BACKFLOW RISK ADVICE

SCHOOLS, COLLEGES & HIGHER EDUCATION ESTABLISHMENTS

December 2018

WRAS
WATER REGULATIONS ADVISORY SCHEME

CONTENTS

The Water Fittings Regulations 2

Introduction
How they apply to schools
Responsibilities of water suppliers

The contamination risks 3

Contamination of drinking water
Backflow risks in schools

Backflow prevention arrangements 4

Scope
School laboratories
Backflow protection
Storage cisterns
Tap gaps
Laboratory taps
Type DC arrangement
Check valves
Reduced pressure zone (RPZ) valves
Examples of backflow risks in schools
- Distillation equipment
- Eye wash baths
- Kitchens
- Water using appliance in school laboratories and technician preparation areas
- Swimming pools
- Recycled and private water supplies

Summary 9

Key points to remember

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Further copies can be obtained from the WRAS website www.wras.co.uk

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BACKFLOW RISK ADVICE FOR SCHOOLS, COLLEGES & HIGHER EDUCATION ESTABLISHMENTS

1 THE WATER FITTINGS REGULATIONS

Introduction

The Water Supply (Water Fittings) Regulations 1999, the Water Supply (Water Fittings) (Scotland) Byelaws 2014 and the Water Supply (Water Fittings) Regulations (Northern Ireland) 2009, here after referred to as the regulations, are national requirements enforced by water undertakers, here after referred to as water suppliers.

The regulations apply to all water fittings and appliances receiving water supplied by a water supplier, setting requirements for design, installation, use and maintenance. Their purpose is to safeguard public health and conserve water through the prevention of contamination, waste, misuse and undue consumption of water supplies.

Water suppliers are committed to helping those involved in designing, building, maintaining and operating plumbing systems to understand how to comply with the regulations. The primary focus of this booklet is preventing contamination by backflow.

The term ‘school’ is used in reference to schools, colleges and higher education establishments excluding universities.

How do they apply to schools?

The regulations apply to all premises, including schools, which receive water supplied by a water supplier.

Failure to comply with the regulations may result in prosecution as it is a criminal offence if you fail to do so. Under the regulations it is a legal requirement to provide the local water supplier with advanced notification of any proposed work to the plumbing system in a school.

For further information about notification refer to the WRAS leaflet ‘Information on notification of proposed plumbing work’ available from the WRAS website www.wras.co.uk.

The regulations require all water fittings to be of an appropriate quality and standard and be suitable for the circumstances in which they are used. There are a number of specific requirements for water fittings in respect of both mechanical performance and the materials of construction. For further information contact your water supplier or refer to the WRAS website.

Water Suppliers always recommend that schools use an approved contractor for any plumbing work. One of the benefits of using an approved contractor is that they will provide a certificate of compliance which can be used as a legal defence if their work is found to be non-compliant. For further information about approved contractors contact your water supplier or refer to the WaterSafe website www.watersafe.org.uk

Responsibilities of water suppliers

Water suppliers, have the statutory duty to enforce the regulations in their area of water supply. In addition to granting consent for proposed work water suppliers carry out a range of inspection activities on both new and existing premises to ensure compliance.

2 THE CONTAMINATION RISKS

Contamination of drinking water

Water suppliers are legally required to ensure that the water they supply for domestic purposes (drinking, washing and food preparation), is wholesome. Contamination occurs when there is a change in water quality irrespective of whether or not it is harmful to health.

If the water supply in a school were to be contaminated it would potentially pose a risk to the health and wellbeing of not only the students and staff on site but could also, if it entered the public water supply, affect public health in the wider community.

The regulations identify five categories of contamination risk, reflecting the impact and risk to health. These range from no risk (fluid category 1) to serious health hazard (fluid category 5). For further information refer to the 'Fluid Categories explained' information note published available from the WRAS website www.wras.co.uk.

Backflow risks in schools

Contamination of the public water supply by backflow is a very real possibility. To address this risk to public health the regulations make it a requirement for all installations to incorporate adequate backflow protection to prevent backflow from any appliance, fitting or process.

