Description of document: Employees' Guide To Radiation Protection Atlantic Richfield Hanford Company informational booklet, 1960s

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Atlantic Richfield Hanford Company

EMPLOYEES' GUIDE TO RADIATION PROTECTION

Reprocessing of radioactive fuel elements and the concentration of radioactive wastes are conducted in the 200 Areas. Since the ionizing radiations emitted by these materials are potentially harmful, a comprehensive radiation protection program is conducted to protect employees, the environment and the public.

The success of this protection program depends on how thoroughly you and your associates understand the need for such a program and that you do your part to make it effective.

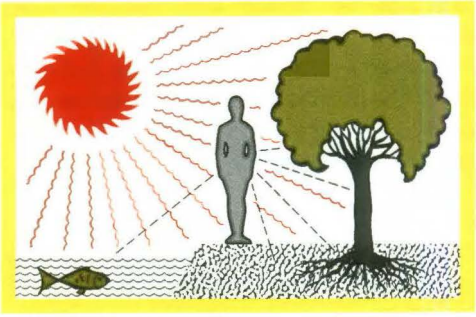
The information in this booklet will give you a basic understanding of what radiation is, make you familiar with some Hanford "Radiation Language", and make you aware of the precautions that must be followed when you work with or near radiation or radioactive contamination.

If you are assigned to work in a Radiation Zone, you will receive further orientation and training from your foreman or supervisor and from members of Radiation Monitoring.

WHAT IS RADIATION?

Humans have been exposed to radiation in one form or another, since the earth was first inhabited. Ordinary light and heat are common forms. If you have ever been sunburned, you can blame it on ultraviolet radiation. Medical and dental x-rays are other familiar forms.

As with toxic substances, exposure to excessive quantities of radiation can be harmful. Such exposures can be prevented by properly following protective procedures. These procedures provide assurance that no deleterious body effects will result from radiation work.

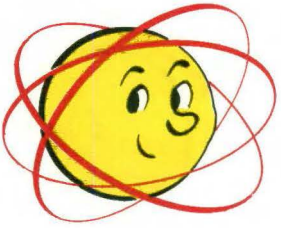


All matter is made up of atoms—billions and billions of atoms—too small to be seen even with the most powerful microscope. These atoms, in turn, are made up of still smaller particles called neutrons, protons, and electrons.

Each atom has a core or nucleus. That is where the protons and neutrons are.

The electrons revolve around the nucleus—much like our planets revolve around the sun.

STABLE ELEMENT

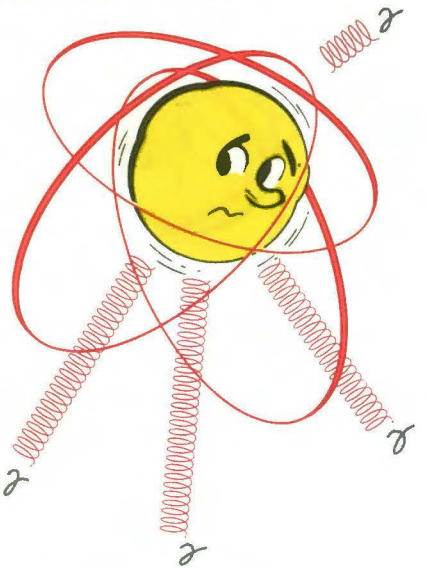


The number of electrons spinning around the nucleus is exactly the same as the number of protons inside the nucleus. Protons are positively (+) charged; electrons are negatively (-) charged. Neutrons, on the other hand, have no charge. Since the number of protons and electrons is the same, they cancel out each others' charges, making the atom neutral.

Despite their incredibly small size, the atoms of many elements are very complex arrangements. Some, with a couple of hundred or more particles, are so complex they don't seem to like it. So they throw off excess particles and energy—RADIATION—trying to "settle down" to something more stable. In doing so they actually change into entirely different elements. These

unstable elements are called RADIOACTIVE, and the process of changing into different elements is called RADIOACTIVE DECAY.

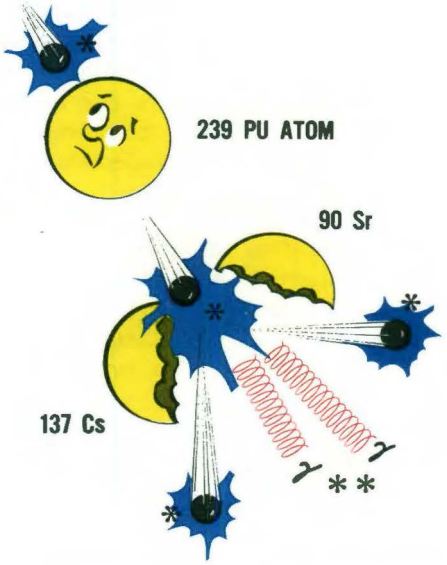
UNSTABLE ELEMENT



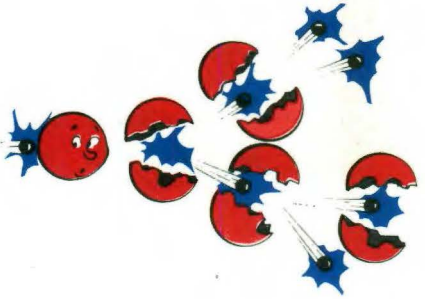
NUCLEAR RADIATION

Here at Hanford such changes take place, but not entirely on their own accord. For example, uranium—already a bit unstable—is put into a reactor. The uranium atoms are bombarded by neutrons until they split apart. This splitting up of atoms is called FISSION. By this process, many uranium atoms are broken up into "fission products." Other uranium atoms, however, build up into atoms of a new element—plutonium. Each time an atom under-

FISSION EVENT



goes fission, neutrons shoot out from the broken nucleus and break up other atoms, which in turn release more neutrons to break up still more atoms, and so on . . . . That is what is meant by a "chain reaction."



