

Water Regulations Tutorial # 7 Washroom

Updated 23/12/13

Two principal objectives of the new Water Regulations are – conservation and greater harmonisation with mainland Europe. The latter means freedom of trade - which requires similar regulation requirements for fittings in order for a fitting to be acceptable to all EU member states. The most significant change in the UK is the allowance of non-siphonic flushing apparatus for WCs.

It is no longer necessary to flush WCs and urinals from flushing cisterns. It is permissible to flush from the mains supply pipe or domestic boosted cold water circuit providing the appropriate controls are fitted.

This whole subject is covered in detail - complete with colour illustrations and diagrams - in chapter 9 of the Water Regulations Guide.

WC FLUSH VOLUME

Schedule 2, paragraph 25 (1) (d) requires any type of flushing device installed from 1 January 2001 to have a maximum flush volume of 6 litres to a WC pan.

Dual flush cisterns were banned under the old byelaws but are now permitted again; providing – the maximum flush volume is 6 litres and the lesser volume is a maximum of two thirds of the greater volume - i.e. 4 litres if the greater volume is 6 litres.

The period from 1 July 1999 to 1 January 2001 was transitional and allowed the installation of either 7.5 or 6 litre cisterns.

METHODS OF FLUSHING WC PANS

Siphon - The original 1880 Thomas Crapper design remains the most popular method in the UK, since the siphon or “valveless” control is inherently reliable at not leaking. It does require a physical effort to operate and this is considered by some to be rather cumbersome and outdated.

Mechanical Valves – Outlet valves controlling the flow to the pan are now permitted. These are known as “Drop” or “Flap” valves. A mechanism is required to hold the valve open for the whole duration of the flush. This could be a solenoid valve with a “non-touch” electronic activation sensor. These mechanical sealing valves can leak and therefore waste a lot of water. Most cisterns fitted with this type of valve are manufactured with an internal overflow and an “overflow” condition may be relatively inconspicuous.

Pressure Flushing Cisterns – PFC’s have a pressure vessel in the cistern that utilises mains water pressure to compress the gas during filling. This stored energy is released during the flush to increase the velocity of water. This is used in some American States but is unlikely to be used widely over here.

Pressure Flushing Valves – FV’s allow the WC pan to be flushed without a cistern. The valve allows a predetermined quantity to be flushed. The flushing can be initiated manually or automatically – providing the maximum consumption rates are observed. The water is supplied either directly from the mains or boosted supply pipe or from a storage cistern via a distributing pipe. In both cases suitable backflow protection is required. This method is likely to be widely used in “non-house” buildings but flushing valves are not permitted in houses. *(Note - “Pressure Flushing Valves” will be shortened to “Flushing Valves” in this tutorial).*



DC Pipe Interrupter (model [DC257](#)) for a urinal – flush from the mains or cold boosted water without a cistern

BACKFLOW PROTECTION

The contents of a WC pan or urinal is Fluid Category 5 – the highest category – and therefore must be protected with either –

- AUK1 interposed cistern arrangement (i.e. gravity supply)
- DC Pipe Interrupter e.g. [model DC257](#).
- Type AB air gap (with booster pump)

A conventional WC suite will consist of a 6 litre cistern, float valve (with type AG air gap) and overflow arrangement. This creates a type AUK1 interposed cistern. In other words, the cistern can be supplied from a supply pipe or storage cistern and no additional backflow protection is required. Remember a servicing valve is required e.g. [model AFL](#).

A WC pan with no cistern, i.e. flushed by a flushing valve, should be supplied through any of the three arrangements listed above. The WRAS guidance clause R25.2 allows an interposed cistern (type AUK1) to be used. This is a storage cistern (with type AG air gap), which supplies water under gravity to the WC pan, urinal or bidet. A single distributing pipe (AKA down service) is acceptable according to G15.10 for flushing any number of WCs and urinals. This **distributing pipe** must **not** be used for washbasins or other applications. The same **cistern** may be used for the hand washbasins providing they are supplied from a separate distributing pipe from that cistern.



