WE 6: STOP WASTING DRINKING WATER FOR COOLING

New York City Plumbing Code
Proposal developed by the Water Efficiency & Building Stormwater Committee

Summary

Issue:
"Once-through" cooling systems emit heat into potable water, which is then drained into the sewer. No other cooling systems waste water in this manner.

Recommendation:
Prohibit new installations from using “once through” cooling systems.

Proposed Legislation, Rule or Study

Amendments to the New York City Plumbing Code:

1. Amend Section 202 to include the following definitions:

   **SUBSTANTIAL REPAIR OR REPLACEMENT.** Repair or replacement of an item of equipment or system costing 50% or more of the cost of replacing the entire existing item of equipment or system.

   **ONCE-THROUGH COOLING.** The practice of using potable water to cool a condenser or other item of process or building equipment and then discarding the water to a sanitation drain. Once-through cooling also includes the use of potable water to temper hot water or steam before sending it to a sanitation drain.

2. Add a new Section 428 as follows:

   **SECTION PC 428 PROHIBITED WATER USES**

   **428.1 Potable water prohibited for once-through cooling.** Potable water shall not be used for in once-through cooling equipment or substantial repair or replacement of existing cooling equipment. Equipment such as ice-making machines, walk-in coolers, refrigerated walk-in boxes, or environmental air conditioning equipment shall be provided with air-cooled condensers or recirculating condenser water systems, or supplied with non-potable water as permitted by Appendix C of this code.

   **PC 428.2 Approvals.** If a proposed design includes the use of non-potable water for cooling, calculations shall be provided and approved by the department demonstrating that sufficient non-potable water is available at all times for the proposed cooling load. Potable water may be used as an emergency backup providing sufficient backflow equipment is provided and the emergency feature can be used no more than 24 hours consecutively and no more than 24 hours in any year.

   **Exception:** The department may waive the requirements of this section in connection with the substantial repair and replacement of existing cooling equipment upon the submission of a cost and savings analysis prepared by a licensed professional that demonstrates that the elimination of once-through water-cooled equipment in accordance with this section has a payback longer than five years assuming a water/sewer cost escalation of 7% per year. In no case shall such equipment be used in sizes that exceed maximum sizes specified in RCNY Title 15 Chapter 20-08.

Supporting Information

**Issue – Expanded**
Most large building air conditioning and refrigeration systems operate with a recirculating system of cooling water. Throughout the city, however, there are small-to-medium size systems that pass potable water once through a piece of equipment to provide cooling and then dump the potable water into the sewer system. Examples include ice-making
machines in hotels, restaurants, taverns and similar occupancies, walk-in coolers in food business facilities, older medical x-ray and laser equipment and local cooling particularly for “back office” portions of an office building where people and computer heat loads exceed what was originally anticipated for the air conditioning system. The Department of Environmental Protection’s (DEP) water use rules currently limit the size of such equipment to no more than six tons of refrigeration capacity (1 ton = 12,000 BTUH) or two tons of air conditioning capacity. Each “ton” of cooling uses about 250,000 gallons of single-pass cooling water each year, amounting to more than $200 per year in water/sewer costs. This is 40 times more water than would be used in a recirculating system using an evaporative cooling tower operating at five cycles of concentration and 100% more than an air-cooled system.2 3

Once-through water-cooled equipment is particularly susceptible to “silent leaks” that can waste an enormous amount of water and cost the customer a great deal of money. A small solenoid valve is meant to turn the cooling water supply “on” or “off” depending on whether the compressor needs cooling at that moment. To avoid damage to the expensive compressor from overheating, the solenoid valve is designed to fail in an open position, meaning water flowing full time. Under that circumstance, normal operation, which might mean 0.5 – 2.0 gpm water flow for 15-20 minutes each hour, escalates to continuously flow, 24 hours a day. The valve and equipment do not provide any indication of valve failure without a physically difficult inspection. According to Department of Environmental Protection water conservation officials, virtually every high water bill complaint from a food or medical business turns out to have to water-cooled equipment as the primary problem.

Environmental & Health Benefits
By conserving potable water, we are also reducing the amount of energy and resources spent on water treatment and distribution. Using less water also reduces the amount of sewage in our sewer systems and reduces the frequency of combined sewer overflows (CSOs).

This proposal was determined to have a low, positive environmental impact per building and to impact a small number of buildings. It was thus given an environmental score of 1.

This proposal was determined to have no significant health impact.

Cost & Savings
As described in the Executive Summary, Bovis Lend Lease prepared cost estimates for each Task Force proposal in the context of well-defined construction projects in specific buildings. Where possible, members of the Technical Committees prepared savings estimates for some of these projects and buildings. These cost and savings estimates are presented in the February 1st draft version of Appendix A. The innate uncertainty in how construction and operation will vary from one building to another, the complexity of the Task Force proposals, and the wide range of applications in which the proposals may be realized mean these figures are truly estimates.

This proposal is not expected to have any significant impact on capital costs.

Precedents
Austin, Seattle, Phoenix, San Antonio, Denver, and Hawaii are among the jurisdictions that prohibit once-through equipment. The draft of Portland, OR’s new water conservation standards requires potable water used in once-through cooling systems to be reused.4

LEED
LEED addresses the use of condensate water as a water conservation strategy for irrigation and building sewage conveyance systems. For these purposes, this proposal will assist in achieving all prerequisites and credits in LEED Water Efficiency sections of the various rating systems.

LEED also addresses the use of treated stormwater as condensate water as one method of reducing the amount of wastewater going into the sewer system. For these purposes, this proposal will assist in achieving all Stormwater Design credits in LEED Sustainable Sites sections of the various rating systems.

Implementation & Market Availability
There are no known implementation issues for this proposal. All replacement and substitute systems, such as high-efficiency (EnergyStar rated) air-cooled condensers for heat rejection or a connection to a recirculating cooling water system, are readily available.

Notes
RS 16 P107.16 of the 1968 building code and DEP regulations allow once through cooling systems. The 2008 building code no longer expressly allows once through cooling but instead references DEP or has removed references to these cooling systems.
ENDNOTES:


