

## High-intensity discharge lamp

Having read a few articles about these lights and the potential hazards we may face at an RTC, I have put these facts together.

I am not going to give out any rescue related information, as the information found on the internet so far doesn't allow me to give you an accountable solution.

**High-intensity discharge lamps (HID lamps)** are a type of [electrical gas-discharge lamp](#) which produces light by means of an electric arc between [tungsten electrodes](#) housed inside a translucent or transparent [fused quartz](#) or fused [alumina](#) arc tube. This tube is filled with both [gas](#) and [metal](#) salts. The gas facilitates the arc's initial strike. Once the arc is started, it heats and evaporates the metal salts forming [plasma](#), which greatly increases the intensity of light produced by the arc and reduces its power consumption. High-intensity discharge lamps are a type of [arc lamp](#).

Brand new high-intensity discharge lamps make more [visible light per unit of electric power consumed](#) than [fluorescent](#) and [incandescent](#) lamps since a greater proportion of their radiation is visible light in contrast to infrared. However, the lumen output of HID lighting can deteriorate by up to 70% over 10,000 burning hours.

Many modern vehicles use HID bulbs for the main lighting systems, some applications are now moving from HID bulbs to Laser technology.

[wikipedia.com](http://wikipedia.com)

### **A Paper written by the following:**

#### **BY MATT STROUD AND PAUL BINDON**

As you are driving one evening, you round a corner, and all of a sudden you are blinded by bluish-white beams piercing the dark. Have you come face to face with a UFO? A 747's landing lights? The entrance to the Pearly Gates? No, you have just witnessed high intensity discharge (HID) lighting at its finest.

Today, HID lighting seems to be installed in all kinds of vehicle makes and models. It used to be only in high-end BMW or Lexus models, but now it is in that multicolored 1985 Honda Civic, truck accessory lighting, and motorcycles. You might even have it installed on your fire apparatus as floodlights. [www.heavyrescue.se](http://www.heavyrescue.se)

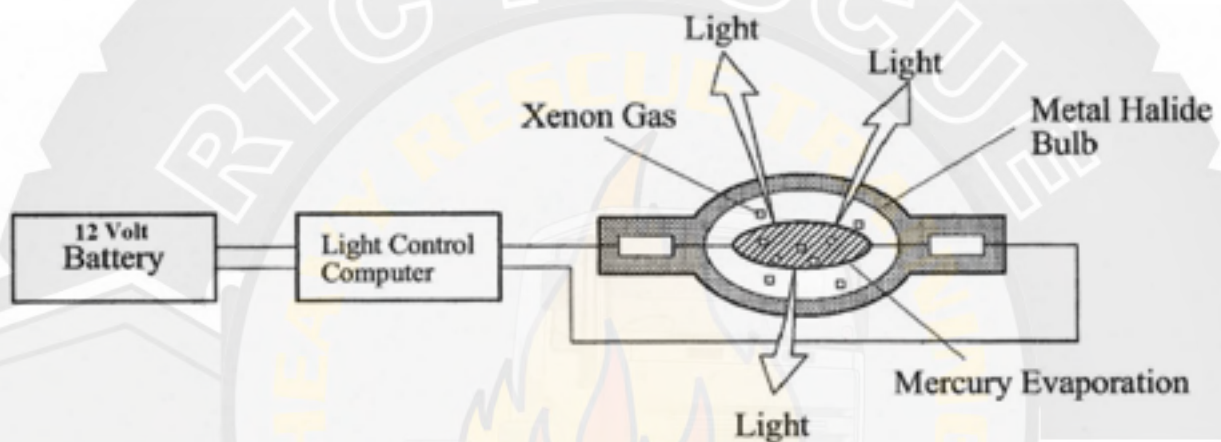
#### **HOW HID LIGHTING WORKS**

The use of HID lighting began in the early 1990s in higher-end European car models. The U.S. and Japanese car manufacturers adopted the HID system in the mid-1990s. Lincoln, Acura, and Lexus were just a few of the companies using this technology. Since then, almost all manufacturers have offered models with the HID headlight system as standard or optional equipment.

How do the HID systems work? To better understand this new technology, you must first have a good idea of how conventional headlight systems function. Conventional systems use a bulb containing a filament that produces light when voltage is applied; just like a standard lightbulb you use in your home, these bulbs have a short life span and are fragile. The light produced has a yellowish hue and is rated in watts. Most conventional headlight systems are Department of Transportation-rated at 55 watts, and the voltage they use to produce their light is 12 volts.

HID headlight systems work differently. Rather than using a filament, the HID bulb is comprised of a quartz capsule that contains xenon gas, mercury (2004 and earlier HID bulbs), and metal halide salts with tungsten metal electrodes at each end. A high-voltage current produced by the HID control unit in each headlight assembly forms an arc in the capsule. This control unit draws 12 volts from the vehicle and steps it up to as much as 25,000 volts.

Figure 1. Operation of an HID System



Think of it as a controlled lightning strike in a small bottle. The light emitted from this process is rated about 4,000 Kelvin (K). A Kelvin rating is a method used to describe theoretical temperature of color. To put this in perspective, a conventional headlight bulb is rated about 2,800 K, which produces a yellow-or amber-colored light. A halogen headlight bulb is rated about 3,200 K. These bulbs produce a much whiter color of light. HID bulbs produce a bluish-white color of light, rated about 5,000 K, which is closest to natural sunlight at midday. Emitting this color of light from the front of a vehicle at night allows the operator to see and react faster and more accurately to obstacles in the road.

