SPRINKLER SYSTEM CORROSION INHIBITORS

Jeff Hebenstreit – UL Solutions
Principal Engineer – Water-based Fire Protection Products

September 30, 2026

SAN ANTONIO, TX

AFSA American Fire Sprinkler Association

1

Jeff Hebenstreit

UL Solutions

Jeff Hebenstreit is a Principal Engineer and a Distinguished Member of the technical staff at UL Solutions, specializing in water-based fire suppression products. During his 25-year career at UL, he has been involved with several of UL's testing and certification activities. He is a member of several NFPA technical committees, including Sprinkler System Installation Criteria, Hanging and Bracing of Water-Based Fire Protection Systems, Private Water Supply Piping Systems, and Installation of Standpipe and Hose Systems. Jeff obtained his B.S. degree in Chemical Engineering from the University of Illinois at Chicago.

UL Solutions

Jeffrey.R.Hebenstreit@ul.com | 224-545-5586

INTERNAL: UL Solutions Confidential, Internal Use Only

3

HOUSEKEEPING ITEMS

TO RECEIVE CREDIT FOR THIS SEMINAR, YOU MUST:

1) scan badge upon entry,
2) attend seminar in its entirety, and
3) submit evaluation within 14 days

No individual or entity - including a presenting author - may electronically record or broadcast any portion of this AFSA training without prior written consent of AFSA. Unauthorized recording (audio, video, still photography, etc.) of this presentation without the express written consent of AFSA is strictly prohibited.

National Fire Protection Association
The authority on fire, electrical, and building safety

DISCLAIMER

This seminar and its content is not a formal interpretation issued pursuant to NFPA regulations.

Any opinion expressed is the personal opinion of the author and presenter and does not necessarily present the official position of the NFPA and its Technical Committees.

INTERNAL: UL Solutions Confidential, Internal Use Only

4

Corrosion Inhibitors for Fire Sprinkler Systems in Sprinkler Systems & NFPA Standards Requirements

5

Agenda

1. Corrosion in Sprinkler Systems and NFPA Requirements
2. UL Solutions Listing Requirements
   – Product Evaluation and Example Products
   – Ongoing Certification Requirements
3. Discussion / Q & A

6

Corrosion in sprinkler systems

Forms of corrosion identified in NFPA 25: 2026, Annex D.2.6

- Uniform corrosion
- Pitting
- Galvanic corrosion
- Crevice corrosion
- Selective leaching
- Erosion corrosion
- Environmental cracking
- Intergranular corrosion
- Microbiologically Influenced Corrosion (MIC)

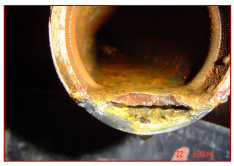


Photo Source: Mark Hopkins

7

Some corrosion control options

- Use of corrosion control additive or corrosion inhibitor
- What is a corrosion control additive?
- Premixed solution for filling the wet pipe system
- Or chemical added to the water in a wet pipe sprinkler system
- What about dry and preaction systems?
- Chemical intended to be added to the air supply

Photos Source: Mark Hopkins

8

NFPA 13, 2025 Edition

Chapter 5 Water Supplies

5.1.4.1

5.1.4.2

Photos Source: Mark Hopkins

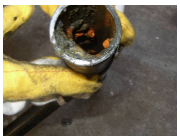
9

NFPA 13, 2025 Edition

5.1.4.3 Inhibitors

5.1.4.3.1

5.1.4.3.2



Photos Source: Mark Hopkins

10

NFPA 13, 2025 Edition

7.8 Additives and Coatings

7.8.1

7.8.2

7.8.3

Photo Source: Mark Hopkins

11

NFPA 13, 2025 Edition

1.5 Equivalency

1.5.1

1.5.2

Photos Source: Mark Hopkins

12

NFPA 13, 2025 Edition

8.2.11 Vapor Corrosion Inhibitor

8.2.11.1

8.2.11.2

8.2.11.3

Photo Source: Mark Hopkins

13

NFPA 13, 2025 Edition

16.4.2.5 Where conditions are found or are known to exist ….. using at least one of the following methods:

(1)

(2)

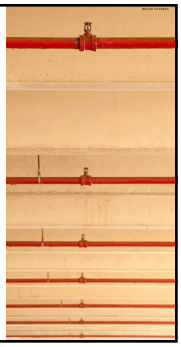
(3)

