Offsite Response to a Radiological Emergency

FOR THE EMERGENCY RESPONDER

Objectives

- Identify types of Radiological incidents
- Identify Radiological dose consequences
- Identify protections against radiation
- Identify contamination controls, to limit the spread of contamination

Question

What is a Radiological Emergency?

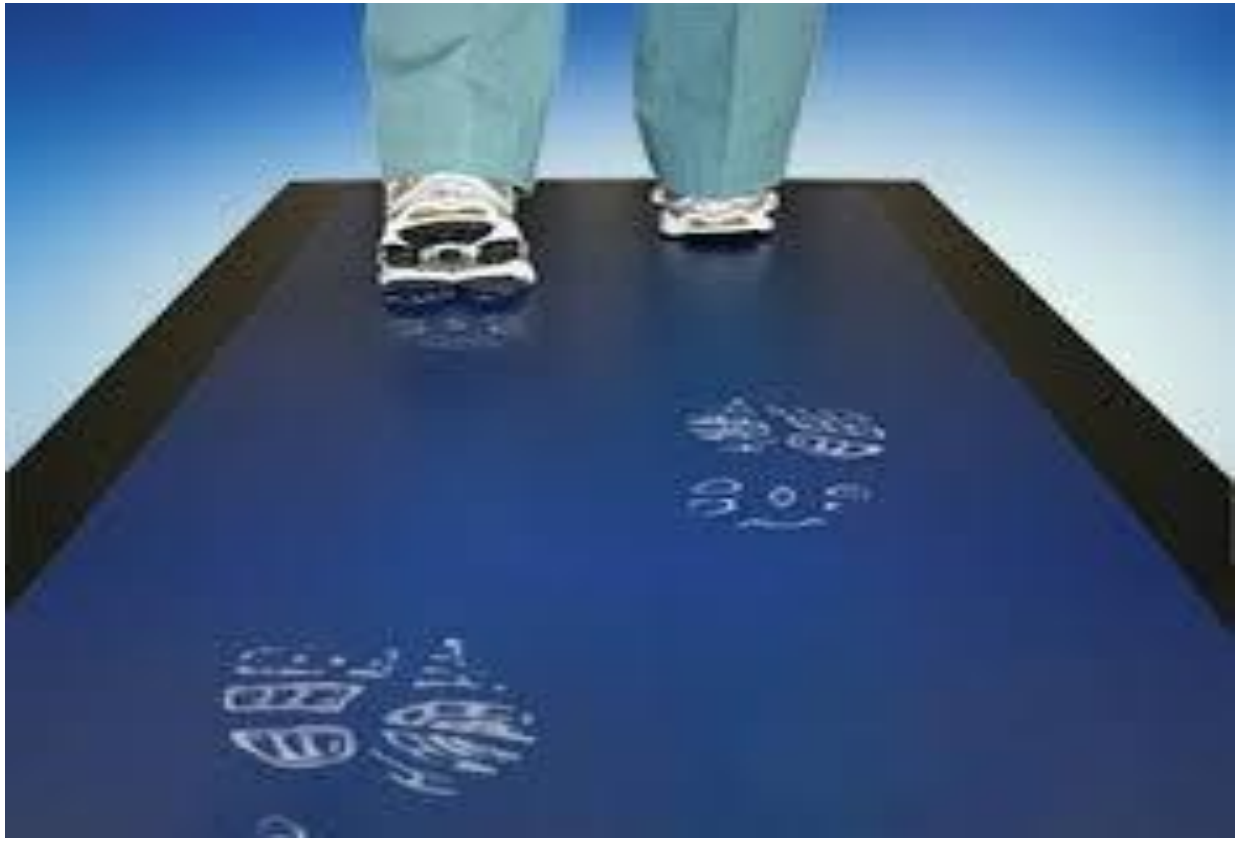
What we believe

Why is that?

- Chernobyl
- Fuskushima
- Three Mile Island

What it really is

Contamination Control



What it really is

Radiation Protection

Types of incidents

Transportation Accidents

Terrorists (Dirty Bomb)

Nuclear incidents

Priorities

- #1 Life safety
- Your Safety is a Priority
- Scene Safety

  Contamination/Radiation control does NOT take precedence over saving the life of your patient

Contamination Verses Radiation

Differences

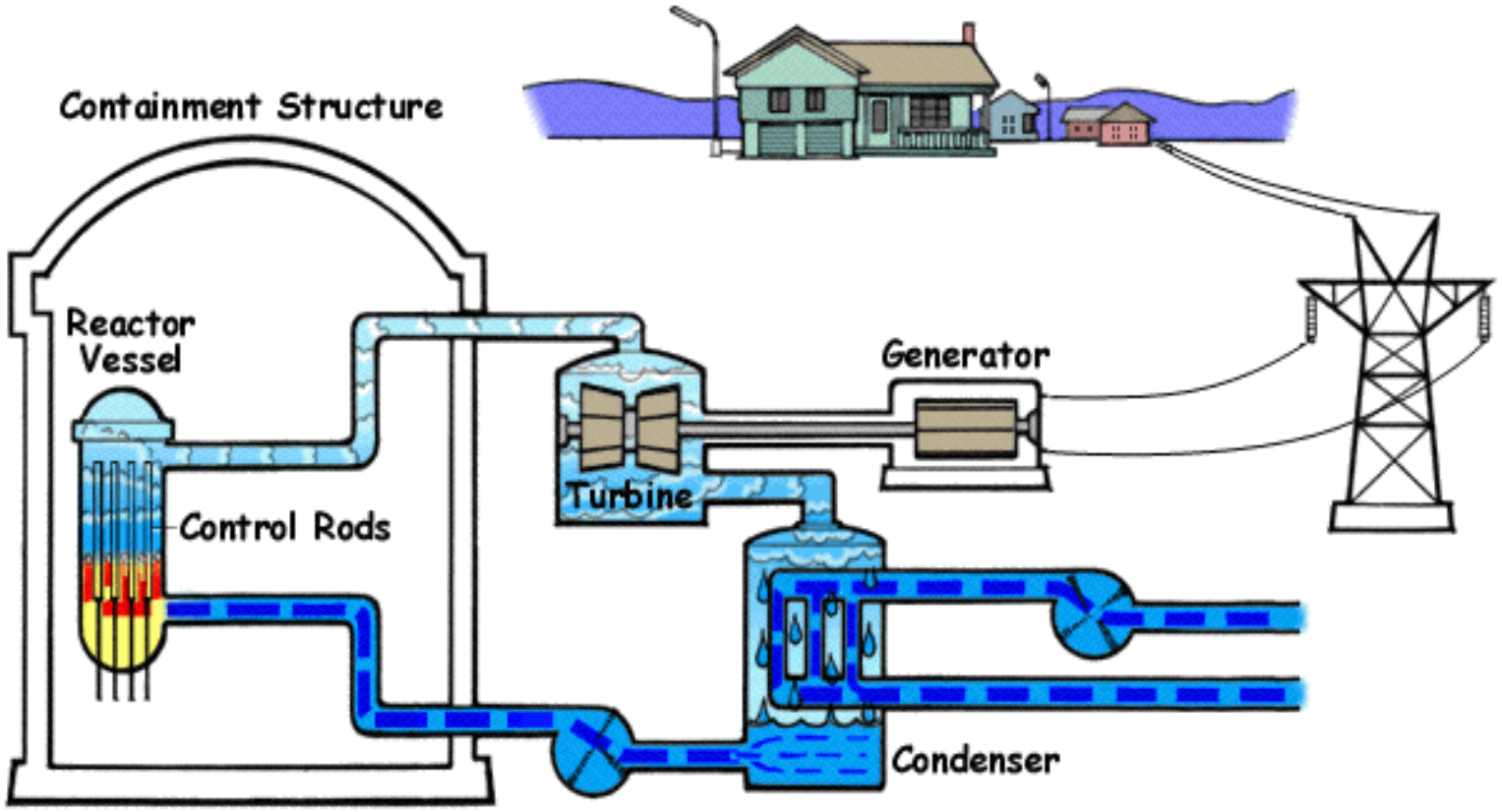
- Contamination is something, someplace where you don't want it to be
- Radiation is energy, like the sun or a light bulb

