water systems in dwellings:
    - Primary circuit.
    - Secondary circuit.
  5. State the system layout features for the open vent and cold feed pipes of primary and secondary open vented hot water circuits.
  6. State the connection requirements for feed and expansion cisterns into open vented primary hot water circuits.
  7. State the system layout features for plastic feed and expansion cisterns:
    - Typical cistern sizes for small dwellings.
    - Warning pipe (overflow) arrangements.
    - Inlet/ outlet position.
    - Position of float operated valve.
    - Position of cistern vent.
    - Service valve requirements.
    - Cistern base support requirements.
  8. Identify the types and typical sizes of open vented storage cylinder used in hot water systems in dwellings:
    - Direct.
    - Single feed indirect.
    - Double feed indirect.
    - Double feed indirect super duty recovery.
    - Combination.
  9. State the system layout features for hot water heaters:
    - Mains fed Instantaneous multipoint water heaters including combination boilers.
    - Localised (point of use) open vented hot water heaters.
  10. State the typical pipe sizes used with mains fed instantaneous hot water heaters and open vented point of use water heaters in dwellings.
  11. Identify the need for temperature control of hot water systems:
    - Thermostats.
    - Overheat thermostats.
    - Temperature relief valves.
  12. State the factors that can lead to backflow from hot water outlets and equipment in dwellings
  13. Identify the standard backflow prevention devices that are used in hot water systems in dwellings supplying water to appliances:
    - Baths.
    - Over the rim bidets.
    - Wash hand basins.
    - Sinks.
    - Mixer taps.
    - Showers.
  14. State the system layout features for the installation of hot water components:
    - Gravity fed showers.
    - Mains fed showers.
    - Instantaneous electric showers.
    - Thermostatic mixing valves.

## **Unit 007/207    Understand and apply domestic hot water system installation and maintenance techniques**

Outcome 2    Know the site preparation techniques for hot water systems and components

### **Assessment Criteria**

The learner can:

1. Identify the sources of information required when undertaking work on hot water systems:
  - Statutory regulations.
  - Industry standards.
  - Manufacturer technical instructions.
2. Identify the preparatory work required to be undertaken to the building fabric in order to install, decommission or maintain hot water systems and components
3. Identify the protection measures required to the building fabric or customer property, during and on completion of work on hot water systems and components
4. Identify the pipework materials and fittings required to complete work on hot water systems
5. State the range of hand and power tools required to complete work on hot water systems and components.

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Outcome 3    Be able to apply site preparation techniques for hot water systems and components

### **Assessment Criteria**

The learner can:

1. Check the safety of the work location in order for the work to safely proceed:
  - Safe access and exit.
  - Immediate work location eg tripping hazards.
  - Appropriate risk assessments/ method statements are available.
2. Wear personal protective equipment appropriate to the installation, decommissioning or maintenance task being carried out
3. Apply protection measures to the building fabric or customer property, during and on completion of work on hot water systems and components
4. Select the pipework materials and fittings required to complete work on hot water systems ensuring that they are not damaged
5. Select the hand and power tools required to complete work on hot water systems and components
6. Carry out preparatory work in order to install hot water systems and components.

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Outcome 4    Know the installation requirements of hot water systems and components

### **Assessment Criteria**

The learner can:

1. State how to take readings of hot water supply pressure and flow rate
2. State the positioning and fixing requirements of hot water pipework and components:
  - In suspended timber floors.
  - In solid floors.
  - Embedded in walls.
  - In areas of the building subject to frost.
3. Identify how expansion and contraction may be catered for in hot water pipework containing:
  - plastics
  - copper
4. State how to select clips and brackets appropriate to the hot water system pipework and the industry recommended spacings:
  - Horizontally mounted pipework.
  - Vertically mounted pipework.
5. State the positioning requirements of components in hot water systems:
  - Heaters/storage cylinders.
  - Cisterns – hot water feed cisterns and feed and expansion cisterns.
  - Drain valves.
  - Service valves.
  - Thermostatic mixing valves.
  - Showers – gravity fed mixer, mains fed mixer and instantaneous electric.
6. Identify how to measure, mark out and drill plastic storage cisterns to receive pipework connections
7. Identify how to make pipework connections to storage cisterns
8. Identify how to make pipework connections to open vented hot water storage cylinders
9. State how to position, fix and connect new hot water pipework to outlets and supply sources:
  - Bath tap or shower mixer valve.
  - Wash hand basin tap.
  - Sink tap.
  - Combination boiler.
  - Cold water storage cistern.
  - Hot water storage cylinder.
  - Thermostatic mixing valve.
10. Identify suitable methods of making new pipework connections into existing hot water system pipework:
  - Copper.
  - Plastic.
11. Identify the insulation requirements of hot water system components:
  - Pipework.

- Cisterns.
- Storage vessels.

