

Corrosion Assessment & Nitrogen Inerting Case Study: 90% Cost Savings at Illinois Distribution Center

History and Background

Specifics on subject building:

- Large distribution center located in Illinois – open floor construction
- 376,000 sq. ft. of fire sprinkler system coverage area
- 13 individual wet pipe risers serving the building – average system volume 1,200 gallons
- 6" mains with 2" branch lines following the roof pitch to the center of the building; 4" floating main on the far wall
- Building age - 24 years

Corrosion related leak history:

- Leaks occurring in branch lines at apex of building on the branch lines
- Leaks occurring on the top side of the mains at the mechanical tee connection for the branch lines
- Content damage risk due to fire sprinkler water leak
- \$25,000 cumulative repair expenses

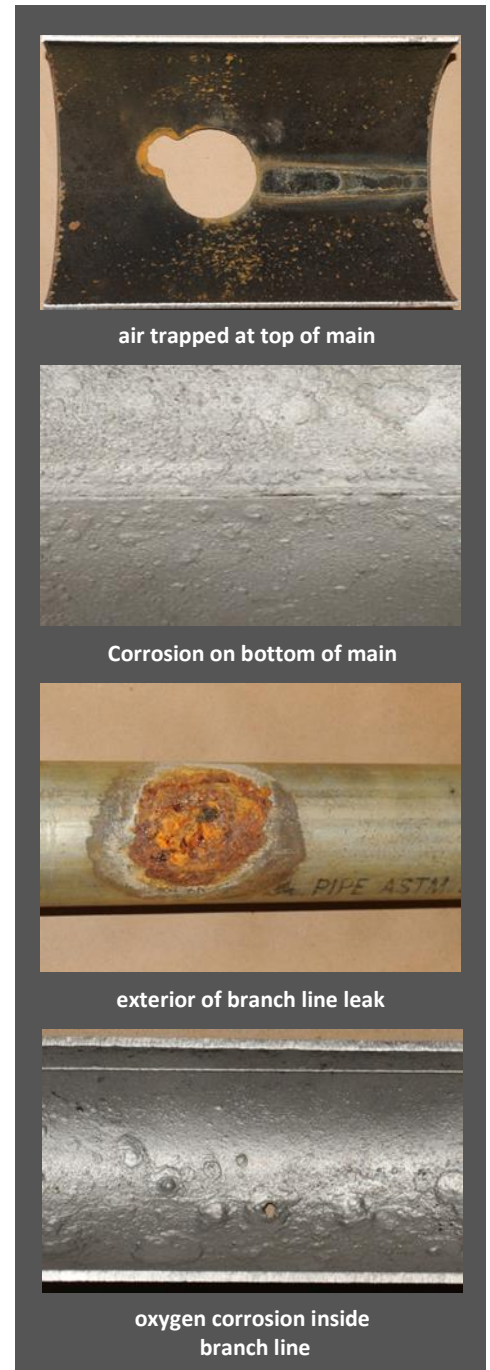
Fire sprinkler piping materials:

- Mechanical tees at riser nipples off of the mains
- Threaded schedule 7 XL piping – galvanized coating on the exterior pipe surfaces

Preliminary Assessment Work

In order to determine the root cause for the corrosion related leaks within the fire sprinkler system a corrosion assessment study was performed. The assessment included:

- Study of repair and pipe replacement history
- Elemental analysis of the supply water and deposits from the systems
- Profile of microbial contamination throughout the systems
- Failed pipe analysis – extent of damage, pit depth, metal loss characteristics
- Video scoping of the fire sprinkler piping system



The assessment study determined that the root cause for corrosion within the systems was oxygen attack of the black steel piping. The majority of the damaged piping was found at the air/water interface adjacent to trapped pockets of air at the high points at the apex of the building. The mains also showed corrosion at the base of the mechanical tee at the riser nipple. Although bacteria were found within the fire sprinkler system, they were determined to be very minor contributors to the corrosion related leaks. Much of the fire sprinkler mains contained accumulations of corrosion by-product (iron oxide-hematite) solids.

Recommendations

1. Perform limited pipe replacement of the 2" branch lines on either side of the roof apex – approximately 50 linear feet per system
2. Install ECS Protector Nitrogen Inerting Vents on each wet pipe system
3. Install ECS Protector Nitrogen Injection Ports on each of the wet pipe risers
4. Perform nitrogen inerting of the fire sprinkler systems using the ECS nitrogen inerting protocol for wet pipe fire sprinkler systems
5. Use nitrogen cylinders to supply the necessary nitrogen gas for the inerting procedure on the fire sprinkler systems



ECS Protector Nitrogen Inerting Vent



Pressurized cylinders provide nitrogen gas at sprinkler risers

Financial Analysis of Repair Options

The most common response to escalating leak frequency and increasing fire sprinkler system repair costs is to completely remove and replace the fire sprinkler system piping. Estimated replacement cost of the fire sprinkler piping for this facility was \$2 per square foot for a total of approximately \$750,000.

Results and Conclusions

The owner and fire sprinkler contractor determined that implementation of the ECS wet pipe nitrogen inerting technology was the most cost effective solution for the facility based on the results achieved from other WPNI projects in similar conditions over the past 3 years. The video scoping evidence proved conclusively that 80% of the 24-year-old piping in place had very little internal corrosion damage. The piping components that exhibited corrosion were selectively replaced. During the month of July 2011 nitrogen inerting vents and injection ports were installed on each of the zones. The total cost to the owner for deploying the limited pipe replacement/nitrogen inerting approach was \$80,000. This represents an approximately **90% total reduction in repair costs**. Since the initial inerting of the 13 wet pipe fire sprinkler systems there have been no leaks reported in the building.