Types of Nuclear Reactors

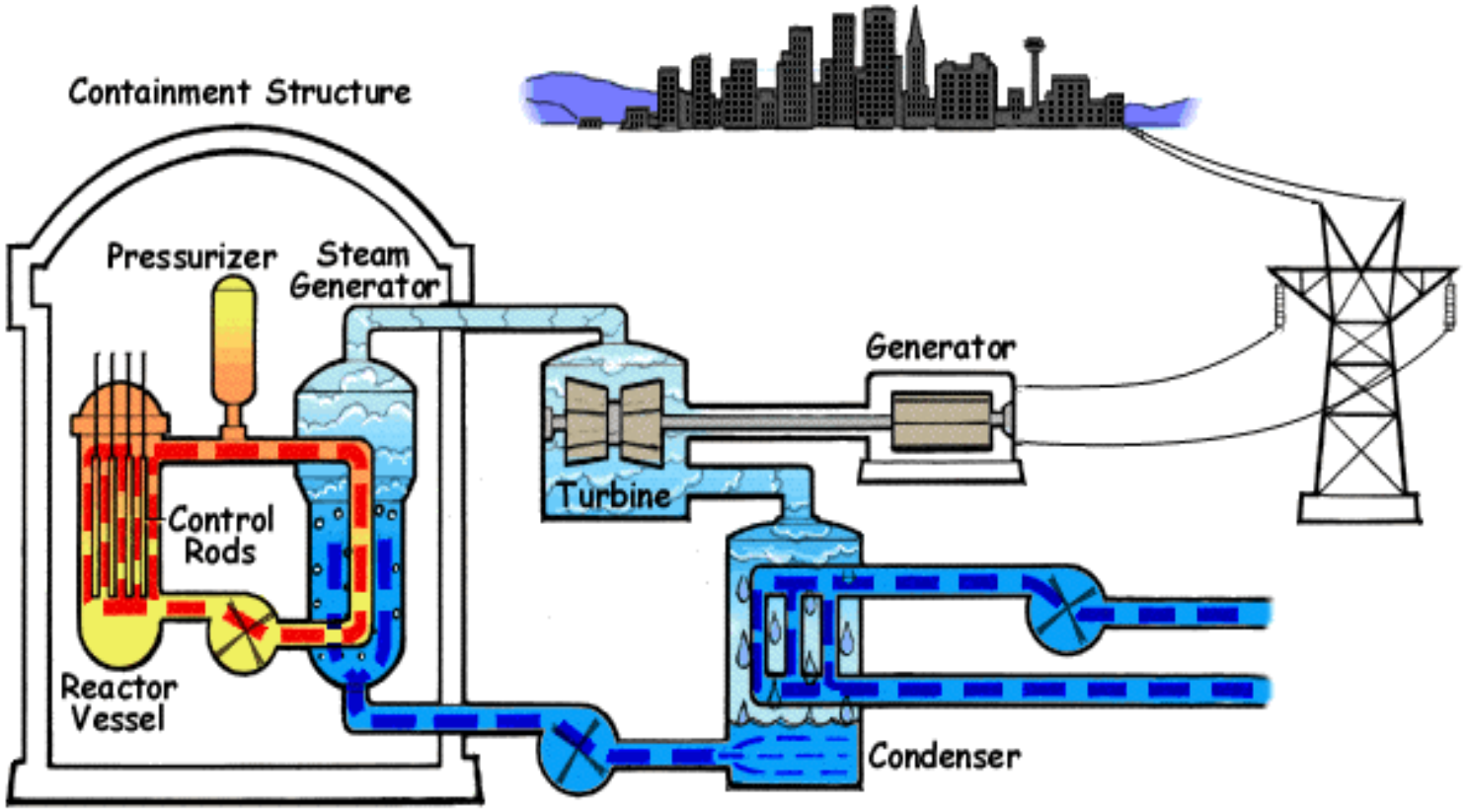
Boiling Water Reactor (BWR)

Pressurized Water Reactor (PWR)

Boiling Water Reactor (BWR)



Pressurized Water Reactor (PWR)



Factors to limit Events

- Highly regulated (Nuclear Regulatory Commission (NRC)
- Defense in Death
- Operating Experience
  - Industry Sharing

Defense in Depth

- Nuclear Power plants have redundant safety systems
- Multiple power sources
  - Onsite
  - Offsite
  - Batteries
- Trained Operators
  - Trained every 5 weeks
  - Tested annually to keep the license
- Fission Product Barriers