## CRASH HAZARDS

This is normal operation in a vehicle driving down the road. What happens when the vehicle crashes? As emergency first responders, you know that nearly 99 percent of vehicles in accidents sustain some sort of damage to the front end. The headlights are probably broken. What about that nice bluish-white, light-emitting, 25,000-volt headlight system?

The HID system does not care that the car has been damaged; the system is still trying to function. The controlled lightning strike we mentioned still needs a place to go. This can create a serious hazard for first responders who could come in contact with this extremely high voltage. To put this in context, if you have ever been shocked by a spark plug wire on a lawnmower or vehicle, you probably remember how that felt. The HID system voltage is a constant 25,000 volts and works more like a Taser® or stun gun. It has a higher refresh

rate and therefore a much higher shock danger and can also pose a greater risk of igniting a fire.

When responding to a motor vehicle accident, you commonly need access to the engine compartment for fire suppression or to disable the 12-volt battery. When you attempt to open the hood, if your hands (or other body parts) come in contact with the rogue high-voltage arc, involuntary convulsive reactions can cause personal injury, and you will likely be thrown from the vehicle. However, if the HID system has been damaged, the vehicle body itself will not be charged with high voltage—your body must come in contact with the arc. Since the HID output is a low-amperage system, the risk of death by electrocution from this system is very low.

Now that you know the facts, you must take care when approaching the front of any vehicle with an HID lighting system. It is important to know that simply turning the ignition off will not turn off the headlights on most vehicles. They will remain operational until you turn them off at the switch or disconnect the 12-volt battery. You must disconnect the 12-volt battery to disable the supplemental restraint system (SRS) air bags, and this will also disable the HID system.

Note: The 12-volt battery may not be under the vehicle hood. Alternate locations for battery placement are becoming more common, especially on hybrid vehicles.

As you can see, vehicle technology has advanced to the point where first responders' jobs have become more complicated and potentially hazardous. Hybrids, alternative fuel vehicles, SRS air bags, and complex body structures are just some of the technologies that can present complications and hazards when you are performing a rescue or an extrication. Up-to-date training has become one of the most critical tools when dealing with all of these technologies.

### **An Exert from firehouse.com**

#### **Truth about HID headlights**

It is true that HID headlights operate on high voltage; however, the amperage is low. An electric ballast, similar to that found in a fluorescent lamp, converts the car's 12 volts DC (direct current) to up to 25,000 volts AC (alternating current) when the headlight is first turned on. This high voltage creates an arc that jumps across the small gap inside the electrodes of the sealed lamp unit. This energizes the xenon gas, causing the gas to produce the bright light. Once the arc is formed and the headlight warms up, the voltage drops to approximately 80 volts AC.

To understand the risk of electricity at crash scenes, we must first accept the fact that a person contacting an energized source of high voltage can be injured or killed. With that understanding, let's use a brief "reality check" hazard checklist to consider the safety concerns surrounding HID headlights at crash scenes:

1. The 12-volt DC and the high-voltage AC current is only present when the headlight circuit is turned on and the vehicle's electrical system is intact.
2. If the headlights are turned OFF or the vehicle's 12-volt electrical system is shut down, no DC or AC current is present within the HID headlight.
3. The high-voltage AC, when present within the HID unit when it is turned ON, is present inside an approximately three-inch-long, sealed glass bulb that is about the size of a person's little finger.
4. This bulb is typically at the rear portion of the headlight assembly, deep inside the headlight housing, and is not readily accessible.



5. To properly focus the light produced by the xenon gas, HID headlights use a thick glass lens. This lens is directly in front of the tip of the tubular xenon bulb and prevents direct contact with the xenon bulb from the front of the vehicle.

6. HID headlights utilize an outer cover of a plastic material at the very front of the headlight. This protective layer forms the outer shape of the headlight when it is mounted in the vehicle.

So, how would a rescuer make contact with and be injured or killed by the energized, high-voltage source present inside a HID headlight? What chain of events has to take place? It would essentially be the "perfect storm" of events:

- The vehicle's electrical system would have to be completely functional after the collision
- The HID headlight switch and headlight electrical circuit would have to be intact after the crash
- The HID headlight would have to be still illuminated; headlight ON
- The outer protective cover of the headlight unit would have to be broken away almost completely; large enough for a rescuer's hand to be placed inside the headlight housing assembly itself
- The thick, glass lens that focuses the headlight's beam and its mounting bracket inside the HID unit would have to be displaced or torn off sufficiently enough that the small, xenon bulb would be accessible
- The glass cover of the sealed bulb would have to be broken away, but the two thin electrodes would have to still be intact and gapped properly
- The rescuer would have to have a bare hand – no glove on – in order to fit into this small space
- The rescuer would have to stick a hand directly into the broken, but still illuminated HID headlight far enough that a finger touches the end of the electrodes while it is energized

After all this, yes, a person could be shocked enough to cause injury or death. But what is the likelihood of this happening? If the headlight is OFF or if the vehicle's 12-volt electrical system is shut down, there will be no hazard.

Study the construction of a typical HID unit and decide for yourself how hazardous you feel that HID units are. By understanding how HID headlights are designed and function, rescuers can develop safety protocols for working with a vehicle that has HID headlights and the degree of risk can be put into proper perspective along with other hazards and risks that can be present at a crash scene.

These are a few bits of information form around the net, take from it what you like, if you manage to get any additional factual information please sent it in to me and ill publish it. [rtc.rescue@gmail.com](mailto:rtc.rescue@gmail.com)

Thanks to those mentioned below for their research and sharing this with us.

[firehouse.com](http://firehouse.com)

[wikipedia.com](http://wikipedia.com)

Matt and Paul from [mgstech.net](http://mgstech.net)