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The Latest News from Allrisk Engineering, Inc



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# 2022 Spring Meeting and 18th Global Congress of Process Safety

April 10-14, 2022, at the San Antonio Convention Center

Allrisk Engineering will be attending the annual AIChE meeting happening in San Antonio, TX. Look for us at the Expo:

#### Booth 106

We will be discussing an important topic for the energy & chemical industry: Process Safety Management (PSM) for fire protection systems at your site.

So...

## What is your Site Fire Protection Concept?

# Five Pillars of Fire Protection

- Emergency Response
- Fixed Fire Protection Systems
- Emergency Isolation Valve
- Drainage Systems
- Construction and Layout (new sites) / Fireproofing (existing sites).

## A Fire Protection Concept should be

- Safe
- Reliable
- Sustainable



A formal Fire Protection Concept allows a site to manage their fire risk holistically.

# The Fire Protection Concept

Fire protection is not a standalone item. It builds upon five pillars which work together to reduce risk.

Even the best designed and managed facilities can have a fire. The Fire Protection Concept is how a facility manages its potential fire scenarios.

The five pillars of the fire protection concept for the energy & chemical industry are:

- Emergency Response
- Fixed Fire Protection Systems
- Emergency Isolation Valves
- Drainage Systems
- Construction and Layout (new sites) / Fireproofing (existing sites).

These pillars are functionally independent of each other BUT can affect each other's performance in a fire emergency.

For example, a change in a process unit drainage system can affect Emergency Responder tactics, expose more equipment supports to pool fires and require modifications to the area sprinkler protection.

A well thought-out Site Fire Protection Concept carefully uses all of the pillars in a practical, cost-effective manner to address their specific fire risks.



# **The Fire Risk Report**

Uses the Five Pillars technique to identify the potential methods for managing fire risks at a facility.

The Fire Risk Report will identify the primary facility fire scenarios and evaluate the current arrangement of the Five Pillars.

If one pillar is not present or not wanted by a facility, the other pillars must be strong enough to reduce the fire risk to an acceptable level.

Recommendations to improve the pillars are generated with input from the Client. The goal is to achieve the right mix of pillar strengths and develop a formal Fire Protection Concept for the facility or a specific process unit.

The Fire Protection Concept can be used as a design basis for future process units, a RAGAGEP for PHA Teams, and can also be incorporated into the Management of Change (MOC) program.



## Hazard Identification and Evaluation

- Each facility has different process chemistry, equipment, and inherit risks
- Identify the major fire scenarios specific to the facility.
- Identify potential performance issues with each pillar.
- Evaluate the probable consequences of the fire scenarios.

### **The Pillars**

- Each pillar is evaluated independently.
- The combined strengths of the pillars make up the Fire Protection Concept.
- Construction, layout, and "fireproofing" can be interchanged depending upon the facility



The Fire Risk report evaluates a site's fire risks and protection features.

### **Four Methods**

- CCPS Guidelines for Fire Protection in Chemical, Petrochemical, and Hydrocarbon Processing Facilities, Risk Area Method
- API RP 2001 Fire Protection in Refineries, Risk Area Method
- NFPA 13 & 15, Fixed Systems plus Hose Stream Method
- API RP 2001 Fire Pre-Plan Method - Expanded

### Analysis

- The API and CCPS methods are very conservative and lead to large water demands
- The NFPA method is used mostly for enclosed process buildings
- The Scenario Based method works best with a Fire Risk Report.



What is your greatest fire water demand?

# **Firewater Needs Analysis**

How much water does your facility need to extinguish a major fire safely and reliably?

#### **IT DEPENDS**

The answer **depends** upon the nature of the local fire hazards and the site's Fire Protection Concept.

API RP 2001 and the CCPS Guideline on Fire Protection offer Risk Area methods for estimating this value. NFPA 13 and 15 recommend combining the automatic sprinkler or deluge water spray system demand with a fixed hose demand.

Our Fire Risk Report has evaluated the hazards of your facility and determined the potential fire scenarios that could occur. Using this report with input from the local Emergency Response personnel, we can estimate the fire fighting water demand per the API 2001 Fire Pre-Plan method.

The first three methods are desktop exercises while the final method is a comprehensive scenario-based analysis. The amount of fire water needed for a successful fire extinguishment is a function of all five pillars of the Fire Protection Concept.



# **Firewater Base Model**

A base hydraulic model provides the groundwork for understanding the firewater system.

