Water Softeners and “The International Plumbing Code”

In an effort to finally put the question to rest: “Is a water softener required to meet plumbing code?” The following information should leave no doubt. It will also clarify if a water softener “Is required to have NSF 44 certification” to meet the plumbing code on a residential home and “whether a back flow preventer is required on a water softener.”

International Plumbing Code 611 (Drinking Water Treatment Units) April 21, 2015.

This question was submitted to the International Code Council by Tony Marlin (Marlin Mechanical) for clarification: “If a water softener is required to have an NSF 44 certification to meet the plumbing code.” The following is the response:

611.1 Design.
Drinking water treatment units shall meet the requirements of NSF 42, NSF44, NSF 53, NSF 62, or CSAB483.1

“Tony

Q: Does a cation water softener require NSF 44 certification?

A: Section 611.1 requires that drinking water treatment units comply with various standards, NSF 44 (covering cation exchange water softeners) being one of the available standards. If the cation exchange water softener discharges water that is used for drinking water then “yes”, that water softener must comply with NSF 44 and Section 304.4 requires third party certification of that product to NSF 44.

The code does not have a definition of drinking water. However, the federal requirements for “low lead” (0.25 percent lead) components in a potable water system does provide some direction on what constitutes drinking water (and what water paths and water outlets are providing drinking water).

For example, a water softener serving a building with dwelling units would, undoubtedly, be providing drinking water to the dwelling units. However, a water softener providing water only for laundry machines or showers would not be required to meet any standard (and therefore, not be required to be certified to any standard).

If you need further information or have questions on the above, please contact me directly by email or telephone.”

Respectfully,

Fred Grable, P.E.
Senior Staff Engineer
International Code Council

(Page 1)
Dwelling units: (Wikipedia Encyclopedia)

In law, a dwelling (also residence, abode) is a self-contained unit of accommodation used by one or more households as a home, such as a house, apartment, mobile home, houseboat or other ‘substantial’ structure. A dwelling typically includes nearby outbuildings, sheds etc. within the curtilage of the property, excluding any 'open fields beyond'. It has significance in relation to search and seizure, conveyancing of real property, burglary, trespass, and land use planning.

“lead free” mandate, effective Jan. 4, 2014, Under the Reduction of Lead in Drinking Water Act, signed Jan. 4, 2011, “lead free” will be redefined as “not more than a weighted average of 0.25% lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.”

Definition of a drinking water system under (Led Free Mandate:)

On January 4, 2014 Federal Law mandated that the wetted surface of every pipe, fixture, and fitting sold for or installed in potable water applications.

Wetted surfaces include meters, expansion tanks, backflow preventers, flexible connectors, strainers, and assorted gauges, fittings, valves, water heaters etc. — any product used to convey water anticipated for human consumption. Wetted components for nonpotable services such as manufacturing, industrial processing, outdoor watering, or toilets are therefore exempt. (*Led free drinking water standards 2014.)

Conclusion:

According to the “Federal Drinking Water Standards” and the definition of what a Drinking Water System is, there should be no doubt as to the intent of the International Plumbing Code, which is the requirement mandating whether a water softener is required to have NSF 44 certification. “If the softener is installed in a home.”

It would not be conceivable that both the hot and cold water in a dwelling unit would not have the possibility to be used for one if not all drinking, brushing teeth, washing dishes, bathing or cooking.

Recap: (Referenced to Page one by ICC Council.)

“A: Section 611.1 requires that drinking water treatment units comply with various standards, NSF 44 (covering cation exchange water softeners) being one of the available standards. If the cation exchange water softener discharges water that is used for drinking water then “yes”, that water softener must comply with NSF 44 and Section 304.4 requires third party certification of that product to NSF 44.”

“For example, a water softener serving a building with dwelling units would, undoubtedly, be providing drinking water to the dwelling units. However, a water softener providing water only for laundry machines or showers would not be required to meet any standard (and therefore, not be required to be certified to any standard).”
Is a Water Softener required to meet the flow rate and pressure loss demands for the systems application.

April 24, 2015
RE: 2015 IPC Section E103.3

Mr. Marlin,

Thanks for submitting your code opinion question to ICC. Your question referenced Section E103.3 of Appendix E of the 2015 IPC, and is paraphrased as follows:

Q: Are water softeners or other water treatment devices installed in a plumbing system required to meet flow rate and pressure loss demands for the system application?

