

A is for AIR GAP

An air gap is required for backsiphonage/backpressure protection of fluids contained in fluid category 5. These fluids represent a serious health hazard because of the concentration of pathogenic organisms, radioactive or very toxic substances including any fluid containing human waste, butchery waste or pathogens from any other source. An air gap is described as: a visible, unobstructed and complete physical air break between the lowest level of water discharge and the level of potentially contaminated fluid downstream within a cistern, vessel, fitting or appliance. The gap should be not less than 20mm or twice the internal diameter of the inlet pipe whichever is the greater, with the water discharging at not more than 15" from the vertical centerline of the water stream.

There are various types of air gaps contained in the Regulations, with the majority involving storage cisterns. However, a type AD device is a non-mechanical arrangement of water fittings with a horizontal injector containing a physical air gap of a minimum 20mm. This device is commonly known as a 'jump jet' and can be used to protect against both back-pressure and back-siphonage. Please note that not all air gaps can be used on category 5 fluids.

B is for BACKFLOW

Backflow means a flow upstream that is contrary to the intended normal direction, which could lead to the contamination of the water supply through back-pressure or back-siphonage.

Back-pressure is the reversal of flow in a pipe caused by an increase of pressure in the system. The expansion of water from an unvented hot water heater passing back into the supply pipe is a good example.

Back-siphonage is a backflow caused by the siphonage of water from an appliance back into the pipe that feeds it. An example that is often used describes the hosepipe from an unprotected garden tap placed in a watering can. The tap is in use when a break in the mains water supply occurs and the contents of the watering can is siphoned back into the supply system. Backflow protection is a large section within the Regulations, with the five fluid categories determining the level of protection required. Avoidance of backflow should be achieved by good system design and the provision of a suitable backflow prevention device, dependent upon the fluid category downstream of the device.

C is for COLOUR CODING

and the prevention of cross connections to unwholesome water: Any water fitting conveying any fluid, not supplied by a water undertaker, (rain or recycled) or any fluid that is not wholesome (fire fighting), shall be clearly identified so as to be easily distinguished from any supply or distributing pipe.

These pipes should be colour coded with a series of coloured bands, in accordance with BS 1710, to identify the pipe and service for which it is used, helping to prevent cross connections. The identification marks can be made up of one or more marks, such as green, auxiliary blue, green, as used to identify drinking water.

D is for DEZINCIFICATION

This is a condition where all the zinc content of the brass fitting has been destroyed, leaving the copper behind and the remaining brass in a porous and brittle condition. It often manifests itself in the form of hollow shaped moulds of zinc corrosion products, at the point where the destruction of the zinc is taking place. This condition occurs due to aggressive water in the surrounding soil, causing electrolytic corrosion. Because of this the Water Regulations state that all concealed water fittings, except terminal fittings, (including those buried underground), together with backflow prevention devices, are to be manufactured of gunmetal or other dezincification resistant materials.

Dezincification resistant fittings should be of DRA quality and marked with the symbols, DRA or CR. Gunmetal, made of copper and tin, contains no zinc and is therefore immune to dezincification.

E is for ENERGY CONSERVATION

As with the old Water Byelaws, the Regulations commit to reduce or prevent wastage or excessive use of water. In addition, thermal insulation, preventing heat losses from hot water circulation systems are also addressed.

Amongst the water saving devices in the regulations are: - 6 litre flushing cisterns, control devices for urinals, showers, water consumption figures for domestic appliances such as washing machines and the Inspectors favourite, waste plugs. Every bath, wash basin or similar appliance shall be provided with a water tight and readily accessible plug or other device capable of closing the waste outlet. A plug! There are exceptions of course, such as shower trays, drinking fountains, medical appliances and others, but despite frequent floods in the wetter months around the country, water conservation is a real issue.

F is for FREEZING

- Every water fitting shall be so constructed and **installed** as to inhibit damage by freezing or any other cause.
- Freezing point, is the physical change at which a liquid changes into a solid. Water freezes at 0°C and expands by approximately 1/10th in volume while changing to ice.

