



Corrosion in Water Systems: A Guide for Tennessee Municipal Elected Officials

Part 1 of a 6 Part Series

Steve Wyatt, MTAS Utility Operations Consultant

July 2020



Municipal Technical Advisory Service
INSTITUTE *for* PUBLIC SERVICE



What is corrosion in a water system?

Corrosion control is a constant task for water system personal. The system staff uses various tools to minimize the effects of corrosion within a system and in the plumbing of their customers. This short report is an overview of the tools used and the some of the requirements as specified by the State of Tennessee.

According to the Center for Disease Control:

“Metal pipe corrosion is a continuous and variable process of ion release from the pipe into the water. Under certain environmental conditions, metal pipes can become corroded based on the properties of the pipe, the soil surrounding the pipe, the water properties, and stray electric currents. When metal pipe corrosion occurs, it is a result of the electrochemical electron exchange resulting from the differential galvanic properties between metals, the ionic influences of solutions, aquatic buffering, or the solution pH.”

There are different types of corrosion found in a water system. The two main classifications are generalized corrosion and localized corrosion. These could either be on the external portion or on the internal portion of the infrastructure.

Corrosion in water system can:

- Damage infrastructure and increase maintenance expenses
- Shorten the life expectancy of infrastructure
- Reduce flow through pipes
- Reduce water quality provided to the customer

Protecting the water system from corrosion is an on-going task for the water utility. The strategy on how to protect this valuable asset has many facets.

- Materials used within the system
- Paints and coatings applied to tanks
- Cathodic protection for tanks
- Corrosion inhibitors added to the water during treatment
- Proper water movement through the system
- Testing and monitoring

The Tennessee Department of Environment and Conservation (TDEC), Division of Water Resources has rules, which specify what is allowed to address corrosion in a water system. Listed below are excerpts from that rule.

Materials used within the system

Rule 0400-45-01-17 (22)

All pipe, pipe or plumbing fitting or fixture, solder, or flux which is used in the installation or repair of any public water system shall be lead free. The term “lead free” shall have the meaning given it in T.C.A. § 68-221-703.

T.C.A. § 68-221-703. (14) “Lead free” means:

(A) Not containing more than two-tenths of one percent (0.2%) lead when used with respect to solder and flux; and

(B)

(i) Not more than a weighted average of twenty-five hundredths of one percent (0.25%) lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures;

(ii) The weighted average lead content of a pipe, pipe fitting, plumbing fitting, or fixture shall be calculated by using the following formula: For each wetted component, the percentage of lead in the component shall be multiplied by the ratio of the wetted surface area of that component to the total wetted surface area of the entire product to arrive at the weighted percentage of lead of the component. The weighted percentage of lead of each wetted component shall be added together, and the sum of these weighted percentages shall constitute the weighted average lead content of the product;

(iii) The lead content of the material used to produce wetted components shall be used to determine compliance with this subdivision (14)(B);

(iv) For lead content of materials that is provided as a range, the maximum content of the range shall be used; ...

Paints and coatings applied to tanks

Rule 0400-45-01-17 (34)

Paints and coatings for the interior of potable water storage facilities must be acceptable to the Department. Paints and coatings accepted by the Environmental Protection Agency (EPA) and/or the National Sanitation Foundation (NSF) for potable water contact are generally acceptable to the Department. Paint systems for steel tanks shall be consistent with AWWA Standard D102-78. Factory coated bolted steel tanks shall be in accordance with AWWA D103-87. Wire-wound circular prestressed concrete tanks shall be in accordance with AWWA D110-86.

Corrosion inhibitors added to the water

Rule 0400-45-01-17 (36)

By January 1, 1995, all chemicals, additives, coatings or other materials used in the treatment, conditioning and conveyance of drinking water must have been approved by the National Sanitation Foundation (NSF) or American National Standards Institute (ANSI) certified parties as meeting NSF product standard 60 and 61. Until 1995, products used for treatment, conditioning and conveyance of drinking water shall have been listed as approved by the US EPA or NSF.

Proper water movement through the system

Rule 0400-45-01-17 (23)

All dead-end water mains and all low points in water mains shall be equipped with a blow-off or other suitable flushing mechanism capable of producing velocities adequate to flush the main.

Sources

Water Transmission and Distribution. Principles and Practices of Water Supply Operations. (2003) (Third edition). American Water Works Association.

Rules of Tennessee Department of Environment and Conservation. Division of Water Resources. Chapter 0400-45-01.

<https://publications.tnsosfiles.com/rules/0400/0400-45/0400-45-01.20190217.pdf>



Municipal Technical Advisory Service
INSTITUTE *for* PUBLIC SERVICE

mtas.tennessee.edu