*“Ablution Plant”
(model [BTHW](#))
Delivers safe hot water
with Fluid Category 5
backflow prevention*

BIDETS AND ABLUTION HOSES

The Water Regulations identify ascending spray bidets and any hose used for toiletry purposes as Fluid Category 5, therefore requiring a suitable air gap arrangement. For hygiene reasons, bidets must be supplied with domestic water, meaning Fluid Category 1 (cold) or Fluid Category 2 (hot). In the case of a boosted system with the pump drawing water from a cistern with type AB air gap, this same cistern **cannot** be used for a bidet if it is already supplying the flushing valves to WC pans or urinals (assuming no DC Pipe Interrupters are used). This is because the cistern theoretically could be contaminated due to backflow from the WC pans and one would not want to wash one’s private parts with that! Arrow Valves’ Ablution Plant ([model BTHW](#)) provides point of use Fluid Category 5 backflow protection and delivers warm water at the required safe temperature to a bidet or Ablution hose adjacent to a WC. *This subject will be discussed further in tutorial 8.*

REGULATOR’S SPECIFICATION

Clause G25.11 states, *“All WC Pans and all flushing devices for WC pans should conform to a specification approved by the Regulator”*. This means a flushing arrangement and pan should be tested and approved as a suite rather than individually. This requirement does not apply to urinal bowls.

DESIGNER’S CHOICE

Consulting engineers generally design mains or boosted hot and cold water systems and gravity storage cisterns are rarely used these days for many good reasons. In this instance WC pans flushed with a flushing valve should be flushed from a **dedicated** cistern with type AB air gap. A booster pump will be required to restore pressure. A compact unit is available as “Boost-A-Break” [model BTAB](#). The duration of the flush should be controlled with a flushing valve. In view of the Regulator’s Specification, high flow demand, lack of flushing valves / large DC Pipe Interrupters, means few consulting engineers are using this technology for WC pans at present. This situation is quite different for urinals, where there are suitable approved fittings and “cisternless” urinals are being installed.



*“Boost-A-Break”
Break tank and pump set
with Type AB air gap
(model [BTAB](#)) for Fluid
Category 5. Flush WCs
or urinals without
additional backflow
protection. Supplied as
complete unit*

DC PIPE INTERRUPTERS

A DC Pipe Interrupter is a non-mechanical arrangement that provides Fluid Category 5 protection against backsiphonage (vacuum on the supply). It is not suitable for backpressure. It has a nozzle, which creates a jet. Downstream of this nozzle are several radial holes to atmosphere. It is clear that negligible restriction can exist downstream - otherwise water would simply come out the vent holes. No control valves are permitted downstream, and the Pipe Interrupter must be fitted at least 300 mm above the spillover level of a WC pan or urinal and 150 mm above the sparge pipe outlet of a urinal, and discharge vertically downwards. DC Pipe Interrupters must therefore be fitted to vertical pipes with the flow in a vertical downward direction.

Large Pipe Interrupters for WC pans are currently not available for UK use. When available, care should be taken with the design to avoid leakage from these devices. For large buildings, supplying water from a dedicated boosted circuit drawing water from a cistern with a type AB air gap is likely to be a better solution. Arrow Valves "Boost-A-Break" model BTAB Break Tank and Booster set meets the requirements with the minimum amount of space.

URINAL FLUSHING

The conventional method for flushing urinals using a flushing cistern is still acceptable. There is now a second method – flushing without a cistern from a supply pipe via a DC Pipe Interrupter.

Clause G25.9 states –

Urinals may be flushed with either:

- a. manual or automatically operated cistern; or*
- b. a pressure flushing valve directly connected to a supply or distributing pipe which is designed to flush the urinal, either directly manually or automatically, provided that the flushing arrangement incorporates a backflow arrangement or device appropriate to fluid category 5 (see Schedule 2: paragraph 15).*

Clause G25.13 states –

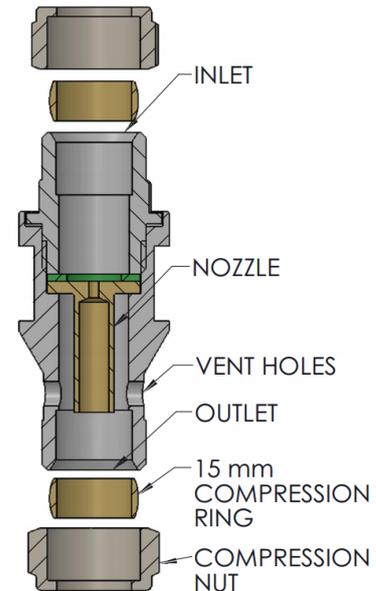
"Where manually or automatically operated pressure flushing valves are used for flushing urinals, the flushing valve should deliver a flush volume not exceeding 1.5 litres per bowl per position each time the device is operated."

