Changes to Part G Building Regulations

Will they deliver 'water smart' homes?

Will the updates to Part G of the Building Regulations result in water efficiency and safer hot water systems in new dwellings as promised by the previous government? In this article Cath Hassell covers the updates that are most relevant to sustainable building.

The updated Part G finally came into force on April 6th 2010. Originally planned for April 2006, it was shelved by Yvette Cooper, the then Housing Minister[1]. We were then promised its arrival in October 2009, only for it to fall foul of a European regulation. But it is here now and, unless work has already started on site, or planning permission has been granted, and work commences before April 2001, then any building work must conform to it.

The document has increased from 14 to 43 pages and now has six sections compared to three previously. The three headline changes to Part G are: a requirement to limit hot water at bath taps to 48°C, enhanced safety for all stored hot water systems, and; the requirement for all new dwellings to achieve a water efficiency standard of 125 litres use of wholesome water per person per day. There are other updates that stand out. Rainwater or greywater can be used in buildings for certain purposes; compost toilets are referred to for the first time; solar thermal systems require automatic protection against legionella; and hot taps must be positioned on the left of any appliance.

Rainwater and greywater

G1 allows for the provision of water of suitable quality to any sanitary convenience fitted with a flushing device, whilst requiring a supply of wholesome water[2] to showers, baths, bidets, washbasins, sinks (in an area where food is prepared), and any place where drinking water is drawn off. The document classifies alternatives to wholesome water as: water from wells, springs, boreholes or water courses; harvested rainwater; reclaimed greywater; and reclaimed industrial process water.

Rainwater and greywater can be used for WC and urinal flushing, washing machines and irrigation, provided an appropriate risk assessment has been carried out. The risk assessment should ensure that any rainwater or greywater system does not cause waste, misuse, undue consumption or contamination of wholesome water.

Enhanced provisions on hot water supply and safety

Under the old Part G, there was a stated requirement for safety measures to ensure the safe operation of unvented hot water systems greater than 15 litres. Part G3 has now been extended to cover all types of hot water system including thermal stores and vented cylinders. In brief, any hot water system, including the associated storage and expansion vessel, must be designed to cope with the effects of any temperature or pressure changes that occur in normal use, or as a consequence of an operating fault. If the operating temperature of the stored hot water could exceed 80°C under normal operating conditions (potentially thermal stores, and hot water cylinders connected to solar panels or solid fuel boilers), a temperature mixing valve (TMV) must be installed on the hot water draw off to limit the temperature to 60°C[3]. Ensuring that hot taps are always installed on the left hand side has long been good practice so that blind and partially sited people know which is the hot tap; it is good that it is finally a legal requirement. Controls to provide automatic protection against legionella proliferation in solar thermal systems are now required. These controls ensure that either the back up boiler, or the immersion heater, raises the temperature of the solar heated stored water to 65°C for 1 hour a week to ensure that there is no risk of legionella in poorly designed systems.

Prevention against scalding

Part G3 also states that the hot water supply temperature to a bath should be limited to a maximum of 48°C. To comply, a TMV (or similar) which will fail-safe at temperatures higher than 48°C, and cannot be easily altered by the building users, must be specified. A TMV installed on the hot water draw-off, where it could be easily accessed for the required yearly maintenance, would be the optimum solution. However, because of concern about the potential for colonisation of waterborne pathogens (mainly legionella) in the pipe runs, the length of supply pipe between the valve and the final outlet is required to be kept to a minimum[4]. In effect this means a TMV will be sited under the bath in most situations. Due to the concern within housing associations of increased maintenance costs, coupled with the length of time it has taken Part G to come into force, the market has already provided solutions to this regulation. There are mixer taps available on the market with an integral TMV in the tap body, making maintenance far easier. Private developers are still likely to install TMVs under the bath so that they have as wide a choice of bath taps as possible; any future maintenance will be the responsibility of the householder.

Compost toilets

G4 states that compost toilets require a suitable arrangement for the disposal of the waste either on or off the site, and that the waste must be able to be removed without carrying it through any living space or food preparation area. It further states that composting toilets should not be connected to an energy source other than for purposes of ventilation or sustaining the composting process. This effectively rules out the installation of dehydrating composting toilets, which must be applauded. To use an electrical element to dry out faeces (3.5-4 kWh every 24 hours) makes no environmental sense at all, and is something I have been arguing against since 1998. You can still install compact composting toilets if space is limited and there is no reliable water supply to the building[5].

