The proactive approach
to sustaining fire-rated life safety code compliance

How one private university health system is setting a new standard for preventive maintenance risk assessment

REMEDI8™
Compliance Made Easy®

Executive Summary

Above-ceiling fire barrier penetrations. Cables resting on fire sprinkler piping. Open junction boxes. Untreated head-of-wall joints. Facility managers refer to these as "the monsters in the ceiling," the unknown risks that could result in fines for noncompliance—or worse during an emergency.

A trailblazing private university health system is the first healthcare organization to create a comprehensive and robust approach to risk mitigation planning for fire-rated life safety code compliance.

The health system's approach proactively mitigates risk, creates labor and cost savings for the entire system, and is designed to be replicated by other acute care facilities. It can help healthcare organizations make progress toward The Joint Commission's goal of "zero harm" in hospitals, and address nagging non-compliance issues involving fire safety.

In the following pages, you'll learn the story of how this approach came to be, and how it can help mitigate issues with fire-rated life safety code compliance before they happen.

We'll also demonstrate how you can implement this methodical and systematic process at your own hospitals.

The proactive approach to sustaining fire-rated life safety code compliance

Hospital fires: a costly, all-too-frequent reality

A hospital's top priority is to ensure the safety and well-being of its patients, staff, and visitors—but unfortunately, fires happen all too often at healthcare facilities.

Of course, fires can occur anywhere—even in areas where patients are most vulnerable.

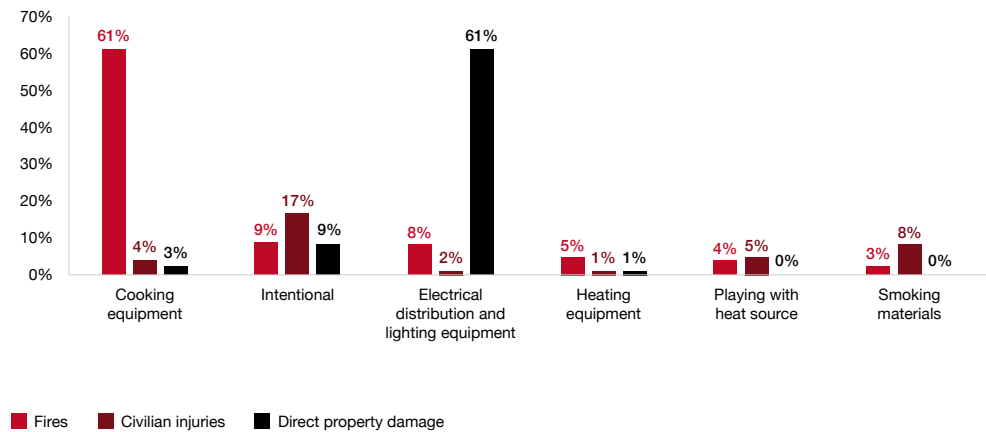> Overall, hospital and hospice fires cause an average of 32 civilian injuries and $8.8 million in direct property damage every year.

According to *Anesthesiology* journal, on average, 650 fires occur annually in operating rooms alone.

The National Fire Protection Association found that electrical distribution and lighting equipment accounted for by far the most property damage to healthcare facilities.

Hospitals depend on barriers to contain fires and prevent them from spreading to areas where patients and staff are less able to self-preserve.

This is a particularly hazardous area for fires to happen, given the state of the patient and the numerous ignitable components, like nitrous oxide used in anesthesia, and those that could easily accelerate a fire (such as blankets, gowns, and alcohol-based skin preps). Operating room fires result in two to three patient deaths per year.

The proactive approach to sustaining fire-rated life safety code compliance

REMEDI8™

Structure fires in hospitals or hospices by leading cause, 2011-2015 annual averages.

According to a National Fire Protection Association (NFPA) study conducted from 2011-2015, most hospital fires (41%) occurred in kitchen or cooking areas.

