

Massive gas explosion obliterates Greenwood businesses

Seattle firefighters were called to a reported gas leak in Seattle's Greenwood neighborhood shortly after 1 a.m. on Wednesday.



NATURAL GAS EMERGENCIES

Zone 1 Response Policy

[King County Model Procedure #24](#)

Best Practice Natural Gas Response

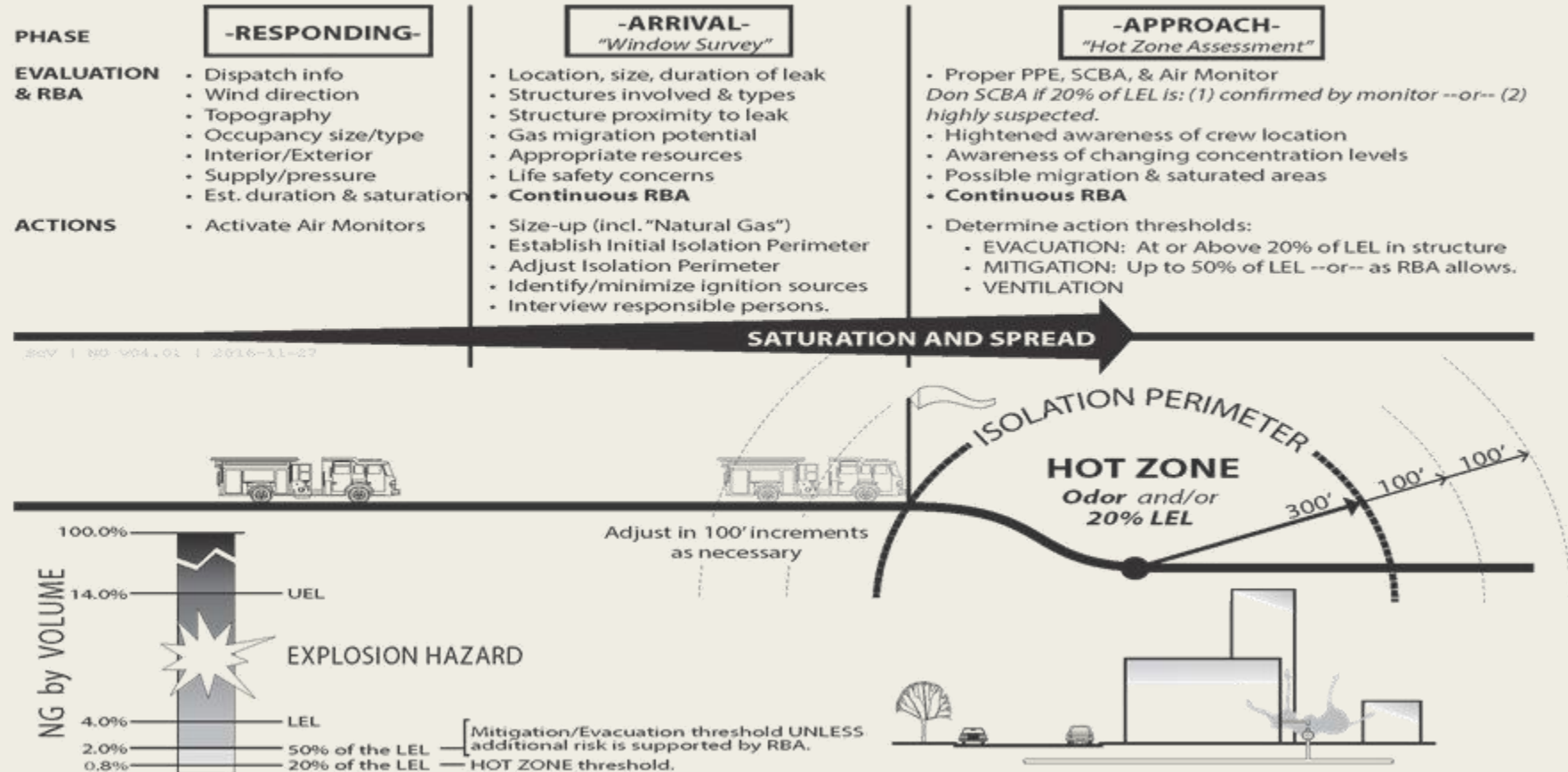
[Greenwood AAR](#)

Purpose

- This model procedure is endorsed by the King County Fire Chiefs Association as a template for planning, training, and deployment for all departments within King County.
- This Natural Gas Emergency Response plan is to provide a basic understanding of natural gas characteristics; recognition of hazardous conditions and incident response steps; and defensive measures when responding to emergencies involving local and regional natural gas delivery infrastructure.

