SQA/SNIJIB

Training and Assessment Programme for SVQ 3 Plumbing: Domestic Heating and Plumbing

H98F 04: Install and test domestic plumbing and heating systems

H98G 04: Service and maintain domestic plumbing and heating systems

H98H 04: Inspect and pre-commission domestic plumbing and heating systems

H98J 04: Commission domestic plumbing and heating systems

H98K 04: Decommission domestic plumbing and heating systems

Section: Hot and Cold Water Systems

Stage 1: Syllabus Codes HC1.1–1.4: HC2.1–2.4

Stage 2: Syllabus Codes HC3.1–3.4: HC4.1–4.2 and Assignment

Learning and delivery guidance

This Unit covers all aspects of hot and cold water installation: from initial theory input to practical installations. Delivering this Unit to a group of learners will involve many teaching and learning techniques and approaches.

It is recommended that teaching and learning take place in an environment where learners experience simulated full-scale working hot and cold systems. The use of modern teaching and learning aids, eg 'smart' boards, and proprietary interactive teaching materials would also greatly enhance the learning experience.

The syllabus document is set out in a manner that allows the lecturer to determine the areas of work to be covered within a certain time frame. It is envisaged that this Unit will be offered over the first two years of 'off the job' training. It is presented in four syllabus sections with each section concluding with a summative assessment.

The programme structure outlines how the learner should progress through the Unit and how it integrates with the other Units of the qualification.

Assessment

A holistic approach has been adopted for the formative and summative aspects of the practical installation part of this Unit. This is in conjunction with Unit 1: Apply Health and Safety Legislation and Working Practices; Unit 5: Install and Commission Central Heating Systems; and Unit 7: Install Above-Ground Drainage Systems.

The TAP contains practical tests for both formative assessment (Pipework exercises for Year 1) and summative assessment (Install Weathering Systems Year 1 and 2 and Installation Practice Year 2).

Assessments other than practical assessments will be undertaken using the SOLAR e-assessment method. This process is completed entirely online and randomly selects the assessment questions from a bank of questions which cover the Unit content. In this Unit there are four assessments over the two years of the Unit's duration.

Assignment

This Unit has an assignment which is intended to bring together aspects of hot and cold water supply to an articulate conclusion. The assignment should commence midway through Year 2 of the Unit with a completion date being stipulated nearer to the completion date of the Unit.

Learners should be introduced to the assignment as part of the induction to the Unit — to give direction and motivate learning.

Syllabus

HC1.1 Function of statutory and advisory documents applying to hot and cold water installations

Assessment method: SOLAR e-assessment

- Installation requirements of systems as specified in current Building Standards (Scotland) Regulations
- Current Water Byelaws and British Standards and appropriate further British and European standards
- Water Regulations Advisory Scheme
- Minimum requirements for cold water supply in a dwelling
- Application and function of the bye-laws, ie scope of bye-laws (systems, responsible people), notification of work, penalties for contraventions, categorisation of good workmanship, 'Approved contractor' status

HC1.2 Basic cold water system layouts (direct and storage) and direct open vented hot water system layouts

Assessment method: SOLAR e-assessment

- Service pipe installation from the water main to entry into property
- Minimum/maximum depths; overcoming obstacles
- Valves; pipe identification
- Pressure applied by static head in N/m^2, bar, kPa and metres head
- Pressure of typical water mains; pressures in typical domestic hot and cold systems
- Direct and storage systems of cold water supply
- Components, pipework and valves required in cold water systems
- Pressures and performance of direct and indirect systems
- Direct hot water pipework layouts and the respective connecting points between cisterns, cylinders, boilers and terminal fittings
- Accommodation of expanded water
- Convection current circulation
- Typical pipe diameters and type of connecting fittings
- Terminology relating to pipework, components and fittings
- Location and relationship of components and valves
- Direct pattern and combination type cylinders and tanks

HC1.3 Protection of hot and cold systems from extreme temperatures, mechanical damage and contamination

Assessment method: SOLAR e-assessment

- Installation depths of underground pipes
- Protection of external pipework
- Pipe routes throughout building to avoid cold spots
- Insulating materials, properties of insulating materials, thickness of insulating material required, and application of insulation to internal and external pipework
- Insulation of storage cisterns; prevention of inflow of cold air through warning pipe
- Requirements where pipes enter buildings; use of pipe ducts
- Provision of stop valves and draining valves on internal and external pipework
- Grading of pipe runs
- Concealed water pipes
- Permeation of pipework by contaminants

HC1.4 System components, fittings, materials and their functions

Assessment method: SOLAR e-assessment

- Metallic and plastic pipework materials
- Quality marks, eg BSI Kitemark, WRAS approved product, CE mark
- The effects of temperature, corrosion; durability and permeability of materials
- Soft and hard waters and their effect on plumbing systems
- Resistance to electrolytic action; de-zincification
- Compression and capillary fittings; use of lead-free solders to prevent contamination of water supplies
- The principle of capillary attraction and its effect and use within plumbing
- Press-fit fittings; push-fit plastic and metallic fittings; solvent weld fittings
- Principle of fittings and component operation (jointing techniques)
- Factors affecting selection of pipework, fittings and valves (mains/storage)
- Suitability of materials, fittings and valves for different locations
- Identification of stop valves and service valves
- Suitability of valve types for above and below ground; types of valves up to 50 mm, ie screw-down stop valves to wheel operated (gate) valves; slot-type and lever-operated spherical plug valves
- Functions, installation requirements and location of control valves — to include stop valves, service valves, float-operated valves
- Check valves, double-check valves, drain valves, terminal fittings, blending valves
- Materials used to manufacture cold water storage cisterns
- Location of cisterns; access to cisterns; adequate support for cisterns
- Prevention of contamination of stored water
- Types, operation, securing and setting of float-operated valves; water levels in cisterns; relationship of pipework connections
- Sizing and termination of warning pipes
- Duplication of cisterns (breeching)
- Cold-feed, open vent, primary and pumped secondary circulation and distribution pipework
- Direct hot water cylinders
- Materials, grades and capacities of cisterns and cylinders
- Heat sources, boilers, immersion heaters (top and bottom entry)

HC2.1 Commissioning of hot and cold systems

Assessment method: SOLAR e-assessment

- Visual inspection
- Soundness testing
- Flushing and disinfection
- Performance testing
- Final checks and handing over

HC2.2 Factors affecting gravity primary and pumped secondary circulation

Assessment method: SOLAR e-assessment

- 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
- The effect that various applications of temperature have on plumbing and associated systems

HC2.3 Layouts of a single and double-feed open vented indirect hot water systems and their operation

Assessment method: SOLAR e-assessment

- Pipework layouts and the respective connecting points between cisterns, cylinders, heat exchangers, boilers and terminal fittings
- Pipework arrangements for showers, bidets, pumped showers and related equipment
- Primary water definition
- Typical pipe diameters; location of control and drain valves
- Temperature control
- Function of components and pipework to ensure system operation
- Prevention of corrosion (cylinder protection)
- Filling and venting of systems
- Provision for water expansion
- Method of heat transfer
- Operating principles of single- and double-feed systems
- Termination of vent pipes, temperature controls, provision for draining

HC2.4 Common faults in domestic open vented hot water systems

Assessment method: SOLAR e-assessment

- Trapped air, overheating, friction loss, heat loss, spasmodic discharge, insufficient temperature, and insufficient flow of hot water
- Remedial action to include: correct grading of pipes; temperature control/heat input; adequate insulation; hydraulic gradient (re-routing pipe-runs); sizing of pipework

HC3.1 Prevention of contamination of water supply

Assessment method: SOLAR e-assessment

- Types of backflow
- Mechanical and non-mechanical backflow devices
- Fluid categories
- Appliance protection
- Outside taps
- Whole site and zone protection
- Legionella and bacteria causes and prevention in systems
- Good installation practice to prevent bacteria growth in systems
- Max lengths of dead legs
- Risk areas in systems for bacteria growth
- Prevention of cross connection of wholesome to unwholesome water supply

HC3.2 Boosted systems of cold water supply

Assessment method: SOLAR e-assessment

- Reasons for use of pump-boosted systems of cold water supply
- Direct and indirect (including auto pneumatic) pump-boosted cold water supply systems
- Location, installation, functions and operation of components and control devices required in pump-boosted systems (to include float, pipeline, pressure and time delay switches and check valves)
- Sizing and installation of break and storage cisterns
- Provision of drinking water in pump-boosted systems
- Installation and sizing of drinking water headers and cisterns
- Automatic filling of header pipes
- Types of pumps — installation requirements for pumps
- Problems associated with excessive water pressures
- Control of water pressure
- Maintaining the quality of stored water

HC3.3 The principles of operation and installation requirements of instantaneous and low-storage capacity mains-fed water heaters

Assessment method: SOLAR e-assessment

- Statutory requirements relating to the installation of water heaters
- Types of water heaters — low-storage, non-storage, instantaneous and multipoint heaters, continuous flow, inlet- and outlet-controlled water heaters
- Over and under sink, floor- and wall-mounted heaters; electric showers
- Fuel/power sources suitable for operating water heaters
- Basic operation of water heaters, installation requirements and precautions for different types of water heaters
- Temperature control, provision for water expansion in different types of water heaters
- Sanitary appliances normally served by water heaters
- Factors affecting selection of water heaters — selection of appropriate water heaters for given situations