All cold water fittings located within the building but outside the thermal envelope or those outside the building, should be protected against damage from freezing. In domestic and other types of premises, where habitable rooms are normally heated for up to 12 hours each day, fittings in unheated rooms need to be protected from freezing, particularly overnight even though they are within the envelope of the heated accommodation e.g. cloakrooms, storerooms or utility rooms. The insulation thickness required should provide a minimum of 12 hours protection. An absence of more than 24 hours is not considered normal occupation.

For fittings installed outside a building, inside any unheated part of a building or outside the thermal envelope e.g. under suspended ground floors, above the level of ceiling insulation in a roof space, domestic garages or externally above ground level, the thickness of insulation should be substantially increased. If in doubt, the advice of insulation specialists or manufacturers should be obtained.

Where low temperatures persist, insulation will only delay the onset of freezing. Its efficiency is dependent upon its thickness and thermal conductivity in relation to the size of pipe, the time of exposure, location and possible wind chill factor.

An easy to follow table is contained within the WRAS guide.

G is for **GREY WATER**

Grey water is covered in Schedule 2: Paragraph 14 (1), prevention of cross connection to unwholesome water. Grey water is classed as water that originates from the mains wholesome supply, which has been used for bathing, washing or washing dishes. Treated grey water, also known as recycled or reclaimed water is grey water that has been treated so that its quality is suitable for particular specified purposes, such as toilet flushing, irrigation etc.

Grey water systems are available, to collect, store, treat and distribute this water to help reduce both the amount of mains water used by a premise as well as the amount of water entering the sewer. Grey water and its recycling systems are classed as a category 5 fluid risk, due to the likelihood of pathogenic micro-organisms being in the used water. Therefore, Regulation 14 (1) states, any water fitting conveying rain water, recycled water or any fluid other than water supplied by a water undertaker, or any fluid that is not wholesome, shall be clearly identified so as to be easily distinguished from any supply pipe or distributing pipe. Cross connection could lead to serious health implications. Two other terms that are currently used within this subject area are Black water, defined as domestic waste including sewage and Green water, is the term for treated black water.

H is for **HOT WATER**

There are two apparently conflicting factors that need to be taken into consideration when designing or installing hot water installations. Firstly the temperature of the hot water system should be high enough to stop naturally occurring bacteria in the water supply from multiplying to a level that will cause health problems to susceptible people and secondly recommendations for maximum outlet temperatures to prevent scalding. The guidance states that hot water should be stored at a temperature of not less than 60°C and distributed at a temperature of not less than 55°C. Where practicable the hot water distribution system should be designed and installed to provide the required flow of water to a terminal fitting at a water temperature of not less than 50°C and within 30 seconds after fully opening the tap. This requirement can often be achieved by careful design and in larger installations by the use of a secondary circulation. The guide also states that this criteria may not be achievable where hot water is provided by instantaneous or combination boilers.

I is for **IRRIGATION SYSTEMS**

In house garden situations or recreational areas, (excluding agricultural and horticultural use) that have pop-up sprinklers but do not use insecticide or fertiliser additives, should be protected by a BA device or no less effective device (RPZ valve). Mini irrigation systems installed in house garden situations, require backflow protection at the hose union tap (usually a double check valve), combined with a pipe interrupter with atmospheric vent, positioned at the hose union tap or at least 300mm above the delivery point (porous hose).

J is for **JOINTS, SOLDERING**

There has been a spate of reports in various magazines with regard to leaded solder infringements on wholesome water supplies. The regulations are quite clear, stating that soft solder for capillary jointing of copper or copper alloy water fittings should consist of Tin/Copper Alloy or Tin/Silver Alloy. To you and me, lead free! However, where a wholesome supply is not necessary - such as a heating system - the recommendations suggest that the above does not apply. This is where the problems start, with two different types of solder in the tool bag; the possibility of a mix up is obvious. Please be careful and don't be tempted. Once the correct solder has been used to complete the joint successfully, I know you all remove the green

trails of excess flux - but what about inside the pipe. r2.12 states that only the minimum amount of flux required to make a successful joint shall be used and the residue removed by flushing.

