

Introduction Con Edison employees are fully aware of the hazards that FDNY Firefighters face on a daily basis. They also realize that electric, gas and steam--when transported through Con Edison pipes and wires and used properly--are safe. However, when third-party contractor damage, equipment failure, extreme weather, human error, fires, water main breaks, building collapses, etc., are added to the mix, electric, gas or steam can become hazardous, especially for first responders. The purpose of this and future articles, suggested by Deputy Chief Mark Ferran, Division 14, is to heighten the awareness of FDNY Firefighters and Officers to the hazards they may encounter when responding to and operating at either an incident where a Con Edison service may be the reason for the response or is indirectly involved with the incident.

This first article covers natural gas hazards. Upcoming issues of WNYF will feature articles submitted by various Con Edison employees, who are experts on a particular subject. These articles will be co-written and reviewed by experienced members of FDNY. Some topics to be covered include underground and overhead electric, steam, substations and power plants. Additionally, there will be an article on Con Edison improvements at emergency response and usage of the Incident Command System.

These articles will serve to enhance the partnership in safety between the FDNY and Con Edison. Additionally, Con Edison provides utility training for FDNY members at Con Edison training center; Division staff meetings; firehouse training to discuss hazards; joint familiarization drills; and lessons learned discussions held after significant incidents. By training and planning together, FDNY and Con Edison will enhance the safety of the first responders, as well as the citizens of New York City.

System overview

Natural gas is fed into New York City from gas fields located mainly in the southern United States. The gas is moved by compressor stations through pipelines at approximately 700 psi. When entering the New York City system, it is regulated down to 300 psi. These gas pipelines are known as transmission gas mains and they are the primary feeds that supply the City. They enter the City north from Westchester into the Bronx, south from New Jersey (underwater) into Long Island and west from New Jersey (under the Hudson River) into Manhattan.

The gas pressure then is reduced to high pressure (approximately 60 psi) or low pressure (1/4 pound psi) for commercial and residential use. Ask your local utility representative to verify the system pressure (high or low) used in your response area.

Piping materials for the gas mains include steel only for transmission mains, either steel or plastic for high-pressure mains and steel, plastic or cast iron for low-pressure mains. Mains are the lines that normally run parallel with the curb (in the street) and feed the entire block. High-pressure mains have isolation valves that turn off and isolate sections of piping. Most low-pressure systems do not have these isolation valves associated with their mains. Services are the lines that feed indi-

Natural Gas Properties

- Colorless
- Tasteless
- Odorless--Mercaptan is added to give off the familiar "rotten egg" smell.
- Lighter than air--it will rise.
- Explosive range--five to 15 percent

Uses

- Boilers
- Hot water heaters
- Stoves
- Ovens
- Dryers
- Some barbecues
- Some vehicles

Utility Hazards

Natural Gas Hazards

by Battalion Chief Frank Montagna and Matthew Palmer

This natural gas explosion/fire required a fourth-alarm assignment on December 29, 1989, at 132nd Street and Locust Avenue in the Bronx.

vidual structures--commercial or residential. Service line materials can be steel, plastic or copper.

The Con Edison gas territory encompasses all of Manhattan and the Bronx, as well as portions of west Queens (Astoria, Long Island City, small sections of Woodside and Sunnyside) and northeast Queens (College Point, Bayside, Whitestone, Flushing, Douglaston, Little Neck, Bellerose, Glen Oaks, Floral Park and Fresh Meadows). Con Edison's territory also includes Governors and Roosevelt Islands. Keyspan covers all of Brooklyn, Staten Island and parts of Queens.

Hazards and operational tactics--(10-40 code 1)

Listed below are hazards associated with natural gas that Firefighters will encounter. Awareness of these hazards, along with some recommended tactics, will enhance the safety of the first responders. Notify the appropriate utility to respond to a confirmed natural gas leak.

Outdoor gas main/service ruptures caused by excavating equipment

The following tactics are recommended for Firefighters when life and property are **not** in jeopardy:

1. Secure the area. Keep the public (and FDNY personnel) at a safe distance.
2. Eliminate all sources of ignition (backhoes, lighting, electric tools, etc.).
3. Hook up to a hydrant at a secure location and stretch a charged precautionary line to a safe area with enough line to cover exposed buildings.
4. Hand-lines and large-caliber streams with fog nozzles can be used to direct escaping natural gas away from exposed structures.
5. If the leak ignites, set up hand-lines and large-caliber streams to protect exposed structures. Extinguishing the leaking gas fire likely will result in re-ignition at the site of the leak.
6. Position all apparatus and Firefighters upwind, out of the path of escaping gas.
7. If possible, do not let water flow into the excavation.
8. Using a gas meter, check surrounding structures for any

all photos courtesy of Matthew Palmer



This is an example of what *not* to do! Never attempt to shut the flow of gas from a ruptured plastic gas line due to possible static electricity charge on the pipe. Please note that this is a *training* photo; not one taken at an actual incident.

migration of gas. A gas line accidentally damaged may not only leak gas at the site of the damage, but may, in fact, have been pulled out of the building or even out of the gas main in the street. As a result, gas could be leaking near the building wall and in the street, remote from the rupture. This greatly increases the danger area and the likelihood of gas migrating into a nearby structure. Evacuate if necessary. The gas detector currently carried by most Battalions detects natural gas, but does not indicate the degree of hazard present. Special-call a Rescue or Squad Company for use of its digital gas detectors. Any on-scene utility personnel will be equipped with a digital gas detector and can assist FDNY with a hazard assessment.

