

## Regulating for Health Aspects of Plumbing in Relation to Water and Sanitation



Plumbing is the system of pipes, fixtures and appliances within a property, and also all of the work associated with the design, installation, removal, alteration or repair of piping, fixtures and appliances in connection with drinking-water supply, non-drinking-water supply and drainage systems, which flow in and out of buildings and between given connection points to points of use and/or disposal. Some define plumbing as beginning at the property line, others define it more broadly.

Adapted from WHO Health and Environment Lexicon, [www.who.int/thelexicon](http://www.who.int/thelexicon)

While the above definition is applicable to a range of plumbing aspects, including heating and gas, the focus of this issue sheet is on water and sanitation issues.

### Why is this issue important?

Good plumbing is one of the key building blocks in protecting and promoting public health. Although largely still an urban privilege, today more than half of the world's population has a piped water connection in or nearby their homes. This proportion is increasing rapidly and there is a need to ensure new plumbing is designed, installed and operated according to up-to-date standards, and that existing plumbing is updated to new standards. No pipes, valves, taps and other

fittings used are allowed to contain harmful substances that can leach into water, such as lead and cadmium, above established guidelines values. Leakage and wastage should be controlled and minimized for the public health, economic and environmental reasons.

Existing or potential problems associated with substandard plumbing can lead to:

- Threats to public health and safety, such as outbreaks of Legionellosis and other water-borne illnesses and an increased risk of scalding of children and the elderly; and
- Substantial costs, including those associated with property and environmental damage.

In both developed and developing countries, inadequate or faulty plumbing has led to water-borne disease outbreaks. In the United Kingdom, from 1911 to 1995, 36% of reported water-borne disease outbreaks were caused by problems in the public water supply (Hunter, 2004). Similarly, in Scandinavia, between 1975 and 1991, cross-connections or backflow were responsible for 20% of the reported water-borne disease outbreaks in community supplies and 37% of the outbreaks in private systems (Stenström, 1994). In 2006, over 170 cases of cholera were identified in Zimbabwe. The higher risk of cholera outbreaks was attributed to Zimbabwe's crumbling health system and social infrastructure as well as the degradation of drinking-water and sewage systems, following six years of severe economic recession (International Federation of Red Cross and Red Cross Societies, 2006).



An investigation into an outbreak of Severe Acute Respiratory Syndrome (SARS) in Hong Kong in March 2003 concluded that at the Amoy Gardens Estate the sewerage was responsible for the spread of contamination (Department of Health, 2003). It was found that inadequate regulations and plumbing design, coupled with faulty plumbing materials caused the loss of a water barrier seal in a U-shaped water trap. The water barrier seal evaporated, thus enabling the contaminated air to escape from within the sanitary drainage system into the building. Several hundred cases of infection were recorded in Amoy Gardens.

In 2007, Pirbright, Surrey, United Kingdom, a failed sewerage drainage system caused the release and subsequent outbreak of foot and mouth disease, illustrating the need for introducing and maintaining better drainage standards (Health and Safety Executive, 2007). The disease escaped from a biosecurity site through a faulty site drainage system. Not only was public health and safety compromised, but it also inflicted a substantial cost burden, estimated at £100 million (\$USD130 million), to producers with the sheep industry being the hardest hit (Department for Environment Food and Rural Affairs, 2007).

In addition to the adverse health and safety aspects of substandard plumbing, its cost of can be substantial. For example, it is estimated by the State of Victoria's Plumbing Industry Commission in Australia that damages arising from plumbing faults (e.g. property damage) costs the State of Victoria up to AUD 25 million/year (State of Victoria's Plumbing Industry Commission, 2008). This estimate only considers the direct costs of rectifying a fault and does not take into account the potentially serious costs associated with injury, illness and disease nor indirect costs associated with damage to the environment.

Consumers who hire the services of plumbers and those that undertake their own plumbing are, for the most part, not aware of the potential risks of sub-standard plumbing to themselves and others. The majority of consumers also lack the technical expertise and knowledge to effectively judge the attributes and quality of plumbing services. Additionally, the nature of plumbing works means that it may take many years for some problems to manifest themselves. Consequently, regulation and enforcement of plumbing standards are effective and required

tools for regulators to mitigate health risks and potential costs associated with substandard plumbing.