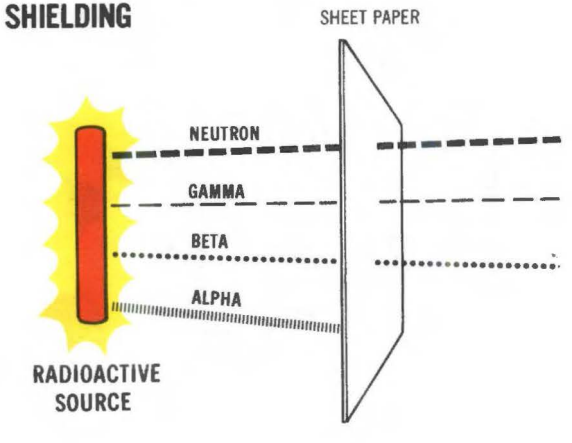
Materials formed by fission are extremely unstable. In trying to become stable, they give off intense radiation. As with any toxic substance, exposure to excessive amounts of radiation can be harmful. Overexposure can be prevented by properly following the established protective procedures.

TYPES OF RADIATION

Both penetrating radiation and radioactive contamination may be encountered in the course of your work. You cannot see, hear, feel, taste, or smell them—they can only be detected and measured by special instruments. Some of the most common types you may encounter are:

α Alpha Radiation:

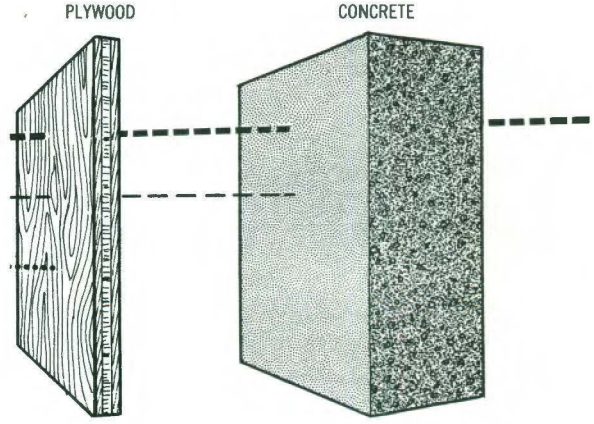
Alpha radiation is the least penetrating of all types of radiation. It can be stopped or "shielded out" by an ordinary sheet of paper. Clothing or even



the outer layer of skin will prevent it from penetrating your body. However, material emitting alpha radiation may be harmful if it gets into your body—by breathing it, through cuts or scratches, or through your mouth. Uranium and plutonium are typical alpha emitters.

β Beta Radiation:

Beta radiation can be effectively stopped by thin plywood or sheetmetal. It can penetrate to the sensitive tissues of the skin. Simply stepping back a few feet from a beta source will greatly reduce the exposure to the body. In many locations where you may encounter beta radiation, your protective clothing will shield out a portion of it. Excessive doses of beta radiation may be harmful when taken into the body in sufficient amounts. Fission products are the source of most beta radiation.



γ Gamma Radiation:

Gamma radiation—waves of energy similar to radio waves or x-rays—will penetrate through the skin and the body. Dense materials such as concrete, lead or steel are necessary for shielding. Excessive doses received externally may be harmful to internal organs of the body as well as the skin. Materials emitting gamma radiation may also be harmful if taken into the body.

n Neutron Radiation:

Neutron radiation may readily penetrate shielding such as lead which is useful for shielding gamma radiation. Special materials, with high hydrogen content, are required to shield neutrons. Neutron radiation sources are primarily nuclear reactors, certain radionuclides, such as californium-252, and neutron generating machines. Excessive doses may be harmful to all parts of the body.

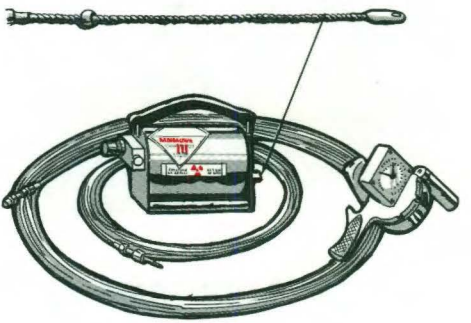
X-RAY GENERATING MACHINES AND/OR RADIOGRAPHIC EXPOSURE DEVICES

A radiation generating machine or radiographic exposure device is any machine or device so constructed or operated to purposely generate a field beam of ionizing radiation. A common

use of such devices here at Hanford is the INDUSTRIAL RADIOGRAPHY—the examination of welds, pipe, tanks, etc., utilizing high intensity X- or gamma radiation and film.

Dose rates to personnel from industrial radiography cannot be estimated since they can be zero or exceed hundreds of R/minute in the beam of an energized x-ray tube or from an unshielded radioactive material source.

