NANTeL

Generic Plant Access Training

Content Document

Effective Date

December 2018

The purpose of this document is to provide the content that a student sees when taking this course. This document satisfies the requirements of the American Nuclear Insurers for being able to reproduce historical content for the course.

This document can also be used at a site for purposes of creating study guides or lesson plans as required by individual site procedures.

Revision History*

Rev. #	Reason for Revision	Updated by:
Rev 10 (11/19/2016)	Revised for HHR implementation	B. Wood
Rev 11 (12/22/2018)	Added respirable silica	**Warren Prince**

* **Note: This document format effective June 30, 2016 for all future revisions.**

Objectives

Making Nuclear Power Objectives

Describe the basic process used to produce electricity at a nuclear facility.

Understanding Radiation Objectives

Define “fission,” "radioactive material," "radiation," "contamination," and "dose, " and state the difference between radioactive material, radiation, and contamination.

Define "background radiation."

Contrast the average amount of radiation received by radiation workers and members of the general public.

Identify potential long-term effects from exposure to low levels of radiation.
Contrast the risk of working in a nuclear facility to the risk in other industries.

Accessing the Plant Objectives

State purpose and the function of the Security Department.

State individual responsibilities regarding complying with Security rules (oral and written).

Identify areas of the station that are controlled by Security including the Owner Controlled Area, Protected Area, and Vital Areas.

Describe the procedure for entering and exiting the Protected Area and security doors such as those used for vital areas.

State when Security personnel may perform physical searches.

State where and when security photo identification badges will be worn and the actions to be taken if lost or found.

Identify materials/items that are prohibited in the Protected Area.

Describe escorting responsibilities.

State the action(s) to be taken upon discovery of an unescorted visitor or an individual without a security badge.

Define "tailgating" and explain why it is not allowed.

State the purpose of the exit portal contamination monitor.

Working on Site Objectives

State the function of the following station departments:

- Operations
- Maintenance
- Radiation Protection
- Training

– Quality Assurance/Quality Control

– Emergency Planning

– Safety

State individual responsibilities regarding the following policies:

– operating plant equipment

– working on plant equipment without authorization

– reporting problems for resolution

– complying with radiation protection rules (oral and written)

Describe the nuclear safety culture.

State the company policy regarding procedure compliance and use of controlled documents.

State individual responsibilities regarding station cleanliness and housekeeping.

Identify steps involved with self-checking and state conditions that require self-checking.

Discuss individual industrial safety responsibilities regarding reporting of problems, unsafe working conditions or industrial safety near-misses.

Regarding Quality Assurance:

– State the function of the Quality Assurance (QA) program.

– Identify individual responsibilities regarding QA.

– State the authority of QA personnel.

– State the purpose of QA audits and surveillances.

Regarding Quality Control:

– State the function of the Quality Control (QC) program.

– Identify individual responsibilities regarding QC hold points.

– State the authority of QC inspectors.

– State the company policy on harassment of QA/QC personnel.

State individual roles and responsibilities regarding the reporting of potential items of noncompliance.

Explain the purpose of the Employee Concerns Program.

Explain how to report nuclear safety concerns to the Nuclear Regulatory Commission (NRC).

State the purpose of the emergency plan and the need for accountability during an emergency.

State the classifications of station emergencies.

State the policy concerning the release of information to the public and news media regarding an emergency.

State the purpose of personal dosimetry.

State the colors and symbols used on radiological postings and the methods used to identify radiological areas (for example, signs, ropes, tape).

State the action(s) to be taken if a radiological area or radioactive material is encountered.

Explain the following:

– consequences of willful misconduct

– how to report unusual behavior

– how to report conditions of vandalism or tampering

Identify the policy for control and handling of Safeguards Information.

Managing Industrial Safety Objectives

Discuss individual industrial safety responsibilities regarding the following:

- adherence to safety instructions (rules, procedures, and permits)
- reporting work-related injuries, accidents, and medical emergencies
- administration of first aid (if qualified)
- observation of safety postings, barriers, tags, and signs
- use of personal protective equipment including hard hats, safety glasses, protective footwear, hearing protection, and gloves
- general use of safety equipment such as eyewash stations, first aid kits, and safety showers

Recognize potential health hazards and methods for reducing the risks involved with the following:

– use of asbestos on some plant components

– electrical equipment

– steam leaks

– confined spaces

– trip, slip, and fall hazards

– heat stress

– compressed gases

– moving/rotating equipment

– high noise areas

– falling objects

– eye hazards

– hazardous chemicals

State where information may be obtained explaining the risks, hazards, and handling associated with a chemical or toxic substance.

State individual responsibilities regarding fire protection including the following:

- fire barriers such as fire dampers, doors, and seals
- actions to take upon discovery of a fire
- control of fire loading (wood, solvents, oil) and the disposal of flammable materials
- types of hot work requiring a permit

Why Take This Training

Nuclear power is a complex process. The United States has 23 electric utilities that run 99 nuclear reactors at 63 stations. These reactors produce about 19 percent of our country's electricity*.

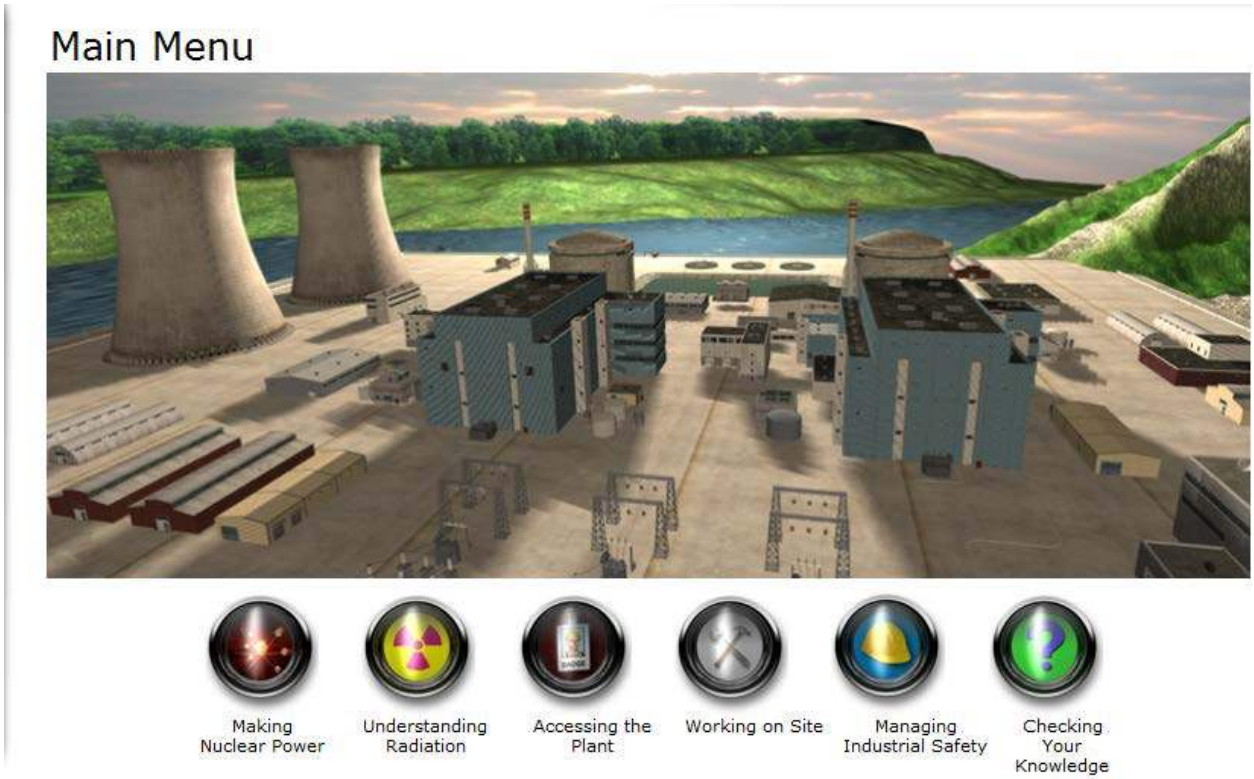
Like any industrial setting, a nuclear power station can be hazardous for workers. In addition, it is very important to protect the nuclear reactor from the work activities going on around it.

In this course, you will learn general information about how a nuclear station operates, what is expected of you, and how you can work safely all the time.

This course meets the Nuclear Energy Institute's objectives for generic training of all nuclear plant workers.

Note: This course is a designated "Hard Hat Ready" course and will be accepted by all U.S. nuclear power plants. Any site specific requirements will be satisfied using site procedures, programs, and briefings.

