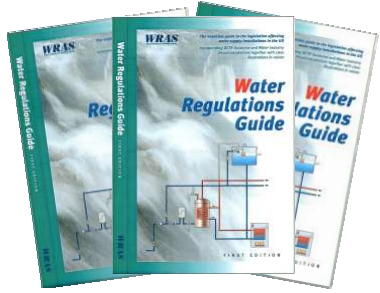
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Plumbing Section

Diploma in Plumbing and heating



Sources of Information for Hot & Cold Water Systems Installations

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**Statutory Regulations**

**The Water Supply (Water Fittings) Regulations 1999**

These regulations superseded the 1986 Water Bylaws in England and Wales. The water authorities in Scotland began to enforce new by-laws in April 2000 which mainly mirror the regulations for England and Wales. They have also been adopted by the Department of the Environment in Northern Ireland. The new regulations embody most of the requirements of the 1986 Water By-laws; the main differences relate to backflow protection, differences in the categories of water, and WC flushing. More emphasis is also placed on conservation.

As with previous by-laws, the main reasons for the need for regulations may be summarized as avoidance of: waste, contamination, misuse and undue consumption. Undue consumption may be interpreted as using more water than is actually required. It is also an offence to fit a supply of water to a metered premises in such a way that it does not pass through the meter.

Every practising plumber or fitter whose work entails the installation or repair of hot and cold water supply systems must be conversant with the regulations, as the penalty for their contravention is very severe.

**Part 1 (the preliminaries)**

Regulation 1 states the title of the Regulations and interpretations of terms used within the Regulations, including a definition of the Regulator.

Regulation 2 defines the application of the Regulations whereby they do not apply to certain water fittings in connection with water supplied for non-domestic purposes, or to water fittings lawfully installed before 1 July 1999

There is no requirement at present to apply the Water Regulations to installations supplied from a private source. e.g. from a private well , however it would be good practice to apply the same standards of installation to ALL water installation work.

**Part II (principal requirements)**

Regulations 3 and 4 impose general requirements in relation to water fittings. Water fittings must not be installed, connected, arranged or used in such a manner that they are likely to cause waste, misuse, undue consumption or contamination, or erroneous measurement, of the water supplied.

They must be of an appropriate quality or standard, and be suitable for the circumstances in which they are used; and they must be installed, connected or disconnected in a workmanlike manner.

The use of lead pipes and solders containing lead has been prohibited for use with potable water for many years. The only exception to this is in situations where lead services are still in use. Any repairs to such services, short of renewal, must be made using copper or a suitable plastic pipe and approved fittings.

Most water authorities also have reservations about the use of galvanised steel tubes, especially in areas where the action of the water on zinc causes dezincification. In most cases, where this material is permitted, its use is limited to distribution and hot water services only where the use of copper or plastic materials may be subject to damage.

The use of storage cisterns with purpose-made covers and overflow screens is mandatory in all new buildings where any water is stored for drinking and domestic purposes, and any replacements to existing water-storage vessels must comply with the 1986 water by-laws. Any pipe-jointing compound used for making joints on pipework or storage vessels must be non-toxic and resistant to bacteriological growth.

Coal tar substances such as bitumen can no longer be used to protect the internal surfaces of pipes or cisterns against corrosion, but suitable anti-corrosion paints are available and a list of these may be obtained from the local water authority. It is not unknown for water to leak from the primary part of a central heating system into the secondary water, i.e. water drawn off via a hot tap. This can occur due to a leak in the connection or coil in the hot storage vessel. Any inhibitor used to protect the heating system from corrosion must therefore be of a non-toxic nature. It is not permissible to run underground service pipes in soil which may be contaminated by sewage or refuse of any description. While pipes made of plastic are very resistant to corrosion, they can be degraded and softened when subject to contact with petroleum products, oils and phenols, i.e. materials derived from coal tar such as bitumen and creosote. If there is any suspicion of such contamination the service may have to be rerouted or passed through a watertight duct. The local water authority should also be advised where any such doubts arise in relation to underground services.