SEALED SOURCE



Any industrial radiographic operation must meet rigid ERDA license requirements for restricting and controlling unauthorized personnel access to radiographic work sites and to prevent excessive doses of radiation to personnel.

Entry into an established radiographic area by unauthorized persons is strictly prohibited. These areas will be defined by ropes, barricades, red warning lights and Radiation Zone signs.

X-RAY GENERATOR

RADIOACTIVE CONTAMINATION

Any radioactive material which has escaped or spread from its intended container or location is called RADIOACTIVE CONTAMINATION. It may be in a form which can be spread to air, into liquids, or onto your body.

Radiation cannot accumulate inside your body unless it is in the form of loose radioactive contamination. Precautions must be taken to prevent this.

Wearing respiratory (full face mask) protection is one of the principal precautions you can take. Wearing proper protective clothing is another.

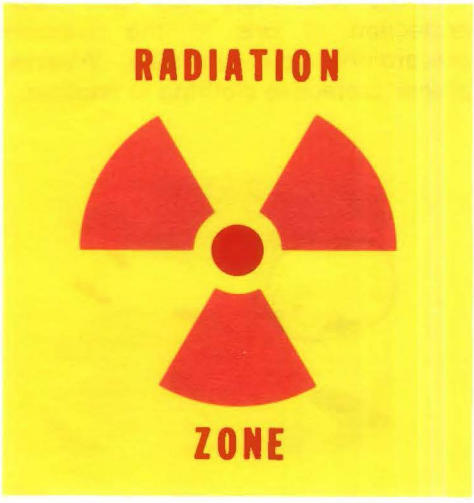
SIGNS AND SYMBOLS

Wherever radiation or radioactive contamination exists, you will see a radiation warning symbol—a magenta-colored "propeller" on a yellow background.

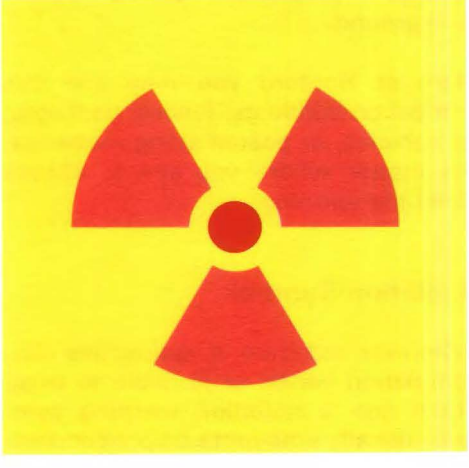
Here at Hanford you may see this symbol on buildings, fences, packages, or vehicles, or posted along roadways. No matter where you see it, always heed the warning.

Radiation Symbol:

Wherever radiation or radioactive contamination exists, or is liable to exist, you'll see a radiation warning symbol—usually a magenta-colored or occa-



sionally black "propeller" on a yellow background. It appears on doors, on packages, and on signs. Always **heed** the warning of this symbol, which indicates there is a source of radiation. It is for your protection.



Fissile Material:

Fissile material is a material capable of sustaining a chain reaction. Certain isotopes of plutonium and uranium in any form—metal, alloy, solution, or compound; alone or mixed, are examples of fissile material. Fissile material should be moved by or under the direction of knowledgeable personnel.

Radiation Zones:

Wherever significant levels of radiation or radioactive contamination are known to exist, a "Radiation Zone" is established. Radiation Zone boundaries are clearly marked by signs bearing the radiation symbol. Eating, smoking, or drinking is not permitted in a radiation zone.

Controlled Zones:

Controlled Zones include corridors (exclusive of the administrative area) shop labs not using radioactive materials, locker rooms, and other designated areas wherein protective clothing, *excluding* shoe covers, is permitted but not mandatory. Food and drink are not permitted in a Controlled Zone. Smoking, unless otherwise posted, is allowed after appropriate surveys for radioactivity.

Uncontrolled Zones:

Uncontrolled Zones include all space not identified as a Radiation Zone or Controlled Zone, i.e. lunch rooms and administrative areas. These areas shall be maintained free of contamination or potential contamination at all times. Radiation sources of greater than 1 mrem/hr at any approach are not permitted. Protective clothing is not permitted. Eating, smoking, or drinking is allowed in Uncontrolled Zones.

RADIATION TERMINOLOGY

You will hear some strange words and phrases tossed around that relate to radiation and its measurement. For example:

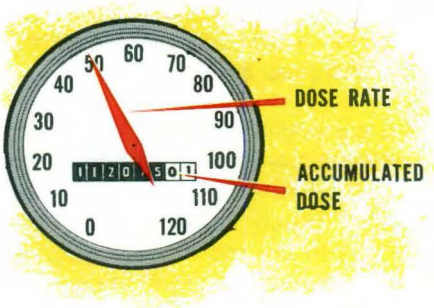
Rad—The rad is the basic unit of absorbed radiation dose. It is simply the label for a specific amount of any type of radiation received by any material—just as the word "yard" describes a specific distance. A millirad (one-thousandth of a rad) is the term you will hear more often. Millirad is written as mrad.

Rem—The rem is the amount of any type of radiation which causes the same biological effect as one rad of x-ray or gamma radiation. It is the appropriate term to use as the unit for a radiation dose. Millirem (one-thousandth of a rem) is written as mrem.