Fission Product Barriers

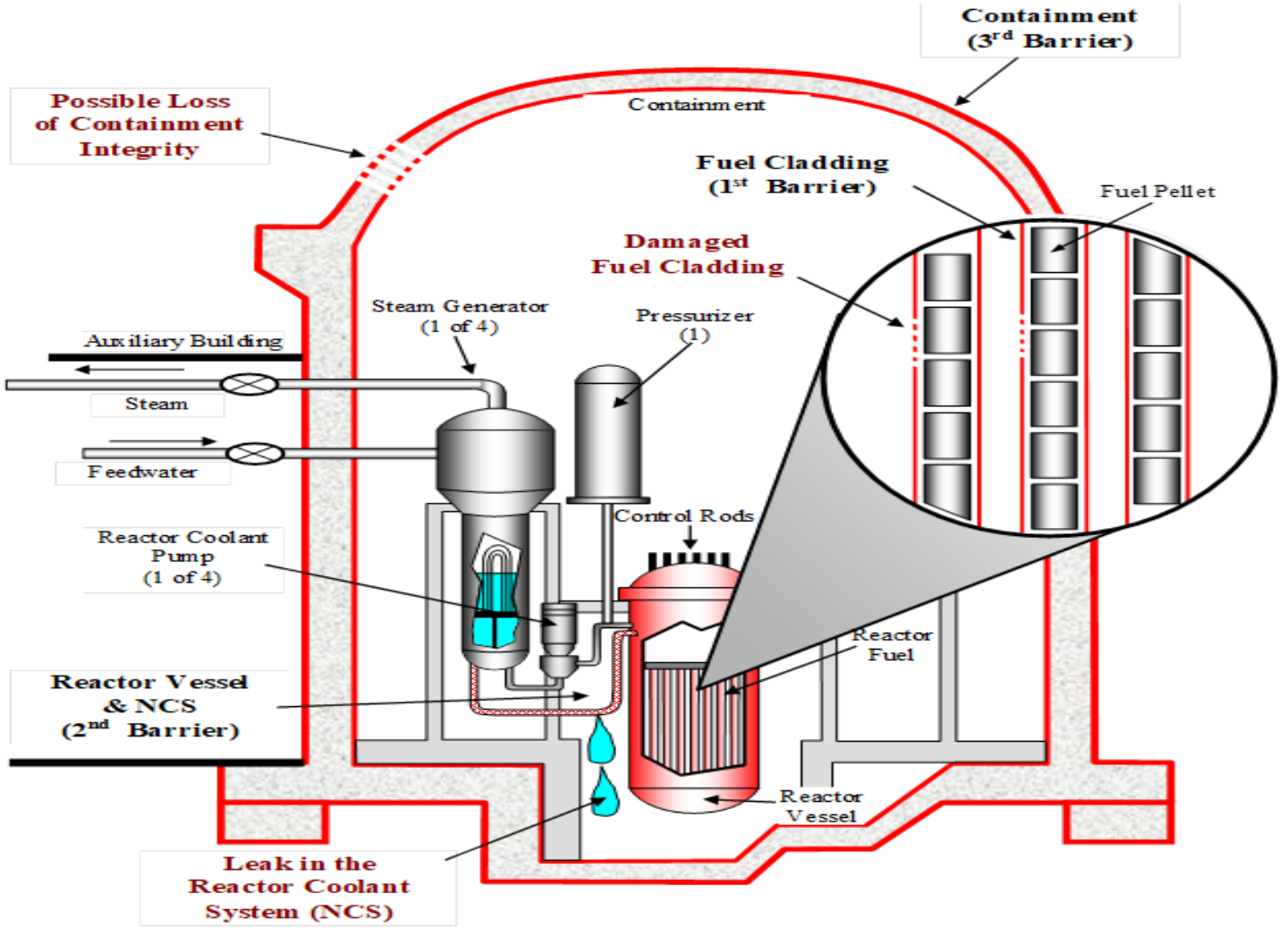
Plant structures specifically designed to hold in (contain) and prevent the spread of radioactive materials (***fission products***) created during the nuclear reaction.

Fission Product Barriers

- 3 Fission Product Barriers
  - **Reactor Coolant System** - Water to cool the core and mode of force for generator
  - **Containment** - Designed to hold in energy from the steam and radioactive materials
  - **Fuel Cladding** - The sealed metal tubes surrounding the fuel pellets

