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WATER SAMPLING PROTOCOL FOR MICROBIOLOGICALLY INFLUENCED CORROSION

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MIC Advisory Panel

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1.0 PURPOSE

The purpose of this protocol is to provide standard procedures for the collection of appropriate water samples in respect of existing and new fire sprinkler systems, which fall under the jurisdiction of the Tennessee State Fire Marshal, for laboratory analysis for the following parameters:

- The possible presence of microbes that would be indicative of microbiologically influenced corrosion (MIC) in the piping system from which the water was sampled.
- The chemical parameters that would be indicative of chemical corrosion and/or deposition of minerals taking place in the piping system from which the water was sampled.

2.0 APPLICABILITY

These regulations apply only to the following facilities:

- New buildings and facilities that will have a fire sprinkler system that falls under the jurisdiction of the Tennessee State Fire Marshal.

- Existing buildings and facilities that have an existing fire sprinkler or fire hose reel system that will be altered, extended or replaced, with a new or remodeled fire sprinkler system, where the fire sprinkler system falls under the jurisdiction of the Tennessee State Fire Marshal.

3.0 NUMBER OF SAMPLES AND LOCATION OF SAMPLING POINTS

3.1 New Buildings and Facilities with Independent New Fire Sprinkler System(s)

One water sample shall be collected from the nearest fire hydrant on the water main that will serve the new building or facility. This requirement also applies to new buildings or facilities that are attached to an existing building or facility, provided that the fire sprinkler system(s) for the new building/facility is/are totally separate from, and independent of that of the attached existing building or facility, i.e. the new building has one or more new risers.

3.2 New Buildings and Facilities with Fire Sprinkler System Dependent on Existing System

The following four water samples shall be collected:

- One sample from the main drain on the existing riser.
- One sample from the drain on the inspector's port at the far end of the existing system.
- One sample from the most remote faucet, sink or water fountain.
- One sample from the nearest fire hydrant on the water main that serve the buildings/facility.

3.3 Additions and Alterations to Existing Buildings and Facilities

In the case of additions and alterations to existing buildings and facilities where there may be one or more new additions to the existing buildings/facilities, and where there are multiple existing fire sprinkler systems that will be impacted or extended, the environmental professional responsible for the MIC sampling and for making the appropriate recommendations following laboratory analysis, shall use professional judgment in selecting the number of samples to be collected, and for selecting the locations for sampling. However, the number and locations of samples shall generally not be less than the following guidelines:

- From the main drain on the riser of each existing fire sprinkler system *of differing age* that will be impacted or extended.
- From the inspector's port at the far end of each existing fire sprinkler system, *regardless of age*, that will be impacted or extended.
- From the most remote faucet, sink or drinking water fountain of the oldest domestic water system that will be impacted or extended. Additional samples may be collected from other domestic water systems, if deemed appropriate by the sampling professional.

- From one of the nearest city fire hydrants serving the building/facility, provided that, in the case of multiple existing hydrants, all existing hydrants are served by the same water main or by multiple water mains, all of which were installed at the same time, and provided that all the new additions will be served by water from domestic and/or fire mains of the same age. In the case of varying ages of supply mains, appropriate additional samples shall be collected.

To clarify the sampling from the main drains on risers (the first bullet above) of impacted systems, if an existing building has multiple risers, all of which were installed at the same time, all of which were constructed of similar materials, and all of which have similar configurations, **only one water sample is required from the main drain on one of the multiple risers.** However, if an existing building has multiple risers and sprinkler systems, all of which were installed at the same time, all of which were constructed of similar materials, and all of which have similar configurations, **one water sample is required from the drain at each inspector's port.**

4.0 SAMPLING PROTOCOL

4.1 Disabling of Fire Alarm System(s)

No sampling of water from an existing fire sprinkler system shall be performed without the building/facility operator arranging for the fire alarm system to be temporarily de-activated for the duration of water sampling.

4.2 Personal Protective Equipment

The person performing water sampling shall don protective eye wear (goggles or splash shield) and a clean new pair of latex gloves before sampling from each sampling location, and shall avoid splashing of fire system water on unprotected parts of the body, especially eyes and mouth. Any inadvertent splashes on unprotected skin, and especially in the eyes or mouth shall immediately be flushed out with copious amounts of clean water.