**These numbers are accurate as of November, 2016.*

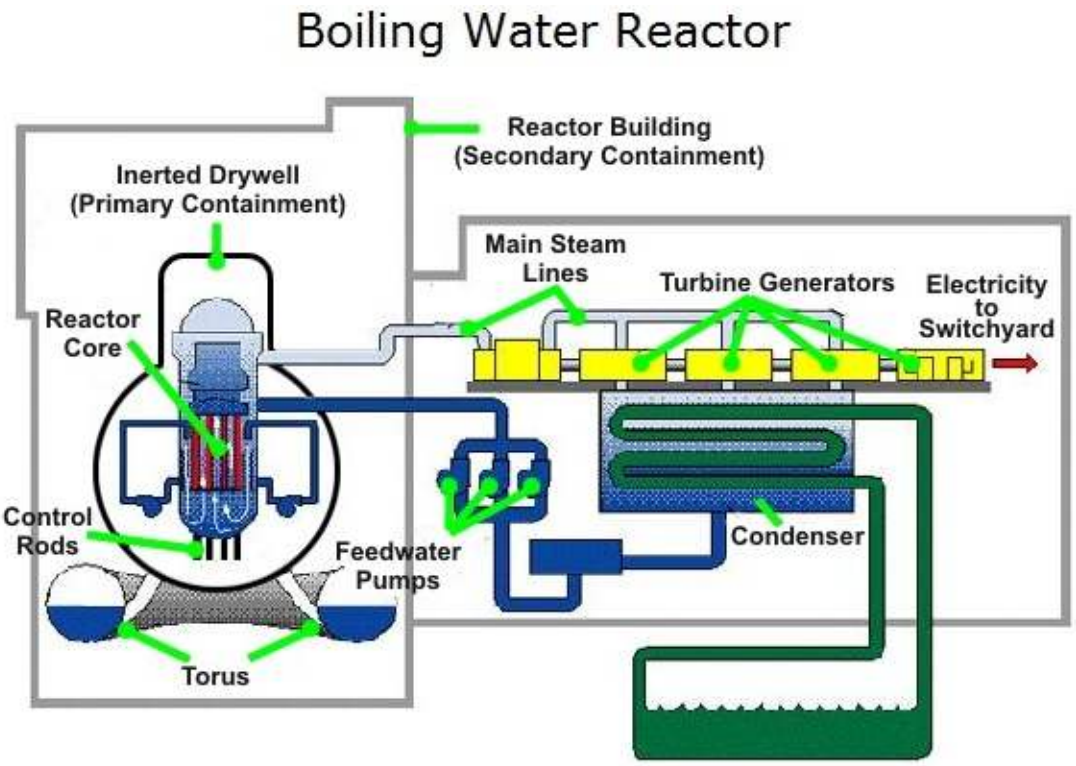


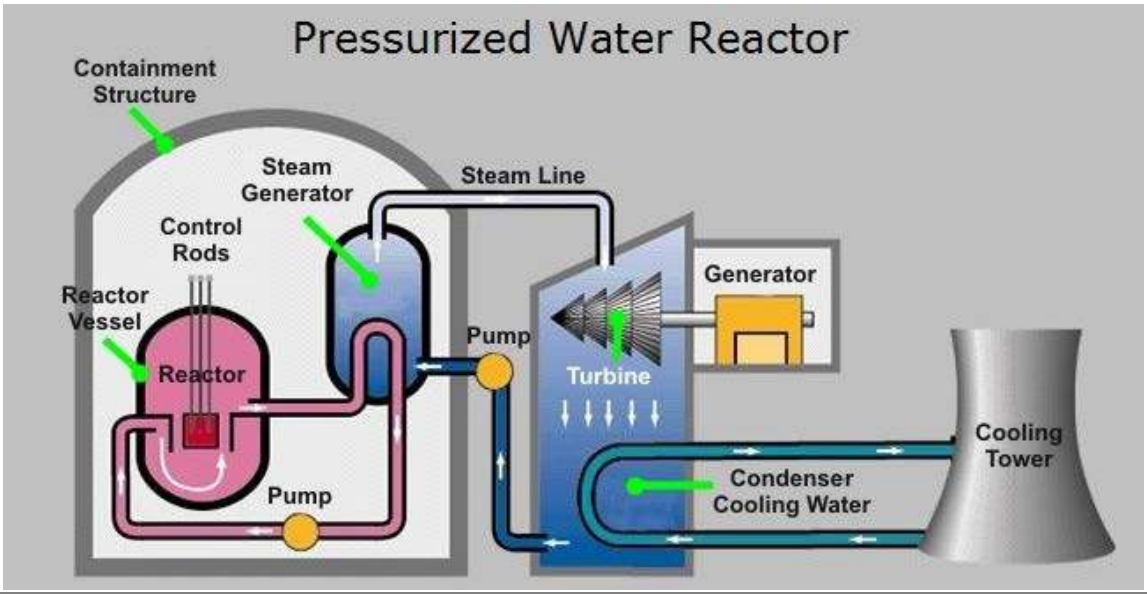
How Nuclear Power is Made

Note: video not available in printed material

PWR/BWR Comparison

The United States uses two types of reactors: Pressurized Water Reactors (PWR) and Boiling Water Reactors (BWR). The nuclear reaction process is the same, but how the water turns into steam is different.





	Pressurized Water Reactor	**Boiling Water Reactor**
Primary water/reactor coolant is heated in the reactor vessel but is kept under pressure so it **never turns into steam**. It runs continuously through a steam generator and back to the reactor.	**X**	
Water is heated in the reactor vessel and turns into steam.		**X**

As the primary water runs through the steam generator tubes, it heats the secondary water that surrounds them. **The secondary water turns into steam**.	**X**	
Steam flows into the turbine, spins the generator, and produces electricity.	**X**	**X**
Steam leaves the turbine, changes back to water, and repeats the process.	**X**	**X**

Summary: Making Nuclear Power

- The two types of reactors used in the U.S. are boiling water reactors (BWR) and pressurized water reactors (PWR).
- Both types of reactors use water heated by the fission process, called primary water (or reactor coolant) to create steam that generates electricity.
- PWRs use steam generators and a pressurizer to keep primary water separate from secondary water which passes through the turbine.
- BWRs do not have pressurizers or steam generators. The primary water is boiled to create steam that is sent directly to the turbine.
- In both BWRs and PWRs, the steam exiting the turbine is condensed back to water.

Understanding Radiation

Nuclear power creates electricity from nuclear fission. In this section, you will learn where radiation comes from and how it is measured. You will also learn about the potential health effects of radiation and why it must be carefully controlled.

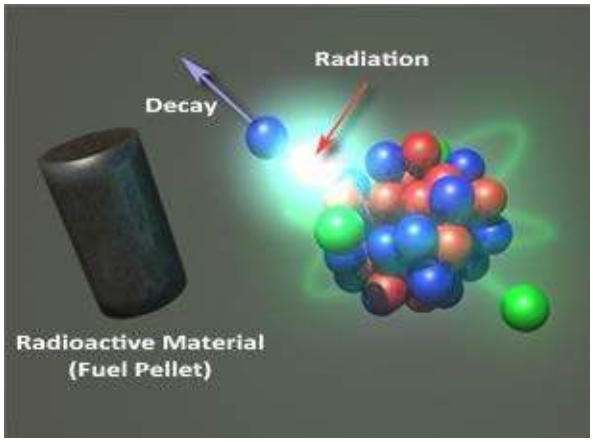
Nuclear Fission

A nuclear power plant produces electricity from the heat that nuclear fission creates. During fission, a neutron is absorbed by a uranium atom to make it split (fission). Neutrons are small particles inside the nucleus of an atom.

When the atom splits (fissions), it releases energy (heat) along with other neutrons. These neutrons are absorbed by other uranium atoms, creating a chain reaction that continues the fission process.

Note: video not available in printed material.

Releasing Radiation



When an atom splits (fissions) it creates unique materials and conditions that must be carefully managed.

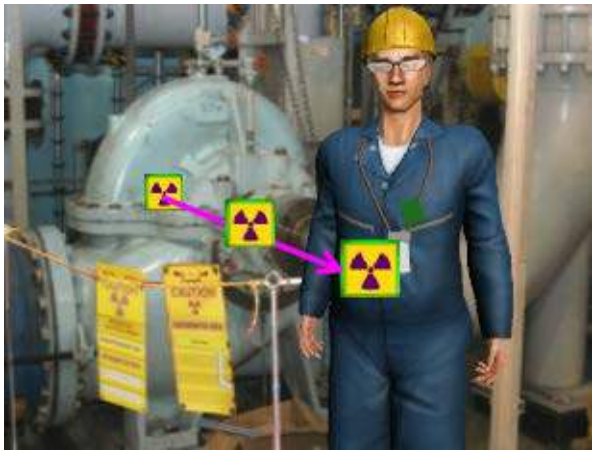
Some energy that is released when an atom splits is called radiation. The process of releasing radiation is called radioactive decay. This can occur naturally or in the controlled setting of a nuclear reactor, as you just learned. Anything that contains decaying atoms and releases radiation is called radioactive material.

Radiation pop-up: The *energy* that is released when an atom splits or decays.

Radioactive Decay pop-up: The process of releasing radiation is called **radioactive decay**.

Radioactive Material pop-up: Anything that contains decaying atoms and is releasing radiation is called **radioactive material**.

Measuring Radiation



Radiation is measured by the amount of energy released from radioactive material.

When the body or any specific organ is exposed to radiation, the amount of radiation received is called dose. This is measured in units called rem or millirem (1/1000 rem).

Dose pop-up: When the body or any specific organ is exposed to radiation, the amount of radiation that it receives is called **dose**. This is measured in units called **rem** or **millirem** (1/1000 rem).

Contamination

In a power plant, radioactive material needs to be carefully controlled. Contamination occurs when radioactive material gets outside the place it is intended to be. When this happens, the radiation it releases is no longer controlled. This can result in dose that is not tracked, which can be a health hazard.

Remember that contamination is radioactive material; radiation is the energy that the material releases.

Contamination pop-up: Occurs when a tiny particle of radioactive *material* gets outside the place it is intended to be. When this happens, the radiation it releases is no longer controlled.

Knowledge Check

Answer the following question by clicking on the correct answer.

Q: What is the unit for measuring radiation dose?