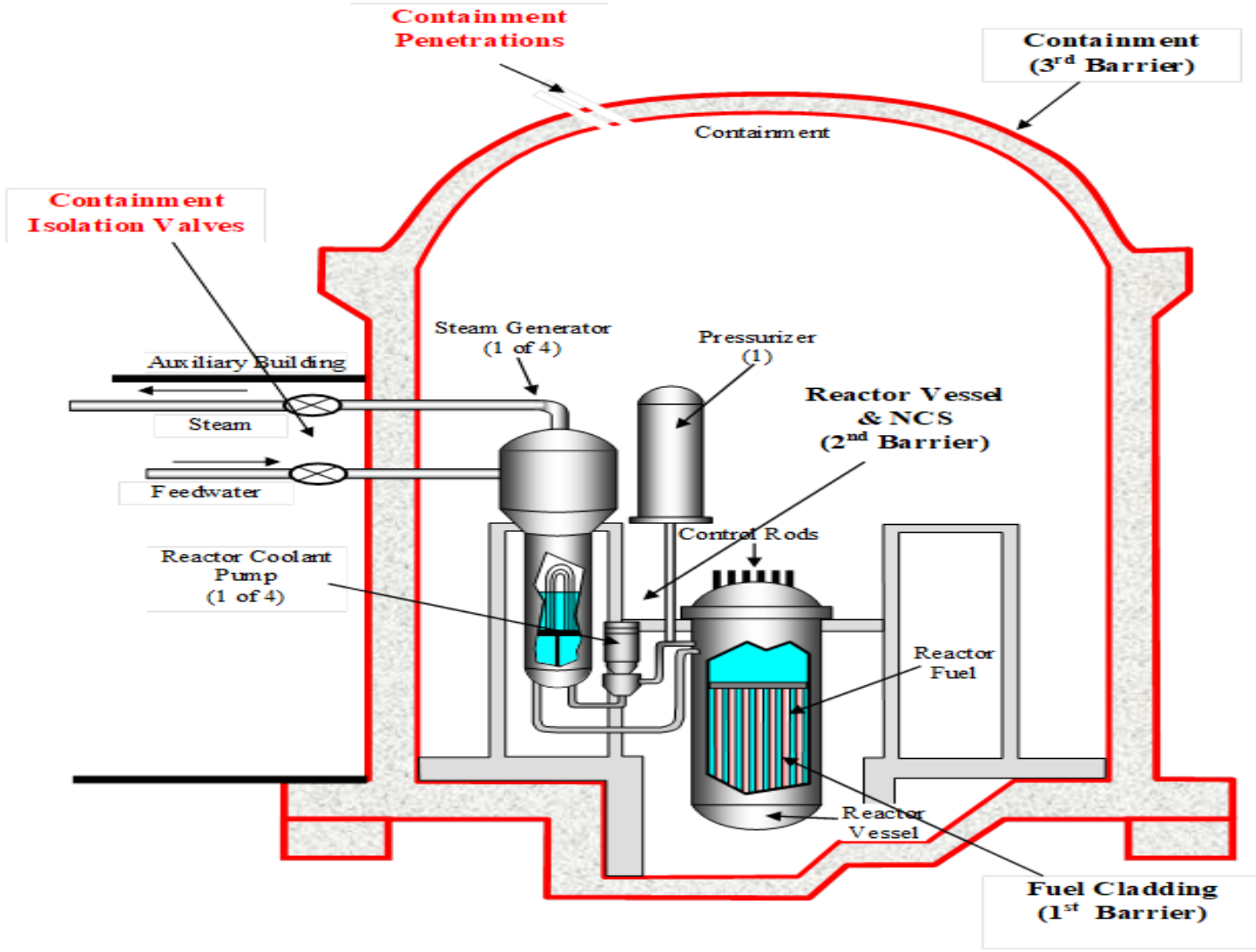
Fission Product Barriers

Fuel Cladding



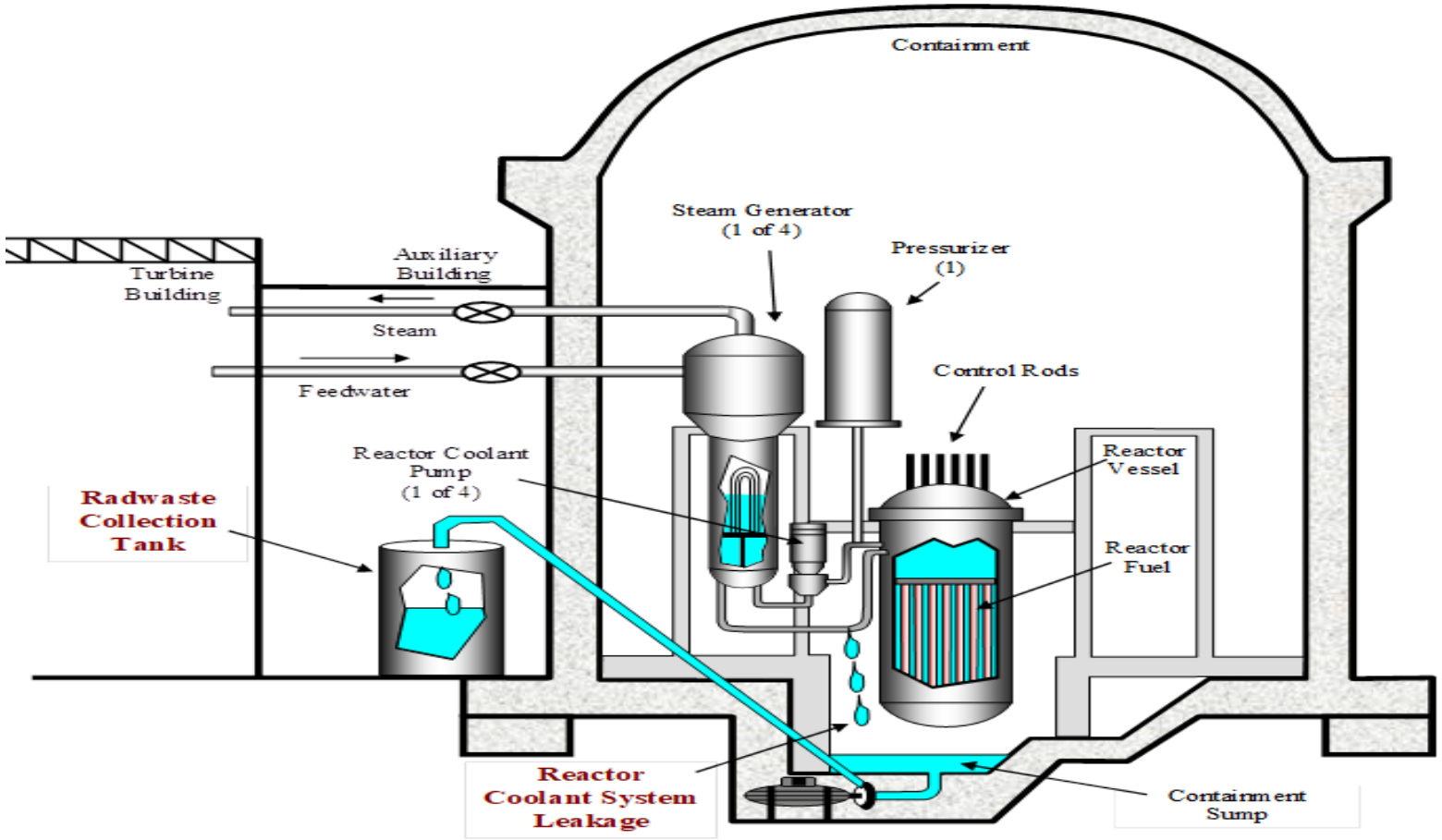
Fission Product Barriers

Containment



Fission Product Barriers

Reactor Coolant System (RCS)



Fission Product Barriers

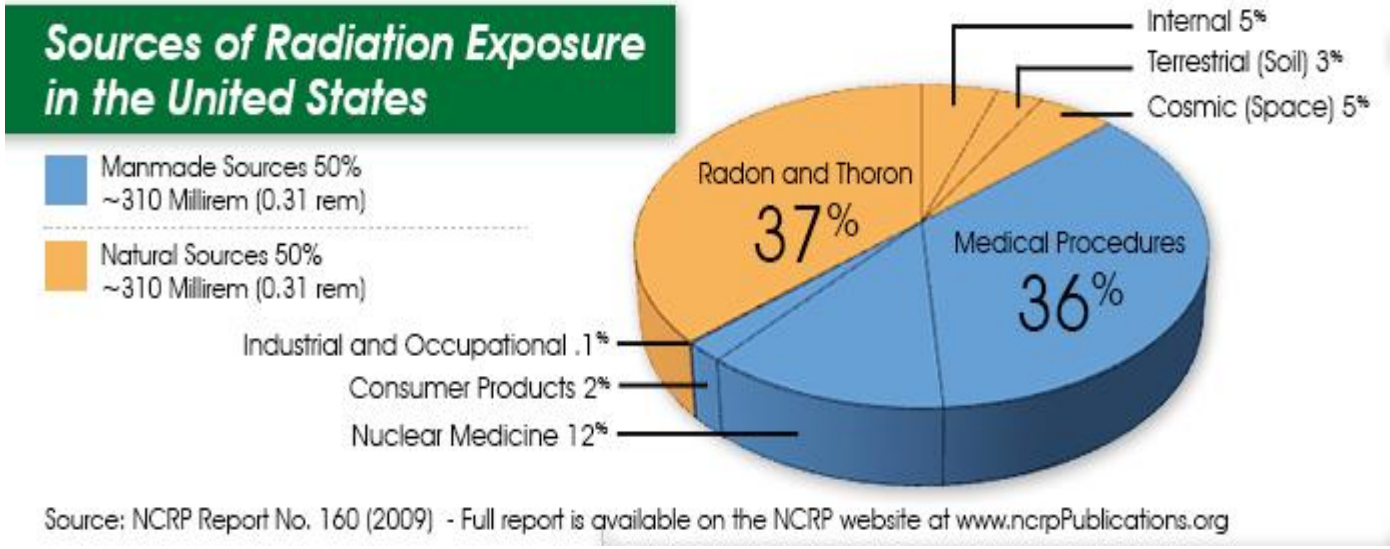
As long as any one of these barriers stays intact, significant amounts of radioactive fission products CANNOT be released outside the plant

