

Ask Jon Eakes

# The low flush toilet controversy & MaP toilet testing

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(This is a real good example of a living history. I wrote the first part of this entry in 2001. With a book you would have to wait for the next edition for developments. With a bulletin board you would have to read a lot of old entries. What I love about my web site is that I can change, adapt and make this database entry new any day that this story evolves. Read on for the January 2008 update -- and keep coming back, because this story is not yet complete. In fact it wasn't until 2011 that I took the time to edit the video footage of the Drain Line research to help my brother-in-law that was having "unidentified" problems in a commercial building which just sounded to me like the last flush on Friday sat and dried in the line until Monday, when it caused a back-up. Most residential drains are not long enough to cause that problem, but commercial buildings, yes.)

Can Low Flush Toilets work? Yes, but not all of them and not in all conditions!

You can call it a controversy or you can call it evolution. The fact of the matter is that each of us flushes a lot of potable water down the drain every single day. The reality is that as a society we must do something to conserve as much of that water as possible. In the mid 80's we took the first step by changing standard toilets from 20 litres (5 gal) per flush to 13 litres (3.5 gal) per flush. At the same time many gadgets started to be used, from tank dams to milk bottles, that would displace some of the water in our existing tanks. The new toilets worked, but the gadgets did not. It turned out that the old toilets just were not designed to move a lot of stuff with so little water. The first picture shows the cross section of a standard 13 litre (3.5 gal) toilet. The second picture is a graphic of the flow path for one model of the a 6 litre (1.6 gallon) low flush toilet.

In the 90's, the ecological movement kept pushing to reduce water use and the 'low flush toilet' , using only about 6 litres of water, was invented. Many regulatory bodies jumped quickly to solve their local water supply problems (and reduce water treatment costs) and mandated the installation of these low flush toilets. But not many of them worked very well. The engineering wasn't yet perfected and most of the manufacturers left a rough lining on the walls in the drain part of the toilet, which just couldn't clear with so little water. So they were dubbed the 'double flush' toilet -- you had to flush it twice to get it to work -- and the water savings were flushed down the toilet at the same time. The city of Vancouver decided to ignore the problems and simply required low flush in all new construction and renovation. The province of Ontario has had a similar requirement on the books since 1996, but they held meetings with the toilet manufacturers and the two agreed not to enforce it in new construction for three years, hopefully enough time for the companies to come up with better toilets. For an even longer time the official requirement for low flush toilets in renovation in Ontario was left largely un-enforced, while the industry was still studying what happens when you add a new low flush toilet to an old drain system. The Americans, on the other hand, were legislating low flow toilets across the board and smuggling Canadian 13 litre toilets south became big business.

From Evolution to Controversy

So what could have been a smooth evolution became a controversy. Those who wanted to save water were basically legislating clogged toilets for much of the population. But controversy or no controversy, the evolution of plumbing continues. Some of the manufacturers finally got the toilets right with re-engineering of the water flow and better manufacturing methods to get a smooth siphon trap, so now the waste does get through the toilet. Well it does with some of the models -- but with lots of models people were still finding that they needed that second flush to clear the waste. Almost 45% of the low flow toilets on the market have proven in independent testing to not clear waste from the toilet with one flush (January 2004). Unfortunately the code bodies are not requiring builders and

plumbers to put in toilets that actually work, -- they are only requiring ones that use very little water.

### MaP Toilet Testing

In the meantime, many water-conscious municipalities in both the US and Canada have been providing financial rebates to consumers for the replacement of old toilets with water-conserving low flush toilets, but they have been inundated with consumer complaints about toilets that didn't work well. So finally the Canada Mortgage and Housing Corporation, some Ontario government bodies and a whole bunch of municipalities in both the US and Canada got together under the lead of the Canadian Water and Wastewater Association (CWWA) to do an end run on the standards bodies and do some realistic testing of toilets, with the objective of providing an approved list of specific toilets that they could subsidize for their water conservation programs; so MaP (Maximum Performance) testing and certification was born -- testing above and beyond regular standards boards testing like CSA but actually testing for performance under real conditions. Today MaP values are as prominent on packaging as the standards board seal of approval. Veritec Consulting in Mississauga, Ontario was hired to test toilets with a material that was for the first time very close in its physical properties to real life human waste using tubes of soy bean paste and toilet paper. They even had to invent a new tool for the water conservation industry, the T5 FlushMeter -- a flow meter that measures the real water consumption of an installed toilet in a real home without bothering the plumbing. They found that almost 45% of the low flush toilets on the market still don't clear waste from the toilet with one flush. Their initial final report was made public in January of 2004 complete with the quantitative information. At first they just released pass/fail results for their new standard. But that doesn't really help a consumer or a builder to choose models that are better than marginally acceptable. So the final report includes quantitative results on how much material the toilet can clear on a single flush. When you read the full report, you will see that some models cleared 10 times more material than others, and that the price of the toilet had little bearing on performance.