The Regulator's Specification for backflow prevention arrangements and devices identifies the types of backflow protection that can be used for this purpose and stipulates when these are considered acceptable.

A risk assessment of individual elements making up a water supply system in a school will be required to determine the type and level of risk posed. This can result in different categorisations of risk for the same fittings used in different installations. Water suppliers may be willing to consider a number of elements as making up a system. For example, installations in a school laboratory and preparation room as one system (see Fig 1 for detail).

For further information on backflow protection in schools refer to the interpretations published on the 'Interpretations and Advice' page on the WRAS website or your local water supplier.

Table 1: examples of installations posing backflow risks in schools: the actual categorisation of risk will be dependent upon the outcome of a risk assessment.

Laboratories & food technology rooms	
Taps Fume cupboards Autoclaves Distillation/Water purification	Dish washers Washing machines Eye washes and safety showers Laboratory equipment – water jacket condensers, filter pumps etc.
Sports/leisure facilities	
Swimming pool Showers	
Kitchen/ canteen	
Taps Steam ovens Potato peelers Waste disposal units	Dish washers Washing machines Bain marie /food warming cabinets Chemical dosing units
Outside installations	
Sports ground irrigation systems Hose union taps	Nature ponds (with top up) Water features
Other water systems	
Firefighting equipment Heating system Water heaters Water softeners/conditioners Drinking fountains	Air conditioning Private water supplies Recycled water systems Toilet facilities Vending machines

3 BACKFLOW PREVENTION ARRANGEMENTS

Scope

This document details the backflow prevention arrangements for installations supplying water for non-domestic use only, for example in a school laboratory. It excludes systems supplying water for domestic purposes such as drinking and hand washing. (A definition for domestic purposes is given in section 218 of the Water Industry Act and equivalent legislation in Scotland and Northern Ireland.)

School Laboratories

Water use in a school laboratory is classed as non-domestic use.

Because high risk contaminants are likely to be present in a school laboratory the distribution system supplying water to laboratories must be separated by appropriate backflow protection from that supplying water for domestic purposes. This can be achieved in a number of ways, which include those described below.

Backflow protection

The regulations require that every plumbing system be protected against backflow by adequate point of use backflow protection. This can be provided in a number of ways. By an appropriate air or tap gap arrangement or an appropriate mechanical backflow prevention device.

The suitability of backflow prevention arrangements is dependent upon many factors. As some have operational limitations it is recommended that you always check with your local water supplier to make sure that an arrangement is suitable for the intended application.

If high risk contaminants are likely to be present in any system, because these represent a greater risk to health, in addition to any point of use protection the water supplier can also require the installation of zone or wholesite backflow protection.

Storage cisterns

A dedicated storage cistern fed by a type AA or Type AB air gap, may be used as a means of providing backflow protection for a system supplying water for non-domestic use to a school laboratory. (Dedicated storage cisterns are sometimes referred to as break cisterns or tanks, not to be confused with a cold water storage cistern supplying drinking water.)

Having more than one outlet from such a dedicated storage cistern, supplying different installations in a laboratory, is permitted (as shown is Figure 1). A storage cistern being used to supply water for domestic purposes (drinking, cooking, bathing etc.) may not be used to supply laboratories.

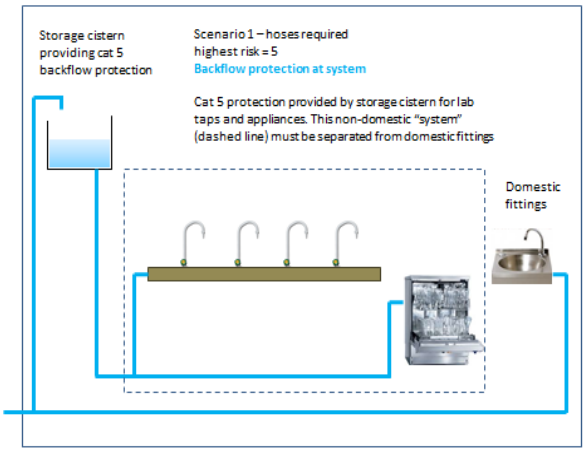

Fig 1: Storage cistern providing backflow protection to multiple installations in a laboratory

Fig 2: Storage cistern (break tank) supplying school laboratory

If the gravity-fed flow from the cistern is inadequate, the installation of a booster pump on the supply from it may be an option. However the water supplier's consent will be required for a pump which can deliver more than 12 litres per minutes.

