The Dual-Flush 'Ratio' and Determining Effective Flush Volumes of Dual-Flush Toilets

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In many cases, claims by one or more manufacturers as to the 'effective flush volume' of dual-flush toilets are based upon assumptions that don't necessarily occur in the real world.

First of all, the vast majority of the dual-flush toilets in the marketplace today flush at one of these combinations:

a. 1.6 gallon full flush/0.8 gallon reduced flush
b. 1.28 gallon full flush/0.8 gallon reduced flush
c. 1.6 gallon full flush/1.0 gallon reduced flush

The voluntary choice of a 'full' flush versus a 'reduced' flush rests with the user. Therefore, the overall 'effective' (or average) flush volume achieved in any given installation is entirely dependent upon the user's behavior. As a result, the water savings depend entirely on whether the user cares about efficient use, is accurately understanding the purpose of a dual-flush toilet, or just takes the 'safe' choice and operates the 'full' flush every time.

So, what is the actual or accepted 'ratio' of 'reduced' flushes to 'full' flushes that we should use to calculate theoretical water use and savings? Some manufacturers claim it should be 4 to 1, or 4 'reduced' flushes to every 'full' flush. (This means, of course, that the 'effective' flush volume of a 1.28/0.8 dual flush toilet would calculate to about 0.90 gallons) Unfortunately, this 4:1 is not substantiated by any facts developed independent of manufacturers. According to a recent summary[1], the real world in residential usage is actually somewhere between 1:1 and 2:1. (By the way, the Federal Government's U.S. EPA WaterSense Program uses a ratio of 2:1, or 2 'reduced' flushes for every 'full' flush in residential installations, which is the accepted ratio used by water efficiency professionals, architects, engineers, and others engaged in plumbing design.)

Therefore, on the basis of the 2:1 ratio, calculating the effective flush volume of the three dual-flush designs mentioned above….

a. 1.6 + 0.8 + 0.8 divided by 3 flushes = 1.07 gallons per flush effective flush volume
b. 1.28 + 0.8 + 0.8 divided by 3 flushes = 0.96 gallons per flush effective flush volume
c. 1.6 + 1.0 + 1.0 divided by 3 flushes = 1.2 gallons per flush effective flush volume

While the above 2:1 ratio and resultant calculations are justified for residential installations, they are NOT generally valid for non-residential public installations, where most people have little or no understanding of dual-flush and, therefore, will seldom activate the 'reduced' flush. Today, many water efficiency specialists do not recommend dual-flush for non-residential installations. Instead, for those applications, remove the behavioral factor and recommend single-flush toilets with a flush volume of 1.0 to 1.2 gallons (3.8 to 4.5 litres).

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[1] Water Efficiency magazine, January-February 2010, "Dual Flush Savings – An Analysis of Field Data". Available at: http://www.waterefficiency.net/WE/Articles/Dual_Flush_SavingsAn_Analysis_of_Field_Data_15791.aspx