- Rem or millirem
- Becquerel
- Disintegration per minute
- Curie or microcurie

- Correct Answer: Rem or millirem

Putting It All Together

Think of all these radiological terms like your fireplace.

The heat that is released from the logs as they burn is like radiation that is released from radioactive material as atoms decay.

Suppose you open the glass doors to put a new log on the fire. Suddenly, burning hot ashes pop out all over you and the hearth. You and the hearth are now contaminated with ash embers, which can be spread to other places.

The hotter the fire and the closer you stand, the more heat (or dose) you receive. When the fire burns out completely it stops producing heat. Likewise, when radioactive decay stops, the radioactive material is no longer producing radiation.

Radiation/Contamination Exercise

Identify whether each of the items below is an example of radiation (energy) or contamination (material) by clicking the appropriate label.

✗ ○ Radiation

✓ ○

✗ ○ Radiation

✓ ○

✓ ○ Radiation

✗ ○

✓ ○ Radiation

✗ ○

✗ ○ Radiation

✓ ○

Background Radiation Dose






Background radiation is radiation everyone receives from natural and man made sources. Natural sources, such as the sun and some types of rocks, and man made sources such as medical treatments and x rays, contribute much more dose than occupational dose.

According to the National Council on Radiation Protection, background sources of radiation account for an average annual dose of over 620 millirem to people living in the U.S.

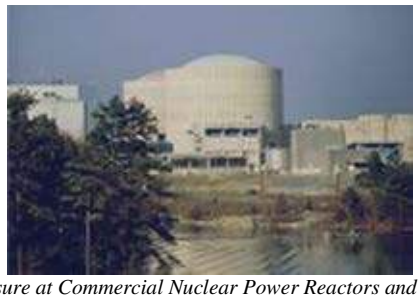
Occupational Radiation Dose

As a radiation worker, you will receive “occupational dose” from radiation on the job. This dose, on average, will be much less than what you receive from background radiation. According to the Nuclear Regulatory Commission (NRC), the average occupational dose received by a radiation worker at a nuclear power plant in the U.S. is 140 mrem (less than one fourth the amount of dose received from background radiation). Radiation workers will receive special equipment to monitor their dose.

Many workers at a nuclear plant are not considered radiation workers. Federal law limits their occupational dose to the same as members of the general public, which is 100 mrem per year.

Radiation Worker Occupational Dose

140 mrem**



***Source: "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities: Forty Seventh Annual Report" (NUREG 0713, 2016).*

Background Dose

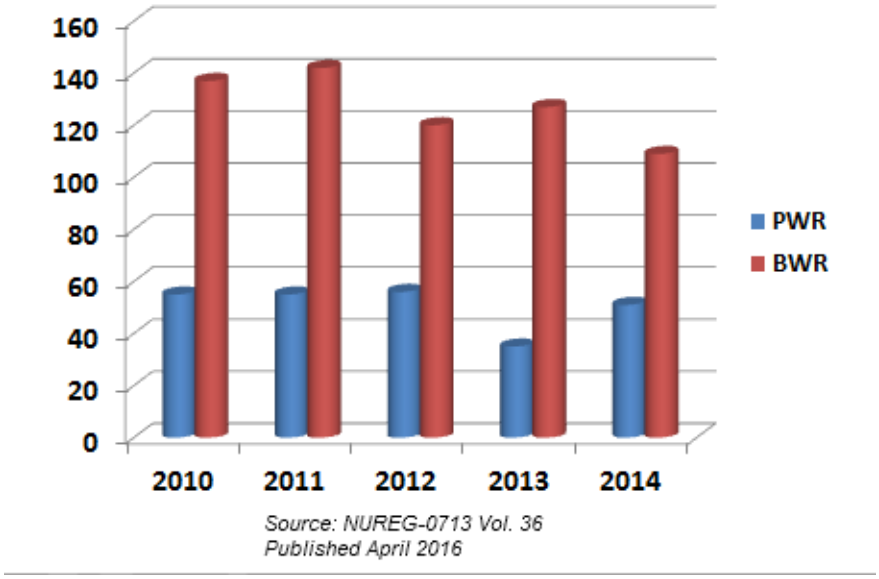
620 mrem*

**Source: "Ionizing Radiation Exposure of the Population of the United States (2009)," National Council on Radiation Protection and Measurements (Last updated November, 2014)*

Collective Radiation Exposure

Research shows that exposure to high levels of radiation increases the risk of contracting cancer and other illnesses. To be safe, we assume that long-term exposure to even low levels of radiation will slightly increase health risks. This is why radiation dose is kept as low as reasonably achievable (ALARA) in the plant.

Over the years the industry has worked to reduce the overall radiation dose to plant personnel as shown by these charts on collective radiation exposure.



Health Risks

The U.S. Nuclear Regulatory Commission (NRC) calculates that 1000 mrem of occupational dose per year (which is much more than the average amount received by radiation workers) increases the risk of contracting fatal cancer by .04 percent.

For example, if a group of 10,000 people could normally expect to develop 2500 cases of fatal cancer, exposing each person to 1000 mrem of occupational dose each year would

increase that number to 2504.

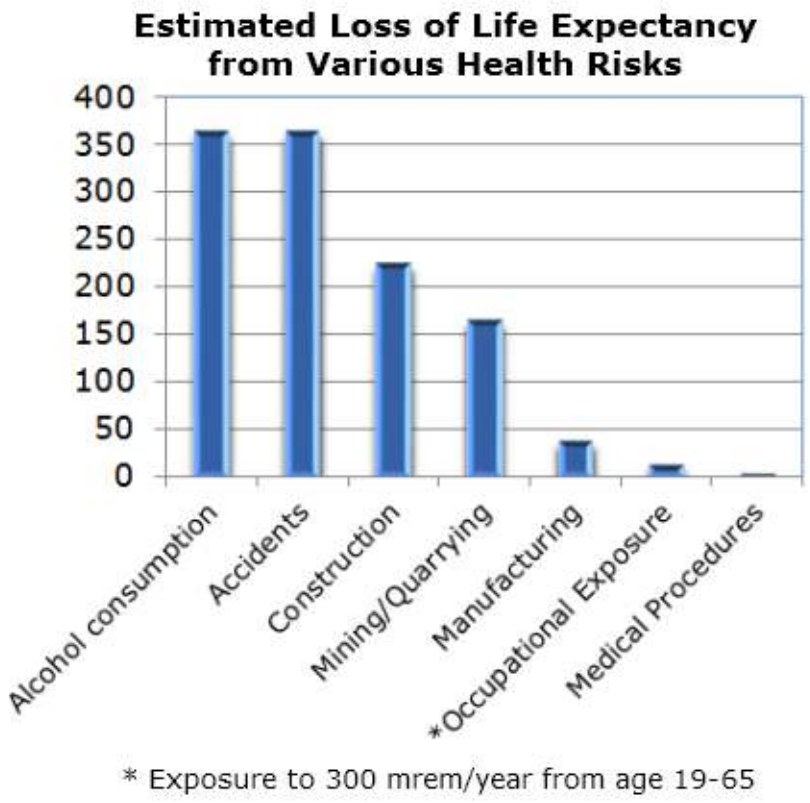
Age Sensitivity

In general, younger people are more sensitive to the effects of radiation, because their cells are developing more rapidly. Therefore, unborn children are at the greatest risk because they are most sensitive to the effects of radiation.

Most sensitive

Least sensitive

Comparison of Health Risks



The delayed effects from radiation exposure, such as contracting cancer, are not a good certainty. These increased risks can be described by how much they may reduce life expectancy for the average person. The chart identifies the average number of days lost based on the various health risks in each category.

Summary: Understanding Radiation

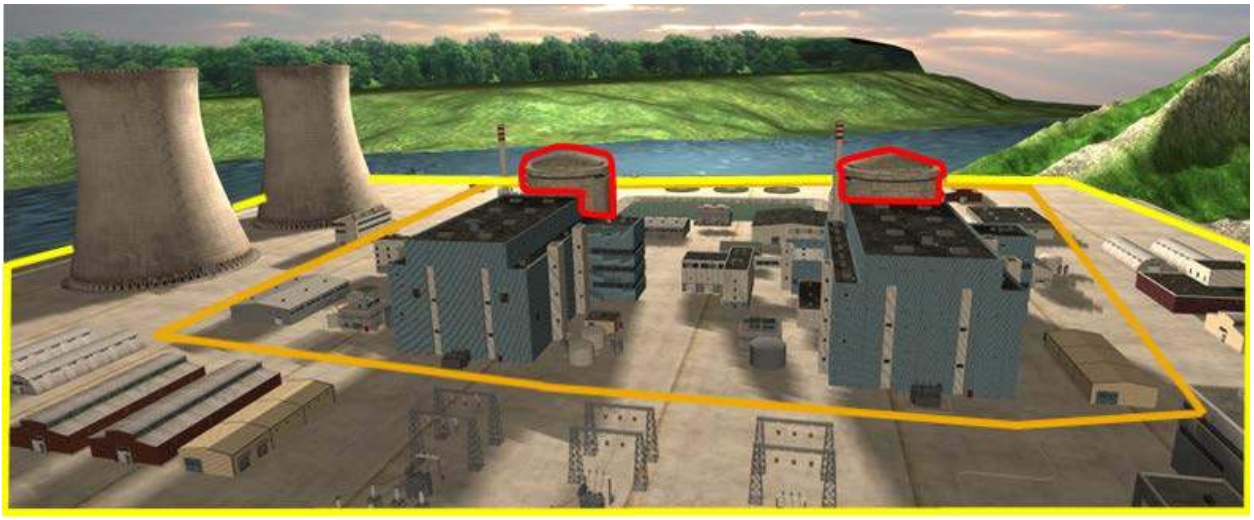
- Fission (radiological decay) is the process of splitting atoms in a chain reaction to release energy (called radiation).
- Contamination is radioactive material where it doesn't belong.
- Dose is the amount of radiation the body receives. It is measured in units called rem or millirem.
- Everyone is exposed to many sources of background radiation.
- The average dose for station workers from both background and occupational sources of radiation is 760 mrem per year.
- There are some health risks from exposure to high levels of radiation. Younger people

are more sensitive to these risks.