## What regulatory frameworks should be in place?

Plumbing regulations should protect public health and safety, specify standards for design, installation, maintenance and materials used for water, wastewater, and drainage systems, establish training and education standards for plumbing professionals, and provide authority for oversight and enforcement. Regulations should cover the design, materials, installation, operations and maintenance of plumbing. Technical requirements to be met to ensure that any or all of these components are in conformity with regulations are typically found within codes of practice.

Codes of practice specify technical standards of design, materials, workmanship, installation, operation and maintenance of plumbing systems. In some countries, the term "ordinance" is used to describe them. The primary aims of a plumbing code are to ensure that:

- planners, administrators and plumbers develop the required competency level, through adequate training and education, so these codes are respected and applied;
- standards are set to ensure that plumbing assemblies, materials and technologies are safe and effective;
- plumbing installations meet these standards; and,
- plumbing installations are maintained to ensure continuous safety and effectiveness.

### 1. Protect public health and safety

Plumbing regulations should be designed with the primary objective of protecting public health and safety, apart from other compelling and valid reasons such as reducing property damage and the direct cost of rectifying a fault. For example, plumbing should be designed, installed, operated and maintained so as to:

- protect the water supply from cross-connections with unsafe sources or with wastewater plumbing systems;

- cope with the hazards of backpressure or back-siphonage;
- ensure the water supply is only in contact with materials that meets appropriate standards;
- dispose of liquid wastes promptly and hygienically; and
- define roles, responsibilities, and communication and reporting requirements between plumbing professionals and other public officials or authorities.

Ideally, regulations should recognize plumbing professionals as front-line public health workers.

## **2. Establish design, installation, operation and maintenance and material standards**

Regulations or the associated codes of practice must specify minimum design, installation, operation and maintenance, and material standards for water, wastewater and drainage systems. In short, this component can become a good practice manual to be followed. Standards should include, but not be limited to:

- minimum quality, safety or performance specifications for products and performance;
- quality and performance specifications against which plumbing materials are assessed; and,
- testing of plumbing installations and, as appropriate, disinfection before they are put into service.

## **3. Establish training and education standards**

A skilled work force should be the solid basis for any regulatory framework for plumbing; therefore regulations must establish minimum occupational training and education standards for the plumbing sector. Training and education standards should be flexible enough to accommodate new technologies, standards and complexities in water and sanitation systems. Outcomes of regulating these standards should include, but not be limited to:

- training programmes that cover both theoretical (knowledge-based) and practical (field training) aspects of plumbing;
- an accreditation system to ensure individuals have achieved and demonstrated appropriate levels of competency;
- professionals trained to identify and use only appropriate materials that conform to regulatory requirements; and
- workmanship that meets accepted standards.

Where no or limited training exists, regulators should progressively introduce training and education requirements.

Ideally those who call upon the services of plumbing professionals should be aware of and sensitized to the importance of hiring trained and, where appropriate, certified professionals. This approach is often more sustainable over longer periods.

## **4. Provide authority for oversight and enforcement**

The requirements for training and education are only another layer in a regulatory framework.

A skilled plumbing work force still requires ongoing oversight and, as such, regulations should include the ability to undertake inspections and audits.

Regulations must make provisions for enforcement powers to enable disciplinary action if required and for rectification of faulty work. One sanction is to revoke the certification and/or license of a person deemed not competent to practice as a plumbing professional.

## **Criteria for the successful management of issues**

In order to protect public health, the surveillance role should be performed by a regulatory authority or a third-party. The following questions are a starting point for evaluating the performance of the plumbing sector:

- Have there been outbreaks of water-borne illness as a result of sub-standard plumbing?
- Are minimum installation and material standards for water, wastewater and drainage systems being met?
- Have minimum training and education standards been met?
- Is the provision for regulatory oversight (i.e. inspect and audit standards of work) and enforcement (i.e. power of entry, enforcement of disciplinary action if required and rectification of faulty work) being implemented and met?
- Is the oversight process based on standards and procedures that are known and available to industry?



## Further Reading

WHO and World Plumbing Council (2006). *Health Aspects of Plumbing*. Geneva, World Health Organization  
[www.who.int/water\\_sanitation\\_health/publications/plumbinghealthasp/en/](http://www.who.int/water_sanitation_health/publications/plumbinghealthasp/en/)

## Key References

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