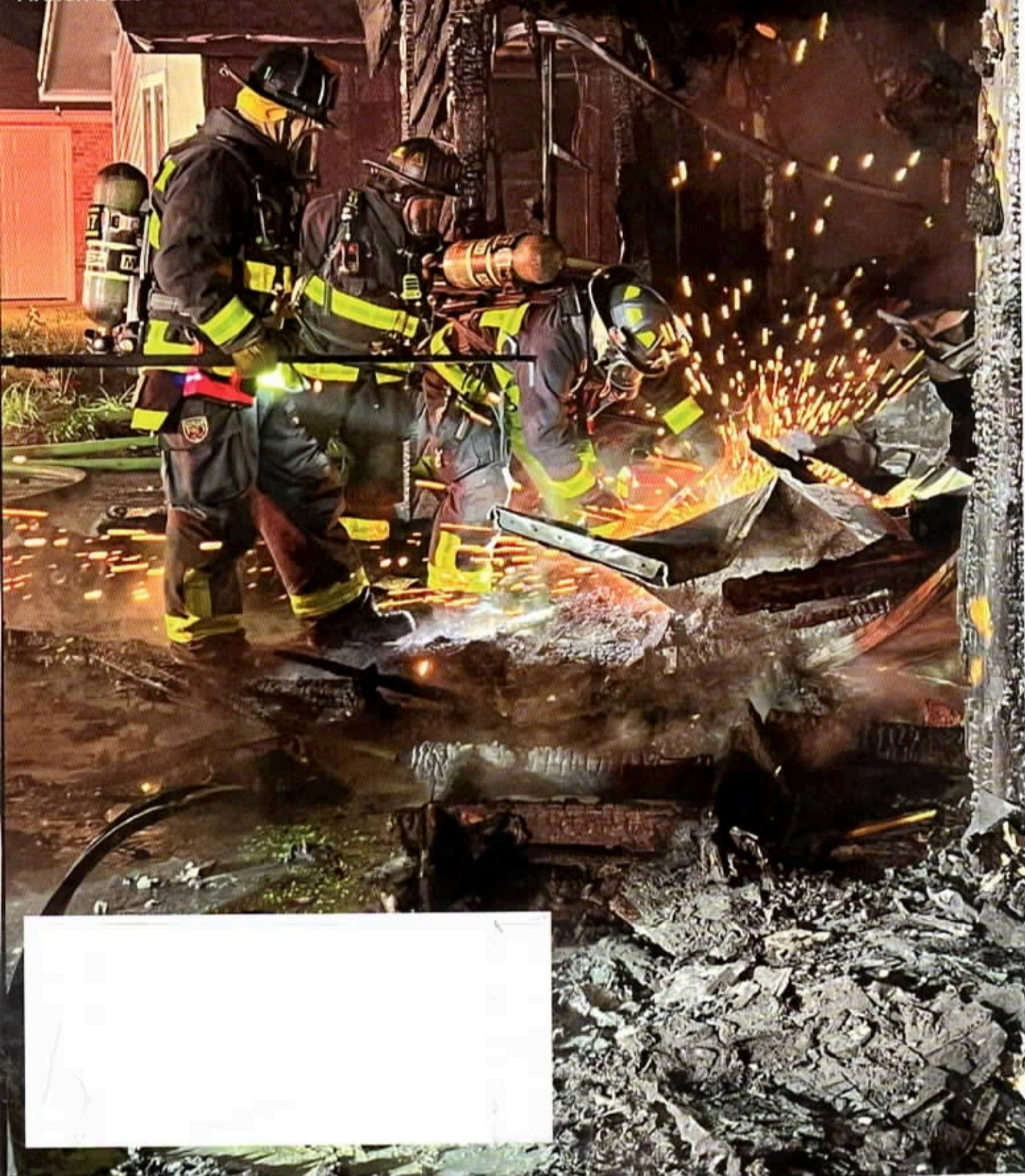


FIRE ENGINEERING

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TRAINING THE FIRE SERVICE SINCE 1877



Ventilation Failure Points: The Human Factor

BY NICHOLAS PAPA

THE INTERNET has its fair share of fireground footage displaying the actions of firefighters resulting in unfavorable outcomes, such as rapid fire growth and spread. Ventilation is unequivocally at the top of that list, but is the tactic to blame?