Roentgen—The Roentgen (pronounced runt'gen) is also a unit of radiation measurement, but is limited to x-ray and gamma radiation as measured in air. Roentgen is commonly written and referred to as an R, a milliroentgen (one-thousandth of an R) is written as mR.

Dose and Dose Rate:

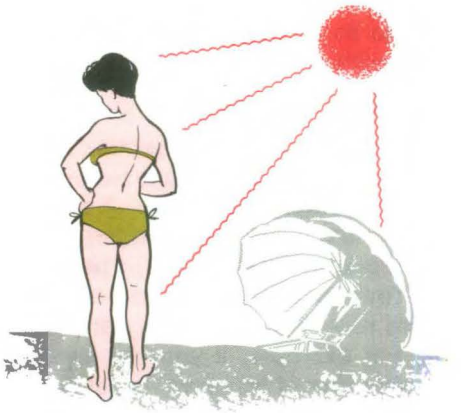
Often you will hear the terms "dose" and "dose rate." There is an important difference between the two. A **dose** of radiation is the quantity of radiation you have received over a certain period of time. Your dose **rate** is the rate at which you are receiving radiation at any given time. For example, if you are exposed to a dose rate of 50 mrad/hr, after half an hour the dose you receive would be 25 mrad; after an hour, 50 mrad; after two hours, 100 mrad. It is like the speedometer in your car. It tells you how



fast you are traveling (dose rate, speed) and how far you have gone (dose, distance).

EXPOSURE LIMITS

Danger from radiation is determined by the amount of exposure received. It is like being exposed to the sun—if you get too much, you get sunburned!



Here at Hanford, your chances of being "overexposed" to radiation are very remote. Those chances depend, of course, on how well you understand and follow the radiation protection rules and procedures designed for you.

Specific permissible occupational radiation exposure limits have been established by the ERDA. These limits determine how much radiation you can receive in the course of your employment. You could be exposed at or below

these levels for the rest of your life without harming your health.

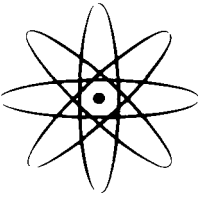
The radiation protection program is designed to assure that your exposure to radiation is controlled within the prescribed limits.

RADIATION MONITORING (RM)

Radiation Monitoring is the organization which provides applied radiation protection services. Many of the staff members who work directly with you to provide this service are called Radiation Monitors. These services include:

- establishing Radiation Zones
- measuring personnel dose rates
- measuring surface and airborne contamination levels
- establishing protective equipment requirements and other instructions for Radiation Zone work
- performing or guiding personnel decontamination.

In many cases, Radiation Monitors will make recommendations—and sometimes even insist—that you do things a certain way. Do as he says. He knows what he is doing.



The Radiation Monitoring organization also provides the following services:

- issuing, collecting, reading and controlling personnel dosimeters
- maintaining personnel exposure records
- initiating Radiation Work Procedures
- controlling exposure.

EXPOSURE MEASUREMENT

Personnel Dosimeters

Employees are issued personnel dosimeters which measure the amount of radiation received from sources outside the body.

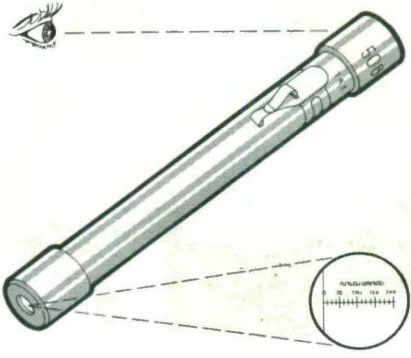
A multipurpose thermoluminescent dosimeter (TLD) is issued to each person who routinely enters and works in Radiation Zones. This dosimeter measures the dose from beta, gamma, and neutron radiation. It is exchanged either monthly or quarterly, depending upon job assignment.

A basic TLD is issued to persons who do not routinely work in Radiation Zones, but who may be assigned to areas where they are required. This dosimeter is exchanged at the end of each calendar year.

Self-Reading Pocket Dosimeters

Self-reading pocket dosimeters, commonly called "pencils", supplement the personnel dosimeters by providing a measure of the radiation dose on a daily or weekly basis as it accumulates. They may be issued to employees doing Radiation Zone work.

PENCIL



After the pencils are issued, they are normally read and recharged (zeroed) weekly. The readings are used as a guide for radiation exposure control. Pencils can be read anytime by simply holding them up to a light source and viewing the position of the hairline image on the graduated scale. They detect penetrating (gamma or x-ray) radiation, only.

Pencil Charging (Zeroing)

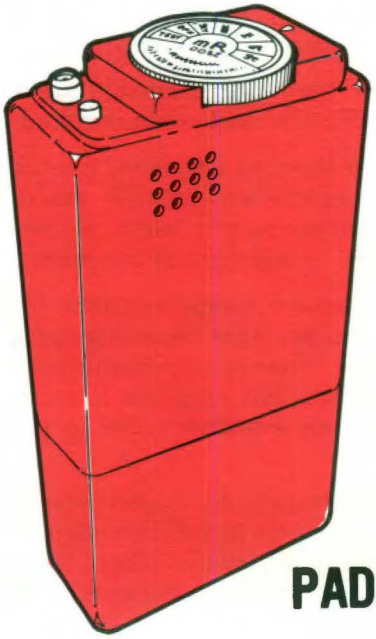
The self-reading pencil is a valuable dosimeter only if it is properly treated and charged. Anytime a pencil result is questionable, bring the pencil to a Radiation Monitoring office for evaluation. Radiation Monitoring will charge and re-zero the pencil dosimeter for you.