The Base Model allows for future analysis to insure Emergency Responders and Fixed Fire Protection Systems are able to extinguish potential fire scenarios.

While this model can be done without a site visit, it is essential that as much information as possible be gathered from the site. All this information helps provide an accurate hydraulic model and firewater system drawing.

We use AutoSprink to develop drawings and hydraulic calculations. This program is a powerful tool that allows for the balancing of many water sources and nodes. Although other programs do exist for this type of task, this tool offers several unique real-time features that can help determine Long Term Improvement Goals and manage System Impairments.



#### **Information Gathering**

- Autodesk CAD file (.dwg) or PDF files
- Accurate Firewater System Drawings
- Size, type, and age of pipe
- Fire pump testing data
- Fixed fire protection system data
- Other water source information

#### Building the Firewater Base Hydraulic Model

- We use AutoSprink to generate a computer model for hydraulic analysis
- Detail drawing created along with the hydraulic model
- Four system demand points are included in the analysis



A Hydraulic model allows all areas of a facility to be evaluated without flowing water throughout the entire site.

### Test Plan Development

- Work with the client to generate the firewater system testing plan
- Large scale flow tests and loop testing "C-Factors" are options
- Firewater effluent drainage and retention need to be considered

### Field Visit / On-site Testing

- Testing conducted by our consultants working with facility personnel
- Calibrated gauges and testing equipment is used.
- Testing can include fire pumps, deluge systems, fire monitors, and fire hydrants



How much water can my facility truly provide?

# Firewater Validated Model

The base model is a good start, but validation is needed to provide **real** numbers on the underground firewater system performance.

In order to verify the assumptions and conditions built into a Base Model, firewater system testing must be completed at the facility. Real data can then calibrate the Base Model and allow for in-depth engineering analysis.

Large-scale flow testing has proven to be more effective in calibrating the hydraulic Base Model than conventional C-factor testing. Valves, fittings, and multi-source flows make obtaining quality C-factor numbers very difficult.

A testing plan will be developed to properly validate the model and executed as efficiently as possible to minimize production and water treatment issues.

Validated models provide project engineers with data they can trust.



# Firewater Adequacy Analysis

Finally, we use all the information from the Validated Model and the Firewater Needs Analysis to determine if the firewater system is adequate and reliable.

If this analysis finds a gap in the firewater system, an improvement plan is developed with the Client.

The improvement plan will include a prioritized list of potential fire pump and piping changes; or other Fixed Protection Assets.

Modifications to the other Fire Protection Pillars can also be used to assist the site in reducing firefighting water needs.

The result of this improvement plan is a firewater system that meets the facility's needs in a safe, reliable, and sustainable way.



#### Analysis

- Improvements may include pump and piping changes
- The goal is to reliably meet the firewater demand
- Improvements to reduce the firewater demand are outside the scope of this report (Fire Risk Report)
- Improvement plans will include short, mid, and long term goals



Is your current firewater system able to meet your largest anticipated demand?

Can it meet this demand with one of its fire pumps out of service?

# **About Us**

Allrisk Engineering Inc. is a network of experienced professional risk engineering consultants.

We provide risk management and fire protection engineering consulting services to the manufacturing world and the insurance industry that serves it.

*Risk management engineering consulting* is an extrapolation of traditional Highly Protected Risk (HPR) engineering. It incorporates the Client's risk tolerance and modern Process Safety Management principles into the risk enginering survey process. We analyze the business, not just the sprinkler systems.

Our consultants lead risk engineering surveys and generate underwriting marketing reports with recommendations and loss estimates. Our reports are well recognized by in the insurance community and are routinely used to obtain coverage in excess of \$1.0 Billion per location.

We can also work with the insured to prepare for 3rd party property insurance surveys, validate loss estimates and to close out insurance recommendations.

*Fire protection engineering consulting services* include Fire Water System Testing, Plan Review and Engineering support. Our consultants have worked on world scale fire protection projects in North America, Asia and Europe. We are familiar with IBC, NFPA and API guidelines and most insurance company standards.

Firewater System testing services include large scale flow tests of fixed systems, hydrant tests and fire pump performance testing. We gather and analyze the data and provide the Client with a detailed report in a timely manner.

Our engineering support services, extend beyond fire code compliance and sprinkler system plan review. We assist the Client in making well informed, pragmatic engineering decisions that will meet both their internal needs and their external fire protection requirements. We will be your "in-house" fire protection engineers.

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Ready to learn more? Contact us today for a free quote!

**Allrisk Engineering** 



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