K is for **KNOW YOUR REGS!**

As we all know, at present there is no legal requirement for a person installing or repairing water services to be suitably qualified. However, anyone who contravenes the Water Regulations can be prosecuted and if found guilty is liable to a fine for each separate offence. The first successful prosecution has taken place in the Southwest just recently. I am sure that the great majority of home-owners are unaware that they can commit an offence if they use a fitting which does not comply with Regulations. Therefore, knowledge of the Regulations is not only essential for your own good but also a safeguard for your customers. (Should you be promoting this fact?). Knowledge can be gained from centres around the UK or by distance learning on either a BPEC/WRAS or WTI/C&G course. Once you have gained this knowledge and if you satisfy the other criteria you have the option of becoming an Approved Contractor. (Please contact the Institute for further details on the IOP ACP scheme).

L is for **LOCATION**

This heading includes that old chestnut of pipes in walls and solid floors. g7.1 states that unless they are located in an internal wall which is not a solid wall, a chase or duct which may be readily exposed, or under a suspended floor which may if necessary, be readily removed and replaced, or to which there is access, water fittings should not be located in the cavity of a cavity wall, or embedded in any wall or solid floor, or installed below a suspended or solid floor at ground level! So heating pipes in a chase are permissible provided they are insulated; there is room for expansion and contraction; a minimum number of fittings are used and (the key words) may be readily exposed. This suggests that a duct is required for hot and cold pipe work but a quick check with the local Water Company may be advisable.

M is for **MINIMUM SIZE OF WARNING/OVERFLOW PIPE**

Here's the scenario. One newly installed cold-water cistern. The locking nut securing the float to the arm of the 15mm float operated valve wasn't tightened correctly, resulting in the float working loose and dropping off. The mains water supply, now unrestricted flows into the cistern. The question is, does the 22mm warning/overflow cope with the onrushing water or does the water continue to rise with the inevitable consequences? In reality, probably the latter! While this size pipe can cope with the failure of a worn washer, piece of dirt in the valve etc, a rethink for valve failures was required. So G16.10 states a warning/overflow pipe should be not less than 19mm internal diameter but the actual internal diameter of the pipe(s) installed should be capable of taking the possible flow in the pipe arising from any failure of the inlet valve. What this really means is that a pipe sizing exercise is now required to determine the correct size of warning/overflow. To complicate the equation slightly, any possible restrictions caused by any insect screen will need to be taken into account. Most of us will have seen the mess caused by the above scenario and you must agree that installing a warning/overflow one size larger than the float valve may not be enough and therefore this little extra work should be acceptable.

N is for **NOTIFICATION**

Regulation 5 requires a person who proposes to install water fittings of a certain type, to notify the Water Company and not commence work without their consent. This is because if they think it necessary, they can withhold consent or grant it with certain conditions. This requirement does not apply to some fittings, which are installed by an Approved Contractor Person. So those of you who are members of the IOP ACP or other

recognised schemes, can take advantage of these benefits.

Notification includes a description of the proposed work or material change of use, in some cases a plan of those parts of the premises to which the proposal relates and a diagram showing the pipework and fittings to be installed. The Water Company has 10 working days to respond, after which consent will have been deemed as granted.

O is for **OUTSIDE TAP**

As before with the old byelaws, taps to which hoses are or may be connected and are in house garden locations are to be protected against backflow by means of a double check valve. However G15.20 now states that the double check valve should be located inside the building to protect it from freezing. This is because double check valves have been shown to be susceptible to frost damage. This is not quite the end of the hose union tap that incorporates the double check valve because where an existing tap is to be replaced, it may not be practicable or possible to locate the double check valve within the building. In such cases the original tap may be replaced by the afore mentioned fitting providing there is a servicing valve to enable the tap (and double check valve) to be drained of water in freezing weather conditions (R15.21).

P is for **PROVISION OF SERVICING VALVES/DRAIN TAPS**

A common query from members of the public is in regard to providing servicing valves to baths and wash basins. This of course is not necessary, but does apply to the inlets to all float operated valves, cisterns, washing machines, water heaters, water softeners and other similar appliances. What you may not be aware of however, is the fact that R11.1 states that the provision of servicing valves also applies to any mechanical backflow prevention device protecting against fluid category 4 or 5. These valves should be readily accessible and as close as is reasonably practical to the appliance.

G11.4 starts off by stating that **sufficient** (how many?) draining taps should be provided but gains clarity with, to facilitate the draining of **ALL** supply and distributing pipes within the building. While much of the system can be emptied through kitchen, utility room taps etc. there may be various locations that require drain taps, to drain the lower points. However, G11.6 states that draining taps should not be buried or covered with soil or installed so that they are submerged, or likely to be submerged.