HC3.4 Pipework arrangements and installation requirements for domestic storage mains-fed (unvented) hot water supply systems

Assessment method: SOLAR e-assessment

- Statutory requirements relating to installation of units/systems
- Direct and indirect units and packages
- Supply and distribution pipework; discharge pipework
- Typical pipe diameters
- Temperature control; three-tier level of protection water flow control
- Prevention of contamination and waste
- Commissioning and testing
- Terminal fittings; secondary pipework circulation requirements
- Methods of determining working pressures and acceptable flow rates on existing main supply pipework
- Suitability of pipework materials to withstand elevated water pressures and temperatures under fault conditions
- Functions of: filters/strainers; pressure reducing valves; pressure limiting valves; check valves; expansion relief valves; temperature relief valves; expansion vessels; high temperature cut-out devices; discharge pipework and thermostats
- Methods of tracing and rectifying faults in domestic mains-fed unvented hot water systems
- Faults to include: expansion/pressure relief valve; temperature/pressure relief valve discharge; thermostat and high energy cut-out failure; expansion vessel failure; pressure reducing and limiting valve failure; partially blocked strainer

HC4.1 Pipework arrangements and installation requirements for domestic thermal stores (water-jacketed tube heaters)

Assessment method: SOLAR e-assessment

- Principles of thermal store unit operation
- Direct and indirect methods (or combination of both) of heating the unit, ie open vented and sealed (systems) boilers
- Solar collection
- Principles of the service pipe connection to and from the unit
- Temperature control of unit water
- Temperature control of domestic hot water (ie blending valve)
- Thermal store performance, ie expected flow rates and pressures and factors affecting
- Corrosion inhibitors in thermal store
- Pipework arrangements to include relationship to space heating requirements
- Functions of: heat exchangers; blending valve; boiler and unit thermostats; expansion vessel; pressure reducing valves; possible connections and relationship to central heating systems; possible connections and relationship to solar panels
- Pressure rating of thermal store and heat exchanger
- Thermostat relationships
- Positioning and location of units
- Investigate symptoms associated with faulty: boiler and thermal store thermostats; blending valves; line strainers; expansion vessel; and other controls

HC4.2 Solar hot water heating

Assessment method: SOLAR e-assessment

- Levels of solar radiation that fall in the UK
- Optimum direction and tilt angles for solar collectors
- Principle components that form solar water heating systems
- The principle components that form flat-plate, evacuated-tube collectors
- Types of hot water storage configuration that can be used with solar water heating systems
- The size of collector array
- Suitable collector positions
- Basic pipework installation and design requirements for the most commonly installed types of DSWH systems
- Methods for control of the pump for SHW systems
- Installation requirements for differential temperature controllers
- System fluids types and function
- Testing, inspection and commissioning procedures for solar water heating systems

End of Unit assignment

Assessment method: Assignment

This assignment is intended to bring together aspects of the Unit. It is anticipated it will commence in the latter part of the Unit with a completion date being stipulated nearer to the completion date of the Unit.

Assignment

Information for assessors

Install and commission hot and cold water systems

Aims of the assignment

The aim of the assignment is to introduce learners to the planning and design aspects of hot and cold water supply. It further develops skills already gained within the first two years of the SVQ programme.

Assignment overview

The assignment focuses on the hot and cold water requirements of a two storey domestic dwelling. Plan and elevation views are given both to provide information about the dwelling. Plans and tables are provided for the learner to work on.

The learner will be asked to produce two designs of a hot and cold water system. One design is of a traditional open-vented system and the other design has to include an unvented system. The drawings on plan are not to scale.

The learner will also be asked to specify major components for each system and discuss their choices.

The pipe-sizing part of the assignment is a simple drawing and it should be emphasised to learners that it is the principle and method of pipe sizing that is important. The drawing is a simple illustration not to scale.

Syllabus to be covered

The following areas must be covered prior to the assignment being issued.

- Pipe sizing:
  - Loading units, flow rates
  - Effective, actual and equivalent pipe lengths
  - Appropriate method of pipe sizing
- Interpret drawings
- Familiarisation with merchants' catalogues and websites
- Principles of hot water design in relation to stored capacities and heat input

Model answers

The model answers should be viewed as a guide, as various designs and component selections are possible.

Information for learners

Install and commission hot and cold water systems — Assignment

In this assignment you will be asked to design and specify the hot and cold water requirements for a domestic dwelling. This will involve the following:

(a) Producing on-plan views of:
- the cold water layout based on the criteria set
- the hot water layout based on the criteria set

(b) Specifying appropriate components and materials to ensure system function and performance — discussing your component selection, outlining system operation and discussing alternative options

(c) Designing the systems to comply with current building regulations, water bye-laws and British Standards

(d) Calculation of pipe diameters

To cover the areas above, the assignment is set out in the following tasks:

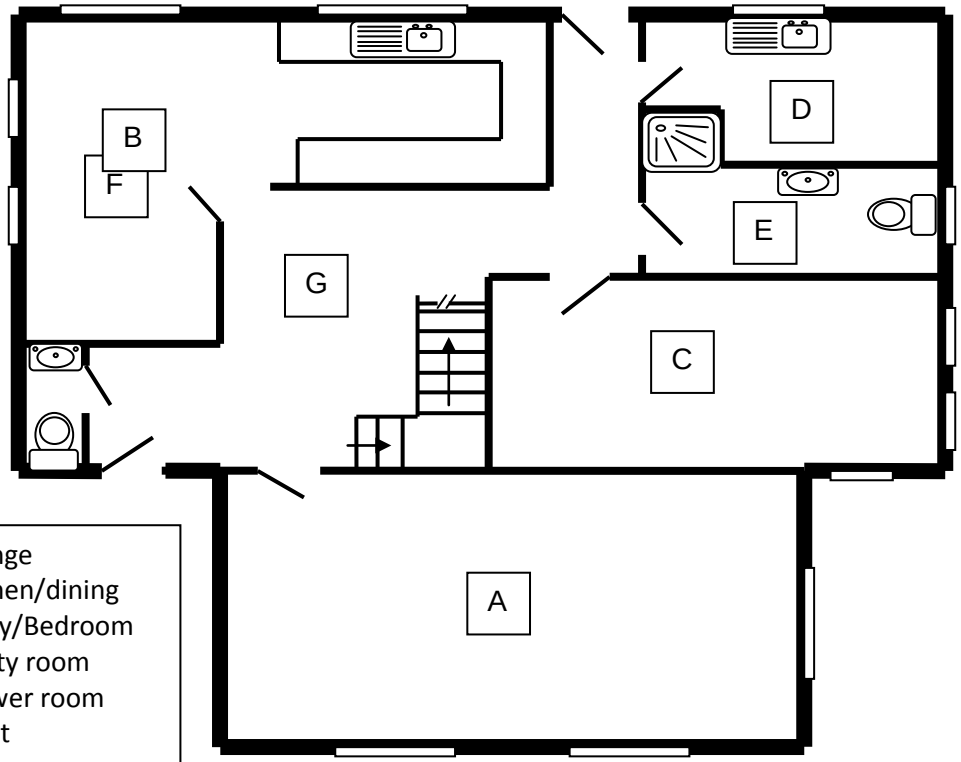
1 Design 1
2 Design 2
3 Pipe sizing component
4 Component selection, system operation and alternative options

Each task is further described under its own brief.

The following two pages give an overview of the domestic property that the tasks relate to.

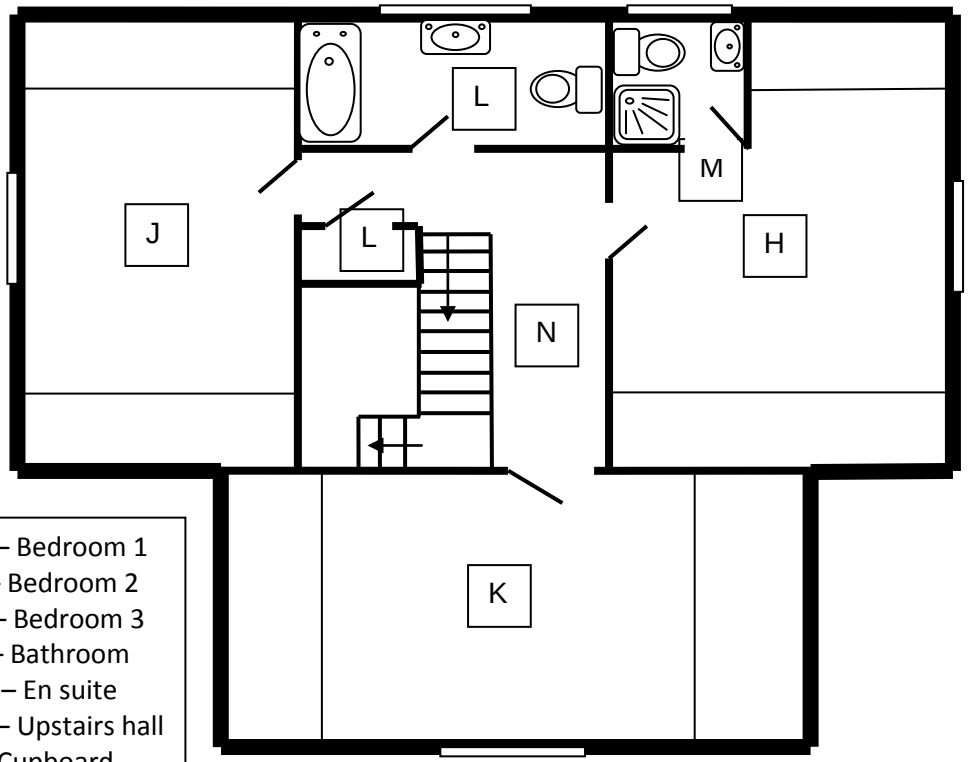
Install and commission hot and cold water systems — Assignment

Plan views of the dwelling are shown below. These plans are to give an overall view of room names and the relationship between the two floors. The layouts should be completed on separate plans for each floor and each design.



