1 Water supply systems

1.1 Domestic systems

The Wefatherm system can be applied for typical domestic water supply systems such as:
- Drinking water; Drinking water is considered fresh water up to a temperature of 25°C for drinking and preparing food.
- Hot tap water; Hot tap water is heated drinking water up to a temperature of 60°C.
- Sanitary applications; Sanitary applications are applications for which the drinking water quality is not required, such as flush systems, washing and irrigation.

Typical hot and cold water applications classified as class 1 and class 2 in standard ISO 15874 'Plastic piping systems for hot and cold water installations - Polypropylene PP'.

Hot water applications with temperatures above 70°C are considered as heating applications. Heating applications classified as class 5 in standard ISO 15874 are not covered in this specification manual.

Similar, but not identical, classifications are used in standards;
- DIN8077 - Pipes of Polypropylene (PP)
- ASTM F2389-15 Pressure rated Polypropylene (PP) piping systems

Pipe work is usually concealed in the wall/floor in order to not disturb the visual appearance of the sanitary room. In non-sanitary lounge rooms the pipe work is usually surface mounted, because the visual aspect is less important.

Illustration 1.1

1.2 Supply systems

A domestic water supply system finds its application in family houses and residential buildings with apartments/condominiums. When more than 2 houses are combined in one system it is considered a large plant which consist of:
- Floor distribution
- Rising mains
- Transport to rising mains

Illustration 1.2

Illustration 1.3

Water supply systems

1.3 Hot tap water installations

Hot tap water installations are technical sophisticated installations which need to consider requirements on water quality, hygiene, comfort and economy. A judgement of sometimes contradicting requirements leads to a responsible hot water supply.

Hot water installations can be divided in:

- *Centralized installations*
  All tapping points in one (or more) building(s) are supplied by one utility net and heated by one (or more) water heater(s).
- *Decentralized installations*
  Groups of close by tapping points with larger distances between these groups and heated by multiple water heaters to the multiple groups. Or a single tap point is supplied by a single water heater.

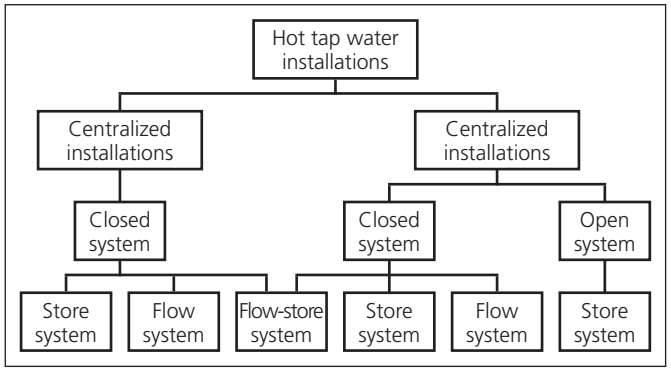

Illustration 1.4

Hot tap water installations can be realized as flow, store and combined flow-store systems:

- *Flow systems*
  The drinking water is heated while flowing through the heater. Direct heating is applied in gas and electrical heaters, indirect heating is applied in heat distribution systems.
- *Store systems*
  The drinking water is heated directly or indirectly and stored before it will be tapped on demand. This can be done in open and closed systems. An open system is a non-pressurised system, in general for one tapping point, connected with specialized valves. In closed systems multiple tapping points can be connected, executed with proper cleaning and maintenance facilities. A distinction is made between small scale and large scale installations. For large scale installations following considerations need to be taken in account:
- *Operating temperature*
  Hot water installations should not consume more energy as necessary for its application. To prevent corrosion and calcification, limits are set for the operating temperature. From a hygienic view (legionella prevention) the installation should operate so that the temperature of the water in any point of the circulation system should not drop under 55°C for long term operation (see DVGW work sheet W551 and W552).
- *Operating pressure*
  Hot water installations are designed for a nominal pressure of 10 bar. Water heaters for nominal pressure of 6 bar are applicable when a suitable pressure reducing valve is applied.
- *Technical safety measures*
  Every closed system requires a pressure relief valve in the cold water supply line and the relieved water needs to be drained into the drain system (see DIN 1988).

In general the smallest pipe diameter and shortest route to the tapping points is preferred. The pipe system must be insulated. The circulating volume flow needs to be adjusted permanently. The non-operational pipe segment has to be disconnected.

Hot tap water installations need to be maintained by annual inspection.