Q is for **QUALITY OF WATER**

Wholesome water was a term used to describe water fit to drink when I was an apprentice, studying at college. Over a decade ago and up to the current Regulations, I have used the term potable water to describe water fit to drink in specifications and other literature. To clarify, the term wholesome water is equivalent to potable water (i.e. fit to drink) but potable is a term no longer used in the Regulations. Wholesome water is described in the Regulations as: water supplied by a Water Supplier and complying with the requirements of regulations made under Section 67 of the Water Industry Act 1991 (water quality). Although wholesome water is the preferred term, I believe that potable water is still acceptable in certain circumstances, such as when referring to stored water that is used for drinking purposes.

R is for **REDUNDANT FITTINGS**

G11.7. Any draw-off fitting that is permanently removed from the installation should have the branch pipe servicing the fitting disconnected at its source.

This is to prevent contamination due to water in any unused pipework becoming stagnant. Therefore, the capping off of that old supply as it enters the out buildings is not acceptable. This also applies to fittings

that remain connected but are no longer in use. For instance that old school toilet that is no longer in operation due to smaller pupil numbers and is now being used for storage, or the old supply to the cold water storage cistern that is now redundant due to the installation of a new combi boiler. Even in the case of a possible future extension to the property and its services, it is not permissible to lay branch pipes, which terminate in stop ends unless there is a physical break at the junction with the supply pipe. However, if a fitting is in need of repair or replacement, a period not exceeding 60 days is allowable.

S is for **STORAGE CISTERN**

We have all used or worked to the term Byelaw 30, whether specifying it in a contract or simply asking the plumber's merchant for a Byelaw 30 kit to use in connection with the cold water storage cistern. As the Byelaws no longer exist, what phrase are we using now? To be correct, you would have to ask for a Schedule 2, section 7, paragraph 16, G16.13/R16.13.1/2/3 kit. In reality, a G16.13 kit may be a more likely option!

However, whether Byelaw or Regulation, the principles have stayed the same. Cisterns storing water for domestic purposes still need to be provided with warning and overflow connections as appropriate, which exclude the ingress of insects. They should have a rigid, close fitting and securely fixed cover, which is not airtight but excludes light and insects from the cistern. Be made of a material or materials which will not contaminate any water that condenses on its underside and in the case of a cistern storing more than 1000 litres, be supplied with a securely fixed access cover for maintenance purposes, not necessitating the removal of the whole cover. R16.13.3 provides information on insulating the cistern, not only from freezing but also from heat gain, as the ideal temperature for stored water is less than 20°C.

T is for **TESTING**

Schedule 2, section 4, paragraph 12, provides information on 'the test pressure', stating that the water system shall be capable of withstanding an internal water pressure not less than 1.5 times the maximum pressure to which the installation or relevant part is to be subjected to in operation.

This Regulation applies to both above ground and underground pipework. If pipework is to be buried or difficult to access, a test before the pipework is covered would be a sensible option, with a final test upon completion of the installation and all builders work. This requires the sealing of all outlets, and the capping off of all float valves. If for any reason defects are revealed, these obviously need to be rectified and retesting carried out until the system is deemed satisfactory. The test methods are contained in G12.3.

U is for **URINAL FLUSHING DEVICES**

As with WC's, The Regulations have changed, to allow for modern practices and future innovation. It is no longer necessary (but you can if you wish) to flush urinals via a flushing cistern, as a pressure flushing valve connected directly to a supply or distributing pipe can now be installed. They can be flushed either manually or automatically, provided that the flushing arrangement incorporates a backflow prevention device appropriate to fluid category 5. The recommended device is a pipe interrupter with permanent vent. The flushing valve should be installed so that the lowest vent aperture is not less than 150mm above the sparge outlet and not less than 300mm above the spillover level of the urinal. It is also recommended that a servicing valve be provided to each pressure-flushing valve, for maintenance purposes.