Ventilation is a highly beneficial intervention that can be the deciding factor in a successful outcome. The linchpin for its effectiveness, however, is the individuals executing the operation—the human factor. Because the fireground involves variable and dynamic components (terrain, weather, and fire location/extent) that impact ventilation, it must be tailored to each incident. This fact requires firefighters responsible for performing ventilation operations to be intimately familiar with the ins and outs of the tactic. These firefighters must be cognizant of where they are fallible, and they must proactively address any weaknesses. This way, they can take the necessary precautions to anticipate and counteract any emerging problems. By recognizing the potential pitfalls, the venting firefighters can minimize their chance of failure or mishap.

Understanding the Opponent

Just like professional athletes, firefighters must watch “game film” to better understand their opponent (fire) and to learn from the experiences of others. The key to productively and respectfully examining fireground footage, especially when the performance was substandard, is to place yourself in the position (and, more specifically, in the mind) of those individuals in an attempt to recognize their vantage point and mental state. Only by analyzing the incident through their lenses can you appreciate what they encountered, what they were likely thinking, and what they attempted to accomplish in that moment.

Once you have a grasp of the environment, the circumstances, the intended outcome, and the thought processes, the root cause and contributing factors of the deficiencies can be teased out. By identifying any mistakes, oversights, shortcomings, or overarousal for the sole purpose of preventing them from occurring again, we can improve our overall performance and incident outcomes.

Failure Attributes

An in-depth and objective examination of numerous “ventilation gone wrong” cases, including my own experiences and personal actions, revealed four behaviors that repeatedly surfaced as the primary and underlying causes of operational malpractice:

- Overzealousness.
- Freelancing.
- Unawareness.
- Misguidedness.

Overzealousness

Being overzealous is commonly associated with more junior or inexperienced firefighters. Whether it is one of their first (“good”) jobs or the first time they are performing a particular function (e.g., the outside vent firefighter position), these firefighters may be overly anxious to get into the fray and execute their assigned task. When smoke or fire is showing and they are ready with a tool in their hands, that overwhelming desire (often called the “itchy trigger finger”) may cause them to impulsively engage (e.g., prematurely take a window).

This lack of patience is caused by a loss of composure and is a sign of operational immaturity. Firefighters, especially those responsible for such tasks, must understand that the cornerstone of coordinating ventilation is positional discipline—namely the timing component. Creating an opening

hastily can be the catalyst for the overall failure of an incident or, at the very least, undue loss or injury.

Freelancing

Engaging in freelancing—any unsolicited, unwarranted, or uncoordinated actions—should be prevented and prohibited. While the occurrence of this potentially detrimental behavior has seen a marked decline with the advent of the incident command system and the majority of agencies assigning every firefighter a portable radio, it is still a problem that exists.

The associated lack of accountability may result from poor organizational structure or weak command presence. Through the establishment of operational systems, such as standard operating procedures, the baseline expectations can be laid out ahead of time. You can facilitate continuity and integrity with predetermined unit and riding assignments. The associated doctrine should include the roles, responsibilities, and even the tool selection of each company and member.

Unawareness

We see varying degrees of being unaware, ranging from not picking up on subtle details or events to a complete breakdown of one’s faculties, distorting perception of time and space. The most seemingly obvious cause of this behavior is a lack of vigilance. While inattentiveness or a lackadaisical mindset can certainly be a contributing factor, the heart of this issue goes much deeper.

Missing information or not realizing certain events are taking place can be the result of a deficiency in education or training or sheer inexperience. Firefighters who do not possess the essential background or familiarity with a particular operation may not know how to

The Fireground Playbook

This fireground playbook must be reinforced through training and upheld at all incidents to develop familiarity, promote compliance, and instill discipline (Figure 1). Company officers and incident commanders must ensure the rationale behind

Figure 1. Standard Operating Procedures

NEW BRITAIN FIRE DEPARTMENT STANDARD OPERATING PROCEDURE		
	LADDER COMPANY OPERATIONS	NUMBER: 02
		Date Issued: 09-11-2023
		Revision: 1
AUTHORITY OF: Fire Chief		
1. INTRODUCTION 1.1 The responsibility of the ladder company is to support the firefighting actions of the engine company with regards to the strategic priorities of life safety, incident stabilization, and property conservation. The primary tactical objective of the ladder company, however, is to locate and remove any trapped occupants. 1.2 First-Arriving Ladder Company Functions and Critical Tasks: Rescue, Confinement, and Search (Fire Floor)		
Having standard operating procedures designating the roles, responsibilities, and riding/tool assignments sets clear expectations and promotes implicit operations. [Courtesy of the New Britain (CT) Fire Department.]		

these systems and their importance are fully understood and appreciated.