Phase Diagram

Best Practices Natural Gas Response Phases Diagram



Investigation finds natural gas caused fatal house explosion in southern Indiana



ATF joins investigation into Denver natural gas explosion; fundraisers pop up for victims

Posted: 11:46 AM, Aug 15, 2018 Updated: 5:45 PM, Aug 15, 2018



By: Blair Miller



Eight people injured in natural gas explosion in NW Portland

By FOX 12 Staff

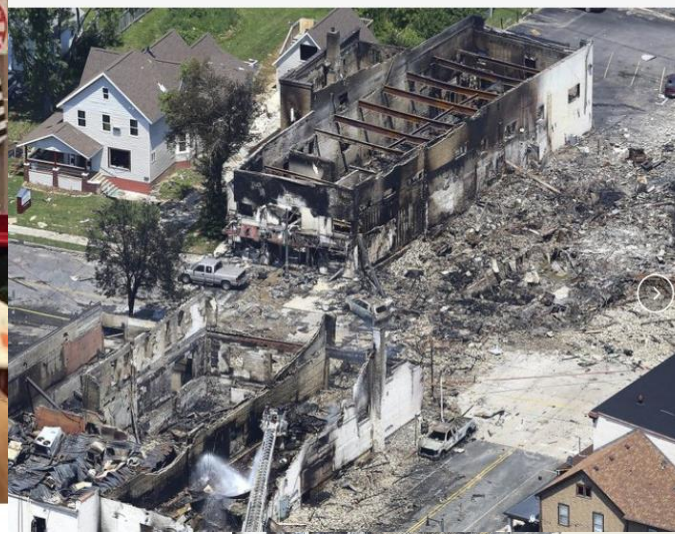
| © Posted Oct 19, 2016



Scene of natural gas explosion in northwest Portland. (KPTV)

Firefighter killed in gas explosion, fire near Madison

By TODD RICHMOND July 11, 2018



Overview

- In general, a natural gas emergency should be approached in a manner similar to a hazardous material emergency. This does not necessarily require that it generate a hazardous materials response.
- Due to the enormous potential associated with a natural gas emergency (continuous RBA is essential).

Natural Gas



Incident can vary depending upon location of the leak.



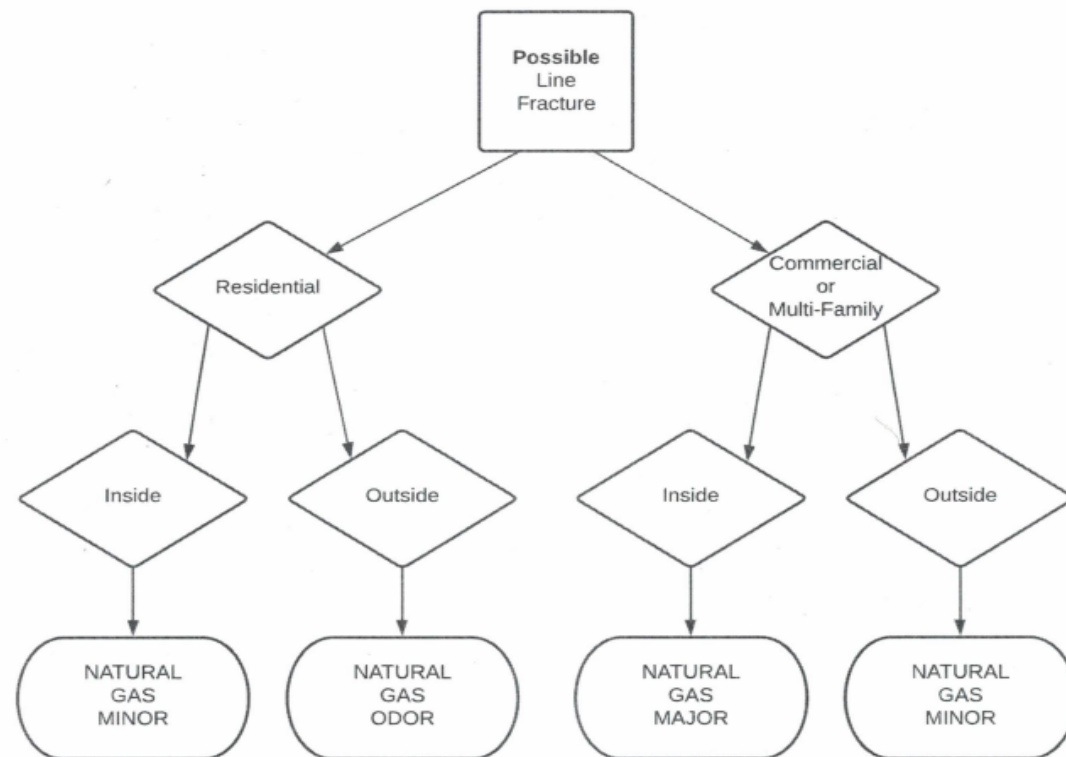
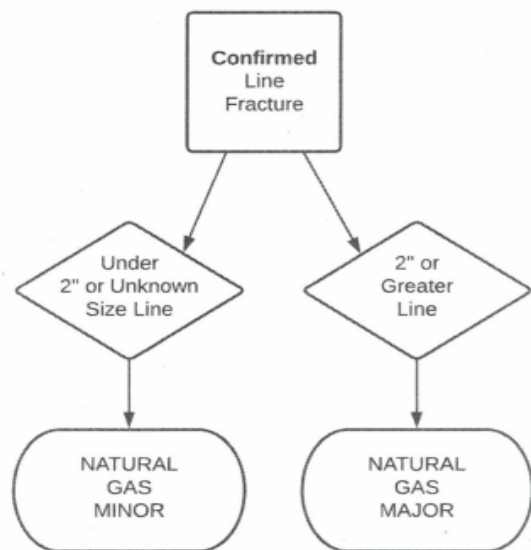
Low vapor density that causes it to rise in air.



