

# Lexington Avenue Steam Pipe Explosion

by Deputy Chief Robert J. Boyce, Jr.



Lexington Avenue/41st Street area.

The release sent a 150-foot geyser of scalding mud, rocks and steam flying in all directions, crashing through many windows. Escaping steam rose in a deafening, billowing roar, high above street level.

Arriving at 1804 hours, Battalion Chief John Joyce, Battalion 9, was advised by an NYPD sergeant that an explosion had occurred in the subway below Lexington Avenue and that there were three trains in the station. (After investigation, this turned out to be an inaccurate report.) A minute after his arrival, Chief Joyce transmitted a third alarm. Engines 65, 3, 40 and 28, Ladders 35 and 3, Safety Operating Battalion and Battalion 4 (Staging Area Manager) and then Deputy Assistant (now Assistant) Chief John Coloe, the designated Command Chief, were assigned.

Simultaneously, a civilian excitedly reported to Chief Joyce that there were people trapped in two articulating City buses next to the explosion. At 1806 hours, Chief Joyce transmitted a fourth alarm. Engines 33, 39, 55 and 24, Ladders 7 and 25 and the Mask Service Unit were assigned.

Due to the extreme noise, face-to-face communications and handie-talkie were next to impossible in the vicinity of the escaping steam. The Officer of Rescue 1 reported in to the Incident Commander. Chief Joyce had him split his company to drive the buses in reverse out of the area and search the subway station. As Chief Joyce was establishing the inter-agency Command Post at Lexington Avenue and East 42nd Street, the Officer of Ladder 4 reported in. Chief Joyce ordered him to assist in removing the two buses from the proximity of the escaping steam. Each of the articulating buses held approximately 90 people.

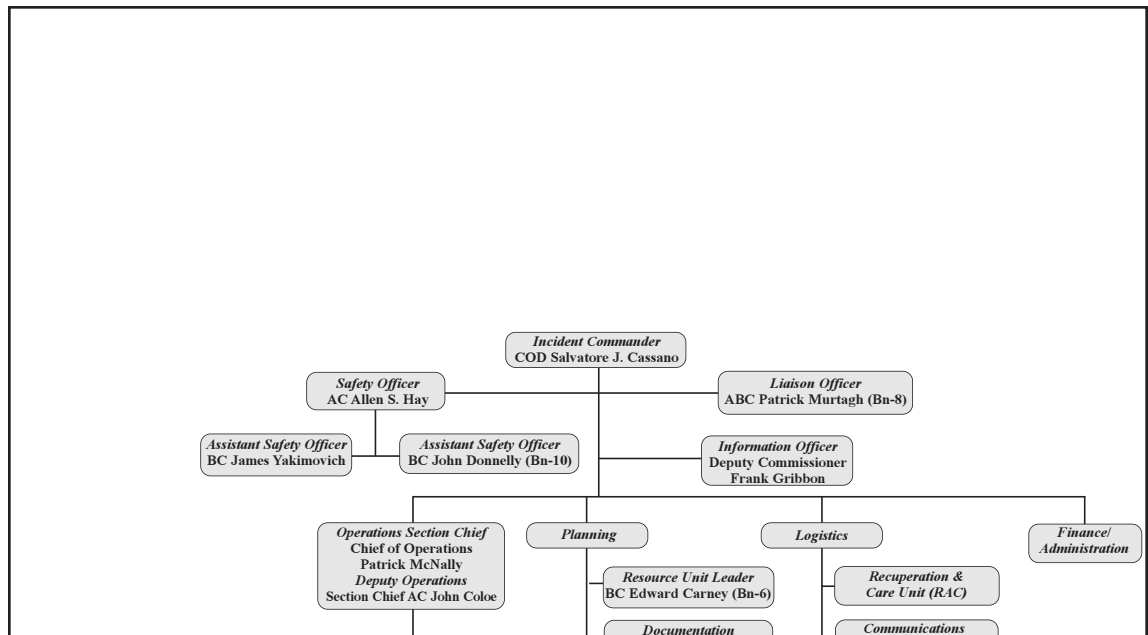
Immediately thereafter, another excited civilian reported to him that a wall had collapsed and people were trapped in the basement of 380 Lexington Avenue. (This report also proved false.) Chief Joyce had his Battalion Firefighter search this basement. During the search, the Firefighter found a badly burnt woman (the tow truck's passenger). Assisted by a member of Ladder 4, he removed her to the street.