Because dedicated storage cisterns provide the backflow protection that safeguards the health and wellbeing of those within a school, and potentially the wider community, it is essential to notify the local water supplier of any proposed changes to them. They should never be removed without the water supplier's consent.

There may be opportunity for a school to limit the need for large storage cisterns (as shown in Fig 3: scenario A). A school can identify certain laboratories where hose union taps are required and others where they are not (as shown in Fig 3: scenario B). Those laboratories which do not require a hose union tap (e.g. physics laboratories) can then simply remove the facility to attach a hose (shown in Figure 6).

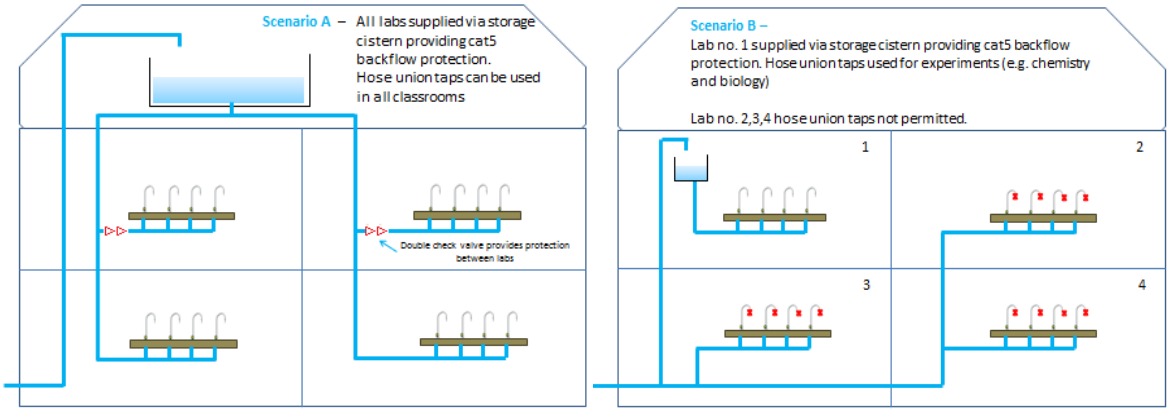

Fig 3: Storage cisterns can provide backflow protection to all labs and non-domestic fittings (Scenario A) or can be sized to provide "dedicated" backflow protection to a particular lab e.g. where hoses are required on lab taps (Scenario B).

Tap gaps

There are two types of tap gap, Type AUK2 and AUK3. Both only provide protection against back siphonage. A tap gap relies upon maintaining a defined gap between the tap outlet or any hose/shower head and the spillover level of the sink, bowl or receptacle below it.

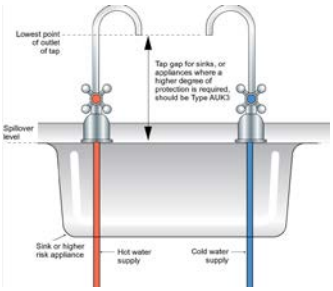

Fig 4: tap gap

Where a system, supplied via a tap, is categorised as a fluid category 5 risk the point of use protection may be provided by means of a Type AUK3 tap gap. Type AUK2 tap gaps are only considered adequate for fluid category 3 risks. Please refer to the Regulators Specification for backflow for further information.

It is essential that users are made aware of the need to maintain this air gap when using taps, especially when hoses can be attached.

Figure 5: hose union taps are only permitted when backflow protection is in place (e.g. supplied from a storage cistern). The hose compromises the tap gap.