Accessing the Plant

Access to a nuclear plant is carefully controlled. In this section, you will learn about the three plant boundaries and how to gain access to certain areas of the plant. You will also learn the role of the Security organization and your responsibilities for supporting the security of the plant.

Security Areas



Nuclear plants are divided into three areas with different levels of security. C*lick the buttons to see the areas.*

Inside Yellow Line: The **Owner Controlled Area (OCA)** is all the company property immediately surrounding the protected area's security fence. Access is normally limited to people on official business.

Inside Orange Line: The **Protected Area (PA)** is inside the security fence. All of this area can be considered "the plant." You must have a badge issued to you by Security to go into the PA.

Inside Red Line: The **Vital Area (VA)** contains safety-related equipment inside the protected area. The failure or damage of safety-related equipment in the VA could prevent safe shutdown of the reactor and possibly endanger the public health and safety by exposure to radiation.

Access to a vital area requires additional authorization. If you are not sure of your authorization, contact Security **before** attempting to enter.

Although each site may have different types of card readers and turnstiles, the process is the same. Any site specific information will be provided in a site briefing.

Security

When you approach the plant, the first group you will encounter is Security. Security officers protect the plant and its workers, and protect against nuclear sabotage. Their responsibilities include the following:

- Control Protected and Vital Area access
- Issue access badges
- Control security doors within the plant
- Protect against the theft of special nuclear material

Everyone on site shall follow all written and verbal Security guidance.

Searches

All vehicles are subject to being searched when they first enter the Owner Controlled Area. They may be searched again at any time while on company property.

Everyone who enters the PA is subject to being searched along with anything they are carrying at any time while on site.

All searches are by implied or expressed consent. Signs explain the search policy. Passing these signs implies your consent. Anyone who refuses a search will be escorted

off company property and may have their access and possibly their employment terminated.

Prohibited Items

Many items are prohibited from being brought into the OCA and/or the PA. Be sure to check your station procedures to determine what is prohibited. Here are common examples:

1. fixed-blade knives not normally used at work
2. explosives
3. unauthorized weapons
4. incendiary devices
5. alcoholic drinks
6. illegal drugs
7. ammunition
8. repellant sprays such as mace

Any site-specific prohibited items will be provided at a site-briefing.

Boundaries Exercise

Drag and Drop exercise not included in printed material

Entering the Protected Area

Entering a nuclear plant is similar to going through airport security. When entering the Protected Area (PA) you will process through metal detectors and explosive detectors.

Hand carried items such as lunch boxes, back packs, purses, and brief cases/laptops must be examined using an X-ray machine or hand searched by a Security Officer. Most stations also have a hand reader or badge reader that identifies you before entering the PA.

Be careful of your conversation during this process. Jokes and comments about bombs or dangerous behaviors are taken very seriously.

Badges

Anytime you are in the PA you must wear your security photo ID badge. Wear it on the outer clothing of the upper front portion of your body. The picture must face out. Remember that if you take off your outer clothing, you must transfer the badge.

Control of your badge is essential. No one is allowed in the PA without a badge, and no one else may use your badge. If you lose it, check the immediate area first. If you cannot find it, notify Security immediately and wait for an officer to arrive. If you find a lost badge, notify Security immediately.

Security Doors and Boundaries

Security doors allow only authorized workers into sensitive areas.

- Do not hold or prop doors open unless you first get permission from Security.
- Always make sure doors close fully behind you.
- Do not make repeated attempts to gain access. If you have difficulty, call Security.
- Never tamper with locks, video cameras, or other detection equipment.

Any work that will breach the integrity of a protected or vital area boundary must be approved in advance. If you discover an opening in a security boundary, notify Security immediately.

Tailgating

Following a worker through a security door without using the card reader is called tailgating. This is prohibited. Tailgating bypasses security controls and prevents accurate accounting of personnel during an emergency.

Tailgating pop-up: Following a worker through a security door without using the card reader is called tailgating.

Escorting Visitors

All visitors must be escorted while in the protected and vital areas. Escorts must be authorized, badged employees with unescorted access to the areas they will enter.

Escorting visitors is an important function that involves serious responsibilities:

- Make sure visitors properly wear a visitor badge.
- Maintain visual control of visitors at all times. They may enter a restroom or locker room unescorted if there is only one entry/exit that the escort watches continuously.
- Make sure visitors are authorized by Radiation Protection management before entering radiologically controlled areas.

- Ensure visitors follow all plant policies and procedures.

Refer to your site procedures for the number of visitors you may escort in the PA and VA.

Returning Visitors to Security

When the visit is over, return visitors to the security access point. Do not leave until you are certain that the visitors have either left the PA or they are being escorted by other authorized personnel.

Transferring Escort Responsibilities

Escort duties can be transferred to another qualified escort, who then becomes responsible for the visitor.

If another escort cannot be found, escort your visitor back to the security access point. Improper escort of visitors can result in disciplinary action.

If you find an unescorted visitor or an individual without a security badge, report it to Security immediately.

If the individual refuses to follow instructions, contact Security. Do not attempt to physically force the visitor to comply with instructions.

Badging Exercise

Fill in the blanks by dragging a word into the proper space in the sentence.

side

knee

innermost

head

back

Correct Answer:

first blank: Head or waist
second blank: waist or head (not picked for first blank)
third blank: front
fourth blank: outermost

Knowledge Check

Answer the following question by clicking on the correct answer.

Q: When a visitor has completed their job, the escort should:

- Accompany the visitor to the Protected Area exit.
- Search the visitor's belongings to make sure no confidential material is leaving site.
- Thank them for coming and report back to normal duties.
- Call Security and let them know the visitor is on the way out.

Correct Anwer: Accompany the visitor to the Protected Area exit.

Exiting the Protected Area

As you exit the Protected Area you will pass through an exit portal contamination monitor.

The exit portal contamination monitor checks all employees for radioactive contamination. If the monitor alarms, stay in the area and notify the appropriate personnel based on your station's procedure.

Nuclear medical treatments such as thyroid tracers (iodine) or barium tracers can cause the portal monitor to alarm. If you have had this type of treatment, notify the appropriate personnel **before** you enter the PA.

Summary: Accessing the Plant

- The three plant boundaries are the Owner Controlled Area, Protected Area, and Vital Area.
- Security officers protect the plant and its workers and guard against nuclear sabotage.
- Everyone is subject to search by Security while on site.
- Workers must pass through metal and explosive detectors to enter the PA.
- A photo ID badge, properly worn, is required at all times in the PA.
- Entering a security area without using the card reader (tailgating) is prohibited.
- Escorts must maintain visual control of visitors at all times and ensure they follow plant procedures.
- The exit portal contamination monitor checks employees for contamination as they leave the PA.

Working on Site

In this section, you will learn about the special requirements for working at a nuclear power plant. They require every worker to follow special safety behaviors when working on site. You must follow procedures, use self-checking, practice good housekeeping, avoid protected equipment, and report possible safety problems. You also need to be aware of the functions of certain station organizations.

The Nature of Nuclear Power

Nuclear power is unique. It has special characteristics and hazards not found in other industrial settings.

A nuclear reactor has more energy stored in it than almost any other device in the world. Extensive safety systems control this energy, protecting the equipment from damage and protecting the public from harm.

Nuclear Safety Culture

Every nuclear plant worker has a responsibility to protect the reactor core and safety systems at all times. This means you must demonstrate key principles of a healthy nuclear safety culture:

- Take personal responsibility for nuclear safety in everything you do.
- Consider safety first when making every decision.
- Bring a questioning attitude to your work. If something doesn't feel right, stop and ask for help.

A successful nuclear worker respects the technology and protects the safety systems. The integrity of the reactor - and ultimately the health and safety of the public - depends on you.

Global Responsibilities

Workers have many different responsibilities depending on where they work on site and what their jobs are. However, every individual has certain responsibilities that apply at all times:

- Follow procedures.
- Use self-checking methods.

- Avoid protected equipment.
- Practice good housekeeping.
- Report problems.
- Protect safeguards information.

Following Procedures

Station procedures and other controlled documents ensure that work is performed consistently, in a quality manner, and in a logical sequence.

When a job calls for a procedure, be sure to use the latest approved version. It's always a good idea to review the procedure first and verify that all your tools and parts are available.

Procedures must be followed exactly as written. If you believe you can't follow the procedure as written for any reason, stop the job, put it in a safe condition, and contact your supervisor to resolve the problem.

Self-Checking

NOTE: video not available in printed material.

Self-checking is a mental process that helps you prevent human errors. This is especially important when a task could cause problems if it is performed incorrectly. Examples are as follows:

- manipulating a valve or component
- connecting test equipment
- opening panel doors
- entering radiologically controlled areas or confined space
- entering data on a log or document

Self-Checking

The self-checking process is easy to remember. Use the first letter in each step to form the word **STAR**:

Stop: Plan and prepare.