V is for **VISIBILITY OF DISCHARGE FROM WARNING PIPES**

Despite the flood (excuse the pun) of information, the WRAS Guide, manufacturers literature, Internet sites, numerous magazine articles and including above all else common sense, some (so-called) plumbers have not grasped the concept of the internal overflow. There have been reported instances of WC cisterns being installed without connection to the side or bottom entry overflow fittings. G25.6 states; except for pressure flushing cisterns, cisterns should be provided with a connection for a warning pipe, the outlet of which is to discharge in a prominent position, or other equally effective device. Whilst clearly visible, I would argue that water dripping onto a bathroom floor is not really a prominent position. The overflowing water must terminate safely and sensibly. A clearer interpretation comes from the Industry recommendations and are as follows:

- An internal overflow discharging into a WC pan (through the flushing mechanism).
- A warning pipe discharging into a flush pipe.
- A warning pipe discharging 150mm above the top edge of a WC pan, urinal channel or drainage gully.

When a prominent position is not possible, the no less effective device comes into play. These consist of:

- A mechanical device that disables the flush.
- An audible signal.
- A device that detects a rise in water level and closes the water supply.
- A visible warning such as a tundish, sight glass or indicator lamp.

Many would still prefer the warning pipe to terminate externally of the building and this is actually noted in clause R 16.9.

If in doubt, please contact your local Water Authority for clarification.

W is for **WASHING MACHINES AND OTHER APPLIANCES**

One of the many points that the Regulations have addressed, is water conservation. Schedule 2 Section 11 Paragraph 29 covers the water consumption of washing machines etc. The requirements were designed to limit the volumes of water used in a single cycle of operation, of certain domestic appliances.

G29.1 Domestic horizontal axis washing machines should not have water consumption per cycle greater than 27 l/kg of washload.

G29.2 Domestic washer-dryers should not have water consumption per cycle greater than 48 l/kg of washload.

G29.3 Domestic dishwashers should not have water consumption per cycle greater than 4.5 l/place setting. The Water Fittings and Materials Directory, published by WRAS, lists such appliances.

X is for **EXAMPLES OF FLUID CATEGORIES**

This list is not exhaustive, but is made up from commonly asked queries.

- Category 1 Wholesome water
- Category 2 Domestic softening plant, mixing of H&C supplies, ice machines
- Category 3 Heating water, baths and showers, domestic washing machines
- Category 4 Dairies, bottle washers, printing equipment, car washing plant
- Category 5 Bidets, drain cleaning plant, grey water systems, laboratories

For further information consult the WRAS guide or your local Water Company.

Y is for **Pen - Y - Fan (WRAS)**

I think it is appropriate, as we reach the last 2 letters of the alphabet, that I point you in the right direction for further details and/or answers, if required, on the Water Regulations. By Christmas 2000 the Water Regulations Advisory Scheme (WRAS) had published the first edition of the *Water Regulations Guide*, followed by a re-printed (second edition) in June 2001. If you do not have a copy of this indispensable guide for installers and designers and continue to follow the requirements of the old Byelaws, you could be installing illegally. If you are a member of the Institute of Plumbing you can buy the guide by contacting Head Office, tel : 01708 472 791. For non-members, please contact WRAS direct. In addition to the guide, WRAS also provide:

- a postal, telephone and e-mail advisory service
- arranges for the testing of water fittings and materials
- publishes the water fittings and materials directory and other guidance notes.

The contact details for WRAS are as follows:

Water Regulations Advisory Scheme
Fern Close
Pen-y-Fan Industrial Estate
Oakdale
Newport NP11 3EH

Tel: 01495 248 454
Fax: 01495 249 234
e-mail: info@wras.co.uk
website: www.wras.co.uk

Z is for **ZONE PROTECTION**

Zone protection is often used in non-domestic situations, such as chemical or medical premises, sometimes grouping together fittings of similar risk. G15.26 states, zone protection may be required in other than domestic premises where particular industrial, chemical or medical processes are undertaken. For instance, there could be an area in an elderly persons home that includes sluices, medic baths and commercial cloths washing equipment. The individual fittings could have their individual backflow protection and have additional zone protection between the mains supply and this particular area of risk, ensuring the quality of the wholesome supply for the rest of the building.

If you are training for a career in the plumbing and heating industry and wish to know more about membership of the Institute of Plumbing & Heating Engineering, please phone the Membership Department on 01708 463108 or email membership@iphe.org.uk.