Underground or confined release may migrate to remote locations.

Categories of Natural Gas Emergencies

- **Natural Gas Odor:** Involves a report of an odor of natural gas inside of or outside of a structure.
 - One engine or ladder
- **Minor leak:** Involves a broken gas line (or known leak) with a diameter less than two inches. May also describe a gas leak in a residential structure, and/or a gas leak of short duration.
 - Two engines or ladders and one Battalion Chief
- **Major leak:** Involves a broken gas line with a diameter of $\geq 2"$. May also describe a gas leak in a commercial or multifamily structure, and/or a gas leak of extended or unknown duration.
 - Four engines, two ladders, two Battalion Chiefs, medic, aid car, and one hazmat unit



Detection



Multi Gas Detector, will be used by Hazmat operation trained personnel (*i.e.*, 4 Gas or 5 Gas detector personnel will be trained by Authority Having Jurisdiction (AHJ)).



Combustible Gas Indicator (CGI), Zone One HazMat technicians will be using SENSIT CGI detectors.



[Puget Sound Energy](#) may bring other instruments and may be deployed by a HazMat Technician after instructions by PSE employee.

LEL = LEL stands for “Lower Explosive Limit” and is the lowest concentration of a particular gas

that has the potential to be flammable or combustible.

- For example, methane or natural gas has a 5% by volume LEL and 17% by volume UEL. The upper limit is not important when considering the risk of explosion, but if the percent volume of methane present was 5% gas then the gas monitor would display 100% LEL.
- Flammable Range of Methane is 5% to 14%; lighter than air
- Propane is 2% to 9.5%; heavier than air
- Pentane is 1.5% to 8% - (calibration gas)
- Take Away = our calibration gas Pentane has a lower LEL than Methane; therefore we have a >50% safety factor built in! If you are reading 10% LEL in a Methane atmosphere, it's really 5%.
- When metering, measure from the bottom to the top of the space and take into consideration the suspected gases' vapor density for where to concentrate your efforts.

MSA Altair 5x gas detector

- 1% drop in O₂ = 50,000 ppm of something displacing oxygen. Therefore, every 0.1% represents 5,000 ppm. So, pay attention to this. MSA will normally read 20.8% O₂.
- The LEL sensor will alarm when it reaches 10%.
- The LEL sensor will alarm and remain in alarm when it reaches 20%. This is the threshold for IDLH (2 in – 2 out).
- Remember that we still have 80% to go to get to the LEL which means we can do a lot of work to Evacuate, Investigate and continue to reassess our Control Zones.
- If you're dispatched to a "Natural Gas MAJOR", you have completed an investigation with zero readings, and you believe your monitor is operating appropriately...you MAY recommend to the BC to reduce the call to a "MINOR" and continue the hazmat unit.