9. Do not attempt to stop the flow of gas from plastic gas lines. Gas flowing through plastic pipe creates static electricity, which can collect on the exterior of a broken gas pipe. Touching or coming near the pipe can result in a static discharge, causing ignition of the leaking gas.
10. Do not attempt to extinguish burning gas outdoors; let it burn. An extinguished outdoor natural gas fire can re-ignite due to fuel and heat that still exist. Additionally, the still-leaking gas will form a combustible vapor cloud that may threaten exposures or personnel. The best and safest way to extinguish burning gas is to stop the gas feeding the fire.

Inside gas leaks

When responding to an inside gas leak that has been located, attempt to isolate it as close to the leak as possible. For a leaking appliance, shut the appliance valve. The next source of control would be the meter valve, located just prior to the meter. If needed, the service valve--located inside at the point of entry to the building for the gas service--will shut down the gas to the entire structure. If necessary, the curb valve can be accessed, shutting the gas supply to the entire building. (See *Training Bulletin*, Emergencies.)

If the leak has not been located, the possibility exists that it may be migrating into the structure from a leaking service or main outside or seeping in from another apartment or attached structure. Use caution even when the source of a gas leak has been turned off. The amount of gas in the structure still may be in the explosive range (five to 15 percent). Always use a digital gas detector to determine when the gas level is safe. Evacuate if necessary.

Prevent sources of ignition by:

- Knocking on doors. **Do not** ring the doorbell!
- Using intrinsically safe handie-talkies. (All FDNY handie-talkies are intrinsically safe; cell phones, however, are not.)
- Notifying Con Edison Electric to respond to shut the power

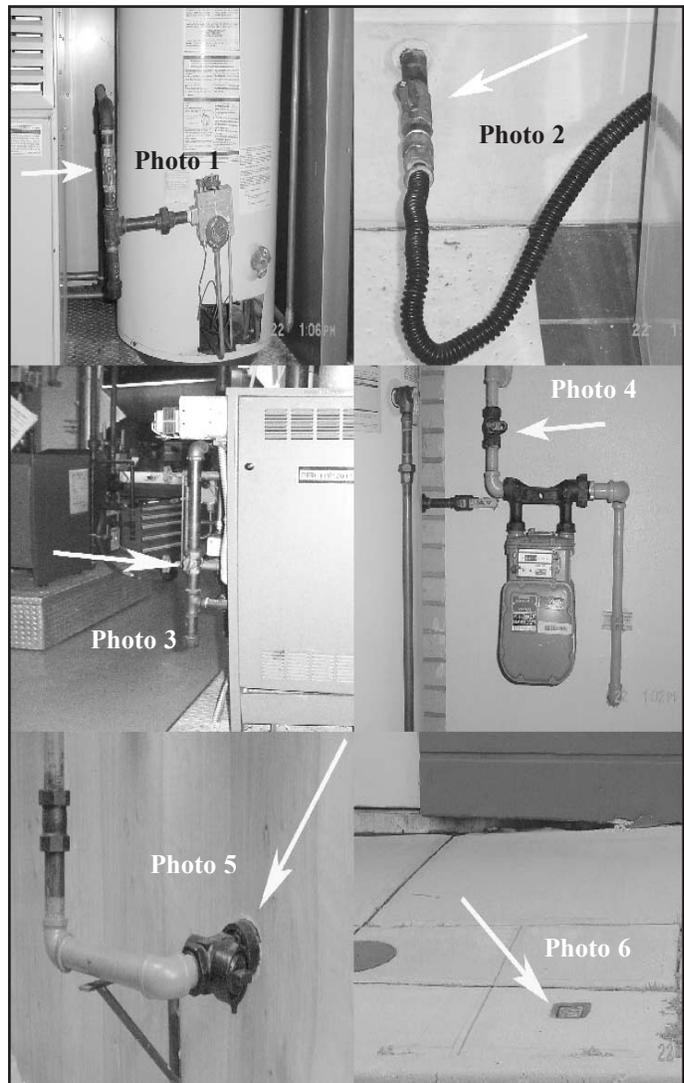
from the outside. If the electric is to be turned off to eliminate possible ignition sources, do not shut the power at the electric panel or switches in the building. Do not pull the electric meter because gas can migrate up into the meter. Pulling it can generate a spark, which might ignite the leaking gas.

Never re-open any gas valves that were shut.