Regulation 5 requires a person who proposes to install certain water fittings to notify the water undertaker, and not to commence installation without the undertaker’s consent

Except for minor extensions or alterations to a water system, permission must be applied for and granted in connection with the following:

|  |
| --- |
| 1. The erection of a building or other structure not being a pond or swimming pool. |
| 2. The extension or alteration of a water system on any premises other than a house. |
| 3. A material change of use of any premises. |
| 4. The installation of-   1. a bath having a capacity, as measured to the centre line of overflow, of more than 230 litres; 2. a bidet with an ascending spray or flexible hose; 3. a single shower unit (which may consist of one or more shower heads within a single unit), not being a drencher shower installed for reasons of safety or health, connected directly or indirectly to a supply pipe which is of a type specified by the regulator; 4. a pump or booster drawing more than 12 litres per minute, connected directly or indirectly to a supply pipe; 5. a unit which incorporates reverse osmosis; 6. a water treatment unit which produces a waste water discharge or which requires the use of water for regeneration or cleaning; 7. a reduced pressure zone valve assembly or other mechanical device for protection against a fluid which is in fluid category 4 or 5; 8. a garden watering system unless designed to be operated by hand; or 9. any water system laid outside a building and either less than 750 mm or more than 1350 mm below ground level. |
| 5. the construction of a pond or swimming pool with a capacity greater than 10,000 litres which is designed to be replenished by automatic means and is to be filled with water supplied by a water undertaker |

All notices to the water authority must include the following:

(a) The name and address of the person giving the notice.

(b) A description of the proposed work.

(c) Particulars of the location and premises to which the proposals relate and the intended use of the premises.

There are exceptions to the foregoing: a plumber who is an ‘approved contractor’ will not require permission to install such appliances as those listed in 4(b) or 4(g).

Regulation 6

Where an approved contractor installs, alters, connects or disconnects a water fitting, he must provide a certificate that it complies with these Regulations.

**Part III (enforcement)**

Regulations 7 and 8provide for a fine not exceeding level 3 on the standard scale for contravening the Regulations. It is a defence to show that the work on a water fitting was done by or under the direction of an approved contractor, and that the contractor certified that it complied with the Regulations. This defence is extended to the offences of contaminating, wasting and misusing water under section 73 of the Water Industry Act 1991 (Regulation 8).

Regulation 9 enables water undertakers and local authorities who enter premises to carry out inspections, measurements and tests for the purposes of the Regulations.

Regulation 10 requires the water undertaker to enforce the requirements of the Regulations; this duty is enforceable by the Regulator or the Director General of Water Services.

Regulation 11 enables the Regulator to relax the requirements of these Regulations on the application of the Water Undertaker.

Regulation 12 requires the Regulator to consult water undertakers and organisations representing water users before giving an approval for the purpose of the Regulations, and to publicise approvals.

Regulation 13 provides for disputes arising under the Regulations between a Water Undertaker and a person who has installed or proposes to install a water fitting to be referred to arbitration.

Regulation 14 revokes the existing Water Byelaws made by water undertakers under section 17 of the Water Act 1945.

**Schedule 1: Fluid Categories**

|  |  |
| --- | --- |
| **Fluid Category 1** | **Wholesome water supplied by a water undertaker** and complying with the requirements of regulations made under section 67 of the Water Industry Act 1991 |
| **Fluid Category 2** | Water in fluid category 1 whose **aesthetic quality is impaired** owing to:   1. a change in its temperature, or 2. the presence of substances or organisms causing a change in its taste, odour or appearance, including water in a hot water distribution system |
| **Fluid Category 3** | Fluid which represents a **slight health hazard** because of the concentration of substances of low toxicity, including any fluid which contains:   1. ethylene glycol, copper sulphate solution or similar chemical additives, or 2. sodium hypochlorite (chloros and common disinfectants). |
| **Fluid Category 4** | Fluid which represents a **significant health hazard** because of the concentration of toxic substances, including any fluid which contains:   1. chemical, carcinogenic substances or pesticides (including insecticides and herbicides), or 2. environmental organisms of potential health significance |
| **Fluid Category 5** | Fluid representing a **serious health hazard** because of the concentration of pathogenic organisms, radioactive or very toxic substances, including any fluid which contains -   1. faecal material or other human waste; 2. butchery or other animal waste; or 3. pathogens from any other source. |

*Technical details on how to comply with the Water Regulations are found in Schedule 2*

**The Private Water Supply Regulations 2016**

These ensure that water supplied from a private source are safe for people to drink. Private water supplies are classified into four categories:

* Large supplies serving commercial and public buildings such as hotels, restaurants, nursing homes, bed and breakfast establishments, village halls and large domestic users using more than 10m3/day or supplying more than 50 people per day on average.
* Small supplies serving two or more domestic properties but with no commercial usage, using less than 10m3/day or fewer than 50 people per day on average.
* Single property supplies where water is supplied for domestic purposes only.
* Private distribution networks. The scope of the regulations now includes networks where the water is distributed further beyond the responsibility of the licenced water company. These include such properties as caravan parks, industrial estates or country estates or where water is distributed by tanker.