Water efficiency and Regulation 17K

For the first time ever the Building Regulations will address water efficiency. There is a maximum allowable amount of 125 litres of wholesome water per person per day in dwellings[6]. This is known as Regulation 17K and at face value looks good given that average UK use is 150 litres/person/day, and therefore this regulation requires an approximate 18% reduction in water consumption. To show compliance there is a calculator available online, which is straightforward to use[7]. WCs, baths and taps need to be chosen and the flushing volume, or flow rates of all the appliances must be entered. The calculator provides a total water consumption figure in litres/person/day, which is then presented to Building Control to show compliance. It seems straightforward but this is where the problem lies.

The water calculator that is used to determine whether a dwelling will reach the presumed use of 125 litres per person per day, is the same calculator that is also used to show compliance with the Code for Sustainable Homes. Although the original calculator was upgraded in 2009, it is still subject to many of the same problems that beset the original, not least the seemingly random uses of water it assumes (right down to 2 decimal places in some cases). In some aspects the new calculator is even worse; the most notable example being the 'normalisation factor' that knocks almost 10% off the calculated usage to arrive at a reduced daily consumption.

The calculator assumes a person spends 5.6 minutes in the shower, fills the bath halfway up before getting in (50% of maximum volume), and flushes the toilet 4.42 times a day[8]. If they have a bath and a shower in the dwelling they use the shower 80% of the time and the bath 20% of the time[9]. The calculations used to determine consumption from taps is unclear. Current calculated usage ranges between 11.24 to 13.00 litres at kitchen sinks at flow rates as varied as 2 - 6 litres and between 4.74 to 11.06 litres usage for flow rates between 2 – 6 litres at the wash basin[10]. It is assumed that the property will have connections for a washing machine and dishwasher, and if no appliances are specified a default figure is used of 17.16 litres per person for a washing machine, and 4.5 litres per person for a dishwasher[11]. If a waste disposal unit is specified, the calculator assumes a water use of 3.08 litres per person. Inefficient water softeners (using more than 4% for replenishment) will add to the load. Water softeners that use less than this amount for replenishment can add 4.4 litres to daily use, yet the calculator assumes zero water consumption[12].

The calculator produces a 'total calculated use' figure in litres, multiplies it by a 'normalisation' factor of 0.91 to arrive at a 'total water consumption' in litres/person/day[13].

Table 1. Specification 1. A Large house with 1 main bathroom, 3 ensuite bathrooms, a downstairs WC, a utility room with a second sink. PASSES

Appliance	Details of flow rate or volume	Total litres
WC x 5	Dual flush 4/2.6 litres	13.54
Basin x 5	4.0 litres/min at all basins	7.90
Shower x 4	2 x 15 litres/min, 2 x 8 litres/min	50.26
Bath x 4	210 litres	23.10
Sink x 2	6 litres/min at all sinks	13.00
Washing machine	None specified (default used)	17.16
Dishwasher	None specified (default used)	4.50
Water softener	Efficient model	0.00
Waste disposal	None	0.00
Total calculated use		129.46
Normalisation factor		0.91
Total water consumption		117.81
External water use	Swimming pool, jacuzzi and irrigation system	5.00
Total water consumption	For Regulation 17K	122.80

Table 2. Specification 2: A 1 bed flat. With 1 bathroom and one separate WC and wash basin. FAILS

Appliance	Details of flow rate or volume	Total litres
WC x 2	Dual flush 4/2.6 litres	13.54
Basin x 2	4.0 litres/min at all basins	7.90
Shower x 1	15 litres/min	65.55
Bath x 1	210 litres	23.10
Sink x 1	6 litres/min	13.00
Washing machine	None specified (default used)	17.16
Dishwasher	None specified (default used)	4.50
Water softener	Efficient model	0.00
Waste disposal	None	0.00
Total calculated use		144.75
Normalisation factor		0.91
Total water consumption		131.72
External water use	None	5.00
Total	For Regulation 17K	136.70

It then adds 5 litres for outside use, to say whether the dwelling meets Regulation 17K. 124.9 litres meets the regulation, 125.1 litres doesn't.

The calculator adds 5 litres for external water use regardless of the actual situation. Living in a flat with no outside space? You use 5 litres of water per day. Living in a large detached house with a swimming pool, jacuzzi and an automatic irrigation system? You use 5 litres of water per day. Now, there are different arguments put forward about outside use only happening part of the year, or that once a swimming pool is filled up it requires little water to refill. But adding on 5 litres for all dwelling types just makes the calculator look stupid. Incidentally, a swimming pool that is just 8m by 4m x 1.5 m deep, installed in a dwelling occupied by a family of four would use up 6.6 years worth of outside use for each resident at 5 litres per day, a usage of water that shouldn't be classified as 'efficient'.

