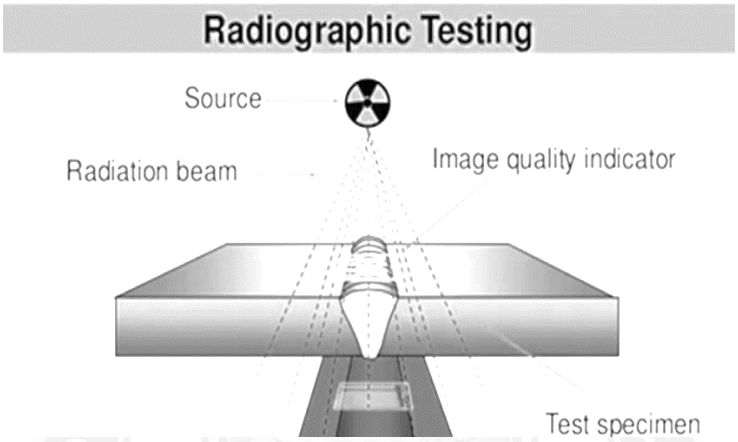
## 3.6 RADIOGRAPHIC TESTING

- Radiographic Testing (RT) is a non-destructive testing (NDT) methods which uses either x-rays or gamma rays to examine the inter of manufactured components identifying any flaws or defects.




- X-rays are commonly used for thin or less dense materials while rays are used for thicker or denser items.
- The term radiography usually implies a radiographic process that produces a permanent image on film (conventional radiography) or paper ( radiography or x ray radiography), although, in a broad sense, it refers t forms of radiographic inspection.
- When inspection involves viewing of a real-time image on a fluorescence screen or image intensifier, the radiographic process is termed real inspection. When electronic, non-imaging instruments are used to measure the intensity of radiation, the process is termed radiation gaging.
- Neutron radiography refers to radiographic inspection using neutrons rather than electromagnetic radiation.

### 1. PRINCIPLE

- In Radiography Testing the test-part is placed between the radiation sou and film (or detector). The radiation passed through a test piece to dec defects.

### 3. BASIC COMPONENTS OF RADIOGRAPHIC TESTING

**(a) Source**

- X-rays are generated by directing a stream of high speed electrons target material such as tungsten, which has a high atomic number. the electrons are slowed or stopped the interaction with the particles of the target, X-radiation is produced.
- The neutron, energy is released in the form of gamma rays. Two e most common industrial gamma-ray sources for industrial radiography Iridium-192 and Cobalt-60.

**(b) Radiographic Film**

- When X-rays or gamma-rays or light strike the film, some of the halogen atoms are liberated from the silver halide crystal and thus leaving the silver atoms alone.
- This change is detected by a method is called a "latent (hidden) image. When the film is exposed to a chemical solution (developer) the reaction results in the formation of black.

## 4.WORKING PRINCIPLE OF RADIOGRAPHIC TESTING

- The testing specimen part to be placed between the radiation source (x or gamma source) and a piece of film which records the defect data.
- The undefeated part will stop some of the radiation. Thicker and den area will allow less radiation to pass through. The discontinuity allow rays to pass.
- The property of the film will vary with the amount of radiation reaching the film through the test object. These differences in "absorption" can be recorded on film, or electronically. The energy of the radiation affects its penetrating power.
- Higher energy radiation can penetrate thicker and denser materials.
- The radiation energy and exposure time must be controlled to properly image the region of interest.

## 3. RADIOGRAPH FILM ANALYSIS

- If an object has a high density, ie a thicker object, it absorbs more radiation causing less radiation to hit the film, which produces a lighter image.

- If an object has a low density, ie when the through section is reduced or there is a lower-density material such as slag (compared to the surrounding material), it will absorb less radiation causing more radiation to hit the film, producing a darker image.
- The image on the film cannot initially be seen; this is called the latent image and can only be seen when the film is developed. The quality of this image mainly depends upon two properties.
- Density- This is the degree of blackness on the radiograph. There will be minimum and maximum amounts of density to make the radiograph readable and give the required sensitivity.
- Contrast- Radiographic contrast is the degree of difference between density fields on a radiograph. If there are only blacks and whites on a radiograph, this would be high contrast. If only tones of a similar density are on the graph, this would be low contrast.

## 6. SAFETY ASPECTS OF RADIATION TEST

- **Film badges/TLDs (thermoluminescent dosemeters)**

  The detectors worn by all industrial radiographers that measure the dose a radiographer receives over a period of time, usually one month.

- **Survey meters (dose rate meters)**

  The instruments that can measure dose rates per unit time.

## 7.ADVANTAGES

- Both surface and internal discontinuities can be detected.
- Permanent test record is obtained.
- Minimum surface preparation required.

## 8. DISADVANTAGES

- Highly directional (sensitive to flaw orientation) Depth of discontinuity is not indicated.
- It requires a two-sided access to the component
- Many safety precautions for the use of high intensity radiation Many hours of technician training prior to use.
- Access to both sides of sample required.
- Orientation of equipment and flaw can be critical.
- Determining flaw depth is impossible without additional angled exposures.
- Expensive initial equipment cost.

## 9. APPLICATIONS

- Industrial Radiographic testing is used extensively on castings and weldments.
- Radiography is also well suited for testing of semiconductor devices for cracks, broken wires, unsoldered connections, foreign material and misplaced components.
- Sensitivity of radiography to various types of flaws depends on many factors, including type of material, type of flaw and product form.
- Both ferrous alloys can be radiographed, as well as non-metallic materials and composites.

**Used in fields of,**

- Aerospace industries
- Military defense
- Offshore industries
- Marine industries
- Power-gen industries
- Petrochem industries
- Waste Management
- Automotive industries
- Manufacturing industries
- Transport industries