*The Role of local authorities in regulating private water supplies*

The local authority acts as the regulator for the private water supplies in their area and have statutory duties under the Regulations. Local Authorities must:

* Conduct a risk assessment on every property with private water supply in their area.
* Undertake monitoring in order to determine compliance with water standards.
* Provide monitoring data to the Drinking Water Inspectorate (DWI).

The local authority has enforcement powers to ensure that a water supply is improved, should it fall below the minimum cleanliness requirement, by the relevant person(s) who control that supply.

*The Role of Drinking Water Inspectorate (DWI) in regulating private water supplies*

The DWI plays a statutory role in acting as technical advisors to Local Authorities in relation to the implementation of the Private Water Supplies Regulations 2016. This includes technical and scientific assistance on all aspects of drinking water quality on both public and private supplies.

**Building Regulations Approved Document G** - Sanitation, hot water safety and water efficiency

In 2010 the Building Regulations were updated and amended. Approved Document G was extended to bring new areas under the control of the Building Regulations, most notably, the installation of systems and water efficiency.

The amended Approved Document Gis broken down into 7 parts:

**G1 - Cold Water Supply**

Requirements on supply of wholesome water for drinking, washing or food preparation. G1 also deals with the provision of suitable water for flushing WCs, irrigation, etc.

**G2 - Water Efficiency**

G2 and Regulation 36 of the Building Regulations 2015 set out new requirements on water efficiency in NEW dwellings.

**G3 - Hot Water Supply and Systems**

Enhanced and amended provisions on hot water supply and safety, applying safety provisions to all types of hot water systems and a new provision on scalding prevention.

**G4 - Sanitary Conveniences and Washing Facilities**

Requirements for sanitary conveniences and hand washing facilities.

**G5 - Bathrooms**

Requirements for bathrooms, which apply to dwellings and to buildings containing one or more rooms for residential purposes.

**G6 - Kitchens and Food Preparation Areas**

New provision requiring sinks to be provided in areas where food is prepared.

**Water efficiency Calculator for new dwellings**

Sets out the methodology required to allow the calculation of water consumption in dwellings, limiting water use to 125 litres (optional 110 litres) per person per day

**Water efficiency Calculator for new dwellings**

The requirement under G2 of the Building Regulations states that:

*Reasonable provision must be made by the installation of fittings and fixed appliances that use water efficiently for the prevention of undue consumption of water.*

**Water efficiency of new dwellings *(Regulation 17K)***

Reg 36

1. The potential consumption of wholesome water by persons occupying a new dwelling must not exceed the requirement in paragraph (2).
2. The requirement referred to in paragraph (1) is either -
   1. 125 litres per person per day; or
   2. in a case to which paragraph (3) applies, the optional requirement of 110 litres per person per day,

as measured in either case in accordance with a methodology approved by the Secretary of State.

1. This paragraph applies where the planning permission under which the building work is carried out -
   1. specifies the optional requirement in paragraph (2)(b); and
   2. makes it a condition that that requirement must be complied with.
2. In this Part, “new dwelling” does not include a dwelling that is formed by a material change of use of a building within the meaning of regulation 5(g).

**Wholesome water consumption calculation** (Regulation 20E)

Reg 37.

1. Where regulation 36 applies, the person carrying out the work must give the local authority a notice which specifies—
2. which of the requirements in regulation 36(2)(a) or (b) applies to the dwelling; and
3. the potential consumption of wholesome water per person per day in relation to the completed dwelling.

Requirement G2 applies only when a dwelling is -

1. erected; or
2. formed by a material change of use of a building

The water efficiency calculator uses the water consumption figures that are provided from manufacturers’ data. These must be obtained before the assessment can be attempted. The figures are then entered into a series of tables to determine the water consumption per person. Water consumption/flowrate figures are required for:

* WCs
* Washing machines
* Taps
* Showers
* Baths
* Water softeners
* Dishwashers
* External taps.