A – Lounge
B – Kitchen/dining
C – Study/Bedroom
D – Utility room
E – Shower room
F – Toilet
G – Hall

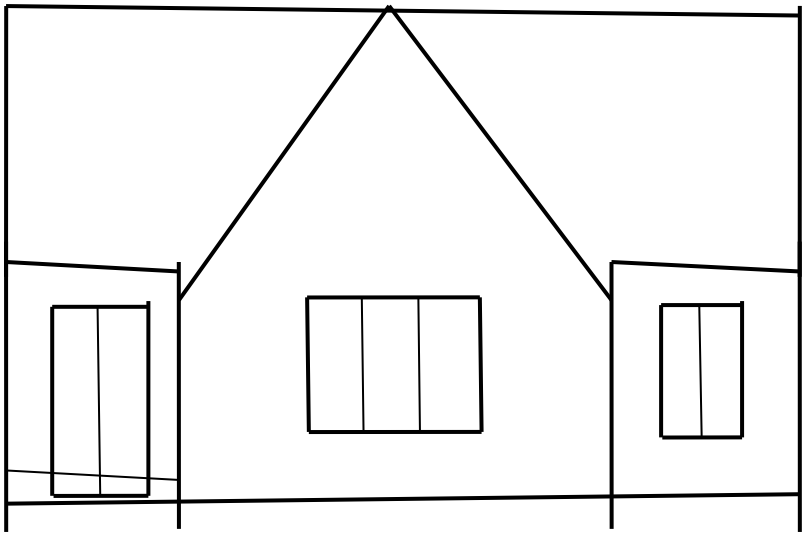
Plan view ground floor



H – Bedroom 1
J – Bedroom 2
K – Bedroom 3
L – Bathroom
M – En suite
N – Upstairs hall
L–Cupboard

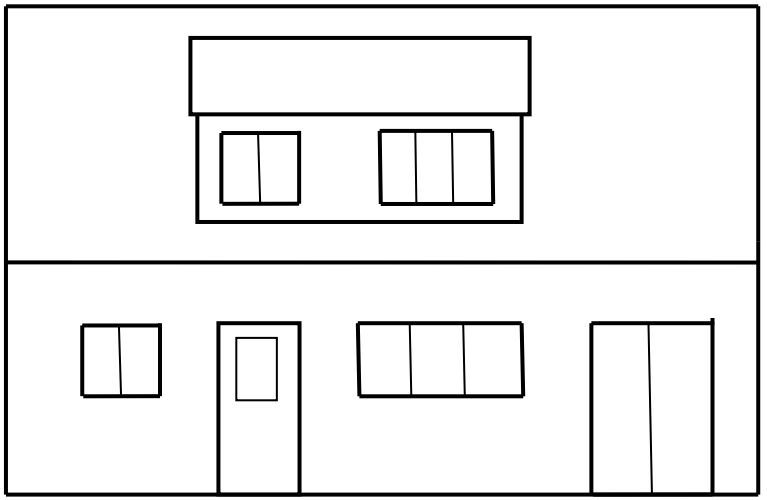
Plan view upper floor

End Elevation A



Front

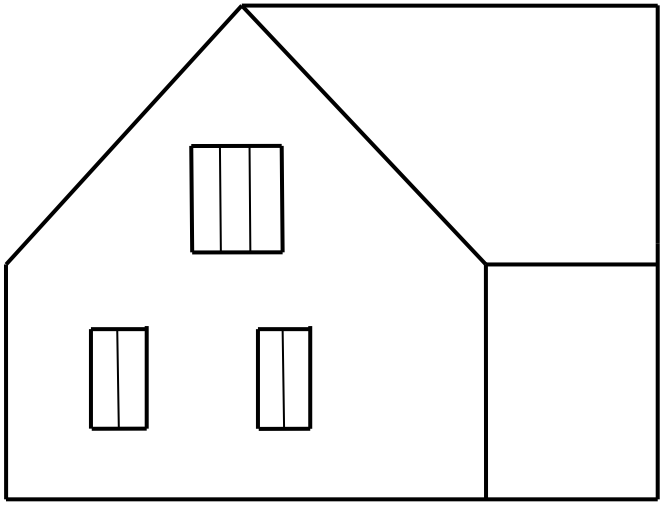
End Elevation B



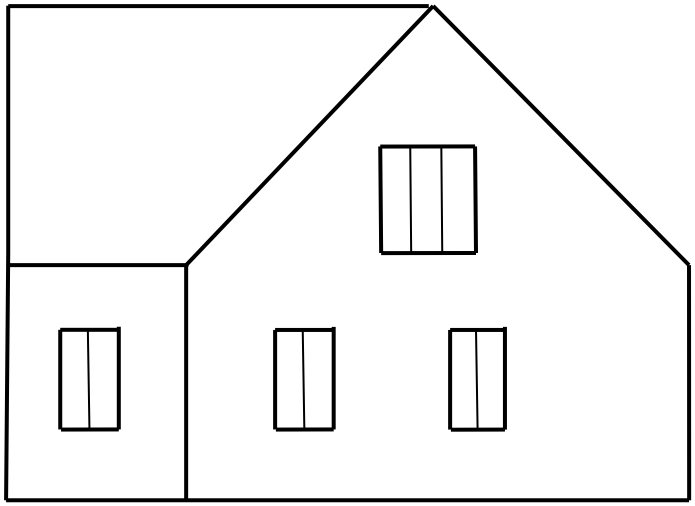
Rear Elevation

Elevations of the various views of the dwelling are shown here.

They are for information to give perspective when designing the systems on plan.



End Elevation



End Elevation

Learner brief — Design 1

The hot and cold water system for Design 1 has to be completed using a **direct system of cold water supply** and an **indirect open-vented system of hot water supply**.
In the design of this hot and cold water system you have to use the following major components:

- cold water storage cistern
- indirect hot water cylinder
- open-vented room sealed boiler

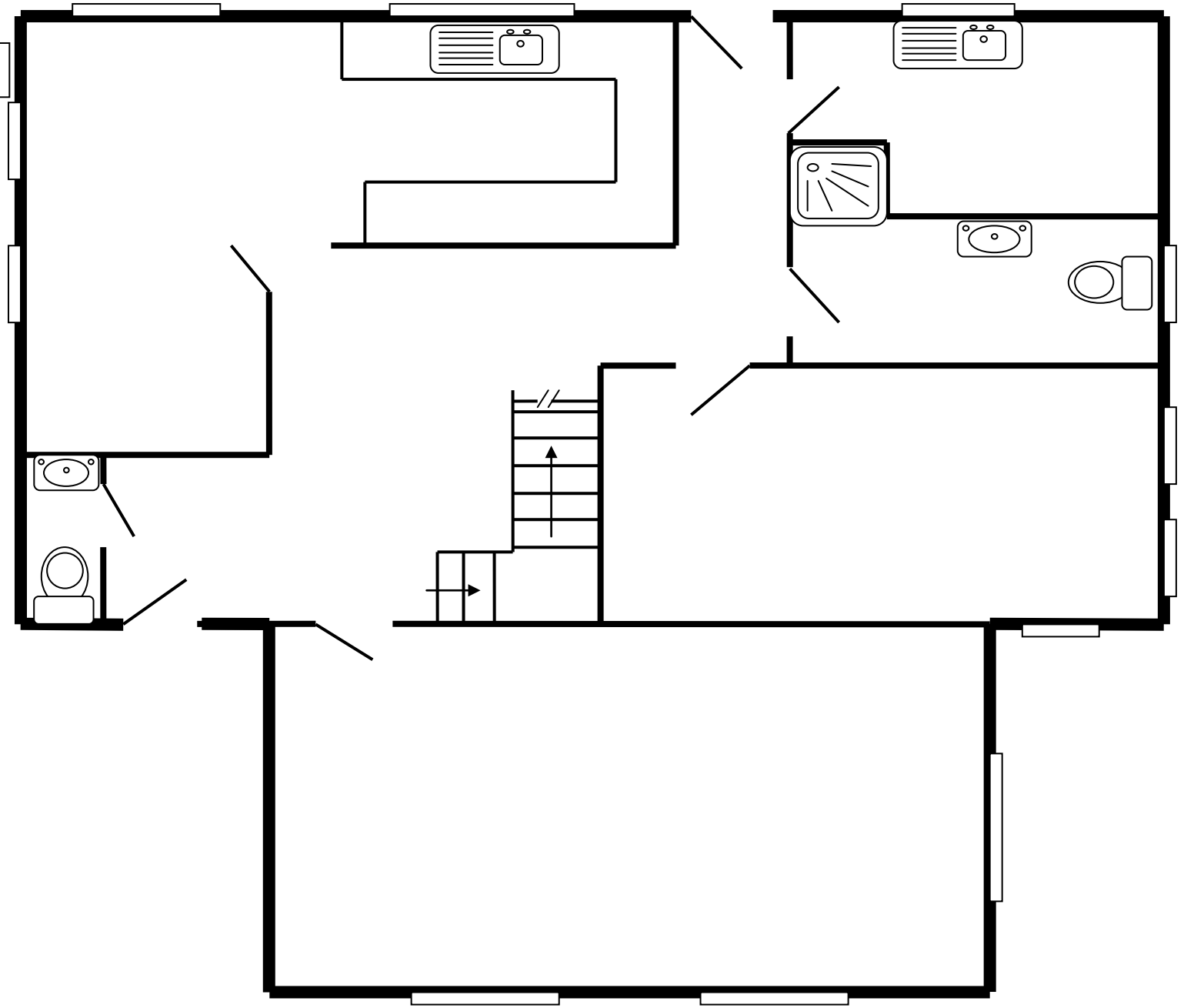
These components should be positioned as appropriate for function and performance.