These procedures must be clear and direct to produce consistent behavior and repeatable results. They must not, however, be restrictive or convoluted. And they must not promote micromanagement, either.

Allowing for flexibility within the standards will provide company officers and firefighters with a reasonable degree of discretion to make justifiable alterations based on the unique conditions or circumstances of an incident. It is imperative to note that any deviation from the standard must be communicated. This helps everyone maintain accountability and ensures the action is aligned with the progress of the other operations as well as with the commander's intent. Firefighters should be empowered to call these "audibles" and seize opportunities when it will allow them to better accomplish their tactical objectives or to address a strategic priority, especially in matters of life safety.

Organizational culture must foster a mission-oriented mindset. Its doctrine must be written as to not stifle initiative or innovation. Washington, D.C. Rescue Squad 3 Lieutenant Gregory Turnell put it best when he said, "The rules are never more important than the mission."

properly assess the environment. As a result, they may not understand or even recognize what is taking place and how to address the situation at hand. As the old saying goes, "You don't know what you don't know."

Without having been shown the way, you will have difficulty going where no one has taken you before. This reinforces the importance of a commitment to deliberate preparation, encompassing the mental, physical, and tactical domains (known as the Performance Triad).^{1,2} By remaining diligent in our operational readiness we can optimize our impact on the fireground.

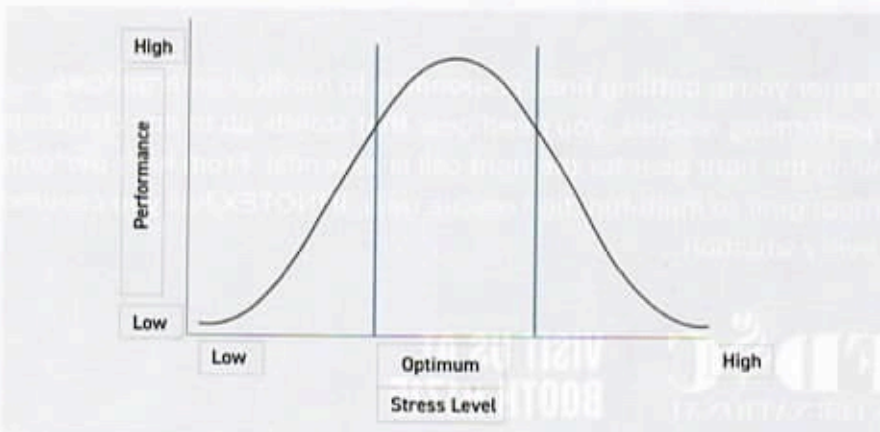
One of the most pervasive but insidious factors associated with this problem ties back to arousal. The effect of stress on performance, both physiological and psychological, is defined by the Yerkes-Dodson law. The associated stress-performance bell curve visually demonstrates that high performance occurs at a moderate/intermediate stress level (Figure 2).

Stress is a "necessary evil," as it is required for us to perform optimally—stimulating and priming our bodies and minds for action. When we are experiencing the

ideal level of stress, we are energized and dialed in, also known as being in the zone. Low stress can fail to capture our attention, producing a lack of focus and urgency, which can lead to carelessness. High stress can trigger anxiety and frustration as well as suppress the senses (tunnel vision and auditory exclusion) and diminish motor skills. Exceeding the positive threshold of stress is a state also known as "going off the backside of the curve" or being "right of center."¹⁻⁷

The more excited or overwhelmed that firefighters become, the greater the effect it will have on their cognitive and physical abilities. Once their level of arousal reaches that point of diminishing return—hormonally induced from emotional stress in response to the environment and the situation, not just physical stress and exertion, the firefighter will start to become impaired. The principal triggers of overarousal are perceived danger, uncertainty, friction, complexity, and pressure. The higher the stakes

Figure 2. Visual Representation of the Yerkes-Dodson Law



Source: Wikimedia Commons/Public Domain.

