Division of Facilities Development (DFD) - Domestic Water Pipe Sizing Instructions

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Introduction

As part of an ongoing effort to improve water quality in state-owned buildings, the State of Wisconsin - Division of Facilities Development has conducted research on actual flow conditions to justify the reduction of water distribution system pipe sizes. This data has been collected by using externally applied ultra-sonic flow meters connected to data loggers.

The primary goals of this design revision are to reduce water age in the system piping by downsizing or right sizing and increasing the flow rate through the pipe to create an occasional scouring velocity of 5 FPS. If the pipe is right sized, this should occur daily or at least every few days.

DFD has continued the use of the standard DSPS water calculation worksheet, with minor changes, for arriving at the PSI loss per foot available for uniform loss or "A" value and the standard WSFU fixture loading for the assignment of GPM for each pipe and fixture. It is at this point that DFD's method diverges from the standard method. DFD has created a series of tables based on Table 382.40-3 that reduces the conversion factor from WSFU to GPM in 5% increments, from 100% down to 60%. From there, the designer moves to additional tables which were created for PSI uniform loss that show GPM only and that is used for the pipe sizing.

Deviations from Standard DSPS Pipe Sizing Methods -

1. Water Calculation Worksheet:
    a. Building Demand - Begin with the DSPS Code Water Conversion Table that is based on the DSPS standard code sizing method. Discuss the required reduction from Code with DFD prior to assigning a value to the project. The building demand (GPM) is based on this reduction.
    b. The remainder of the Worksheet can be completed as usual, with one exception. Item G - The developed length of the system piping is normally given an allowance of an additional 50% to account for valves and fittings in the run. This is conservative in most applications and drives the "A" value down. The designer must choose a multiplier between 10% and 50% as it applies to their project.

        There should be no conservative numbers used in completion of this worksheet as the result is oversizing of the piping systems. DFD recommends that piping not be oversized for future building expansion. If future expansion is a possibility, an additional disconnected main, or mains should be routed through the original construction or new equipment room and service included in the expansion plan.

2. Assign WSFU to Piping:
    a. Using the project piping plans, assign the water supply fixture units (WSFU) to each segment of piping using the values in Table 382.40-2.

b. No reduction in WSFU quantity should be taken at this time. Use the full value Hot, Cold and Total WSFUs listed. As an example, a branch line serving an individual automatic clothes washer and a janitor's sink will still have a 4.0 HW / 4.0 CW / and 6.0 Total.

3. Calculate and Assign GPM to Piping:
    a. Utilize the appropriate Code Reduction Tab located within the DSPS Code Water Conversion Tables spreadsheet or utilize the automated conversion calculator that is provided on the 100% worksheet. Again, assign GPM to each segment of piping converting the WSFUs to GPM.
    b. Using the example of the individual automatic clothes washer and janitor sink and Code 70% Tab, the branch piping serving these fixtures would be required to flow 3.0 GPM for both hot and cold services.

4. Use Calculated GPM to Size Piping:
    a. With the GPM and A-Value now known, refer to the PSI Loss Table to determine the appropriate pipe size for each segment of piping. Make sure to use the appropriate piping system type tab.
    b. Again, using the branch piping example for the individual automatic clothes washer and janitor sink, 3.0 GPM at an A-Value of 10 would yield a ¾" PEXa pipe size for cold water. The hot water at an A-Value of 5 would also result in a ¾" pipe size.