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## HIGH-EFFICIENCY FLUSHOMETER TOILETS IN NON-RESIDENTIAL APPLICATIONS

A caution for water-efficiency practitioners, design professionals, and facilities managers

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There are two primary concerns related to the proper operation of toilet fixtures - flushing performance and drainline carry. While it is fairly easy to define an adequate level of flushing performance (we want the toilet to remove all of the waste from the bowl in a single flush), it is far more difficult to define how far a toilet flush should transport this waste through the building drain piping to the sewer. There are many things to consider when attempting to assess drainline carry performance, e.g., how much waste is being flushed, what type of waste is being flushed, what is the diameter and slope of the drainline, what is the age and physical condition of the drain, etc.

The current ASME<sup>1</sup>/CSA<sup>2</sup> drainline carry testing protocol<sup>3</sup> not only uses non-realistic test media ( $\frac{3}{4}$ -inch plastic balls), but it also uses the same testing procedure regardless of whether toilet fixtures are destined for residential or commercial installations. Therefore, we believe that this protocol fails to adequately address the concern of real waste movement in the drain system. This is somewhat disconcerting since we know (a) that there is a clear difference between  $\frac{3}{4}$ -inch balls and "real" waste and (b) that there are significant differences between residential and commercial toilet installations. For example:

- commercial fixtures are often installed on 4-inch diameter drain pipes set at a 1-percent slope whereas residential fixtures are typically installed on 3-inch diameter pipes set at a 2-percent slope,
- commercial toilets, which are often required to flush paper toilet seat covers, paper towels, large amounts of toilet paper, etc., are typically subjected to a much greater waste loading than residential toilets,
- the lengths of drain runs are often much longer in commercial installations, and

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<sup>1</sup> American Society of Mechanical Engineers

<sup>2</sup> Canadian Standards Association

<sup>3</sup> As contained within the ASME/CSA national standard ASME A112.19.2-2008/CSA B45.1-08 and used to certify toilet fixtures for sale and installation in the U.S. and Canada

- supplemental flows are often much less in commercial installations (supplemental flows from bathing, clothes washing, etc., in residential applications help transport waste through drainlines).

A significant number of testing programs have shown a direct correlation between drainline carry distance and flush volume. As such, we KNOW that if we continue to reduce toilet flush volumes without making commensurate changes to the plumbing/drain system, we will eventually begin to experience blockages in drains. This is a fact!

We are very confident that high-efficiency toilets (HETs), especially WaterSense-certified HETs, are suitable for use in residential applications because of the smaller diameter drain piping, steeper slope, and availability of supplemental flows. However, we are not nearly as confident about the use of flushometer HETs in all commercial applications.

We know by experience that 1.6 gallons (6 litres) appear to be sufficient to satisfactorily transport waste in commercial sites, and we know by experimental data that there is some flush volume less than 1.6 gallons where we will begin to experience problems. The problem is that we don't know what that lower volume is. What's more, we want to avoid a situation where the flush volumes of commercial toilets are reduced to the point where drainline problems begin to occur with frequency only to have to 'take a step back' and increase the flush volume back to 1.6 gallons (6 litres).

There are significant differences between residential and commercial flushometer valve toilets – both in their physical construction and operation as well as in the “demand” placed upon them – there is no inherent reason that they should be required to meet the same flush performance / drainline testing requirements or that they should necessarily flush at the same volume.

In the largest buildings with high density use (e.g., office buildings, factories and warehouses, public gathering venues, shopping malls and big box retail stores, etc.), flushometer valve toilets prevail.<sup>4</sup> These buildings also possess some of the longest drainlines void of supplementary water. As such, our concern over drainline waste movement is focused entirely on these types of facilities.

We are not saying that installing flushometer valve HETs in commercial installations will lead to drainline plugging and problems. Instead, we are suggesting that caution be used when choosing whether or not to install these fixtures in existing commercial sites – especially if the physical conditions of the existing drainlines may be suspect or if there are little or no supplemental flows available at the drainline to augment the carry of waste. In new commercial construction, we recommend that building designers seriously consider (a) the placement of other water consuming fixtures (e.g., lavatories and flushing urinals) upstream of the HETs and (b) providing for drainline slopes of greater than 1-percent.

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<sup>4</sup> Tank-type toilets of the type labeled through the WaterSense Program are usually installed in light commercial applications with shorter drainline runs.