

DIN EN 806-2



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Supersedes parts of DIN 1988-2 and
DIN 1988-5, December 1988 editions.

Specification for installations inside buildings conveying water for human consumption
Part 2: Design
English version of DIN EN 806-2

Technische Regeln für Trinkwasser-Installationen – Teil 2: Planung

This standard has been included in the body of Codes of practice for gas issued by the *DVGW Deutscher Verein des Gas- und Wasserfaches e.V.* (German Association of Gas and Water Engineers).

National foreword

This standard has been prepared by CEN/TC 164 'Water supply' (Secretariat: France), WG 2 'Internal systems' (Secretariat: Germany).

The responsible German body involved in its preparation was the *Normenausschuss Wasserwesen* (Water Practice Standards Committee), Technical Committee IV 7 *Häusliche Wasserversorgung*.

The DIN Standard corresponding to the European Standard referred to in clause 2 of the EN is as follows:

European Standard	DIN Standard
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EN ISO 6509	DIN EN ISO 6509
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Installation type B (vented) has been introduced to take account of the technical conditions and conventions in some CEN member countries and to ensure acceptance of the standard in these countries. Principles, requirements and technical details relating to the vented system are given in several clauses, particularly in clause 19. These specifications are largely unknown to German users of the DIN 1988 standards series.

Technical Committee NAW IV 7 *Häusliche Wasserversorgung* expressly points out that, in Germany, installation type A (closed) is the standard type and the principles laid down in DIN 1988 continue to be valid. This is to establish the technical basis for compliance with the requirements of the *Trinkwasserverordnung* (German Drinking Water Regulation).

Amendments

This standard differs from DIN 1988-2 and DIN 1988-5, December 1988 edition, as follows:

- a) The content has been completely revised and restructured.
- b) Installation types A (closed) and B (vented) have been introduced.
- c) Three operating pressure classes have been specified.
- d) For plastic pipe systems, two temperature classes have been specified.
- e) Reference is made to all suitable types of pipes and fittings that are dealt with in European product standards.
- f) Annexes A and B have been included.

Previous editions

DIN 1988: 1930-08, 1940-09, 1955-03, 1962-01; DIN 1988-2: 1988-12; DIN 1988-5: 1982-12; 1988-12

Document comprises 49 pages.

English version

**Specification for installations inside buildings
conveying water for human consumption**

Part 2: Design

Spécifications techniques relatives
aux installations pour l'eau destinée à
la consommation humaine à l'intérieur
des bâtiments – Partie 2: Conception

Technische Regeln für Trinkwasser-
Installationen – Teil 2: Planung

This European Standard was approved by CEN on 2005-02-03.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

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CEN

European Committee for Standardization
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Europäisches Komitee für Normung

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Foreword

This document (EN 806-2:2005) has been prepared by Technical Committee CEN/TC 164 "Water supply", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2005, and conflicting national standards shall be withdrawn at the latest by September 2005.

This document has been prepared under the direction of CEN/TC 164 and is intended for the use of engineers, architects, surveyors, contractors, installers, water suppliers, consumers and regulatory inspections.

This standard has been written in the form of a practice specification. It is the second part of a European Standard consisting of five parts as follows:

- *Part 1: General*
- *Part 2: Design*
- *Part 3: Pipe sizing*
- *Part 4: Installation*
- *Part 5: Operation and maintenance*

NOTE : Products intended for use in water supply systems must comply, when existing, with national regulations and testing arrangements that ensure fitness for contact with drinking water. The Member states relevant regulators and the EC Commission agreed on the principle of a future unique European Acceptance Scheme (EAS), which would provide a common testing and approval arrangement at European level. If and when the EAS is adopted, European Product Standards will be amended by the addition of an Annex Z/EAS under Mandate M136 which will contain formal references to the testing, certification and product marking requirements of the EAS. Until EAS comes into force, the current national regulations remain applicable.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This document gives recommendations, and specifies requirements, on the design of potable water installations within buildings and for pipework outside buildings but within the premises (see EN 806-1) and applies to new installations, alterations and repairs.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references the latest edition of the referenced document (including any amendments) applies.

EN 26, *Gas-fired instantaneous water heaters for sanitary uses production, fitted with atmospheric burners (Including Corrigendum 1998).*

EN 89, *Gas-fired storage water heaters for the production of domestic hot water.*

EN 545, *Ductile iron, pipes, fittings, accessories and their joints for water pipelines — Requirements and test methods.*

EN 625, *Gas-fired central heating boilers — Specific requirements for the domestic hot water operation of combination boilers of nominal heat input not exceeding 70 kW.*

EN 805, *Water supply — Requirements for external systems and components outside buildings.*

EN 806-1:2000, *Specifications for installations inside buildings conveying water for human consumption — Part 1: General.*

prEN 806-3, *Specifications for installations inside buildings conveying water for human consumption — Part 3: Pipe sizing.*

EN 973, *Chemicals used for treatment of water intended for human consumption – Sodium chloride for regeneration of ion exchangers.*

EN 1057, *Copper and copper alloys – Seamless, round copper tubes for water and gas in sanitary and heating applications.*

EN 1254-1, *Copper and copper alloys – Plumbing fittings – Part 1: Fittings with ends for capillary soldering or capillary brazing to copper tubes.*

EN 1254-2, *Copper and copper alloys – Plumbing fittings – Part 2: Fittings with compression ends for use with copper tubes.*

EN 1254-3, *Copper and copper alloys – Plumbing fittings – Part 3: Fittings with compression ends for use with plastics pipes.*

EN 1254-4, *Copper and copper alloys - Plumbing fittings - Part 4: Fittings combining other end connections with capillary or compression ends*

EN 1254-5, *Copper and copper alloys – Plumbing fittings – Part 5: Fittings with short ends for capillary brazing to copper tubes.*

prEN 1254-7, *Copper and copper alloys - Plumbing fittings - Part 7: Fittings with press ends for metallic tubes*

EN 1452-1, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U) — Part 1: General.*

EN 1452-2, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U) — Part 2: Pipes.*

EN 1452-3, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U) — Part 3 : Fittings.*

EN 1452-5, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U) — Part 5: Fitness for purpose of the system.*

EN 1452-7, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U) — Part 7: Guidance for the assessment of conformity.*

EN 1487, *Building valves — Hydraulic safety groups — Tests and requirements.*

EN 1488, *Building valves — Expansion group — Tests and requirements.*

EN 1489, *Building valves — Pressure safety valves — Tests and requirements.*

EN 1490, *Building valves — Combined temperature and pressure relief valves — Tests and requirements.*

EN 1491, *Building valves — Expansion valve — Tests and requirements.*

EN 1717, *Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow.*

EN 10226-1, *Pipe threads where pressure tight joints are made on the threads — Part 1: Taper external threads and parallel internal threads — Dimensions, tolerances and designation.*

EN 10240, *Internal and/or external protective coatings for steel tubes — Specification for hot dip galvanized coatings applied in automatic plants.*

EN 10242, *Threaded pipe fitting in malleable cast iron.*

EN 10255, *Non-Alloy steel tubes suitable for welding and threading — Technical delivery conditions.*

EN 10284, *Malleable cast iron fittings with compression ends for polyethylene (PE) piping systems.*

EN 12201-1, *Plastics piping systems for water supply — Polyethylene (PE) — Part 1: General*

EN 12201-2, *Plastics piping systems for water supply — Polyethylene (PE) — Part 2: Pipes*

EN 12201-3, *Plastics piping systems for water supply — Polyethylene (PE) — Part 3: Fittings.*

EN 12201-5, *Plastics piping systems for water supply — Polyethylene (PE) — Part 5: Fitness for purpose of the system.*

CEN/TS 12201-7, *Plastics piping systems for water supply — Polyethylene (PE) — Part 7: Guidance for the assessment of conformity.*

EN 12502-1, *Protection of metallic materials against corrosion — Guidance on the assessment of corrosion likelihood in water distribution and storage systems — Part 1: General.*

EN 12502-2, *Protection of metallic materials against corrosion — Guidance on the assessment of corrosion likelihood in water distribution and storage systems — Part 2: Influencing factors for copper and copper alloys.*

EN 12502-3, *Protection of metallic materials against corrosion — Guidance on the assessment of corrosion likelihood in water distribution and storage systems — Part 3: Influencing factors for hot dip galvanised ferrous materials.*

prEN 12502-4, *Protection of metallic materials against corrosion — Guidance on the assessment of corrosion likelihood in water distribution and storage conveying systems — Part 4: Influencing factors for stainless steels.*

EN 12502-5, *Protection of metallic materials against corrosion — Guidance on the assessment of corrosion likelihood in water distribution and storage systems — Part 5: Influencing factors for cast iron, unalloyed and low alloyed steels.*

EN 12842, *Ductile iron fittings for PVC-U or PE piping systems – Requirements and test methods.*

EN 13443-1, *Water conditioning equipment inside buildings - Mechanical filters - Part 1: Particle rating 80 µm to 150 µm - Requirements for performances, safety and testing.*

EN 14095, *Water conditioning equipment inside buildings - Electrolytic treatment systems with aluminium anodes - Requirements for performance, safety and testing.*

EN 14525, *Ductile iron wide tolerance couplings and flange adaptors for use with pipes of different materials: ductile iron, Grey iron, Steel, PVC-U PE, Fibre – cement.*

prEN 14743, *Water equipment inside buildings - Softeners - Requirements for performance, safety and testing.*

EN 29453, *Soft solder alloys; chemical compositions and forms (ISO 9453:1990).*

EN 60335-2-21, *Household and similar electrical appliances - Safety - Part 2-21: Particular requirements for storage water heaters (IEC 60335-2-21:2002, modified).*

EN 60335-2-35, *Household and similar electrical appliances - Safety - Part 2-35: Particular requirements for instantaneous water heaters (IEC 60335-2-35:2002).*

EN 60534-8-4, *Industrial-process control valves — Part 8 : Noise considerations — Section 4: Prediction of noise generated by hydrodynamic flow (IEC 60534-8-4/1994).*

EN 60730-1, *Automatic electrical controls for household and similar use — Part 1: General requirements (IEC 60730-1:1999, modified).*

EN 60730-2-8, *Automatic electrical controls for household and similar use — Part 2-8: Particular requirements for electrically operated water valves, including mechanical requirements (IEC 60730-2-8:2000, modified).*

EN ISO 3822-1, *Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 1: Method of measurement (ISO 3822-1:1999).*

EN ISO 3822-2, *Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 2: Mounting and operating conditions for draw-off taps and mixing valves (ISO 3822-2:1995).*

EN ISO 3822-3, *Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 3: Mounting and operating conditions for in-line valves and appliances (ISO 3822-3:1997).*

EN ISO 3822-4, *Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 4: Mounting and operating conditions for special appliances (ISO 3822-4:1997).*

EN ISO 6509, *Corrosion of metals and alloys - Determination of dezincification resistance of brass (ISO 6509:1981).*

EN ISO 15874-1, *Plastics piping systems for hot and cold water installations – Polypropylene (PP) – Part 1: General (ISO 15874-1:2003).*

EN ISO 15874-2, *Plastics piping systems for hot and cold water installations – Polypropylene (PP) – Part 2: Pipes (ISO 15874-2:2003).*

EN ISO 15874-3, *Plastics piping systems for hot and cold water installations – Polypropylene (PP) – Part 3: Fittings (ISO 15874-3:2003).*

EN ISO 15874-5, *Plastics piping systems for hot and cold water installations – Polypropylene (PP) – Part 5: Fitness for purpose of the system (ISO 15874-5:2003).*

EN ISO/TS 15874-7, *Plastics piping systems for hot and cold water installations– Polypropylene (PP) – Part 7: Guidance for the assessment of conformity (ISO/TS 15874-7:2003).*

EN ISO 15875-1, *Plastics piping systems for hot and cold water installations – Crosslinked polyethylene (PE-X) – Part 1: General (ISO 15875-1:2003).*

EN ISO 15875-3, *Plastics piping systems for hot and cold water installations – Crosslinked polyethylene (PE-X) – Part 3: Fittings (ISO 15875-3:2003).*

EN ISO 15875-5, *Plastics piping systems for hot and cold water installations – Crosslinked polyethylene (PE-X) – Part 5: Fitness for purpose of the system (ISO 15875-5:2003).*

EN ISO/TS 15875-7, *Plastics piping systems for hot and cold water installations– Crosslinked polyethylene (PE-X) – Part 7: Guidance for the assessment of conformity (ISO/TS 15875-7:2003)*