Types of Radiation

- Alpha
  - Alpha radiation is a heavy, very short-range particle and is actually an ejected helium nucleus.
- Beta
  - Beta radiation is a light, short-range particle and is actually an ejected electron.
- Gamma
  - Gamma radiation and x rays are highly penetrating electromagnetic radiation.
- Neutron
  - Neutrons are high-speed nuclear particles that have an exceptional ability to penetrate other materials. Of the five types of ionizing radiation discussed here, neutrons are the only one that can make objects radioactive.

Radiation Effects

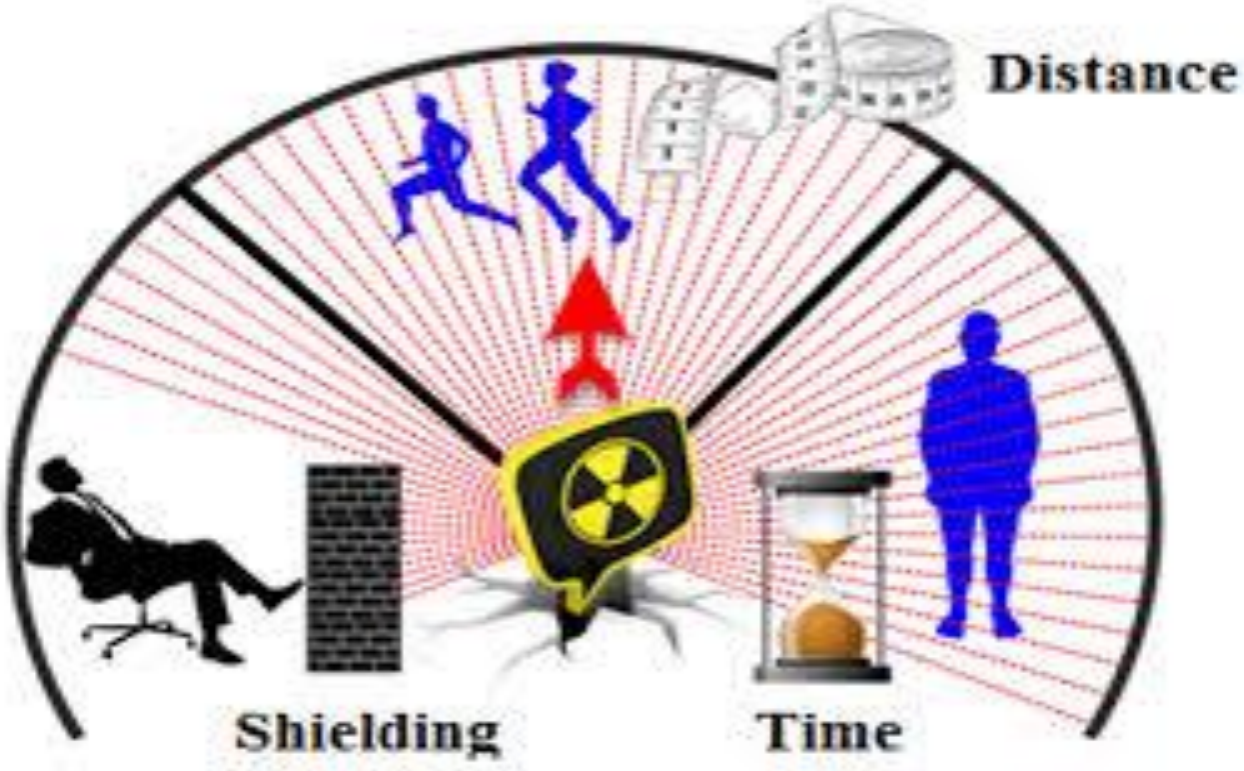
- Dental X-Ray = .0005rem
- Flight from New York to LA = .0035rem
- Chest X-Ray = .01rem
- Average Annual Dose Rate = .620rem
  - 310 mrem from manmade sources
  - 310 mrem from natural sources
- CT Scan = 1 rem
- Damage to Blood Cells = 50rem
- Acute Radiation Syndrome = 100rem
- 50% lethal Dose = 400rem (death for 50% of those who receive 400rem)
- 100% lethal Dose = 1000rem (death for 100% of those who receive 1000rem)