The plan to drive the buses in reverse away from the escaping steam proved futile because of the amount of debris in the street. Members of Rescue 1 and Ladder 4 removed many of the buses' occupants by physically carrying them over the steaming water

Sometime after 1130 hours on July 18, 2007, within a short period of time, New York City experienced an unusually heavy rainstorm of more than one and a half inches. Many of the City's primary and secondary roadways experienced flooding. Most FDNY companies were busy during the afternoon, responding to storm- and water-related emergencies.

At 1757 hours, the Manhattan Communications Office received a verbal alarm from Engine 21--while they were responding to another alarm--for a transformer explosion. The following units were assigned--Engines 21, 8 and 16, Ladders 24 and 4, plus Battalion 9. Almost immediately, Captain Richard Patterson transmitted a second alarm for a transformer explosion. At 1758 hours, Squad 18, Engines 26, 1, 54, 23 and 34, Ladders 21, 12 and 16 (designated as the FAST unit), Battalions 7, 6 (Resource Unit Leader) and 10 (Safety Officer), Division 3, Rescue 1, RAC 01, Field Communications Unit and Engine 9/Satellite 1 were assigned. Units responded to the

photo by Lucas Jackson, New York Daily News



flowing in the street. The civilians were protected from the falling debris by covering their heads with the members' helmets. Multiple trips were required to remove all of the passengers.

Chief Joyce transferred Command to Deputy Chief Robert Boyce (covering Division 3) at 1808 hours. Chief Boyce divided the incident into four more manageable Sectors, consisting of the northwest, northeast, southwest and southeast corners of Lexington Avenue and East 41st Street. He ordered Chief Joyce to supervise the northwest Sector, which included 374 and 380 Lexington Avenue and 122 East 42nd Street. Due to the jet-engine roar of the escaping steam, Chief Boyce re-established the Command Post inside the Strawberry Store on the northwest corner of Lexington Avenue and East 42nd Street.

While Chief Joyce and his Battalion Firefighter surveyed and sized up their Sector, they found a woman on the corner of Lexington Avenue and East 41st Street, approximately 25 feet from the escaping steam crater. She was being burned by the steam and pummeled by debris. As they removed her, they noticed her right leg below the knee was barely attached. They removed her into 380 Lexington Avenue where Engine 54 members took her to waiting Emergency Medical Service personnel.

Battalion Chief Kevin Woods, Battalion 1, supervised operations in the northeast Sector, which included 128 and 150 East 42nd Street. Battalion Chief Christopher Lennon, Battalion 7, directed operations in the southwest Sector, which included 370 and 364 Lexington Avenue. Acting Battalion Chief Steve Corcoran, Battalion 2, supervised operations in the southeast Sector, which consisted of 369 and 363 Lexington Avenue.

Due to the large amount of debris seemingly falling from the numerous surrounding high-rise commercial buildings and the unknown structural damage, Chief Boyce transmitted a signal 10-60. Division 1, SL-01 (Special Operations Command Logistics), SC-01 (Special Operations Command Compressor), Squads 1 and 288, TR-1 (Technical Response Vehicle), Rescues 2 and 4, Haz-Mat 1, Hazardous Materials Battalion, Ladders 116 and 14 and SSL-131 and 117 were assigned. To have reserve and relief units at the scene, Chief Boyce transmitted a fifth alarm and ordered all these units to report to the Staging Area on East 42nd Street, underneath Park Avenue. Engines 14, 5, 44 and 22 were assigned at 1820 hours. Chief Coloe assumed Command at approximately 1823 hours.

Chief of Operations Patrick McNally arrived on-scene at 1828 hours. He assumed command until Chief of Department Salvatore J. Cassano's arrival at 1833 hours.

### Lessons learned/reinforced

- Treat every blast/explosion as a potential terrorist event. While relatively early on this incident was determined to be an accidental steam discharge, it easily could have been a Vehicle Borne Improvised Explosive Device (VBIED) that severed the steam main 15 feet below the street. Every company should deploy its RadaAlert 50™ radiological monitors.
- Incident Command System (ICS) is built from the bottom up, *not* the top down. At this incident, the Sectors were logically designated by the four corners of East 41st Street and Lexington Avenue. All companies must report into the Command Post. This provides for accountability and prevents freelancing.

Remember the basic characteristics of ICS:

**Manageable span of control**--3:1 to 7:1 is the range of subordinates to supervisor ratios, with 5:1 as the ideal ratio.