EN ISO 15876-1, *Plastics piping systems for hot and cold water – Polybutylene (PB) – Part 1: General (ISO 15876-1:2003).*

EN ISO 15876-2, *Plastics piping systems for hot and cold water installations – Polybutylene (PB) – Part 2: Pipes (ISO 15876-2:2003).*

EN ISO 15876-3, *Plastics piping systems for hot and cold water installations – Polybutylene (PB) – Part 3: Fittings (ISO 15876-3:2003).*

EN ISO 15876-5, *Plastics piping systems for hot and cold water installations – Polybutylene (PB) – Part 5: Fitness for purpose of the system (ISO 15876-5:2003).*

EN ISO/TS 15876-7, *Plastics piping systems for hot and cold water installations – Polybutylene (PB) – Part 7: Guidance for the assessment of conformity (ISO/TS 15876-7:2003).*

EN ISO 15877-1, *Plastics piping systems for hot and cold water installations – Chlorinated poly(vinyl chloride) (PVC-C) – Part 1: General (ISO 15877-1:2003).*

EN ISO 15877-2, *Plastics piping systems for hot and cold water installations – Chlorinated poly(vinyl chloride) (PVC-C) – Part 2: Pipes (ISO 15877-2:2003).*

EN ISO 15877-3, *Plastics piping systems for hot and cold water installations – Chlorinated poly(vinyl chloride) (PVC-C) – Part 3: Fittings (ISO 15877-3:2003).*

EN ISO 15877-5, *Plastics piping systems for hot and cold water installations – Chlorinated poly(vinyl chloride) (PVC-C) – Part 5: Fitness for purpose of the system (ISO 15877-5:2003).*

EN ISO/TS 15877-7, *Plastics piping systems for hot and cold water installations – Chlorinated poly(vinyl chloride) (PVC-C) – Part 7: Guidance for the assessment of conformity (ISO/TS 15877-7:2003).*

ISO 15875-2, *Plastics piping systems for hot and cold water installations – Crosslinked polyethylene (PE-X) – Part 2: Pipes.*

IEC 60064-5-54, *Electrical installations of buildings - Part 5-54: Selection and erection of electrical equipment; Earthing arrangements, protective conductors and protective bonding conductors*

3 General requirements

3.1 Water supply

This document applies irrespective of the water being supplied by a statutory water supplier or from a private supply. Attention is drawn to national or local regulations and requirements.

3.2 Basic concepts

3.2.1 General

For design and construction of a potable water installation two types of installation are considered:

- installation type A: Closed potable water installations, see EN 806-1:2000, 5. and Annex A, Figure 2.
- installation type B: Vented potable water installations, see EN 806-1:2000, 5.11 and Annex A, Figure 3.

Installation types A and B may be combined.

The potable water installation shall be designed to:

- a) avoid waste, undue consumption, misuse and water contamination;
- b) avoid excessive velocity, low flow rates and stagnant areas;
- c) enable water supply to all individual water outlets, taking into consideration pressure, flow rate, water temperature and use of building;
- d) avoid the trapping of air during filling and the formation of air locks during operation of the installation;
- e) not cause danger or inconvenience to persons and domestic animals nor endanger buildings or their contents;
- f) avoid damage (e.g. scaling, corrosion and degradation) and to prevent the water quality being affected by local environment;
- g) facilitate access and maintenance operations of appliances;
- h) avoid cross-connections and
- i) minimise the generation of noise.

3.2.2 Water and energy conservation

The designer shall consider the water usage and energy demands of an installation and seek to minimise these.

3.3 Underground pipework

All underground pipework covered by this standard shall conform with the requirements given in EN 805.

3.4 Materials, components and appliances

3.4.1 General

All materials, components and appliances used in the construction of potable water systems shall comply with appropriate CEN product standards or European Technical Approval guidelines if applicable. Where these are not available national standards or local regulations should be used.

The design and selection of materials shall take into consideration the service conditions and water quality.

Information and criteria about the reasonable choice of metal pipe material taking into account corrosion likelihood is given in EN 12502-1 to -5.

3.4.2 Pressure and temperature

To ensure adequate strength, all components of the system shall be designed to meet the test pressure requirements of the local and national laws and regulations. The test pressure shall be at least 1,5 times the allowable maximum operating pressure (PMA).

All pipes and joints of a potable water installation shall be designed for a service life of 50 years taking into account appropriate maintenance and specific operating conditions.

Unless otherwise specified in European Standards, the materials, components and appliances for hot drinking water installations shall be capable of resisting water temperatures up to 95° under fault conditions.

The minimum operating conditions for calculation purposes for pipes and pipe fittings shall be as given in Table 1 and Table 2.

Table 1 — Allowable maximum operating pressure classes

Allowable maximum operating pressure (PMA) class	Pressure kPa
PMA 1,0	1000
PMA 0,6	600
PMA 0,25	250

Table 2 — Classification of service conditions for plastic pipe systems

Application class	Design temperature, T_D °C	Time at T_D years	T_{max} °C	Time at T_{max} years	T_{mal} for fault condition °C	Time at T_{mal} for fault condition h	Typical field of application
1	60	49	80	1	95	100	Hot water supply (60 °C)
2	70	49	80	1	95	100	Hot water supply (70 °C)

All systems which satisfy the conditions specified in Table 2 shall also be suitable for the conveyance of cold water for a period of 50 years at a temperature of 20 °C and a design pressure of 10 bar.

If not required in national or local regulations the sum of operation pressure and surge pressure should not exceed test pressure of the installation.

Surge pressures resulting from the operation of valves in fire extinguishing and fire protection systems which are operated no more than once a month for test purposes and otherwise only in the event of a fire are excluded from this requirement.

3.5 Water flow rates

Design flow rates from outlets are given in prEN 806-3.

3.6 Operating Temperature

30 s after fully opening a draw-off fitting, the water temperature should not exceed 25 °C for cold water draw off points and should not be less than 60 °C for central hot water systems unless otherwise specified by local or national regulations.

Hot water systems should have the facility to enable the temperature at the extremities of the system to be raised to 70 °C for disinfection purposes (see 9.1).

4 Private water supplies

Where a private water supply is to be used in addition to water supplied by a statutory water supplier, the supplier's approval to the proposals shall be obtained before work commences. There shall be no cross connection of systems carrying water from different water suppliers or of different sources from one supplier. See EN 1717.

5 Acceptable materials

5.1 Choice of material

The following factors shall be taken into account in selecting materials used in a water system:

- a) effect on water quality;
- b) vibrations, stresses or settlement;
- c) internal water pressure;
- d) internal and external temperatures;
- e) internal and external corrosion;
- f) compatibility of different materials;
- g) ageing, fatigue, durability and other mechanical factors;
- h) permeation.

Lead pipes and -fittings shall not be used.

A non-exhaustive list of acceptable materials is given in Annex A.

NOTE In the framework of the EU-Mandate M136 under the Construction Products Directive (CPD) and the Drinking Water Directive (DWD) a system of European Standards (EN) and other regulation is in preparation to establish a European Acceptance Scheme (EAS) for testing and certification of products in contact with water intended for human consumption.

5.2 Pipe joints

All joints used for potable water shall conform to the relevant standards.

Pipe joints shall be permanently water-tight under the alternating stresses occurring in operation.

Basically two different designs will be distinguished: pipe joints which can take up axial forces and such which need a fixation to prevent disconnection. For the latter, suitable fixing points shall be provided to absorb hydraulic forces acting on the joints.

5.3 Materials used in pipe joint assemblies

Only solders free from lead, antimony and cadmium shall be specified, unless permitted by national or local regulations.

Other materials and systems can be used if they comply with the general requirements given in 3.4.1.

Table 3 — Material for pipes and fittings, metals

Available jointing methods for metallic piping systems	Material for pipes			
	Ductile iron	Stainless steel	Hot dip galvanized steel (HDGS)	Copper
	Material for fittings			
	Ductile iron	Stainless steel and brass	Hot dip galvanized malleable cast iron	Copper and copper alloys
Capillary solder fitting	-	-	-	X
Brazing	-	X ^d	X ^d	X ^c
Welding	-	X ^d	-	X ^c
Threaded joint ^a	-	X ^b	X	X ^c
Compression fittings	-	X	X	X
Crimped fittings	-	X	-	X
Sockets with elastomeric sealing ring and spigot ends	X	-	-	-
Push fit fittings	X	X	X	X
Flanges	X	X	X	X
Demountable unions	X	X	X	X
Further commentaries				
	Pipes and fittings according to EN 545. Protective coatings and linings may be required. Sockets with spigot ends according to EN 545.	Pipes and fittings. Small copper connections to large stainless steel tanks should be avoided. Fluxes containing chlorides, borides and other substances that can cause pitting of stainless steel shall not be used - phosphoric acid based fluxes shall be used.	Pipes in HDGS according to EN 10255 only medium or heavy series with hot dip galvanized coating according to EN 10240 only coating quality A.1. Hot dip galvanized malleable cast iron fittings are normally used for jointing. Site formed bends shall not be used to avoid damage to galvanizing, hot dip galvanized bends according to EN 10242 shall be used instead	Pipes, fittings, pre-fabricated assemblies. Solders shall be tin copper alloy (No 23.24) or tin silver (No 28.29) in accordance with EN 29453. Pipes see EN 1057. Copper and copper alloy capillary fittings for soldering and brazing, see EN 1254-1 and EN 1254-5. Copper alloy compression fittings, see EN 1254-2. For push fit fittings see prEN 1254-7. For threaded ends see EN 1254-4.
^a Thread according to EN 10226-1				
^b Thread on transition fittings				
^c See national regulations and standards				
^d Corrosion risks have to be considered, see also national regulations and standards				
X permissible				
- not permissible				

Table 4 — Material for pipes and fittings, plastics (PE-X, PE, PVC-U)

Available jointing methods for plastics piping systems	Material for pipes										
	PE-X		PE								PVC-U
	Material for fittings										
	Plastic fittings	Metallic fittings ^c	Ductile iron	Malleable cast iron	Copper alloys	POM	PP	PE	Ductile iron	PVC-U	
Welding (electro fusion, butt fusion, ...)	-	-	-	-	-	-	-	X	-	-	
Solvent cemented joints	-	-	-	-	-	-	-	-	-	X	
Threaded joint ^a	X ^b	X ^b	X ^b	X ^b	X ^b	X ^b	X ^b	X ^b	-	X ^b	
Compression fittings	X	X	X	X	X	X	X	-	X	X	
Crimped fittings	X	X	-	-	-	-	-	-	-	-	
Sockets with elastomeric sealing ring and spigot ends	-	-	X	X	-	-	-	-	X	X	
Push fit fittings	X	X	-	-	-	-	-	-	-	-	
Flanges	X	X	X	X	X	-	X	X	X	X	
Demountable unions	X	X	-	X	X	-	-	X	X	X	
Further statements											
	Pipes, fittings and pipe joints according to EN ISO 15875-1, ISO 15875-2 and EN ISO 15875-3 in conjunction with EN ISO 15875-5 and EN ISO/TS 15875-7.	Only joints with fitness for purpose of the PE-piping system according to EN 12201-5; fittings with compression or socket ends in accordance with EN 12842.	Only joints with fitness for purpose of the PE-piping system according to EN 12201-5; compression fittings in accordance with EN 10284.	Only joints with fitness for purpose of the PE-piping system according to EN 12201-5; compression fittings in accordance with EN 1254-3.	Only joints with fitness for purpose of the PE-piping system according to EN 12201-5.	Pipes, fittings and pipe joints according to EN 12842, EN 14525	Pipes, fittings and pipe joints according to EN 1452-1, EN 1452-2, EN 1452-3 in conjunction with EN 1452-5 and ENV 1452-7.				
a	Thread according to EN 10226-1										
b	Thread on transition fittings										
c	Compatibility between pipe material and metallic material shall be demonstrated by the supplier.										
X	permissible										
-	not permissible										

a Thread according to EN 10226-1

b Thread on transition fittings

c. Compatibility between pipe material and metallic material shall be demonstrated by the supplier.

X permissibile

- not permissible

Table 5 – Material for pipes and fittings, plastics (PVC-C, PP, PB)

[illegible]

6 Components

6.1 Stop valves

It is recommended that only stop valves that do not unduly obstruct the flow should be installed in pipes (e. g. spherical valves, gate valves).

6.2 Expansion joints

Metal bellows expansion joints shall be designed to withstand the maximum service condition and for not less than 10 000 full axial strokes (expansion/contraction). Proof of compliance with this requirement shall be provided by the manufacturer. The applicable test method should be agreed between the manufacturer and the customer.