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Outcome 5    Be able to install hot water systems and components

### **Assessment Criteria**

The learner can:

1. Use test instruments to take readings of the hot water supply pressure and flow rate from existing hot water outlets
2. Make pipework fixings to copper and plastic pipework
3. Joint hot water pipework components:
  - Copper – capillary soldered and compression.
  - Plastic – pushfit.
4. Measure, mark out and drill plastic storage cisterns to receive pipework connections
5. Make pipework connections to storage cisterns
6. Make pipework connections to open vented hot water storage cylinders
7. Position, fix and connect new hot water pipework to outlets:
  - Bath tap or shower mixer valve.
  - Wash hand basin tap.
  - Sink tap.
  - Combination boiler.
  - Cold water storage cistern.
  - Hot water storage cylinder.
  - Thermostatic mixing valve.
8. Apply insulation to hot water system pipework
9. Demonstrate that hot water components and pipework systems cannot be brought into operation by the end user before the work has been fully completed.



## **Unit 007/207    Understand and apply domestic hot water system installation and maintenance techniques**

Outcome 6    Know the service and maintenance requirements of hot water systems and components

### **Assessment Criteria**

The learner can:

1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components
2. Identify how to carry out routine checks on hot water components and pipework as part of a periodic maintenance programme:
  - Visual inspection of pipework for leakage, adequate support and insulation.
  - Effective operation of terminal fittings.
  - Effective operation of float operated valves.
  - Effective operation of service valves.
  - Condition of hot water cylinder/heater and storage cisterns.
  - Effective operation of thermostatic control devices.
3. State the procedures for dealing with defects in hot water components and pipework:
  - Incorrect support to hot water system pipework and storage cisterns.
  - Excessive noise in pipework systems.
  - Leakage of hot water system pipework and fittings.
  - Cistern failure.
  - Hot water storage cylinder/ heater failure.
  - Leakage or ineffective operation of:
    - Terminal fittings.
    - Float operated valves.
    - Stop and service valves.
    - Mixer showers.
    - Thermostatic mixing valves.
4. Identify the types of information to be provided on a maintenance record for hot water systems.

## **Unit 007/207    Understand and apply domestic hot water system installation and maintenance techniques**

Outcome 7    Be able to service and maintain hot water systems and components

### **Assessment Criteria**

The learner can:

1. Use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components
2. Carry out routine checks on hot water components and pipework as part of a periodic maintenance programme:
  - Visual inspection of pipework for leakage, adequate support and insulation.
  - Effective operation of terminal fittings.
  - Effective operation of float operated valves.
  - Effective operation of service valves.
  - Condition of hot water cylinder/heater and storage cisterns.
  - Effective operation of thermostatic control devices.
3. Carry out repairs to defects in hot water system components:
  - Leakage of hot water system pipework and fittings – repair to water-filled pipework
  - Leakage or ineffective operation of:
    - Terminal fittings
    - Float operated valves
    - Stop and service valves
4. Complete the required details contained in a simple maintenance record for a hot water system.

## **Unit 007/207    Understand and apply domestic hot water system installation and maintenance techniques**

Outcome 8    Know the decommissioning requirements of hot water systems and components

### **Assessment Criteria**

The learner can:

1. Identify the working methods that reduce the time periods during which hot water systems need to be isolated
2. State the information that needs to be provided to other persons before decommissioning work takes place
3. State how to temporarily decommission hot water system components and connecting pipework systems
4. Identify the work sequences for permanently decommissioning hot water components and pipework systems
5. Identify the methods used during the decommissioning process to prevent the end-user from operating hot water system components:
  - Temporary capping of pipework sections.
  - Use of warning notices and signs.

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Outcome 9    Be able to decommission hot water systems and components

**Assessment Criteria**

The learner can:

1. Advise appropriate persons before hot water components or pipework are isolated in order to undertake work
2. Carry out temporary decommissioning of cold water system components and connecting pipework systems
3. Check to ensure that the decommissioning procedures carried out prevent the end-user from operating the hot water system components.

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Outcome 10    Know the inspection and soundness testing requirements of hot water systems and components

### **Assessment Criteria**

The learner can:

1. State the checks to be carried out during a visual inspection of a hot water system to confirm that it is ready to be filled with water
2. State how to fill hot water pipework with water at normal operating pressure and check for leakage
3. Identify how to carry out a soundness test to industry requirements on hot water systems pipework and components
4. State the flushing procedure for hot water systems and components
5. Identify the actions that must be taken when inspection and testing reveals defects in hot water systems:
  - Dealing with systems that do not meet correct installation requirements.
  - Remedial work associated with defective pipework bracketing.
  - Remedial work associated with leakage from pipework systems.

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Outcome 11    Be able to inspect and soundness test hot water systems and components

**Assessment Criteria**

The learner can:

1. Carry out a visual inspection of a hot water system to confirm that it is ready to be filled with water
2. Fill hot water pipework with water at normal operating pressure and check for leakage
3. Perform a soundness test to industry requirements on hot water systems pipework and components
4. Flush the system with wholesome water on completion of soundness testing.