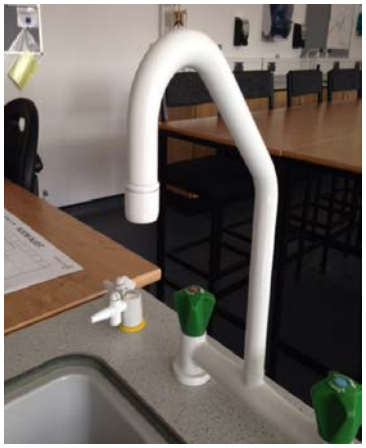

Figure 6: non concussive hose union taps (sometimes called hoseless taps) must be fitted in Fig 3: Scenario B – rooms 2, 3, &4. The tap gap must be maintained at all times

Systems in school laboratories have the potential to pose a significant contamination risk. Taps above laboratory sinks are a fluid category 5 risk.

Laboratory taps are usually designed to maintain a Type AUK3 tap gap between the spout outlet and the spillover level of the sink or any receptacle below. A receptacle includes any flask or beaker. Laboratory taps are often connected to laboratory equipment which can pose their own backflow risk.

Compromising the tap gap commonly occurs when an attached hose becomes submerged in a flask or receptacle, or is used to connect the tap to apparatus as part of an experiment, the latter of these having the potential to subject the system to contamination by backflow. In both circumstances a site-specific risk assessment will be necessary to determine the risk posed and the level of backflow protection required.

Fig 7: attaching laboratory equipment to lab tap compromises the “tap gap” – backflow protection is required e.g. supply from a storage cistern

Type DC arrangement

A type DC arrangement is a form of fluid category 5 backflow protection, formed by installing a specific design of pipe interrupter in a particular way. The installation of compliant pipe interrupter on the outlets of laboratory tap(s) may be deemed as meeting the requirement for category 5 backflow protection. To be accepted as providing a Type DC arrangement a distance of at least 150 mm must be maintained between the air vents of a permanently attached pipe interrupter and spillover level of sink or any receptacle below. The flow of water must be in a vertical downwards direction and there must be no restriction on the outlets e.g. no lab apparatus. Any obstruction or interference with the air apertures, such as taping up or plugging, will eliminate the backflow protection placing the water supply at risk. (For further information refer to interpretation B41 published on the ‘Interpretations and Advice’ page on the WRAS website.

For these reasons, this arrangement is unlikely to be suitable for all applications in school laboratories, including those school science experiments which restrict the flow.

For example, use of a Liebig condenser whereby restricting the flow results in water discharging through the DC device. Taps must then be supplied via an alternative form of appropriate backflow protection (e.g. storage cistern).

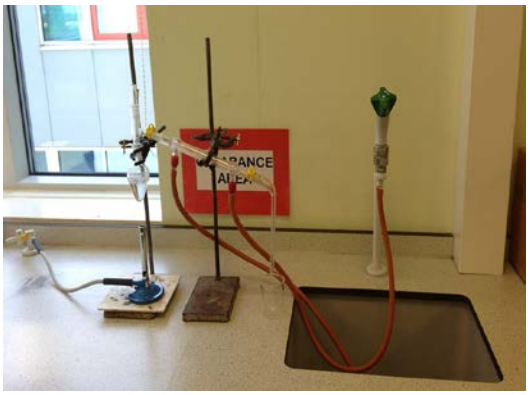

Fig 8: DC devices are not designed to provide sufficient pressure to laboratory equipment. Restricting the outlet of the DC device will cause water to discharge through the device

Fig 9: Any obstruction or interference with the air apertures, such as taping up or plugging, will eliminate the backflow protection placing the water supply at risk

Check valves

There are two types of check valves, a double check valve (offering up to fluid category 3), and a single check valve (offering up to fluid category 2) backflow protection against both back pressure and back siphonage. Double check valves are one of the most common forms of backflow protection used on a wide a range of systems.

Fig 10: reduced pressure zone (RPZ) valve

Reduced Pressure Zone (RPZ) Valves

RPZ valves, or Type BA devices, provide backflow protection up to fluid category 4 against both back pressure and back siphonage. In a school, a fluid category 4 risk could typically be presented by the heating system.

