

# Tritium - The Driving Force Behind Our Self-Luminous Exit Sign

## Tritium Questions and Answers

Here are some common questions asked about exit signs powered by tritium gas, and the straightforward answers.

### What Is Tritium?

Tritium gas (chemical symbol H-3) is an isotope of hydrogen gas, and is colorless, odorless, and lighter than air. Most physical characteristics are the same as hydrogen, but the atoms in tritium are slightly different, causing them to emit low energy radiation in the form of beta particles, or electrons. Tritium is considered “user friendly” because it has the lowest energy rating of any radioisotope.

### Are Tritium Signs Radioactive?

NO, BECAUSE NO RADIATION IS EMITTED BY THE PRODUCT. It contains radioactive material, but the product itself is not “radioactive.” In the sign, tritium gas is hermetically sealed into pyrex glass tubes-like a miniature fluorescent lamp. The glass completely stops all radiation. Actually, tritium beta emissions are so weak that even in free air, the particle can only travel less than 1/4 inch. A sheet of tissue paper will stop it.

### What Happens If The Tubes Break?

If tritium is released from broken tubes, the sign could emit a very small amount of radiation. First of all, these signs are very tough and it is hard to break tubes in an installed sign. Government regulations require that they pass drop tests from 8 feet to concrete! But let’s assume somebody strikes one with a hammer ... Repeatedly. We will assume the most conservative, or the “worst case scenario.” We can calculate the potential radiation dose assuming that all 12 tubes are broken, which in practice would require the outer case and all inner parts to be broken. Released tritium gas will behave exactly like hydrogen-it’s very light and dilutes rapidly in air-which reduces the amount anyone can breathe. But we assume that somehow, a person is standing with his/her face literally inches away from the sign, breathing hard for at least 5 minutes during and after a breakage, and absorbs all the tritium. Under these extremely conservative and unrealistic conditions a person might get a radiation dose about the same as a tooth x-ray. Clearly, this is not hazardous.

### How Is Light Produced From Tritium?

The electrons (beta particles) from tritium energize a phosphor compound which is coated on the inside of the glass tubes. Phosphor has the property of emitting light when stimulated by electrons, and is used in television tubes and fluorescent lights. The surface of the tritium tube emits light continuously when the phosphor layer is energized. The mechanism is exactly the same as in an electrical fluorescent lamp, except that electrons are provided by tritium instead of by electrical current. The energy of tritium electrons is much less than those generated in electrical lamps,

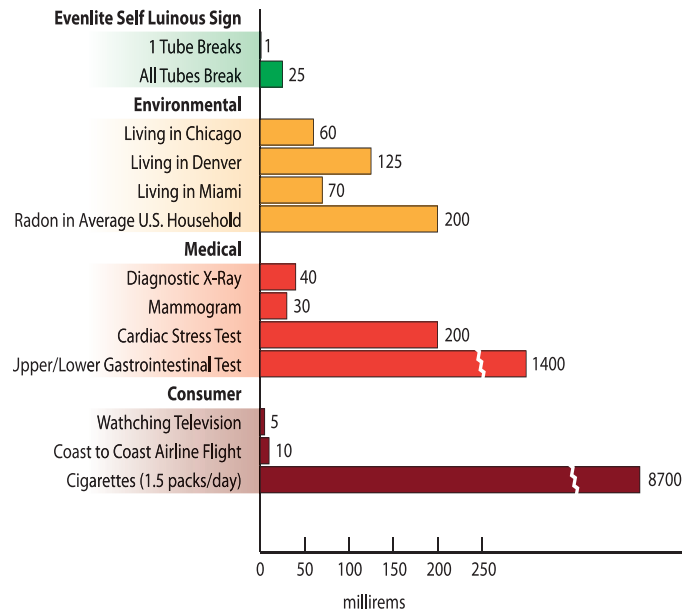
which is why you can’t see tritium tubes glow except in dim light or darkness.

### How Do You Determine The Life Of Tritium Signs?

Tritium gas, like other radioisotopes, decays at a known rate. This rate is usually specified by the “half life,” which is the time taken to decay to half the initial energy. For tritium, this is 12.3 years. In addition, we know the minimum brightness required to meet national and local codes for tritium exit signs. With these two figures, we can calculate exactly the right amount of tritium required in a new sign to produce light for the guaranteed period before the minimum brightness is reached. We offer signs with up to 20 years of guaranteed useful life before replacement is needed.

### Evenlite’s Self-Luminous Exit Sign vs. Everyday Radiation

In the Code of Federal Regulations, Title 10, Part 20, the U.S. government has set the acceptable limit for radiation exposure from man-made sources at 300 millirem per year for the general public. Therefore as shown in this graph, in the unlikely event that an Evenlite self-luminous sign is broken, there is no significant health risk.



