WHOLE LIFE CONSULTANTS LTD

Dundee University Incubator
James Lindsay Place
Dundee, DD1 5JJ, UK
t/f: +44 (0)1382 224304
enquiries@wlcuk.com

S-WC2

WATER CONSERVATION & EFFICIENCY WITHIN BUILDINGS

TARGET AUDIENCE & OBJECTIVES: This information sheet is intended for all construction professionals and homeowners and provides an introduction to the basics and background to water conservation & efficiency within buildings. This sheet outlines the benefits of several water conservation solutions. Further signposting is provided to direct the reader to more detailed and specific information.

1 INTRODUCTION

Water is essential to life on earth. We need water to grow food, keep clean, provide power, control fire, and last but not least, we need it to stay alive! If water is constantly being cleaned and recycled through the earth's water cycle, why do we need to conserve it? The answer is that people use up our planet's fresh water faster than it can naturally be replenished. To provide enough clean fresh water for people, water is cleaned at drinking water treatment plants before it is used. And after water is used, it is cleaned again at wastewater treatment plants before being put back into the environment.

2 WATER CONSERVATION

Water Conservation can be defined as:

1. Any beneficial reduction in water loss, use or waste as well as the preservation of water quality.
2. A reduction in water use accomplished by implementation of water conservation or water efficiency measures; or,
3. Improved water management practices that reduce or enhance the beneficial use of water. [1, 2] A water conservation measure is an action, behavioural change, device, technology, or improved design or process implemented to reduce water loss, waste, or use.

3 WATER EFFICIENCY

Water efficiency is a tool of water conservation that results in more efficient water use and thus reduces water demand. Water efficiency differs from water conservation in that it focuses on reducing waste. It also emphasises the influence consumers can have in water efficiency by making small behavioural changes to reduce water wastage and by choosing more water efficient products.

Examples of water efficient steps includes fixing leaking taps, taking showers rather than baths, installing displacements devices inside toilet cisterns, and using dishwashers and washing machines with full loads. These are things that fall under the definition of water efficiency, as their purpose is to obtain the desired result or level of service with the least necessary water[3].

4 GOALS OF WATER CONSERVATION

The goals of water conservation efforts include as follows:

- Sustainability. To ensure availability for future generations, the withdrawal of fresh water from an ecosystem should not exceed its natural replacement rate.
- Energy conservation. Water pumping, delivery, and wastewater treatment facilities consume a significant amount of energy.

- Habitat conservation. Minimizing human water use helps to preserve fresh water habitats for local wildlife and migrating waterfowl, as well as reducing the need to build new dams and other water diversion infrastructure.

5 WATER CONSERVATION SOLUTIONS

5.1 LOW-FLUSH AND DUAL FLUSH TOILETS

The flush of a modern low flow toilet discharges 6 litres of water. This is a relatively small amount of water when compared with the 9 or 13 litre flush of an older toilet. There is no prescribed lower limit for the volume of a flush but reducing the volume of water further must be carried out with care as the prime function of the toilet must be retained - which is removal of the waste in one flush[4].

Dual flush toilets are also available that use a lower volume of water to remove urine than that to remove faecal matter. They have two buttons or handles to flush different levels of water. Dual flush toilets use up to 67% less water than conventional toilets.

5.2 COMPOSTING TOILETS.

Composting toilets do not use water to flush away the contents of the toilet bowl. Instead the waste simply falls into a composting chamber where it is broken down into harmless matter by the action of aerobic bacteria. The waste is either mixed manually or by motor to mix the fresh material with old material containing active bacteria. The process of digestion by bacteria converts the waste into compost or humus which falls into the humus tray for storage.