(4)

(5)

(6)

(7)



14

NFPA 13, 2025 Edition

Chapter 30 Existing System Modifications or Evaluation

30.1.11

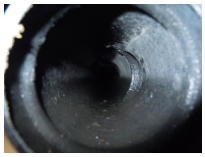


Photo Source: Mark Hopkins

15

UL Solutions Listing Requirements & Product Evaluation

16

Corrosion control additive example

Photo Source: Huguenot Laboratories

17

UL 2901A – Corrosion Control Additives

Requirements:

Several Reference UL 2901 Requirements

- UL 2901 - Antifreeze Solutions for Use In Fire Sprinkler Systems

Some differences based on product type, use, and different concerns

18

UL 2901A – Corrosion Control Additives

Summary from UL 2901

- Characterization Test
- High Ambient Temperature Stability
- Temperature Cycling
- Conductivity & Galvanic Action
- Material Compatibility Testing
  - Metallic Materials
    - Corrosion Rate
    - Pit Depth Corrosion
    - Stress Corrosion
  - Non-metallic Materials
    - Elastomers
    - Plastics
    - Coatings

Example Test Set up for Corrosion Rate & Pit Depth Corrosion

Bottom Photos are Control Samples without Inhibitor

19

UL 2901A – Corrosion Control Additives

Summary from UL 2901 Continued

- Toxicity
- Fire performance
  - Exposure to fire
  - Firefighting effectiveness
- Viscosity
- Resistance to Leakage
- Manufacturing and Production Control
- Installation Instructions
- Marking Requirements

Figure 17.2
Details of Fire Exposure Test Arrangement

20

UL 2901A – Corrosion Control Additives

UL 2901A (Corrosion Inhibitor) vs. UL 2901 (Antifreeze)

- May be premixed or field dosed
- Compatibility with plastic piping not required
  - Permitted to limit use to metallic sprinkler pipe
- Fire Fighting Effectiveness
  - Utilizes the UL 350lb Wood Crib test for solutions ≥ 98% water
  - References UL 2901 for solutions < 98% water
- Field Dosing Concentration Testing
  - If dosed in the field, a means for verification of field concentration is required

21

Example product listing - Product iQ™ database

https://productiq.ulprospector.com

22

Example listing

COMPANY

HUGUENOT LABORATORIES
101 RIVERDALE RD
PORT JERVIS, NY 12771 United States

DESIGNATION INFO

FSS ProGuard 295UL

RATINGS

Maximum Concentration	Maximum Volume
0.4% by volume	No limitations on sprinkler system volume.

23

Single injection system treating multiple risers

Photo Source: Huguenot Laboratories

24

Treatment of system with portable unit

Photos Source: Huguenot Laboratories

25

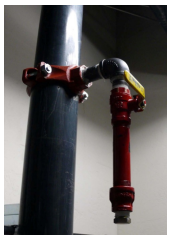
Field dose verification

Photos Source: Huguenot Laboratories

26

Corrosion monitoring system

Photos Source: Huguenot Laboratories



27

UL 2901B – Vapor Corrosion Inhibitors

UL 2901B

Vapor Corrosion Inhibitors for Use in Fire Sprinkler Systems

Published Date: November 28, 2023

Last Revision: July 12, 2024

ANSI Approved: July 12, 2024

SCC Approved: July 12, 2024

Scope

Summary of Topics

Requirements:

Some similarities to corrosion control additives requirements

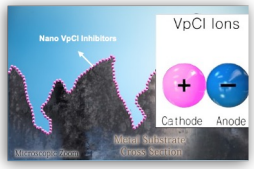
- Similar approach to assessments with modified methods

28

What is a Vapor Corrosion Inhibitor (VCI or VpCI)?

NACE International defines **Vapor Corrosion Inhibitor (VCI)** as a chemical substance that acts to reduce corrosion by a combination of volatilization from a VCI material, vapor transport in the atmosphere of an enclosed environment, and condensation onto surface in the space, including absorption, dissolution, and hydrophobic effects on metal surfaces, where the rate of corrosion of metal surfaces is thereby inhibited.

