California: First with HETs and HEUs

Moving forward with more efficient plumbing fixtures and systems

By John Koeller, P.E.

Many California members are already familiar with the new toilet and urinal efficiency legislation signed into law by our governor just a few months ago. But, because this particular trend toward more efficient plumbing fixtures is likely to spread nationally, it seems as though a summary of California's approach might be helpful.

Some Background

The process to reduce maximum flush volumes on toilets (1.6-gallons) and urinals (1.0-gallon) below EPAct 92 maximums began five years ago when key state legislators proposed to mandate dual-flush toilets for all sales and installations in California. The water utility industry, which had been engaged in aggressive toilet fixture programs since the early 1990s, suggested to the legislators that not only was the dual-flush design not yet widely available for such a statewide mandate, it would be much too design restrictive to mandate a particular technology (such as dual-flush).

Instead, we suggested that when the time was right, any new mandates should specify outcomes (such as flush volumes and fixture performance), and leave technology development and innovation to the plumbing industry. That recommendation was heeded and the push for dual-flush was dropped by those legislators.

By 2006, however, the plumbing industry had successfully developed a wide range of toilets and urinals that functioned exceedingly well at reduced flush volumes. New high-efficiency toilets (HETs) and high-efficiency urinals (HEUs) were available from nearly all manufacturers, large and small. In fact, the past two years have seen more than 45,000 HETs installed in California residences alone.

Definitions

The definitions of the two types of fixtures became universally acceptable to the manufacturers, water utilities, designers, specifiers and government, and were later incorporated into the new 2007 California legislation:

High Efficiency Toilet (HET) - High Efficiency Water Closet means a water closet that is either of the following:

- A dual flush toilet with an effective flush volume that does not exceed 1.28 gallons, where effective flush volume is defined as the composite, average flush volume of two reduced flushes and one full flush. Flush volumes are determined through testing in accordance with national standards ASME A112.19.2 and ASME A112.19.14.
- A single flush water closet where the effective flush volume does not exceed 1.28 gallons. The effective flush volume is the average flush volume when tested in accordance with national standard ASME A112.19.2.

High Efficiency Urinal (HEU) means a urinal that uses no more than 0.5 gallons per flush. It includes non-water urinal technologies.

Today, nearly 200 different HET models are available from 26 different manufacturers. And nearly 50 different HEU models from 10 manufacturers are available.

California's HET-HEU Legislation

Simply stated, California's Assembly Bill 715, signed by Gov. Arnold Schwarzenegger just a few months ago, provides for the following:

1. Beginning on Jan. 1, 2014, 100 percent of all toilets and all urinals sold or installed within the state must be high-efficiency fixtures as defined above, meeting the requirements in the two key plumbing standards, ASME A112.19.2 and ASME A112.19.14.
2. In the intervening six years, manufacturers selling within the state are required to offer a certain percentage of high-efficiency models in the combined fixture categories of toilets and urinals as follows:
   a. By Jan. 1, 2010:.....50 Percent
   b. By Jan. 1, 2011:.....67 Percent
   c. By Jan. 1, 2012:.....75 Percent
   d. By Jan. 1, 2013:.....85 Percent
3. Exceptions to the above provisions:
   a. Blow-out (non-siphonic) urinals.
   b. Institutional toilets, defined as fixtures not typically found in a residential or commercial application, including, but not limited to, wall-mounted floor-outlet fixtures, toilets used in jails or prisons, toilets used in bariatric applications, and child toilets used in day care facilities.
4. Non-water (waterless) HEUs sold or installed within the state must meet certain requirements:
   a. Meet the performance requirements of the current national standard for vitreous china non-water urinals, ASME A112.19.19-2006 and be listed by a certification agency.
   b. Provide a trap seal compliant with the *California Plumbing Code*.
   c. Be installed with a water supply rough-in to the urinal location.

Omissions and Shortcomings

Of noted absence in the above is the provision for and reference to waterless urinals made from materials other than vitreous china. These urinals are covered within the IAPMO Z124.9 standard for Plastic Urinal Fixtures. I am told that this oversight will be corrected through a legislative process.