Chart: Structure fires in hospitals or hospices by leading cause

Cause	Fires	Civilian injuries	Direct property damage
Cooking equipment	61%	4%	3%
Intentional	9%	17%	9%
Electrical distribution and lighting equipment	8%	2%	61%
Heating equipment	5%	1%	1%
Playing with heat source	4%	5%	0%
Smoking materials	3%	8%	0%

Legend: Fires, Civilian injuries, Direct property damage

The proactive approach to sustaining fire-rated life safety code compliance

REMEDI8™

Fire protection, compromised

Hospitals must meet numerous federal and local fire-rated life safety standards and must implement active and passive protections against fires:

Active fire protection includes systems and devices such as sprinklers, fire alarms, and fire extinguishers. These require some kind of action to function.

Passive fire protection includes smoke dampers, fire-rated walls, and fire doors that are built into hospitals to prevent or stop the spread of smoke and fire.

The goal of passive fire protection is to achieve compartmentation as much as possible, minimizing damage and injury.

For hospitals, that also means enabling Defend in Place strategies that allow patients who are physically unable to leave the hospital (such as those connected to life support) to safely continue receiving treatment.

However, fire resistance can be compromised when holes or other penetrations are made in fire-rated structures. For instance, punching a hole in a fire-rated wall to install ductwork invalidates the fire-resistance rating of the entire wall. Or laying new wiring for information technology (IT) systems above the ceiling—and resting on sprinkler system pipes—could compromise an active fire protection system.

A small hole in a wall may not seem like a fire risk, but as the NFPA study showed, fires caused by electrical and lighting concerns led to the most damage.

Having fire-rated doors and walls work the way they should—and contain electrical fires—is of the utmost importance.

> Staff depend on the safeguards in place for self-preservation in order to manage emergency responses and evacuations of patients, visitors, and other staff.

Additionally, noncompliance impacts the response of external resources to an emergency. Firefighters count on up-to-date life safety plans to act as a roadmap for their response so they can work efficiently and prevent injury when coming on-site.

The proactive approach to sustaining fire-rated life safety code compliance

REMEDI8

The true cost of noncompliance

All that said, noncompliance with life safety code is one of the top four most-given citations according to The Joint Commission's Committee for Environment of Care. In 2018, five of the top ten most-cited standards were related to life safety noncompliance issues.

Percentage noncompliant

LS.02.01.35

88%

The hospital provides and maintains systems for extinguishing fires.

LS.02.01.20

66%

The hospital maintains the integrity of the means of egress.

LS.02.01.30

72%

The hospital provides and maintains building features to protect individuals from the hazards of fire and smoke.

LS.02.01.10

69%

Building and fire protection features are designed and maintained to minimize the effects of fire, smoke, and heat.

Source: The 2018 Joint Commission Hospital Accreditation update

The proactive approach to sustaining fire-rated life safety code compliance

REMEDI8™

These code violations introduce new risks to the hospital:

Safety risks—where failing to achieve compartmentation means patients and staff cannot safely egress the area.

Reputational risks—where noncompliance due to fire barrier penetrations and other oversights damages the branding and reputation of hospitals and healthcare organizations.

Financial risks—where failing to meet regulatory code compliance leads to fines and lawsuits, not to mention the costs of property damage caused by fires.

The costs go even further, and quickly add up. According to industry analysis, a new 360,000-square-foot building could have up to 1,200 non-compliant fire-barrier penetrations upon occupancy.

> The same analysis found the average cost of repairing fire-barrier deficiencies to be $700 per issue. That means it would cost $1.1 million to fix them all.

Hospitals typically do not have an extra million dollars to spend on largely avoidable deficiencies. But as this private university health system can attest, fire-rated life safety code compliance is a complex challenge with no easy answers.

REMEDI8™

Revamping a highly reactive process

NFPA Life Safety Code is a set of minimum requirements intended to "provide a reasonable degree of safety from fire." These measures cover installation, inspection, testing, maintenance, performance, and general safe practices so that buildings can protect patients and staff from fire, smoke, and panic.