VCI is also referred to as **volatile corrosion inhibitor, vapor-phase corrosion inhibitors (VpCI), and vapor-transported corrosion inhibitors.**



29

UL 2901B – Vapor Corrosion Inhibitors

Example Installation

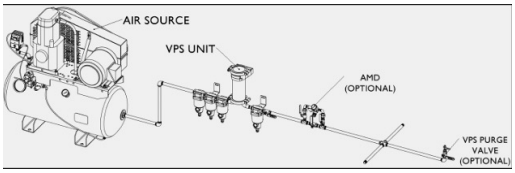


Illustration Source: General Air Products

30

Vapor Corrosion Inhibitor Example

Photo Source: General Air Products

31

UL 2901B – Vapor Corrosion Inhibitors

Summary

- Composition Test
- Material Compatibility Testing
  - Metallic Materials
    - Corrosion Rate
    - Pit Depth Corrosion
    - Stress Corrosion
  - Non-metallic Materials
    - Elastomers
    - Plastics
    - Coatings

Example Test Set up for Corrosion Rate & Pit Depth Corrosion

Example Control Samples without Inhibitor

32

UL 2901B – Vapor Corrosion Inhibitors

- Compatibility with plastic piping not required - permitted to limit use to metallic sprinkler pipe
- Flammability Assessment vs. Fire Performance in UL 2901
- Toxicity
- Deliver Systems Components
- Manufacturing and Production Control
- Installation Instructions
  - A means for verifying presence in the system
- Marking Requirements

Photo Source: General Air Products

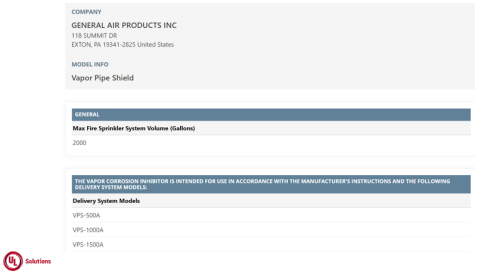
33

Example Product Listing - Product iQ™ Database

https://productiq.ulprospector.com

34

Example product



35

Vapor Corrosion Inhibitor delivery system

Compressed Air with Vapor Pipe Shield

Tank Mounted Air Compressor Configuration

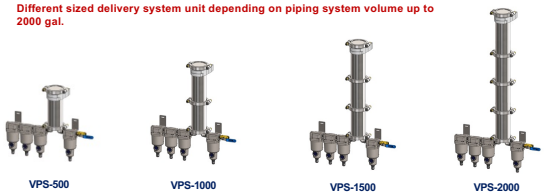
Riser Mounted Air Compressor Configuration

Illustrations Source: General Air Products

36

Vapor Corrosion Inhibitor delivery system

Different sized delivery system unit depending on piping system volume up to 2000 gal.

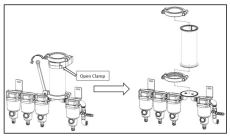


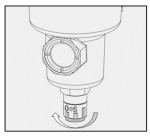
VPS-500 VPS-1000 VPS-1500 VPS-2000

Illustrations Source: General Air Products

37

Annual maintenance





Annual Maintenance involves replacement of the corrosion inhibitor cartridge(s), and two filters.

- Generally takes 5-10 minutes for a 500 gallon unit, and 10-20 minutes for a larger capacity unit.

Illustrations Source: General Air Products

38

UL Solutions Follow-Up Services Program

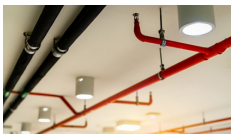
The ongoing surveillance program consists of 2 primary pieces:

Factory Inspections

- Conducted by a UL Solutions Field Engineer
- Unannounced inspections 4 times per year

On-going Testing

- Samples selected during inspections and sent to UL Solutions for testing
- Supplements the required production control testing



39

Solutions

Thank you

UL.com/Solutions

Safety. Science. Transformation.™

40

REQUIRED

FOR CEU CREDIT:

- ✓ Badge scanned at start of seminar
- ✓ Attend full seminar
- ✓ Complete survey 1 of 2 ways:
  - ✓ Survey link is emailed to attendees with scanned badges
  - ✓ Event app by EventsAir
    - Login to app
    - Navigate to seminar survey
  - ✓ Surveys close 10/31/26

Thank you!

Jeff Hebenstreit

UL Solutions

Jeffrey.R.Hebenstreit@ul.com

224-545-5586

AFSA45

Scan QR code to submit questions for **Ask the Experts!**

41

2027 Training Schedule

WEBINARS

1/6	Updates to NFPA 20
1/20	Calculating Pressure Reducing Hose Valves
2/3	Consumer Alert: Nitrogen in Sprinkler Systems
2/17	Reviewing Hydraulic Calculations
3/3	Updates to NFPA 13, 2028 Ed.
3/17	Updates to NFPA 13R & 13D, 2028 Eds.
4/7	Topic Coming Soon
4/21	NFPA 25: Roles & Responsibilities
5/5	Standpipe Flow Test Procedures
5/19	Storage 101
6/2	NFPA Technical Meeting - Voting Guide
6/16	Topic Coming Soon
6/30	Topic Coming Soon
7/7	Updates to NFPA 14, 2027 Edition
7/21	Adjacent Hazards & Design Methods
8/4	Acceptance Testing
8/18	Modifications to Existing Systems
9/22	Topic Coming Soon
10/6	Seismic 101
10/20	Proposed Updates to NFPA 25, 2029 Ed.
11/3	Evaluating Fire Pump Flow Tests
11/17	Top 10 Tech Reviews
12/1	Designing Water Storage Tanks
12/15	Pump Room Layout

PROGRAMS

Feb 9 - Mar 5 Apr 20 - May 14 Aug 3 - Aug 27** Oct 26 - Nov 19	Beginning Design School*
Apr 26 - May 7 Nov 1 - 12	Intermediate Design School*
Feb 8 - 10** Apr 12 - 14 Jul 12 - 14 Oct 11 - 13	Sprinkler Hydraulics Calculations Workshop
Apr 19 - 21 Oct 18 - 20	Advanced Hydraulics Calculations Workshop
Feb 11** Apr 30 Jul 23 Sep 24	Introduction to the Fire Sprinkler Industry
Mar 1 - 3 May 17 - 19 Aug 16 - 18 Oct 18 - 20**	NFPA 25 Essentials Workshop
Jun 7 - 10 Sep 20 - 23	Experienced Inspector Skills Lab
Mar 4 - 5 May 20 - 21 Aug 19 - 20 Oct 21 - 22**	NFPA 25 Fire Pump Workshop
Spring Summer Fall	ITM Inspector Development Program* *This program is 20 months.*

** Hybrid course **At General Air Products Lab, Exton, PA*

AFSA46

September 8-11	Manchester Grand Hyatt San Diego, CA

For More Details Visit:
firesprinkler.org

AFSA
American Fire Sprinkler Association

Dates subject to change. Programs subject to minimum registrations.

rev 9/14/2026

Virtual Instruction Path (VIP)

for Sprinkler Fitting Apprentices

Level 1 - Begins January 2027

Level 2 - Begins February 2027

Level 3 - Begins January 2027

Level 4 - Begins March 2027

www.firesprinkler.org/VIP

AFSA
American Fire Sprinkler Association

HANDS-ON WORKSHOPS FOR 2027

FEATURING AFSA'S TRAINING LAB

NFPA 25 Essentials Workshop

Mar | May | Aug | Oct

Description: Understand roles, responsibilities, and NFPA 25 ITM procedures through hands-on testing of wet systems, dry systems, and fire pumps.

NFPA 25 Fire Pump Workshop

Mar | May | Aug | Oct

Description: Develop practical NFPA 25 fire pump ITM skills, including no-flow and full-flow testing, water supply graphing, and performance evaluation.

Introduction to the Fire Sprinkler Industry

Feb | Apr | Jul | Sep

Description: This course is designed for those new to the industry. An introductory, wide-ranging 8-hour course that provides a broad overview of core fire sprinkler industry concepts for those new to the field.

Experienced Inspector Skills Lab NEW

Mar | Sep

Description: Take your ITM expertise beyond the basics. Designed for experienced technicians, this course combines focused classroom instruction with hands-on system lab training to strengthen your application of current NFPA 25 inspection, testing, and maintenance requirements. Refine fire sprinkler testing practices, improve documentation, deliver more consistent service, and help reduce liability while reinforcing knowledge commonly covered on certification exams.

Learn more about AFSA's fire sprinkler lab featuring functional risers, a spray room, fire pumps, and an interactive classroom.

firesprinkler.org/lab