

Corrosion Risk Assessment

for Fire Sprinkler Systems

setting the standard for risk management



ISO 9001:2015
CERTIFIED COMPANY

 **PRI Registrar**
PERFORMANCE REVIEW INSTITUTE

Identify Risks

Piping Failure Risk

Will the sprinkler piping fail and leak resulting in water damage to the structure and building contents?

Business Continuity Risk

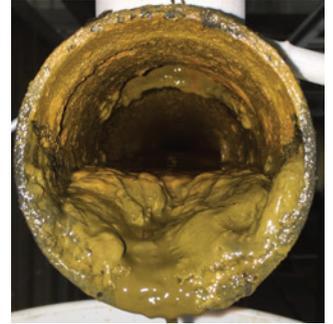
Will the failed (leaking) fire sprinkler system cause business interruption or downtime?

Life Safety Risk

Will the fire sprinkler system provide the appropriate level of response to prevent injury or loss of life?

Catastrophic Structure Risk

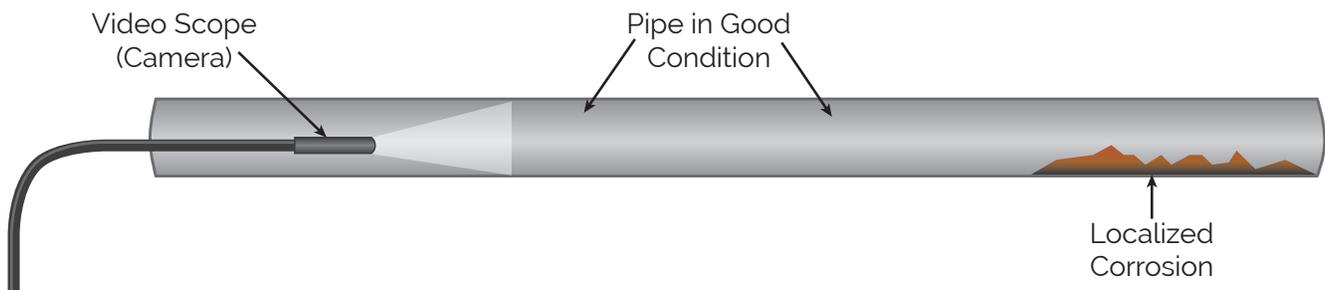
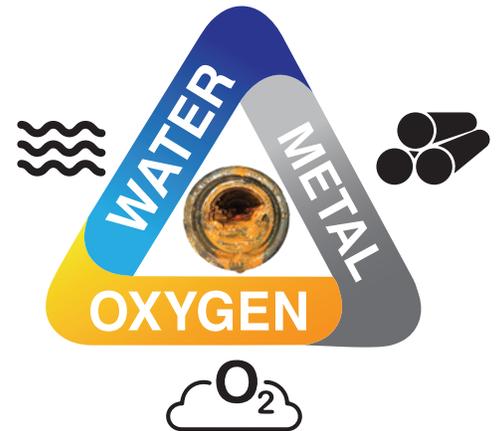
Will the fire sprinkler system prevent loss of the structure?



Science of Corrosion

Whenever oxygen, liquid water, and steel are in direct contact, a chemical reaction takes place forming iron oxide, commonly known as rust. Both dry pipe systems and wet pipe systems are vulnerable to corrosion through this combination of elements.

- Corrosion is cumulative and accelerates as deterioration happens.
- Life expectancy - Worst case scenario
 - Galvanized Dry: 5 years
 - Thin-walled Wet: 10 years
- Risk Factors - Thin wall pipe, design, draining & filling, system elevation, etc.
- Corrosion is highly localized, complete system replacement is rarely required.



What ECS Does

Due Diligence

An engineer from our consulting team will perform a thorough review of the system risk factors and leak history to determine the best assessment strategy.

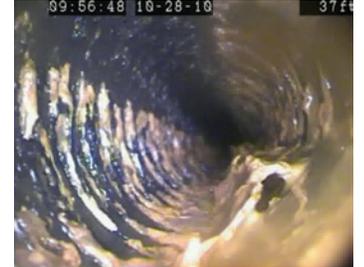
On-Site Work

Using data collected from comprehensive video scoping, pipe sample analysis, system design, leak history, and our expert experience, ECS determines the following:

- Locations of damaged piping
- Locations of piping in good condition
- Severity of existing damage
- Risk levels for leaks & obstructions



Branch line at 16ft with no corrosion, water filled with no air-water interface



Same branch line at 37ft with significant corrosion deposits, clear air-water interface

Pipe Sample Analysis

Can be performed as a stand alone project or in conjunction with an assessment. Pipe sample analysis are performed at our laboratory to determine the following:

- 1 Root cause of corrosion
- 2 Existing wall loss
- 3 Remaining service life

Before
Media
Blasting



After
Media
Blasting



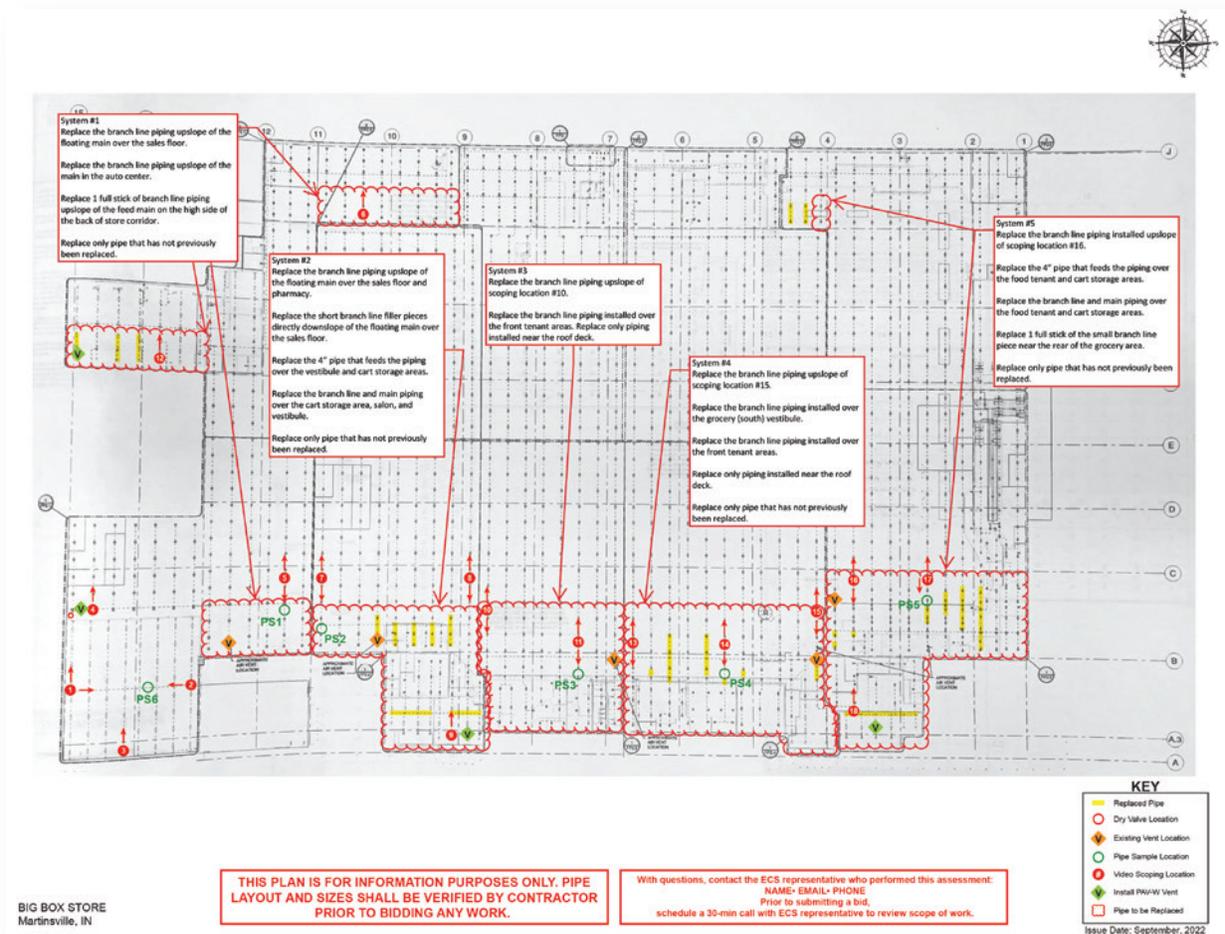
What You Get

Report

- Technical summary of corrosion and risk factors
 - Images from interior of sprinkler pipe with commentary
 - Images of unique, observable evidence
 - Design and maintenance considerations specific to your facility
 - Root cause of corrosion and what factors contributed to the current condition.
- Remediation Recommendations Based on Your Long-Term Strategy
 - Surgical pipe replacement
 - Corrosion control
 - Design modifications
- Annotated sprinkler drawing with recommendations – allowing you to communicate remediation steps to contractor with minimal overhead.
- Post assessment support from ECS Engineer available.
 - Meetings with contractor to communicate scope of work
 - Meetings with owner
 - Post construction verification that scope of work was completed correctly



Drawings



Return on Investment

Facility Characteristics

Facility Type

Industrial Warehouse

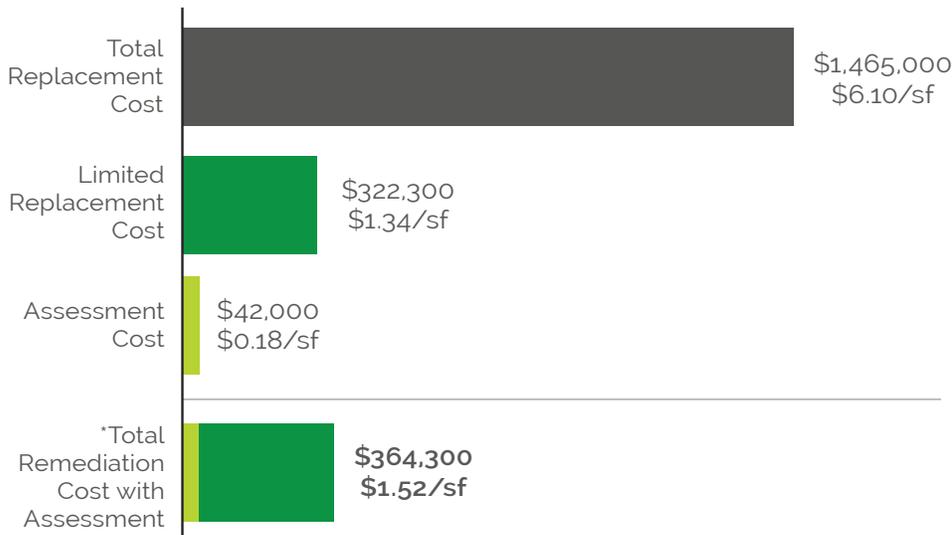
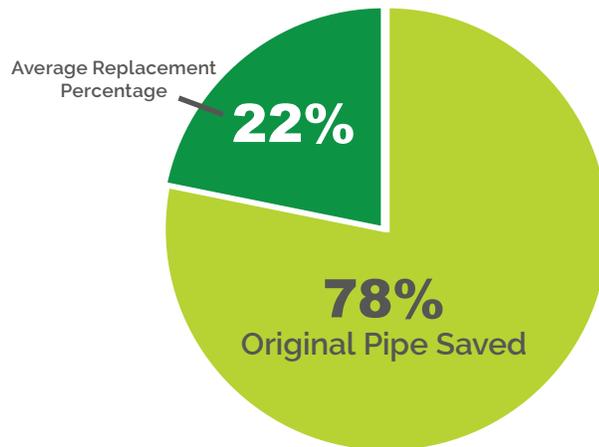
Sprinkler System

240,000 sq. ft. facility

6 Early Suppression Fast

Response (ESFR) Wet Systems

Results After Assessment



*Actual cost may vary depending on facility characteristics

75%

Cost Reduction
Compared to
Total System
Replacement

The Cost of Doing Nothing

- Corrosion is cumulative and accelerating – leaks will continue to get worse
- One of the largest assets in your building cannot be managed without knowledge of its current condition

Financial

- Reoccurring leak repair cost
- Water damage – drywall repair, relocation of tenants, etc.
- Unable to plan capital and operating expense budget

Risk

- Business interruption, unplanned operation downtime
- Damage to goods, equipment, and infrastructure
- Degraded system performance in event of fire
- Life safety

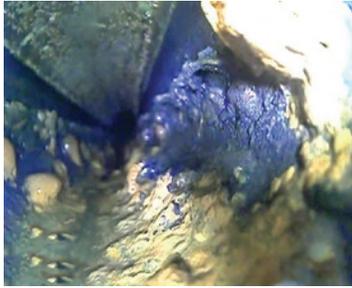
Case Study

Big Box Stores: Minimizing Remediation Spend

Project Background

In 2021, after experiencing a structural failure caused by corrosion related fire sprinkler system leaks, a large, US-based retail store operator sought to address their leak risk. Of the stores this operator owned, many were experiencing leaks to the point where total system replacement was being considered. The operator wanted to eliminate their operating expense from fixing leaks and minimize the downstream effects like business interruption and customer safety while fitting the remediation program into a limited capital budget.

ECS partnered with the operator's national sprinkler service provider to design a corrosion assessment program that would thoroughly address the leak risk, while minimizing pipe replacement.



Assessments

ECS performed comprehensive corrosion assessments on a total of 102 stores during a one-year period, focusing on stores with the most extensive issues and where total system replacement was already being considered. Through video scoping and pipe sample analysis, each corrosion assessment characterized the root cause of corrosion, severity of metal loss, and specific areas where corrosion was present.

Project Overview

Project Type:

102 Big Box Stores

Location:

Across United States

Sprinkler System:

Overhead Wet Systems, Galvanized Dry Systems

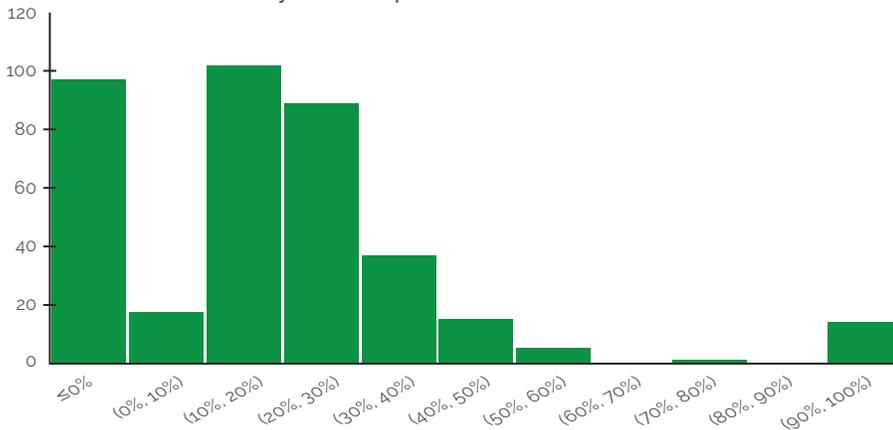
Goal:

Eliminate Leak Risk While Minimizing Pipe Replacement

Results

The goal of this assessment program was to eliminate leak risk while minimizing pipe replacement. Because corrosion was highly localized, on average only 22% of the pipe in each system was recommended for replacement.

Wet System Replacement % Distribution



“Compared to total system replacement, the reduction in pipe replacement saved the client 75%.”

Several key takeaways were discovered during the corrosion assessment program:

- Corrosion in each system was highly localized.
- Location and severity of corrosion varied significantly depending on system layout and sprinkler system design.
- Corrosion severity was impacted by the remodel history and the number of drain and fills – Corrosion was not based on the age of the piping alone.
- Many systems without existing leaks would have leaks issues soon.
- Corrosion issues created more severe system impairments i.e., closed control valves.

Case Study

The Cost of Being Reactive: 23 Year Old Nursing Home Attic System

Project Background

This nursing home was originally built in 1998. It is protected by two fire sprinkler systems:

- Dry pipe system protecting the attic and exit vestibules
- Wet pipe system providing ceiling level protection in resident rooms and common areas

Due to a long history of leaks developing on the dry pipe system, an internal video scoping corrosion assessment was performed to determine what corrective action should be performed to minimize on-going leak risk and ensure proper operation of the system in the event of a fire. No corrosion strategy, such as nitrogen, was previously implemented.

Assessment Findings

Significant issues were observed in the dry system piping:

- Trapped water throughout the dry system mains. This piping was run with little to no pitch
- Use of thin-wall schedule 7 pipe has significantly reduced service life of the system piping, with existing leaks found throughout the attic
- Large amounts of iron oxide deposits present throughout the main piping
- Several locations were observed to be 75%-100% obstructed by deposits
- These obstructive deposits would prevent the system from operating as designed in the event of a fire

Results

This system had exceeded its useful service life. Corrosion of the thin-walled piping will continue to result in sequential leaks, and the presence of corrosion deposits inside the piping has severely impacted the ability of the system to respond to a fire. The reactive approach of repairing leaks as they develop will now require complete system replacement. In the case of aging dry pipe fire sprinkler systems...

Project Overview

Project Type:
Nursing Home

Sprinkler System:
Two sprinkler systems; dry pipe system in attic and wet pipe system for ceiling level protection

Assessment Completed:
May 2021



Location 4: 3" Low Main, Over Northern Wings



Location 8: 3" Low Main, End Cap over NW Wing

“Taking a proactive approach to corrosion control can eliminate the need for system replacement and most importantly, save lives.”



Our Mission

We are not your typical fire protection service provider. We think differently. We are innovators at the intersection of corrosion and fire protection who set out to become the world's best. Our laser focus on the industry is the reason why we're the leader in corrosion control solutions and services.

As an organization, we've spent the last 20+ years working to understand corrosion in fire sprinkler systems. Each employee at ECS adds a unique perspective and skill set that has created an unequaled knowledge base. Our team includes Licensed Fire Protection and Mechanical Engineers, Industrial Engineers, a Metallurgical Engineer, and Electrical Engineers. Three (3) of our people have worked in fire protection system design as consultants prior to joining ECS. We have been members of NFPA technical committees, NICET, and have a firm grasp of the Codes and Standards that regulate our industry.

The culmination of our work and innovation means that we don't settle for the status quo in addressing the lifecycle needs of your fire sprinkler system. Our technical background and extensive corrosion science experience allows us to provide services that are simply unmatched by other players in the industry. We are invested in the long-term success of our partners.

We realize that our success is tied to yours.

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