New Plumbing Code: Cutting Costs or Cutting Corners?

by Milton Snyder

The National Association of Home Builders (NAHB) has been working hard to change the model codes that control the structural, plumbing, and mechanical aspects of home buildings. They are confining their work to one- and two-family dwellings.

It certainly is possible that the codes for these dwellings should be different than the codes for other structures. But this does not mean that these differences should reduce the quality of the work or equipment. Nor should they affect the health, safety, or life expectancy of the occupants.

The changes NAHB recommends in the plumbing code have been adopted in the 1986 One- and Two-Family Dwelling Code written by the Council of American Building Officials (CABO). The CABO code is recognized by the three model-code organizations. The plumbing-code changes are based on some calculations, some experimental work, and limited actual installation—possibly only *one* installation. The changes would alter codes that are based on a great number of calculations, a great deal of experimental work, and many years of satisfactory performance.

Codes should not remain static, of course; they can and should change from time to time. But they must always be changed to improve quality, not reduce it. If the quality can be maintained—and costs reduced—then the changes are worthwhile.

Pipes Too Small

A review of NAHB's plumbing-code revisions shows that many changes have been made in the sizing and loadings of water-supply and drainage systems. Apparently, the code assumes that new plumbing fixtures can get by with smaller water piping and more fixtures per drainage line. Although some new plumbing fixtures, such as water closets, showers, and lavatories, will have reduced flow as mandated by water-conservation measures, the downsized piping is not merited, based on a thorough examination of the available information.

The code recommends very small water-supply piping—in many instances, ¼- and ⅜-inch tubing. With adequate pressure, and the reduced requirements of some fixtures, this sometimes will suffice. But other fixtures, such as bathtubs, washers, laundry trays, outside faucets, and dishwashers, for the most part will not have restricted flows, and ¼- and ⅜-inch supplies will fall short.

This code states that these small lines should be increased one pipe size if they are longer than ten feet. A pipe-sizing table in the code says that a ⅜-inch line can supply two ¼-inch fixture branches, and a ½-inch line can supply three ⅜-inch lines. It also states that all water piping should comply with standard hydraulic calculations, or with the tables, for the small sizes.

Even with the required 40-pound pressure, using the small sizes specified in the tables can lead to many water-supply problems. Sizing tables should be conservative—not tightly sized. Leave tighter sizing to those who make detailed hydraulic calculations.

In addition to creating hydraulic problems, these small sizes can lead to blockages in small water lines, and future problems with improperly made bends. Higher water velocities will shorten the life expectancy of piping and increase noise and water-hammer problems.

Scalding Water

Another serious problem that may occur is the scalding of shower users. When a toilet is flushed, cold-water pressure may drop in the shower cold line and the mix become very hot for a short time. This code says that hot water must be a minimum of 110° F., with no maximum temperature. Other codes generally define hot water as having a minimum temperature of 120 degrees, and a maximum of 140 degrees.

Perhaps the thinking is that at 110 degrees, the water will not become scalding during fluctuations. This is a poor assumption, because the code does not specify a maximum temperature. And regardless of the water temperature, a sudden fluctuation can cause a "startle" effect. The water does not need to scald to cause problems; it can even become colder. There are cases where this effect has caused bathers to jump back from the water, and slip and fall. We know of one case where a bather broke his back.

The water temperatures called for in the code will require larger storage tanks because a typical hot-and-cold mix will use as much as 30 percent more hot water.

Small-diameter water piping can create serious problems, including negative pressures and reverse flows. The new water-piping tables assume a 40-pound pressure at the water source. This may eliminate many well-water jobs from using these tables because they can't produce this as a continuous minimum pressure.

The Waste Side

The new code requirements for the drainage, waste, and vent systems differ only slightly from other codes for the drainage- and waste-piping capacities. The capacities of building drains, branches, and stacks remain unchanged as to the number of fixture units permitted on each line. The differences show up in the fixture-unit ratings of the individual fixtures and fixture groups. The fixture-unit ratings have been reduced across the board. This permits more fixtures to be installed on a DWV line.

History shows that ½-inch vents—when new and clean—protect trap seals. But after a while, they fail.

The code, in itself, does not justify the new, reduced fixture-unit ratings. A reasonable assumption is that the ratings were reduced because some of the fixtures now have a lower rate of water supply. This is not a sufficient reason. Some fixtures are not affected by the reduced supply rates. A bathtub uses the same amount of water no matter how slowly it fills, as do water-closet tanks. Clothes washers and dishwashers are not restricted. Also, there is no indication that fixtures will be used less frequently.

Let's dismiss this rate-of-supply calculation and analyze what differences can occur in the discharge rate. A fixture that stores water and then discharges it will discharge at the full rate, no matter how long it takes to store the water. There are water closets on the market that allegedly can work satisfactorily with even less water than is mandated for water-conservation fixtures. But this should not make a real difference in drainage ratings.

Drainage ratings are based on drainage flow in gallons per minute, not on the total volume of drainage in gallons. Every plumbing calculation and experiment bears this out. Bathtubs and other stored-water fixtures discharge at the same rate no matter how slowly they fill, or how little they store. Tests on low-volume water closets show that even though they discharge more quickly, we are back where we started when we calculate the flow rate in gallons per minute.

The new code also has some smaller trap sizes, such as 1¼-inch instead of two-inch for a shower stall. Some years ago, one code changed from two-inch to 1½-inch for a shower and changed back to two inches after a short time because of complaints and problems. Reducing shower trap size has been field tested and found to be bad plumbing.

The Biggest Problem

The biggest weakness in the drainage, waste, and vent part of the code is in vent sizing. Almost every required vent has been substantially reduced in size. Plumbing history shows that since the 1880s there have been experiments with vent sizes starting (as this code does) with ½-inch pipe. History also shows that—when new and clean—the small vents often supplied enough air to protect the integrity of trap seals.

But after being in use for a while, these vents failed. They closed up totally or partially from blockages within the system and from blockages generated externally, such as from insects or leaves.

Even though this code says that the full size of the drain must be extended to above the flood-level rim of the fixture before being reduced to the vent size, the blockage problem is not solved. A choked waste line will cause waste materials to back up into the vent.

If the piping is concealed, the simplest way to clean this part of an otherwise dry vent is to mechanically clean the line from the vent top down. This will require a full-size vent line, not a ½- or ¾-inch line. If the small part of the line chokes from bugs or dirt, there is no way to clean a small, concealed line. Vents must be cleanable for their entire length. Installing vents through side walls and at lower levels will generate many problems.

The use of mechanical vents, as detailed in the code, also will create problems. Various state code authorities have tested mechanical vents and found them to be troublesome. The vents get dirty, attract bugs, and permit sewer gas to enter the house when they don't close properly. Under the best of conditions, they protect only against negative, not positive, pressures. Moreover, the life expectancy of these mechanical devices is limited.

Finally, the NAHB code revisions list as acceptable materials that are not acceptable in some other codes. In particular, it allows plastic water piping, which does not meet accepted temperature and pressure maximums.

This code has been developed to reduce plumbing installation costs. This is a wonderful objective. But the changes are too much, too soon, and some of the cost savings will come back to haunt designers, installers, and developers. ■

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