As part of the assignment these major components have to be resourced from manufacturers' catalogues and recorded on the sheets provided.

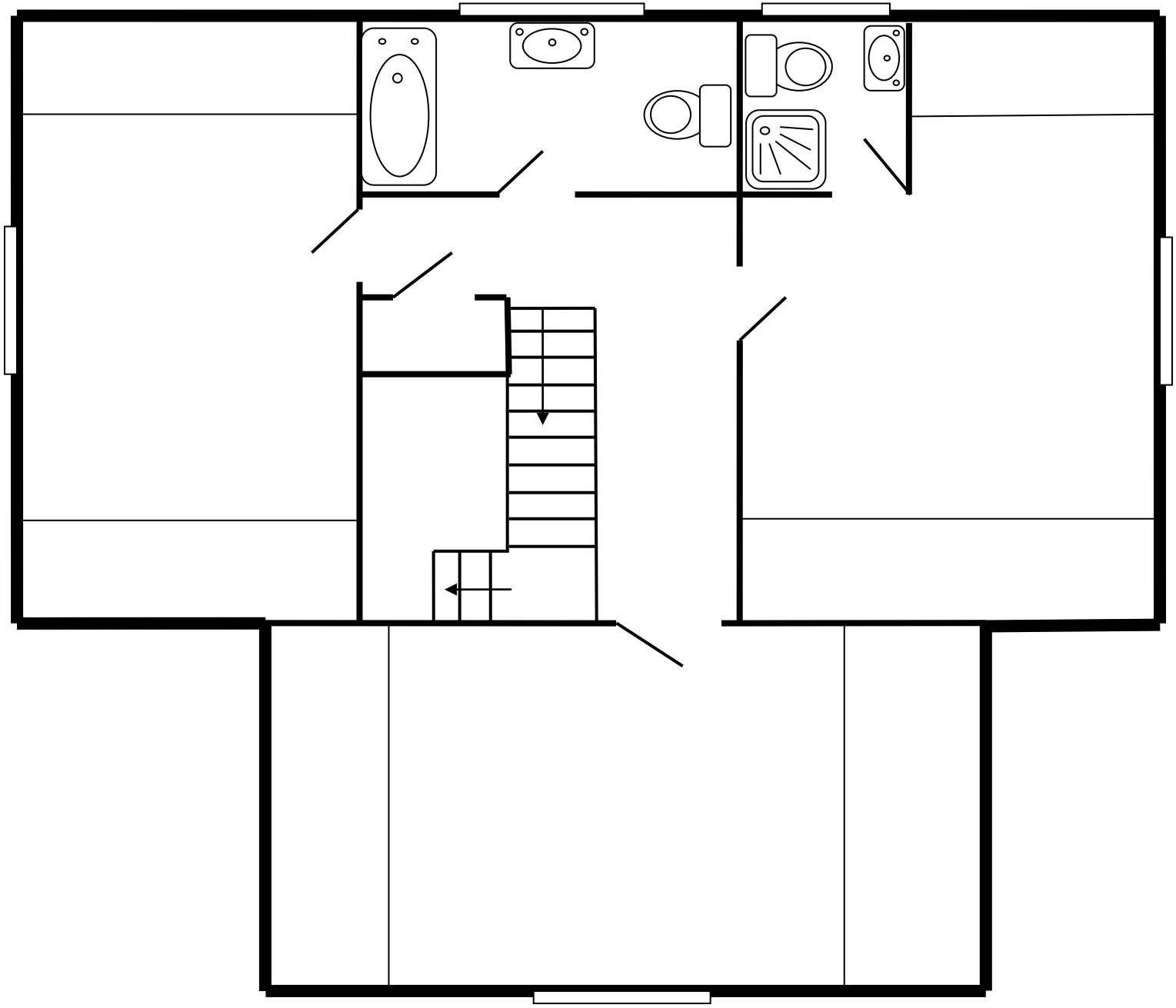
The design should comply with the necessary regulations, bye-laws and standards.

The use of coloured pencils/pens would help to distinguish between pipes.

Design 1 Ground Floor



Design 1 Upper Floor



Major component selection — Design 1

Component	Supplier	Manufacturer	Catalogue or product code
Reason for component selection			

Component	Supplier	Manufacturer	Catalogue or product code
Reason for component selection			

Component	Supplier	Manufacturer	Catalogue or product code
Reason for component selection			

Learner brief — Design 2

The hot and cold water system for Design 2 has to be completed using a **direct system of cold water supply** and an **indirect unvented system of hot water supply**. (Thermal stores are deemed as 'unvented' for the purpose of this assignment — to avoid confusion.) In the design of this hot and cold water system, you have to use the following major components:

- unvented cylinder or thermal store
- room sealed system boiler

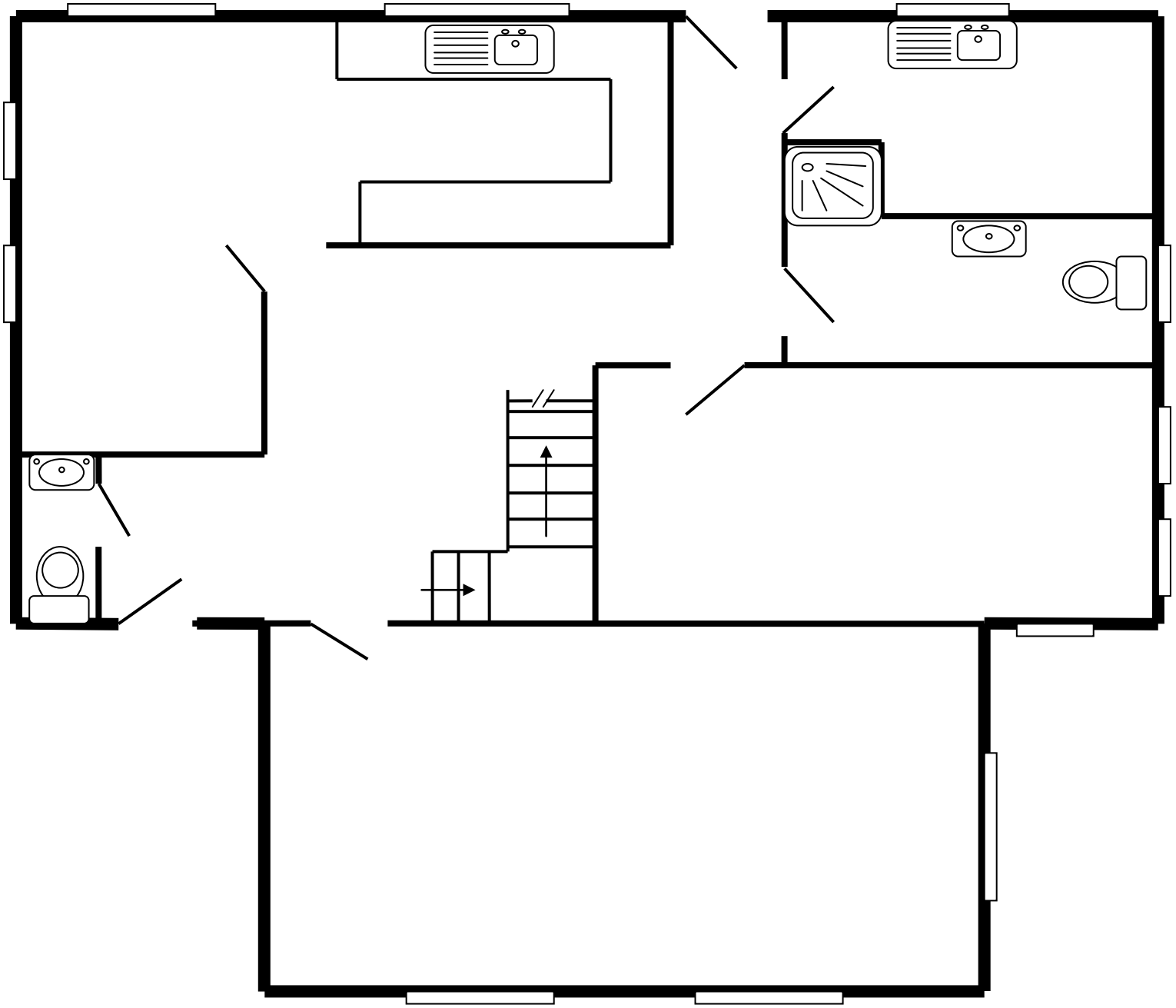
These components should be positioned as appropriate for function and performance.

