

What You Should Know About Gas Leaks

BY FRANK C. MONTAGNA

WE ARE NOT EXPERTS ON ALL THINGS, BUT WE can and do respond to incidents that require expert advice for safe mitigation. Natural gas incidents fall into this category. Called to a ruptured gas main in the street, we might see gas blowing out of an excavation. We have neither the expertise nor the equipment to determine if it is also leaking elsewhere underground or if it is migrating toward surrounding buildings. At a downed wires incident, unless the wires are arcing, we do not know if they are live. At a smoking manhole incident, we are not able to tell if other manholes will become involved or if the smoking manhole will blow its 300-pound metal cover several stories into the air. When a high-pressure steam main ruptures, we do not know what other damage has been done to the buried

and, as previously stated, will require expert advice, specialized tools, and highly trained personnel to safely mitigate.

Fortunately, we have experts available to us, the utility responders. They have the training, the tools, and the experience to do what needs doing—and to do it safely. Their availability, however, does not relieve us of the responsibility to keep the public and our firefighters safe, and the incident commander (IC) may have hard decisions to make before the utility arrives on the scene. It is not unheard of to wait an hour for a utility response; that can be one long, possibly disastrous hour for the uninformed IC. So, what does the IC do while he is waiting for the utility, be it one hour or 10 minutes?

We are used to doing a size-up at fires. We have Jersey City (NJ) Fire Department Deputy Chief Michael Terpak's 15 points of size-up to ponder as well other versions of this information-gathering

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gas and electric lines and to other underground infrastructure in the area. So, what are we to do and how do we operate safely and effectively at these incidents?

Even though we are not the subject matter experts on these types of incidents, we still must respond to them. We still must make decisions that may put our people at risk and that will have an impact on the safety of civilians. We still must operate at them, so what do we do to operate both safer and smarter?

LEARN AND APPLY BASIC INFORMATION

Although we are not subject matter experts, there is basic utility property and hazard information we must know. This is very specific information, and it is not always intuitive. We have to learn it, and we have to learn to apply it to the incidents to which we respond. Without this information, we are courting disaster, and our decision making at these incidents will be flawed, putting us in danger. Sometimes, just knowing this information is, unfortunately, not enough. When dealing with the hazards inherent in the delivery of gas, electric, and high-pressure steam, the reality is that the hazards can be complex

task. With the information gathered by this process, we make better decisions at structural fires. Adding this size-up information to what we know about building construction, fire behavior and travel, and our knowledge and experience in fire extinguishment, we are well equipped to fight most structure fires. For utility incidents, we also must go through information gathering relative to the hazard to make intelligent decisions. We also need to know some basic utility property and hazard information.

SCENARIO: LEAKING GAS SERVICE LINE

Imagine that you are responding to a leaking gas service line. When you arrive, you see an unstaffed backhoe parked at the edge of an excavation. You can hear the loud sound of escaping gas, smell a heavy odor of natural gas, and see dirt and debris blowing up out of the hole. You need to ask some questions and make some decisions at this time.

- What is the hazard, and what information will you include in your preliminary report?
- What help will you need to safely mitigate this incident?
- From what direction should you tell units to respond, and

● GAS LEAKS

where can they safely stage?

- Is there a life hazard, and what can you do about it?
- Where is the gas going, and where will it collect?
- Will the gas ignite?
- What will you do if the gas ignites?
- Is there property that must be protected?
- How will you deploy your firefighters?

What You Should Know

You may have more decisions to make, depending on the incident, but these questions will almost certainly need to be asked. Some can be answered by knowledge of basic utility property and hazard information. For instance, you should know that the loud sound you are hearing means that a high-pressure gas line has been damaged and is leaking. Calling for the gas company is just common sense at this point. Your standard operating procedure (SOP) and the degree of hazard perceived will dictate the additional help you should request. If you don't have an SOP for gas incidents, get one.