The use of elastomeric expansion joints in a potable water system is only permitted if they have been suitably approved implying their adequacy of design and material. Elastomeric expansion joints shall have a minimum lifetime of 10 years when fitted according to manufacturers instructions.

6.3 Hoses

Flexible hoses may be used to compensate for displacement and angular deflections which occur under given service conditions for which they are designed.

All hoses used instead of pipes and which are permanently under pressure shall comply with 3.4.1.

A servicing valve shall be installed immediately upstream of every hose connection to an appliance.

Hoses should not be longer than 2,0 m.

7 Pipework inside buildings

7.1 Isolation

Supply and distributing pipes shall be capable of being isolated and drained.

In every building or part of a building to which a separately chargeable supply of water is provided and in all premises occupied as a dwelling, whether or not separately charged for a supply of water, a stop valve shall be provided that controls the whole of the supply to the premises concerned without shutting off the supply to any other premises. This stop valve shall, so far as is practicable, be installed within the building or premises concerned in an accessible position above floor level and close to the point of entry of the pipe supplying water to that premises, whether this be a supply pipe or a distributing pipe.

The supply pipes for each storey and those in the individual flats shall be capable of being shut off separately.

A servicing valve shall be provided on the inlet connection to appliances e.g. WC-cistern, storage cisterns, water heaters, washing machines.

In addition, where a common supply or distributing pipe provides water to two or more premises, it shall be fitted with a stop valve that controls the water supply to all of the premises supplied by that pipe. This stop valve shall be installed either inside or outside the building in a position to which every occupier of the premises supplied has access.

7.2 Positioning

A stop valve shall be installed in every pipe supplying water to any structure erected within the cartilage of a building but having no access from the main building. This stop valve shall be located in the main building as near as practicable to the exit point of the supply pipe to the other structure or if this is not practicable in the other structure itself as near as possible to the point of entry of the supply.

Hot water taps shall be on the left, cold water taps on the right.

In a dwelling divided into a number of flats, where the risers are centrally located, the stop valves shall be installed in a room near the riser or space to which access is possible.

Where a supply provides water to more than one building a riser shall be installed in each building.

In the case where less frequent use is made of the draw off capacity, such as in the case of single family houses or similar dwellings, there need only be a stop valve and, where required, a drain facility on the incoming supply.

Where pipes for hot and cold potable water are arranged one above another, the hot water pipe shall be located above the cold water pipe.

Except where a pipe is installed in a sleeve, duct or chase, no pipework shall be embedded in any wall or solid floor or installed in or below a ground floor unless it can be readily removed and replaced, unless allowed by national or local regulations or standards.

Pipes shall not be installed in the following types of shafts still used for their original purpose, e.g.

- in smoke shafts;
- in ventilation shafts;
- in elevator shafts;
- in domestic garbage shafts;

Pipes shall not be laid through drains or sewers.

Fire protection has to be maintained.

7.3 Surface mounting

Where practicable all supply and distributing pipes should be surface mounted. Pipework may be boxed in.

7.4 Backflow protection

The design and manner installation of components e.g. sanitary taps with hoses and cold water appliances shall comply with the backflow protection requirements of EN 1717 (e.g. vending machines).

8 Cold potable water services

8.1 Potable water taps

No potable water point shall be installed at the end of a long pipe from which only small volumes of water are drawn or water is drawn infrequently.

Pipe runs to cold water taps within buildings shall not follow the routes of space heating or hot water pipes or pass through heated areas such as airing cupboards or, where local proximity is unavoidable, the hot and cold pipes shall be insulated from each other.

A potable water tap shall be provided at the kitchen sink in every dwelling (see EU-Directive 98/83).

8.2 Differentiation and identification of pipes and components

Taps shall be identified. If colour code is used for this purpose, red shall identify hot and blue shall identify cold water.

In the case of two or more water systems (potable and non-potable water) and in accordance with national or local regulations pipework, cisterns, valves etc of the potable and the non-potable water system shall be adequately and permanently marked e.g. with the appropriate colour banding to facilitate identification and to avoid operating errors.

Draw-off points for non-potable water shall be identified with the words "Non-potable water" or by a prohibition sign as shown in figure 1. If the majority of draw-off points on industrial premises are for non-potable water, the draw-off points for potable water may be identified by the words "Potable water" or by the "Potable water" symbol specified in Figure 1, provided that notices are posted to draw attention to this deviation from normal practice.



Figure 1 — Symbol "Potable water" and prohibition sign "Non-potable water"

8.3 Supply and distributing pipes

No pipe shall be secured to another pipe e.g. gas pipe, or used as a support for other pipes.

A servicing valve shall be fitted upstream of, and as close as practicable to, every float-operated valve.

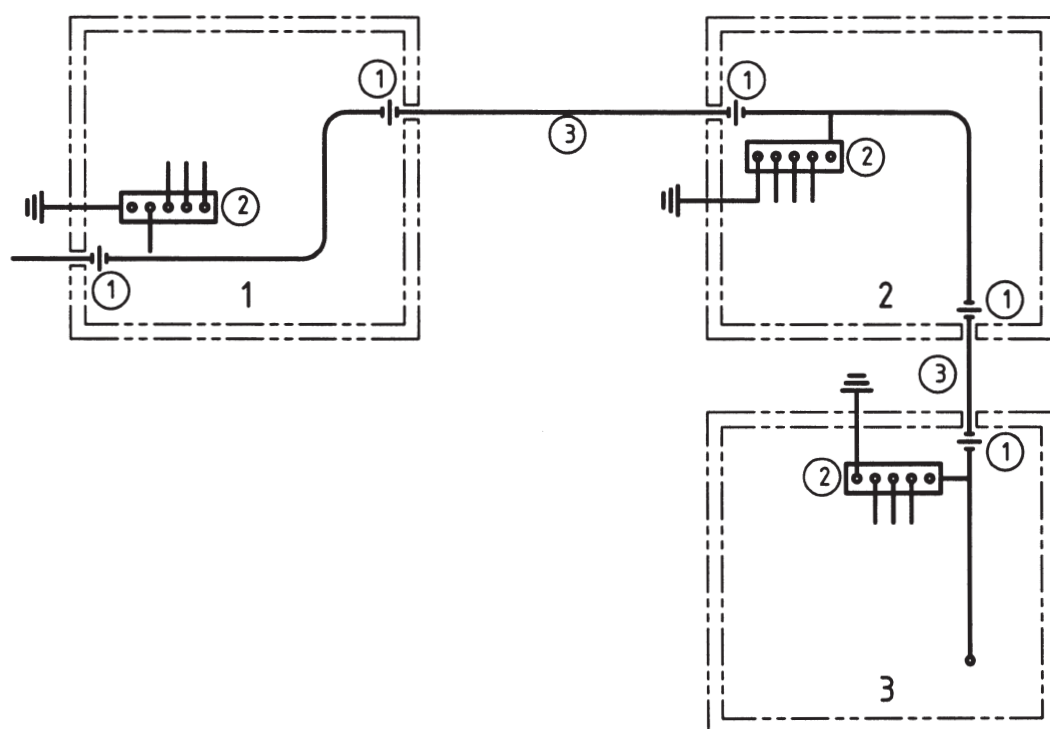
Draining taps should be fixed over a drain or have provision for discharging the water to the nearest convenient point for disposal.

Water outlets shall only be placed in positions where there is a drainage system of sufficient capacity, or where the water in other ways can be drained off or collected in an appropriate way.

8.4 Electrical isolators

Where national or local regulations require electrical isolators for buried metal service pipes, an isolator shall be installed near the supply stop valve in the building, care being taken to ensure that this isolator cannot be bridged accidentally.

Buried metal service pipes that service a number of buildings shall be fitted with isolators both before leaving one building and after entering another. The pipework within each building shall be connected to potential equalizing bars. Special measures (e.g. protective insulation) shall be taken if electrical actuators are installed in such pipes (see Figure 2 for example).



Key

- (1) Water isolator
- (2) Potential equalizing bar IEC 60064-5-54
- (3) Buried metal supply pipe
- 1 Building 1
- 2 Building 2
- 3 Building 3

Figure 2 — Example of the arrangement of electrical isolators in metal pipes

8.5 Additional requirements for vented cold water systems (Installation Type B)

See 19.1.

9 Hot water systems

9.1 General

Hot potable water installations consist of a water heater, the equipment necessary for the safe operation of the system, heating equipment and the associated pipework with valves and fittings.

The hot water system shall comply with EN 1487, EN 1488, EN 1489, EN 1490 and EN 1491.

In respect to the prevention of growth of legionella bacteria national or local regulations shall apply.

The hot potable water installation shall not be used for space heating purposes except for towel rails, where national regulations permit this practice.

9.2 Components

9.2.1 General

To ensure adequate strength to all parts of the system, components shall be rated to allowable maximum operating pressure class (PMA) (see Table 1). The difference in temperature between flow and return connections on the water heater shall be equal or less than 5 K.

9.2.2 Cold feed pipe

Shall discharge near the bottom of the heater or storage vessel or vessels.

A service valve shall be provided in a convenient and accessible position in every cold feed pipe. In cistern fed installations this valve shall be fitted close to the feed cistern.

9.3 Taps and mixing valves

9.3.1 General

When using mechanical (non-thermostatic) mixing valves scalding can occur if water from a different source fails or the cold water pressure is reduced therefore mixing valves and single outlet combination taps should be supplied with hot and cold water from the same source, e.g. storage cistern or mains. Non-thermostatically controlled mixing valves shall not be used to control the water to more than one outlet simultaneously.

9.3.2 Scalding prevention

Hot drinking water installations shall be installed so that the risk of scalding is minimized.

At outlets where particular attention is required for the control of temperature such as hospitals, schools, elderly people's homes etc., the installation of thermostatic mixing valves with maximum temperature limiting devices should be considered to minimize the risk of scalding. Recommended maximum temperature is 43 °C.

At shower installations etc. in kindergartens and certain sections of nursing homes care should be taken to ensure that the temperature cannot exceed 38 °C.

9.4 Surface temperatures

When there are no national or local regulations pipes and storage vessels shall be insulated to promote maximum economy of fuel and water, and where accidental contact is possible, the temperature of exposed surfaces of storage vessels, pipes and ancillary fittings should not exceed the value for the specific application (e.g. kindergarten, old peoples homes etc.)

9.5 Connections between cold and hot water pipes

Check valves shall be fitted to hot and cold feed pipe connections where a common shut off device is incorporated in the outlet nozzle. Protection against cross flow shall be in accordance to EN 1717.

9.6 Additional requirements for vented hot water systems (Installation Type B)

See 19.2.

10 Prevention of bursting

10.1 General

The possibility exists that the heated drinking water entering the installation will exceed the temperature of 95 °C. In this case, precautions must be envisaged to take this possibility and its consequences (pressure, temperature) into account (e.g. metallic pipes, temperature relief valve, temperature mixing valve, thermostatic valve).

Successful and continuing safe operation of a system is in practice dependent on having the right equipment correctly installed in a well designed system that is properly maintained.

If it is a national or local mandatory requirement that unvented appliances shall have all necessary safety devices fitted to them at the factory, it is recommended that all other functional controls, such as expansion vessels, expansion (pressure relief) valves, check valves, pressure reducing valves and isolation valves are provided by the heater manufacturer to prevent omissions occurring during installation on site.

Safety units, safety valves, temperature and pressure relief valves, expansion valves, temperature-operated manually reset energy cut-outs and thermostats and other control devices should be accessible.

Pressure control devices such as pressure relief valves, pressure reducing valves or boosters shall be selected to protect the hot and cold systems from bursting.

The reliability and durability of the equipment on which the safety of the installation depends should be considered, bearing in mind the conditions under which it will operate. Systems dependent on good maintenance for their continued safety should not be installed without reasonable expectation that this will exist. A notice drawing attention to maintenance requirements should be provided in a prominent position for the operator. It is essential that components independently assessed to relevant European Standards (or appropriate national standards or local regulations) should be used for all equipment on which safety depends and should be suitably marked to prevent faulty adjustment or incorrect replacement.

10.2 Energy control

10.2.1 Control device for heat sources capable of raising the temperature above 95 °C

Except where otherwise stated in 10.2, wherever stored water is heated the following energy controls and safety devices are required:

- a) the energy supply to each heater shall be under thermostatic control;
- b) the energy supply to each heater shall be fitted with a temperature-operated manually reset energy cut-out independent of the thermostatic control; and,
- c) a means of dissipating the power input under temperature fault conditions shall be provided in the form of a temperature relief valve or a safety group, where this is required.

