



## Industrial Radiography

Manufacturers use a method called industrial radiography to check for cracks or flaws in materials. Radiation is used in industrial radiography to show problems not visible from the outside without damaging the material.

- Workers who use industrial radiography equipment must be trained to use it and wear special badges that measure their exposure to radiation.
- Exposure of the public to radiation from industrial radiography equipment is not likely, because the public is not permitted in areas where testing is conducted.

## About Industrial Radiography

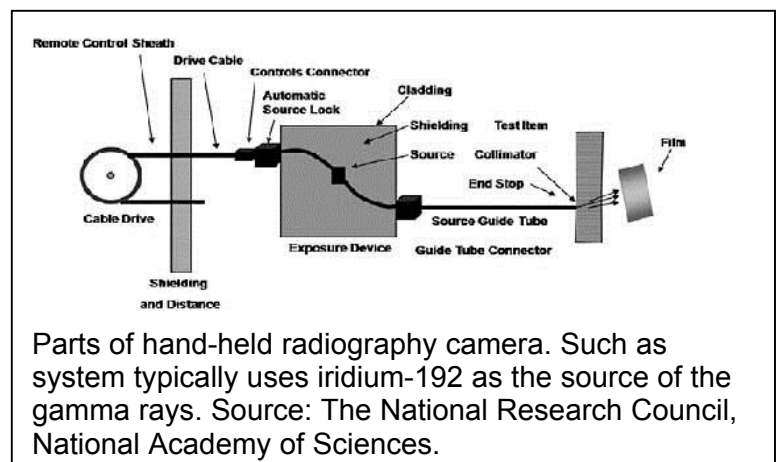
Manufacturers know that consumers expect the products they buy to be safe, to work well and to last. This reliability becomes even more important when product failure can be expensive or dangerous.

Manufacturers also use industrial radiography to check for cracks or flaws in their products. Just like medical x-rays are used to find breaks or cracks in bones, industrial radiography uses x-rays or gamma rays to take pictures of the inside of products because they can show problems not visible from the outside. Radiography is useful because it does not damage or change the product being tested.

For example, industrial radiography is used to test:

- Gas and oil pipelines.
- Metal welding.
- Boilers.
- Vehicle parts.
- Aircraft parts.

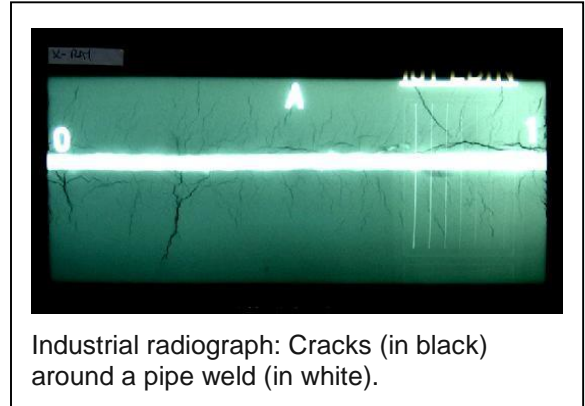
**Here's how it works:** A beam of x-rays or gamma rays is pointed at the item being tested. A detector is lined up with the beam on the other side of the item. The detector records x-rays or gamma rays that pass through the material. The thicker the material, the fewer x-rays or gamma rays can pass through. Because the material is thinner where there is a crack or flaw, more rays pass through that area. The detector captures the rays that pass through, which form a picture of the crack or flaw. At right is a drawing of the parts of a special camera, called a radiography camera, which is used to capture radiography pictures. The pictures from these cameras are called radiographs.



The radiograph image below is an example. It shows the condition of metal around a welding site. The welding site shows up bright white because it is thicker than the rest of the material. It has stopped the rays almost completely from passing through. The cracks are the darker areas.

X-ray and gamma ray devices are different and used for different purposes.

- X-ray radiography devices are powered by electricity. When the device is turned off, x-rays are not produced. X-ray radiography generally creates very clear pictures. The devices are large and good for use in factories.
- The gamma rays used in radiography come from radioactive material inside the radiography device. Gamma ray devices do not need electricity. They are smaller than x-ray devices. Their small size makes them useful for checking inside pipes, ships and other small spaces. However, they cannot be turned off like an x-ray device. The radionuclides in the device always produce gamma rays. The only way to “turn off” a gamma ray radiography device is to interrupt the beam by covering the opening with a heavy metal plate. Workers must be careful to close the opening when the gamma device is not in use to avoid exposure.



Industrial radiograph: Cracks (in black) around a pipe weld (in white).

## Rules and Guidance

### U.S. NUCLEAR REGULATORY COMMISSION (NRC)

People who want to own radiography equipment must have a license. People who want to operate the equipment must have proper training and education to be qualified and licensed as radiographers. NRC writes the rules for obtaining these licenses and governing the use of equipment and radiation sources. They also write rules for the personnel involved in industrial radiography.

### THE STATES

Many states have formal agreements with the Nuclear Regulatory Commission. These agreements give states the authority to license the use of the device as well as people who want to work as industrial radiographers. States with this agreement with NRC are called Agreement States. However, their agreements may or may not include industrial radiography licensing.

### U.S. DEPARTMENT OF TRANSPORTATION (DOT)

DOT writes rules about transporting radioactive sources, such as those used in portable gamma radiography devices used in the field (for example, at construction and cleanup sites).

## What you can do

You are unlikely to be exposed to radiation from industrial radiography equipment because the general public is not permitted nearby when testing is conducted. However, if you are anywhere near these devices, be sure to follow all safety rules.

## Where to learn more

You can learn more about industrial radiography by visiting the resources available on the following webpage: <http://www.epa.gov/radtown/industrial-radiography.html#learn-more>.