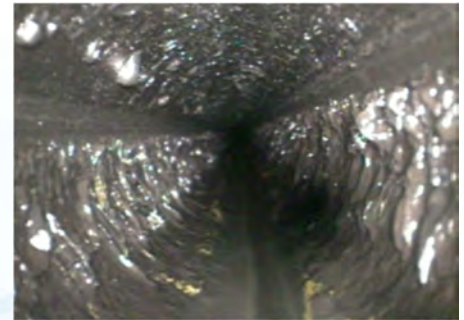




Project Case Study - California Mall

Project Type: Large, Multi Tenant Shopping Mall
Location: California, USA
Sprinkler Systems: 1,400,000 sq. ft. of coverage area
 54 wet pipe risers, average size
 1,000 - 1,500 gallons
Nitrogen Introduced: September, 2016



Oxygen Corrosion in Branch Line

History and Background

Specifics on subject building

- Multi Tenant Shopping Mall in California
- 1,400,000 sq. ft. of fire sprinkler system coverage area
- Eight (8) remote riser rooms containing a total of fifty-four (54) wet pipe risers serving the building
- Average system volume 1,000 - 1,500 gallons

Corrosion related leak history

- Long history of fire sprinkler leak repair and pipe replacement
- Partial replacement of sprinkler piping in select tenant spaces
- During 2014 the facility averaged one corrosion related leak every two weeks which required repair
- High risk liability due to fire sprinkler water leak damage to tenant goods and interference with mall operations

Fire sprinkler piping materials

- Schedule 10 black steel supply mains with schedule 7 black steel branch line piping
- Fire sprinkler systems installed in early 1990's



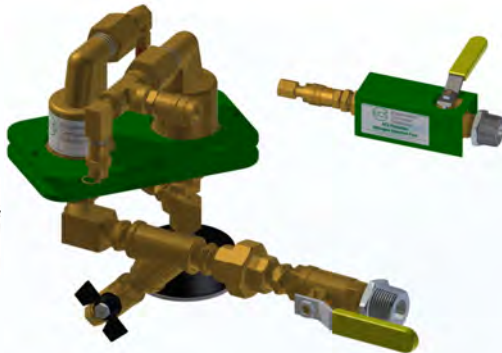
Multiple Leak Repairs on a Single Branch Line

The root cause for corrosion within the systems was oxygen attack of the black steel piping. The majority of leaks have occurred at the air/water interface in the branch line piping over the tenant spaces. The unique characteristics of mall operations result in frequent tenant space modifications and build-outs. The high frequency of system draining events causes frequent introduction of fresh air into the system piping, resulting in extremely high localized corrosion rates.

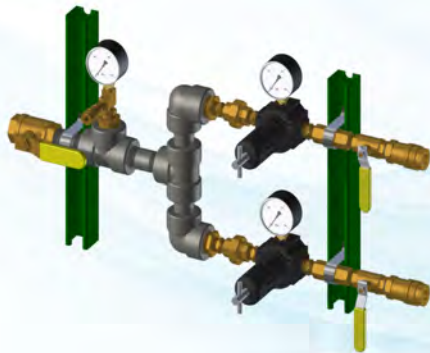
Wet Pipe Nitrogen Inerting

To mitigate the risk of oxygen corrosion in the wet pipe systems serving the mall, it was determined that the ECS Wet Pipe Nitrogen Inerting (WPNI) protocol be implemented to remove oxygen from the system piping and prevent its re-entry. The mall opted **not to replace** any damaged piping, but rather implement the corrosion control strategy and replace pipe in the future on an as-needed basis. The ECS equipment installed to facilitate the WPNI protocols includes the following:

1. A high capacity ECS Nitrogen Generator, gas storage tank, and 1¼" nitrogen supply line to provide a permanent, on-demand source of nitrogen gas to each of the 8 sprinkler riser rooms
2. ECS Nitrogen Inerting Manifolds installed in each riser room to easily distribute nitrogen to each wet pipe sprinkler riser
3. ECS Protector Nitrogen Injection Ports on each of the wet pipe sprinkler risers
4. ECS Protector Nitrogen Inerting Vents on each of the wet pipe sprinkler systems



ECS Nitrogen Inerting Vent



ECS Nitrogen Inerting Manifold

Results and Conclusions

After installation of the ECS WPNI equipment and the nitrogen supply line to each sprinkler riser room, ECS and the local fire sprinkler contractor began inerting the individual wet pipe fire sprinkler systems the week of September 11th, 2016. The inerting of all systems was completed by the end of the month.

Approximately 10 months after the inerting was completed, the mall operations manager stated that there has been a **drastic reduction** in leaks on the damaged thin wall piping of the 54 fire sprinkler systems, despite no pipe replacement having been performed. The operations manager noted that the drastic reduction in fire sprinkler leaks has allowed mall maintenance personnel to spend time on other important facility.



ECS Nitrogen Generator, storage tank, and air compressor feeding nitrogen supply