

Columbia Gas of Massachusetts – Project Issue Analysis – AD642 Individual Assignment 2

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It was late in the afternoon of September 13, 2018. Professor Rich Maltzman looked up, startled, as three sharp raps on his car window interrupted the online course he was teaching from his car. Why *from his car*? Everyone in the town of Andover (Massachusetts, USA) had already been told to get out of their their homes, and they awaited word from the police – should they leave the *town* altogether?

Yes! The three raps were from the Professor's wife, and she was animatedly and urgently conveying the message: "we have to LEAVE TOWN. **NOW!**"

The urgency was coming from the breaking story so well-summarized by the podcast series, "[Fire in the Valley](#)". Fires and explosions were occurring in over 100 structures in the **Merrimack Valley** region of Massachusetts, north of Boston, in particular in the City of Lawrence and the towns of North Andover and Andover, Massachusetts, where the Professor and his family reside.



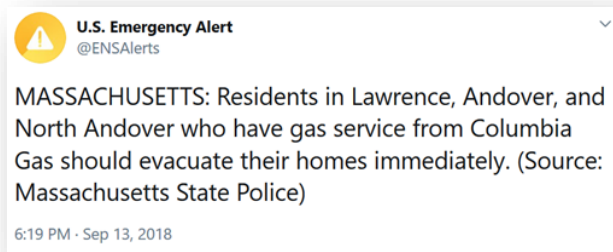
It was hard for residents to get the important details. Local news stations were covering the story, but the information was scattered and hard to decipher meaningfully. The Twitter feed from Columbia Gas of Massachusetts, the utility that operates the natural gas lines that were involved had this post on their web page **for hours** during the incident:



This was of little help – and if it wasn't so sad, it would actually be funny.

The local police were doing a better job posting advice and making announcements and sending out reverse 911 calls to residents. This is what triggered the raps on the windows and yielded the decision for Professor Maltzman to prematurely end his class, which ironically was about qualitative **decision making**.

This tweet from the authorities made things much more clear:



So, the Professor and his family headed to Cape Cod to stay with relatives – they were very lucky to have this option available. Others were not so lucky. See [this video](#) from Rabbi Howard Mandell who tells his story, which starts with a 6-foot flame emanating from his boiler’s gas supply.

What **happened** here?

A tremendous write-up of the story comes from an article from the June, 2019 issue of Popular Mechanics – an article entitled, “*The Day the Town Blew Up*”.

Here the key extract:

...On the Salem Street side of the O’Connell South Common (in Lawrence, Massachusetts), a public park, a contractor removes a length of cast-iron pipe, caps it, and sets it aside.

Feeney Brothers Utility Services (“Providing Underground Utility Services since 1988”) has a permit to open up a two-foot-wide, 340-foot-long stretch of Salem Street, for the purpose of “completing gas main tie-ins and retirement of dual cast-iron gas mains.” Feeney Brothers is a family-owned operation with seven hundred employees. They’ve worked extensively not only for Columbia Gas but also for the region’s other major natural-gas supplier, Eversource. In recent years, gas utilities in Massachusetts have increasingly relied on contractors to carry out projects like this.

It’s usually cheaper.

The job today is to install new polyethylene pipeline and tie it into a new distribution main, also plastic. The Feeney Brothers contractor may or may not be aware that a regulator sensing line—a gauge that measures gas pressure—is attached to the pipe he had discarded. But it’s important to note that he and his crew are performing their duties as directed, under Columbia Gas supervision, and correctly following the steps in the work package Columbia Gas developed and approved. Columbia Gas’s work order doesn’t mention the sensor and was not prepared by a professional engineer. Until four years ago, a technician from the Meter and Regulation Department would have been assigned to the site to monitor pressure readings on the affected section of gas main, but Columbia Gas, for undisclosed reasons, has ended this practice.