The control and safety devices in a) and b) above shall be factory fitted by the manufacturer. Thermostats, temperature cut-outs and temperature relief valves shall be set so that they operate in that sequence as temperature rises.

10.2.2 Control device for heat sources incapable of raising the temperature above 95 °C

The requirements of 10.2.1 shall be deemed to be non-essential where water is heated:

- a) from a source of heat that is incapable of raising the temperature above 95 °C;
- or
- b) by:
 - an instantaneous electric water heater complying with EN 60335-2-35;
 - an instantaneous gas water heater complying with EN 26;
 - an electrical storage water heater complying with EN 60335-2-21;
 - a gas fired storage water heater for sanitary appliances complying with EN 89;
- or

— a combi-boiler complying with EN 625.

10.2.3 Temperature and hydraulic control units

Thermostats and temperature-operated manually reset energy cut-outs shall comply with EN 60730-1. Where an electro-mechanical (motorized) valve forms part of a temperature-operated manually reset energy cut-out, it shall comply with EN 60730-2-8. Temperature and pressure relief valves shall comply with EN 1490.

Hydraulic control units shall comply with EN 1487, EN 1488, EN 1489, and EN 1491.

10.2.4 Temperature and pressure relief valves, safety units

Temperature and pressure relief valves and safety units shall:

- a) be located directly on the storage vessel, sensing the stored water temperature to ensure the water does not exceed 95 °C, except where national or local regulations apply;
- b) only discharge water below their opening temperature when subjected to a pressure at least 50 kPa greater than the working pressure in the vessel to which they are fitted.

No valves shall be fitted between the temperature and pressure relief valve and the vessel.

In the case of hot water storage heaters provided only with a means of direct heating, the temperature and pressure relief valve shall have a rated discharge capacity at least equal to the maximum power input to the water.

In the case of hot water storage heaters provided with a primary heater (i. e. indirectly heated), the combined temperature and pressure relief valve, when tested in accordance with a water discharge test shall discharge water at a rate not less than 500 l/h.

10.2.5 Discharge pipes

The discharge pipe shall be at least the same size as the outlet of the temperature and pressure relief valve.

The discharge shall be through an air-break over a tundish (see EN 1717) located in the same room or internal space and vertically within 500 mm of the temperature and pressure relief valve. The discharge pipe from the tundish shall be laid to a gradient for draining and shall be of a suitable material. The size of the tundish discharge pipe shall be at least one size larger than the nominal outlet size of the valve, unless its total equivalent hydraulic resistance exceeds that of a straight pipe 9 m long, i.e., discharge pipes between 9 m and 18 m equivalent resistance length shall be at least two sizes larger than the nominal outlet size of the valve, between 18 m and 27 m at least 3 sizes larger, and so on.

The discharge from a temperature and pressure relief valve or an expansion valve shall be located so that it cannot create a hazard to persons in and around the building or cause damage to electrical components and wiring, and provides a visible warning of fault conditions. (See 10.4).

10.2.6 Non-mechanical safety devices

A hot water storage vessel fitted with a non-mechanical water releasing safety device (e.g. a fusible plug) shall also be fitted with a temperature relief valve designed to open at a temperature not less than 5 K below that at which the non-mechanical safety device operates or is designed to operate.

10.3 Pressure control

10.3.1 General

The pressure in the system shall not exceed the operating pressures of the component parts.

Where necessary, the supply pressure shall be controlled by pressure reducing valves.

10.3.2 Expansion valve

An expansion valve shall be located on the cold feed upstream of the heater and no isolating valves shall be fitted between the expansion valve and the heater.

10.4 Expansion water

Provision shall be made to accommodate expansion water by the following method:

- a) Expansion water may be allowed to discharge to waste by means of an expansion valve unless local regulations require it to be contained within the system.

Any discharge from expansion valves shall be disposed of safely and be readily visible. (See also 10.2.5.)

- b) Where local regulations require such containment, an expansion vessel shall be fitted in the cold potable water supply pipe between the check valve and the heater. The expansion vessel shall accommodate an expansion equal to a minimum of 4 % of the total volume of water heated.
- c) Where local regulations require such containment, an expansion space (bubble top) shall be created at the top of the water heater vessel. The expansion space shall be equal to a minimum of 4 % of the total volume of water heater.

11 Guidelines for water meter installations

11.1 General

Installations of water meter assemblies inside and outside buildings (in chambers or pits) shall comply with the regulations of EN 805 and of the water supplier.

Water meters used for the sale of cold water shall comply with the Directive 75/33/EEC (b) and for hot water the Directive 79/830/EEC.

11.2 Selection

Sizing in accordance to the EC-Directive 75/33/EEC and prEN 806-3.

11.3 Location - accessibility

The water meters shall be installed - horizontally or vertically - in a position which allows easy access for reading and maintenance.

The meter shall be protected against damage.

Mounting of water meter assemblies shall ensure that stresses induced on removal of the water meter or any other component can be minimised or accommodated by the remaining pipework.

11.4 Risk of freezing

- Water meters installed in areas subject to frost shall be adequately insulated to avoid damage by freezing.
- Insulation shall be arranged so as not to seriously impede meter reading or meter replacement.

12 Water conditioning

12.1 General

12.1.1 Water conditioning shall be restricted to the requirements of the particular application and is only permitted within the limits of the EU-Directive 98/83/EC, national or local regulations.

12.1.2 The processes considered in this standard are intended, where necessary or required by the user, to modify the water quality regarding:

- suspended matter content, corrosion likelihood, scaling tendency;
- marginal organic and inorganic constituents.

Aspects for water conditioning see clauses B.1 to B.3.

12.2 Basic requirements

12.2.1 The type of protection device to be applied depends on the risks that may appear with the different methods of conditioning (see EN 1717).

12.2.2 The selection, design and the operating conditions of water conditioning equipment inside buildings shall be adjusted to the water quality and pipeworks materials downstream. The materials used in the construction of water conditioning equipment shall be adequately resistant to all likely physical, chemical, microbiological and corrosive effects brought about by the water and the conditioning process itself.

12.2.3 The size and capacity of the equipment shall be selected as a function of the flow rate and shall be capable of peak flows, while not exceeding the maximum acceptable pressure drop allowed by the general configuration of the system and the available pressure at the point of entry.

12.2.4 When the equipment is out of service or disconnected, the continuity of the water supply shall be ensured, as far as necessary.

12.2.5 Sampling points should be available upstream and downstream of the equipment and at any other places relevant to the function of it.

12.2.6 Water conditioning equipment inside buildings shall operate up to the rated flow rate without producing disturbing noise (see EN 60534-8-4) and shall not produce excessive pressure surges.

12.2.7 Parts of the equipment subjected to hydrostatic pressure shall be rated for a test pressure of the potable water installation.

12.2.8 Water Conditioning equipment inside buildings shall only be selected, sized and installed by designers and installers.

12.2.9 Equipment for water conditioning inside buildings shall not result in excessive use or waste of water.

12.2.10 The installation of water conditioning equipment inside buildings is intended to prevent corrosion or scaling, it should not compensate for wrong design of the system or unsuitable materials. Whenever practical the replacement of the wrong material and/or the improvement of the design shall be considered first.

12.2.11 Where the water conditioning apparatus involves a phase of effluent draining off or is equipped with an overflow, a disconnection device including an air gap shall be installed. See EN 1717.

12.2.12 Adequate facilities shall be provided to allow for drainage of the maximum flow rate necessary for the cleaning, rinsing, complete emptying and possible overflow the water

12.2.13 Where water conditioning equipment is located in a separate room, the room shall be clean, kept above freezing and shall be accessible only by authorised personnel, except in domestic premises.

12.3 Water conditioning processes

See clauses B.4 to B.13.

13 Acoustics

13.1 General

Systems except fire fighting installations shall be designed to ensure, that the generation of noise is minimized and that local or national regulations are fulfilled.

13.2 Pipework

13.2.1 Pipework shall be positioned so that any noise generated within them will create the minimum acceptable annoyance. Pipework should be adequately supported so that they are not in direct contact with the structure.

13.2.2 Preferably flexible vibration-isolating clips or brackets shall be used. Pipes shall not be rigidly fixed to lightweight panels.

13.2.3 Noise caused by movement of pipes in hot water systems as a result of temperature changes may be reduced by the use of resilient pipe clips or resilient pads between pipes and pipe clips. Expansion loops or a suitable alternative shall be used for long straight lengths of pipe to facilitate pipe movement.

13.3 Components

Noise and vibration transmitted from pumps and other equipment shall be minimized to an acceptable level. Laboratory test methods on noise emission from appliances and equipment are described in EN ISO 3822-1 to -4. National regulations for maximum noise level and test methods should be taken into account.

14 Protection of systems against temperatures external to pipes, fittings and appliances

14.1 Freezing

14.1.1 Location of pipes, fittings and appliances

The design of potable water installations should be planned to avoid the following:

- a) external situations above ground;
- b) an unheated part of the roof space;
- c) an unheated cellar or under floor space;
- d) any other unheated part of the building, unheated stairwells or lift shafts or any outhouse or garage;
- e) positions near a window, airbrick or other ventilator, external door or any other place where cold draughts are likely to occur;
- f) chase or duct formed in an external wall external to any insulation.

If it is possible to avoid these locations, then the requirements of 14.1.5 to 14.1.7 apply.

14.1.2 Underground pipes

For underground piping see EN 805.

14.1.3 Pipes entering buildings

Any pipe or part of a pipe which lies above the depth of cover to prevent freezing (DCPF) or less than that distance from the external face of an outside wall shall be protected from freezing. Where pipes rise from below the ground, the protection from freezing shall extend to at least a distance equal to the DCPF below the ground.

Whatever its position relative to an external wall, a pipe passing through the air space under a suspended floor, an unheated cellar or a garage shall be continuously insulated not only where it is within the air, but also within the ground to the DCPF.

14.1.4 Pipes and fittings above ground outside buildings

Where the placing of pipes and fittings above ground outside buildings is unavoidable, these pipes and fittings shall be protected by insulation having a weatherproof finish. Where pipes rise from the ground, the insulation shall extend to the DCPF below ground.

Above ground pipework outside heated buildings shall be provided with means of draining, trace heating and insulation appropriate for the lowest temperature anticipated.

14.1.5 Pipes and fittings inside buildings

Where practicable, pipework in unheated roof spaces shall be fixed so as to take advantage of any insulating material laid for restricting loss of heat through the ceilings or inside the cistern insulation.

14.1.6 Insulation

The minimum thickness of thermal insulating materials used for the protection of water pipes and fittings shall be in accordance with local or national requirements. When fixing pipes and fittings that are to be insulated, space shall be allowed for the required thickness of material to be applied.

Where necessary, insulation material shall be resistant to or shall be protected by suitable covering against mechanical damage, rain, moist atmosphere, subsoil water and vermin. Open cell and fibrous insulating materials shall be provided with vapour barrier bonded to the outer surface of the insulation.

14.1.7 Local or trace heating

Local heating, in conjunction with a frost thermostat, should be used where other methods of protection are unsuitable, e.g. for pipes in unheated roof spaces when it is inconvenient to drain them and the building is to be unheated for a period during the winter.

14.1.8 Draining

If pipes are located in areas where frost damage is likely and trace heating or local heating is not practicable, insulation may not always prevent freezing if the system is not in service, therefore facilities shall be provided for draining the pipes and fittings inside the building.

Draining facilities are required for maintenance and repair.

14.2 Heat gain

Cold water pipework shall be adequately protected against heat gain by being installed with sufficient clearance or by insulation.

The requirements for insulation against heat gain are similar to those for insulation against heat loss.

14.3 Condensation

Cold water pipes should be adequately protected to prevent the formation of condensation.

Where cold water pipes pass through areas of relatively high humidity condensation will form unless precautions are taken. Insulation to prevent condensation can be subject to the same requirements as insulation against heat loss and gain.

15 Boosting

15.1 General

Pressure boosting may be installed where the service pressure under normal conditions is unable to provide the required pressure of any draw-off point.

Use of pumping should be minimised by making maximum use of mains pressure, for example, by using mains pressure to supply lower floors of buildings and only pumping floors where mains pressure is insufficient.