Your knowledge of the properties of natural gas tell you that it is lighter than air and will rise if unconfined and travel in the direction in which the wind is blowing. You should also know that gas, if ignited, will not explode unless it is at least partially confined. It will ignite, however, if it encounters an ignition source, and a fireball will accompany the ignition as the accumulation of escaping unburned gas ignites. This information should indicate to you that you do not want responding units

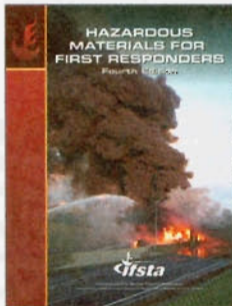
to enter the gas cloud. Have the units respond upwind from the leak. Any firefighters or civilians near the leaking gas could be caught in the fireball should ignition occur, so remove them from the danger area and keep them out of it.

You should also know that if the gas ignites, you will be left with a gas flame fed by an inexhaustible supply of gas, giving off radiant heat. The size of the flame and the amount of radiant heat given off will be determined by the size and pressure of the damaged main. You should set up protective lines, covering exposures as a precaution, before the gas ignites.

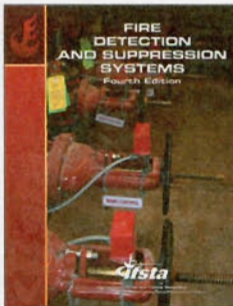
By observing the wind's behavior, you can know where the gas cloud will go. Your knowledge of the likely hazards and the behavior of leaking gas should tell you that gas may be leaking at locations other than the obvious one you saw when you pulled into the block. The backhoe not only might have gouged the pipe but it could also have pulled the pipe, causing it to break away from the building, separate from an underground coupling, or be pulled out of the main in the street. The result would be gas leaking underground. Because you have studied the need-to-know information about natural gas hazards, you know that this gas can be trapped underground by pavement or a layer of frost, may migrate underground, and can infiltrate into surrounding buildings. This knowledge should indicate to you that you must monitor surrounding buildings for gas infiltration.

This brings up another piece of basic information that you need to know about natural gas: It has no odor. The odor we associate with leaking gas is intentionally added to the gas so that

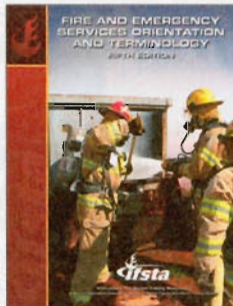
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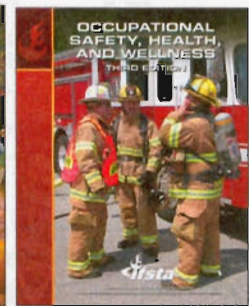
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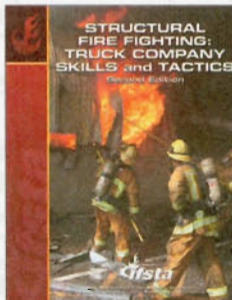
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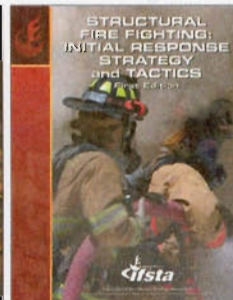
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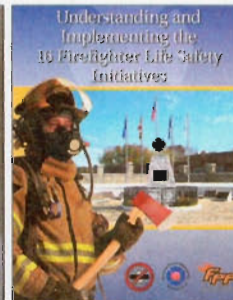
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a leak will be quickly noticed, reported, and repaired. This odor can be scrubbed out of the gas as it migrates through the ground, with the dirt acting as a filter. Should this occur, the gas infiltrating and spreading through the building may have no odor and will not be noticed by the occupants or by investigating firefighters. The way to identify natural gas after the odorant has been scrubbed out is to use a combustible gas indicator (CGI). You should always use a CGI when checking for gas infiltration. Without it, you cannot be sure that gas is not present, nor can you tell if it is approaching, is within, or is above its explosive range.

Today, plastic pipe is the pipe of choice for gas lines, and you can find it in use in all parts of the country. Small-diameter plastic pipe can easily be crimped to stop the flow of leaking gas, but your knowledge of basic gas hazards tells you that it cannot be done safely. Gas flowing through a gas pipe generates static electricity. If a plastic gas pipe is broken and leaking, this static electricity can build up on the exterior surface at the break. This is not a problem with metal pipe, but plastic pipe, unlike metal pipe, is nonconductive, and the charge will not go to ground but rather will build up on the plastic pipe at the site of the leak. A firefighter attempting to stem the flow by bending the pipe can trigger a spark that ignites the gas. Leaking plastic pipe should not be crimped in an attempt to stop the flow of gas. Doing so could result in a firefighter's being engulfed in a ball of flame.