Compliance is required for all healthcare facilities participating in the Medicare and Medicaid programs, and buildings are assessed regularly by state agencies.

Like many hospitals, the health system's approach to compliance was highly reactive. After performing a code compliance assessment of their hospitals, they would address any problem areas to remain fire-rated life safety code compliant.

Compliance efforts would begin again after the next audit or inspection identified further problem areas, and the cycle would repeat.

The idea of "waiting until it's broken" is a broken way of thinking in and of itself.

Proactively addressing compliance issues is the more effective and efficient way forward.

The proactive approach to sustaining fire-rated life safety code compliance

REMEDI8™

"If you've seen one hospital, you've seen one hospital"

This approach—identify compliance issues, then react—is typical of the entire industry. It's a key reason why life safety compliance fails to improve year over year. According to The Joint Commission research, the percentage of surveys with requirements for improvement (RFI) for firestop compliance have actually increased over the past four years.

Year	Standard	EP	Total survey events	% of surveys with RFI for this EP
2017	LS.02.01.10	14	1190	38.1%
2018	LS.02.01.10	14	1206	44%
2019	LS.02.01.10	14	1109	48%
2020	LS.02.01.10	14	451*	43.2%

Source: The Joint Commission research

* This number is lower in 2020 due to COVID-19

The proactive approach to sustaining fire-rated life safety code compliance

REMEDI8™

Why is it so difficult for hospitals to resolve noncompliance issues year after year? Because hospitals are constantly changing, and each is doing so under its own unique circumstances.

Hospitals continuously undergo updates and renovations of their infrastructure, regardless of when the hospital was originally built. This leads to numerous complications that make it difficult to monitor and sustain code compliance, including:

• **Hospitals are being worked on by numerous teams and vendors.** This makes it more complicated to align on compliance standards, as those resources (such as teams doing IT maintenance) may be used to working under different standards or unaware of the standards they need to follow. It also makes it more difficult to monitor work as it's being done in order to ensure compliance.

• **Areas within hospitals may have been built and continuously renovated under different codes and standards.** This level of constant, rapid change is complicated by disparities even within the same hospital. One wing could have been built in the 1950s, another in the past decade. What was life safety compliant when it was constructed may not be now.

Furthermore, each hospital has different resources available to them. Many do not have dedicated resources to inspect for code compliance, and contracting with outside professionals to do the inspections may not be possible given budget constraints.

Lastly, many hospital systems must deal with moving regulatory goal posts. Individual hospitals within a system may be subject to different editions of the same codes, standards, and regulations in each municipality—some of which may contradict each other. Not only do facility managers in these instances have to keep up with changing standards, but they also must keep different standards straight for different hospitals.

Add all these factors up, and that's why facility managers say: "If you've seen one hospital, you've seen one hospital."

Fighting back against the "monsters in the ceiling"

With such disparity between hospitals, it's difficult to create a uniform approach to code compliance other than to address deficiencies as they're brought to light.

> This leads to a fear of the unknown. What penetrations could have gone unnoticed? What cables are laying hidden over piping? What other "monsters" are hiding in the walls and ceilings, keeping facility managers up at night?
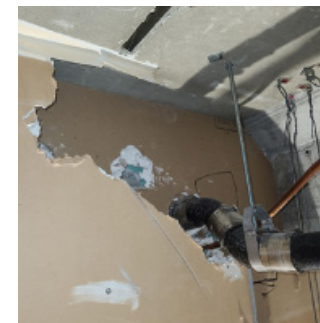
The private university health system needed to know. And they didn't want to know after something became a problem—they wanted to be able to continuously monitor adherence to code requirements in their hospitals, even amidst constant, rapid change.
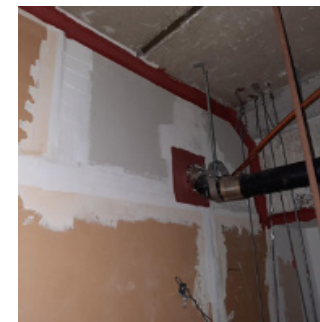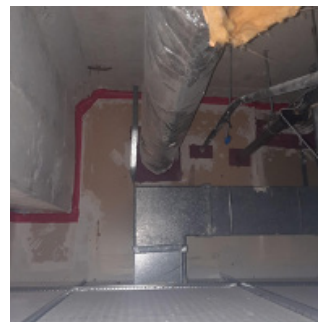