Think: Think about what you are supposed to do and what result you expect.

Act: Perform the action.

Review: Verify that you got the correct response.

Self-Checking Exercise

Type the name of each step in the STAR self-checking process in the boxes below.

S =

T =

A =

R =

Correct Answer:

S = Stop

T = Think

A = Act

R = Review

Protected Equipment

Although the equipment in a nuclear plant is built to very high standards, some components are sensitive to bumping or radio interference. Postings and barriers often surround these areas to prevent accidental contact or interference. Be aware of your surroundings to avoid accidental bumping of components.

During outages, extra barriers are put in place around equipment needed to cool the reactor core. These areas are identified as “protected” equipment.

When you see a posting for protected equipment, stay out of the area. Only authorized qualified workers and operators with specific briefings and oversight may enter these areas. It is not acceptable even to walk through an area marked as protected.

Outages pop-up: A time when the station is shut down for refueling or maintenance.

Housekeeping

Messy work area

Clean work area

You are expected to keep your workspace as neat as possible while you work and to clean up when the work is done. The goal is to leave the area cleaner than you found it. If you discover a housekeeping problem that you can't resolve, contact your supervisor.

Reporting Problems

During your day-to-day activities, you might find something that could be a safety problem. This can include the following:

- a wrong part on a safety system
- a valve out of position
- someone using an outdated procedure
- a fire or security barrier left out of position
- unsafe conditions like missing handrails or defective ladders
- a "near-miss" event where only luck prevented injury or equipment damage

Use the station procedure to report all potential problems so they can be reviewed and corrected. This usually begins with telling your supervisor.

Standard Reporting Processes

Most problems can be resolved through processes such as condition reports or action requests. Check with your supervisor to determine what type of system your station uses to report problems.

If normal means of addressing problems do not resolve the issue, you have the right to pursue it further.

Employee Concerns Program

Every station has its own Employee Concerns Program. Workers may confidentially or anonymously raise issues that might affect any of the following:

- health and safety of site personnel or the general public
- nuclear safety
- quality

- plant performance

Plant management wants and expects an environment in which workers feel free to raise concerns without fear of negative consequences. You have the right to address concerns without fear of intimidation, discrimination, or discipline.

Reporting Problems to the NRC

You may contact the Nuclear Regulatory Commission and request an inspection if you believe a regulation has been violated or if you know about unsafe radiological conditions or practices. Federal law protects workers from retaliation by the company when they file an inspection request.

The NRC will inform you in writing of the investigation results.

NRC Form 3

The NRC Form 3 is a notice to employees describing their rights and responsibilities at nuclear plants. Copies are posted throughout the site. The form shows a map of the NRC regions and includes their office phone numbers. To contact the NRC, find your region on the map and call the number for that region.

Whether you contact the NRC to report a concern or the NRC requests information from you while on the job, always provide complete and accurate information. Be open, honest, and cooperative about all aspects of work and its documentation.

Willful Misconduct

Any action by an employee or contractor to willfully violate NRC requirements or to cause the company to be in violation of those requirements is willful misconduct. This may include, but is not limited to, the following examples:

- recognizing a procedural violation and not taking corrective action
- falsifying records
- willfully providing, or causing someone else to provide, the NRC with inaccurate or incomplete information
- willfully withholding safety-significant information from supervisory personnel
- submitting false information to gain unescorted access to a nuclear station

Willful misconduct will not be tolerated. It may result in discipline up to and including termination or civil penalties, including fines and/or imprisonment.

Vandalism and Tampering

Report any plant conditions that might be the result of vandalism or tampering to the appropriate plant management. There are many examples, including the following:

- misaligned breakers or valves

- cut wires or cables
- foreign objects in machinery, reservoirs, or tanks
- inappropriate cuts or holes in pipes, tubes, or hoses
- damage to equipment that interferes with a safety or security function

Safeguards

Safeguards information describes the plant's detailed security measures. Safeguards documents are marked as such on every page. Only authorized individuals can see this information. It must be protected at all times and stored in an approved, locked container.

If you ever find safeguards information unattended, do not open it. Take possession of it and contact Security immediately. Unauthorized disclosure of safeguards information may result in civil and criminal penalties.

Station Organizations

Each organization on site has a different set of responsibilities.

Operations

The Operations Department is responsible for the “hands-on” control of the plant. The operators are involved in many plant activities, including the following:

- operating plant equipment
- placing protective tags
- approving most types of plant work
- controlling reactor power
- staffing the control room
- responding first to most problems in the plant

You should only operate plant equipment if you are qualified and authorized by the control room personnel or by procedure.

Maintenance


The Maintenance Department keeps the plant equipment in good operating condition. This group's work generally falls into two categories: repair and preventive maintenance. Maintenance personnel work on all types of plant equipment, including instruments, pumps, valves, and motors.

Only qualified, authorized personnel may work on plant equipment. All work on plant equipment must be approved before starting. If you are unsure of your qualifications, check with your supervisor.

Radiation Protection


The Radiation Protection (RP) Department is also called Health Physics at some plants. RP personnel limits the radiological exposure of workers and prevent the accidental release of radioactive material. RP activities include the following:

- escorting workers into high radiation areas
- monitoring radiation and contamination levels around the plant
- preparing radiation work permits (RWPs)
- controlling access to and from radiologically controlled areas

You are expected to follow all RP instructions (written and verbal).

Radiation Monitoring Devices (DLR)

There are two common legal records of your dose used in the nuclear industry:

- Thermoluminescent Dosimeter (TLD)
- Optically Stimulated Luminescent Dosimeter (OSLD)

Both dosimeters provide your dose of legal record (DLR) while working at a nuclear plant. They are very accurate and have no electronic or moving parts, which makes them extremely reliable.

However, they cannot be read by the user. They are read in a laboratory with specialized equipment.

The DLR is normally worn on the front of the body on the outer clothing between the neck and waist, just like a plant access badge.

Self-Reading Dosimeter (SRD)

Front of an self reading dosimeter.
This one has a beta window.

Top view of self reading dosimeter
showing the digital read out.

Because you cannot check your own dose using a DLR, self-reading dosimeters (SRDs) allow you to routinely check your dose while you are working.

The *Electronic alarming dosimeter* (EAD) is the most commonly used of self-reading dosimeters. The EAD shows your dose on a digital display and provides an audible alarm when it reaches a dose or dose rate limit. The EAD provides an approximate dose.

SRDs can measure gamma and beta radiation but are primarily used to measure gamma. This is more than adequate since MOST of the dose received by nuclear workers comes from gamma radiation. Dose from beta radiation is measured by the DLR as mentioned earlier.

RP Signs and Postings

Signs and postings warn workers about the location of radiological hazards. This prevents accidental exposure to radiation or radioactive materials.

These postings have a yellow background. The three-bladed (tri-foil) radiation symbol and lettering are magenta or black. Yellow and magenta rope, ribbon, or tape marks the boundary of a radiological hazard. These types of postings mean there is a radiological hazard behind them and the area is called a radiologically controlled area.

Be aware of your surroundings. Some areas that are not normally posted as radiological areas might be posted during special operations.

Radiation Areas and Material

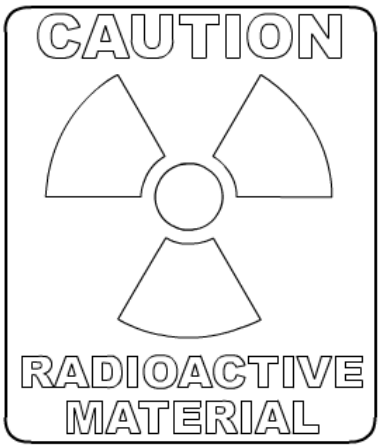
Unless you have completed radiation worker training, do not enter any radiologically controlled areas. This includes doing things such as the following:

- reaching across a boundary to retrieve a tool
- removing a cover with a posting on it
- working on a pipe marked with yellow and magenta tape
- entering a radiological area to pick up trash

Report any uncontrolled radioactive material or any suspected radioactive material found outside a radiologically controlled area to RP personnel.

Postings Exercise

Color in the radiological posting at the right. Click on a color in the palette first to select the color and then click on its location in the posting.



Correct Answers:

Training

The Training organization helps train and qualify workers for their jobs and has three main functions:

- Work with other departments to create training programs.
- Present training courses.
- Keep records on training and qualification.

Qualifications

Most jobs in the plant have specific qualification requirements before a worker can do them. This can include attending training classes, demonstrating skills in a laboratory, and working in the plant under supervision.

Qualifications can expire if you don't maintain them through continuing training and requalification activities. Always check to make sure your qualifications are current before starting a job.

Quality Program

All workers should take pride in their craftsmanship. Accept nothing less than high-quality work. Strive to do every job right the first time.

The station's Quality Program reinforces and supports this goal. It spot checks plant activities to ensure they follow procedures and meet certain standards. The program does this in several ways:

- monitoring plant activities
- reviewing programs
- inspecting safety-related parts and supplies

Program Components

The Quality Program ensures that the plant is meeting federal regulations and completing work according to documented instructions, procedures, and drawings.

The program has two components: Quality Assurance (QA) and Quality Control (QC). Each has a different function. *Click on each button to learn more.*

QA button pop-up:

Quality Assurance provides confidence that equipment and structures will work properly in service. QA personnel do not supervise work; they provide an independent check of completed work. They conduct periodic audits and surveillances, including the following:

- review of documentation and records
- inspection of job sites
- observation of activities

Surveillance pop-up: The act of observing activities and hardware, and/or reviewing documentation to verify conformance with specified requirements and to evaluate their adequacy and effectiveness.