Note – "supply" pipe means mains water (typically 2 – 4 bar at ground level). "Distributing" pipe is the down pipe from a storage cistern (10 m head = 1 bar). The boosted cold water circuit can be used to fill or flush WCs and urinals, providing appropriate backflow protection is provided – see backflow prevention.

FLUSHING WITHOUT A CISTERN (USING A FLUSHING VALVE)

This new method has several advantages compared with flushing cisterns. The operation is as follows - water is supplied from a supply pipe (mains) or the boosted cold water circuit. A low voltage solenoid valve controls the flow and backflow protection is afforded by a DC Pipe Interrupter. A large bore braided flexible hose links the pipe to the urinal sparge outlet.

An active Infra-red sensor is located above each bowl in the false wall (or in the ceiling), which senses a person. The sensor must see the user for 10 seconds - this prevents false operation when someone walks past. The controller will then operate the solenoid for the selected. One litre (1.5 legal max.) is a typical flush volume.



Section of Arrow Valves DC Pipe Interrupter (model [DC257](#)).

One device is used per urinal bowl.
Supply - mains or boosted water

FLUSHING URINALS FROM A CISTERN

This conventional arrangement consists of a cistern mounted above a single or group of urinals. Water gradually fills the cistern either at a continuous slow rate (through a “pet cock”) or modulated (turned on or off) at a higher flow rate. The cistern flushes once the water level reaches the self-siphon level.

AUTOMATIC URINAL FILLING RATE

Schedule 2, paragraph 25 states the legal requirements for WCs and urinals. This is repeated and reinforced by the two guidance clauses reproduced below -

Clause G25.12 states –

An automatically operated flushing cistern serving urinals should be filled with water at a rate not exceeding:

- a. 10 litres per hour per urinal bowl for a cistern serving a single urinal; or
- b. 7.5 litres per hour per urinal bowl or position or, as the case may be, for each 700 mm width of urinal slab for a cistern serving two or more urinals.

Clause G25.10 states –

“Unless a urinal cistern is manually operated, or fills and flushes by a device operated by an electronic sensor, pressure pad or no less suitable device which ensures that the urinal is only flushed after it is used, the inlet to the flushing cistern is to be controlled by a time switch opening an inlet valve or some other equally effective automatic device which regulates the periods during which the cistern may fill.”

There are three acceptable methods for preventing flushing when the urinals are not being used –

- Time switch and pet cock – this is a crude arrangement with many inherent limitations
- Hydraulic impulse device (original Cisterniser) – these devices rely on a man washing his hands after using the urinal. Providing the washbasin tap is taken off the same circuit as the device it should initiate a mechanical timer. If the user does not wash his hands or uses the hot tap the device will not work. Reliability is impaired with high calcium carbonate in the water. Electronic sensors are much better
- Electronic movement detectors – this method is technically superior to others. They can be battery operated (often providing more than 2 years life) or mains operated. Devices are available for controlling conventional flushing cisterns or flushing valves (no cistern required).



Cistern Flush Valve
([model CFVWW](#))

WATER COSTS

It has been common practice to flush a group of three urinal bowls simultaneously from one cistern. Possibly only one may have been used. The following example compares water charges with different control methods.

The table below illustrates the annual water cost for a typical building based on the following. A bank of 3 urinals is used to serve a building with 25 men, who use the facility twice during a day. The working hours are 8 hours a day, 5 days a week, 48 weeks per year.

The combined water and sewerage charge is based on £1.52 per cubic metre. The maximum permitted volumes of 7.5 litres/urinal/hour for the flushing cistern and 1.5 litres per flush for the flushing valve are used.

Description	Annual Cost £	Comment
Flushing cistern serving 3 bowls with no control	£300	No control - contravenes Regulations. This is a typical 9 litre cistern flushing every 24 minutes day and night.
Flushing cistern serving 3 bowls with Cistern Flush Valve - CFV	£66	Electronic controller (e.g. CFV) isolates cistern when not used. With 50 users/day it is assumed there is unlikely to be a period of more than 30 minutes of no use during the working day.
No cistern. 3 Flushing Valves controlled by Urinal Flushing Valve controller	£27	This is the total cost for 3 bowls! The primary reason for the Urinal Flush Valve saving is that it flushes only the bowl that has just been used, whereas the Cistern Flush Valve flushes 3 bowls simultaneously (irrespective of use). In practice a smaller flush volume is often used, e.g. 1 litre or less – providing further savings.