Finger Ring Dosimeters

Certain work locations may require that you wear finger ring dosimeters in addition to your personnel dosimeter. These dosimeters measure the exposure to your hands and are required when the radiation exposure to your hands may be significantly higher than the radiation exposure to the rest of the organs of the body.

Pocket Alarm Dose Integrator

In addition to the personnel dosimeters and self-reading pencil, a Pocket Alarm Dose Integrator or PADI may be used where the dose rates are high. The PADI can be preset for a given radiation



PADI

dose. When the preset dose has been reached, a warbling alarm will sound; thus signaling the wearer to leave the Radiation Zone.

Other Dosimeters

Certain work locations may require that you wear other types of dosimeters on a case-by-case basis. You will be issued these dosimeters and instructed in their use when they are required.

USE AND CARE OF DOSIMETERS

It is the responsibility of every individual who is issued a dosimeter or other measurement device to:

- afford them reasonable care;
- turn them in, exchange them or have them read when required;
- wear them as instructed (personnel dosimeters and pencils are to be worn above the waist, below the neck, on the front of the body);
- make every reasonable effort to prevent them from becoming contaminated. When contamination is known or suspected, they are to be made promptly available to RM for proper action.
- notify responsible supervision when they become lost or damaged. If lost while in a Radiation Zone, the individual shall leave the zone immediately.

- notify responsible supervision immediately when it is discovered that assigned dosimeters are inadvertently forgotten after entering a Radiation Zone.

Note: Deliberate exposure or tampering with assigned dosimeters will be cause for immediate disciplinary action or termination.

INTERNAL DOSE

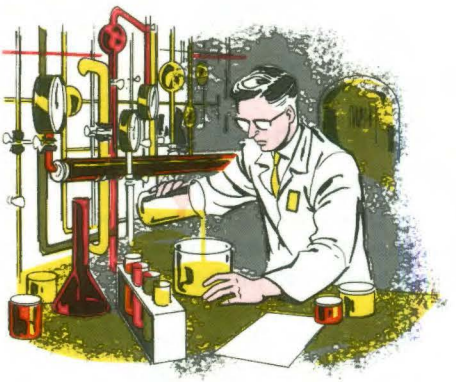
Individuals who routinely work in Radiation Zones will receive periodic checks to determine if radioactive material has been taken into the body. The frequency of such checks depends upon the types and amounts of radioactive materials and the individuals' involvement with them. The two methods normally used to detect and measure radioactivity in the body are bioassay and in vivo counters.

BIOASSAY

Radioactive material taken into the body through the mouth, the nose, or breaks in the skin are totally or partially eliminated through the urine. If both the quantity of material eliminated and the rate of elimination are measured, the amount of material contained in the body and the internal radiation dose can be determined and evaluated.

Bioassay samples may be requested following certain job assignments.

Each individual will be notified when scheduled to submit a sample. In some cases, resampling may be necessary. If resampling is required or if any significantly high sample result is reported, the individual involved will be notified.

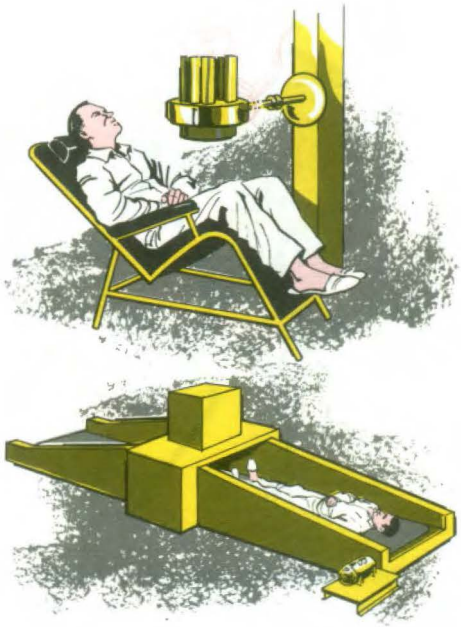


IN VIVO COUNTERS

In vivo counters are extremely sensitive instruments capable of detecting and measuring very small amounts of radioactive material in the body. The types of counters most frequently used are whole body counters and lung counters. You may have already experienced a "count" from one of these instruments when you were hired.

The counting program is administered in much the same manner as the bioassay program, except that periodic whole body counts will normally be scheduled in conjunction with the individual's medical examination.

Special whole body and/or lung counts may be scheduled for individuals involved in incidents where the ingestion of radioactive material is suspected.



MASK FITTING

Employees who routinely enter Radiation Zones may, at any time, be required to wear respiratory protective equipment. In order to receive full protection from such equipment, it is important for individuals to know their mask size or if a proper mask fit can be obtained.

Mask fitting and training is required for all individuals who may be required

to wear a mask during job assignments or in emergency conditions. Fittings and training may be conducted at the time of hire-in or in conjunction with medical examination.

It has been determined that individuals with beards, long bushy sideburns or long hair cannot obtain an efficient mask seal with the face. If a proper seal cannot be maintained, the individual shall not enter an area where masks are required.

