

Information for Operating Plumbing Systems for the Supply of Water for Domestic Purposes to Ships in Ports

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1. Introduction

The Water Supply (Water Fittings) Regulations 1999 in England and Wales, (and the Scottish Water Byelaws 2004 and Northern Ireland Water Regulations, collectively known as 'the regulations'), are intended to prevent the waste, misuse, undue consumption or contamination of public water supplies. All who install or use plumbing systems have a legal duty to comply with these regulations.

As owners and occupiers of port premises, the port authorities have legal duties to their employees and to those who visit their ports. Under the Water Industry Acts and the Water Fittings Regulations (or equivalent legislation in Scotland and Northern Ireland) they must ensure that water supplies within the ports are adequately safeguarded against contamination. They must also take responsibility for ensuring that water fittings are installed and maintained in compliance with the regulations. Under health and safety legislation they must ensure their premises are not the source of a health and safety risk. Any serious risk to health from the water supplies may result in the supply being disconnected. The Water Supplier has the power to prosecute infringements of the Water Fittings Regulations and is likely to recover the significant costs incurred in responding to a water contamination incident.

Water Suppliers have a duty to ensure that water they provide to premises for domestic purposes (e.g. drinking, washing and cooking) is 'wholesome' at the time they supply it. Wholesome water is that which meets the national water quality requirements in the Water Supply (Water Quality) Regulations 2000. After it has been supplied, water can become contaminated by being in contact with unsuitable materials in the plumbing system, by ingress of contaminants – for example into an uncovered storage cistern – or by backflow of contaminated water from fittings or appliances.

Backflow means the flow of water in a direction opposite to the intended normal direction and can occur either by

backpressure – where the water in the plumbing system is subjected to a greater pressure at a 'downstream' point than that upstream, allowing it to flow backwards, or by

backsiphonage – where the downstream end of a pipe or device is only at atmospheric pressure, but the pressure upstream is less, effectively sucking water back upstream.

There have been a number of significant incidents where the public water supply has been contaminated due to backflow at ports and harbours in the United Kingdom. The most common cause is the cross-connection of pressurised seawater pipework and water supply pipes, resulting in water from the dock being pumped into drinking water systems within the port area.

2. Scope

A small expert group, established by the water supply industry through WRAS, reviewed the approach of ports and harbours in preventing contamination of the wholesome water supply by backflow. In conjunction with port authorities, the working group identified suitable methods for filling vessels, which will comply with the regulations. This Information and Guidance Note includes recommendations to assist port authorities in complying with their legal obligations and ensuring the safety of drinking water supplies in ports and their surroundings.

The specific aim of this guidance is to prevent contamination of drinking water supplies by backflow or cross connection with other sources of water. This is particularly relevant when initially filling or replenishing ships' wholesome water tanks. Backflow in these circumstances could contaminate drinking water supplies on ships, elsewhere in the port premises or in the surrounding neighbourhood. Contaminants could include toxic chemicals or disease-causing micro-organisms (pathogenic bacteria or viruses) from the dockside, from the harbour itself or from unwholesome water already stored on-board.

3. Contamination High Risk Areas

Some dockside activities and equipment are particularly serious backflow risks because of the types and quantities of possible contaminants or the likelihood of backflow conditions occurring. These include:

- Filling of ships' drinking water tanks;
- Refuelling and general water loading points;
- Dry docks – especially maintenance work on plumbing systems;
- Sewage disposal;
- Fish houses and markets;
- Pressurised systems and equipment for non-drinking water;
- Fire-fighting systems using other than mains water.

4. Fluid Categories and Backflow Prevention

The regulations classify backflow risks according to the severity of the potential contaminants – using one of five fluid categories. Fluid category five is the most serious contamination risk; fluid category one is the least – equivalent to wholesome drinking water as supplied by the Water Supplier. The degree of backflow risk is dependent on local circumstances. Risk assessments, if not carried out by your local water supplier, should be confirmed by it.

Fluid category 5 is defined as fluid representing a serious health hazard because of the concentration of disease-causing (pathogenic) micro-organisms, radioactive or very toxic substances, including any fluid that contains:

- a. Faecal material or any other human waste
- b. Butchery or other animal waste or
- c. Pathogens from any other source.

Fluid five backflow risks are likely to include fire hose reels (where the hose outlets could be immersed in drains etc.), hose pipes on hose union taps, pressurised sewage, fire sprinkler and cooling systems and uncovered water storage for fire-fighting purposes.

The Regulations require every backflow risk to be protected by a recognised backflow prevention device which has a fluid category rating at least equal to that of the contaminants which may be present.

5. Filling Procedures: Ships' Water Tanks

When filling a ship's water holding tank, it is essential that the quality of water entering the tank is wholesome and that contaminants are prevented from entering the supply mains pipework by backflow.

The water being loaded onto the ship can become contaminated by mixing with unwholesome water already stored on board or by cross connection with pipelines carrying sewage or other contaminants

within the vessel. Prevention of this includes good design and maintenance of the ship's water and waste systems and good management by the vessel's operators of water supply, waste and other systems, such as fire-fighting systems.