15.2 Design principles

15.2.1 Pressure boosting

A pressure booster is only necessary if the lowest normal service pressure (SPLN) is less than the total of:

- pressure loss as a result of difference in elevation;
- the minimum flow pressure at the highest, draw-off point ($p_{\min Fi}$);

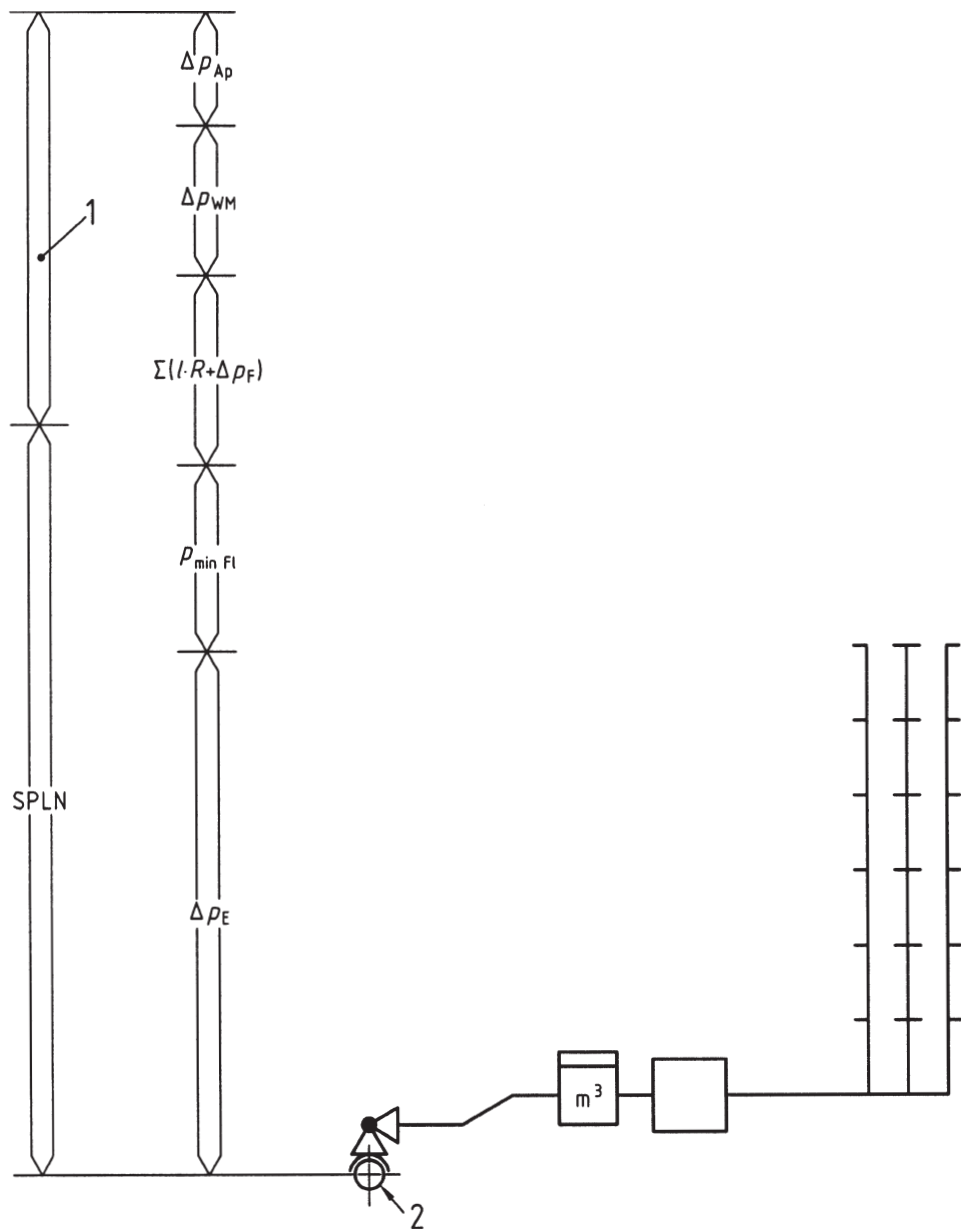
and the total of the pressure losses resulting from:

- wall friction resistance and single points of resistance $\Sigma(l \times R + \Delta p_F)$;
- the resistance of the water meter;
- and the appliances resistances, e.g. filters, dosing apparatus.

Figure 3 shows an example of the pressure conditions in which the installation of a pressure booster is necessary because of the lowest normal service pressure.

15.2.2 Pressure reduction

A pressure reducing valve shall be installed if the service pressure or the operating pressure at the delivery pressure side of a pressure booster may rise above the maximum design pressure (PMA) of appliances, valves and other components.



Key	
1	Different pressures required to be supplied by a pressure booster
2	Water main
Δp_E	Pressure loss due to difference in elevation
SPLN	Lowest normal service pressure
Δp_{Ap}	Pressure loss of apparatus
Δp_{WM}	Pressure loss of water meter
$\Sigma (l \times R + \Delta p_F)$	Sum of wall friction resistance and single points resistance
$p_{min FI}$	Minimum flow pressure

Figure 3 — Schematic representation of the pressure loss components in a drinking water supply system

15.2.3 Pressure reduction and pressure boosting

If the difference between the minimum supply pressure and the maximum supply pressure to a property or building is great (for installation type A greater than 100 kPa), it can be necessary to install both pressure boosters and pressure reducers together.

15.3 Pressure boosters

15.3.1 General

Pressure boosters shall be designed, operated and maintained in such a way that continuity of water supply is provided and there shall be no interference with the public water supply or other supply systems. Any degradation of the potable water quality shall be prevented.

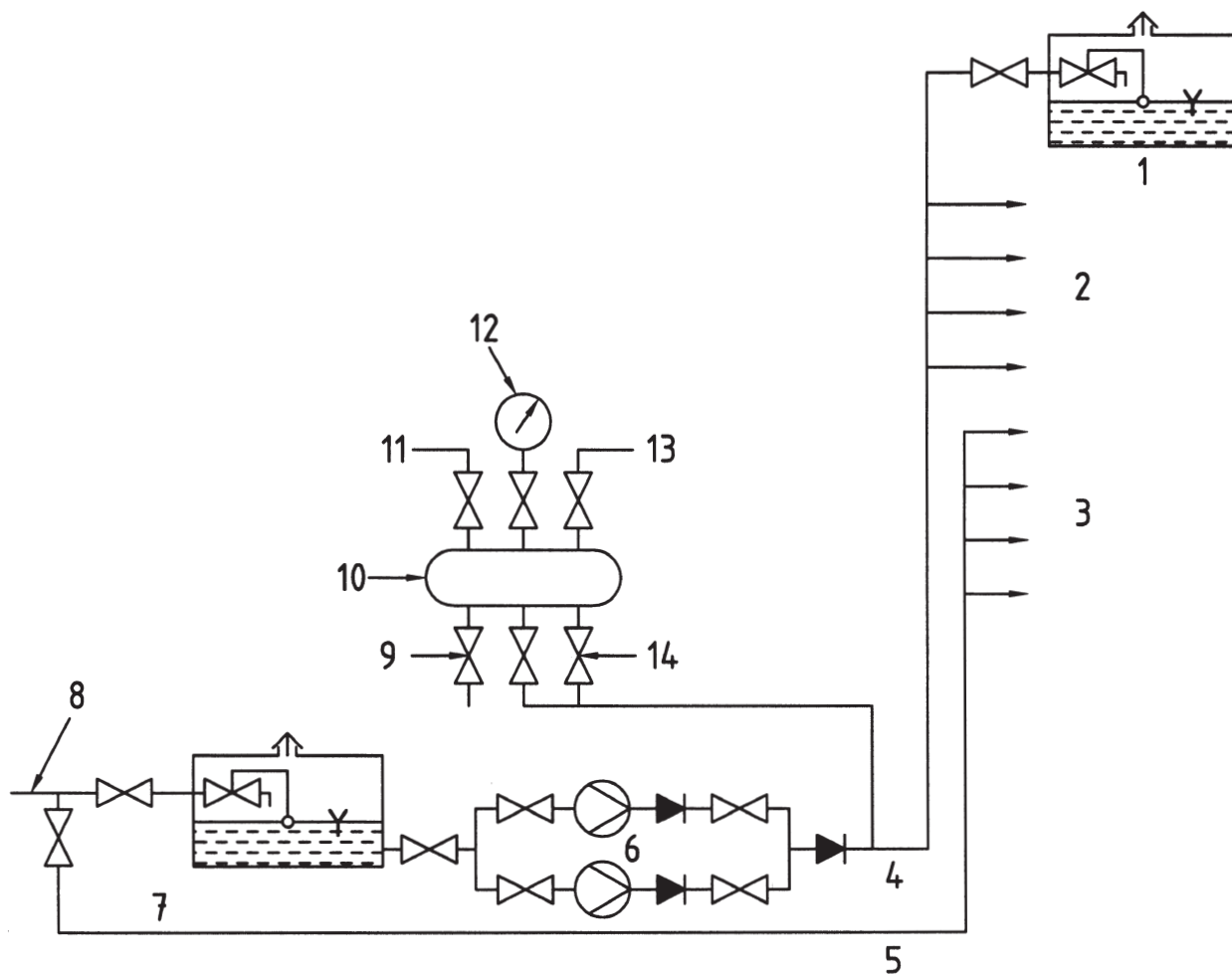
It is necessary to determine whether the pressure booster is necessary for the complete building or whether it is only required for storeys which cannot be constantly supplied with the minimum supply pressure. In the limit case, the requirement for a pressure booster shall be demonstrated by means of a differentiated calculation procedure (see EN 806-3).

15.3.2 Determination of the pressure zones

The following designs are possible where different pressure zones are to be installed:

- Installation of several pressure boosters, so that a separate pressure booster is allocated to each pressure zone.
- A single pressure booster with a central pressure reducing valve for each pressure zone.
- A single pressure booster with pressure reducing valves at the branches for the lower storeys.

Energy conservation should be considered when installing pressure boosting systems.



Key

- 1 Storage cistern (if required)
- 2 Drinking water supplies taken from boosted supply pipe
- 3 Drinking water taken from unboosted supply where mains pressure is sufficient
- 4 Boosted supply
- 5 Unboosted supply
- 6 Duplicate pumps
- 7 Supply cistern, if necessary
- 8 Incoming supply pipe
- 9 Drain tap
- 10 Pressure vessel, if necessary
- 11 To pressure switches
- 12 Pressure gauge
- 13 Air line compressor
- 14 Pressure relief valve

Figure 4 — Example of pressure booster installation

15.3.3 Pressure boosters for both supply and fire-fighting purposes

The greater of the values shall be used as the delivery from the pressure booster.

15.3.4 Determination of the booster pressure

The booster pressure is determined as the difference in the sum of

- pressure loss as a result of difference in elevation;
- minimum flow-pressure at the draw-off point with the most unfavourable location;
- pressure loss from wall-friction resistance and single points of resistance;
- pressure loss in the water meter;
- pressure loss from the appliances, e.g. filters, dosing apparatus;

and the

- lowest normal service pressure.

The calculation assumes that the data for the elements, e.g. the material and the nominal sizes of the pipes, are known.

As a rule, the nominal sizes of the distribution pipes after the pressure booster are determined when the design of the pressure booster installation system has been specified and the available pressure downstream of the pressure booster is known. For this purpose it is necessary to ask the responsible public water supplier for data relating to the material and the nominal size of the service pipe, the pressure loss in the water meter and the lowest normal service pressure.

It is recommended that the delivery pressure of the pressure booster be calculated from the difference between

- the operating pressure required at peak flow-rate downstream of the pressure booster (p_{out});

and

- the operating pressure available upstream of the pressure booster at design flow-rate (p_{in}).

15.3.5 Determination of the method of connection

15.3.5.1 General

Depending on the method of connection, the flow velocity in the service pipe and the distribution pipe leading to the pressure booster shall be limited to certain maximum values. The result of this is that

- supply to neighbouring consumers is not unacceptably affected by excessive pressure drop; and
- unacceptable pressure surges in the service pipe and in the pipes for the central water supply system are avoided.

15.3.5.2 Direct connection (when allowed by national or local regulation)

Direct connection refers to direct connection of the pressure booster with the supply pipe. Since there is no risk of a health hazard contaminating the drinking water in the closed system a direct connection is preferred to an indirect connection.

The system may be operated without a pressure tank on the intake pressure side of the pumps, if

- a) The maximum difference in the flow velocity in the service pipe and in the distribution leading to the pressure booster generated by each pump or valve on the pressure booster being switched on or off is less than

0,15 m/s. In order to avoid unacceptable pressure surges, even in the case of power failure, the difference in the flow velocity in the service pipe and in the distribution pipe leading to the pressure booster in the events of the failure of all service pumps, shall not exceed 0,5 m/s;

or

b) it is ensured that

- the pressure does not fall by more than 50 % below the lowest normal service pressure SPLN and remains 100 kPa or greater as the pumps are switched on;
- the pressure rise Δp_2 when the pumps are switched off is not more than 100 kPa more than the permissible operating pressure at the consumer side of the service pipe when the pressure booster is not operating.