RADIATION DETECTION

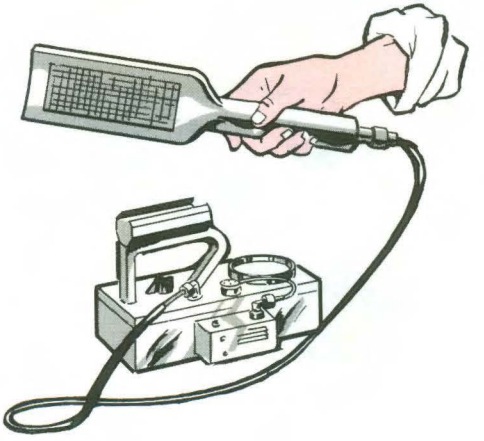
It was mentioned earlier that since you can't see, hear, feel, taste or small radiation, special instruments are needed to detect and measure its intensity. Some of the more common types of

instruments you will see being used for such purposes are described on the following pages.

POPPY OR PAM

The poppy or PAM is used to detect alpha radiation. Buildings where plutonium is stored or handled have these instruments stationed at room exits, in corridors, and in change rooms. It's called a "poppy" because it makes a popping noise through a speaker when the probe is held close to a source of alpha radiation.

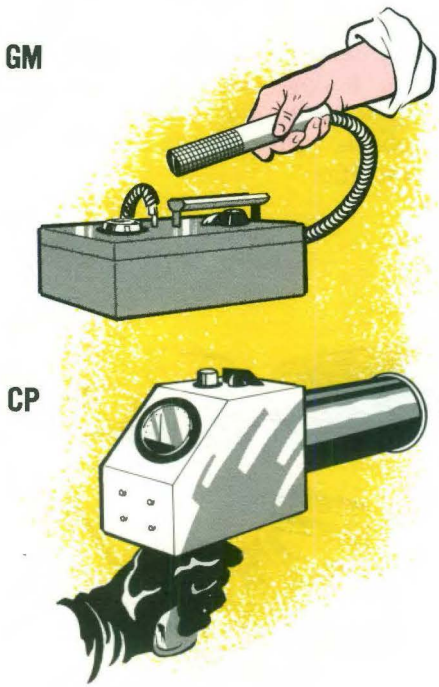
PAM



GEIGER-MUELLER COUNTER (GM)

This instrument is the well-known "Geiger Counter" that uses a Geiger-Mueller tube as the detecting device.

The GM tube is sensitive to both beta and gamma radiation. When radiation penetrates the thin wall of the GM tube, it causes pulses of electric current to jump across the tube. The pulse rate (in counts/minute) is indicated on a dial and can also be heard on headphones or speaker.



CUTIE PIE (CP)

The CP is used to measure dose rates. Its pistol-like barrel is an ionization chamber which measures both beta and gamma radiation. There is a mov-

able shield that can be placed over the end of the barrel to shield out the beta radiation. The response is read from a dial on the face of the instrument.

HAND AND SHOE COUNTERS

In buildings where radioactive material is present, special instruments called "Hand and Shoe Counters" are located near Radiation Zones and main building exits. These counters will show you in a few seconds if your hands and shoes are contaminated.

"Warning Levels" are posted on each counter. If the number of counts exceeds the warning level for either your hands or your shoes, remain at the counter and have someone notify your foreman or supervisor and a Radiation Monitor.

If you are working in buildings that have these counters, check your hands and shoes regularly—especially before you eat or leave the building.

RADIATION AND YOUR JOB

The first part of this booklet is written to give you an introduction to radiation and acquaint you with some of the terms that relate to radiation here at Hanford. However, if you work with or near radiation or radioactive contamination, you will need to become familiar with many additional details, procedures, and precautions for your continued guidance, protection and safety.

BEFORE ENTERING A RADIATION ZONE

Radiation and Work Procedures

Entry into a Radiation Zone for any reason requires authorization and instructions in the form of a Radiation Work Procedure (RWP).

Sometimes, a certain Radiation Zone may have different jobs going on at the same time—each covered by a different RWP. It is very important that you know which one to use and know

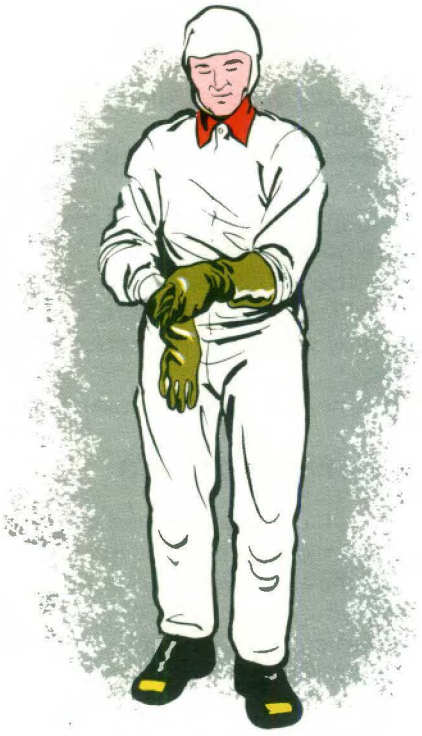
exactly what the particular radiation protection requirements are. RWP's provide the following information:

- dose rates (if they are known in advance),
- the work to be performed and the location,
- radiological conditions and monitoring requirements,
- protective equipment requirements,
- special instructions and precautions that are necessary to perform the work,
- personnel dosimeter requirements.