For years the performance reports were available on the Canadian Water and Wastewater Association website: [www.CWWA.ca](http://www.CWWA.ca). Now all the information including continual updates, full research reports and a convenient search engine which enables you to dig through this growing body of research and find out all the details about any given toilet, or any group of toilets that fit your requirements and you want to know how they perform with low flush technology; go to the MaP website: [www.map-testing.com](http://www.map-testing.com).

The Toilet works, but how about the Drain Line?

But we haven't gotten to the end of the evolution yet. Some toilets were getting the waste out of the toilet, but the drain pipe seemed to still be problematic. Many plumbers and builders were still complaining that, even with the best of the toilets, there were far more cases of recurring clogging than there should be. Apparently the flush gets the 'stuff' out of the toilet, but not down the line. So I set out to find out what has been done to ensure that the diameter and slope of the drain pipe will work with just 6 litres of water, and what happens when a toilet uses 5 litres to get the waste out of the toilet and only one litre to move it down the pipe? There seems to have been very little research done on the pipe that runs from the toilet to the soil stack or out to the street.

Once the basic low flow fixture testing mentioned above was completed, showing that we are finally beginning to be able to define what makes a good toilet, it was possible to convince this same group of interested parties to extend the initial research to the horizontal drain line. The fun part of that was that I got to go film 'stuff' moving down transparent horizontal drain lines -- just the kind of video you want to dream about at night. The latest report on that CMHC study is also on the CWWA and Veritec's web sites: Evaluation of Water-Efficient Toilet Technologies to Carry Waste in Drainlines, revised April 2005.

With Low Flow, 3" drains are better than 4" drains

The drainlines were doing better than we thought but it was shown that low flow toilets do better with 3" diameter drain pipes, not 4" -- this gives more of a floating effect to moving waste. Generally if there is a proper slope and no dips in the drainlines, drainlines were not presenting problems for most low flow toilets. The problem could come with long runs or improper slopes and infrequent toilet use

as in a long run it often took a later second flush to clear the line, giving time for things to dry out and no longer move freely. In most residential situations, even with poor drain pipes (4" and an improper slope) the stuff would get to the vertical stack which was not very far on a single flush. But there are many reports of guest bathrooms causing problems, weeks after the guest has left. What is going on? The last flush didn't get out of the horizontal drain line into the vertical stack and then there was no additional water supplied for days -- allowing the plug to dry and stick. The next use of the toilet many days later would totally block the line. The moral: after a guest leaves, give the toilet a second flush to clear the line. A frequently used toilet doesn't usually develop this problem.

**Why commercial installations have more problems**

Commercial installations often have very long runs and cyclical usage. If low flow lines are blocking after a weekend of that last flush sitting and drying in the line, you may need to add a source of flush out water to clear the lines before any weekend or holiday. That could be as simple as the last one out gives it a double flush, or as complex as a timer valve that adds a couple of gallons of water to a troublesome line every night, or every Friday night.

**Recommendations**

What can I recommend for people who do want to conserve water, but don't want the unsanitary condition of backed up pipes? The good news is that there are a good number and variety of toilets that perform quite well with little water. Go to the Map-Testing web site listed above and only purchase toilets that performed well in the tests. If you insist on only buying performing toilets (and, as I said, a higher price did not necessarily indicate better performance), that will force all the manufactures to improve their toilets and possibly get on this list. In fact, if you read the report carefully you will see some manufacturers who made significant changes in their toilets in the period of time between when this testing started and before the final report was issued. Those who won't pay attention will simply be left behind, clogged up in their own development. I expect some dramatic and quick changes in the toilet industry because of this report and the ones to follow. The proof of that is 5 years after this testing started, voluntary MaP testing values are showing up on packaging in stores.

For more information on the history of this problem check **Low Flush** in the keywords section of the database and most interestingly on the rapidly developing Dual Flush option -- Low Flush and Ultra Low Flush. Improper flapper replacement can either waste all the water savings of a low flow toilet, or reduce its performance.

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