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ZERØ EMISSIONS. ZERØ COMPROMISE.

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# HYDROGEN SYSTEMS ARE SAFE

Hydrogen systems are as safe, if not safer, than conventional fuel systems, including gasoline and natural gas. Hydrogen is ubiquitous in the universe. On Earth, hydrogen is a molecule consisting of two atoms and has a propensity to bond with other molecules.

Hydrogen has been safely used by many different industrial sectors for more than 50 years. Ten million metric tons of hydrogen is produced every year for use in a range of industrial applications such as chemical, refining, electronics, and pharmaceuticals. Hydrogen can create clean energy and stores energy from renewables, is used to make fertilizer, and makes consumer goods and food more shelf-stable.

In the transportation section, hydrogen has been safely used as a fuel for cars, trucks, buses, forklifts, and other applications. In fact, FCVs meet the strictest safety and quality standards set by both the United States National Highway and Transportation Administration (NHTSA) and the United Nations Global Technical Regulations (GTR).

**On the next page are six facts demonstrating hydrogen's unique safety qualities.**



Hydrogen has been safely produced, stored, transported, and used in the American industrial sector for the past 50 years.



FCVs meet the National Highway Safety Transportation Administration's strictest safety and quality standards.

## 1 | LOW RADIANT HEAT

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Hydrogen flames have low radiant heat. Hydrogen combustion produces heat and water. Due to the absence of carbon, a hydrogen flame has significantly less radiant heat compared to a hydrocarbon fire. Since the flame emits low levels of radiant heat and takes (the flame itself is just as hot) the risk of secondary fires is lower.

## 2 | NEEDS OXYDIZER TO COMBUST

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Combustion cannot occur in a tank unless both a fuel (hydrogen) and an oxidizer are present. This means an oxidizer, such as air, must be present in the hydrogen tank or systems. Due to the physical properties of hydrogen and hydrogen storage system designs, it is impossible to get air in a tank under normal conditions.

## 3 | CARBON-FIBER TANKS

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FCV car manufacturers have developed and tested carbon-fiber hydrogen storage tanks, which withstand crash, drop test, fire, and ballistic testing.

## 4 | SAFETY SYSTEMS

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Hydrogen tanks and the vehicle systems are designed with multiple safety enhancements to prevent leaks in both routine use and extreme circumstances. In the very unlikely scenario that an issue should occur, hydrogen systems are designed to safely release and ventilate the hydrogen.

## 5 | SAFE AND FAST HYDROGEN FUELING

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The hydrogen fueling protocol has been universally accepted around the world to ensure safe refueling of fuel cell vehicles in three to five minutes for a range of 300 - 400 miles on a tank of fuel.

## 6 | SAFETY, CODES, AND STANDARDS

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As a result of decades of fundamental research into hydrogen behavior by private sector companies, the U.S. Department of Energy, and other organizations around the world, we have learned how to make hydrogen systems as safe, if not safer, than conventional fueling systems such as gasoline, natural gas, propane, and others.

Hydrogen safety information resources and best practices are being developed and continually refined for emergency responders and authorities having jurisdiction based on safety research and development, as well as stakeholder input from the fire-protection community, academia, automobile manufacturers, and the energy, insurance, and aerospace sectors.

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**For further reading on hydrogen safety, we recommend the following resources:**

The Hydrogen and Fuel Cell Safety Report maintained by the Fuel Cell and Hydrogen Energy Association:  
[www.hydrogenandfuelcellsafety.info/](http://www.hydrogenandfuelcellsafety.info/)

Hydrogen Tools Portal maintained by the Pacific Northwest National Laboratory (PNNL):  
<https://h2tools.org/>