****CDC.gov****

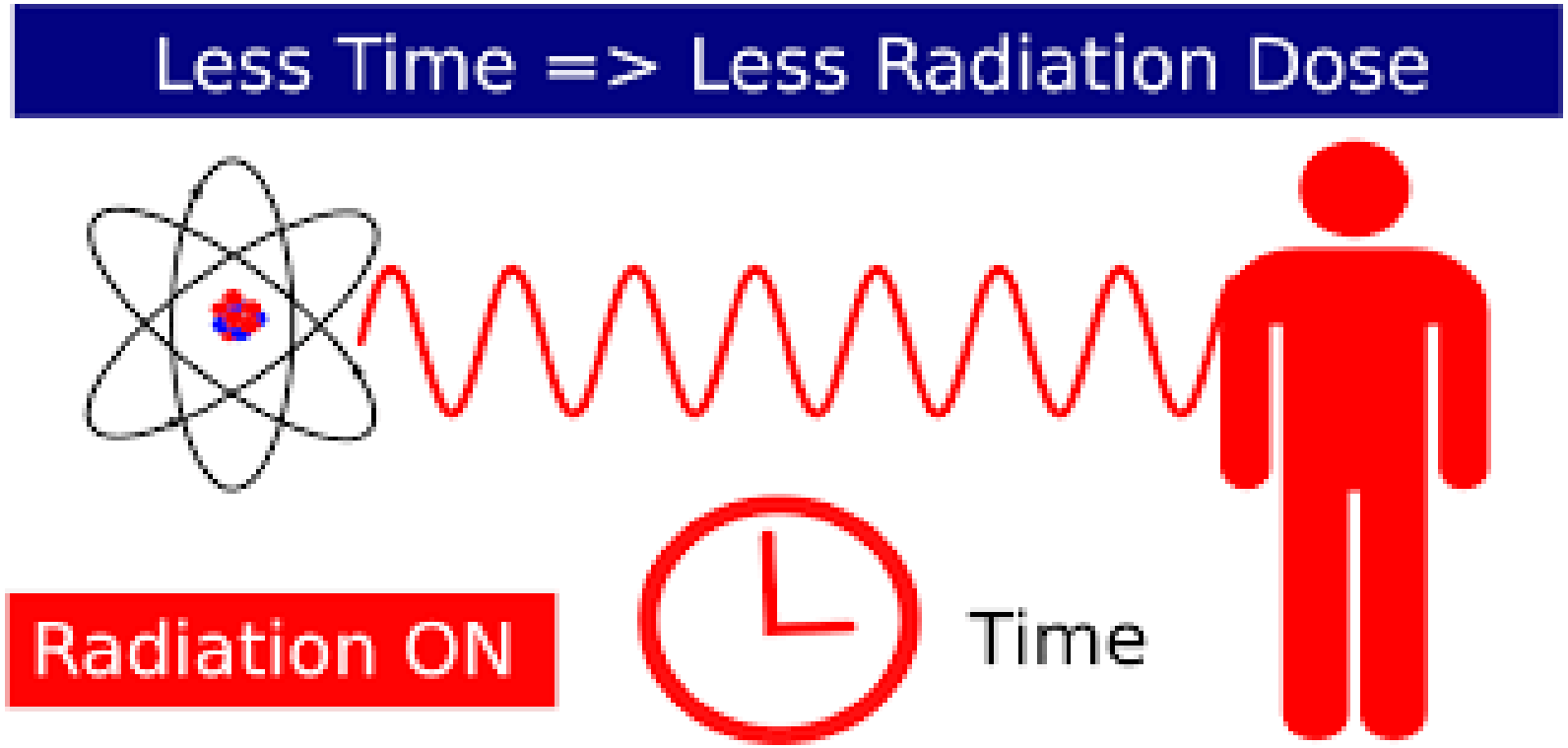
ALARA

- As Low As Reasonably Achievable



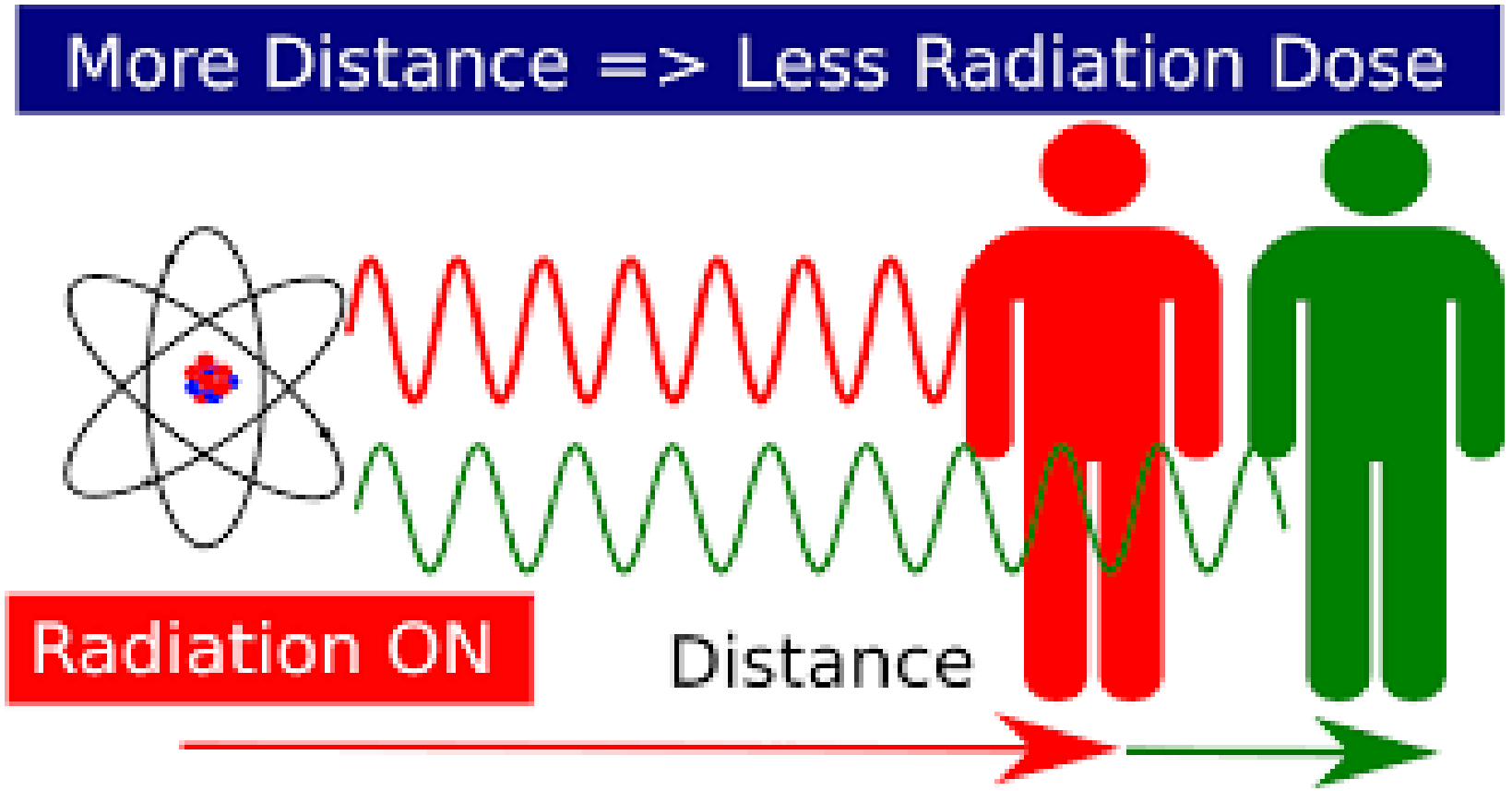
Time

Reduce Exposure by reducing the amount of time



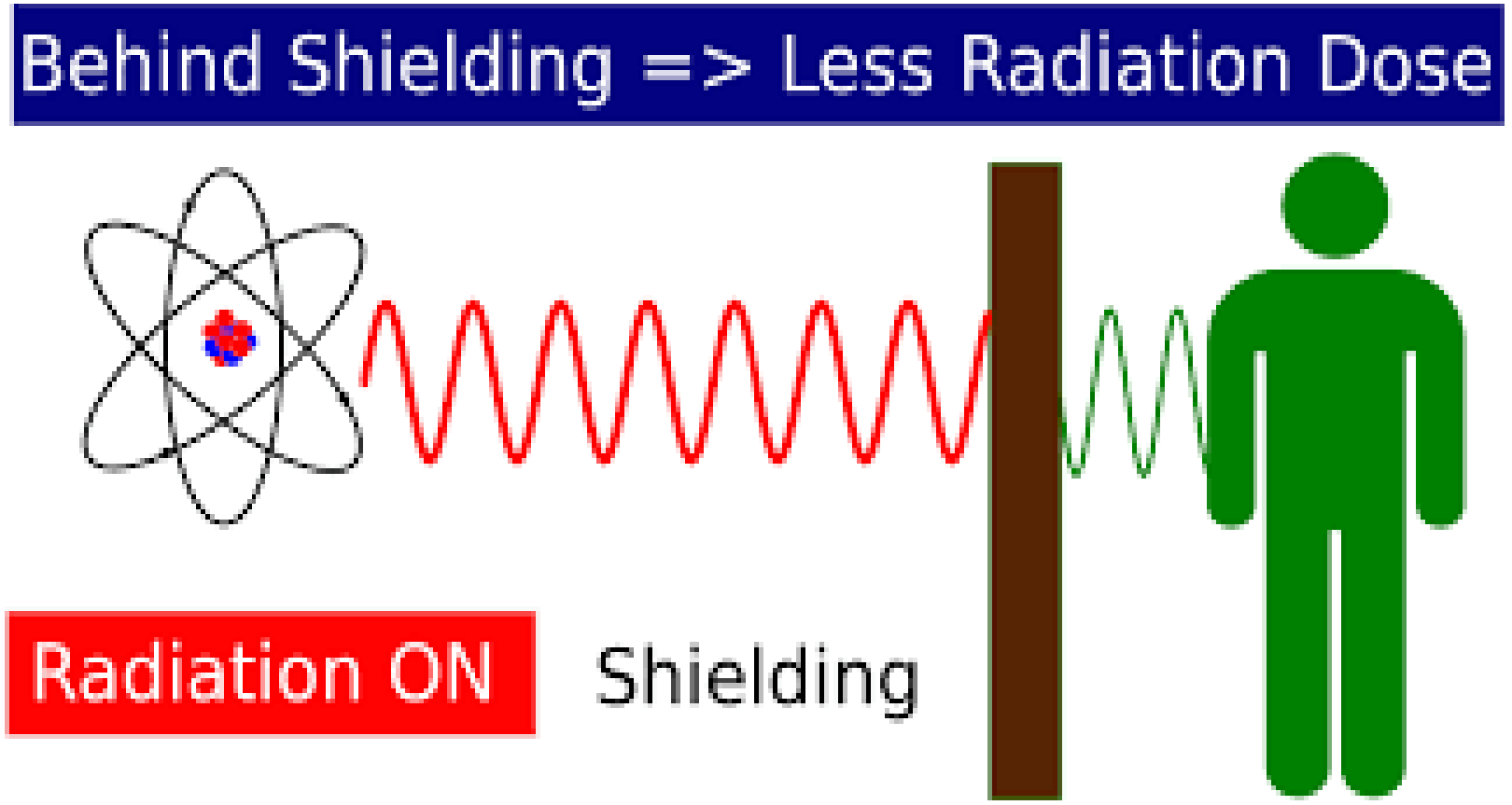
Distance

Put distance between you and the source

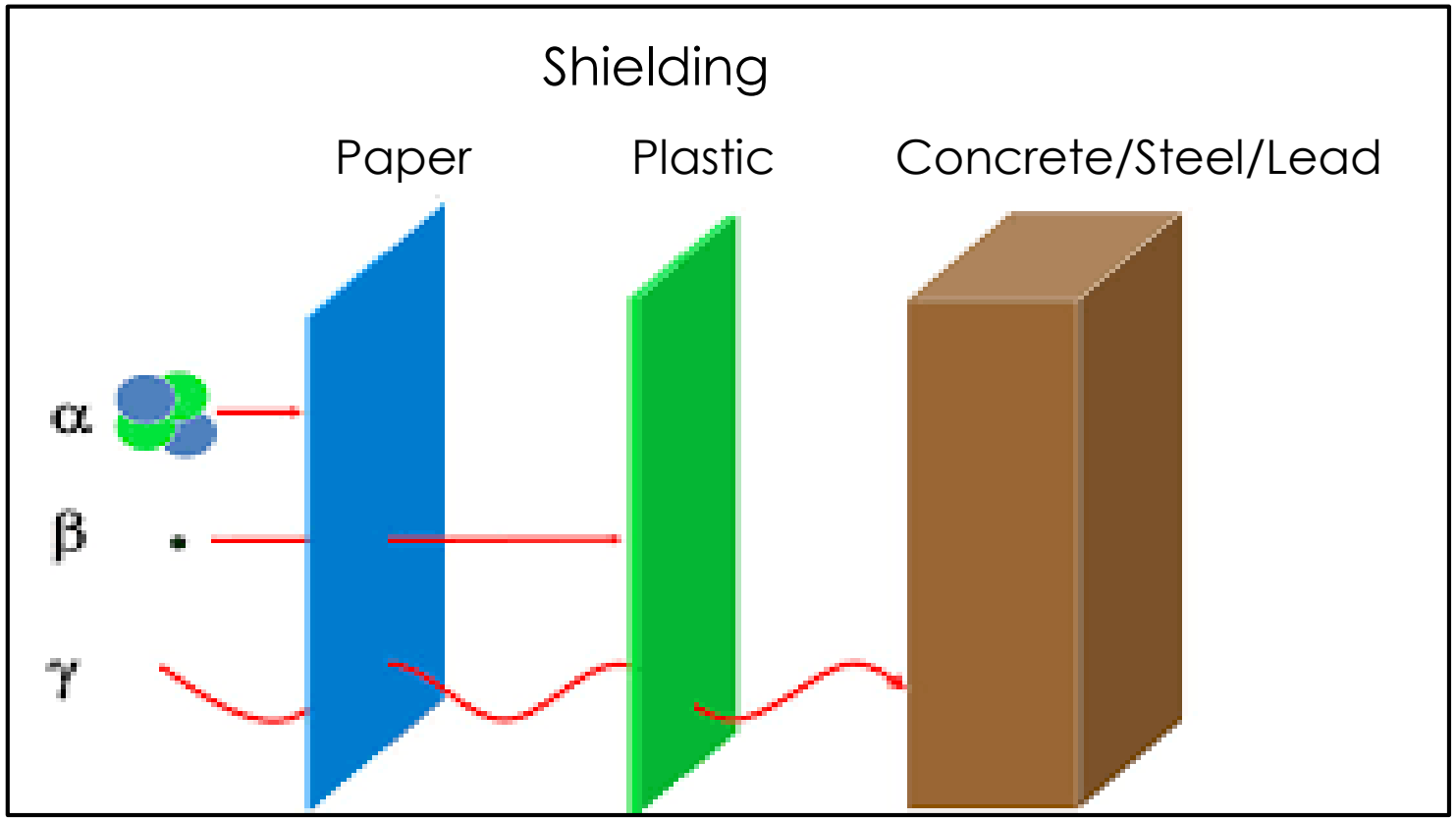


Sheilding

- You
- The patient
- Your partner



Types of Radiation



DECON

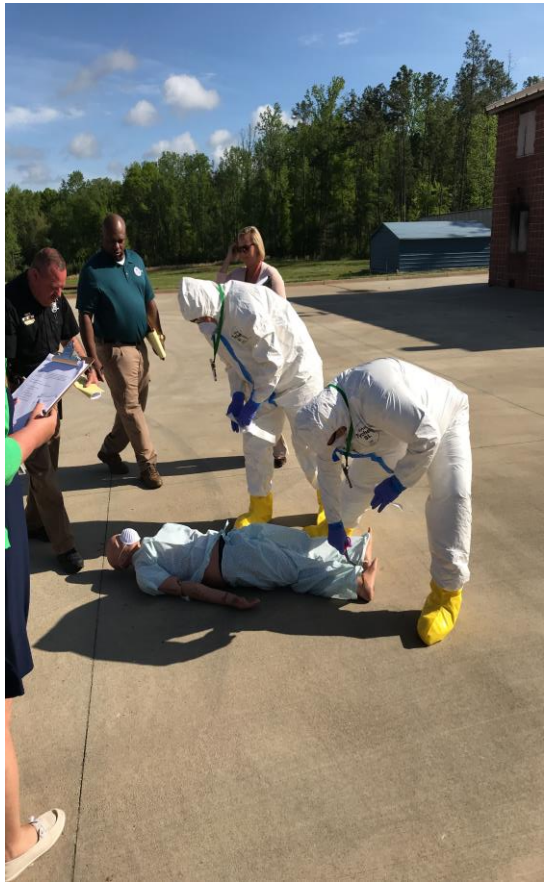
- Remove the clothing
- Rinse a wound
- Tape the skin
- Shower
- Scrub

Contamination Control

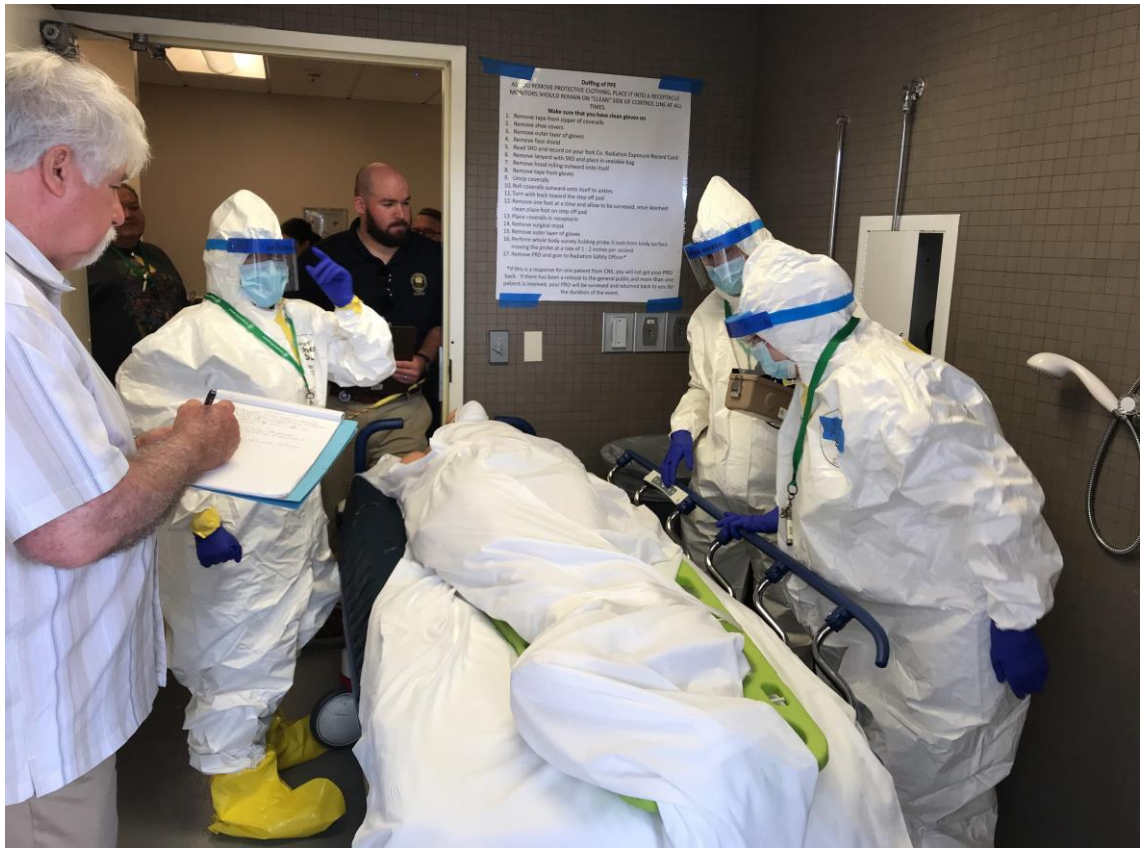
Cocooning the patient

- To help contain any contamination, wrap the patient in a sheet or plastic cover.
  - You can still have full access to the patient, but this will help contain anything that potentially could be on his or her skin.