There is an ongoing cost for RPZ valves as a condition of their installation is that they are regularly tested (usually annually) by a recognised RPZ tester. Evidence of their ongoing compliance must be submitted to the water supplier. For further information refer to the RPZ AIM published on the WRAS website.

Examples of backflow risks in schools

Distillation equipment

Equipment used for the distillation of water is considered to be a fluid category 3 risk.

However if distillation equipment used in a school laboratory discharges into a sink without maintaining a AUK3 tap gap it will be categorised as a fluid category 5 risk.

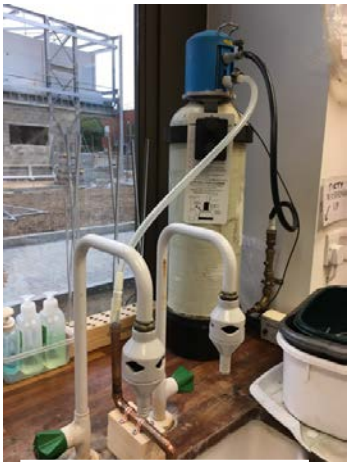

Fig 11: Distillation equipment in a school lab requires a double check valve on the supply

Eye wash baths

BS EN 15154 requires water for safety devices to be wholesome and supplied from a dedicated known clean source. Whilst it is acceptable for eye wash baths to be fed from the same storage cistern as that supplying other laboratory equipment, it is not recommended.

Where a permanently connected eye wash arrangement maintains an appropriate tap gap above the spillover level of the sink or any receptacle below, the installation of a single check valve will be required.

Kitchens

Catering equipment, such as potato rumblers, pre-wash taps and steaming ovens with a direct connection to mains pose a contamination risk, especially if they have outlets that can be splashed or submerged. To comply with the regulations all water using appliances must have adequate backflow protection. Many of the water using appliances installed in a school kitchen are categorised as a fluid category 5 risk. They commonly, but not always, incorporate suitable backflow protection: those which do not need to be supplied via appropriate backflow protection.

Fig 12: examples of equipment typically found in school kitchens

Water using appliances used in school laboratories and technical preparation areas:

Dish washers and washing machines used in these areas are deemed to be for non-domestic use and require a minimum of fluid category 4 backflow protection, however water undertakers reserve the right to categorise them as a fluid category 5 risk. As shown in Figure 14, with the water undertakers consent these appliances can be supplied via the same storage cistern as that supplying and providing backflow protection to lab taps.

Fig 13: examples of a dishwasher used for domestic and non-domestic purposes within the same school building.

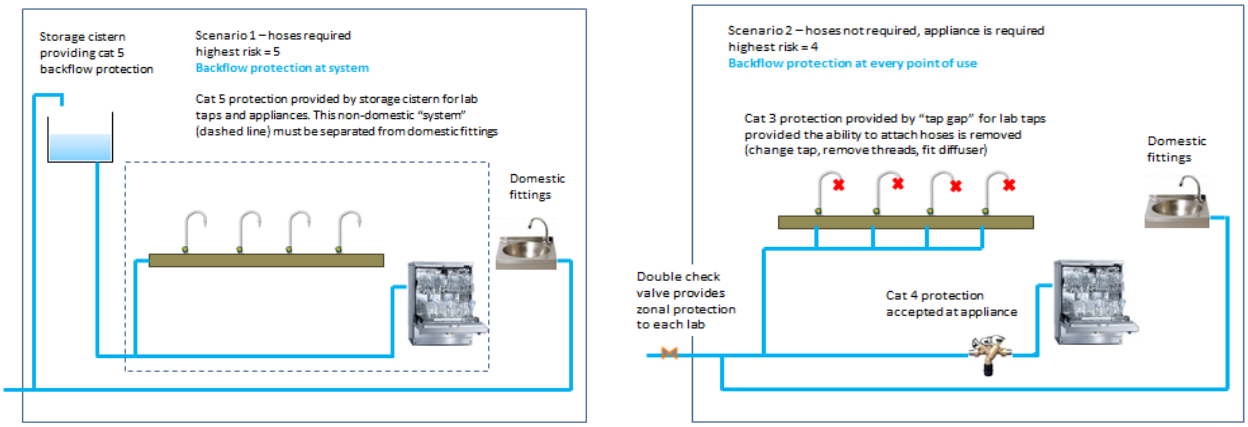

Fig 14: examples of a how backflow protection can be provided for appliances in schools.