INDIVIDUAL URINAL FLUSHING (USING FLUSHING VALVE)

This new method of flushing an individual bowl after use with a flushing valve (no cistern required) has the following advantages –



Automatic Flow Limiting (AFL) Valve. Servicing Valve with flow limiting cartridge. Arrow Valves AFLs have a lever and colour coded identity disc indicating the flow rate of the cartridge inside

- Maximum water saving – individually flushed
- Minimum smell – flushes automatically **immediately** after each use
- No bulky cistern or large pipes – pipes are 15 mm and normally concealed
- No overflow required
- Flush volume and flow rate easily altered at any time
- No small pet cocks or small orifices to block
- No planned maintenance
- Reliable (individual isolation if maintenance is required)
- Hygienic and visually impressive!



There are 8 colour-coded AFL cartridges that are fit into valve **in-situ**. Cartridge fits into centre of ball via side port – **no need to isolate or drain supply**. Pliers can be used to remove cartridge. A cartridge can be fitted or changed in less than a minute

Overflows/Warning Pipes

The 3/4" nominal (22 mm od) overflow pipe from a flushing cistern is generally described as a “warning” pipe. Clause G25.6 states- *“Except for pressure flushing cisterns, all WC flushing 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.”*

Clause R25.6 states that internal overflows are considered as a “no less effective device (in place of a warning pipe)”. Consequently, many WC cisterns now have an internal overflow, which discharge down the pan. The acceptance is conditional upon measures to reduce the likelihood of the internal overflow being used. A strainer should be incorporated or fitted upstream of the float valve. Clearly it is desirable to have a strainer that can be cleaned without dismantling the valve or pipe. The [AFL Valve](#) with a 180 micron strainer is ideal, since this also complies with the requirement for a servicing valve - Schedule 2, paragraph 16 (2).

The allowance of internal overflows and non-siphonic flushing apparatus is a retrograde step in terms of water conservation. There are concerns that users will not observe, not realise there is a fault or choose to ignore the trickle down the pan. There are alternatives to the internal overflow including –

- Visible warning – tundish, sight glass, mechanical or electrical indicator
- Audible signal
- A mechanical device, which disables the flush, thereby indicating to the user there is a fault

- A device that detects when the water level rises above the maximum operating level and closes the water supply to the float valve.

HAND BASINS

Water supplied to the cold tap should be “wholesome” (Fluid Category 1) so it is suitable for drinking. Taps not suitable for drinking (e.g. Hose Union taps) should be labelled in accordance with clause G27.4 “Not Drinking Water”. It is also equally acceptable to label the “Drinking Water” taps to distinguish them from those that are not.



Assuming no plugs are provided, self-closing taps should be used – G28.1 (see *tutorial 6*). A servicing valve with an automatic flow limiter is ideal for conserving water and preventing splashing - model AFL.

Compact surface mounted stainless steel box (model [HUTB](#)). With spherical valve and hose connection. Foam encapsulated

HOSE UNION TAP

The hose union tap in a washroom is likely to be risk assessed as Fluid Category 5 and must be supplied from a break tank with Fluid Category 5 protection such as type AB air gap – e.g. Break Tank and Booster Set - “Boost-A-Break” [model BTAB](#). Diagram R15.12.2a allows the same cistern used for WC or urinal flushing valves to be used for a Hose Union tap in the toilet vicinity.

Where a gravity system is used, the supply to the hose union tap can be from a distributing pipe (R15.12.2), either dedicated or one serving WC & Urinal flushing valves.

Clearly this tap is not suitable for drinking. It should be labelled in accordance with clause G27.4 “Not Drinking Water”. Furthermore it would be wise to use a lockable tap. A solution is offered with the Arrow Valves secure hose tap housed in a lockable stainless steel box [model HUTB](#). This reduces likelihood of unauthorised use and someone inadvertently drinking.

SUMMARY

1. It is a legal requirement to use some form of device to prevent flushing of urinals when not used.
2. Urinals can now be flushed from a supply pipe without a cistern - providing a DC Pipe Interrupter and flushing valve are used.
3. Instead of DC Pipe Interrupters, a booster pump drawing water from a cistern with type AB air gap may be used. This cistern can supply WC pans, urinals and a hose union tap in the toilet area.
4. Internal overflows from WC cisterns are permitted.
5. A servicing valve should be provided for every cistern and flushing valve – a valve incorporating a serviceable strainer is recommended.

Thank you for your interest