What is worse is that if you install several showers, with different flow rates you can offset high flow rate showers against low flow rate ones, thus allowing power showers in the main bathrooms. This enables large houses with several en-suite bathrooms to be fitted with showers with a flow rate of 15 litres per minute, (as long as they are offset with lower flow rates elsewhere in the dwelling), whilst that cannot happen with just one shower, as shown in Tables 1 and 2[14]. Five minutes in a shower at 15 litres/minute uses 75 litres of hot water with a carbon intensity of near to 7kgCO_2 per m^3. Allowing power showers in a dwelling that is supposed to be water efficient is surely nonsensical.

CO2 emissions from hot water use

You can install 15 litre/minute power showers, have a swimming pool and jacuzzi and still pass the water efficiency criteria within Part G! So how much does this really matter? Isn't it the CO_2 from heating and lighting our homes which produce all the CO_2 emissions? Well no actually. Within new homes the CO_2 emissions from water use will be as much as those for heating the property, even in a dwelling without power showers. When looking at the existing housing stock in the UK, the government has calculated CO_2 emissions from hot water use as 6% of the UK's total CO_2 emissions, and is concerned enough about that figure to have encouraged a number of initiatives to reduce it.

At the urging of DEFRA, the BMA (Bathroom Manufacturer's Association) has devised a water efficiency rating system that is clear, easy to understand and has been enthusiastically taken up by manufacturers. Showers with a flow rate of between 10 and 13 litres/minute are rated as poor while showers with a flow rate greater

than 13 litres/minute are in the red zone. And, under the CERT scheme, energy companies are being paid to send households flow regulators that reduce flow rates from existing showers to less than 8 litres/minute. There are some good measures around to reduce hot water use in existing dwellings, to ensure that there is a greater choice of water efficient appliances on the market and that they are easy to identify. It's a shame there is no requirement to fit them in a new dwelling.

Conclusion

In summary, there are some good aspects about the changes to Part G. However, using the water efficiency calculator as it currently stands will do little to ensure that dwellings (especially houses as opposed to flats) built outside of the social housing sector will meet the government's stated aim of water efficient homes. It is to be hoped that the new administration will realise this and will bring in a set of proscriptive standards, such as the AECB water standard, as soon as possible. If not we will have the farcical situation where the average householder is being urged to choose a water efficient shower for their bathroom upgrade, whilst in the government's so called 'water smart' new homes, the residents will be splashing away under their power showers.

Cath Hassell

References

1. The official reason being that the industry had enough to get to grips with because of all the changes to Part L, which happened at the same time.

2. Wholesome water is the current term for potable water which, in this situation, refers to water supplied from the mains.

3. This TMV needs to be fitted as well as the TMV limiting bath water to 48°C.

4. If intermittent use of the bath is anticipated, provision should be made for high temperature flushing. Again this is to prevent legionella proliferation and is mostly aimed at little used baths in hospitals and nursing homes.

5. The best one I have found is the Separett which diverts urine and has an integrated fan to vent the chamber. The 12V model uses just 0.046kWh of electricity every 24 hours.

6. The figure is based on Levels 1 and 2 of the Code for Sustainable Homes, which requires an internal use of 120 litres, with 5 litres for outside use added

7. www.wrcplc.co.uk/partgcalculator/Default.aspx is a link to the water calculator itself. The documentation from CLG as to how the methodology works can be found at: www.planningportal.gov.uk/uploads/br/water_efficiency_calculator.pdf

8. Reduced from 4.8 times under the original calualtor.

9. The old calculator assumed if there was a bath and a shower in the dwelling a resident would use the shower 60% of the time and the bath 40% of the time. As this meant only baths with ridiculously small volumes could be specified in dwellings built under the Code for Sustainable Homes, it was changed.

10. The old calculator assumed 2/3rds of 8 uses at 28 seconds per use at the basin and sink. This meant that calculated water usage ranged from 6.88 litres at a flow rate of 2 litres/min to 21.7 litres at a flow rate of 6 litres/min, which allowed for massive savings within the calculator if unrealistic flow rates were specified at tap outlets.

11. Equates to 8.17 litres/kg and 1.25 litres/place setting.

12. 4% replenishment would be @ 110 litres of water per day Allowing 10 litres from the kitchen cold tap = 4.4 litres per day, but this is not added anywhere. The scale problems of hot water within combi boilers especially and the varying performance of water conditioners, may mean that this compromise of extra water use is well worth it, in terms of CO_2 emissions, and water softeners are something that should be supported in new homes but, if so, this is not the way to go about it.

13. This is also the figure for levels 1 and 2 of the Code for Sustainable Homes.

14. You do have to specify 4/2.5 litre dual flush WCs instead of 6/4 litres dual flush in this example. However, if you offset the 15/litre/minute shower with 2 x 6 litre/minute showers and slightly reduce the flow rates at the washbasin, you can have 6/4 litre dual flush WCs with 15 litre/minute showers.

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