A very significant shortcoming in the legislation is the absence of new and more rigorous performance requirements for both types of fixtures. In particular, the certification requirements today for toilets are such that marginally performing fixtures still make it into the marketplace. While nearly all of the HETs currently in the marketplace are excellent performers, it is certainly easy to imagine that reducing toilet flush volumes by 20 percent or more for the entire marketplace will result in some flush performance issues for the fringe products. Hopefully, this will be avoided by raising the performance bar in the ASME standard and insisting that toilets remove 100 percent of "real world"–type waste in a single flush. We look forward to the standards committees addressing this in the near future.

Other States and National Implications

The legislation clearly provides a template for the other states and municipalities already considering similar action. Whether or not these other entities follow the California template exactly is doubtful, and therein lay a problem.

Manufacturers do not want to repeat the very costly and confusing patchwork experiences of 1989-1992, when

17 states each adopted their own individual requirements for toilets. Manufacturers, their supply networks, consumers, specifiers, designers and code authorities are all better served if there is a uniformity of requirements across the entire United States (and, better yet, Canada, as well).

As such, plumbing manufacturers and those involved in the standards-writing process have proposed to initiate the work necessary to take these requirements national, making them effective in a time frame similar to that of California. This path, of course, would serve to avoid the possibility of differing requirements among the states. With 2014 as a reasonable target date for national HET and HEU requirements to become effective, watch for developments along those lines in these next six years.

BUT, Do They Work?

Most manufacturers and water efficiency specialists already agree that cutting the maximum flush volume for urinals in half to 0.5 gallons is feasible, reasonable and necessary. However, the 20-percent reduction in toilet flush volumes is another story. Some individuals have yet to witness the improved performance of these new HETs and question whether a substantially reduced fixture flush volume (i.e., from 1.6 gallons today down to as low as 1.0 gallon) will cause problems. Amazingly, however, when it comes to flush performance, today's high-efficiency products outperform their older 1.6-gallon and 3.5-gallon counterparts.

Since beginning Maximum Performance (MaP) testing of toilets in 2003, we have seen the average waste removal capabilities of toilets increase by more than double, a result of the manufacturers' emphasis upon re-engineering tank and bowl hydraulics and using newly developed tank components. For example, in 2003, more than half of all fixtures tested could not remove the minimum 250 grams of solid waste determined to represent the maximum "demand" placed upon a fixture by the male population. Today, dozens of HET fixtures easily remove 700 grams or more, with many achieving 1,000 grams, and doing so with only one gallon of water. Plus, unlike the certification testing, MaP testing requires 100 percent removal of all waste in a single flush.

Go to the MaP testing Web site (www.cuwcc.org/maptesting.lasso) for background and for downloading the latest 11th Edition report, which provides test results on nearly 600 different fixture models (including nearly 200 HETs) in the marketplace.

Those of us in the water utility and "green building" industry certainly hope that the standards writing body (ASME) raises the bar on toilet flush performance in upcoming changes to the standards. Whether MaP testing is incorporated into the national standard or not, it is quite clear that the current performance requirements are not only inadequate, but also not necessarily representative of the "real world" conditions to which these fixtures are subjected.

A second issue frequently raised by plumbing professionals is that of transport of waste in the typical drainline to the sewer. That is, will these reduced liquid flush volumes result in drainline stoppages? Laboratory studies completed to date (go to: www.cuwcc.org/toilet_fixtures.lasso#Drainline) for residential applications clearly indicate that waste transport is not a problem for HETs, provided that prevailing codes are followed in new construction. Dips, sags, root and other intrusions that might exist in older dwellings could certainly affect the waste removal and transport performance of any fixture (regardless of flush volume) or plumbing system. However, the recent installation of more than 5,000 HETs in older dwellings in Redwood City, Calif., has not resulted in any reports of drainline issues. Furthermore, in California, approximately 45,000 HETs have been installed in the last four years, mostly as replacements in residential dwellings. No significant problems have been reported.

Drainline concerns remain for non-residential applications with very long runs (such as the lone fixture 100 feet away at the other end of the warehouse), particularly where there is no supplementary water (lavatory sink, shower, etc.) connected to that drainline. These issues will be addressed over the intervening six years to Jan. 1, 2014, as standards and conditions of installation are defined.

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