If the gas ignites, your knowledge of gas hazards and properties will tell you not to extinguish it. Even if you extinguish it, it will likely reignite as gas continues to pour out of the damaged pipe. Flaming gas is preferable to a gas cloud threatening occupancies and people downwind of the leak. You will know that the only safe way to extinguish the gas fire is to shut the supply of gas, and that is just what the utility will do when its representatives arrive. Your resources are best spent monitoring the surrounding buildings and area, removing endangered civilians, restricting access to the hazard area, and setting up hoselines in a safe location to protect exposures.


Your knowledge of possible ignition sources for natural gas will lead you to

instruct incoming units to approach from upwind to prevent a responding apparatus from providing an ignition source to the gas plume. That same knowledge will prevent you from approaching the parked backhoe to turn the ignition off. Although it is an ignition source, it should not be shut down. If the gas ignites as you are near or in the machine, a fireball will envelop you. Let the backhoe run; if it causes the gas to ignite, so be it. Backhoes can be replaced; firefighters can't. You should, however,

eliminate ignition sources that can be safely eliminated. For instance, by restricting vehicle access to the area, you eliminate passing vehicles as an ignition source and keep them out of harm's way.

What If You Do Not Know the Basic Information?

What if you do not know the basic information about natural gas properties and hazards? Without this basic knowledge, you would have no reason


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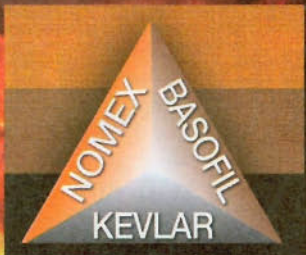
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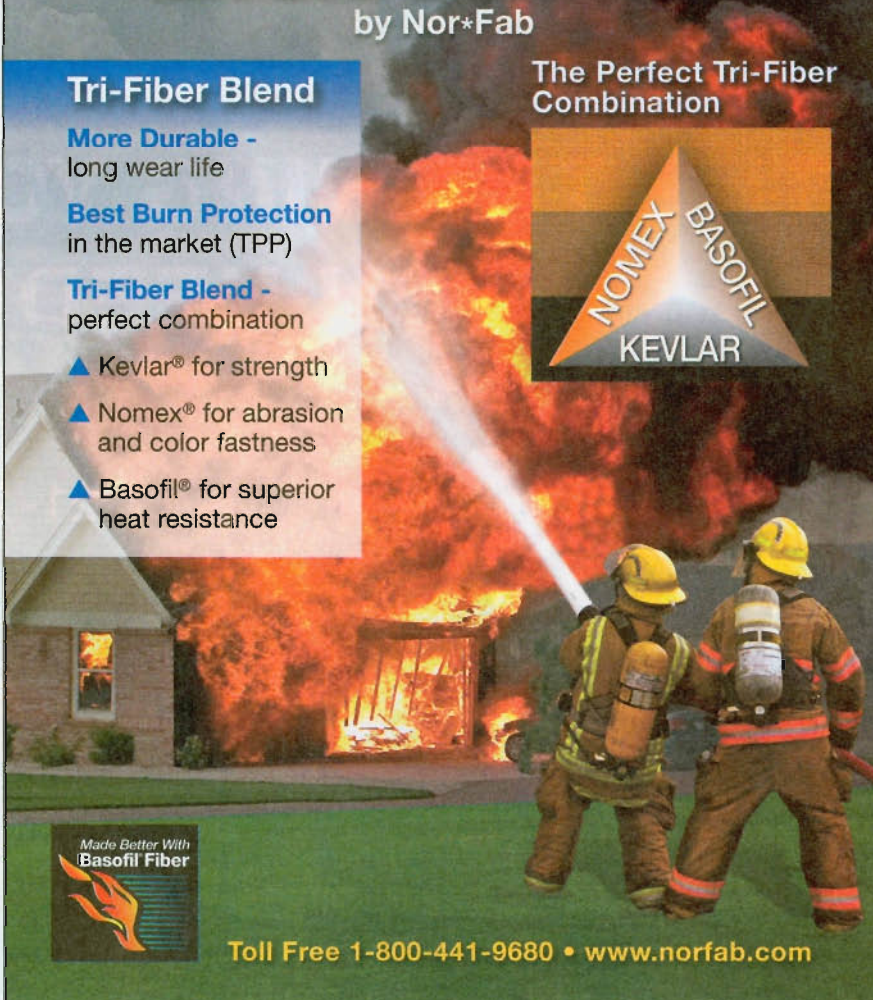
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to check surrounding buildings for gas infiltration, and the result could be the accumulation, ignition, and explosion of the gas within the building. What if you did not know that the odorant in natural gas could be scrubbed out, rendering the gas odorless? Without this basic knowledge, you would accept as fact the report of a gas-free building from a firefighter investigating without a CGI, and the result could be the accumulation, ignition, and explosion of the gas within the building. What if you did not know about the static electricity problem associated with leaking plastic gas pipe? You might attempt to crimp the pipe triggering gas ignition and become engulfed in a fireball.