15.3.5.3 Indirect connection

Indirect connection refers to indirect connection of the pressure booster with the service pipe branching from the main supply, via a cistern which is permanently open to the atmosphere and into which the water runs through one or more float-operated valves. The conditions for connection specified in 15.3.5.1 shall also be complied with in this case.

Other than where required by national or local regulations, indirect connection is only necessary if

- a) the minimum flow pressure cannot be achieved at the highest draw-off point of the supply systems as a consequence of the draw-off through the pressure booster;
- b) it is intended to mix potable water from the public water supply with water from a private water supply.

15.3.6 Installation and accommodation of the pressure booster

The pressure booster shall be accommodated in a frost-free and well ventilated room, and preferably in the service area and in a lockable and otherwise unused room. It should not be possible for noxious gases to penetrate the room. An adequately sized drainage connection is necessary. Pressure vessels should be installed such that they can be inspected on all sides, are accessible for internal inspection and the works plate is easily recognizable.

A room not in the immediate neighbourhood of sleeping or living accommodation should be selected to accommodate the pressure booster. Noise-insulated installation of the pressure booster is recommended. If expansion pipes are used to dampen vibration, their durability shall be taken into consideration. It shall be easy to replace them.

16 Pressure reducing valves

16.1 General

Examples where pressure reducers may be necessary:

- If the static pressure at the draw-off points exceeds 500 kPa;
- To limit the operating pressure in the distribution pipes if the maximum possible static pressure at any point in the drinking water supply system can reach or exceed its maximum permissible working pressure or if appliances and equipment can be connected which may only be operated at a lower pressure;
- If the static pressure upstream of a pressure-relief valve exceeds 75 % of its response pressure. The pressure reducing valve shall be installed to achieve the same pressure in cold and hot water systems;
- If multiple-storey buildings are supplied through a single pressure booster and a number of pressure zones are required. In such cases, the pressure reducing valves are installed either in the zone risers or in the main storey branch pipes.

The installation of pressure reducing valves in fire-fighting pipes should be avoided. If this is unavoidable, the local specifications for fire protection shall be taken into consideration.

Pressure reducing valves shall not be sized according to the nominal size of the pipe lines but the required flow rate.

16.2 Installation

Pressure reducing valves are generally installed in the cold water pipe downstream of the water meter assembly.

Manufacturer's special instructions shall be taken into consideration. Stop valves and a pressure tapping shall be provided upstream and downstream of the pressure reducing valve for regulation and servicing purposes. A run of pipe with a length of at least 5 times the internal diameter should be installed as a run-out section on the delivery side of a pressure reducing valve in order to prevent back pressure effects.

If parts of the system located on the delivery side can be overloaded by an unacceptable high pressure in the event of incomplete closure of the pressure reducing valve, a pressure-relief valve shall be installed. In these cases the delivery pressure of the pressure reducing valve shall be set to at least 20 % below the response pressure of the pressure-relief valve.

If a bypass pipe is necessary for operating reasons this shall also be fitted with a pressure reducing valve. The pressure reducing valves shall be selected in accordance with the actual operating conditions and set so that water flows through both valves.

17 Combined drinking water and fire fighting services

17.1 General

Where subject to local or national regulations combined systems of potable water and fire fighting services are acceptable, the system design shall be as follows:

17.2 Design

17.2.1 General requirements

17.2.1.1 Responsibilities of designers, installers and operators

The consent of the public water supplier shall be obtained before installing fire fighting equipment for connection to potable water supply systems. For this purpose, the water supplier shall be provided with the documentation (drawings, calculations) permitting an assessment of the system. Any local bye-laws or building regulations relating to fire protection shall be observed.

Fire fighting installations inside buildings are designed to provide protection of property and/or life. The quantity of water required according to the hazard classification and design criteria shall be agreed with the water supplier, whether this quantity is available or not.

17.2.1.2 Health and safety

Fire fighting installations are rarely used during their service life. Where they are permanently charged with water, this can stagnate and present a health hazard. If such installations are connected to potable water supply systems, this can lead to contamination of the drinking water quality. The design, installation and operation of such systems shall prevent stagnation and contamination of the drinking water installation (see EN 1717).

17.2.1.3 Service pipes

Where fire fighting pipes and supply pipes are fed from a common service pipe, it should be of a size sufficient to supply water to all services. The design should be such that there will be adequate renewal of water in the service pipe when water is drawn from the supply pipes.

17.2.1.4 Direct connection to the main

A protection device shall be installed in or immediately downstream of the water meter assembly (in accordance with EN 1717), even if water used for fire fighting is not metered.

17.2.1.5 Connection to potable water installation

Fire fighting installations connected directly to potable water installations are fed with potable water; therefore, backflow devices shall be installed (see EN 1717). Since non-potable water (e.g. water from tankers, streams, fire fighting water reservoirs and wells) shall not enter such systems, inlet connections for supply from external sources are not permitted.

18 Prevention of corrosion damage

18.1 General

This clause provides guidance in order to prevent or to minimize the risk of corrosion damage in potable water installations by giving information with regard to:

- the corrosion characteristics of the metallic material to be used;
- the water characteristics;
- the design, installation and operating conditions of the potable water installation.

Corrosion effects occur in potable water installations as a result of the interaction between the metallic material and the water, influenced by the above mentioned parameters. Corrosion often causes the formation of protective layers and does not necessarily lead to corrosion damage.

18.2 Selection of materials

The designer shall consider any practical experience gained with regard to the particular water supplied. If no experience is available, the designer shall contact the water supplier in order to obtain water analysis data permitting assessment. The necessary water analysis data and the methods of assessment are described in prEN 12502. The water supplier should be additionally consulted with regard to his experiences with the use of certain materials and whether changes in the supply conditions or water composition are to be expected.

18.3 Design

The designer shall choose components and appliances which comply with the relevant product standards. Where no such standards or codes of practice exist only those products for which proof of suitability including adequate corrosion protection has been provided shall be used.

The system shall be designed so as to assure regular renewal of the water under normal service conditions in order to avoid stagnation.

18.4 Water conditioning

If an apparent risk of corrosion damage remains the designer shall check whether this risk can be reduced by water conditioning in accordance with prEN 12502 (see also clause 12).

18.5 Storage and assembly

All components shall be stored by the installer to prevent contamination of their inside surface. Where necessary all piping components and fittings shall be cleaned and any loose particles removed (e.g. sand, soil metal filings). Care shall be taken to prevent the ingress of contaminants during assembly.

18.6 Jointing

The method of jointing chosen by the designer shall be in accordance with the recommendation of the pipe manufacturer.

18.7 Corrosion protection of outside surfaces

Measures shall be taken on site to prevent the outside surfaces of pipework from coming into contact with moisture over prolonged periods. Pipework installed in damp locations shall be protected against moisture. Such protective materials shall not be aggressive to metallic pipework.

Thermal insulation of copper pipes shall be free from nitrites and its content of ammonia shall not exceed 0,2 % by mass. The content of water soluble chloride ions in insulating material used for stainless steel shall not exceed 0,05 % by mass.

Where hot dip galvanized steel pipes are laid on concrete floors, sheeting with plastic, approximately 1 m wide, shall be placed between pipe and floor in addition to providing the pipe with a suitable protective coating.

Hot dip galvanized steel pipes are not allowed to be fixed using gypsum plaster. Nor shall they be installed in contact with mortar with containing chloride additives.

Where metallic pipes are laid in floor channels, measures shall be taken on site to ensure that such channels are protected against the ingress of water and flooding or can be vented and safely drained.

In general, where pipes are installed on or in walls corrosion protection may not necessary if there is a space between the pipe and the wall.

19 Additional requirements for vented cold and hot water systems

19.1 Cold water services

19.1.1 Potable water taps

For buildings other than dwellings, the method of supply shall be related to the size and usage of the building and the number of appliances to be served.

In offices and other commercial buildings potable water points should be located in areas intended for the preparation of food and for its consumption in addition to rooms provided for beverage making. Where beverage making facilities are not provided, potable water points should be sited in the vicinity of, but not inside, toilets. Where a potable water fountain is installed within a toilet area it should be sited as far away as possible from WCs and urinals and should be of the shrouded nozzle type discharging above the top edge of the bowl.

19.1.2 Method of supply

Potable water shall be taken directly from the water supplier's main wherever practicable or, when circumstances dictate otherwise, from a cistern protected in accordance with 19.1.3.

Depending on pressure available, considerations of storage, the type of appliances being supplied and whether high or low resistance draw-off taps are used, water supplies within buildings may be derived from supply pipes (mains pressure), distributing pipes (cistern fed), boosted supplies, or a combination of these methods.

Where draw-off fittings are above the height to which the water supply is able or obliged to supply, e. g. in multi-storey buildings, the drinking water taps shall be supplied from a storage cistern that is protected in accordance with 19.1.3 or, where permitted, from a potable water heater supplied from a directly boosted supply.

19.1.3 Storage cisterns

Storage cisterns and covers for domestic purposes shall not impart taste, colour, odour or toxicity to the water, nor promote or foster microbial growth.

Any cistern from which water for domestic purposes may be drawn shall be watertight and shall be:

- a) fitted with a rigid, close fitting and securely fixed cover which is not airtight but excludes light and insects from the cistern, fit closely around any vent pipe, made of materials, which will not shatter or fragment when broken and will not contaminate any water which condenses on its underside;
- b) where necessary, lined or coated with a material suitable for use in contact with potable water;
- c) insulated against heat and frost;
- d) supplied with water from a supply pipe from the water supplier's mains or from a pump drawing water from a cistern which is also a watertight closed vessel similarly equipped and supplied as above;
- e) when of capacity greater than 1 000 l, so constructed that the interior can be readily inspected and cleaned and the inlet control valve adjusted and maintained without having to remove the cover or the whole of any cover which is in two or more parts; and,
- f) provided with warning and overflow pipes, as appropriate, which are constructed and arranged to exclude insects.

19.1.4 Capacity of storage cisterns

Table 6 gives recommendations for storage capacities related to various types of use but these are to be regarded as a guide only.

In determining the total capacity of cold water storage in the premises concerned, account shall be taken of:

- a) the need to prevent stagnation by ensuring that water is held in storage for as short time as possible; and
- b) the requirements of any associated water fittings and appliances, particularly where supply interruptions can cause damage to property or inconvenience to the user.

Table 6 — Recommended minimum storage of cold water for domestic purposes (hot and cold outlets)

Type of building or occupation	Minimum storage l
Hostel	90 per bed space
Hotel	200 per bed space
Office premises: with canteen facilities	45 per employee
without canteen facilities	40 per employee
Restaurant	7 per meal
Day school: Nursery or primary	15 per pupil
Secondary or technical	20 per pupil
Boarding school	90 per pupil
Children's home or residential nursery	135 per bed space
Nurse's home	120 per bed space
Nursing or convalescent home	135 per bed space

The probable pattern of water use (draw-off rates and their durations) should be determined and account taken of any local conditions of low or reduced mains pressures likely to affect cistern refilling at times of peak demand.

Separation of capacity among two or more cisterns should facilitate water distribution, but inlets and outlets should be located to prevent short-circuiting within the cisterns.

The water supplier should be consulted before finalising cistern capacity to hotels, hostels, office premises (with or without canteen facilities), schools (day and boarding) and other substantial establishments.

For most dwellings where a constant supply at adequate pressure is a statutory requirement, a maximum capacity of 80 l per person normally resident should prove satisfactory. A larger capacity based on 130 l per person would be appropriate where cistern refilling normally takes place only during the night hours.

19.1.5 Materials

The material of a cistern shall be corrosion resistant or shall be coated internally with an approved non toxic corrosion resistant material. The cistern and its cover shall be designed to have sufficient strength to perform its function without undue deformation.

19.1.6 Support

The cistern shall be supported on a firm level base capable of withstanding the weight of the cistern when filled with water to the rim. Every plastic cistern shall be supported on a flat rigid platform fully supporting the bottom of the cistern over the whole of its area.

19.1.7 Positioning

Adequate access shall be provided under and around the cistern for maintenance and the outlet of any overflow pipe shall be above outside ground of flood level.

Every cistern providing potable water shall be protected from ingress of contaminants.

Cisterns sunk in the ground shall have special measures to detect leakage.