*The sensor on the discarded length of pipe thinks it’s still measuring the gas pressure in a vast underground network. In fact, it is measuring nothing: The pipe has been disconnected from the network. **The sensor might as well be attached to a hot dog.** But the sensor doesn’t know any of that, and there is no other sensor in this segment of the network to contradict it.*

The sensor sends a message to the regulator valves in this segment of the network: Boost the pressure! Which they do. But the sensor, because it’s still attached to the dead piece of pipe,

*doesn't detect any of that. Instead, it registers a pressure drop, all the way down to 0.01 psi. More pressure, it tells the valves, until they have opened completely, **and two distribution systems that were supposed to be segregated, cordoned off from each other, are instead tied directly into each other for twenty-six minutes.***

A wave of high-pressure gas rushes into the regional gas-main system that serves Lawrence, Andover, and North Andover. In the older cast-iron segments of the network, the pressure rises to at least 6 psi, twelve times what the pipes are capable of handling.

At 4:04 p.m., the first high-pressure alarm is received by the NiSource monitoring station—in Columbus, Ohio. A second alarm is received at 4:05 p.m.

In the control room in Ohio, the NiSource employees have no capacity to control, let alone shut down, the gas flow. They can only contact the Meters and Regulations Group at Columbia Gas, which at 4:06 p.m. dispatches its entire team of inspectors to investigate—a total of two people, or approximately one per 2,494.75 miles of pipe.



The result of this over-pressurization: 141 fires, 5 explosions, 21 serious injuries, 1 death, many people displaced and/or without heat or the ability to cook - for months, and the bankruptcy of Columbia Gas of Massachusetts.

This was the incident. How about the **cause**?

The NTSB incident report summarized the case in the following way:

NTSB investigators learned that, **until about 4 years ago, Columbia Gas required that a technician monitor any gas main revision work which required depressurizing the main. The technician—typically from the Meter and Regulation department—would use a gauge to monitor the pressure readings on the impacted main and would communicate directly with the crew making the change. If a pressure anomaly occurred, the technician could quickly act to prevent an overpressurization action. Columbia Gas offered no explanation as to why this procedure was phased out.**

Although the Columbia Gas monitoring center in Columbus, Ohio, received high-pressure alarms and reported the event to the Meters and Regulations department two minutes after receiving the first alarm, **there were no technicians prestaged or positioned to immediately close valves when the overpressurization occurred. Had Columbia Gas adequately performed MOC (Management of Change) and placed personnel at critical points along the system, Columbia Gas could have immediately addressed the issue and mitigated the consequences of the event.** Therefore, the NTSB recommends that NiSource apply MOC processes to all changes to adequately identify system threats that could result in a common mode failure. Additionally, the NTSB recommends that NiSource **develop and implement control procedures during modifications to gas mains to mitigate the risks identified during MOC operations.** Gas main pressures should be continually monitored during these modifications and assets should be placed at critical locations to immediately shut down the system if abnormal operations are detected.

NTSB Recommendations

In November 2018, the NTSB issued a series of “urgent” **safety recommendations**. The report contained four recommendations for NiSource, the parent company of Columbia Gas, and one for the state, seeking elimination of the professional engineer licensure exemption for public utility work and a requirement for a professional engineer’s seal on public utility engineering drawings.

The **NTSB report** recommends NiSource do the following:

- revise the engineering plan and constructibility review process across all subsidiaries;
- review all records and documentation of natural gas systems;
- apply management of change processes to all changes to identify threats that could result in a common mode failure;
- develop and implement control procedures during gas main modifications to mitigate risks.

See below for important references and resources.

References and Resources

[NTSB Incident Report](#)

Popular Mechanics article, “[The Day The Town Blew Up](#)”

Boston Magazine [article](#) on the real story of the Merrimack Valley explosions

[Fire in the Valley](#) – Podcast – Four episodes

Episode 1: [The first minutes of a disaster](#)

Episode 2: “[I had never gone toward explosions before](#)”

Episode 3: [The sun rises after a disaster](#)

Episode 4: [Making the Valley whole again](#)