Overpressurization of Natural Gas Distribution System, Explosions, and Fires, in Merrimack Valley, Massachusetts

Roger D. Evans
Investigator-in-Charge
Accident Location

The impacted area
Consequences

• 1 fatality
• 22 individuals transported to the hospital
• Over 50,000 residents asked to evacuate
• Electricity shut off for 18,000 customers
• Gas shut down for 11,000 customers
Property Damage

• 131 structures impacted
NiSource, Inc.
4 million Customers
8,000 Employees

Columbia Gas of Virginia
265,000 Customers

Columbia Gas of Kentucky
135,000 Customers

Columbia Gas of Pennsylvania
433,000 Customers

Columbia Gas of Massachusetts
325,000 Customers

Columbia Gas of Maryland
33,000 Customers

Columbia Gas of Ohio
1.4 million Customers

Northern Indiana Public Service Co.
830,000 N. Gas/ 470,000 Elec. Customers
Safety Issues

• Overpressure protection in low-pressure gas distribution systems

• Engineering management for gas distribution systems

• Emergency response to large-scale accidents
• NTSB issued:
  • One recommendation to Massachusetts
  • Four urgent recommendations to NiSource

• Congressional hearing:
  • Chairman Sumwalt participated in the Congressional hearing
Industry Postaccident Actions

AGA Released:

“Leading Practices to Reduce the Possibility of a Natural Gas Over-Pressurization Event”

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Parties to the Investigation

- US Department of Transportation – Pipeline and Hazardous Materials Safety Administration
- Massachusetts Department of Public Utilities
- Massachusetts State Police
- NiSource, Inc.
- Columbia Gas of Massachusetts
Pipeline Operations

Roger D. Evans
Investigator-in-Charge
The Winthrop Avenue Regulator Station:
South Union Street Project Timeline

- 2015 – Project planning began
- 2016 –
  - March: First constructability review
  - June: Project begins
  - August: 8-inch polyethylene installed at Winthrop regulator station
  - October: Sensing line e-mail from construction
  - November: City suspends project
South Union Street Project Timeline (cont.)

• 2017 –
  • January: Second constructability review
  • December: Third constructability review
• 2018 –
  • January: City permits work to resume
  • September: Accident occurred
Events of September 13

• South Union Street project was underway on a pressurized main
• The final tie-in to complete the work was at the north end of South Union Street
• The Winthrop Regulator Station is at the south end of South Union Street
The Excavation Site at Salem and South Union Streets
Previous Related NTSB Investigations

- Seven similar accidents investigated over the past 50 years
  - El Paso, Texas (1977): nearly identical
- Single point of failure
- Current overpressure protection not optimal
System Safety

Mike Hoepf, Ph.D.
Topics

NiSource/Columbia Gas - Engineering Management

• Records and Documentation
• Constructability Review
• Professional Engineer Review and Approval
• Risk Assessment
Columbia Gas Engineering Management

- Overpressurization, fires, and explosions result of failure to relocate sensing lines
- Contractors followed instructions
- Systemic deficiencies in the engineering management of Columbia Gas
  - Incomplete engineering plans
Columbia Gas Engineering Workflow

Field Engineer

Constructability Review

Supervisory Engineering Approval
Columbia Gas Documentation

- Geographic information system: computer-based centralized record system
- Used in development of project
- Sensing line information not included
Columbia Gas Documentation (cont.)

- No engineering plans to relocate sensing lines
- E-mail: “eventually” be relocated
- Informal and unstructured approach to documenting critical step
Columbia Gas Constructability Review

• Structured evaluations of construction plans to ensure there are no conflicts, errors, or omissions - stakeholder input critical
• Measurement and Regulation Department maintains sensing lines
• “As-needed basis”
Columbia Gas Constructability Review

Constructability Review Signatures

(M&R only needs to sign when applicable)

(Land Services only needs to sign when applicable)
Professional Engineer License

- Technical competency
- Continuing education requirements
- Code of ethics
- Duty to public safety & health
- Personally accountable for work approved
Columbia Gas Professional Engineer Review and Approval

• Field engineer had not met experience requirements for license
• Columbia Gas did not require project evaluation from professional engineer
Professional Engineer Exemptions

- Massachusetts eliminated exemption on December 31, 2018
- Currently, 31 states with industrial exemption for natural gas infrastructure projects
## Columbia Gas Internal Guidance

### Distribution Operations

| Issue Date: | 09/02/2015 |
| Supersedes: | N/A |

**Below Grade Regulator Control Lines: Caution When Excavating Near Regulator Stations or Regulator Buildings**

**Companies Affected:**
- NIPSCO
- CGV
- CKY
- CMD
- COH
- COA
- CMA
- CPA

**Operational Notice**
- Notice Number: ON 15-05
- Page 1 of 3
Columbia Gas Risk Assessment

- Did not mitigate all the risks identified
- Did not conduct an effective risk assessment for the South Union Street project
- Did not ensure necessary engineering controls for overpressure protection
State and Local Emergency Response

- **Fire Departments**: 184
  - 167 engines
  - 65 ladder trucks
  - 54 ambulances

- **State and Local Police Agencies**: 141
  - > 1,000 officers
Radio Communication Issues

• Coordination of hundreds of emergency responders
• Limited radio channels available to three fire departments
• Statewide planning for multi-jurisdictional event
Flow drop after Winthrop Avenue regulator station is shut down around 4:30 p.m.
Columbia Gas Emergency Response

• Did not follow their own emergency response procedures

• Did not update state and local officials of their activities in a timely manner

• Lack of information complicated emergency response and strained resources
National Transportation Safety Board