

Insight: Managing Fire Protection System Impairments

Recognizing the Risk

There are times when fire protection or detection systems must be disabled- such as for fire system planned or emergency maintenance and repair or, as part of site construction additions. History has repeatedly shown that during such times facilities are at greater risk of large fire losses. A heightened risk occurs any time a fire protection system is not in full service as any fire occurring in (or spreading, too) such an area can very quickly grow out of control.

If not properly managed, each time a fire protection or detection system is impaired there is also a heightened potential that hidden system impairments (i.e., partially/fully closed control valves, etc.) can remain after work was thought to be completed, but in reality, systems have been left inoperable. This leaves a site unknowingly unprotected from fire without awareness of the urgency that manual response may be the only means to save a facility from destruction should even a small fire occur.

A National Fire Protection Association (NFPA) study of fires from 2015 to 2019 indicated sprinklers operated effectively in 88 percent of the fires large enough to trigger them. However, in nearly 60% of incidents where sprinklers failed to operate, the systems had been shut off. This is, they were impaired when the fire started. More alarming, in nearly 80% of incidents where sprinklers operated but were ineffective, the water did not reach the fire or not enough water discharged leading to the conclusion that partially impaired fire system control valves were an issue in many of these cases.

Increased risks during fire protection impairments can also be affected by experience and situational awareness. Loss history has shown many times sites that rarely handle impairments lack a full familiarity and understanding of the increased risk and precautions that should be taken- especially in managing contractors when involved. Conversely, sites and contractors that perform impairments regularly may over time become overly comfortable with the process and added risks or practicing increased loss prevention. In both cases, the consistent use of a mandatory written impairment management program can greatly reduce the risk of large losses both by direct process management and reducing hidden impairment potential.

An impairment is considered to occur any time a fire protection system and/or associated equipment is removed from full service. This is, completely or partially taken from a state of full-function readiness. There are three basic types of impairments- each representing specific risks and, opportunities for added risk management leading to risk reduction.

1. **Planned Impairment** – A Planned Impairment is one that has been anticipated, i.e., planned, in advance of the expected impairment. It is typically part of construction improvements and/or modifications to existing fire detection or protection systems. In these situations, fire protection systems can be removed from full service (i.e., impaired) in a controlled manner allowing the benefit of added planning time to evaluate how best to minimize the impairment duration and size. Equally important, there is added time to evaluate and mitigate fire hazards in the area with systematic risk management.
2. **Emergency Impairment** – An Emergency Impairment occurs when an unexpected event occurs, such as a broken water main or sprinkler pipe, that typically requires unplanned immediate action to remove an existing fire detection or protection system from normal function. This can include situations such as unplanned broken water mains, leaking sprinkler pipes, and the identification of a critical fire pump malfunction during routine testing. In many cases, the immediate action needed, due to concern over building flooding or damage, etc., can lead to associated confusion over identifying valves to properly close, alarm systems/devices to turn off, contacting appropriate resources and even following set procedures. Worse, often the quick response taken to reduce flooding, etc., can lead to excessive or wrong undocumented control valves closures and then, hidden impairments during system restoration as some valves were never identified as closed. For emergency impairment, an implemented, accessible, and practiced emergency response program tied to impairment management is critical.
3. **Hidden/Concealed** – A Hidden Impairment, also referred to as an Improperly Impaired System (IIS), occurs when a system is identified in a state other than “full operational readiness” that, is unknown to a site. Reasons for an IIS are typically unknown at first discovery but investigation almost always leads to a previous unauthorized closure or improper impairment handling procedure. In one case, during site fire hydrant testing an entire mall municipal water supply was found to be 30% below what was expected (and initial sprinklers systems designs). Based on hydraulic

analysis, at a minimum, this drop in the water supply likely would have rendered each mall store storage area inadequate in fire control. Quarterly fire and alarm system testing did not flag this abnormality. After several months of investigation, it was determined three public water main valves and one valve in the mall loop were found partially (15-20%) closed. And all indications were these had been in this position since mall construction completion three years earlier.