OPEN TRENCH WITH A LINE FRACTURE



ASSESSING A STRUCTURE PRIOR TO ENTERING



STANDBY AND ASSESSMENT

Initial Isolation Perimeter	Cold Zone	Warm Zone	Hot Zone	Action Zone
• Stop 300 feet away, do not park over utility access. Avoid parking a vehicle where it would likely be struck by debris from an explosion inside a building. This should increase or decrease in 100 feet increments based on smell and detectors.	• The area of the site that is free from contamination and that may be safely used as a planning and staging area.	• The transition area between the Cold and Hot Zones. This area is where responders enter and exit the exclusion zone and where decontamination activities take place.	• (20%LEL): The area with actual or potential contamination and the highest potential for exposure to hazardous substances. Full PPE in place with atmospheric monitoring is required when operating in the Hot Zone.	• The area within the hot zone where mitigation measures may take place based upon the Risk/Benefit Analysis (RBA) up to 50 percent LEL

Control Zones

Responding

Evaluation and RBA

- Dispatch Information
- Activate Air Monitors
- Wind direction
- Topography
- Occupancy size and type
- Interior/exterior
- Supply/pressure
- Estimated duration and saturation

Actions

- Activate Air Monitors



Arrival “Window Survey”

- Stop 300 feet away, establishing the Initial Isolation Perimeter. $\pm 100'$ increments based on olfactory and meters.
- The officer should initiate command responsibilities, perform a 360 (when possible) and conduct an RBA. Within the descriptive size-up the term “**Natural Gas**” should be stated, establishing that this policy is in effect.

Evaluation and RBA

- Location size, duration of leak
- Structures involved and type
- Structure proximity to leak
- Gas migration potential
- Appropriate resources

Actions:

- Size-up (include “Natural Gas”)
- Establish Initial Isolation Perimeter
- Adjust Isolation Perimeter
- Identify/minimize ignition sources
- Interview Responsible persons

Approach “Hot Zone Assessment”

Evaluation and RBA

- Proper PPE, SCBA, and Air Monitor
- Don SCBA if 20% LEL is (1) confirmed by monitor or (2) highly suspected
 - 20 % LEL is considered **HOT ZONE** and is recognized as the IDLH thus, 2 in/2 out rule shall apply
- Heightened aware of crew location
- Awareness of changing concentration levels
- Possible migration and Saturation
- Continuous RBA

Actions

- Determine action thresholds:
 - *Evacuation*: At or above 20% LEL in structure
 - *Mitigation*: Up to 50% of LEL or as RBA allows
 - *Ventilation*

Shutting off Natural Gas

Shutting the gas off at the valve in the street should only be done by qualified PSE personnel.

It should be a top priority of responding personnel to shut natural gas off at the lowest acceptable risk (e.g., at the meter or appliance).

Once a natural gas valve is closed it should only be opened by PSE.

Personnel should not perform crimping or plugging actions.



40% LEL Exterior Upgrade and Operational Mode is Defensive



Action

- Determine action thresholds (*i.e.*, Go/No-Go) based upon the RBA's life profile and then property profile.
- Evacuation should be a priority when it is assumed there is an elevated saturation level or confirmed LEL reading is at or above 20% of the LEL within the structure.
- Interior mitigation and/or evacuation actions can be conducted within the Hot Zone up to a threshold of 50% of the LEL unless additional risk is supported by the RBA
- It is imperative that readings are constantly monitored for changes and that gathered information from the exterior or interior be used to project and estimate the downrange/forward concentration levels. Crews must use judgment and incorporate all RBA factors when determining the associated level of engagement.
- Consider forcible entry only after monitoring door jambs. Do not use spark-producing equipment if readings are at or above 20 percent of the LEL (*e.g.*, irons).

50% Lower Explosive Limit (LEL)



Evacuation

- When evacuating, command should evaluate ventilation consistent with this SOG.
- Consider using apparatus PA systems or other remote means of notification in order to evacuate the Hot Zone.
 - *Do not use systems within a structure*
 - *Do not use “fire alarm or building PA systems”*
 - *Include in repeated verbal evacuation instructions the importance of not creating ignition sources:*
 - *Do not use light switches, flashlights, elevators, cell phones.*
- Provide an assembly area for evacuated civilians.

35% LEL in a WAREHOUSE



Ventilation

- No Ventilation: May be used when a structure is saturated with concentration levels above the UEL.
- Natural/Horizontal Ventilation: During Hot Zone assessment from investigating teams, ventilation openings can be made as the crew(s) progress systematically through the structure.
- Forced Ventilation or Positive Pressure Ventilation (PPV).

PPE



NOMEX GARMENT



POLLY COTTON GARMENT