4.3 Collection of Water Samples

4.3.1 Water samples shall be collected in pre-cleaned new sample containers that were appropriately sterilized by the laboratory or by the laboratory's supplier. Sample containers shall be of adequate volume to complete the required testing.

4.3.2 In order to remove possibly excessively contaminated fire sprinkler water that is not representative of the majority of the water in the fire sprinkler system, at each sampling location approximately five gallons of water shall first be slowly flushed out of the sampling location before the collection of the water sample in the laboratory's sampling container. This volume shall be collected in a five gallon bucket, or the volume determined by other appropriate means. This flushed water shall be discarded onto the ground surface in an appropriate nearby location where it will not cause any harm or significant discoloration of paved surfaces. This initial flushing out of stagnant water shall not apply to sampling from drinking water locations, such as faucets, sinks, and drinking water fountains that are in regular use.

4.3.3 The sterilized sample container from the laboratory shall then be filled and emptied four times with water from the sampling source. The cap of the sample container should be similarly flushed out using the water from the sampling source. This flushing out of the sample container and cap will eliminate any residual sterilant in the sample container and cap that could possibly sterilize or otherwise impact the results of the laboratory analysis for microbial life in the sample of fire sprinkler or domestic water.

4.3.4 The sample container shall then be slowly filled completely full of water from the water source, including allowing the meniscus to develop above the very top of the rim of the sampling container. Approximately twenty (20) seconds shall be allowed for any entrained air to escape from the water. A cap full of sample water shall then be collected in the cap of the same sample container, and this sample water shall then be carefully and slowly poured into the top of the sample container to ensure that the meniscus remains or is fully developed above the top of the rim of the sampling container before placing the cap slowly and carefully onto the sample container. The objective of these procedures is to eliminate, as far as humanly possible, any air bubble being entrapped in the sample container.

4.3.5 The sample container shall then be marked with unique identifying information, including not less than the following details:

- sampling company name
- sampling company project number
- sampling location
- sample number

4.3.6 An appropriate chain of custody shall be used for each project. The chain of custody shall include not less than the following details:

- sampling company name, address & telephone #
- project name & address
- sampling company project number
- date & time of sample collection
- name & signature of sampler
- sampling location
- sample number
- laboratory name, address & telephone #
- required analyses
- remarks
- spaces for signatures of persons and times of transfer of samples along the chain from sampling in the field to delivery at the analytical laboratory

4.4 Sample Packaging & Shipping

4.4.1 Sample kits shall be provided by an approved laboratory, and shall ensure that the integrity of samples is maintained from collection to receipt at the laboratory. The sample kit shall include, at a minimum, the following:

- Cooler – A hard case cooler (e.g., Igloo or similar) or other appropriate insulated container capable of protecting the sample(s) and maintaining temperature of the sample(s) during shipment to the laboratory. Samples shall be stored on ice until return to the laboratory. Raw Styrofoam coolers without a hard case are not recommended when using a common carrier (i.e., FedEx, UPS...) due to potential damage and leakage during shipment.

Once collected, samples shall be stored at approximately 4°C using wet ice. Samples shall be maintained at the 4°C temperature until return to the laboratory within 24-hours of completion of sampling.

Blue ice is not recommended due to its inability to maintain the proper temperature. Dry ice is not recommended as it will cause the samples to freeze.

- Chain-of-Custody Document – This document shall be designed to record the information required in section 4.4.5, and to track the custody of the sample(s) from the field to the laboratory. The information provided on this document shall also be used in the final report. This document shall accompany samples to the laboratory, and shall be signed/dated by all persons involved in handling of the sample(s) from the field sampling until receipt at the laboratory.
- Sampling Instructions – Instructions provided by the laboratory shall be specific for the sampling kit provided and shall meet the guidelines presented in this document (Water Sampling Protocol for MIC).
- Shipping Instructions – Instructions for packaging of the samples and return shipment to the laboratory shall also be provided, and shall meet the guidelines provided in this document (Water Sampling Protocol for MIC). Samples shall be maintained at the 4°C temperature until return to the laboratory within 24-hours of completion of sampling. The laboratory shall also indicate the ability to accept weekend delivery of samples.
- Containers – The laboratory shall provide pre-cleaned/sterilized containers with adequate volume to complete the required testing. A label shall be provided for each container to ensure that each sample is clearly and uniquely identified.
- Temperature Blank – Typically a small, separate container of water (clearly labeled Temperature Blank) shall be used to verify the temperature of the cooler upon receipt at the laboratory.