A “partial impairment” (i.e., partially closed valve) can be equally critical when fire protection valves are not fully reopened after a previous impairment. Simple hydraulics can show even a system with a valve 90 percent open could create a sprinkler system that is 100% ineffective against fire control. This is one reason recording the number of turns to close and then reopen a valve is important as a best practice. And this practice is especially true with road box key valves (i.e., in ground valves) where history has repeatedly shown, many times they are left partially impaired (i.e., only partially open) because when opening the added friction from corrosion makes them “feel” fully open when they are not.

Controlling the Hazard

Essentials of an Effective Impairment Risk Management Program

To help ensure fire protection impairments are properly managed from planning or emergency response to complete system restoration, several basic components are recommended. Where applicable, as a minimum these precautions should include:

1. A formally written and adopted Impairment Risk Management Program with mandatory program compliance.
2. A tag-based permit system as part of the program such as using AIG’s Fire Protection Equipment Impairment Tags (available free of charge to all AIG customers and meeting NFPA 25 mandatory tag requirements).
3. Impairment program management and overall responsibility, including issuing permits, assigned to one individual such as a plant engineer, maintenance supervisor, or safety supervisor. Secondary/emergency authority may be required but this should always also be assigned to company personnel and not contractors. Contractors should never have the authority to issue permits for their own planned work or sole oversight in restoration.
4. A prework review to ensure all feasible risk reduction precautions will be taken during the impairment including those on AIG Impairment Tag Back Part A as well as:
 - ✓ Reviewing (and potentially modifying) planned emergency response with public fire service department personnel should a fire occur during the impairment including identification of available alternative water supplies when primary supply water mains are impaired.
 - ✓ Minimizing the risk of fire during impairments such as temporarily discontinuing hazardous processes, relocating combustibles, and forbidding all area hot work (as noted on AIG Fire Protection Equipment Impairment Tags). Any welding or cutting required for the repair should be performed in a protected area and NOT in the area of the impairment without extraordinary precautions.
 - ✓ Starting repairs or modifications immediately upon system impairment notification- i.e., do not impair systems before work is ready to begin.
 - ✓ Planning for continuous expedited work by ensuring all expected repair parts and tools are on-site and readily available before impairing the system and starting the work.
 - ✓ Limiting Impairment Tag issuance durations to a maximum of one day (24 hours) of work. When work is to be spread over numerous days- restoration should be made nightly when possible, with new tags (and area risk assessments) re-completed daily.
 - ✓ Limiting Impairment Tag issuance scope to one system per tag. When multiple valves are required to be impaired, each should have a separate tag with all valves closed clearly documented on the permits- either in the provided tag cells or under Back Part B Notes.
 - ✓ Requiring supplementary alternative fire protection during high-risk or extended duration impairments such as having pre-laid hose lines, adding fire extinguishers, or increasing area security presence. This can also include installing temporary water supply connections (i.e., cross-feeding sprinkler systems via hoses and coupling modification, etc.).

During emergency or longer duration impairments, temporary water supply connections should be considered. This may be a fire department requirement in some high density occupancies to continue operations. Your local AIG property Account or Risk Engineer can assist with this analysis.

Using the AIG Fire Protection Impairment Permit

The AIG Impairment Tag System is designed to facilitate a consistent approach to the following:

1. Implementing general precautions every time systems or components are impaired.
2. Ensuring all impaired systems are fully restored with visual/physical verification.
3. Documenting person(s) and actions taken by both those authorizing/approving impairment and those performing the work associated with the impairment.
4. Posting a warning tag at the point of impairment flagging the impaired device and, notification that the area is at higher risk of large fire loss during this time.
5. Generating a permanent comprehensive record of work properly planned, completed and restored (in compliance with NFPA 25).

AIG Impairment Notification

During all impairments, fire system valves or system components should be properly “tagged” out-of-service. Both AIG notification of planned impairment and subsequent restoration should be made via one of the following ways:

- **Telephone-** verbally give pertinent information to an AIG Impairment Desk Operator.
- **Email-** Using the AIG preformatted electronic form available to AIG customers for use. For emailing impairment notifications using the preformatted electronic form, follow instructions on the form.
- **Email-** Using a freestyle message with all required information.
- **Email-** Sending a photo of an AIG Impairment Tag at planning and restoration. For impairment notification by submitting an impairment tag photo, be sure information in photo is legible with pre-impairment sections completed and submitted before work begins and then, followed by a restoration email tag photo with restoration sections completed at the end of the impairment.

