



ANN ARBOR FIRE DEPARTMENT

Standard Operating Procedures – 3.11 Flammable Gas Incident



FLAMMABLE GAS INCIDENT

Effective: August 13, 2021
Scheduled Review: August 13, 2024
Approved: Fire Chief Mike Kennedy

I. PURPOSE

This procedure is to ensure departmental compliance and adherence to the Michigan Occupational Safety and Health Administration (MIOSHA), Part 85, “The Control of Hazardous Energy Sources” for both natural gas and propane incidents.

II. NATURAL GAS

Natural gas is delivered to end users through a distribution system of pipes of varying pressures and sizes. The gas in transmission pipes can be 1,200 to 300 psi. The pressure is lowered from 175 to ¼ psi and provided to end-users. Regulators and other pressure reducing equipment typically have a relief vent. This is a safety device that vents gas to the atmosphere preventing high-pressure gas from being released inside buildings. Natural gas pipes are made of various materials including steel, cast iron, copper, and plastic.

Properties of natural gas:

- Primarily comprised of methane (~95%)
- Odorless, colorless, and tasteless - an odorant is added as a warning signal
- Non-toxic – simple asphyxiant by creating an oxygen deficient atmosphere
- Vapor density of ~0.6 - Lighter than air – it rises
- Can migrate especially when trapped underground
- Ignition temperature 930°F and greater
- Lower flammability limit of 4 to 5 percent
- Upper flammability limit of 15 percent

III. NATURAL GAS RESPONSE

Natural gas may be encountered in a variety of incident types. The following procedures present an approach which will be applicable in the majority of situations, but do not replace good judgment and experience in dealing with any particular incident. The procedures should be used whenever situations are encountered that do not clearly indicate that a different approach is required to safely resolve the hazard.

Natural gas is much lighter than air and will usually dissipate rapidly in the outside environment. Inside buildings, however, it tends to pocket, particularly in attics and dead air spaces. The flammable limits for natural gas is approximately 4% to 15%.

Burning natural gas should not normally be extinguished, since this would change the situation from a visible to invisible hazard with explosive potential. Fires should be controlled by stopping the flow.

Approach to the incident should be from upwind. Utilize wind speed/direction from dispatch and observe any on-scene indicators (trees, flags and any other items that may show direction).



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IV. DTE ENERGY RESPONSE

DTE Energy shall be notified on all-natural gas incidents within the City of Ann Arbor. Even if the fire department is unable to determine an actual leak, such as a “smell of natural gas in the area” incident, DTE Energy shall be notified. For incidents where no apparent leak is found, it is unnecessary for AAFD units to remain on scene until the arrival of DTE Energy. However, DTE Energy shall still be notified.

V. INCIDENTS WHERE AN EXPLOSION HAS OCCURRED

Units arriving at a scene of a structural explosion must consider natural gas as a possible cause. Underground leaks may permit gas to travel considerable distances before entering a structure through the foundation, around pipes or through void spaces. In these circumstances, the cause of the explosion may be difficult to determine.

- A. Until it can be determined that the area is safe from the danger of further explosions, evacuate all civilians and keep the number of AAFD and DTE Energy personnel in the area to the minimum number necessary to stabilize the situation.
- B. Do not rely on gas odor. Use an air monitor to check all suspected areas.
- C. Check areas systematically using an air monitor. Start outside of the area of the explosion and move into the area until readings indicate a detectable concentration. Map the readings for the affected area and pass it on to the Incident Commander.
- D. If the gas concentration is encountered inside, adjacent to, or underneath any building, secure all possible sources of ignition in the affected area. Cut electricity from outside the affected area to avoid arcing. Ventilate buildings where gas is found with explosion-proof blowers only. Never enter inside when the four-gas air monitor is alarming for LEL.
- E. The use of ground probes by DTE Energy is essential to evaluate potential underground leaks.
- F. The Incident Commander must ensure the safety and stability of the structure. If further collapse is possible. The Washtenaw County Technical Rescue Team or an on-call property restoration company on file with EHP fire dispatch may be contacted to stabilize the structure. The City of Ann Arbor Building Department shall be notified.