19.1.8 Water inlet control devices

Except for interconnected cisterns arranged to store water at the same water level, every pipe supplying water to a cistern shall be fitted with a float-operated valve or some other equally effective device.

Float operated valves and other fittings for controlling flow to cisterns, including flushing cisterns, should be:

- a) capable of controlling the flow of water into any cistern or apparatus and, when closed, be watertight and remain watertight; and,
- b) incorporate, as applicable, a renewable seat and washer which are resistant to both corrosion and erosion by water, or have some other no less effective valve closure assembly; and,
- c) as applicable, have a float which is constructed of a material capable of withstanding without leaking any water temperature in which it operates or is likely to operate, and has a lifting effort such that when not more than half immersed, the valve is capable of drop-tight closure against a pressure of 1,5 times the maximum operating pressure; and,
- d) have an operating level which, when the valve is closed will withstand without bending or distorting a force twice that to which it is ordinarily subject and, in the case of a size G1/2 valve, is constructed so that the water shut-off level may altered or adjusted without bending the float lever; and,
- e) where used in cisterns storing water other than for drinking purposes, the installation of the fitting should be such that it is capable of satisfying backflow prevention requirements when the water level in the cistern is level with the centreline of a float-operated valve.

Every float-operated valve shall be securely fixed to the cistern it supplies and where necessary braced to prevent the thrust of the float causing the valve to move and so affect the water level at which it closes. This water level shall be at least 25 mm below the lowest point of the warning pipe connection or, if no warning pipe be fitted, at least 50 mm below the lowest point of the lowest overflow pipe connection.

A servicing valve shall be fitted upstream of, and as close as practicable to, every float-operated valve.

19.1.9 Outlets from cisterns

All cold water distributing pipes serving sanitary appliances from cisterns shall be connected at the lowest point on the cistern.

Connections to distributing pipes feeding hot water apparatus shall be set at a level at least 25 mm above connections to pipes feeding cold water outlets and shall serve no other appliances.

Except pipes connecting feed cisterns to primary circuits every pipe taking water from a cistern shall be fitted with a servicing valve near the cistern.

19.1.10 Large cisterns

Cisterns over 1 000 l capacity shall additionally comply with the following requirements.

To avoid interruption of the water supply when carrying out repairs or maintenance, the cistern shall be provided with compartments or a standby cistern.

A washout pipe shall not be connected to a drain but may be arranged to discharge into open air at least 150 mm above a drain if required.

19.1.11 Warning and overflow pipes

Every cistern of capacity (if filled to the level at which water just starts to flow through any overflow pipe) up to 1 000 l shall be fitted with a warning pipe, and no other overflow pipe. Cisterns of capacity exceeding 1 000 l shall be fitted with one or more overflow pipes. For capacities up to 5 000 l the lowest overflow pipe shall be a warning pipe. For capacities over 5 000 l but not greater than 10 000 l, either the lowest overflow pipe shall be a warning pipe, or a device shall be fitted that indicates when the water in the cistern reaches a level that is at least 50 mm

below the lowest point of the lowest overflow pipe connection. For capacities greater than 10 000 l, either the lowest overflow pipe shall be a warning pipe or a device shall be fitted that gives an audible or visual alarm when the water reaches the level of overflowing and which acts independently of the normal service inlet control valve.

Overflow and warning pipes shall be made of rigid, corrosion resistant material; no flexible hose shall be connected to or form part of any overflow or warning pipe. When a single overflow pipe is fitted its bore shall be greater than that of the inlet pipe to the cistern and in no case shall any warning pipe be less than 19 mm internal diameter.

No warning or overflow pipe shall rise in level outside the cistern.

Every warning pipe shall discharge water immediately the water in the cistern reaches the overflowing level and shall discharge in a conspicuous position, preferably outside the building where this is appropriate.

It is permissible for the separate warning pipes from several storage or WC cisterns to be combined into one outlet, provided that the source of any overflow may be readily identified and that any overflow from one cistern cannot discharge into another. No warning pipe shall be arranged to discharge into a WC pan via flush pipe.

19.2 Hot water services

19.2.1 General principles

The hot water service shall be designed to provide hot water at the point of use, in the quantities and at the temperatures required by the user.

19.2.2 Vented system

Vented domestic hot water service systems are to be fed with cold water from a storage cistern which is situated above the highest outlet to provide the necessary pressure in the system and which can accommodate expansion of the water when it is heated. An open vent pipe rises from the top of the hot water storage vessel to a point above the water storage cistern, into which it is arranged to vent. Explosion protection involving no mechanical devices is provided by the open vent and the cistern.

19.2.3 Direct and indirect heated systems

Direct systems shall be designed to operate by direct heating from a source of heat within a hot water storage vessel, or by gravity circulation of water between a source of heat and the hot water storage vessel.

Indirect systems shall be designed for circulation of heated water, either by gravity or by pumping, between a source of heat and a heat exchanger within the hot water storage vessel.

An indirect system shall be used where:

- a) domestic hot water and hot water central heating are supplied by the same boiler; or
- b) the water supplied is hard and scale deposition is likely to occur; or
- c) both a) and b) above.

19.2.4 Double feed vented primary circuits

In an indirect hot water system with a double feed primary circuit, the primary circuit shall be fed independent of the secondary system.

Vented primary circuits shall have a vent route connecting the flow connection on the boiler to the vent pipe outlet above the expansion cistern and a feed water route from a point near the bottom of the expansion cistern to the return connection on the boiler. Except as specified in this sub-clause, these routes shall be independent. It is permissible for both these routes to be incorporated in parts of the primary flow and return pipework, but the vent route shall not include any valve, pump or any impediment to flow. Where the design of the primary circuit so dictates, it is permissible to include a circulating pump and its associated isolating valves in the feed water route.

A feed expansion cistern for a double feed primary circuit shall accommodate 4 % expansion of the volume of the water in the circuit. Except for a circulating pump and its associated isolating valves and except for a servicing valve, both fitted only in the circumstances specified in this sub-clause, the feed water route shall not include any valve, pump or any impediment to flow.

For domestic installations the vent shall not be less than 19 mm bore. Where the vent pipe is not connected to the highest point in the primary circuit, an air release valve shall be installed at that point.

When an installation is designed for combined central and domestic water heating and the central heating circuit includes a circulating pump while the parallel circuit to the primary heater in the hot water storage vessel operates by gravity circulation, the return pipes of the two circuits should be connected to separate connections on the boiler or shall be combined by means of an injector type fitting installed near the boiler.

19.2.5 Single feed primary circuits

In an indirect hot water system with a single feed primary circuit, the primary circuit is fed from the secondary system by using a hot water cylinder incorporating a special primary heat exchanger. A single feed indirect cylinder shall only be used when both primary and secondary systems are of the vented type.

Where a single feed indirect cylinder is used:

- a) the primary heating element within the cylinder shall incorporate an integral expansion chamber and vent; the whole being installed in accordance with the cylinder and appliance manufacturers' instructions;
- b) where the primary is pumped, the static head of the system shall be in excess of the maximum pump head;
- c) no corrosion inhibitor or additive shall be introduced into the primary circuit; and,
- d) the recommendations of the manufacturers of the boiler and the radiators as to the suitability of their products for use in this system shall be followed.

19.2.6 Cold feed pipe

The cold feed pipe to the hot water storage vessel or water heater shall be sized in accordance with clause 3. It shall discharge near the bottom of the heaters or storage vessels and if the system is cistern fed this pipe shall not supply any other fitting. A separate cold feed pipe from a separate expansion cistern shall be provided to the lowest point of a vented primary circuit in an indirect system unless a single feed hot water cylinder is used.

A gate valve or stop valve with fixed jumper shall be provided in a convenient and accessible position in every cold feed pipe other than those to a vented primary circuit which shall have a valve only when the capacity of the expansion cistern exceeds 18 l.

In direct type boiler systems the cold feed pipe and the return pipe to the boiler shall have their own connections to the hot water storage vessel.

19.2.7 Open vent pipe

The vent pipe to a storage type hot water system shall be taken from the top of the storage vessel or the highest point of the distribution pipework to a point above the cold feed cistern.

When a vented primary circuit is used in an indirect system, unless a single feed hot water storage cylinder is used, the vent pipe shall run from the highest point of the primary circuit to a point above the primary feed and expansion cistern at a height that will prevent a discharge of water from vent pipe and/or air entrainment into the system under normal working conditions, making due allowance for the head induced by any circulating pump used. For gravity circulation systems this height shall not be less than 150 mm plus 40 mm for every metre in the height of the overflow level above the lowest point of the cold feed pipe.

No valves shall be fitted to any vent pipe and the pipe shall rise continuously from its point of connection to the hot water system to its end except where it is permitted to be bent so as to terminate downwards. Vent pipes shall not be less than 19 mm bore.

One pipe shall not serve as both open vent pipe and cold feed pipe, unless the associated system or circuit has the protection specified for an inverted system or sealed primary circuit as appropriate.

Annex A (informative)

List of acceptable materials (non-exhaustive)

A.1 Copper and copper alloys

The following components may be used:

- a) copper pipes;
- b) copper and copper alloy capillary fittings for soldering or brazing;
- c) copper alloy compression and crimped fittings, valves and taps;
- d) copper bends for welding;
- e) welded, brazed or soldered copper or copper alloy pre-fabricated assemblies;
- f) copper and copper alloy brazed fittings.

Where it is known that the local supply water is capable of causing dezincification, or where grid distribution systems might introduce such water, or any doubt exists, fittings manufactured from alloys subject to dezincification shall not be used, except for draw-off taps.

Brass fittings may suffer stress corrosion cracking if:

- parts of the fitting underlie a certain stress; and
- a medium is present with a certain aggressiveness with respect to stress corrosion cracking;
- a test method for testing the stress corrosion is described in EN ISO 6509.

A.2 Ferrous materials

A.2.1 General

The following components may be used:

- a) hot-dip galvanized steel pipes (HDGS) and, if appropriate, those with external, non-metallic protective coating against corrosion;
- b) stainless steel pipes;
- c) welded and brazed prefabricated assemblies and units constructed from individual elements, e.g. pipes, fittings and flanges, with zinc coating;
- d) HDGS malleable cast iron fittings used as coupling for threaded HDGS pipes;
- e) couplings for steel pipes with plain ends, if the internal corrosion protective coating of the pipe is not damaged in proper use;
- f) mechanical stainless steel couplings for stainless steel pipes. If they are suitably protected they may be used for steel pipes.

A.2.2 Hot-dip galvanized steel and malleable iron

HDGS steel tubes shall be preferably jointed by threaded malleable iron HDGS fittings. Only under special circumstances shall welded or brazed joints be used because this would damage the zinc coating. Site bending of zinc coated tube will also damage the coating so where it is necessary to change direction hot-dip galvanized malleable iron fittings shall be used.

A.2.3 Stainless steel

Jointing can be made using compression crimped or other mechanical or capillary fittings made of stainless steel, copper or copper alloys.

A.3 Ductile cast iron

The following components may be used:

- a) ductile cast iron pipes with or without socket;
- b) coated ductile cast iron fittings.

The requirement of the water supplier for a protective coating or lining to the relevant European Standard should be ascertained.

A.4 Plastics

A.4.1 General

Plastics pipes shall not be installed close to sources of heat so that their performance is impaired.

A.4.2 Plastics materials for cold water systems

A.4.2.1 Unplasticized polyvinyl chloride (PVC-U)

The use and installation of unplasticized PVC pipes for the supply of potable water should be in accordance with EN 1452-1. EN 1452-2 specifies the requirements for pipe and EN 1452-3 specifies the joints and solvent cements to be used with the pipe.

PVC-U pipes can be connected by:

- PVC-U solvent cement fittings made by injection moulding or from pipe;
- socketed pipes for solvent cementing;
- PVC-U sealing ring type fittings made by injection moulding or from pipe;
- Mechanical couplings made of appropriate metallic materials.

A.4.2.2 Polyethylene (PE-HD, PE-MD)

PE-HD and PE-MD pipes can be connected by:

- PE-HD socketed welding fittings;
- PE-HD butt welding fittings;
- PE-MD butt welding fittings;

- PE-HD electro fusion fittings;
- mechanical couplings made in plastics materials or in appropriate metallic materials.

A.4.2.3 Polyoxymethylene (POM)

Fittings made from polyacetal can be used for cold water applications.

A.4.3 Plastics materials for hot and cold water systems

A.4.3.1 Cross-linked polyethylene (PE-X)

PE-X pipes can be connected by compression fittings made in appropriate metallic or plastics materials.