If a gas valve is shut during an investigation and it was determined that it had no impact on the leak, do not re-open the valve. Unlike water or electricity, integrity tests must be performed on the piping before it can be re-opened. Also, any pilot lights that were turned off due to the valve closing will have to be re-lighted; otherwise, there will be blowing gas at these locations. Let the gas company representative know what valves were turned off and he will take care of the turn-on process.

CO conditions caused by natural gas appliances (10-38)

When improper combustion and faulty or defective flue/chimney conditions exist, all fuel-burning appliances have the capability to produce excess CO. When FDNY members encounter elevated CO levels in a structure, they should turn off any appliance suspected of contributing to these conditions.



These photos reveal the various shut-off valves (see arrows) that can be used to stop an inside gas leak. Photos 1, 2 and 3 are three appliances--hot water heater, stove, boiler--with the appliance valve locations. Photo 4 is the meter valve, located just prior to the gas meter. Photo 5 is the service valve, showing where the gas service enters the building. Photo 6 indicates the curb valve in the sidewalk area. To close, give these valves a 1/4 turn clockwise.



Water main break on Fifth Avenue and 20th Street in Manhattan on January 2, 1998, undermined the roadway, causing the street to collapse. The collapse, in turn, undermined the gas main and electric cables, resulting in a substantial gas fire that took two hours to control.

CO is colorless, odorless and undetectable without a CO meter. Always use the CO meter to determine when the area is safe. Notify the utility when:

- You have more than nine ppm CO present.
- Anyone has symptoms of CO poisoning.
- You shut the gas.
- The Incident Commander determines he/she requires utility assistance.

Manhole/transformer fires and burnouts (10-25)

During manhole/transformer fires and burnouts, burning underground electrical cables have the potential to burn through adjacent gas pipes. If Firefighters smell or detect natural gas with their gas detector during these incidents, have the gas utility respond forthwith, in addition to the electric utility.

Building collapses

Building collapses--full or partial--may cause additional hazards to Firefighters from broken or damaged gas lines. When a building collapses, the gas lines in the building can break and the impact from falling debris can damage gas mains or gas services in the street/sidewalk. When operating at one of these incidents, notify the utility company to respond to determine if there is an active gas service to the structure or a damaged main in the street. Have the utility turn the gas off before it becomes a hazard to the rescue workers.

Water main breaks (10-40, code 3)

Be aware that the roadway and pavement weakening caused by water main breaks will put the subsurface utilities (especially gas lines) in jeopardy. Severe undermining can cause a gas main break. The leaking gas may ignite due to sparks created by the wearing away of the electric lines, creating a much more serious condition than the original incident (water main break). Have the utility company respond to determine if the gas pipes, electric lines or transformers are in jeopardy.

Main valves

Never attempt to operate a main valve. Rarely will shutting only one valve place the situation under control. Utility employees must access the mapping system to determine what combination of valves have to be closed in order to stop the flow of gas.

Additionally, by indiscriminately closing main valves, more harm than good can be caused. A critical location, such as a hospital, nursing home, housing project, etc., might be shut down. As mentioned previously, extensive integrity testing of all the affected buildings will be required and it may take weeks to restore gas service.



Curb valves usually are located on the sidewalk and main valves usually are in the street. Pictured above is another example of what *not* to do! FDNY members *never* should operate main valves. Once again, this is a *training* photo and not one of an actual incident.

Critical locations

Contact your Con Edison (or Keyspan) representative to identify any utility critical locations (metering, regulator and transfer stations) in your response area. Familiarization drills and entering this information into CIDS will enhance fire-ground safety.

Always look at the “big picture” and consider the various hazards Firefighters may encounter when operating at gas incidents. The Incident Commander should consider the following questions when sizing up these incidents and deciding whether to evacuate a building or area:

- What can go wrong?
- Where is the leaking gas going?
- Where is the gas collecting?
- Is it approaching the explosive range?
- What problems and hazards will be present if the gas ignites?
- Are Firefighters, civilians and apparatus in a safe location?
- What additional resources, information and equipment are needed to safely control and mitigate the situation?

Often, the answers to these questions can be obtained from the utility representative on the scene. Employ them as a resource.

About the Authors...

Battalion Chief Frank Montagna is a 33-year veteran of the FDNY, the past 16 years of which have been as a Chief Officer. He is assigned to Battalion 58. He holds a degree in Fire Science from John Jay College, where he has taught fire science courses. He is a member of the editorial advisory board of Fire Engineering and has published articles in that publication, as well as contributing frequently to WNYF. He is the author of Responding to “Routine” Emergencies.



Matthew Palmer is a 30-year veteran of Consolidated Edison of New York. He is the Field Operations Planner, responsible for responding to emergencies to assist with coordinating and communicating within Con Edison, as well as all agencies on-site, primarily FDNY. He teaches and trains FDNY members (Battalion Chiefs course, Haz-Mat, Rescue) on hazards associated with natural gas. And, he is the cousin of Deputy Chief Orio Palmer, who was killed at the WTC.