PROTECTIVE CLOTHING

Protective clothing is provided for Radiation Zone work to prevent the spread of contamination to your personal clothing or to your body. The RWP written for the particular job will tell you what protective clothing is required.

The amount and kind of protective clothing required depends upon the amount and kind of contamination in the work location. In some places, a lab coat and shoe covers will be all that is required. Other places will require two pair of overalls, a cloth hood, rubber coated gloves over surgical gloves, and canvas boots with rubbers or rubber boots over them. A full face mask may also be required to prevent your breathing contaminated air. All these items are necessary in order for you to be protected while working in highly contaminated zones. So for your own



safety, its important that you take full advantage of this protection. Here are some important items for you to remember.

1. Read the RWP carefully so you know exactly what clothing is required for the job. Then follow the instructions to the letter.

2. Don't wear any protective clothing that has a hole in it.

3. Be sure the clothing is the right size for you. Obviously, you aren't very well protected if your shoe covers or rubbers are so loose they slip off or your coverall sleeves are too short.

4. When wearing an assault mask, be sure you have a good fit so air can't leak in around the edges, and that the canister or filter is properly in place. Always take a mask from a sealed plastic bag. This means it has been cleaned and sterilized.

5. Protective clothing that is provided for Radiation Zone work is to be used only for that purpose. They are not to be worn in offices, or lunchrooms, or in buildings where they are not allowed.

PERSONAL EFFECTS

When the RWP specified, "no personal outer clothing", this means that your ordinary outer clothing—trousers, shirt, coat or sweater—may not be worn into the Radiation Zone beneath your protective clothing. Any personal clothing that becomes contaminated due to your disregard of these instructions will be taken from you. If they cannot be decontaminated, they will not be returned.

Reimbursement will be made for contaminated personal clothing and effects that are permitted in a Radiation Zone provided that the requirements of the RWP are followed and there is no carelessness or negligence on the part of the individual.

Unless specific authorized approval is given, the following personal effects are the only items permitted to be worn or taken into Radiation Zones when the RWP specified "no personal outer clothing".

- underwear,
- shoes,
- socks,
- glasses, hearing aids, or other devices necessary for the safety of the individual.

TIMEKEEPING

Each person who enters and works in a Radiation Zone is expected to keep an accurate estimate of his accumulated whole body penetrating exposure. Your self-reading "pencil" provides you with an excellent method for this purpose—simply read your pencil before entering the zone and after you leave.

However, when work is performed in locations where dose rates are high, a timekeeper will be assigned to keep track of your exposure for you. Radiation Monitoring and your foreman or supervisor will instruct you on the procedures and requirements that are to be followed when it is necessary for you to work in such locations.

TOOLS AND EQUIPMENT

Check with your foreman or supervisor before taking any tools and/or equipment into a Radiation Zone. Most zones have "regulated" tools and equipment

that are stored and maintained for use at the work site. It may not be necessary to take new or "clean" tools with you to do a job. If tools are taken into a Radiation Zone, they must be surveyed and released (be free of contamination) by RM before they can be used outside of a Radiation Zone.

YOUR OWN "PHYSICAL CHECK-UP"

Before entering a Radiation or Contamination Zone, look over your hands and forearms carefully for cuts, scratches, scabs or blisters. If any are discovered, report to your foreman or supervisor—they must be examined by First Aid and be adequately protected before you can be allowed to work in a zone.

MONITORING

When you enter a Radiation Zone to do a job, a Radiation Monitor may go along with you to establish dose rates and check for contamination. In cases where you enter a Radiation Zone without a Radiation Monitor and have questions about conditions, do not proceed until you obtain adequate information. Remember, the Radiation Monitor's job is to assist you in performing your job in the safest possible manner.

INSIDE A RADIATION ZONE

Now that you are actually inside a Radiation Zone and ready to perform your job, there are some very important rules and precautions you must follow.

- Make sure you are wearing all required dosimeters and wearing them properly.
- Eating, smoking, or chewing is not permitted.
- Never remove any article of protective clothing while you are working (except when instructed to do so, or in case of emergency).
- Know how much exposure you are allowed to receive.
- Conserve your exposure. If you aren't actually performing work, wait in the lowest possible dose rate field until you are needed.
- Assume everything inside the zone is contaminated. Don't sit on objects unless you know the radiation levels.

- Know what you are going to do—don't try shortcuts. Do your job quickly, safely, and thoroughly.
- Leave the Radiation Zone immediately and contact your foreman or supervisor if:
  - personnel dosimeters are lost or damaged,
  - a break in the skin occurs or failure of protective dressing applied at First Aid,
  - skin contamination is discovered,
  - you are sprayed or splashed with suspected contaminated liquid,
  - fire breaks out. If your foreman or supervisor is not immediately available, notify the fire station by phone or emergency fire alarm,
  - told to do so by Radiation Monitoring.

LEAVING A RADIATION ZONE

When you leave a Radiation Zone, there are still more precautions that must be taken. There is always the chance of spreading contamination.