Hoses used for filling operations can lead to contamination of mains water by the hose outlet being submerged in the dock water or in drains, puddles or other fluids on the dockside or by backflow of contaminated water from the ship's holding tanks. These are fluid category five risks and the backflow prevention devices allowed by the regulations are all types of physical air gaps between the mains pipework and the ship's intake. A tundish arrangement can provide this air gap, but it is unlikely to be practicable. The recommended method is to supply the hoses used for filling the ship from a break cistern incorporating an air gap. (See Figure 1).

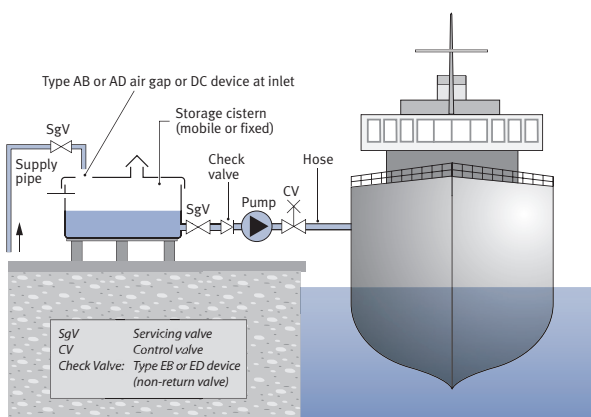


Figure 1: Break cistern and booster pump for backflow protection of mains water supply during filling of ships with water

Requirements for a break cistern

The cistern, whether fixed or mobile, must be of a suitable size to encourage good turnover of stored water and the inlets and outlets must be designed and located to minimise stagnation. The cistern must be protected against the ingress of environmental contaminants.

Every break cistern storing water for wholesome purposes must be designed manufactured and installed to ensure:

- all construction materials in contact with the stored water are suitable and do not cause deterioration of water quality; non-metallic materials must comply with British Standard BS 6920.
- a suitable air gap to provide fluid category five backflow protection. If using a type AB air gap, there must be a slot type weir conforming to the requirements for a type AB air gap, sized to suit the maximum inflow and screened to prevent ingress of insects or other contaminants. A spreadsheet to assist in designing a type AB air gap is given on the WRAS website.
- a screened warning pipe (or other no less effective warning device) and a screened overflow to prevent the ingress of contaminants;

- a securely fitting lid and/or access cover to enable internal inspection and cleaning of the cistern.
- thermal insulation to minimise freezing or undue warming.

Where gravity-fed water pressure is insufficient to supply the required flow a booster pump can be installed. If the pump is capable of drawing more than 12 litres/min, it must not be installed without notifying the water supplier and obtaining its written consent.

The port authority has responsibility to see that regular cistern maintenance is undertaken to ensure the water quality is wholesome.

6. Pipes Laid in Ground which may be Contaminated

Water pipes or fittings must not be laid or installed in any contaminated environment such as in drains, sewers, foul soil or refuse, regardless of any protection to the pipe or fittings. Fittings and pipes made of plastics or other materials, which are likely to be damaged by exposure to oil, petrol or other contaminants should not be laid in contaminated ground, or should be suitably protected. Advice is given on the selection of materials for water pipes in land, which may become contaminated in the WRAS Information and Guidance Note 9-04-03 (The Selection of Materials for Water Supply Pipes to be Laid in Contaminated Land, see *Further Information*). Other advice is given in Pipeline Selection for Use in Contaminated Land – Best Practice Manual', published by UKWIR (see section 8 further information).

7. Whole-site and Zone Backflow Protection

Zone and/or whole-site backflow protection might be required at ports and harbours for a number of reasons including:

- as an interim measure, until full compliance with the regulations for point of use backflow protection is obtained.
- where there has been compliance for point of use, but there is a risk that future modification to the system and/or inadequate control of the water system might compromise compliance.
- where there is compliance for point of use backflow protection, but additional security is required because there remains a concern that in the event of backflow, the risk to public health would be significant.

The decision to permit installation of a temporary device, and the level of protection required to be offered by that device, is at the discretion of the water supplier and depends on the risk assessment for the installation. Further details and advice are given in the WRAS Information and Guidance Note 9-04-5, 'Report of the Expert Group on the Risk of Contamination of the Public Water Supply by Backflow' (see *Further Information*).

8. Further Information

The Water Supply [Water Fittings] Regulations 1999: Statutory Instruments SI 1999 No.1148 and 1506. The text is available from the Government website (*see below*).

Government Guidance Document relating to Schedules 1 and 2 of the Water Fittings Regulations, available from the Government website.

The Government website is www.defra.gov.uk/environment/water/industry/wsregs99/index.htm

Scottish Water Byelaws 2004: Copies available from Scottish Water.

The Water Regulations Guide gives the text of the Water Fittings Regulations, Scottish Water Byelaws, Government Guidance to the Regulations and the Water Industry's recommendations for complying with the regulations. It is published by and available from WRAS.

The Water Fittings and Materials Directory lists products which have been tested and approved by the Water Suppliers for their compliance with the regulations. Available on-line via the WRAS website.

Information and Guidance Notes are available on the WRAS website (www.wras.co.uk).

9. Addresses

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