Cocoon the Patient



Cocoon the Patient



Contamination control (Cont.)

- Make a “Hot” zone
  - If outside, be upwind
- PPE
- Continuous Radiation Monitoring of the patient and area

Contamination Control (Cont.)

- If deconning, make sure rinsing agent is not pooling on or under the patient. Rinsing agent should be diverted off the patient and into a collection container
- Collect ALL trash and items
- Change gloves often

Reasonable Assurance

Reasonable assurance from the NRC

Reasonable assurance from FEMA

The Offsite Responders

- Offsite responders in surrounding counties around a nuclear plant have been designated to provide assistance in the event of an emergency
- Procedures are in place from the nuclear plant and offsite responders to protect the health and safety of the public
- Procedures are practiced and evaluated by FEMA

Resources

- Local hospitals
- Radiation Emergency Assistance Center/Training Site (REAC/TS)
  - On-call and ready to deploy (as well as available for phone advice and consultation) 24 hours a day, seven days a week
  - Emergency Contact 865-576-1005 (Ask for REAC/TS)

Resources (Cont.)

- Nuclear Plant Radiation Protection Technicians
  - If the patient is from a power plant an RP will accompany the patient from to the hospital.
  - Monitor for contamination
  - Consultant for you and the Emergency Room Staff
  - Will NOT interfere with patient treatment efforts

Questions

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