(occupant entrapment) and the more novel or challenging the situation is, the greater the stress potential and the likelihood for overarousal.¹⁻⁷

You can take measures to counteract the negative effects of stress prior to, during, and after an operation:

- Tactical breathing. (This includes box breathing.)
- Resets (pausing to reassess and recalibrate).
- Routines, such as setting up and donning your equipment.
- Visualization, such as performance imagery.
- Positive self-talk and mindset (constructive, opportunistic, process- and task-oriented).

As Navy Sea, Air, and Land (SEAL) Teams Commander (Ret.) Jocko Willink stated, "Don't think of stress as something you need to fight against. Think of it as something you need to work with."⁸ The impact of stress on firefighter performance is one of the single most overlooked and marginalized factors in the fire service.

In a high-stress environment, the physical touch of a brother or sister firefighter (a hand placed on the shoulder) and calming voice, particularly when personalized (using their first name) and injecting humor for levity, can dramatically reduce arousal levels—bringing a firefighter back to or closer to center.¹

The most impactful way to proactively improve confidence and maintain composure is to build your competence (knowledge, skills, and abilities), particularly when it is facilitated through the guidance of seasoned operators and actual fireground experience.¹⁻⁷

While the volume of fire duty cannot be controlled, making fireground experience the limiting factor, there is much we can gain vicariously through watching "film" and storytelling, a tradition that has been in existence since the dawn of time. The more "slides" we have in our mental deck, the better chances we have of finding a match to mitigate the challenges we're confronting.

Misguidedness

Often the most prominent contributing factor in the misapplication of our tactics is misguidedness. Inaccurate assumptions regarding the impact of ventilation, based

on previous experiences and what was perceived to have occurred, are often to blame. As Fire Department of New York (FDNY) Battalion Chief Jason Cascone stated, "We overestimate our ability to make predictions based on past experience, and we underestimate uncertainty."⁹

These false anecdotal interpretations, perpetuated by biases (cognitive, confirmation, and success bias), can become the standard within an organization.¹⁰ Serving as the driving force behind the selection and implementation of tactics, they have the ability to transcend generations of firefighters.

Individuals may overlook a critical aspect and improperly execute an operation, despite the best of intentions, based on this overconfidence in what they think they know or an inability to practically apply the information they actually possess.^{9,11}

President John F. Kennedy said it best in his 1962 commencement address at Yale University: "The great enemy of truth is very often not the lie—deliberate, contrived, and dishonest—but the myth—persistent, persuasive, and unrealistic. Too often we hold fast to the clichés of our forebearers. We subject all facts to a prefabricated set of interpretations. We enjoy the comfort of opinion without the discomfort of thought."

The quote encapsulates the concept of "unconscious incompetence," defined as learners' failure to recognize the gap in their knowledge base and skill set—possessing the "wrong intuition." This mindset represents the first phase in the learning model, originally developed by psychologist Noel Burch, commonly referred to as The Four Stages of Competency.¹²

The progression of the remaining stages is as follows:

- Conscious incompetence: "wrong analysis."
- Conscious competence: "right analysis."
- Unconscious competence: "right intuition."

Individuals at the bottom of the hierarchy, who are unknowingly misguided in their logic, do not believe they have a deficit that needs to be addressed.¹² As the Greek Stoic philosopher Epictetus is believed to have said, "It is impossible to begin to learn that which one thinks one already knows."

Passing It On

The revered military strategist and tactician Prussian General Carl von Clausewitz famously stated, "Everything in war is simple, but the simple things are difficult," a sentiment that rings true for the fire service as well. What is even more challenging is effectively translating the subtleties and the fine details within the fundamentals of warfare (firefighting), many of which are subconsciously accounted for and performed automatically by veteran firefighters into terms that can be readily absorbed by those who are new or inexperienced.

The Mission Critical Team Institute (MCTI), a collaborative applied research group dedicated to improving learning, instruction, and professional development within the public safety, emergency medicine, and military communities, frames this phenomenon using the analogy of riding a bike.¹³ Most people are fully capable of riding a bike, and no matter how much time has passed since their last ride, the act is so ingrained they can jump right back on and effortlessly take off, hence the saying, "It's like riding a bike."