QC pop-up:

Quality Control personnel conduct inspections and tests to verify that certain characteristics have been met. They also check compliance with documented instructions, procedures, and drawings.

A QC inspector may observe an entire job, review the documentation, or witness specific steps in the job. Inspection activities may include examining materials, taking measurements, testing products, and observing work.

QA/QC Authority

The NRC requires each nuclear plant to have a Quality Program. It is a federal offense to threaten, assault, or interfere with personnel conducting Quality Program duties. This is punishable by a fine and/or imprisonment.

QA and QC inspectors have the authority to stop work. If requested, put your work in a safe condition and then stop the work.

QC Hold/Witness Points

When performing work, your work documentation might call for a QC hold or QC witness point. Either of these requires you to contact QC personnel so they can observe the step. Call QC ahead of time to avoid waiting for an inspector.

Willful violation of a QC hold or witness point is subject to discipline up to termination.

QA/QC Exercise

Identify whether each situation relates to Quality Assurance, Quality Control, or both.

	Quality Assurance	Quality Control	Both
1. Ensures the plant is meeting federal regulations	x ○	x ○	✓ ◎
2. Conducts inspections and tests to verify that certain material characteristics have been met	x ○	✓ ◎	x ○
3. Provides independent checks of completed work through audits and surveillances	✓ ◎	x ○	x ○
4. Has authority to stop work	x ○	✓ ◎	x ○
5. May require you to hold a job for observation at certain steps (called "hold" or "witness" points)	x ○	x ○	✓ ◎

Check Answer

Please make a selection for each situation and then click "Check Answer".

Correct answers are shown

Emergency Planning

Every nuclear station has a plan for radiological protection of the public, employees, and the plant in case of an emergency. All station emergency plans are similar, with some differences based on plant design, location, and organization.

There are four types of emergency classifications:

- Notification of Unusual Event (least severe)
- Alert
- Site Area Emergency
- General Emergency (most severe)

An emergency is declared and the classification is chosen based on plant conditions. The classification can change as the conditions change.

Accountability

In an emergency, everyone inside the Protected Area must be accounted for. If an evacuation is necessary, you will hear an alarm followed by an announcement. You will be told when to leave, where to go, and how to get there.

After listening to the announcement, take the following actions:

- Place any equipment and work in progress in a safe condition.
- Escort all visitors to Security or another location identified by site procedures.

- If you are in a radiologically controlled area, exit normally unless told otherwise.

If you are not part of the emergency response team, proceed as directed to the assembly or evacuation area.

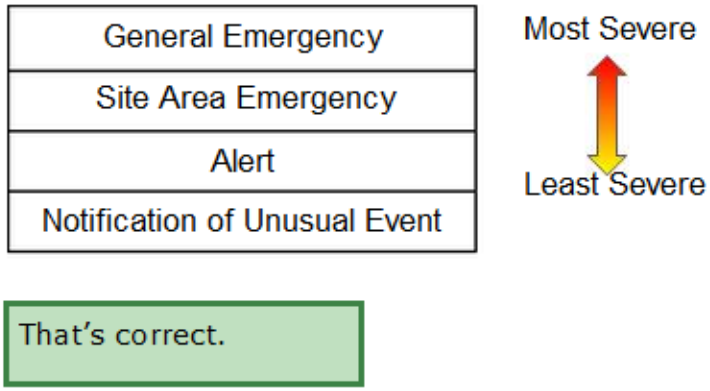
Information Release

The station has identified one spokesperson to give information to the public and news media. Refer all external requests for plant information to this person. (This is a good practice even in nonemergency situations.)

Your family can hear about the plant status and protective actions by listening to the radio. Family members should not call the plant, because phone lines will be needed for emergency response.

Emergency Classifications Exercise

Drag and drop the emergency classifications in order of severity.



Safety

The Safety Department provides oversight of the industrial safety program. Its responsibilities include the following:

- Check air quality in work areas.
- Evaluate industrial accidents.
- Evaluate heat stress concerns.
- Monitor plant safety practices.

Summary: Working on Site

- All workers are responsible for using self-checking, following procedures, and practicing good housekeeping.
- The Operations Department is responsible for hands-on control of the plant.
- The Maintenance Department keeps plant equipment in good working order.
- The Radiation Protection Department limits radiological exposure of personnel and prevents accidental release of radioactive material.
- The Training organization helps train and qualify workers for their jobs.
- The Quality Program spot-checks plant activities to ensure that workers follow procedures and meet certain standards.
- Emergency Planning provides guidance on what to do in case of an emergency.
- The four emergency classifications are:
  - Notification of Unusual Event
  - Alert
  - Site Area Emergency
  - General Emergency
- The Safety organization provides oversight of the industrial safety program.

Managing Industrial Safety

In this section you will learn about safety policies, including requirements to report injuries or “near-miss” events. You will also learn about the use of safety equipment and how to identify and reduce the risks of industrial hazards.

Rules, Procedures, and Permits

A nuclear plant has many safety rules and procedures. Management expects you to follow them all. They are designed to make the plant a safe place to work.

In addition to procedures, some activities require special permits. Examples may include welding, entering a tank, and propping open a fire door. If a job requires a permit, get it before starting work.

If you are unsure about any safety policies/procedures, discuss them with your supervisor before you start work.

You are the most important factor in creating a safe workplace. Disregarding any safety policy may result in disciplinary action.

Signs and Barriers

Signs and barriers throughout the plant warn of hazards such as energized equipment, confined spaces, and flammable material. Always read and obey these warnings.

Safety Tags

Safety tags are another way of protecting you from danger by communicating important information. They have a variety of uses, shapes, and colors. Operating equipment with a safety tag attached could cause injury, death, or damage. Read and obey any tags you find in an area before you start work.

Danger tags, especially “Do Not Operate” tags, are intended to ensure the safety of people working on the equipment or related components. If you find one of these tags not attached to a component, immediately contact the control room.

Never remove a safety tag without proper authorization.

Reporting Problems

It is the responsibility of every employee to report unsafe conditions. Examples of unsafe conditions include a missing handrail, a defective ladder, and tangled cords in a walkway.

Sometimes while working you might have a near-miss event. This is when someone could have been injured but was lucky instead. Report these events to your supervisor. Plant management will evaluate corrective actions to prevent it from happening again.

Personal Protective Equipment

Gloves

Protective footwear

Safety glasses

Hard hat

Hearing protection

The first step in keeping safe is to **wear your personal protective equipment (PPE)**. Different areas of the plant require different types of PPE, and each site has its own procedures for wearing it. You are responsible to **know and follow the rules for your site**.

Click each type of protective equipment to learn more.

Safety glasses protect your eyes from dust, debris, and flying objects. They must be worn whenever a hard hat is required, or when a posting requires them. Standard corrective lenses are not enough. They must meet American National Standards Institute (ANSI) and company safety standards. Side shields are often required.

Hard hats protect your head from pipes, protrusions, low ceilings, and falling objects. They are generally required everywhere on site except inside administrative buildings. They must be worn with the bill facing toward the front.

Protective footwear protects your feet from being cut or crushed. Shoes should have leather uppers. In some cases, steel-toed or other types of safety shoes may also be required.

Hearing protection (earplugs or earmuffs) prevents hearing loss. Wear it in areas posted for high noise.

Gloves are required for work that could cause hand or finger injuries. This includes working with rough materials (wood or rusty metal) or on jobs that might create a pinch hazard.

Plant Safety Equipment


In addition to PPE, the station also installs plant safety equipment near certain hazardous areas for emergencies. For example, first aid kits may be placed throughout the plant. Emergency showers and eyewash stations are placed where chemicals are used.

If you are working near one of these hazards, make sure you know where the safety equipment is and how to use it before you start work. Do not tamper with this equipment or use it for anything except its intended purpose.

First aid kits typically contain basic items for treating minor injuries such as cuts and scrapes. A kit generally includes things like alcohol wipes, bandages, aspirin, and gauze.

Emergency showers wash chemicals off your skin. To use the shower, step under the shower head and pull the chain. Follow plant guidelines for how long to use it.

Eyewash stations wash chemicals out of your eyes. To use the station, place your face near the water fountains and press the handle. Follow plant guidelines for how long to use it.

Reporting Injuries or Medical Emergencies

If you discover someone who is seriously ill or injured, take immediate action:

- Notify the right personnel according to plant procedure. Tell them what the emergency is and clearly state the victim's location.
- Provide any lifesaving aid for which you are qualified.
- When help arrives, offer assistance and then stay clear of the area.

Report all injuries, no matter how small, to your supervisor immediately. This provides evidence that the injury happened on the job in case it becomes something more serious. It could also help prevent similar or more serious injuries in the future.

Safety Hazards

Click on each hazard for a description and guidance on how to reduce the risks.

Asbestos

Asbestos is a fiber that was once widely used in gaskets, insulation, and lagging. It was eventually found to cause serious health problems.

Only employees who have been trained and properly equipped should handle asbestos. If you must work on equipment that might contain asbestos and you have not had the required training, notify your supervisor.

Lagging pop-up: Insulation used to prevent heat loss from pipes and valves.

Respirable Silica

Crystalline silica is a basic component of soil, sand, granite and many other minerals. Quartz is the most common form of crystalline silica. All materials containing silica can result in the presence of respirable silica particles when chipping, cutting, drilling or grinding takes place. Silica exposure occurs through inhalation of silica containing particles and occurs through many construction and general industry methods.