Bidets are exempt from the calculation due to their minimal water consumption

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| The Water Efficiency Calculator | | | | | |
|  | | 1 | 2 | 3 | 4 |
| Installation type | Unit of Measure | Capacity/flow rate | Use factor | Fixed use (litres/person/day) | Litres/person/day (1x2+3) |
| WC (single flush) | Flush volume (litres) |  | 4.42 | 0.00 |  |
| WC (dual flush) | Full flush volume (litres) |  | 1.46 | 0.00 |  |
| Part flush volume (litres) |  | 2.96 | 0.00 |  |
| WCs (multiple fittings) | Average effective flushing volume (litres) |  | 4.42 | 0.00 |  |
| Taps (excluding kitchen/utility room taps | Flow rate (litres/minute) |  | 1.58 | 1.58 |  |
| Bath (where shower also present) | Capacity to overflow (litres) |  | 0.11 | 0.00 |  |
| Shower (where bath also present) | Flow rate (litres/minute) |  | 4.37 | 0.00 |  |
| Bath only | Capacity to overflow (litres) |  | 0.50 | 0.00 |  |
| Shower only | Flow rate (litres/minute) |  | 5.60 | 0.00 |  |
| Kitchen/utility room sink taps | Flow rate (litres/minute) |  | 0.44 | 10.36 |  |
| Washing machine | Litres/kg dry load |  | 2.1 | 0.00 |  |
| Dishwasher | Litres/place setting |  | 3.6 | 0.00 |  |
| Waste disposal unit | Litres/use |  | 3.08 | 0.00 |  |
| Water softener | Litres/person/day |  | 1.00 | 0.00 |  |
|  | 1. **Total calculated use = (sum column 4)** | | | |  |
|  | 1. Contribution from grey water (litres/person/day) | | | |  |
|  | 1. Contribution from rainwater (litres/person/day) | | | |  |
|  | 1. Normalisation factor | | | | 0.91 |
|  | 1. Total water consumption = [(5) – (6) – (7)] x (8) | | | |  |
|  | 1. External water use | | | | 5.0 |
|  | 1. **Total water consumption = (9) + (10) (litres/person/day)** | | | |  |

**Requirements of G3**

G3 is divided into four parts:

Part 1 of G3 is a relatively new requirement. It states that heated wholesome water must be supplied to any washbasin or bidet that is situated in or adjacent to a room containing a sanitary convenience, to any washbasins, bidets, fixed baths or showers installed in a bathroom, and any sink in an area where food is prepared. Pipework should be designed and installed in such a way as to minimise the transfer time between the hot water storage system and hot water outlets

Part 2 states that any hot water system, including associated storage (including any cold water storage cistern) or expansion vessel, must resist the effects of any temperature or pressure that may occur during normal use as a consequence of any reasonably anticipated fault or malfunction. This requirement was introduced after the failure of an immersion heater thermostat that caused the collapse of a storage cistern containing water almost at boiling point.

The cold water storage cistern into which the vent pipe discharges should be supported on a flat, level, rigid platform which is capable of safely withstanding the weight of the cistern when filled with water to the rim and fully supporting the bottom of the cistern over the whole of its area. The platform should extend a minimum of 150mm in all directions beyond the edge of the maximum dimensions of the cistern.

Part 3 now included open vented hot water systems as well as unvented systems and requires that any part of a hot water system that incorporates a hot water storage vessel must include precautions to ensure that **the temperature of the stored water does not exceed 100°C**. For all direct heat sources, **a non-self-resetting energy cut-out should be incorporated to disconnect** the supply of heat to the storage vessel in the event of the storage system overheating. For all indirect heat sources, an overheat cut-out is to be provided to disconnect the supply of heat to the storage vessel in the event of the stored water overheating so that the temperature of the stored water does not exceed 100°C

**On unvented systems a minimum of two independent safety devices must be incorporated to minimize the danger from excessive pressure**. These shall be in addition to any thermostat provided to control the desired temperature of the stored water. Any discharge from such safety devices is safely conveyed to a point where it is visible without constituting a danger to persons in or about the building.

Part 4 states that **any hot water supply to a fixed bath must include provision to limit the temperature of the discharged water from any bath tap to not in excess of 48°C.** This requirement applies to any new-build or property conversions. This requirement is intended to prevent scalding.

It should be noted that the local building control officer should be informed before commencing any installation of a hot water system.

**The Building Regulations Approved Document L (L1A/B; L2A/B)**

This document promotes the conservation of fuel and power. The basic outline to this document is that the building and services contained within a dwelling must be designed and installed to actively reduce the amount of CO2 produced.