The proactive approach to sustaining fire-rated life safety code compliance

REMEDI8™

The before and after photos capture deficiency level information such as what is wrong, the source of issue, risk level, repairs needed, and budget. This information is used to queue up repairs, trend analysis, issue/source identification and quantification, training, and documentation of work.

Before

After

The proactive approach to sustaining fire-rated life safety code compliance

Proactive, preventive, and prescriptive

A private university health system sought to create a badly needed—and first-of-its-kind—solution to code compliance.

Their goal: to effectively create and implement a proactive, standardized, and replicable approach to preventive maintenance risk assessment planning for fire-rated life safety code compliance.

What the health system developed is a life safety program that ties together all the way that hospitals are designed and maintained in order to limit the impact of a fire. The plan gives staff a guide to ensure monitoring and maintenance of fire-rated structures and provides the crucial roadmap emergency responders need when coming on site during an incident.

The health system designed a model for building their preventive maintenance risk assessment plans. The model includes three pillars that ensure the process is standardized and replicable:

1
Proactive

2
Preventive

3
Prescriptive

Let's take an in-depth look at the three P's of this health system's model.

The proactive approach to sustaining fire-rated life safety code compliance

1 PROACTIVE

Hospitals are constantly building, expanding, and renovating. As a result, they need to proactively update floor plans and life safety plans to stay on top of any problem areas for noncompliance.

Complete survey

The private university health system's process starts with the completion of a quality set of accurate, complete life safety drawings to serve as a strong foundation for preventive action. Without this, it becomes more difficult to conduct inspection above ceiling and identify deficiencies. For instance, walls that are no longer required to be rated may appear to be rated because life safety drawings have not been updated.

Since keeping life safety drawings up to date is an ongoing process, hospitals must treat these drawings as a living document that is continuously updated. During any kind of construction, it's important that facility managers are in close contact with architects and the team on site to ensure regular reviews and audits for fire-rated life safety are occurring as construction is happening.

After completion, life safety drawings should be updated regularly. The health system recommends plans be updated as building changes occur, with architects, consultants, and facility managers walking room to room to update plans.

With up-to-date life safety drawings in hand, it's time to survey locations. The health system's surveys include:

- Above-ceiling penetrations
- Electrical junction boxes
- Cables resting on fire sprinkler piping
- Through-floor penetrations

The health system recommends that the survey be completed by someone with previous experience completing an above-ceiling inspection or by someone who is knowledgeable about barriers and fire-rated life safety in general. Having such dedicated resources may not be possible for all organizations, so this is an area where it's valuable to contract with external partners to ensure inspections are done thoroughly and correctly.

2 PREVENTIVE

As planned, deficiencies have been identified and prioritized based on risk. Now it's time to implement preventive steps to remediate current noncompliance, mitigate issues, and prevent future ones.

Develop risk matrix

A complete, thorough, and accurate survey allows teams to establish a risk-based approach that weighs risks, cost, and other factors to prioritize areas to address.

The health system's risk matrix takes into consideration a number of factors:

Intended use of space—does the space house patients? Is it an outpatient facility? Is it an area with a high concentration of flammables and combustibles, such as a lab?

Number of fire barriers in compartment—are there other barriers or protections in case of emergency?

Density—is this a common use or high-touch space? Or is it storage space?

Number and severity of deficiencies—are there numerous noncompliance issues in a single area? Do these issues impede egress for patients and staff, heightening the urgency to address them?

