Engineered Corrosion Solutions

Complete Corrosion Control.

ECS Corrosion Assessment Program for Water-Based Fire Sprinkler Systems

In order to determine the extent of corrosion damage that has occurred inside fire sprinkler piping, ECS offers the **Fire Sprinkler System Corrosion Assessment Program**. This process is used to determine the root cause of the corrosion, the locations within the piping where damage has occurred, the severity of the damage and the current level of risk for leaks going forward. In most cases, it is not necessary to replace the entire fire sprinkler system. Remediation of the system with "surgical" pipe replacement and the implementation of a comprehensive corrosion management strategy can save most systems. In the case of water based fire sprinkler systems, the following is almost always true:

- Oxygen corrosion is the primary cause of corrosion related failures in fire sprinkler systems
- All wet systems have trapped air, often at high elevations, and all dry systems have trapped water generally from hydrostatic testing or a recent trip event
- The risks of a pipe leak in galvanized steel systems is much higher than black steel systems
- Corrosion will be most severe in two places: at the interface where air and water meet and underneath the solid deposits formed by the corrosion process
- It is very common to find leaks that occur at weld seams near the air/water interface
- The risk of a leak increases with system age and activity; the more often a system is drained and filled the more likely severe corrosion will occur

The **activities** that support the corrosion assessment include the following:

- Review of system "as built" drawings, if available
- Identification of "hot spots" within the system where failures have occurred in the past
- Location of most likely locations for accelerated rates of corrosion (trapped water or air, high temperature, locations for solids build-up)
- Interview of building staff who have knowledge of system history (location of failures, repairs that have been performed on the system and any system impairments)
- Fire sprinkler system activity (test frequency, accidental trips)
- Outline corrosion management strategy that addresses the key corrosion mechanisms (materials selection and treatment options)
- Development of surgical pipe replacement plan based on findings
- Recommendation of complete corrosion management strategy going forward for the system with associated system modifications, corrosion device needs and expected program costs
- Recommendation for complete in-situ corrosion monitoring strategy

Assessment Program Investigative Tools (ranked by importance):

1. **Video scoping of the internal piping** – this is the most valuable investigative tool because it provides physical inspection evidence of the piping internals. Corrosion is always associated with solids. Visual evidence of solids and metal loss is the most important physical evidence.

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2. **Sectioning, cleaning and analyzing pipe samples from the system** – this provides for thorough investigation of the actual metal loss that has occurred on the metal surface. Metal loss should be characterized by pit shape, pit depth, pit frequency, pit size, texture of the metal loss, and appearance of the surfaces under deposits and composition of the corrosion by-products.
3. **Determination of the elemental composition of debris collected from inside the system** – this is used to further define the corrosion by-products and the mechanisms that formed those by-products.

ECS strongly recommends that any facility with a black steel sprinkler system over 10 years old or a galvanized steel sprinkler system of any age perform a corrosion assessment to determine the current condition of the piping. If the assessment is performed before the pipe damage is too severe, a complete corrosion control program including the use of nitrogen gas to displace oxygen from system piping can save the system and reduce the leak risk going forward. As fire sprinkler systems age, the risk of a leak and the potential property damage and disruption to business grow exponentially.

Work Required by Others:

A fire sprinkler contractor is required to be on-site for the duration of the corrosion assessment and is responsible for:

- Taking the systems out of service and providing access to sprinkler pipe for scoping
- Taking fire alarm system out of service for the duration of the work period
- Preparation of replacement pipe spools to be installed where samples are extracted
- Shipping pipe samples to ECS offices in St. Louis, MO for analysis
- Providing necessary tarps/plastic sheeting to ensure no water damage results at video scoping locations or anywhere the system piping is opened
- Providing equipment needed to access fire sprinkler system, including lifts and ladders to reach system piping if necessary

Left: galvanized pipe in dry system with trapped water
Right: black steel pipe in wet system with trapped air