**Modular organization**--Complex incidents call for a larger organizational structure.

**Integrated communications**--Initially, communications are on the Primary Tactical channel and later, on the Primary Command



channel and perhaps the Secondary Tactical channels. Also useful are the Interoperability and FDNY/NYPD Tactical "U" frequencies and FDNY's 800MHz and Post radios.

**Incident Action Planning**--The plan will be initiated according to FDNY's Standard Operating Procedures (SOPs). Afterward, as conditions dictate, the Incident Commander will adapt and make changes. Complex incidents require a written plan developed at the scene.

**Resource management**--This alarm was transmitted three minutes before a change of tours. FDNY has vulnerability when alarms are received within the last hour or so of a tour because members of both tours may respond. Company Officers and Firefighters must ensure proper relief procedures are followed. Company riding lists must be kept updated so everyone can be accounted for. Accountability of resources initially is performed by the Incident Commander and then delegated to the Resource Unit Leader.

**Designated Incident Facilities**--For example, Command Post (CP), Staging Area (SA), Operations Post (OP), Recuperation and Care (RAC) Area, Decon and Safe Refuge Areas, etc., will exist. Seek them out and employ them.

• **City-wide Incident Management System (CIMS)**--The first-arriving FDNY Officer is responsible for assessing the incident and either assuming or participating in Incident Command, depending on the type of incident. When a higher-ranking FDNY Officer arrives, he/she will take over this function from the first Officer. As supervisory personnel from various agencies arrive, the command element (single or unified) is established according to the CIMS command matrices. Early into this incident, according to CIMS, it was designated a single jurisdiction/multi-agency event and that all agencies would use a Unified Command element structure. Within an hour of the failure of the steam pipe, a Unified Command Post was established on Vanderbilt Avenue, near East 43rd Street, with Chief Cassano representing the FDNY. The former inter-agency Command Post at East 42nd Street and Lexington Avenue became the Unified Operations Section Post. All agency heads should report to the Unified Command Post and their Operations representative to the Unified Operations Post. Frequently, this is a deficiency that should be addressed in the After Action Report.

Tactical assignments are made according to the individual agency's core competencies. Of FDNY's six core competencies, the four immediate concerns we experienced were:

1. Search and rescue
2. Pre-hospital emergency medical care



## A Brief History on the NYC Steam Pipe System

Central heating (to replace individual heating units) and its contributions to fire prevention cannot be underestimated. Early central steam service had the familiar advantages of immeasurably reducing fire hazards and, in the process, increasing realty values. The advent of steam generation for central heating started in New York in the 1870s. A well-known financier, Wallace C. Andrews, expanded the idea from a spirited pioneer and inventor from Lockport, New York, Birdsall Holly. Steam Heating and Power Company of New York was incorporated in July 1879.

Two years later, the name was changed to the New York Steam Company and began selling steam to Manhattan buildings in 1882. A severe test was imposed on the company by the blizzard of 1888. Since transporting coal through the streets was a monumental task, it was decided that all future power plants would be constructed on the waterfront.

In colder months, steam is used primarily for heating, while in the warmer months, it is used to run cooling systems. High-pressure steam powers turbines that drive compressors, which condense refrigerant into liquids that run air-conditioning systems. Steam also is used to produce hot water. Hospitals depend on steam and use it to sterilize instruments and humidify operating rooms.

Con Edison absorbed the underground steam network in the mid-1950s. Originally coal fire-generated, the power plants later converted to natural gas. Street steam pipes originally were insulated in mineral wool and they later converted to asbestos. Asbestos steam pipe insulation now is being replaced with woven fiberglass.

During the past two decades, at least a dozen steam pipe ruptures have killed several people, injured many more and, in several cases, sent asbestos-laden mud into the air. Prior to the incident described in this article, the last large steam pipe explosion at which the Department operated occurred in the western intersection of East 20th Street and Third Avenue, in the Gramercy Park section of New York, on August 19, 1989.

The current steam pipe system consists of more than 100 miles of piping--a total of more than 880 blocks in Manhattan, the only borough with steam service. This system is a vital energy conduit to approximately 1800 customers. Contrary to popular belief, the number of steam customers is increasing. Approximately 95 percent of commercial buildings south of 96th Street--including the Empire State Building, Rockefeller Center, Time Warner Building, Chrysler Building, 8th Avenue Post Office, most hospitals and many schools and museums--use steam via a 16-inch service pipe from the street.

