

Additional Comments and Solution for UPC Item # 107

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Rinnai strongly recommends either including the proposed changes (or similar changes that result in guidelines for sizing and minimum flow rate for tankless water heaters), or rejecting Item #107 until such guidelines can be included in the UPC.

Summary:

The intention of Item #107 is to call out Tankless Water Heaters in Section 610.2 of the UPC for inclusion in the pressure drop calculation of a plumbing system. As proposed:

610.2 Whenever a water filter, water softener, backflow prevention device, tankless water heater, or similar device is installed in any water supply line, the pressure loss through such devices shall be included in the pressure loss calculations of the system, and the water supply pipe and meter shall be adequately sized to provide for any such pressure loss.

One of the problems with Item #107 as proposed is that it provides no information as to what flow rate should be used to calculate pressure drop through a tankless water heater. This has already and will continue to cause confusion among builders and code inspectors alike. We have seen currently that code enforcement officials are using Chapter 6 to require multiple tankless water heaters based on the pressure drop calculated with the fixture unit flow rate calculation. This is despite the fact that the flow rate through the water heater will be restricted to the amount of water that it can heat to the setpoint.

Example:

A 2.5 bath home with the fixtures listed in the Appendix A requires that the hot water distribution piping be sized for a flow rate of 13 GPM. All major tankless water heater manufacturers would recommend the installation of an 150,000 to 180,000 BTU water heater for a home that size. This results in a flow rate at a 77 degree F temperature rise of around 3.4 to 3.8 GPM. The maximum flow from said unit would be in the 8-9 GPM range. This therefore implies either:

- The water heater must be capable of flowing 13 GPM and thus the water heating system is determined by the distribution pipe sizing guidelines
- The pressure drop through a single water heater must be calculated at an impossible theoretical flow rate

Solution:

A possible solution to eliminate the problem is to provide guidelines for a realistic flow rate to calculate pressure drop through a tankless water heater for the purpose of sizing distribution water piping. Ultimately this means that in Chapter 5 there needs to be requirements for the minimum size of a tankless water heater as there currently is for tank water heaters. This would provide a method for code inspectors to insure there is a satisfactory amount of hot water supplied to the residence.

Proposal:

According to a study commissioned by the NAHB, the average hot water flow rate in a high usage home is 3.2 GPM. Taking this into consideration, we propose adding table 5-2 as follows:

TABLE 5-2 TANKLESS WATER SIZING			
Number of Bathrooms	1 to 1.5	2 to 2.5	3 to 3.5
Minimum First Hour Rating, ¹ Gallons	150	180	228
Minimum Flow Rate (GPM) Required @ 77°F Temperature Rise ²	2.5	3	3.8

1. The first hour rating is found on the "Energy Guide" label
2. Values to be used for pressure drop calculations in Chapter 6

This table would be inserted into Chapter 5 of the UPC as sizing guidelines for water heating systems. As you can see based on the number of bathrooms in the home, the chart (sizing guide) gives both a minimum first hour rating in gallons as well as a minimum flow rate at a 77°F temperature rise per the DOE standard. This information can easily be found on the water heater or on the Energy Guide label.

The second part of our proposal consists of including a reference to the above table in section 610.2. This would allow inspectors or plumbing system designers to reference the minimum flow rate, and then use that flow rate to calculate the pressure drop through the tankless water heater. For example:

610.2 Whenever a water filter, water softener, backflow prevention device, tankless water heater¹, or similar device is installed in any water supply line, the pressure loss through such devices shall be included in the pressure loss calculations of the system, and the water supply pipe and meter shall be adequately sized to provide for any such pressure loss.

1. Refer to the flow rate specified in Table 5-2

These two changes would eliminate any confusion as to which pressure drop to use in the pressure loss calculations for the water distribution system, while at the same time ensuring an adequate amount of hot water for the building.

Appendix A – Fixture list for a 2.5 bath home

Microsoft Excel - Appendix A Plan 1

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Line 39

Fixture Units and Estimated Demands							
Building Supply Demand					Branch to Hot Water System		
Kind of Fixtures	Number of Fixtures	Fixture Unit Demand	Total Units	Building Supply Demand in gpm	Number of Fixtures	Fixture Unit Demand Calculation @ 75%	Demand in gpm
Water Closet	3	2.5	7.5	-	-	-	-
Bathtub	2	4.0	8	-	2.0	6	-
Bathtub with 3/4"	0	10.0	0	-	0.0	0	-
Shower Heads	2	2.0	4	-	2.0	3	-
Lavatory	4	1.0	4	-	4.0	3	-
Kitchen Sink	1	1.5	1.5	-	1.0	1,125	-
Vegetable Sink	0	1.5	0	-	0.0	0	-
Laundry Sink	1	1.5	1.5	-	1.0	1,125	-
Clothes Washer	1	4.0	4	-	1.0	3	-
Furthest Hose Bib	1	2.5	2.5	-	-	-	-
Additional Hose Bibs	2	1.0	2	-	-	-	-
Bar Sink	0	1.0	0	-	0.0	0	-
Bidet	0	1.0	0	-	0.0	0	-
Dishwasher	1	1.5	1.5	-	1.0	1.5	-
Irrigation	1	5.0	5	-	-	-	-
Additional Dishwasher	0	1.5	0	-	0.0	0	-
Total Fixture Units / Gallons per Minute			41.5	= 25 gpm	18.75 = 13 gpm		