As part of the assignment these major components have to be resourced from manufacturers' catalogues and recorded on the sheets provided. In addition, the reason for each component selection should be outlined.

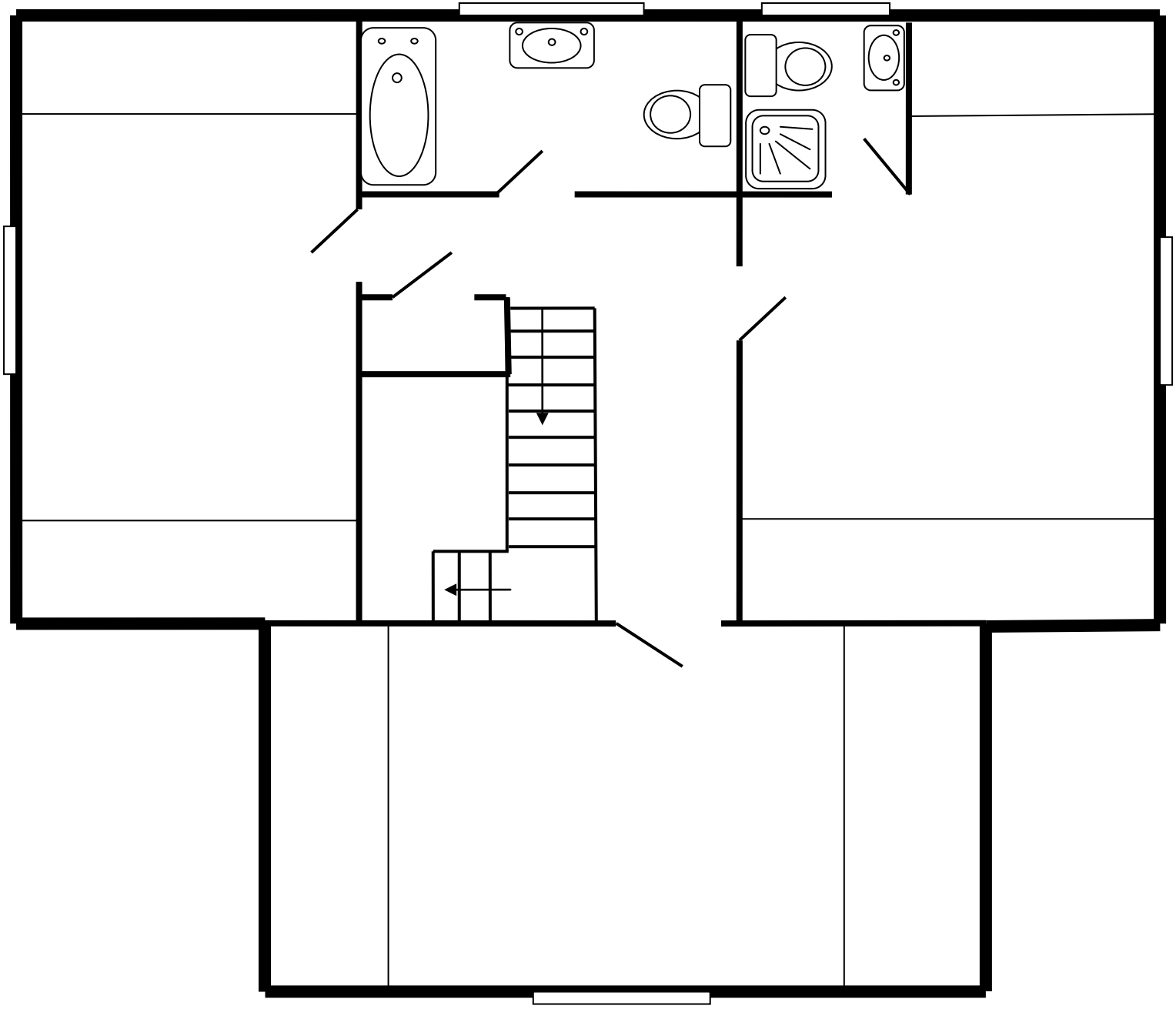
The design should comply with the necessary regulations, bye-laws and standards.

The use of coloured pencils/pens would help to distinguish between pipes.

Design 2 Ground Floor



Design 2 Upper Floor



Major component selection — Design 2

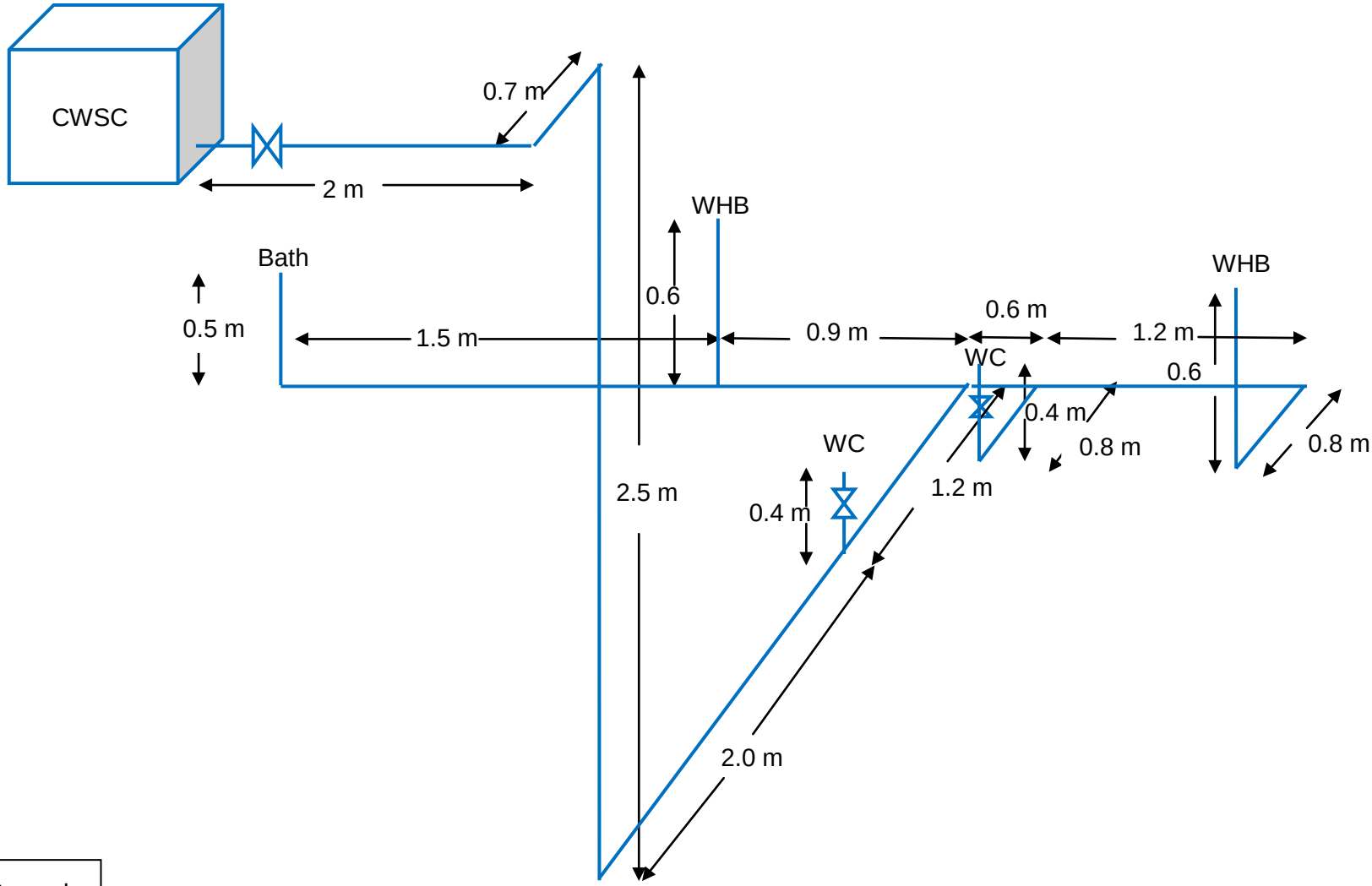
Component	Supplier	Manufacturer	Catalogue or product code
Reason for component selection			

Component	Supplier	Manufacturer	Catalogue or product code
Reason for component selection			

Component	Supplier	Manufacturer	Catalogue or product code
Reason for component selection			

Learner brief — Pipe sizing component

The 3-dimensional drawing shown below is a possible scenario if the cold water supply to the upper floor was to be fed from a storage cistern. Your task is to calculate selected pipe diameters. The pipe sizing method used should be current and appropriate. The next page shows the table to be used in the calculation.



