Flower Branch Apartment Complex in November 2015
Buildings 8701 and 8703 Arliss Street
Gas Odor on August 10, 2016

- 11:00 p.m. - 11:30 p.m.: Resident smelled gas after returning from work
- 11:30 p.m. - 11:50 p.m.: Resident left the building to take the trash out and smelled gas odor while walking down the stairwell. Went to investigate in the basement
- 11:51 p.m.: Building exploded
Field Investigation

- Pressure tests conducted on gas main and two service lines to buildings 8701 and 8703
- Soil bar hole tests conducted around buildings 8701 and 8703; no gas readings or leaks detected
- Postaccident odorant testing found compliant
Field Investigation
Upper regulator vent-line union

Lower regulator vent-line union
Safety Issues

- Location of service regulators within a structure
- Inspection of the gas meter assembly
- Notification of natural gas odor to the gas company
- Detection of natural gas
Parties to the Investigation

- Pipeline and Hazardous Materials Safety Administration (PHMSA)
- Maryland Public Service Commission
- Montgomery County Fire and Rescue Service
- Montgomery County Police Department
- Washington Gas Light Company (Washington Gas)
Service Regulators
Examination

Frank Zakar
Senior Metallurgist
Materials Laboratory
Service Regulators - Reconstruction

Basement at 8701 Arliss Street
Mercury Service Regulator – Overpressure (Venting)
Fire Damaged Upper Regulator

- Leather diaphragm (consumed by fire)
- Displaced spring
- Melted cover
- Melted inspection port
- Intact mercury cup

Undamaged Regulator From Other Building

- Vent Outlet
- Inlet
- Outlet

Key Points:
- Fire damage to the upper regulator
- Leather diaphragm consumed by fire
- Melted cover and inspection port
- Intact mercury cup
- Comparison with undamaged regulator
Upper Service Regulator

- Nipple external threads - deformed
- Mating internal threads at outlet port - fractured

Union (connected)

Upper regulator

Vent pipe
Lower Service Regulator

Unconnected union assembly

Nut
Insert
Socket

Lower regulator

Vent pipe
No evidence of fractured or stripped threads or scars from thread pullout.
NTSB – Finding

Gas venting from the lower mercury service regulator through the unconnected union assembly allowed gas to accumulate in the meter room to an explosive level, and found an ignition source.
Operations:
Mercury Service Regulators

Rachael Gunaratnam
Investigator-in-Charge
Mercury Service Regulators

• Manufactured and installed in 1940-1970
• EPA recommended in 2011 to remove mercury service regulators
• WG removal of mercury service regulators
Replacement of Mercury Service Regulators

• Conditions for replacement:
  • “Blown” or weeping gas through vent
  • Tested and malfunctions
  • Gas system uprated to a higher MAOP of 25 psig
  • Gas service is being replaced
  • Connected piping is altered or replaced
  • Regulator is scheduled for removal
Diaphragm Tear
Debris/Blockage
Leaking Body Connection
Venting
Low Mercury Level
Service Visits to Building 8701

- Visiting building 8701 six different times; turned on gas meter service twice
- Vent line inspection practices
  - Did not verify connection to the vent line for multifamily dwellings
Mercury Service Regulator Testing

Diaphragm Tear

Obstruction to the Valve Seat

Low Mercury Levels
Natural Gas Accumulation

- 8:42 p.m.: Meter room alarm armed
- 11:51 p.m.: Explosion occurred
- Lowest flow rate could create an explosive atmosphere
PHMSA Regulations

• Title 49 CFR Part 192
  • Ventilated area and at least 3 feet from an ignition source
  • Each service regulator must be installed in a readily accessible location and near the service line entrance
  • Service regulator vents and relief vents must terminate outdoors
  • Service regulators installed outdoors are safer
Natural Gas Odor
Detection and Notification

Rachael Gunaratnam
Investigator-in-Charge
Odor Call on July 25, 2016

• Same resident who smelled the gas on August 10, 2016
• Firefighters did not detect gas in building 8701
• No call to Washington Gas
Odor Call on July 25, 2010

- 9-1-1 call
  - Instructed resident to evacuate
  - Did not notify the gas company
- 9-1-1 protocols do not require gas company notification
- Gas company expertise to detect and remedy gas leaks
Previous Odor Calls

• Calls to property management company
  • Six odor calls from 2015-2016

• Washington Gas not notified of gas odors

• PHMSA requirement, Public Awareness Plan
  • Washington Gas had a Public Awareness Plan
Odorants

- Odorization requirements, Title 49 CFR 192.625 and COMAR Chapter 20
- Purpose is to warn of a natural gas leak
- Previous NTSB pipeline investigations found odorant has not sufficiently warned of gas leaks before fires or explosions
Methane Detection

- Natural gas alarms are not required in residential buildings
- OTD, “Residential Methane Detection Program”
  - currently testing commercially available methane detectors
  - advocate for lower detection limit of 10 percent LEL
Industry Standards

• UL1484, “Residential Gas Detectors”
• National gas codes, NFPA and ICC
• National safety standard needed for methane gas detectors