[AIG Global Property Impairment Hotline: +1 817-490-3255](tel:+18174903255) or [+1 877-705-7287](tel:+18777057287)

[AIG Global Property Impairment Email Inbox Address: GlobalProperty.Impairment@aig.com](mailto:GlobalProperty.Impairment@aig.com)

Whichever way impairments are reported to AIG, the following information will be needed for reporting:

- ✓ Caller Name & Company (insured) Name with Telephone Number and Email Address
- ✓ Contractor Name & Company with Telephone Number
- ✓ Type of Impairment (planned or emergency) & Systems/equipment impaired
- ✓ Degree of impairment (partially or full system out-of-service and, percentage of building impaired)
- ✓ Estimated impairment start date/time and duration
- ✓ Estimated impairment restoration date/time
- ✓ Planned precautions (no smoking, no hot work, added security, etc.)

Using the AIG Impairment Tag System

For emergency impairments, controlling the issue to limit damage such as from water flow, is the top priority. However, many times in these situations, multiple valves are closed in response in a somewhat unplanned manner. Thus, as soon as the issue is under control, all known closed valves should be tagged and the program for planned impairments followed through to restoration. This includes a review of the AIG Tag Pre-Impairment Checklist for Impairment Area.

The AIG Impairment Tag should be used/completed with the following process:

1. Work request is made to a company representative authorized to approve fire system impairments and issue tags by persons/company completing work. Tag should be completed by the Approved Impairment Authorizer.

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2. Complete Tag Part A Front Work Conducted By, Planned Start date/Time, Safety Checklists Completed and Estimated Duration information.
3. Complete Tag Part B Front Impairment Scope & Planning Details section.
4. Review and complete Tag Part A Back Impairment Pre-Planning Checklist. Many times, best practice will include surveying the area of work, impaired system coverage, and adjacent areas for risk assessment. This step also includes notification to AIG, site personnel, the local fire service, etc. as applicable. If impairment includes closing valves, the “Number of turns to close” should be completed and recorded when done for each valve. If more than one valve, added details can be recorded in the Back Part B “Notes” section.
5. Complete Tag Part A Front verification that the Impairment Safety Checklist has been reviewed and completed and Impairment Authorization Signature with Contact Number information and Date/Time.
6. Detach Part A and Part B of tag from each other.
7. Post Tag Part A at the point of impairment as a notification flag of impaired system and that the area is at higher risk of large loss from fire. If the impairment involves closing a fire protection valve, the number of turns to close the valve should be recorded on the Tag Part A Back line (for reference when valve is restored). If multiple valves on one system, individual tags should be utilized or, information noted on Tag Part B Back Notes.
8. Retain/post Tag Part B with the company approved impairment authorizer(s) or at a security desk monitoring the area, etc. At no time should a Hot Work Permit be issued in the same area or zone as an Impairment Tag unless extraordinary precautions are taken and noted in Tag Front Part B Special Precautions Required. Such actions, if absolutely required, only should be reviewed with AIG risk engineering before being completed.
9. Complete planned work as documented on Impairment Tag.
10. After work is completed, restore all impaired systems and complete Tag Part B Back Impairment Restoration Checklist- completed or managed by an approved Impairment Authorizer. If the impairment involves reopening fire protection valves, the number of turns to open valves should be recorded with verification that matches the number recorded in Step 4. Notifying AIG of system restoration (with the fire service and alarm company, etc.) as required.
11. Complete Tag Part B Front Impairment Restoration Details. In this step, the approved impairment authorizer is certifying all impaired systems have been verified to now be in the fully restored position. Many times, best practice will include surveying the area of work and impaired system coverage to verify restoration. For impairments such as valve closures, restored systems operational testing is required to be completed such as by main drain flow testing (as per NFPA 25) to ensure interior valve gate did not remain closed due to a shaft break, etc.

Impairment is now considered successfully completed and closed- Retain Tag **Part A** and **Part B** sections together for records.

References & Resources

AIG Hot Work Impairment Program

NFPA 25: Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

US Experience with Sprinklers, Marty Ahrens, October 2021, National Fire Protection Association® (NFPA®)

*While NFPA documents are the global standard used by AIG, international equivalents may be acceptable.

[For more information, contact your local AIG Risk Engineer.](#)

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