Hydrogen Safety Tips for First Responders

U.S. Department of Energy
Hydrogen Program
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Hydrogen may already be used in your community in demonstrations of hydrogen vehicles or fuel cells for on-site power generation. Hydrogen has been safely used by industry for decades, and it is no more dangerous than conventional fuels when handled properly. But some of its properties differ from those of other fuels.

How do I detect hydrogen?

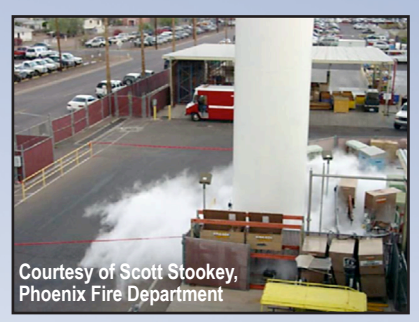
Gaseous hydrogen release

- Listen for high-pressure gas leak (loud hissing sound).
- Gas and flame detectors may be installed in storage facilities and fueling stations. Listen and watch for audible or visual alarms.
- Use an air monitor equipped to detect hydrogen.

Firefighter in standard bunker gear using air monitor

Liquid hydrogen release

- When released, liquid hydrogen creates a white cloud of condensed water vapor from humidity in the air, just as liquid nitrogen does.



Liquid nitrogen release

Hydrogen flame — nearly invisible in daylight

- Heat from a hydrogen flame may be difficult to feel until close.
- Use a portable flame detector, such as a thermal imaging camera.

Compared to the propane flame (right), the hydrogen flame (left) is almost invisible, but can be seen with a thermal imaging camera (shown).

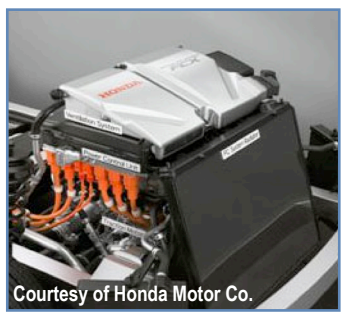
What are the properties and behaviors of hydrogen?

- Colorless, odorless, tasteless, non-toxic, non-corrosive, and non-poisonous
- A gas at ambient conditions
- Fourteen times lighter than air, it rises and disperses rapidly
- Exists as a liquid at -423°F (-253°C)
- Volume ratio of liquid to gas is 1:848

The Basics of Hydrogen Emergency Response

Follow standard response protocol and remember to:

- Look for recognizable signage, listen for escaping gas, and watch for thermal waves that signal the presence of a flame.
- Let a hydrogen fire burn, if safe to do so.
- Never cut through stainless steel hydrogen lines or high-voltage cables.
- Avoid cutting through the floorline of vehicles because hydrogen lines and high-voltage electrical cables and devices are commonly located there.



Orange high-voltage cables in a fuel cell vehicle

Other precautions

- Keep unauthorized personnel away.
- Stay upwind.
- Eliminate ignition sources (electrical, mechanical, or thermal).
- Don't touch or walk through the product.
- Don't spray water into the pressure relief device.

Stationary fuel cell system (left) with hydrogen storage unit (right)

Shell fueling station (gasoline, diesel, hydrogen) in Washington, DC

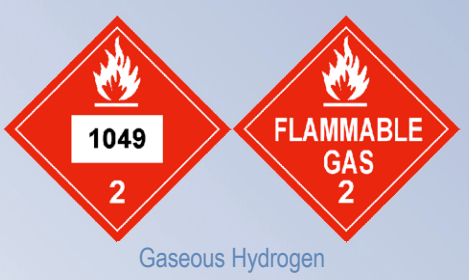
Learn more!!!

Hydrogen course now available

For fire, law enforcement, emergency medical, and other personnel who may witness or discover a hydrogen release. Find it on the web: www.hydrogen.energy.gov/firstresponders or call 877-EERE-INFO (877-337-3463) to request a free paper copy or CD.

How do I identify a hydrogen-carrying vehicle or a hydrogen facility?

Hydrogen transport: DOT Hazardous Material Placards are used for commercial transport of hydrogen in tube trailers (gaseous hydrogen) and tanker trucks (liquid hydrogen).



Gaseous Hydrogen

Liquid Hydrogen

Hydrogen fuel cell vehicles: Usually have a blue diamond on the rear.

Stationary facilities: NFPA 704 Hazard Placards are posted on stationary hydrogen facilities (e.g., stationary fuel cell installations and fueling stations).

Gaseous Hydrogen

Liquid Hydrogen