The cast-iron pipe delivering steam (at 350 degrees Fahrenheit) that failed in July 2007 was installed in 1924 (83 years old) and was insulated with asbestos. The 20-foot-long section was 20 inches in diameter. It was approximately 15 feet below the surface of the street, sharing the space with water and sewer pipes and wires and cables. Eleven valves in the network of pipes feeding the area had to be shut down to control the release.

### 3. Structural evacuation and

### 4. Hazardous materials life safety operations and mass decontamination.

Search and rescue and structural evacuation were performed in the four Sectors by fire suppression forces. Pre-hospital care was provided by the CFR-D and Medical Branch resources. Hazardous materials life safety and mass decontamination were handled by Haz-Mat Group resources.

- Asbestos is a naturally occurring mineral material containing microscopic fibers with barbed ends. The three main types produced commercially are chrysotile (white) UN #2590, crocidolite (blue) UN #2212 and amosite (brown) UN #2212. Since 1980, asbestos has been less widely used. There is no known safe level of exposure to asbestos where asbestosis, lung cancer or malignant mesothelioma may not occur. According to *Fire Tactics and Procedures, Hazardous Materials 3* (dated June 4, 2001), "Asbestos in its natural state or asbestos-containing material (ACM), which, when intact, does not present a health hazard. The hazard is created when the material becomes friable and is allowed into the atmosphere and is inhaled or ingested. This occurs when the material is disturbed during fire or overhaul operations, or flakes off from age or deterioration of the protective covering." It goes on to say asbestos is used as insulation for Con Edison steam pipes, in their steam manholes and on their expansion joints.

If asbestos is *suspected*, precautions *must be taken*:

1. Transmit radio code 10-80, specifying asbestos release.
2. To reduce the amount of decontamination, minimize the commitment of forces to expose as few members as possible.
3. Strictly enforce FDNY's mask policy when operating in the contaminated area to reduce exposure.
4. The major concern of wet ACM is cross-contamination caused by tracking asbestos from one area to another.
5. Isolate members suspected of being contaminated. SCBA must be worn until decontamination procedures are initiated or member has been washed down.

Sampling and positive asbestos determination by the New York City Department of Environmental Protection will be lengthy. At a large steam pipe explosion, *assume asbestos* contamination and begin decon early. The decontamination process at a possible asbestos incident can be precautionary and completed before a positive determination has been made.

- Communications (both face-to-face and via handie-talkie) within approximately two blocks of the release were near impossible. The roar of the steam discharge has to be experienced to be appreciated. Early on, it was decided to move the Command Post inside the Strawberry Store (northwest corner of East 42nd Street and Lexington Avenue). This was effective for a while, but the agencies outgrew the space. At future similar incidents, a nearby large indoor space must be considered for effective command functions. This space must be located where any associated noise levels are negated by distance or sheltering. This might place the Command Post out of the line of sight of the incident.
- Searches and victim removal--At this and future large-scale incidents involving numerous bigger buildings, searches are challenging. FDNY must improvise, adapt and overcome these challenges. Sectoring is how we overcome managing these seemingly monumental tasks.

Initially identifying the buildings affected by the blast that needed to be searched and assigning logical units to each Sector was demanding. Immediately affected were seven buildings, all with multiple addresses and entrances and averaging more than 40 stories in height. Units assigned on the first and second alarms were heavily engaged, guiding the frightened evacuees fleeing the scene, assisting the ambulatory wounded, removing the non-ambulatory victims and searching the streets, vehicles and below-grade levels in the vicinity of the release. Because it was necessary to rapidly transmit alarms, third- and fourth-alarm units arrived before a Staging Area was established. These units, for the most part, were assigned to Sectors to assist in searches. The 10-60- and fifth-alarm companies primarily stood by at the Staging Area for relief. The usual challenges of companies charged with searching high-rise commercial buildings (large-floor areas, crossing floors and accessing the individual occupancies, etc.) were experienced and have to be overcome.

- The Hazardous Materials Branch Director or the Decontamination Group Supervisor (through the Incident Commander) should recognize early into an asbestos event the possibility of needing decon for members. He or she also needs to realize that it is time-consuming to place resources and establish an effective operating Decon Corridor (Technical Decon). Early notification assists in administering a smooth decon operation.

The SOC Decon Support Unit responds from Roosevelt Island. It is staffed with one or two Firefighters. They will respond with Decon supplies and necessary forms. They are trained in setting up, troubleshooting and operating the Decon shower units.

Currently, there are three operational Decon shower units--Ladder 15 and Engines 37 and 283. Two more (Engines 251 and

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