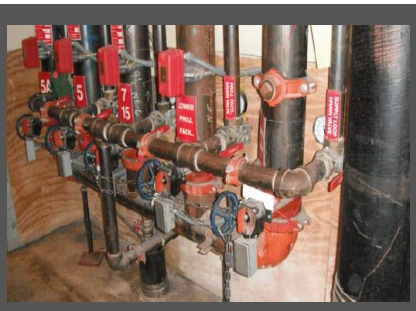
Engineered Corrosion Solutions
Complete Corrosion Control.

Wet Pipe Nitrogen Inerting Case Study:

Over 3 Years of Success at Florida Regional Mall

Wet pipe fire sprinkler systems in malls are especially susceptible to accelerated corrosion rates because systems are drained and refilled frequently for tenant modification projects. The process adds fresh oxygen with each drain and refill cycle. A large regional mall in Tampa, Florida was experiencing one leak per month on its wet pipe fire sprinkler systems. ECS's Wet Pipe Nitrogen Inerting (WPNI) process designed specifically to prevent oxygen corrosion in wet pipe systems was used to stop the leaks.

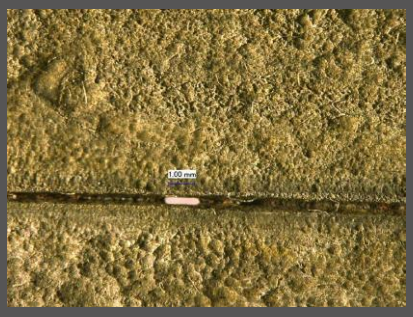
- The mall was experiencing multiple leaks on a monthly basis
- 36 wet systems were nitrogen inerted in December 2012
- Pipe replacement limited to repair of existing leaks
- Only one (1) leak since nitrogen inerting the wet pipe zones



Typical Riser Installation

Iron Oxide Deposits on bottom of main

Exterior Leak on 6" Main



Weld Seam Corrosion Leak

History and Background

Specifics on subject facility:

- Mall opened 2001 – 11 years old when work commenced
- Large, two level, regional mall located in Southern Florida
- 1.19 million sq. ft. of gross leasable space
- 36 wet pipe fire sprinkler systems protect the tenant and common mall areas – anchor stores are served by separate systems not included in this study
- Electric fire pump supplied by municipal water fed the overhead bulk supply loop feeding system risers located in service corridors around the perimeter of the building

Corrosion related leak history:

- Leaks occurring in wet pipe branch lines and mains on a monthly basis
- Leaks occurred in tenant spaces and common mall areas
- Merchandise damage risk due to fire sprinkler water leak

Black steel piping materials:

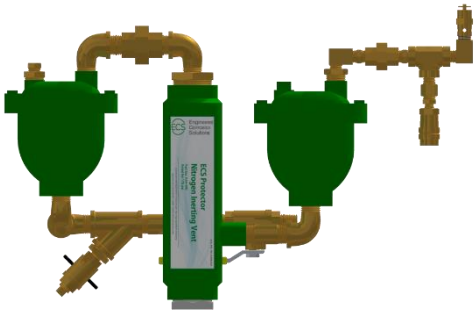
- Schedule 10 mains
- Cross mains and branch lines a mix of schedule 10 and 40

Preliminary Assessment Work

Based on the history of leaks occurring in the facility, Engineered Corrosion Solutions was contracted to identify the root cause of the corrosion and develop a corrosion control strategy to prevent future leaks. The conclusion was that trapped air in the high points of the mains and branch lines resulted in oxygen corrosion of the piping. Oxygen corrosion resulted in the formation of iron oxide deposits in the system piping, further accelerating the metal loss and resulting in additional leaks. The recommended method of preventing additional metal loss and leaks was to remove oxygen from the sprinkler system by using nitrogen gas to inert the piping.

Implementation of ECS Wet Pipe Nitrogen Inerting (WPNI)

1. No significant pipe replacement was performed, existing leaks were addressed
2. Installation of ECS Protector Nitrogen Inerting Vents on each of the 36 wet pipe systems
3. Installation of ECS Protector Nitrogen Injection Ports on each of the 36 wet pipe risers
4. Performed WPNI on all of the fire sprinkler systems using the ECS nitrogen inerting protocol for wet pipe fire sprinkler systems
5. Maintained inert state during subsequent drains and refills of the systems following specific ECS protocols



ECS Protector Nitrogen Inerting Vent

Pressurized cylinders provide nitrogen gas through injection ports at risers

Results and Conclusions

In late December, 2012, the ECS nitrogen inerting equipment was installed on the 36 wet pipe zones protecting the common mall areas and tenant spaces. ECS was onsite with the mall facilities personnel and fire sprinkler contractor to deploy the nitrogen inerting procedures. To ensure that the proper inerting protocols were followed, the mall owner dictated that the primary fire sprinkler contractor must ***always*** be onsite for any drain downs of the system. Even if another contractor performed any work in the facility, the primary contractor was present to perform the draining and refilling protocols to maintain the nitrogen inerted state on the systems.

Since the initial inerting of the 36 wet pipe systems the mall has only experienced one leak. The fire sprinkler contractor referred to WPNI as the ***'miracle cure'*** that has completely resolved the mall's corrosion issues.