VI. INCIDENT INVOLVING A GAS LEAK WITH NO FIRE OR EXPLOSION

Calls for “gas leak”, “gas odor”, “broken gas line” and similar situations may range from minor to a potentially major incident. All these should be approached as potentially dangerous situations.

- A. AAFD units shall take whatever actions are necessary to provide for life safety and property conservation. Isolation distance shall be quantitatively determined by air monitoring.
- B. A minimum number of personnel should be allowed to enter the area and / or staff from DTE Energy to size-up the situation while other units stage in a location out of the potentially dangerous zone.
- C. Provide standby protection with a charged 1³/₄” handline (fog nozzle). Crews shall be in full protective equipment and SCBA. Crews should position themselves upwind.
- D. Evacuate any civilians in the area of escaping gas.
- E. Attempt to locate the source of the gas and any shutoff.



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- F. Attempt to locate the source of the gas and any shutoff devices available to isolate and control the leak, i.e., water heater, stove, dryer, etc.
- G. For gas leaks in a building, where the source of the leak is unknown or uncontrolled, the gas supply shall be shut off at the meter. Command shall ensure the meter is locked off until repairs are complete. The DTE Energy will have locks for a meter.
- H. If there are any indications of gas accumulating within a building, evacuate civilians from the structure and control ignition sources. Check the areas with air monitors.
- I. If the gas leak is outside, the gas will normally rise and dissipate rapidly depending on the size of the leak. This can be confirmed with a four-gas air monitor and perimeters can be established.

VII. EXCAVATION INCIDENT

- A. Anytime a gas line is damaged or suspected of being damaged, it is important to check all surrounding buildings as the gas pipe may have been pulled and come apart inside a structure. If it is a pressure gas service, an explosive atmosphere can be created quickly. There can also be multiple gas leaks.
- B. Ground collapse or excavation damage could occur with no outside gas leak and the gas pipe being pulled out inside a nearby structure.
- C. All surrounding buildings and structures should be checked for leaking gas including those across the street. The four-gas air monitor shall be used to check in each surrounding structures for leaking gas. Evacuate the area as needed.
- D. Keep people upwind and away from the leaking gas. Keep ignition sources away from leaking gas. Move people beyond where a structure explosion could injure them.
- E. Wait for DTE Energy to control the gas. Do not attempt to stop the gas by plugging or attempting to repair the gas pipe. Gas leaking from plastic pipes can create a static charge that could become an ignition source. Multiple types of utility facilities could have been damaged including electric, water, or other pipelines. Beware of overhead electric lines in case the gas leak ignites.

VIII. PERSONNEL SAFETY

All personnel working in the vicinity of a known or suspected gas leak shall wear full protective clothing with SCBA. Personnel working in a suspected ignitable atmosphere shall be backed up by a manned protective handline. The number of exposed personnel will be kept to an absolute minimum.

IX. PROPANE INCIDENT

Propane incidents will be handled similar to natural gas emergencies. The big difference with propane is that it is heavier than air (approximately 1½ times), so propane will not rise, but will remain low. Since it will remain low, it will travel to potential ignition sources. The flammable limits for propane are approximately 2.5% to 9.5%.

Propane and natural gas have a similar odorant added to them and it is difficult to tell the difference by smell. It is critical that the gas be identified for tactical considerations. Propane can be dispersed with hose streams, if necessary, to prevent it from traveling toward an ignition source.



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X. CORRECTION FACTORS FOR COMBUSTIBLE GAS (LEL) SENSORS

AAFD's four-gas air monitors are calibrated to methane, which is appropriate for known natural gas incidents. However, if the incident involves a flammable gas besides natural gas, a correction factor must be used.

Correction Factors

Propane 2.1

Gasoline 1.3

Example: If the flammable gas reading is 2% of LEL for known propane leak, the actual LEL percentage is 4.2% of LEL.