1. Providing firefighters with proper instruction requires explaining the "why," establishing a language for communicating as well as the principles and practices for execution, and allowing for enough "sets and reps" to ingrain the techniques and procedures until they become automatic. (Photo courtesy of author.)

Despite this almost instinctual level of competency, passing on this ability, however, is anything but second nature. Anyone who has attempted to teach a child this largely intuitive skill set can certainly attest to the struggle. Because riding a bike is essentially about balance and tempo, which are tactile sensations, they are difficult to articulate. This is what MCTI refers to as the "Tacit Knowledge Transfer Problem."

To successfully convey these physical cues and micro adjustments, a skill set of its own, they must be codified and their components defined (photo 1). Coleman Ruiz, U.S. Navy SEAL commander (ret.) and MCTI cofounder, subsequently said, "Everyone assumes because you can do a thing, you can teach a thing. That is not true and there are consequences of getting that wrong."¹⁴

This point was abundantly clear when Dr. Preston Cline, a Wharton School of Business Senior Fellow at the University of Pennsylvania, and MCTI cofounder, started his research into tactical law enforcement and special operations units. Even the elite Navy SEALs, with their storied pedigree and wealth of resources, were dealing with this issue when he first observed their training.

The seasoned operators conducting the drills did not have a standardized language or a mechanism for transmitting their tacit knowledge, garnered through extensive real-world combat missions, to the junior "frogmen." The instructors were simply defaulting to teaching through the lens of their own lived experiences (and of those who trained them). Because the perspectives were unique to the individual, shaped by those specific events and actions and their personal interpretations, the content and the messages were variable.¹⁴

One of the most profound examples of this educational shortcoming is the use of overly simplified or generalized statements. Within the fire service, the most glaring of them all is the line, "Every fire is different." Its ambiguity promotes confusion and compounds the uncertainties of the fireground.

While the terrain, weather, and location/extent of the fire are certainly variable factors at every incident, the fire itself remains the constant. Being a natural



2. Providing high-fidelity live fire training, especially for recruits, is of the utmost importance to bringing concepts to life and developing a solid foundation. (Photo courtesy of Flash Fire Industries.)

phenomenon, fire is bound by the laws of physics and chemistry and, consequently, has a considerable degree of predictability. As FDNY Rescue 1 Captain John Ceriello, stated, "The fire is just going to react to the physical world around it, and if the firefighters understand that, there are things they can do to mitigate some of those effects."¹⁵

If the message identifying that which is foreseeable and probable is not conveyed properly, firefighters can perpetually operate in a reactive and suboptimal state, due to the perceived novelty. The firefighters who have a strong foundation in fire dynamics and building construction, however, can find comfort in the commonality. By enhancing their understanding and ability to read the conditions, they can better detect the cues and recognize patterns to anticipate what is to come and proactively take the necessary precautions. When firefighters

couple the requisite mental and physical skill sets, they can decisively select and leverage the proper tactics to their full potential (photo 2).

The fundamental question MCTI has is: "How do we help people learn to more successfully and sustainably navigate uncertainty in the face of rapidly emergent, complex, and adaptive problem sets?"¹⁶ The answer lies within our ability to practically define our working environment, core competencies, and stress response. From there, we can establish a standardized language for communication, a simplistic framework of operational principles and practices, and a comprehensive program for skill acquisition to ultimately develop a reliable process for how we execute our tactics.

By identifying the nuances and parameters for execution, providing the contextual relevance, we can develop a comprehensive system of skill acquisition. This holistic and tacit-level approach becomes the vehicle for transferring

the vocational knowledge, along with the institutional knowledge—capturing both the experiential and the academic domains: “making explicit what is done implicit.”¹⁷ Through the synthesis of “street smarts” and “book smarts,” we can readily and consistently pass these insights on to the proceeding generations so they can practically apply them on the fireground. ■

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panelist for the coordinated fire attack study. Papa is also the founder of the fire service training and consulting organization Fireside Training, LLC.

Nicholas Papa will present “Coordinating Ventilation: Supporting Extinguishment and Survivability” at FDIC International in Indianapolis, Indiana, on Wednesday, April 9, 2025, 10:30 a.m.-12:15 p.m.

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