Workers who inhale these very small crystalline silica particles are at increased risk of developing serious silica-related diseases, including:

- Silicosis, an incurable lung disease that can lead to disability and death;
- Lung cancer;
- Chronic obstructive pulmonary disease (COPD); and
- Kidney disease.

Additional training is required for employees who are involved in work activities that will disturb silica, to ensure they are not exposed to hazardous levels of silica dust, and to provide work practices for common silica related work activities, to minimize exposure.

Compressed Gases

Compressed gas cylinders hold gases that might be flammable or poisonous. Follow these precautions when working with them:

- Store them outside when possible. Protect them from the weather and direct sunlight.
- Store them securely and upright.
- Stay clear of cylinder relief or blow-off valves.
- Make sure hoses are in good shape.
- Do not direct compressed air at any part of the body.
- Move the cylinder by using a cart designed for that purpose.

- Make sure the cap is in place when moving or storing the cylinder.

Confined Spaces



Confined spaces may contain a life-threatening atmosphere. Any area that meets all of the following criteria is a confined space:

- Is not intended for continuous human occupancy
- Has a limited or restricted means of entry and exit
- Is large enough and so configured that a person can bodily enter and perform work

Open spaces such as pits, vaults, and vessels may be confined spaces if they meet this criteria. If you have to work in one of these spaces, check with your supervisor.

To enter a confined space, you must complete confined space training and follow the requirements of the confined space program.

Confined Space Operating Experience

During maintenance on a condensate storage tank, a diver entered the tank without his scuba equipment. The tank's nitrogen blanket caused the diver to lose consciousness. He fell from an internal ladder into the water.

The backup diver entered the tank to help and also lost consciousness. The first diver was pulled to safety by his tether line. The backup diver, who was not wearing a tether line or scuba equipment, drowned.

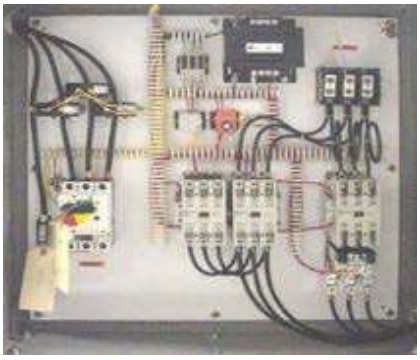
Following proper work practices and controls for entering a confined space could have prevented this fatality.

Electrical Equipment

Equipment throughout the plant carries electrical power ranging from a few volts to thousands of volts. Signs warn of high voltage areas.

Before working near any exposed conductors or equipment that uses electricity, make sure it has been removed from service, de-energized, and tagged. Working on energized equipment is dangerous. It requires special training, qualification, and management authorization.

Avoiding Electrical Hazards



Inspect work areas and equipment for electrical hazards before starting work. There are several things to look for:

- open electrical panels
- frayed cords or cables
- water on or near electrical equipment
- missing or broken ground plugs

Some electrical hazards are inside concrete and other structures. Make sure there are no hidden electrical conductors in an object before drilling, nailing or spraying water on it.

Never touch someone who is in contact with a live electrical circuit.

Electrical Operating Experience

A supplemental worker drilling into a concrete wall penetrated a conduit and contacted an energized 13.8-kV cable. Fortunately, the circuit breaker to the cable tripped after protective relays detected a ground fault. If the circuit breaker had not tripped, the worker likely would have been electrocuted.

A device to find items embedded in concrete walls was used before drilling. However, it was only able to scan 6 inches into the 24-inch wall. An investigation showed that drawings were not checked first for embedded conduit.

Conduit pop-up: Protective cover for cable: a pipe or tube that covers and protects electrical cables.

Eye Hazards


Some activities create serious eye hazards. Chipping, grinding, and welding are just a few examples. Special eye protection is required for this kind of work.
Many places in the plant require you to wear safety glasses at all times. Also, when you are doing anything that might create an eye hazard, you must wear your safety glasses, goggles, and/or a face shield. If you need other eye protection, discuss this with your supervisor.

Falling Objects

Plant equipment, scaffolding, tools, and other objects could fall and cause an injury. Look for work in progress in overhead areas and stay clear. When you are working at heights, remember there might be people below you.

Some equipment is designed to reduce the risk of injury from falling objects. Examples include PPE, scaffold toe boards, and tool lanyards. Good housekeeping also helps.

Scaffolding pop-up: a temporary structure for holding workers and materials during the erection, repair, or decoration of a building.

PPE pop-up: Personal Protective Equipment such as gloves, protective footware, safety

glasses, hearing protection, and hard hats.

Toe-boards pop-up: Boards placed around the base of a scaffold platform to prevent tools and materials from rolling off the platform and falling.

Tool lanyards pop-up: A tool lanyard is a rope or wire device that stops a tool from falling if it is dropped.

Fire Protection

Federal law requires fire barriers to limit the spread of fire, smoke, and gases. They are specially constructed doors, walls, ceilings, dampers, and floors.

Fire barrier penetrations are openings that allow things such as conduit, cables, piping, and ducts to pass through the barrier. The penetrations are sealed to maintain the barrier. Contact your supervisor or other appropriate personnel before starting work that might affect a fire barrier.

Fire doors are specially marked, usually with signs and colors. Always self-check to make sure a fire door closes and latches behind you. Follow procedures if you need to keep one open for a while.

Immediately report any fire barrier problems according to your plant’s procedures.

Fire Loading

Regulations limit the amount of flammable materials that may be stored anywhere. When working with flammable materials, bring only the amount you need for the job or the authorized amount, whichever is less. When you finish, return the materials to their proper storage location in approved fire cabinets.

Wood used in the plant must be fire retardant unless you get written permission otherwise. Fire retardant wood is clearly marked. If you find wood that is not fire retardant, notify your supervisor.

Always dispose of flammable materials properly by referring to your station procedures.

Hot Work Permits


Hot work is any activity that will create heat, sparks or flames. You must get a hot work permit before starting this kind of work. If you are not sure whether a job requires a hot work permit or how to get one, contact your supervisor.

Fire Response

If you discover a fire, notify appropriate personnel immediately. Inform them of the fire's location and what is burning. Then stand in a safe location and warn others until the fire brigade arrives. Do not attempt to fight the fire unless trained to do so.

Hazardous Chemicals

A nuclear plant uses many kinds of chemicals, such as cleaners, acids, petroleum, and caustics. There are several ways you can recognize a potential chemical hazard:

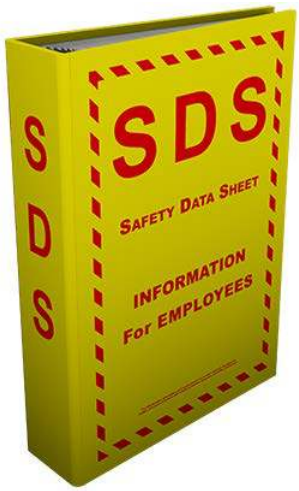
- liquid spills
- labeled or unlabeled containers
- unusual vapors or odors
- posted chemical storage areas

Do not deface the label on a chemical container. Never mix chemicals and never use unidentified chemicals. Always wear proper protective clothing.

Some plant areas store large quantities of hazardous chemicals. These areas are posted and have special entry requirements. Contact your supervisor if you are unsure of those requirements.

Do not pour chemicals into floor drains without prior approval.

Safety Data Sheets



Chemical companies create a Safety Data Sheet (SDS) for each chemical they manufacture. The sheet provides basic information on the identity and dangers of the chemical, including the following:

- physical hazards (fire, explosion)
- health hazards (poisonous, toxic, irritant)
- protective clothing needed
- respiratory protection requirements
- storage requirements
- spill and leak procedures

When using chemicals, always follow the manufacturer's instructions.

Hazardous Waste

Evacuate

Notify

Control

Hazardous waste can be solid, liquid, or gas. It must be properly disposed of according to the federal government’s Resource Conservation and Recovery Act. Wastes such as solvents, fuels, lubricants, and old chemicals are sent to licensed facilities for recycling,

treatment, or disposal.

If you believe a hazardous substance has been spilled or released, evacuate the area, notify the right personnel according to plant procedures, and control access to the area. Only specially trained personnel should attempt any rescues.

Heat Stress

Some plant areas can get extremely warm, especially in the summer. The length of time you are allowed to stay there might be limited to protect you from heat stress. Stay times are based on temperature and humidity. Refer to plant safety guidelines for specific information.

You can reduce the risk of heat stress in several ways:

- Drink fluids.
- Install ventilation, fans, or temporary air conditioning.
- Monitor temperature and humidity.
- Use cooling devices such as ice vests.

Heat stress can also result from strenuous work at normal temperatures. If you begin to feel overheated or dizzy, tell your co-workers, move to a cooler area, and rest. Notify your supervisor and seek medical help.

Heat stroke is the most serious heat related disorder. This means the body can no longer regulate temperature. This is a medical emergency that requires immediate attention.

Heat Stress pop-up: Results from prolonged exposure to high temperatures and humidity, resulting in weakness, nausea, dizziness, and profuse sweating and can ultimately lead to illness or even death.

Heat Stroke pop-up: A condition marked by fever and often by unconsciousness, caused by failure of the body's temperature-regulating mechanism when exposed to excessively high temperatures.

High Noise

Some areas of the plant have high noise levels that can damage your hearing over time. These areas are posted with warning signs. Even if an area is not posted, treat it as a high-noise area if you have trouble hearing or talking.