The proactive approach to sustaining fire-rated life safety code compliance

Risk Matrix Used by Health System

Taking into account all these factors plus others enables the private university health system to assign a risk number to areas or specific deficiencies based on the level of self-preservation and true risk.

RISK SCORE						DESCRIPTION
45%	10%	20%	25%	100%		Smoke
Use	Density	Barriers	Deficiencies	**Total**		Compartment
3	5	6	1	**3.3**	🟢	1A
10	3	6	4	**7**	🔴	1B
3	4	4	10	**5.05**	🟡	1C
3	4	5	6	**4.25**	🟡	1D
3	2	10	2	**4.05**	🟡	1E
7	3	5	5	**5.7**	🟡	1F
3	5	6	4	**4.05**	🟡	1G
1	8	4	2	**2.55**	🟢	1H
6	5	7	3	**5.35**	🟡	1L
1	6	5	1	**2.3**	🟢	1M
1	8	5	5	**3.5**	🟢	1N
3	4	8	8	**5.35**	🟡	1K
3	2	6	10	**5.25**	🟡	2A
3	5	6	10	**5.55**	🟡	2B
1	3	4	10	**4.05**	🟡	2C

🟥 = health system input cells

The proactive approach to sustaining fire-rated life safety code compliance

REMEDI8™ Presents:
Health System Firestopping Remediation

The private university health system uses interactive dashboards to monitor the progress of repairs vs. budgets. These are a valuable tool for talking through maintenance needs with crews. The example here has filters enabled to show completed items from all buildings.
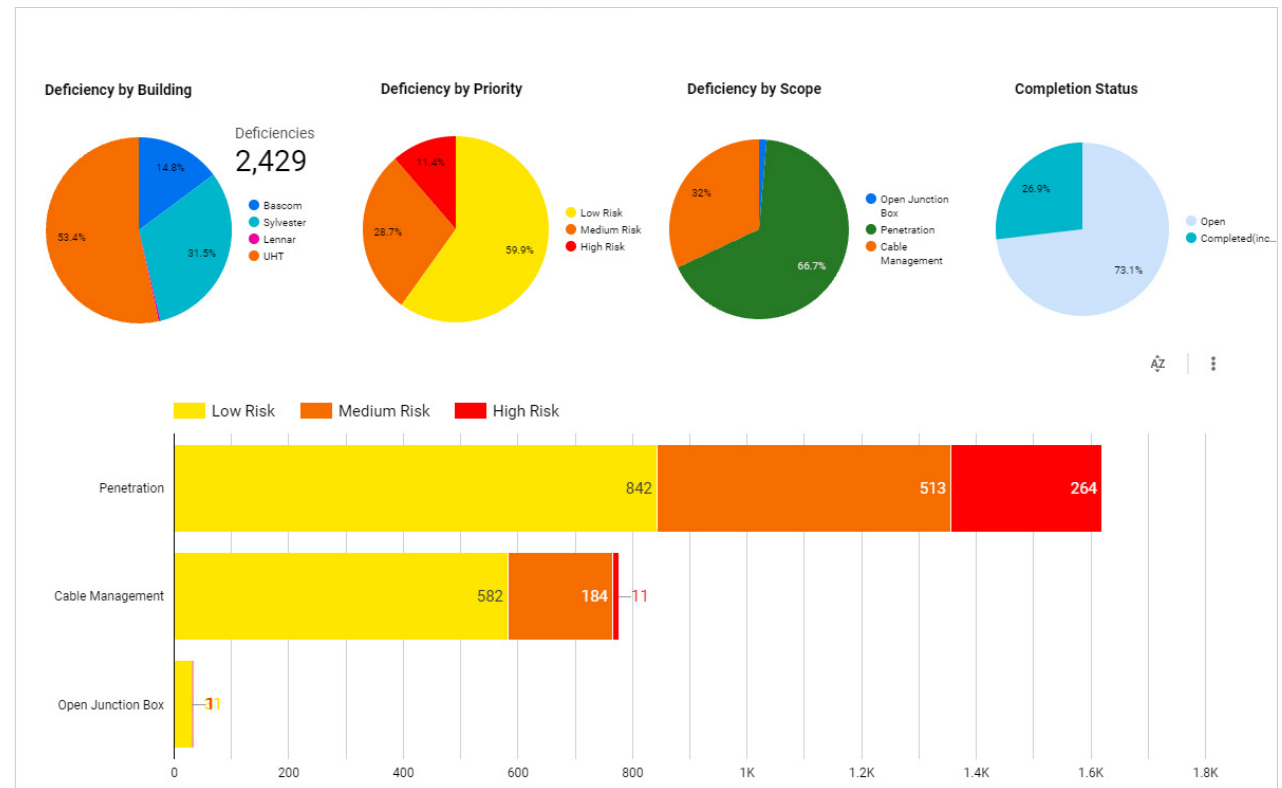
The proactive approach to sustaining fire-rated life safety code compliance
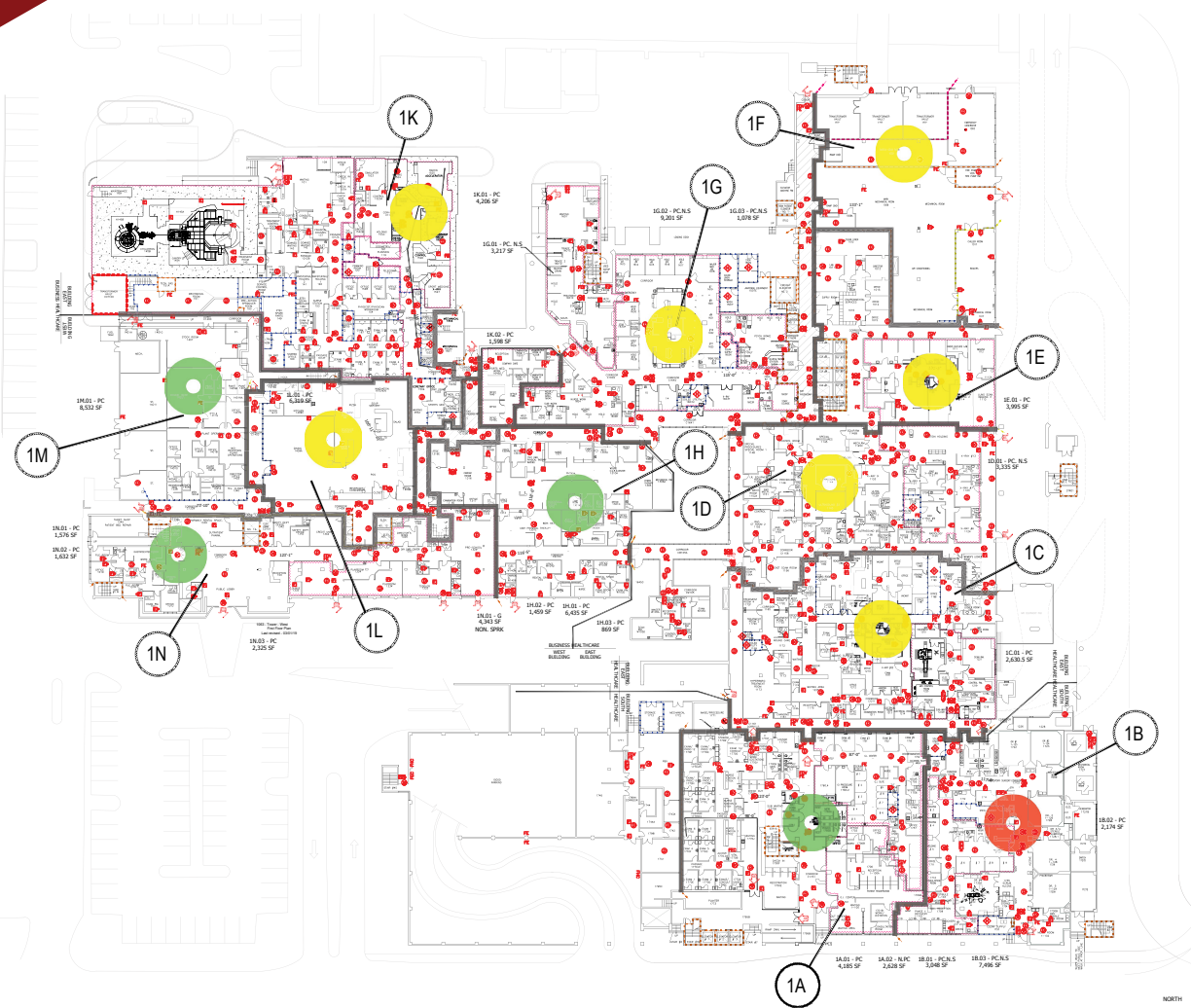
The health system then maps the deficiencies and their risk scores to a map of the building.