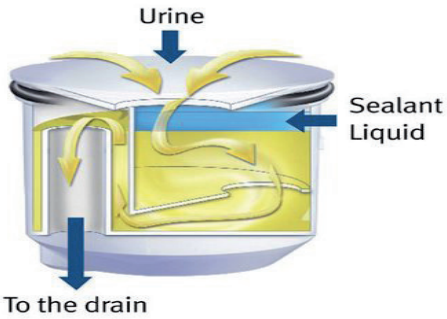
This can then be used as a soil fertilizer. The smallest toilets require a small electric heater to encourage aerobic digestion and to evaporate excess liquids. A fan is also needed to

ventilate the unit which draws in room air, passes it through the composting chamber and discharges odours outside The cost and $C0_2$ output due to the electrical consumption of the fan and heater must be considered when looking at overall environmental benefits[5].

5.3 WATERLESS URINALS

Water is used in conventional urinals to wash the bowl and flush the trap. In practice ceramic urinals repel urine and remain surprisingly fresh without flushing. Similarly standard UK urinals do not actually flush the trap in the way that a WC is flushed but instead just dilute the urine without removing solids such as hair, scale and cigarette ends. As a result, even 'flushing' urinals tend to block and in hard-water areas tough scale will build up quickly in traps and pipes. The Water Regulations specify a maximum water usage of 7.5 litres per urinal bowl, per hour (10 litres for a single bowl). A device must be fitted to prevent the urinals flushing when the building is unoccupied. Assuming correct adjustment this means that each bowl uses about 27 m^3/year for a public toilet open for 10 hours every day. An uncontrolled urinal, but still adjusted to the correct rate would use over 60m^3/year. In practice flushing rates are usually much higher.

The basic principle of waterless urinals, as the name implies, is to eliminate the use of water for flushing. Waterless urinals are available in 2 main forms; barrier system and contact



disinfecting systems. Both systems require that existing traps are replaced by waterless alternatives. A saving in capital costs can be made in new buildings because a water supply to the urinals is not required. Savings will be made in terms of water use but there will be running costs involved in the provision of chemical consumables.

Barrier systems use a low density fluid inserted into the trap. This fluid is a mix of oil and disinfectant and will float on urine in the trap. Additional urine descends through the barrier liquid, through the trap and is discharged to drain.

The trap requires topping up each day, a task that is usually carried out by the cleaners. Complete replacement of the barrier liquid is recommended between 2 and 6 times a year, depending on frequency of urinal use.

Contact disinfecting systems deodorise and disinfect the urine as it leaves the urinal. A disc or rod of material, impregnated with disinfectant, is inserted into the upper part of the trap. Te insert must be replaced on a weekly basis.

As with anything novel, there is a degree of reticence for specifiers to use the systems due to lack of performance information. Armitage Shanks is now producing its own waterless urinal and claims it can save up to 236,000 litres pa. However water saving is not the only reason to specify waterless urinals as they promise a range of benefits including:

- Reduced water and sewage charges.
- No flooding of rooms when traps block or are deliberately blocked
- Reduced pipe blockage in hard water areas.
- No flush controllers to maintain or fail.
- Avoidance of odorous lime-scale on urinal bowls.
- Lower installation costs.
- Reduced sewage volumes to soakaways and treatment plants.
- Less temptation for vandals.

5.4 WATER EFFICIENT & LOW FLOW TAPS & SHOWERS

Low-flow shower heads

Showers can use anything from 12 litres to 45 litres a minute, with power showers using as much water as a bath in just a few minutes. 2 The average shower will use around 15 litres of water a minute. Installing low flow showerheads and taps can reduce the amount of water we consume by around 50-70%, bringing the shower flow for example down to 6-9 litres a minute, without compromising on water pressure. For an average shower length of 8 minutes this can save 60 litres of water, as well as corresponding energy and carbon savings[6].

There are two types of "low-flow" heads available. Non-aerating ones work by restricting the water flow and squeezing it through very small holes; this produces quite a hard, massaging water spray. "Aerating" heads, meanwhile, mix oxygen with the water to create a softer, bubbly, shower[7].

Sensor/infra-red taps

Spouts with integral sensors detect hands within the sensing range and the solenoid valve is opened. The valve remains open for 3 seconds after the removal of hands and up to a maximum of 30 seconds if a hand or object is continuously detected. Spouts with remote sensors operate differently. When hands are detected within close proximity of the sensor, the solenoid valve opens and water is delivered for a maximum of 30 seconds. The solenoid valve can be closed within this period by a second activation of the sensor.

Flow restrictors

Fitting a water restrictor allows you to control the amount of water a tap uses. Water usage is determined by water pressure and the size of valve in the tap. So where you have particularly high pressure a tap could be delivering many unnecessary liters

WATER CONSERVATION & EFFICIENCY WITHIN BUILDINGS

of water per minute. The restrictor is screwed onto the tap outlet and has an aerated nozzle. This gives the user a fine aerated spray of water.

Self closing taps

Self closing taps can be set to run for a pre-determined amount of time typically 10 to 15 seconds. This is carried out at installation. This means taps are not left on by accident as well as ensuring washroom are not flooded. Ideal for schools and high use areas such as theatres.

Faucet aerators

These break the water flow into fine droplets to maintain "wetting effectiveness" while using less water. An additional benefit is that they reduce splashing while washing hands and dishes.

Ceramic disc cartridges:

Apart from being annoying, a dripping tap can waste a lot of water over a period of time. Taps with ceramic disc cartridge control water with impeccable precision. The ceramic disc is extremely durable and eliminates the waste of a dripping tap. A dripping tap that wastes 1 litre of water per hour is the equivalent of wasting 1460 full WC flushes a year.

4.5 WASTEWATER REUSE OR RECYCLING SYSTEMS.

There are 2 main types of waste water re-use in buildings

- Reuse of grey-water for flushing toilets or watering gardens
- Rainwater harvesting

These arediscussed in more detail in info sheet S-WC1

REFERENCES

1. Vickers, Amy. "Water Use and Conservation." Amherst, MA Waterplow Press. June 2002. 434
2. Geerts, S.; Raes, D. (2009). "Deficit irrigation as an on-farm strategy to maximize crop water productivity in dry areas". Agric. Water Manage 96: 1275–1284. doi:10.1016/j.agwat.2009.04.009.
3. Vickers, Amy. "Water Use and Conservation." Amherst, MA Waterplow Press. June 2002. 434
4. Green Building Bible Volume 2, Green Building Press
5. Green Building Bible Volume 2, Green Building Press
6. http://www.dothegreenthing.com/wiki/display/WIKI/Install+low+flow+shower+heads+and+taps
7. http://www.guardian.co.uk/environment/ethicallivingblog/2008/mar/14/switchtolowflowshowerheads

SIGNPOSTING

TITLE/DESCRIPTION	LINK
Water Saving Products	*http://www.greenbuildingstore.co.uk/page--water-saving-products.html*
Water efficiency in new buildings: A joint Defra and Communities and Local Government policy Statement	*http://www.communities.gov.uk/documents/planningandbuilding/pdf/WaterEfficiencyNewBuildings.pdf*
Waterless urinals	*http://www.waterlessurinals.co.uk/home.php?MMCF_Waterless_Urinals&gclid=CPzWv4WQsKYCFQkf4QodQxz2Zg*
Waterless Urinals	*http://www.greenbuildingstore.co.uk/page--airflush-waterless-urinal.html*
Armitage Shanks Waterless Urinals	*http://www.armitage-shanks.co.uk/professional/water_saving.html*
Armitage Shanks Water Savings products	*http://www.thebluebook.co.uk/dynamic/section_index.asp?digits=23:1:0*
Composting Toilets	*http://compostingtoilet.org/compost_toilets_explained/index.php*
Composting Toilets	*http://www.sustainablebuild.co.uk/CompostToilets.html*
Composting Toilets - Natsol	*http://www.natsol.co.uk/*
Composting Toilets - Rotaloo	*http://www.rotaloo.co.uk/*
Water Efficiency - General	*http://www.saving-water.co.uk/?gclid=CMuhieCRsKYCFcgf4Qodn3E4ZQ*
Watewise	*http://www.waterwise.org.uk/reducing_water_wastage_in_the_uk/*
Twyford Water Saving products	*http://www.twyfordbathrooms.com/default.asp?path=1;52;10182*