Hearing protection is required in all high-noise areas. The company provides hearing protection and expects you to use it.

Moving/Rotating Equipment

Motorized equipment (such as pumps, motor-operated valves, lathes, and cranes) can create a variety of hazards when it moves or rotates. Some of this equipment can start automatically.

When working near motorized equipment, do not wear loose clothing (such as ties) or jewelry that could get caught.

Pay attention to postings and alarms. Do not tamper with safety covers around moving equipment.

Moving/Rotating Equipment Operating Experience

A qualified machinist decided to take measurements of the pump shaft he was machining while his lathe was rotating. He had done this successfully on several occasions in the past, which reinforced his belief that it was a safe practice.

This time, though, he lost his grip on the measuring device. When he tried to grab the tool, his left index finger was drawn into the rotating shaft and cutting tool. His index finger was broken at several places and severely cut.

Steam Leaks

Steam is used in many ways and at various pressures. Sometimes equipment will develop a steam leak. The pressure and temperature of this steam can cause serious burns. Steam leaks at very high pressures can be *invisible and dangerous*.

If you find a steam leak, stay away from it and report it to the appropriate personnel. You can identify a steam leak in several ways:

- visible vapor coming from a component
- whistling or hissing noise
- increased temperatures
- moisture on walls, ceiling, or equipment

Activities such as preventive maintenance, corrective maintenance, and periodic operator inspections protect workers from steam leaks. Identified leaks are posted with warning ropes and signs.

Trip, Slip, and Fall Hazards

Some hazards can cause you to trip, slip, or fall. Here are some examples:

- piping, conduit, ropes, and cables
- work on elevated equipment
- unsecured ladders
- scaffolding
- liquid spills

Always be alert to what is in front of and below you. Do not climb on plant equipment such as piping, cable trays, and snubbers.

Safety equipment such as fall protection may be required. This equipment may require special training. Check with your supervisor before using it.

Trip/Fall Operating Experience

An assistant unit operator on his way to perform a task took an alternate path around scaffolding that had been placed in the area. A one-inch electrical conduit about 30 inches off the floor was blocking his path. When he tried to step over it, he lost his balance and fell. The fall resulted in an injury to his thumb, a puncture wound to his face, and a fracture to his cheek bone.

Knowledge Check

Answer the following question by clicking on the correct answer.

Q: Where would you find storage requirements for a new cleaning solvent?

- On the Safety Data Sheet (SDS)
- From your co-workers
- In a training lesson plan
- On the Radiation Work Permit (RWP)

Correct Answer: On the Safety Data Sheet (SDS)

Knowledge Check

Answer the following question by clicking on the correct answer.

Q: What is one method to reduce the risk of heat stress?

- Limit stay time in the environment based on heat and humidity.
- Only do strenuous work at normal temperatures
- Turn off any ventilation that may be causing excessive noise or dust.
- Work faster so you don't stay in the environment as long.

Correct Answer: Limit stay time in the environment based on heat and humidity.

Summary: Managing Industrial Safety

- Everyone is expected to follow all safety rules and procedures.
- Report any unsafe conditions or near-miss events you encounter.
- Report all injuries, no matter how small, to your supervisor right away.
- Personal protective equipment must be worn per station policy.
- Plant safety equipment such as first aid kits, showers, and eye wash stations are located near safety hazards.
- There are many different types of industrial hazards on site. Know what they are and how to minimize the risk before starting work.

NOTE: Interactive Knowledge Checks found in the online course are not included in print materials.

Congratulations!

You have completed the Generic Plant Access Training course. In addition to this training, station procedures and programs will direct your work activities.

You are required to follow all station procedures. All questions about station procedures must be directed to your supervisor.

Click "Exit" to leave this course.

Course Summary

Understanding Radiation

- Fission (radiological decay) is the process of splitting atoms in a chain reaction to release energy (called radiation).
- Contamination is radioactive material where it doesn't belong.
- Dose is the amount of radiation the body receives. It is measured in units called rem or millirem.
- Everyone is exposed to many sources of background radiation.
- The average dose for station workers from both background and occupational sources of radiation is 800 mrem per year.
- There are some health risks from exposure to high levels of radiation. Younger people are more sensitive to these risks.

Accessing the Plant

- The three plant boundaries are the Owner Controlled Area, Protected Area, and Vital Area.
- Security officers protect the plant and its workers and guard against nuclear sabotage.
- Everyone is subject to search by Security while on site.
- Workers must pass through metal and explosive detectors to enter the PA.
- A photo ID badge, properly worn, is required at all times in the PA.
- Entering a security area without using the card reader (tailgating) is prohibited.
- Escorts must maintain visual control of visitors at all times and ensure they follow plant procedures.
- The exit portal contamination monitor checks employees for contamination as the leave the PA.

Working on Site

- All workers are responsible for using self-checking, following procedures, and practicing good housekeeping.
- The Operations Department is responsible for hands-on control of the plant.
- The Maintenance Department keeps plant equipment in good working order.
- The Radiation Protection Department limits radiological exposure of personnel and prevents accidental release of radioactive material.
- The Training organization helps train and qualify workers for their jobs.
- The Quality Program spot-checks plant activities to ensure that workers follow procedures and meet certain standards.
- Emergency Planning provides guidance on what to do in case of an emergency.
- The four emergency classifications are:
  - Unusual Event
  - Alert
  - Site Area Emergency
  - General Emergency
- The Safety organization provides oversight of the industrial safety program.

Managing Industrial Safety

- Everyone is expected to follow all safety rules and procedures.
- Report any unsafe conditions or near-miss events you encounter.
- Report all injuries, no matter how small, to your supervisor right away.
- Personal protective equipment must be worn per station policy.
- Plant safety equipment such as first aid kits, showers, and eye wash stations are located near safety hazards.
- There are many different types of industrial hazards on site. Know what they are and how to minimize the risk before starting work.

Glossary

Chain Reaction

Neutrons released from split atoms cause other atoms to split.

Conduit

Protective cover for cable: a pipe or tube that covers and protects electrical cables.

Contaimnation

Occurs when a tiny particle of radioactive *material* gets outside the place it is intended to be. When this happens, the radiation it releases is no longer controlled.

Covered Work

Work activities that are subject to government regulations under 10 CFR 26.

Dose

When the body or any specific organ is exposed to radiation, the amount of radiation that it receives is called **dose**. This is measured in units called **rem** or **millirem** (1/1000 rem).

Fission

The man-made process of splitting an atom.

Heat Stress

Results from prolonged exposure to high temperatures and humidity, resulting in weakness, nausea, dizziness, and profuse sweating and can ultimately lead to illness or even death.

Heat Stroke

A condition marked by fever and often by unconsciousness, caused by failure of the body's temperature-regulating mechanism when exposed to excessively high temperatures.

Lagging

Insulation used to prevent heat loss from pipes and valves.

Lanyard

A device used to hold or fasten a tool, material, or other item to prevent losing it into an open system. Lanyards are usually made of rope, string, cord, or other type of restraint and can be attached to any secure object.

Millirem

When the body or any specific organ is exposed to radiation, the amount of radiation that it receives is called **dose**. This is measured in units called **rem** or **millirem** (1/1000 rem) sometimes written as **mrem or mr**.

mrem

When the body or any specific organ is exposed to radiation, the amount of radiation that it receives is called **dose**. This is measured in units called **rem** or **millirem** (1/1000 rem) sometimes written as **mrem or mr**.

Near-miss

A situation where people or equipment could have been harmed but weren't, often through sheer luck.

Neutron

Small particles from inside an atom.

Nuclear Fission

Nuclear fission is the splitting of the nucleus of uranium which releases energy, as in a nuclear reactor.

Owner Controlled Area (OCA

The Owner Controlled Area (OCA) is all the company property immediately surrounding the Protected Area's security fence. Access is normally limited to people on official business.

Outage

A time when the station is shut down for refueling or maintenance.

PPE

Personal Protective Equipment such as gloves, protective footware, safety glasses, hearing protection, and hard hats.

Protected Area (PA)

The Protected Area (PA) is inside the security fence. All of this area can be considered "the plant." You must have a badge issued by Security to go into the PA.

Protected Equipment

Equipment that has special barriers in place to prevent or restrict its use.

Radiation

The *energy* that is released when an atom splits or decays.

Radioactive Decay

The process of releasing radiation is called **radioactive decay**.

Radioactive Material

Anything that contains decaying atoms and is releasing radiation is called **radioactive material**.

Rem

When the body or any specific organ is exposed to radiation, the amount of radiation that it receives is called **dose**. This is measured in units called **rem** or **millirem** (1/1000 rem) sometimes written as **mrem or mr**.

Snubber

A device in nuclear power plants to provide pipe restraint during possible pipe rupture or earthquake conditions while accommodating the thermal movement of pipes during plant operation.

Scaffolding

a temporary structure for holding workers and materials during the erection, repair, or decoration of a building.

Surveillance

The act of observing activities and hardware, and/or reviewing documentation to verify conformance with specified requirements and to evaluate their adequacy and effectiveness.

Tailgating

Following a worker through a security door without using the card reader is called **tailgating**.

Toe Board

Boards placed around the base of a scaffold platform to prevent tools and materials from rolling off the platform and falling.

Tool Lanyard

A tool lanyard is a rope or wire device that stops a tool from falling if it is dropped.

Vital Area (VA)

The Vital Area (VA) contains safety-related equipment inside the Protected Area. The failure or destruction of equipment in the VA could endanger the public health and safety by exposure to radiation.