A: "Yes." In Section E103.3, Part 3, Item 3.5, it is noted that “losses through special devices such as filters, softeners, backflow prevention devices, and pressure regulators” must be accounted for in the segmented loss method of system pipe sizing. The value for pressure loss through the water softener or water treatment device must be obtained from the manufacturer. The required pressure for the fixture which is farthest from the supply entry must be met, taking into account any and all losses in the system path.

Code opinions issued by ICC staff are based on ICC published codes and do not include local, state or federal codes, policies or amendments. This opinion is based on the information which you have provided. We have made no independent effort to verify the accuracy of this information nor have we conducted a review beyond the scope of your question. This opinion does not imply approval of an equivalency, specific product, specific design, or specific installation and cannot be published in any form implying such approval by the International Code Council. As this opinion is only advisory, the final decision is the responsibility of the designated authority charged with the administration and enforcement of this code.

Sincerely,

Jeff H. Walker, P.E., C.B.O., M.C.P.
Senior Staff Engineer
Architectural & Engineering Services
International Code Council

**Conclusion:** A Water Softener “must meet” the flow rate and pressure loss demands for all applications on both residential and commercial.

**NSF 44 Certification** is the certification required under reference standards for water “Residential Softeners.” Commercial Water Softeners require engineering listing the flow rate and pressure loss through the equipment.

**NSF 44 Certification** lists on each piece of equipment the flow rate and pressure loss of the equipment..Part of the reason for NSF 44 certification is to help simply determine if the water softener system will meet the flow rate and pressure loss requirements. With out certification and testing it has been found that manufactures list outrageous flows and unobtainable pressure loss calculations. The NSF 44 certification required on all systems installed in a dwelling Unit would require the NSF44 certified listing on the equipment. E103.3 of Appendix E and Tables E103.3 (2), E103.3(3) and 611.1 of the 2012-2015 IPC.
April 24, 2015

RE: 2015 IPC Sections 608.3 and 608.3.1

Mr. Marlin,

Thanks for submitting your code opinion question to ICC. Your question referenced Sections 608.3 and 608.3.1 of the 2015 IPC, and is paraphrased as follows:

Q: Are backflow prevention assemblies required for the supply to an NSF44 Certified Water Softener?

A: “Not necessarily.” Per Section 608.1, “Backflow preventer applications shall conform to Table 608.1, except as specifically stated in Sections 608.2 through 608.10.” Section 608.3 of the 2015 IPC states in part that “Water pumps, filters, softeners, tanks, and other appliances and devices that handle or treat potable water shall be protected against contamination.” This section does not specifically call out a certain type of backflow prevention device or method, thus Table 608.1 may be used in toto.

Table 608.1 defines ‘contamination’ (as noted in Section 608.3) as a high-hazard arrangement, per footnote ‘a’; as a result, any of the Table 608.3 entries which does not list ‘High’ under ‘Degree of Hazard’ would be eliminated from consideration for a water softener arrangement.

The next characteristic of the arrangement in question is whether or not it would subject the supply line(s) to backpressure (note that all devices in Table 608.1 are valid for backsiphonage). The term “Backflow” is defined in Section 202 as “Pressure created by any means in the water distribution system, which by being in excess of the pressure in the water supply mains causes a potential backflow condition.”

The two types of backflow conditions are backpressure and backsiphonage; “backpressure, low head” is defined in Section 202 (under “Backflow”) as “A pressure less than or equal to 4.33 psi, or the pressure exerted by a 10-foot column of water.” In other words, when the system pressure is at or less than one or both of these defined limits, backpressure is deemed by code to be a high probability. Of course, a backpressure situation could be present at any arrangement where the appliance or equipment could produce a higher pressure than system pressure; it ultimately depends upon the characteristics of the appliance or equipment, positioning of the system (elevations), and the system pressure, which all must be evaluated.

Once it is determined whether or not the water softener arrangement is prone to create backpressure in the supply, along with the ‘high degree of hazard’ designation, one can choose any of the devices listed in Table 608.1 which apply.

Assuming that the water softener arrangement is subject to producing backpressure, protection includes most backflow prevention assemblies, backflow preventer plumbing devices (including vacuum breakers), and most other means, such as air gaps. (General Regulations 302.6)

It is not uncommon for local jurisdictions to have ordinances which specifically call out a certain type of backflow preventer for a specific application, as allowed by code.

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Sincerely,

Jeff H. Walker, P.E., C.B.O., M.C.P.