A.4.3.2 Polybutylene (PB)

Polybutylene pipes can be connected by:

- PB socketed welding fittings;
- PB electrofusion fittings;
- mechanical couplings made in appropriate metallic or plastics materials.

A.4.3.3 Propylene copolymer (PP-H, PP-R)

PP pipes can be connected by:

- PP socketed welding fitting;
- PP electro fusion fittings;
- mechanical couplings made in appropriate metallic or plastics materials.

A.4.3.4 Chlorinated polyvinyl chloride (PVC-C)

Screwed joints or unions are suitable.

PVC-C pipes can be connected by:

- PVC-C solvent cement fittings;
- mechanical couplings made in appropriate metallic or plastics materials.

A.4.3.5 Multilayer Metal pipe (e.g. PEhd-Al-PEX and others)

Multilayer Metal pipes can be connected by:

- Crimped fittings made in appropriate metallic or plastics materials;
- Compression fittings made in appropriate metallic or plastics materials;
- Threaded fittings made in appropriate metallic materials.

Annex B (informative)

Aspects for water conditioning

B.1 Corrosion

The issue of corrosion is dealt in EN 12502-1 to -5 "Protection of Metallic Materials against Corrosion, Corrosion Protection in Water conveying Systems".

Water conditioning processes such as:

- mechanical filtration;
- chemical dosing;
- nitrate removal;
- electrolytic processes;
- neutralisation-hardening; and
- reverse osmosis and other membrane processes

can be used with the view of reducing the corrosion likelihood for those types of corrosion which otherwise can cause damages (see also prEN 806-4).

B.2 Scaling

Scaling in water distribution networks mainly results from the formation of calcium carbonate deposits on surfaces in contact with water which may hamper the proper functioning of appliances such as water heaters, shower heads, faucets, etc.

This phenomenon can happen with non aggressive waters at the considered temperature. The determination whether scale can form is complex to evaluate. However, the saturation index of Langelier gives guidance about the risk of scaling.

In case a scaling problem is anticipated, the installation of water conditioning processes should be considered, e. g. softening using ion exchange or dosing of scale inhibitors.

B.3 Suspended matter

If matter in suspension, regardless of its nature or origin, settles in a pipe, it is to produce differential aeration couples, for which the anodic area is constituted by the metal part covered with the deposit. The settling of matter may also facilitate bacteria growth.

Both phenomena can generate corrosion which disseminates very easily and may lead to pipe perforation.

Suspended matter may also cause malfunctioning and blockage of the connected appliances.

When considered to be necessary to forestall intrusion of suspended matter and the risks it brings with it, the installation of an adequate mechanical filter upstream, the internal distribution system should be considered.

B.4 Mechanical filtration

B.4.1 General

A distinction should be made between backwashable and non backwashable filters.

The type of filter referred to in this standard does not include those filters or strainers used in water meters or in taps.

For point of entry filters, as specified in EN 13443-1 should be used.

B.4.2 Field of application

Solid matter such as rust particles or sand grains shall be prevented from entering the potable water installation. Such matter may hamper the proper functioning of, for instance, water heaters, shower heads, etc. or can cause corrosion damage to pipework by wide or deep pitting.

If a mechanical filter is required, it should preferably installed at the point of entry.

B.4.3 Criteria for selection and sizing

The capacity of the mechanical filter shall be determined by taking into account the pressure drop requirements and keeping the frequency of backwash, cleaning and maintaining constraints.

The direction of flow of the water through the filter should be permanently and clearly marked.

B.4.4 Criteria for installation

A control device should be provided to evaluate the level of fouling in order to start automatically or manually the backwash phase or to replace the filtering elements.

Backwashable filters should be provided with a free outlet, as specified in EN 1717.

Mechanical filters are specified at the point of entry should be located downstream of the water meter assembly.

B.5 Chemical dosing

B.5.1 General

Chemical dosing equipment may be used for the controlled addition to water of solutions of chemical agents. The chemical agent selected and the quantity to be injected depend on the problem encountered, the feed water quality, the materials used and the expected service conditions.

B.5.2 Field of application

Depending on the type of chemical it may:

- disinfect the water;
- inhibit corrosion phenomena;
- restore a passive layer on a material in contact with water;
- inhibit scaling phenomena (stabilization of hardness).

B.5.3 Criteria for selection and sizing

The size of the dosing equipment should be selected as a function of the calculated design flow in the drinking water installation and the likely average monthly volume of water to be treated.

The dosing agents should be stored in such a way that the time between two successive refills should not exceed their operational lifetime as specified by their manufacturer, while allowing acceptable maintenance constraints.

When selecting a chemical agent, it should also be checked that the maximum temperature and retention time of water inside the internal pipeworks allow its use without risk of degradation "(hydrolysis)".

B.5.4 Criteria for installation

The chemical dosing unit should be fitted with a device enabling adjustment and locking.

A sight glass or other suitable means should be provided to enable the level of dosing agent in the tank to be determined.

The dosing unit should be designed and installed so that accumulation of air or other gases during operation are avoided and do not impair the dosing accuracy.

B.6 Softening by ion exchange

B.6.1 General

Softeners using the principle of cation exchange replace the calcium and magnesium ions in water by sodium ions and produce softened water at zero hardness which prevents the formation of scale.

Blending devices (internal or external) should be installed in combination with the softener to keep the residual hardness of the softened water within the limits specified in national or local regulations or if the sodium concentration exceeds 200 mg/l (see EU-Directive 98/83 EC).

B.6.2 Field of application

Softening by ion exchange may be used to reduce the hardness of the water when scaling problems are expected to happen.

B.6.3 Criteria for selection and sizing

In order to avoid abnormal microbiological activity, due to too long intervals between two successive regenerations the concept "low installed capacity-frequent regenerations" should be preferred. In any case, the time elapsing between two successive regenerations should not exceed a number of days as given in national or local regulations.

The capacity of the salt tank should be such that it permits a minimum of 5 regenerations between refills.

For further requirements see prEN 14743.

B.6.4 Criteria for installation

If required, the installation should comprise suitable means of adjusting the residual hardness of the soft water.

The disinfection of the equipment prior to its commissioning should be effected using products which are compatible with the materials used in the installation.

The regenerating salt (sodium chloride) should conform to EN 973.

The softener should be operated with economy in the use of salt and water.

B.7 Nitrate removal by ion exchange

When ion exchange is used for nitrate removal this device is similar to softener and the same rules will apply as given in 12.2.

B.8 Electrolytic processes

B.8.1 Definition

The electrolytic processes are based on the dissolution of a sacrificial anode mainly in view of inhibiting corrosion problems, and work with or without external current.

Two types exist:

- the anti-corrosion devices using a magnesium anode within a galvanic cell magnesium/brass, without external current;
- the anti-corrosion devices with, under special conditions, secondary anti-scaling effect, using aluminium anodes which dissolve by electrolysis under the action of an external current which values depend upon characteristics and flow rate of water.

Electrolytic processes requiring an applied current should provide means for preventing nitrate ions being reduced to nitrite ions.

B.8.2 Field of application

The electrolytic process may be used to protect the potable water installation against damage by corrosion.

B.8.3 Criteria for selection and sizing

The tank containing the anodes shall have a volume equal to or greater than one quarter of the maximum output per hour.

Critical parameters of the feed water such as pH and electrical conductivity should remain between the values required by the supplier of equipment.

The electrolytic processes are incompatible with the dosing of inhibitors such as silicates, polyphosphates and phosphates. Those two water conditioning systems should never be combined together. For further requirements see EN 14095.

B.8.4 Criteria for installation

The electrolytic devices requires a regular extraction of sludge. This can be done by a manual or automatic drain ball valve fitted at the lowest point of the tank and which diameter should be as large as possible.

B.9 Neutralisation - Hardening

B.9.1 General

In a hardening process, the water passes through a bed of calcium and/or magnesium carbonate, which dissolves proportionally to the aggressive carbonic acid content of the water. As a consequence, the aggressiveness of the water is reduced and its hardness and pH are increased.

B.9.2 Field of application

The hardening process may be used to reduce the aggressiveness of a water and to increase its pH.

B.9.3 Criteria for selection and sizing

The installed capacity should be determined by taking into account a refilling frequency remaining within acceptable maintenance constraints; the average quantity of water passing through the equipment during this period of time and the equivalent amount of mineral dissolved. Consideration should also be given to the pressure drop requirements.

In order to avoid abnormal bacterial activity in the minerals bed or unacceptable pressure drop due to fouling, the time elapsing between two successive backwashes should not exceed four days, when applicable.

B.10 Disinfection by ultraviolet radiation

B.10.1 General

Ultraviolet disinfection units operate by exposing water to intense ultraviolet radiation in the wavelength range of 250 nm to 260 nm.

B.10.2 Field of application

The UV process is intended to maintain the bacterial quality of the water inside internal network, for instance after a storage tank, or to improve it for a particular application.

B.10.3 Criteria for selection and sizing

For disinfections of water intended for human consumption, exposure to a minimum radiation dose of 16 mJ/cm² should be sufficient, calculated for a particle following the path through the reactor chamber with the lowest UV intensity and mean residence time.

Systems that recirculate all or part of the water to be disinfected should still be sized for the minimum dose level at the maximum output flow.

The minimum radiation transmission factor should be 0,9 per cm. If water is suspected to present a lower value, corrective actions should be taken such as installation of a suitable pre-filtration or other means. For further requirements see prEN 14897.

B.10.4 Criteria for installation

The equipment should be provided with a pre-calibrated non adjustable device enabling the maximum flow rate to be limited.

The ultraviolet device should be installed without by-pass valves. Isolation valves only are required, these are for maintenance purposes.

When used for disinfection purposes, in case of any interruption or reduction of the ultraviolet radiation efficiency the delivery of water to service should be automatically stopped or diverted.

B.11 Reverse osmosis and other membrane processes

B.11.1 General

Reverse osmosis is a process which allows a reduction of the salts dissolved in the water by means of special semi permeable or osmotic membranes which, thanks to their specific selectivity, allow the permeation of water while retaining almost the totality of dissolved salts, trapping micro organisms and organic molecules.

Because of the very low specific micro porosity of the osmotic membranes, a minimum feed water pressure as specified by the manufacturer will be required to achieve acceptable performances.

In order to prevent the accumulation and deposit of substances trapped by the osmotic membranes, the modules (devices supporting the membranes) are constantly washed out by an excess of water which should be drained off. The recovery ratio is the ratio between permeate and feed flows.

The feed water can be preconditioned, before being processed, depending on its composition, the type of membranes used and the operating conditions of the reverse osmosis equipment.

Other membrane separation processes, less selective than reverse osmosis, are based on the same operating mode (i.e. cross flow filtration). Their performances are related to the specific membrane characteristics and operating conditions (nano filtration, ultra filtration and micro filtration).

B.11.2 Field of application

Reverse osmosis and other membrane processes selectively reduce dissolved matter in water.

B.11.3 Criteria for selection and sizing

In membrane processes the product flow rate varies with temperature. Accordingly, the sizing of the equipment should be done taking into account the annual lowest temperature.

In reverse osmosis and similar systems water may be supplied to the drinking water installation in two different ways: either directly from the equipment or from a cistern collecting the processed water. The installed capacity should be sized accordingly.

When a cistern is installed or whenever microbiological growth can be anticipated, the water intended for human consumption shall be disinfected before it is supplied to service.

It can be necessary to pre-condition the feed water if the operating limits given by the supplier are exceeded.

B.11.4 Criteria for installation

The reverse osmosis equipment should be exclusively installed on cold water or on a temperature system regulated to a lower value than the maximum temperature specified by the manufacturer.

When a cistern is used to collect the product water delivered by a pump pressurized reverse osmosis unit, it should be maintained at the atmospheric pressure or very close to it and located in the vicinity of the reverse osmosis equipment, and in any case, at the same level.

The waste water should be discharged to a drain at atmospheric pressure (see EN 1717).

B.12 Active media

B.12.1 General

Active media include adsorbents, ion exchange or chemically active materials that remove or significantly reduce component(s) from water by chemical reaction or by virtue of ionic charge or other surface activity. One active medium may be used singly or in combination with another active medium or with other treatment technology such as mechanical filtration, reverse osmosis, etc.

B.12.2 Field of application

The function of active media filters is to remove taste, odour, colour, other marginal organic or inorganic constituents, etc.

B.12.3 Criteria for selection and sizing

The manufacturer should indicate cartridge lifetime.

B.12.4 Criteria for installation

No other particular criteria are applicable than those stated. See B 11.4.

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