



Engineering Sciences Section - 2015

D44 Forensic Engineering Evaluations of Underground Gas Line Leaks: Residential Explosions Involving Marijuana-Growing Operations in Colorado

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The goal of this presentation is to educate attendees on the cause and origin of gas line leaks and the potential consequences of altering buried gas lines. Attendees will learn several important principles of gas migration in soil, underground utility placement, trench construction, yield stresses in pipe, and the importance of performing utility clearance prior to excavating soil.

This presentation will impact the forensic science community by serving as an example of potential consequences associated with impacting buried utilities. It will also increase an investigator's awareness of various conditions that should be assessed at the time of investigation. This presentation will present photographic documentation for two case studies and discuss the relevant findings and conclusions of each matter.

Case Study 1: A single-family residence, located a few miles from Vail, CO, was heavily damaged during a June 2010 fire that occurred as the result of a propane gas leak/explosion. The source of the propane was a 1,000-gallon tank that was buried approximately 75 feet north of the northeast corner of the residence. The source of the propane leak reportedly occurred at the connection between a buried polyethylene tube (i.e., supply line) and the gas line connection/penetration into the residence.

Some parties alleged that the connection between the underground polyethylene tubing and the adapter at the residence was problematic and/or inappropriately fastened. Because of these alleged issues, the polyethylene tubing became disconnected under loads that it was reportedly designed to withstand (assuming it was connected appropriately). Others alleged that inadequate soil compaction led to soil settlement which caused the gas line separation at the residence. Based on the available data, it is likely that a combination of issues contributed to the gas line separation. The potential issues evaluated as parts of this case study included: (1) soil settlement caused by inadequate compaction; (2) the inherent characteristics of onsite soils; (3) the introduction of water from a marijuana grow operation in the residence's basement; (4) the introduction of water from other sources; and, (5) the material properties of the polyethylene tubing.

Case Study 2: A natural gas explosion occurred in April 2011 at a single-family residence in Denver, CO. This explosion caused serious damage to the structure and bodily injury to the homeowner. According to the Denver Police Department report, the cause of this explosion was linked to a natural gas leak on the adjoining property to the west (a marijuana grow operation). The natural gas leak reportedly occurred due to a separation in a one-half-inch diameter steel gas line (near the gas meter at the adjoining property) and was ignited when the homeowner lit a cigarette.

The litigation and engineering evaluations in this matter primarily focused on two potentially responsible parties who likely impacted the gas line while performing excavation activities on the adjoining property. One party performed excavation activities approximately 14 hours before the explosion and the other party excavated approximately 36 hours before the explosion. Neither party admitted to impacting the gas line; therefore, an engineering evaluation was performed to assess whether gas was more likely to migrate from an underground leak within the shorter time frame. The potential issues evaluated as parts of this case study included: (1) the porosity of soil; (2) gas flow rates; and, (3) engineering calculations regarding migration of gas under various scenarios and assumptions.

Engineering Evaluation, Utility Lines, Fire/Explosion