This visual helps the team dedicate time, resources, and budget to the most important areas for keeping patients and staff safe.

The proactive approach to sustaining fire-rated life safety code compliance

Develop action plan

An action plan establishes a policy and standard operating procedure (SOP) going forward for how the organization will prioritize and remediate noncompliance issues.

It also sets benchmarks for the effectiveness of the preventive maintenance risk assessment plan in general. Key performance indicators (KPIs) help measure, track, and compare compliance over time.

The KPIs used by the health system include:

Number of deficiencies: the health system uses their data to track the total number of fire barrier penetrations, open junction boxes, and cables wrapped around or resting on fire sprinkler piping.

Cost tracking: the organization should see a reduction in cost to repair over time due to proactive, preventive maintenance.

Permits: finding the correlation between the number of open, closed, and pending permits to the total number of deficiencies (and related costs) gives the health system another way to measure the effectiveness of their preventive maintenance efforts. Are the number of issues relative to recent renovation and construction improving?

Turnaround time: are non-compliance issues being addressed in a timely manner?

The proactive approach to sustaining fire-rated life safety code compliance

REMEDI8™

These metrics are critical in conversations with organizational leadership, and lead to more productive and actionable conversations. KPIs speak a language leadership understands and provides them with a panoramic view of the risk caused by numerous code deficiencies.

The metrics also help make a case for continued investment in preventive maintenance planning and give facility managers and their teams feedback on how the program is doing and where improvement is needed.

That way, an area with code deficiencies one year should see none the next—and stay that way long term.

The proactive approach to sustaining fire-rated life safety code compliance

Allocate resources

Using data from the action plan—and then comparing metrics year over year—allows hospitals to make data-driven decisions about how to most effectively allocate resources for preventive maintenance.

Throughout the process, it's important to foster partnership with different teams and departments to ensure buy-in, comprehensiveness, and sustainable success.

These internal partners include but are not limited to:

- Construction design team
- Information technology (IT)
- Public safety
- Facility operations
- Environment of care committee
- Telecommunications
- Governance involving different department heads

> Life safety is a hospital-wide pursuit. Therefore, other teams and departments must be allies in ensuring code compliance. Presenting data can also help in having more productive conversations with these allies.

For instance, let's say contractors from a specific department are causing repeat issues.

Presenting those numbers to the department head proves that a new approach is needed. In the following months and years, both teams can track whether workmanship has improved, which should lead to cost savings and fewer noncompliance issues.

The proactive approach to sustaining fire-rated life safety code compliance

3 PRESCRIPTIVE

A reactive approach leads to a vicious cycle of unknown compliance issues, causing delayed responses, causing more compliance issues.

By following this preventive model, hospitals can break that cycle—through proactive, sustained follow-up to identify deficiencies and problem areas.

Remediate

Creating effective, enforceable policies is the foundation of making a sustainable life safety program.