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Project name:	Approved By:
Catalog No:	Type No:

# General Information

## Regulations

Manufacture of Gaseous Tritium Light Sources and Devices (GTLs) is regulated under Title 10 of the U.S. Nuclear Regulatory Commission Code of Federal Regulations, or by similar regulations under the jurisdiction of Agreement States (which are themselves subject to inspection by the USNRC). These regulations are voluminous and contain all necessary technical specifications for the safe operation of factories and products. A copy of a portion of these regulations is included with every self-luminous exit sign shipped in the U.S.A.

## Sign Brightness & Luminous Life

We offer models with guaranteed useful life ranging up to 20 years or more before replacement is required. Loss of brightness results from the known radioactive decay of tritium, which loses half its energy in 12.3 years. We can therefore accurately predict the rate of loss of brightness of signs, and adjust the initial brightness to give the luminous life required. The minimum brightness for self-luminous exit signs is defined in National Fire Protection Association Life Safety Code 101 (1997). Thus, the amount by which the initial brightness exceeds this figure will determine the useful life before replacement is required.

## Radiation Testing During Service

Not required. Such testing is specifically exempted under 10CFR Part 31.5 (c) (2) (ii) for devices containing tritium. However, testing is required for fire safety reasons, just as for electrical signs. Inspectors like the fact that each tritium sign carries an easily read “replacement date” so they and the user know exactly when replacement is required, just as for fire extinguishers.

## Government Licensing Approval

The product is licensed for use in all buildings used by the public, including schools. Approval was granted by the USNRC after exhaustive analysis of potential hazards, and detailed examination of the design of all products including prototype testing representing the most severe conditions of use. General Information

## Disposal Of Defective Signs

During its working life as marked on the label for each product, if a broken or defective sign, i.e. one in which the light sources appear unlit or unevenly illuminated in darkness, Evenlite should be contacted to arrange for replacement and return of the defective sign. EVENLITE offers an unlimited guarantee to replace any faulty product, unless damage has been caused by obvious mistreatment or abuse.

## Cleanup Of Contamination From Leaking Or Broken Signs

If necessary, this is done by washing surfaces with ordinary soap and water. Contact EVENLITE INC for a detailed procedure. Our

experience is that leaking exit signs are extremely rare, and the amount of tritium released from a leaking sign would be very unlikely to cause contamination of the local area above levels which are allowed under regulations for “unrestricted” (public) areas. Though this amount may be above background (the level of radiation that exists naturally in all buildings), it is not hazardous. However if required, it can readily be removed by the means described.

## Hazardous and/or Explosive Atmospheres

Self-luminous exit signs will not cause or contribute to the ignition of any hazardous or explosive atmospheres. A self-luminous exit sign's illumination is not dependent upon the use of any electrical power, either internal or external. Since the sign does not require electrical power, the potential for arcing at any contact point is eliminated. Also as there is no requirement for a power source, there are no elements or filaments to glow or become hot, which may cause ignition.

EVENLITE INC self-luminous Exit signs meet the requirements for use in hazardous atmospheres as specified in the National Electric Code; Article 500, Class 1, Class 2 and Class 3 conditions.

## Disposal Of Tritium Self-Luminous Signs

SLIMLINE and LIFELINE self-luminous signs powered by tritium gas lights have a guaranteed maximum operating life before replacement is required. The replacement date is clearly marked on each product, on a label located on the lower edge of the housing frame for easy visibility.

**SPECIAL DISPOSAL IS REQUIRED. CONTACT EVENLITE INC. AT LEAST ONE MONTH BEFORE THE REPLACEMENT DATE, NEW SIGNS SHOULD BE ORDERED TOGETHER WITH A REQUEST FOR AN RGA NUMBER TO RETURN THE OLD UNITS FOR DISPOSAL.**

Upon receipt and installation of the new sign, securely pack the old unit in the container received with the new sign, and return to the nominated disposal location advised by EVENLITE INC. via UPS or equivalent freight service. For multiple returns, package a maximum of ten (10) signs in each outer carton or overpack.

**Disposal fees:** If a replacement self-luminous tritium sign is purchased from EVENLITE INC the disposal fee will be waived. EVENLITE INC will accept any manufacturers signs for exchange on a one for one basis i.e buy one, return one. EVENLITE INC will accept any manufacturers signs for disposal only for a \$75.00 per sign, pre-paid disposal fee. If an LED or Photoluminescent exit sign is purchased from EVENLITE INC a reduced disposal fee of \$50.00 per sign shall apply on a one for one basis. The products can also be disposed of by professional services which are licensed to handle Low Level Solid Waste radioactive material. Such companies can be found in the telephone directories under “Radioactive Waste Disposal”. EVENLITE INC reserves the right to revise disposal fees and policy without notice.