Not to scale

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pipe ref.	Loading units	Flow rate	Pipe diameter	Velocity	Pressure loss	Loss of head Drop + Rise -	Available head	Actual pipe length	Equivalent pipe length	Head loss pipe & fittings	Head loss valves	Total head loss	Available residual head

Component selection, system operation and alternative options

Answer the following questions which relate to component selection, system operation and alternative options.

1 Outline the operation of the system in Design 1.

2 Outline the operation of the system in Design 2.

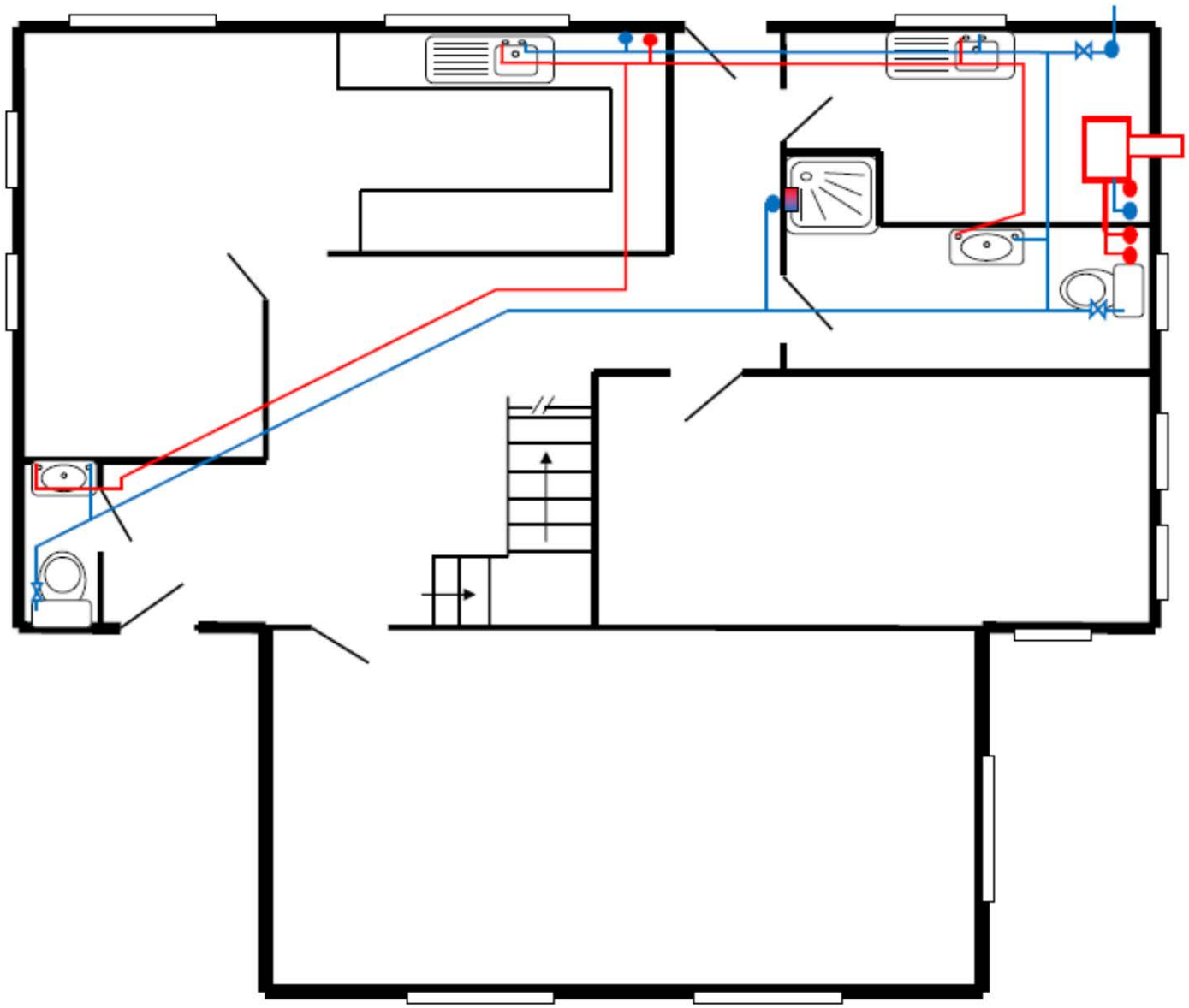
3 In Design 2, the preferred selection for the hot water system is either an unvented cylinder or a thermal store. Discuss why these options may be more suitable for this dwelling than a combination boiler and describe the operation of the unit you chose.

4 Discuss the principle set out in the current British Standard for heat input to the hot water system and storage requirements.

Model answers

Model answer
Design 1 — Ground floor

Notes
Boiler in utility room
Cold water pipe
Hot water pipe
Main stop valve on supply pipe in utility room
Service valves at WC cisterns.
Vertical pipes



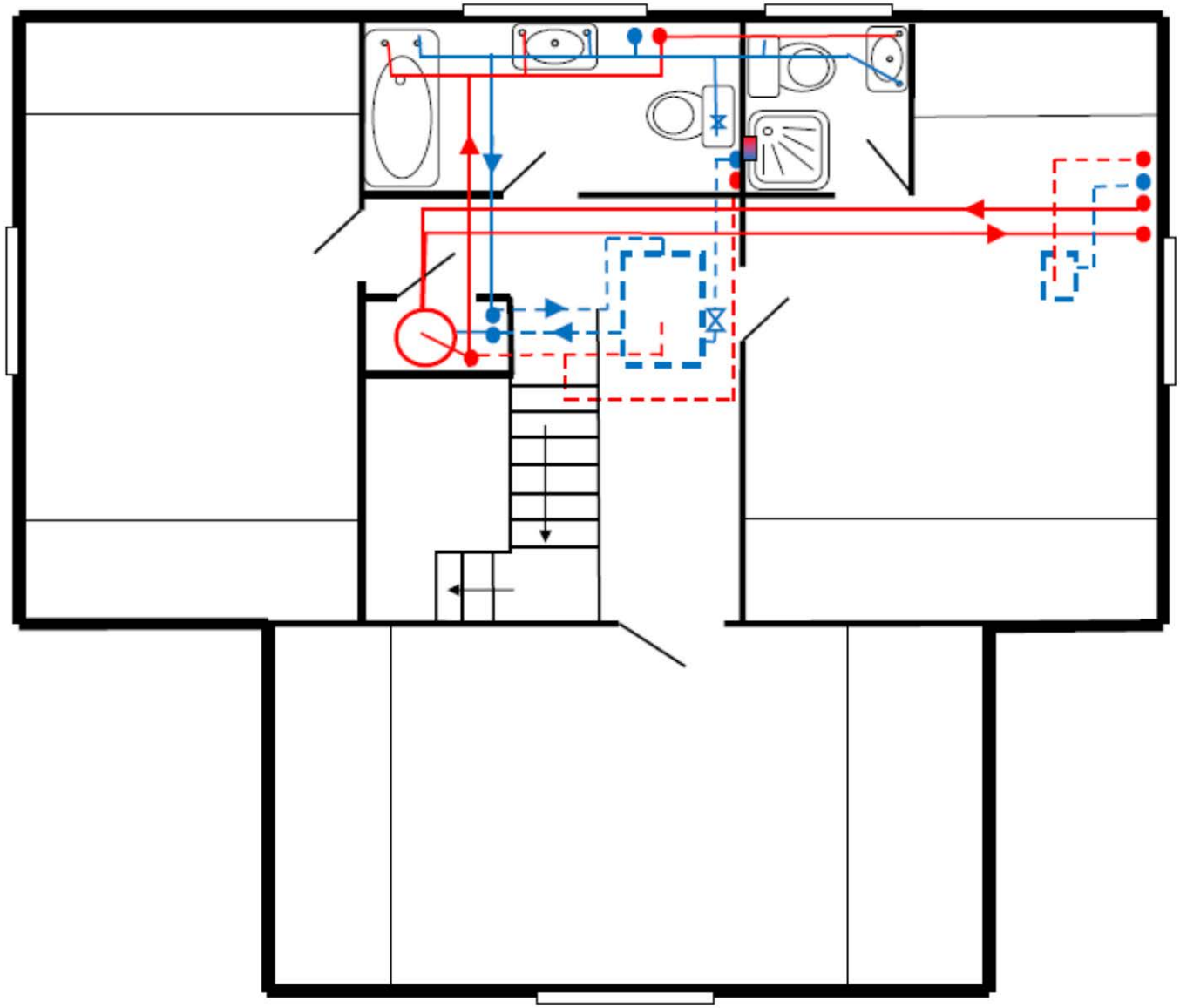
Note:

This model answer should be viewed as an example only.

Pipework to both showers could be completed in different ways. It would be at the centre's discretion to select either a hot and cold feed thermostatic shower or an electrical shower.