2 Requirements on water supply systems

Drinking water is one of our most important elements and is accordingly subjected to very strict regulations. It is obliged to follow national guidelines on drinking water. The guidelines mentioned in this Specification Manual are based on the regulation in Germany and the European Union.

Directives on the quality of water intended for human consumption:
- Germany: Trinkwasserverordnung TrinkwV2001
- European Union: Drinking Water Directive 98/83/EC

Drinking water
High quality, safe and sufficient drinking water is essential for our daily life, for drinking and food preparation. We also use it for many other purposes, such as washing, cleaning, hygiene or watering our plants. The European Union has a history of over 30 years of drinking water policy. This policy ensures that water intended for human consumption can be consumed safely on a life-long basis, and this represents a high level of health protection. The main pillars of the policy are to:
- ensure that drinking water quality is controlled through standards based on the latest scientific evidence
- secure an efficient and effective monitoring, assessment and enforcement of drinking water quality

The Directive overview
The Drinking Water Directive concerns the quality of water intended for human consumption. Its objective is to protect human health from adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean.

The Directive laid down the essential quality standards at EU level. A total of 48 microbiological, chemical and indicator parameters must be monitored and tested regularly. In general, World Health Organization's guidelines for drinking water and the opinion of the Commission's Scientific Advisory Committee are used as the scientific basis for the quality standards in the drinking water.

National Legislation
When translating the Drinking Water Directive into their own national legislation, Member States of the European Union can include additional requirements e.g. regulate additional substances that are relevant within their territory or set higher standards. Member States are not allowed, nevertheless, to set lower standards as the level of protection of human health should be the same within the whole European Union.

Source: European Union

In Germany the relevant requirements on drinking water and technical requirements on drinking water systems are based on long term practical experience and are laid down in codes of practice. These general accepted codes of practice are a combination of laws, standards and guidelines to ensure:
- Hygienic reliable drinking water
- Long term undisrupted system use
- Avoid discomfort like noise
- Prevention from the loss of waste and energy

Substance	CAS Nr.	EINECS Nr.	Application	Requirement	Allowable addition	Max. concentration after treatment	To be observed reaction product	Remarks
Calciumhypochlorit	778-54-3	321-908-7	Disinfection	DIN EN 900 Tab 1, type 1	1,2 mg/l free Cl_2	max. 0,3 mg/l free Cl_2 min. 0,1 mg/l free Cl_2	Trihalogen-methane, Bromat	Additive to 6 mg/l free Cl_2 and content to 0,6 mg/l free Cl_2 after treatment beside else disinfection is not guaranteed or disinfection is reduced by Ammonium
Chlorine	7782-50-5	231-959-5	Disinfection production of Chlorin-edioxide	DIN EN 937 Tab 2, type 1	1,2 mg/l free Cl_2	max. 0,3 mg/l free Cl_2 min. 0,1 mg/l free Cl_2	Trihalogen-methane	Additive to 6 mg/l free Cl_2 and content to 0,6 mg/l free Cl_2 after treatment beside else disinfection is not guaranteed or disinfection is reduced by Ammonium
Chlorinedioxide	10049-04-4	233-162-8	Disinfection	DIN EN 12671 (EN 937, 901, 939, 899, 938, 12926)	0,4 mg/l ClO_2	max. 0,2 mg/l free Cl_2 min. 0,05 mg/l free Cl_2	Chlorite	Maximum value of Chlorite 0,2 mg/l ClO_2 after treat-ment must be maintained. Note possible formation of Chlorate
Natriumhypochlorite	7681-52-9	231-668-3	Disinfection	DIN EN 901 Table 1, type 1 Limit for impurities with Chlorate ($NaClO_3$): <5,4% (m/m) of active chlorine	1,2 mg/l free Cl_2	max. 0,3 mg/l free Cl_2 min. 0,1 mg/l free Cl_2	Trihalogen-methane, Bromat	Additive to 6 mg/l free Cl2 and content to 0,6 mg/l free Cl_2 after treatment beside else disinfection is not guaranteed or disinfection is reduced by Ammonium
Ozon	10028-15-6	Not applicable	Disinfection, oxidation	DIN EN 1278 Attachment A.3.2	10 mg/l O_3	0,05 mg/l O_3	Trihalogen-methane, Bromat	

CAS: Chemical Abstracts Service Registry Number
EINECS: European Inventory of Existing Commercial Chemical Substances

Table 2.1 Water treatment substances for disinfection in drinking water, according to Trinkwasserverordung Trinkw V2001