Swimming pools

Swimming pool water is categorised as a fluid category 5 risk. To ensure that there is no risk of pool water or treatment chemicals contaminating the drinking water supply appropriate backflow protection must be installed. Swimming pool top ups and back wash systems are categorised as fluid category 5 risks requiring fluid category 5 backflow protection, this is usually provided by means of a break cistern supplied via a Type AA or AB air gap. Treatment chemicals used in plant room systems need to be risk assessed to determine the appropriate level of backflow protection required for treatment systems.

Fig 15: examples of equipment found in swimming pool plant rooms.

Recycled and private water supplies

Pipes carrying water from the public water supply must never be connected to pipes or fittings conveying water from another source, such as a private supply, rainwater or grey water systems unless appropriate backflow protection is in place.

Where waters from alternative sources are to be used with water supplied by a water supplier, the supplier's water must be discharged into a storage cistern via a fluid category 5 backflow prevention arrangement as shown below. To reduce the risk of contamination it is important that all pipework and appliances should be marked in accordance with the requirements of BS 1710: 2014.

Fig 16: example of a cross connection between a rainwater and drinking water system

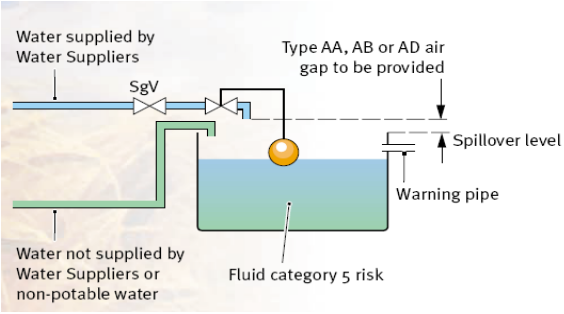

Fig 17: example of separating public water supplies from alternative supplies e.g. recycled and private supplies

Service identifiers for water services (based on table F.2 in BS 1710:2014):

Pipe contents	Basic identification colour	Safety and Code Colours			Basic identification colour
Source of water					
Potable water derived from the public water supply (i.e. water undertaker)	Green	Auxiliary blue			Green
Potable water derived from any other source (e.g. boreholes)	Green	Flint grey			Green
Water quality					
Non-potable water system derived from any other	Green	Flint grey	Black	Flint grey	Green
Non-potable water system derived from the public water supply	Green	Auxiliary blue	Black	Auxiliary blue	Green

Colours in these examples are for illustration only. Permission to reproduce extracts from British Standards has been granted by BSI Standards Limited.

Fig 18: examples of marking requirements set out in BS 1710:2014

4 SUMMARY

The design and installation of water fittings and plumbing systems in schools plays a key role in protecting public health. Water suppliers recognise that the best way to improve compliance with the Regulations is through education and advice. It is the legal responsibility of the school, and anyone who installs plumbing fittings in schools, to ensure that the plumbing systems comply with the regulations.

Five key points to remember-

- ✓ use an approved contractor to carry out plumbing work;
- ✓ notify the water supplier of new installations and any alterations to existing plumbing systems;
- ✓ ensure water fittings are of appropriate quality and standard;
- ✓ plumbing systems must be installed, maintained and used in accordance with the requirements of the Regulations;
- ✓ water in the plumbing system must not become contaminated i.e. there must be adequate backflow prevention arrangements to safeguard water supply quality.

The Water Regulations Guide, available from WRAS and approved by water suppliers provides guidance in greater detail and your local water supplier can provide further advice.

Water Suppliers always recommend that schools use an approved contractor for any plumbing work. One of the benefits of using an approved contractor is that they will provide a certificate of compliance which can be used as a legal defence if their work is found to be non-compliant. For further information about approved contractors contact your water supplier or refer to the WaterSafe website www.watersafe.org.uk