The building fabric must contain insulation to limit heat loss and heating appliances, associated controls and equipment and lighting systems must all reduce the energy wasted. Pipes and storage vessels must also be insulated to reduce the waste of energy.

This document should be read in conjunction with the Building Services Compliance Guide.

**Industry standards**

There are a number of industry standards that we can reference to ensure that we conform to the regulations when installing cold and hot water systems.

**British Standard BS EN 806**

This standard supersedes BS6700 and contains extensive information regarding the design and installation of cold and hot water supply systems. It is comprised of five parts:

Part 1 General

Part 2 Design

Part 3 Pipe sizing

Part 4 Installation

Part 5 Maintenance and operation.

Part 1 of BSEN806 outlines the objectives of the standard, competences required for design and operation, definitions and graphical symbols used.

Part 2 is concerned with design. This document provides technical information so that the following points may be achieved from the design and installation:

* Appropriate pressures and flowrates
* Water quality at the tap is not contaminated or affected by the location or environment
* The system avoids wastage of water and leakage.
* The system is efficient, convenient, reliable and safe.
* The system has a reasonable working life span.

Part 3 details a simplified method pipe sizing. This document describes the simplified method for pipe sizing potable water installations. However, the document is not suitable for some complex systems. For these systems a tabular method should be used, such as the method outlined in BS6700

Part 4 specifies the requirements of water installations within buildings and gives recommendations for their correct installation. It also covers pipework outside buildings but within the premises and applies to new, altered and repaired installations.

Part 5 is concerned with operation and maintenance. Installations and appliances shall be operated in such a manner as to ensure their reliable performance and the quality of potable water is not adversely affected. All information relevant to the installation should be readily available, including the commissioning report.

**British Standard BS 8558.**

This standard provides complementary guidance to **BS EN 806**. It is a guide to the design, installation, testing, operation and maintenance of services supplying water for domestic use.

**PD (Published Document) 855468:2015: Guide to the flushing and disinfection of services supplying water for domestic use within buildings and their curtilages**

Flushing and disinfection of systems used to be part of BS8558:2011. However, the latest version of BS8558:2015 excludes flushing and disinfection. Instead, flushing and disinfection of systems is now a separate document PD 855468:2015.

PD 855468:2015 provides guidance on the cleaning, flushing and disinfection of cold water systems to control microbiological growth and the removal of debris. This includes guidance on:

* Deployment of the correct tools and personnel
* The use of the correct disinfectants
* How to respond if a microbiological problem is identified
* Keeping records of cleaning and disinfection

This new document applies to systems supplying water to domestic purposes within buildings and their curtilages, and includes water used in food preparation.

**The Domestic Building Services Compliance Guide**

This guide provides guidance to the Building Regulations Approved Documents L1 and L2 when installing fixed building services within new and existing dwellings to help them comply with the Building Regulations.

The guide specifically targets space heating, domestic hot water services, mechanical ventilation, comfort cooling and interior lighting. New technologies such as heat pumps, solar thermal panels and micro-combined heat and power systems are also discussed. The guide also refers to other publications that refer to techniques to assist in the design and installation of systems that are over and above the standard that is required by the Building Regulations.

**Manufacturer technical instructions**

The manufacturer’s instructions are probably the most important document to read and consult when installing, servicing and maintaining appliances, components and equipment, because they instruct us on the best methods to use whilst keeping to current legislation and regulations. In some cases, it may appear that these instructions contradict the regulations. This occurs because regulations and codes of practice are only updated periodically, whereas manufacturers are constantly reviewing and updating their literature in line with modifications and current good practice. Where a conflict exists, manufacturer’s literature should always be followed. If not:

* The warranty of the equipment may be void.
* Regulations may be inadvertently broken
* The installation may be dangerous.

Unvented hot water storage systems must be fitted, commissioned and maintained strictly in accordance with the manufacturer’s instructions. These contain vital information for the correct and safe installation, operation and maintenance of the system and its components, such as:

* the minimum required pressure and flow rate of the incoming supply, for satisfactory operation of the system
* the minimum size of the incoming cold water supply
* the minimum size of any hot water distribution pipework
* the required heat input and heat recovery time
* any electrical installation requirements
* the operation of any controls
* the calculation required to ascertain the correct size of the discharge pipework
* fault-finding techniques.