The things you don't know about the properties and hazards of natural gas can result in a disaster before the experts arrive at the scene to advise you. It is up to the IC and each firefighter to learn what is necessary to keep everyone safe. In the past, much of this information was not commonly taught to new firefighters and officers, but this has changed. More and

more, this information is included in basic firefighting courses as well as promotion courses, but what about those of you who have been around long enough to have missed out on this newly added training? You are at risk of making bad and dangerous decisions, and these decisions can result in both death and destruction.

POTENTIAL LIABILITY

Legal liability can ensue as lawyers look to exact payment for the pain, suffering, and property damage resulting from an incident. This can take the form of lawsuits against municipalities; fire departments; and individual firefighters and officers, most commonly ICs. Even if immunity laws seem to protect you and your department from liability, you may still undergo a time, sometimes years, of being the subject of a negligence trial. It will be embarrassing, it can be expensive, and it will be gut wrenching as you are publicly accused of things like negligence and malfeasance. When it is over, even if you are exonerated, what will be remembered? Will they remember that you were acquit-

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ted or that you were accused?

Have I gotten your attention? Good, because even those of you who have not been trained in this need-to-know information can still get it. Ask your training officers to include this information in your regularly scheduled drills. Ask your utility company to conduct drills and guided walk-throughs of its facilities. If the drills do not give you the needed information, let your instructors know that you need more. Did you know that a company maintaining a natural gas pipeline must—yes, I said must—provide training for you on pipeline emergencies? Finally, there are a number of books and articles you can turn to for this information; self-taught information is every bit as useful as that taught by your training officer or a utility representative.

If you have or get this information, will buildings still blow up? Unfortunately, the answer is yes. By the time we get an alarm and respond, bad things have already taken place. The gas has already been leaking and possibly accumulating in a structure. There always seems to be ignition sources available, and sometimes, despite our educated best efforts, things go bad. What having this information will do is help you to make intelligent decisions; enable you to ask the right questions of the utility workers on scene; help you to save lives that may be at risk, including your own; and help you to protect yourself and your department from the lawsuits that appear after an incident that results in injuries or damaged property. ●

**Frank C. Montagna will present
"‘Routine’ Responses" at FDIC 2011
in Indianapolis, Indiana, on Wednesday,
March 23, 1:30 p.m.-3:15 p.m.**

● **FRANK C. MONTAGNA** is a 40-year veteran of the Fire Department of New York, where he has been a chief officer for the past 24 years. He is assigned to FDNY's Bureau of Training and is responsible for curriculum and officer development. He has a degree in fire science from John Jay College, where he teaches a course based on his book *Responding to "Routine" Emergencies* (Fire Engineering, 1999), is a member of *Fire Engineering's* editorial advisory board, and has had numerous articles published in *Fire Engineering* and *WNYF*.

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