Senior Staff Engineer, Architectural & Engineering Services, International Code Council
Conclusion: A Back Flow Preventer is not required on a NSF 44 Certified Water Softener. The system must be protected by an Air Gap when connected to a drainage system. Certification is required on any water softener used in a dwelling unit. 302.6

**611.1 Drinking Water Treatment** requires any dwelling using water for drinking, brushing teeth, washing dishes, bathing or cooking. **Must be NSF44 certified.**

Part One of the NSF 44 certification is testing for toxins or any substance that might be hazardous. Any additional substance that might be added to the water by any component of the system. A water softener cannot add anything not potable to the water, as defined under 611.2. 101.3 “All wetted substances must be tested.”

A water softener must meet the flow rate and pressure loss demand for the home and must be taken into consideration when sizing the meter service pipe and the distribution pipe volume demand for the application. Part two of NSF 44 Certification lists the flow rate and pressure loss on the equipment as required in E103.2.2, 303.3-3.5, Appendix E F, G and H, E201.1 2.3, Table E103.(2), Table E103 (3), Table E201.1
101.3 Intent. The purpose of this code is to provide minimum standards to safeguard life, limb, health, property and public welfare by regulating and controlling the design construction, installation, quality of materials, locations operation and maintenance or use of plumbing equipment and systems.

Plumbing Fixture: (DEFINITIONS) A receptacle or device that is connected to a water supply system or discharge to a drainage system or both. Such receptacles or devices require a supply of water, or discharge liquid waste or liquid-born solid waste; or require a supply of water and discharge waste to a drainage system.

Third-Party Certified: (DEFINITIONS) Certifications obtained by the manufacturer indicating that the function and performance characteristics of a product or materials that have been determined by testing and ongoing surveillance by an approved third party certification agency. Assertion of certification is in the form of identification in accordance with the requirements of the third-party certification agency.

303.1 Identification. Each length of pipe and each pipe fitting, trap, fixture, material, and devices utilized in a plumbing system shall bear the identification of the manufacturer and the markings required by the applicable reference standard.

303.4 Third-party certification. All plumbing products and materials shall be listed by a third party certification agency as complying with reference standards. Products and materials shall be identified in accordance with section 303.1.

604.3 Distribution Design Criteria. The water distribution system shall be designed, and piping sizes shall be selected such that under conditions of peak demand, the capacities at the fixture supply outlets shall not be less than shown in table 604.3 The minimum flow rate and flow pressure provided to fixtures and appliances.

Table 604.3 Water Distribution System Design Criteria Required capacities at Fixture Supply Piping Outlets. Refer to Table For proper sizing.

(Reference Standards)

NSF
44-2007 Residential Cation Exchange Water Softeners 611.1, 611.3

611.1 Design. Drinking water treatment units shall meet the requirements of NSF 42, NSF 44, NSF 53, NSF 62 or CSAB483.1

E103.2.2 water pipe sizing procedures are based on a system of pressure requirements and losses, the sum of which must not exceed the minimum pressure available at the supply source.

5. Losses through special devices such as filters, softeners, backflow prevention devices and pressure regulators. These values must be obtained from the manufactures. 303.1 303.4

303.3-3.5 Segmented Loss method. Losses through special devices such as filters softeners, backflow prevention devices and pressure regulators. These values must be obtained from the manufactures. 303.1 303.4
Appendix E (F, G and H): The pressure losses through filters, softeners, backflow prevention devices and other special fixtures must be obtained from the manufactures. Equipment such as backflow prevention devices, check valves, water softeners, instantaneous or tankless water heaters, filters, and strainers can impart a much greater pressure loss than piping. The pressure losses can range from 8 psi to 30 psi. 303.1

Table E103.(2) Load Values Assigned to fixtures.
 Fixture unit count.

Table E103 (3) Table For Estimating demand.
Fixture Unit to Flow Rate Conversion

E201.1 2.3 Deduct all pressure losses due to special equipment such as back flow preventers, filters, water softeners. Pressure loss data for each piece of equipment shall be obtained through the manufactures of such devices. 303.1 303.4

General Regulations.

302.6 Water softener and iron filter backwash. Water Softener or iron filter discharge shall be indirectly connected by means of an air gap to the private sewage disposal system or discharge onto the ground surface, providing that a nuisance is not created.

Air Gap (DEFINITION) The unobstructed vertical distance through a free atmosphere between the outlet of the waste pipe and the flood level rim of the receptacle into which the wast pipe is discharged.

The information provided is for teaching purpose only in an effort to clarify the intent of the International Plumbing Code and Water Softeners. It is in no way intended to replace the actual International Plumbing Code, which is protected by copy right laws. All Conclusions were written by Tony Marlin (Marlin Mechanical)