Model answer
Design 1 — Upper floor

Notes:
Cold pipes
Hot pipes
Pipes attic
Pipes under floor
Storage cisterns
Indirect cylinder
Vertical pipes
Direction of flow



Design 2 Ground Floor

Model answer

Notes

Boiler in utility room

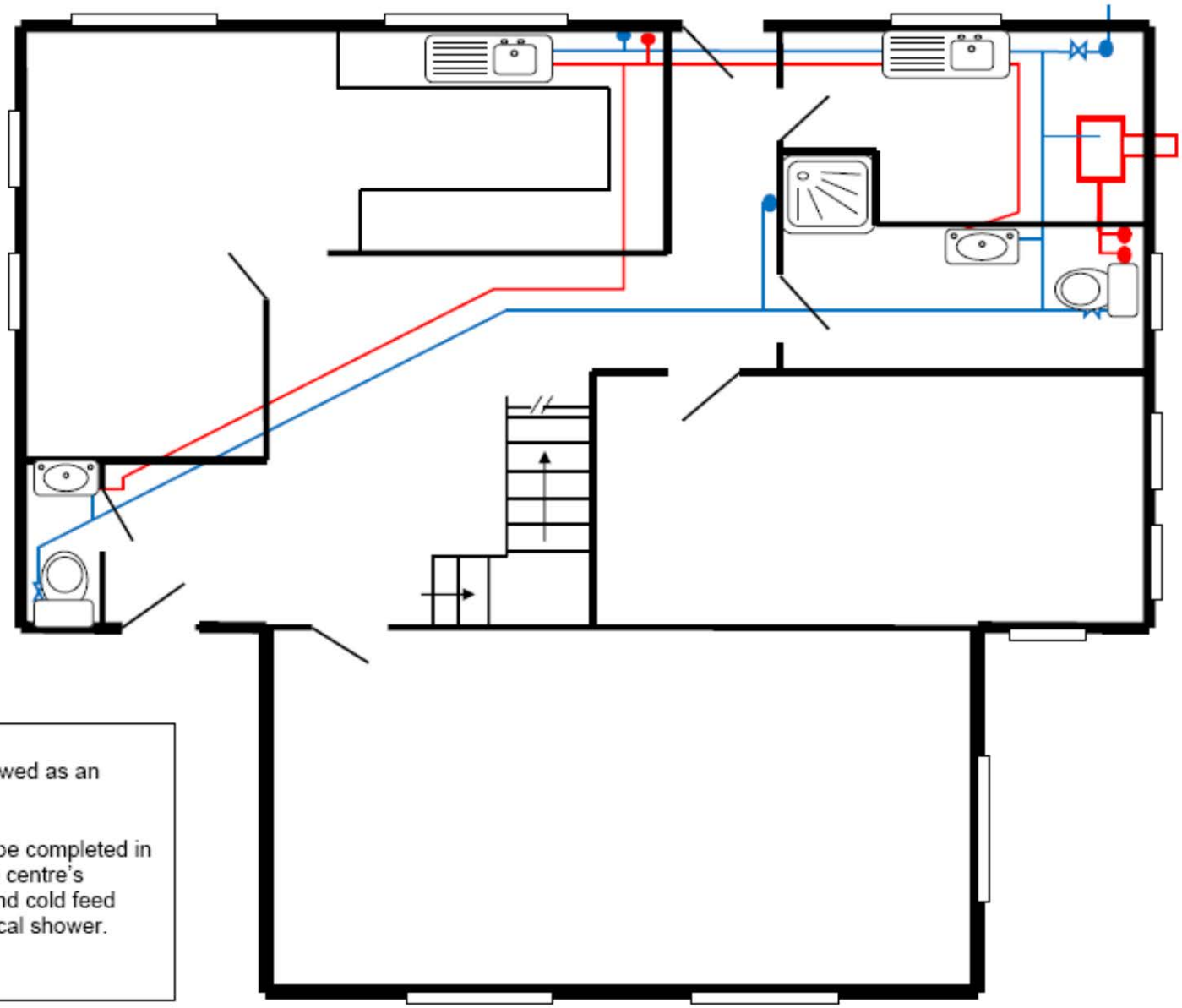
Cold water pipe

Hot water pipe

Main stop valve on supply pipe in utility room

Service valves at WC cisterns.

Vertical pipes



Note:
This model answer should be viewed as an example only.

Pipework to both showers could be completed in different ways. It would be at the centre's discretion to select either a hot and cold feed thermostatic shower or an electrical shower.

Design 2 Upper Floor

Model Answer

Notes:

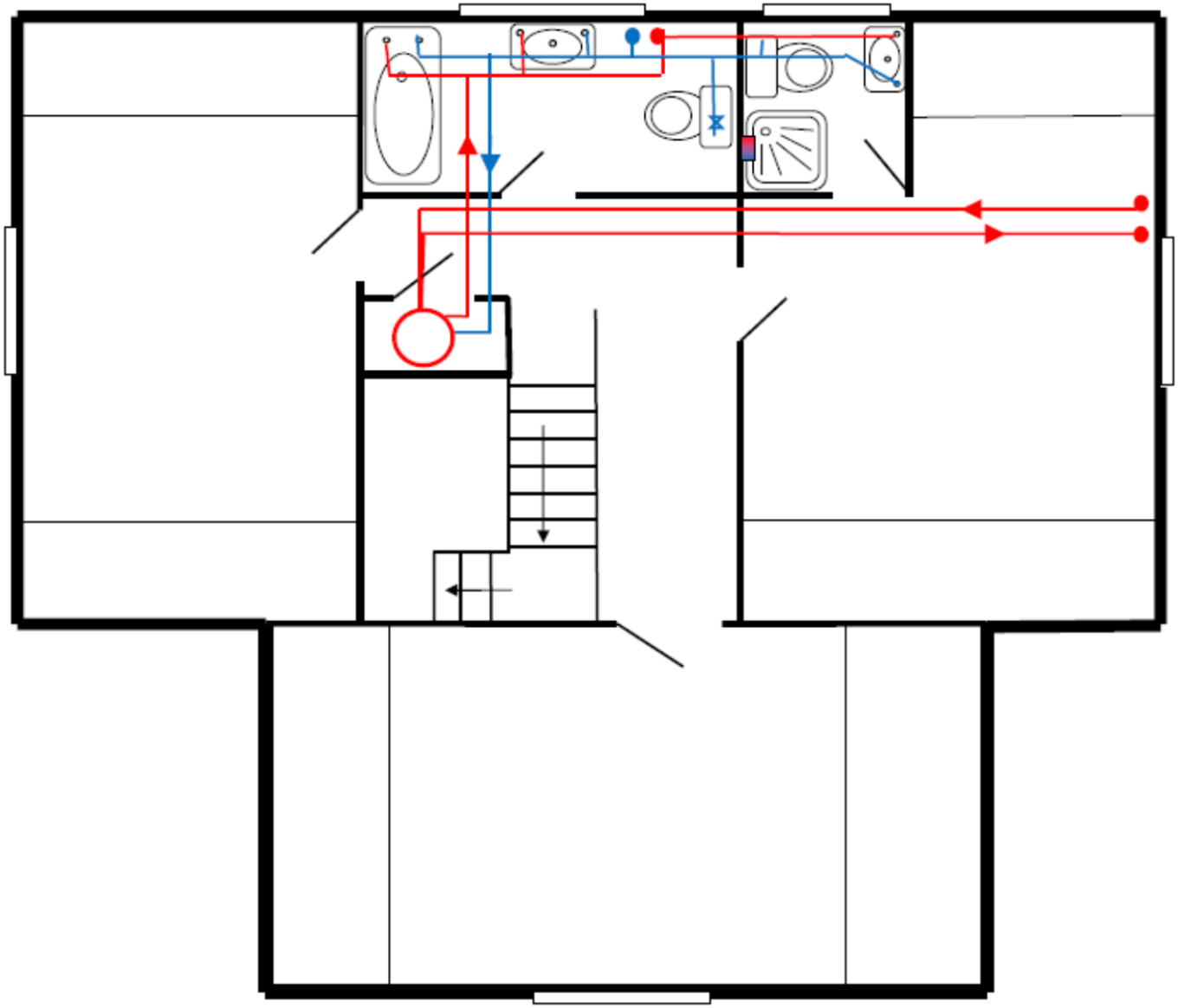
Cold pipes

Hot pipes

Thermal store

Vertical pipes

Direction of flow



Notes for model answer — Design 2

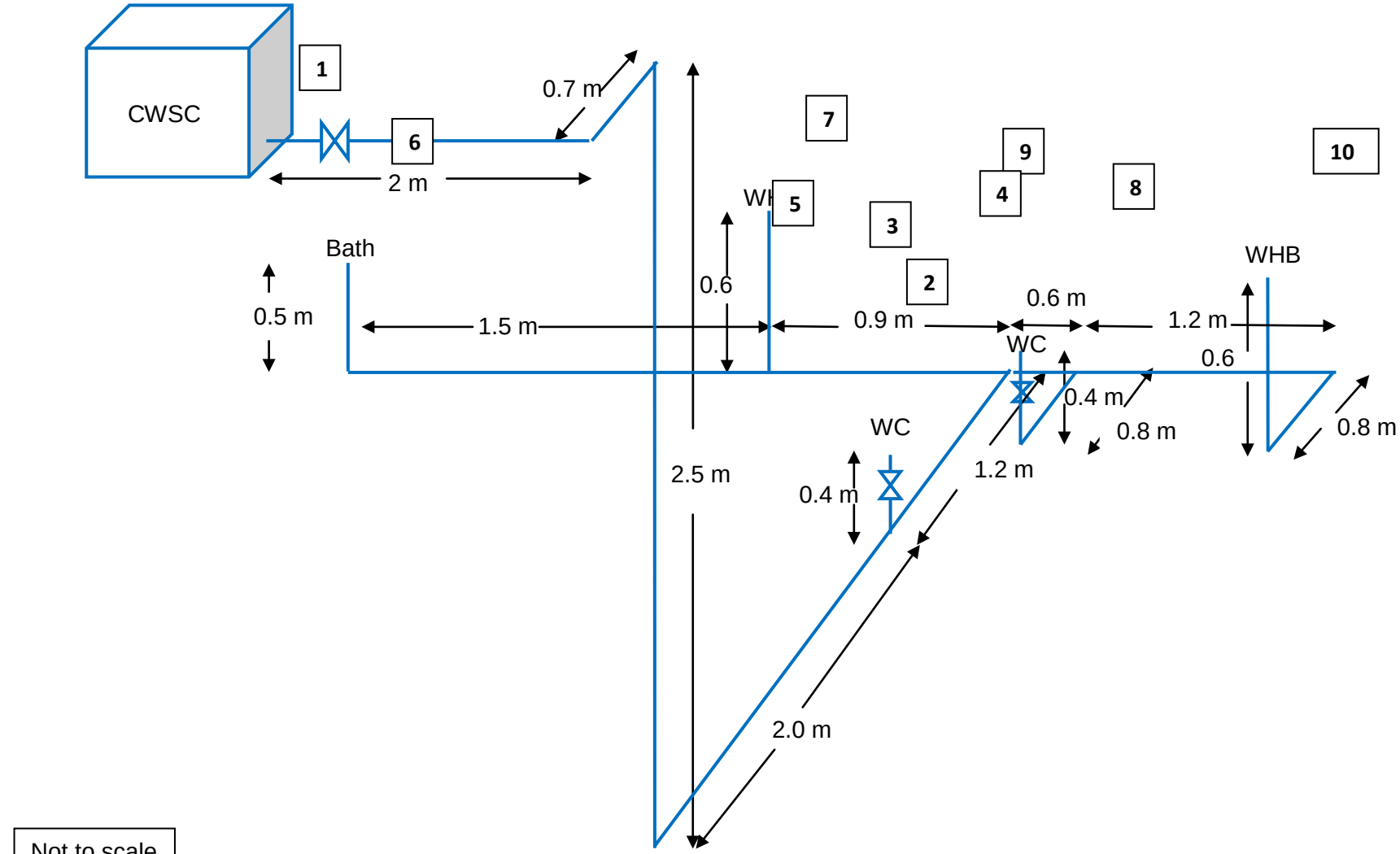
Unlike Design 1 which is an older traditional system, there can be various options available for Design 2. It is at the centre's discretion to monitor each learner's attempts at Design 2 within the guidelines.

For example:

It is requested that learners select either an unvented cylinder (unit) or a thermal store as the method of storing hot water. It has already been stated that combination boilers are not an option due to the expected requirement for hot water in this size of dwelling.

The positions of the units are up to the learner to select. The model answer drawing for Design 2 shows whatever unit is chosen to be in the upper floor cupboard. It could easily be located in the utility room on the lower floor.

Model answer
Pipe sizing component



Not to scale

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pipe ref.	Loading units	Flow rate	Pipe diameter	Velocity	Pressure (friction) loss	Loss of head Drop + Rise –	Available head	Actual pipe length	Effective pipe length	Head loss Pipe & fittings	Head loss Valves	Total Head loss	Available Residual head
		litres/ sec	millimetres	m/sec	KPa /m	KPa	KPa	metres	Actual + equivalent	Multiply columns6 ×10		Add columns 11 and 12	Subtract column 13 from 8
1–2	17	0.41	28	0.65	0.42	n/a	25	7.2	10.2	4.28	0	4.28	20.8
2–3	2	0.13	15	1.2	1.45	–4	17.12	0.4	0.4	0.58	0	0.58	16.54
2–4	15	0.34	22	1.2	0.8	0	21.12	1.2	1.2	0.96	0	0.96	20.16
4–5	11.5	0.32	22	1.1	0.72	0	19.56	0.9	0.9	0.65	0	0.65	18.91
4–8	3.5	0.15	22	0.4	1.45	0	19.56	0.6	0.6	0.87	0	0.87	18.69
5–6	10	0.3	22	0.9	0.6	–5	13.39	2.0	2.8	1.68	0	1.68	11.71
5–7	1.5	0.15	15	1.35	1.7	–6	12.39	0.6	0.6	1.02	0	1.02	11.39
8–9	2	0.13	15	1.2	1.45	–4	15.48	1.2	1.7	2.46	0	2.46	13.02
8–10	1.5	0.15	15	1.35	1.7	–6	13.48	2.6	3.6	6.12	0	6.12	7.36

Model answer

Component selection, system operation and alternative options

Answer the following questions in relation to Design 1 and Design 2.

1 Outline the operation of the system in Design 1.

The cold water is fed directly from the supply pipe using the most direct routes. The hot water is supplied from the cold water storage cistern located in the attic space. An indirect cylinder is used to store the hot water which is heated indirectly from an open vented boiler.

Components have been selected appropriate to their capacity and function.

2 Outline the operation of the system in Design 2.

Thermal store

The cold water points are fed directly from the supply pipe using the most direct routes. The hot water is supplied from the supply pipe as it passes through the thermal store. Although the store is not under mains pressure it provides a situation of 'mains pressure hot water'. The water is heated from a boiler which can be open vented or sealed depending on the type of unit selected.

Unvented cylinder

The cold water points are fed directly from the supply pipe using the most direct routes. The hot water is supplied from the supply pipe as it passes through the unvented unit which is under mains pressure. The water is heated from a boiler which can be open vented or sealed depending on the type of unit selected.

3 In Design 2, the preferred selection for the hot water system is either an unvented cylinder or a thermal store. Discuss why these options may be more suitable for this dwelling than a combination boiler and describe the operation of the unit you chose.

The reason for selecting either a thermal store or an unvented hot water cylinder is that these units are more capable for satisfying the expected hot water demands for this size of dwelling, ie bathroom, shower room, en suite, kitchen, utility room and toilet.

Thermal store

The thermal store itself is not under mains pressure but is supplied with water from and integral cistern within the unit or a remote located cistern. Depending on the unit selected (direct or indirect) heat can be supplied from an open vented boiler which receives its water from the unit (direct) or from a sealed 'systems' boiler which receives its water via a 'filling loop'. The unit selected has a bearing on its location, ie the integral or remote cistern feeding the unit requires to be located above any potential heating radiators if an open vented boiler is used. If a sealed 'systems' boiler is used the unit can be located on the ground floor if desired.

Expansion of water from the unit is accommodated within the unit's storage cistern which also supplies water to the unit. If a sealed 'systems' boiler is used expansion and filling are accommodated within the boiler (note: for the boiler and its pipework only)

Unvented hot water cylinder

The unvented unit is under mains pressure from the supply pipe. Located near or on the units are components to accommodate expansion, maintain inlet pressures and control temperature. The unit can be located anywhere appropriate to the hot water system and is not influenced by the position of storage cisterns. It is heated indirectly from a remote boiler open vented or sealed. An immersion heater is generally included for additional or alternative heat input.

4 Discuss the principle set out in the current British Standards for heat input to the hot water system and storage requirements.

The principle set out in the current British Standard concludes that the estimation of the hot water storage capacity for a situation or dwelling is dependent on the heat input of the heat source. For example, if a 3 KW immersion heater is used, a large amount of hot water would have to be stored with recovery time if all this water was used. Whereas a 35 KW combination boiler would not require storing any hot water as it can produce the desired quantities at the right temperature instantaneously — ie the greater the heat input, the less the need for hot storage.

Marking schedule and learner feedback

Unit 4: Install and commission hot and cold water systems — Assignment

Name:	Class:	Date:
Result:	**Assessor:**	**Date:**

Marking schedule	Yes	No
(a) Producing on-plan views of: the cold water layout based on the criteria set; the hot water layout based on the criteria set		
(b) Specifying appropriate components and materials to ensure system function and performance — discussing your component selection, outlining system operation and discussing alternative options		
(c) Designing the systems to comply with current building regulations, water bye-laws and British Standards		
(d) Calculation of pipe diameters		
Learner feedback		
Learner's response		
Learner's signature		

Note to assessor: Learner feedback should relate to the marking schedule

Checklist

Unit 4: Install and commission hot and cold water systems

Class: Assessor:		Learner's name										
Part	**Marking schedule**											
(a)	Producing on-plan views of: the cold water layout based on the criteria set; the hot water layout based on the criteria set											
(b)	Specifying appropriate components and materials to ensure system function and performance — discussing your component selection, outlining system operation and discussing alternative options											
(c)	Designing the systems to comply with current building regulations, water bye-laws and British Standards											
(d)	Calculation of pipe diameters											