These may include but are not limited to:

Permit program—the health system requires all above-ceiling activities to be permitted.

Work orders—visibility into work orders helps identify areas in need of supervision and, later, inspection, and keeps life safety plans up to date. It also helps in managing contractors for quality and code compliance.

Training—each hospital has different skillsets, resources, levels of experience, and priorities that dictate training. At the health system, that means firestopping, launching permit programs, and contractor education are areas of focus.

Documentation—to sustain compliance with federal, state, and local authorities, the health system maintains the proper documentation and reviews standards regularly. It also completed The Joint Commission and Centers for Medicare & Medicaid Services (CMS) surveys to maintain accreditation and meet high standards for fire-rated life safety compliance.

Standard operating procedure (SOP)—the health system has an SOP for closing fire barrier penetrations, ensuring their process is standardized and replicable.

The proactive approach to sustaining fire-rated life safety code compliance

REMEDI8

Incorporating innovative technologies into the process can greatly aid in managing preventive maintenance. The health system utilizes an application called Fieldwire to record deficiencies in floorplans. The app allows their teams to take photos and track persistent issues back to their sources.

Evaluate

The last step in this process is to ensure the program is effective by measuring and comparing KPIs over time. This includes developing new KPIs to address emerging challenges and examine the value of current metrics being tracked.

This essentially closes the loop in the life safety cycle—proactively shifting focus and resources to new problem areas, taking action to address them, and then reevaluating the effectiveness of policies and protocols.

The proactive approach to sustaining fire-rated life safety code compliance

A **proactive model** for the entire industry

With a holistic approach to preventive maintenance planning for fire-rated life safety code compliance, this private university health system proactively addresses noncompliance issues rather than waiting to fix them. That's because they have a tangible, measurable process for identifying, assessing, and mitigating risks in a methodical and systematic manner.

Now, the health system is providing their model to be used by other hospitals to keep patients and staff as safe as possible when the unthinkable happens, to mitigate noncompliance issues, and to minimize damage from fires.

This model sets a new standard for the healthcare industry, and a new way to reach The Joint Commission's goal of "zero harm."

It gives facility managers the management tools needed to have more impactful conversations with the C-suite, making life safety an organizational effort. And it saves money for budget constrained hospitals that can be invested into other projects.

But most of all, it helps ensure greater compliance, which leads to the most important outcome of all: the entire hospital taking the proper steps to ensure patient safety.

The proactive approach to sustaining fire-rated life safety code compliance

Contributors

Kim Orange Jr.
Sr. Manager, Healthcare Strategy & Offer Enablement | W.W. Grainger, Inc
847-535-1000
kym.orange@grainger.com

Kirk Kaiser
Founding, Partner, Acquisitions | REMEDI8™
913-526-9277
kkaiser@myremedi8.com

Neil Sommers
Founding Partner,
Life Safety Architects
816-699-2862
neil@lifesafetyarchitects.com

About Grainger

Grainger is North America's leading broad line supplier of maintenance, repair, and operating products. We help healthcare organizations deliver safe, quality care at their facilities by partnering to solve their greatest challenges in procurement and inventory management. With more than 250 team members dedicated to healthcare and $1.5 billion in stocked inventory, our experience, access to experts, and product mix for the healthcare industry are unmatched.

About REMEDI8™

REMEDI8™ assists the architect community in developing solutions that will satisfy municipal officials and are realistic to place in the field. Inspections are based upon NFPA, Life Safety Code, ASTM test standards, IBC, and IFC. They utilize employees for construction, installation and remediation and can assist the design team with any facet of the scope of work.

About Life Safety Architects

The LSA process: After the initial on-site building assessment walkthrough, LSA performs a code review that reconciles municipal, and CMS required life safety codes. Once the code review is complete, a color legend is developed with a matrix that indicates the more restrictive requirements for any facility. Finally, color life safety plans are created with code requirements and exceptions for cost savings clearly shown.