STEP-OFF PADS

The step-off pad is the primary method for controlling the spread of contamination outside Radiation Zones. When you encounter a step-off pad, the instructions you see written on the pad are to be followed to the letter. For example, if the pad says "Before Stepping Here, Remove All Outer SWP Clothing"—you remove your outer clothing

before stepping on the pad. The important thing to remember is that you are moving from a contaminated zone to a "clean zone" and you want to leave all contamination behind you. If you are working in an outside Radiation Zone, there may not be a step-off pad at the exit. In those cases, the same clothing removal procedures apply, except you remove them at the Radiation Zone boundary (chain, rope, etc.).

PROTECTIVE CLOTHING REMOVAL

Laundry hampers and/or carts are provided at Radiation Zone exits for the collection of protective clothing. You should use extreme care when removing this clothing. Avoid bringing your bare skin in contact with any of the outer surfaces of the protective clothing. Be particularly careful to avoid brushing your gloved hands against your face, neck, or body.

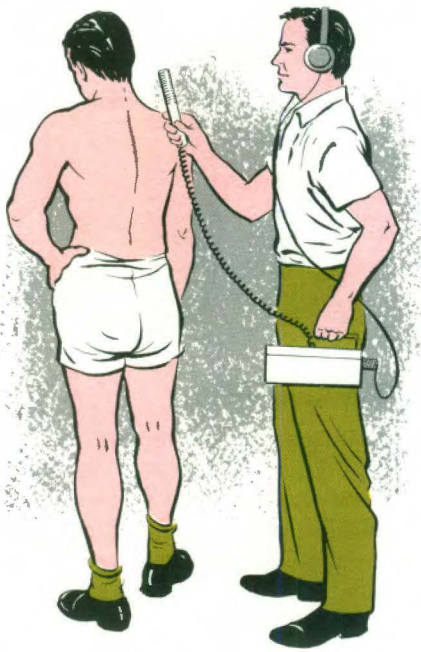
PERSONAL SURVEY

A personal contamination survey will always be required after leaving a Radiation Zone. A hand and shoe count is the minimum requirement. A complete whole body personal survey by a Radiation Monitor may be required by the RWP.

For your own protection, you should have regular personal surveys—**always** before eating or after leaving a Radiation Zone, and before leaving the building or going home. If your RWP specifies a complete personal survey, a hand and shoe count alone is never a safe substitute.

Release of Tools and Equipment

Also remember, that any tool or article that you took into the Radiation Zone is potentially contaminated and must be surveyed and released by Radiation Monitoring before bringing it back out again.



IN CASE OF TROUBLE

Minor Injuries

In many Radiation Zones radioactive material could enter the body through

breaks in the skin. In the event you get a cut, scratch, or puncture, you are to:

1. Leave the zone and notify your foreman or supervisor, or the Radiation Monitor.

2. Obtain a survey of the injured area. Then report to the nearest First Aid Station for treatment. Be sure to tell the nurse that the injury occurred in a Radiation Zone.

3. If Radiation Monitoring is not immediately available, proceed to the nearest supply of cold running water and flush the wound for a full five minutes while gently massaging toward the wound to promote bleeding. Proceed to the nearest First Aid Station. Inform the nurse that the injury occurred in a Radiation Zone, but you did not obtain a survey.

Major Injuries

In the case of major injury such as broken bones, severe bleeding, shock, or unconsciousness, immediate medical treatment takes priority over normal Radiation Zone procedure. At the same time, it is important to prevent contamination from getting into a wound or being tracked to First Aid.

First Aid, Radiation Monitoring, and supervision is to be notified as soon as possible.

SKIN CONTAMINATION

If radioactive contamination is discovered anywhere on your skin, notify your foreman or the **Radiation Monitor** as soon as possible. You should not attempt to remove the contamination yourself. Skin decontamination should be performed or directed only by qualified persons.

There is one situation, however, when you must act on your own, and act quickly. If you are sprayed or splashed with acid or caustic solution—get running water on the area as quickly as possible. Then, notify your foreman or supervisor.

CONTAMINATED PERSONAL CLOTHING

If radioactive contamination is discovered on your personal clothing, remove the item(s) immediately and notify your foreman or supervisor and Radiation Monitoring. In many cases the items can be decontaminated and returned. Never attempt to decontaminate any item without qualified assistance. Release surveys are made only by Radiation Monitoring.

If decontamination is unsuccessful, the items will be identified and held until an agreement is reached for reimbursement.

CONTAMINATED DOSIMETERS

If radioactive contamination is found on your personnel dosimeters, notify your foreman, supervisor, and Radiation Monitoring. Prompt removal of the contamination is imperative.

FIRE IN A RADIATION ZONE

If fire breaks out in the Radiation Zone, it is possible for the smoke and flames

to carry radioactive particles into the air. Leave the zone immediately and notify your foreman or fire station. By remaining in the zone, you take the risk of breathing contaminated air.

EXCESSIVE DOSE

If for any reason you suspect you have received an excessive or unusual amount of external radiation, or may have taken radioactive material into your body, notify your foreman, supervisor, or the Radiation Monitor as soon as possible. The situation will be thoroughly investigated to determine your internal and/or external dose.

EMERGENCY SIGNALS

Here at Hanford, we have emergency signals to warn people of high-level radiation, fire, criticality, and civil defense emergencies which require evacuation and/or take cover. You should learn these signals, what they mean

and what action you should take when you hear one of them. You will be given more information and instructions about emergency signals and action at your assigned work location.

To hear a recorded message of the different Emergency Signals, call 942-2345.

Notes: