JENSEN HUGHES is the global leader in engineering consulting services for the built environment. We are a company of engineers, consultants, and scientists focused on evaluating risks and diligently developing the best, most cost-effective solutions. We offer extensive, practical experience through countless projects, research and industry innovation.

The services we provide include fire protection systems design and analysis, code consulting, risk assessment, commissioning, forensic, environmental, security, research, development and testing services.

Our global clients include a majority of Fortune 500 companies and cover the following sectors: energy, healthcare, education, hospitality, industrial, corporate real estate, transportation, government and military.

REAL SOLUTIONS FOR CORROSION PROBLEMS

JENSEN HUGHES (JH) engineers provide consulting services to help our clients understand corrosion issues and to develop real solutions to corrosion problems. We can offer a range of services to our clients.

The corrosion of fire protection systems can be costly and have detrimental effects on the reliability and anticipated operational performance of sprinkler systems. In some cases, the severity and extent of corrosion can impact the ability of a sprinkler system to control or suppress a fire. Corrosion and its products can limit or prevent adequate water flow in sprinkler systems.

Figure 1 shows a partially occluded section of pipe. It is easy to understand how this significant build-up of corrosion products would provide an obstruction to water flow. Figure 2 shows corrosion in a dry pipe valve. In some instances corrosion in dry pipe valves has been severe enough to prevent operation during a fire.

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JENSEN HUGHES engineers have investigated corrosion in a variety of fire protection systems, including:

- Wet
- Deluge
- Dry Pipe
- Preaction Sprinkler Systems

These systems include:

- Carbon Steel
- Ductile Iron
- Galvanized Steel
- Stainless Steel
- Brass
- Bronze
- Copper Piping

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**Figure 1** - Occluded pipe.  
**Figure 2** - Dry pipe valve corrosion.
MISCONCEPTIONS REGARDING CORROSION

There are a number of misconceptions throughout the fire protection industry regarding corrosion. Some of these misconceptions have enabled poor design and installation practices to continue.

One such misconception involves the use of galvanized steel pipe, which was long believed to provide superior corrosion performance to black steel pipe and was viewed by many people as a panacea in dealing with corrosion. This is not only false, but if incorrectly installed galvanized pipe can prematurely corrode in less than one (1) year.

Figure 3 shows a section of galvanized pipe used in a preaction sprinkler system, which was partially filled with water. Under normal circumstances the pipes in this system should have been filled with pressurized air and completely dry. The accumulation of water in the pipe led to an aggressive form of corrosion (oxygen cell), which resulted in a number of leaks in a short period of time.

Each of the nodules (small mounds) shown in Figure 3 are potential locations for future pinhole leaks. These conditions were reached in approximately 1 ½ years of service life after the system was installed. Figure 4 shows a pinhole leak, which was found at another location in the same system. This hole measured approximately ¼ inch in diameter. The galvanized pipes identified in this example hardly demonstrate superior corrosion performance and would not be acceptable in a measure.

JH works with metallurgical and water testing laboratories to implement a three pronged approach to investigate the extent, severity and root cause of corrosion in fire protection systems. A typical project will involve an examination of the sprinkler system, analysis of the water supply and system water, and a metallurgical examination. Internal pipe examinations are facilitated through the use of a pipe push camera (boroscope), which provides live video from within pipes to allow for instantaneous viewing of corrosion and other abnormalities. The video is also simultaneously saved to allow for analysis and review with clients at a later time.

Findings of these investigations are used to develop solutions for remediation and are carried over to design practices employed by JH staff.

PROJECT EXPERIENCE

U.S. Pentagon (2006)  
Washington, DC  
Sprinkler Corrosion Consulting; Analysis of 22 Sprinkler Systems

Naval Support Facility (NFS) (2007)  
Chantilly, VA  
Water Quality Investigation

Washington, DC  
Sprinkler Corrosion Analysis

Kingsboro Psychiatric Center (2009)  
Kingsboro, NY  
Investigation of Campus Sprinkler System Corrosion; Study of Microbiological Corrosion of Sprinkler Systems; Sprinkler Corrosion Remediation Design

Klondike Gold Rush National Historical Park (2011)  
Skagway, AK  
Corrosion Investigation

Abbott Laboratories (2012)  
Abbott Park, IL  
Corrosion Assessment; Water Supply, Fire Pumps, Water Mains and Sprinkler System

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