Generic Plant Access Training

National Academy for Nuclear Training eLearning System (NANTeL)

April 2010
# Generic Plant Access Training

**Course Title:** Generic Plant Access Training  
**Course Owner:** Jim Caulk

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<tr>
<th>Revision Date</th>
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| 02/17/07      | 07.00.00       | See “Summary of Changes” page.  
This document contains revisions for both Initial and Requal PAT.  
Implemented this version for Initial PAT only. | Bob Wood |
| 02/26/07      | No change      | Removed extraneous navigation control on page 1 of Individual Responsibilities section. | Jim Caulk |
| 3/2/07        | 07.00.00       | Implemented html version Requal course | Bob Wood |
| 3/23/07       | No change      | Revised lesson tracking settings | Jim Caulk |
| 1/25/08       | 07.00.00  
(FFD: 07.00.01)  
(Plant Access: 07.00.01) | Fixed typos in FFD and Plant Access lessons | Jim Caulk |
| 9/14/08       | 08.00          | See “Summary of Changes” page | Greg Sweeney |
| 9/29/08       | 08.01          | Information added on “Post-Event” drug testing. | Greg Sweeney |
| 12/21/09      | 09.00          | See “Summary of Changes” page | Jim Caulk and Bob Wood |
| 12/22/09      | 09.01          | Technical correction to Annual Dose from Occupational Exposure: corrected from 310 mrem to 180 mrem based on NUREG 0713 latest data. | Bob Wood |
| 4/2/2010      | 09.02          | Fixed typos, changed graphics, clarified content, fixed completion coding | Jim Caulk |

*Note: This lesson plan includes all training content. It does not include graphics, videos, interactive exercises, or review questions.*
Summary of Changes

FEBRUARY 2, 2007: v. 07.00.00

The following is a summary of changes to the course in the areas of exams, content, navigation, and enhancements.

Exam Questions

- Reviewed all exam questions with a < 80 percent pass rate (during the fall outage season).
- Provided GET Review Team (USA) with those questions and suggested replacements.
- Incorporated review comments where applicable and created new exam items.
- Archived old questions and implemented new items.

Content

Updated Content for:

- "For Cause" testing to meet intent of the Regulatory Issue Summary (RIS) 2005-28, November 22, 2005.
- Revised the annual average for occupational exposure from 310 mr to 160 mr IAW NUREG 0713 rev. 26
- Included changes to meet NEI 03-04 Revision 3. (Fitness for Duty concerns with dietary supplements and the threat of radiological sabotage).

Added Clarification for the following Content:

- Function of QA and QC.
- Reporting items of non-compliance
- Employee Concerns Program
- Understanding the difference between "radiation" and "contamination"

Removed

- Remove the content (2 screens) for "Blood Borne Pathogens" from the Industrial Safety Lesson. This content is not required by NEI 03-04 objectives.
- Removed the content (9 screens) for “Hearing Conservation” from the Industrial Safety Lesson. This content is not required by NEI 03-04 objectives.

Navigation Changes

- Eliminated the "table of contents" button. The “Next” button returns the student to the main menu when a topic is complete.
- The objectives are displayed at the beginning of each section and added an “objectives” button so the student may see the objectives for that topic at any time.
• Combined similar topics to eliminate topics that consisted of one objective screen, one page of content, and one review question.
• Added a “Mail” button so the student can provide feedback from inside the course.
• Implemented book marking so a student may leave a lesson and be returned to the screen they left from, if desired. All completed sections are kept.
• Restructured review questions. You must choose an answer before proceeding, but you do not have to choose the correct answer. The feedback for incorrect answers provides text clarification for the student (that is, not just “the correct answer is “a”...”). Also, if the student answers a review question and goes back to previous pages, they do not have to answer the review question when they return.
• All screens that contain hidden content (roll overs/pop-ups) are structured so that the student MUST review all testable content prior to proceeding.

Other Enhancements
• Replaced clip art with photographs where possible.
• Updated or improved graphics where possible.
• Included the use of Flash animations to highlight concepts.
• Removed .bmp where possible.

SEPTEMBER 14, 2008: v. 08.00

The following changes have been made to Version 8.0 of NANTeL Generic Plant Access Training and Fitness-for-Duty Training based on feedback from students, utility members, NEI 03-04, and a review of exam questions with a passing rate less than eighty percent. Question changes were reviewed by the Utility Service Alliance (USA) General Employee Training Team and other utilities.

Content was strengthened in areas that were linked to poor exam scores and new information was added including:

• Addition of material to cover objectives added to NEI 03-04:
  o Fatigue management
  o NRC Sanctions
  o Tiered approach for chemical testing
• Definition of stable and unstable atoms was corrected.
• Typographical errors were corrected.
• Twenty-four questions and eight objectives were added to the Fitness-for-Duty exam bank to meet the NRC requirement in 10 CFR 26 that addresses testing of certain knowledge and abilities. The number of questions on the Fitness-for-Duty and Behavioral Observation exam has been increased to test on all objectives.
• The online interface has been upgraded to match the NANTeL template.
• Several graphics and animations were upgraded, mainly in Radiation Worker Training Part 1.
• The “Mail” button has been changed to “Feedback.”
• Review question screens have a new look, distinct from other pages.
• Tool tips were added to navigation buttons.

DECEMBER 21, 2009

The following is a summary of changes to the course in the areas of exams, content, navigation, and enhancements.

Exam Questions
• Reviewed all exam questions with a < 80 percent pass rate for the past year.
• Provided GET Review Team (see Acknowledgements at the end of this document) with those questions and suggested replacements.
• Incorporated review comments where applicable and created new exam items.
• Archived old questions and implemented new items.

Content
• Updated information on requirements to report legal actions.
• Updated average annual occupational exposure to 310 mrem and average annual background exposure to 620 mrem per “Ionizing Radiation Exposure of the Population of the United States (2009)” by the National Council on Radiation Protection and Measurements.
• Removed content on incident response procedures. This content is not required by NEI 03-04.
• Added content to match new NEI objectives:
  o Nuclear safety culture
  o Safeguards information
  o Willful misconduct and vandalism
• Replaced multiple choice review questions with interactions and animations to improve student engagement.

Navigation Changes
• Reduced the total number of lessons in the course from two FFD/BOP lessons and seven PAT lessons to one FFD/BOP lesson and one PAT lesson.
• Updated the NANTeL template with more features for the student. These include the following:
  o Print function
  o Navigation tutorial
  o Drag-and-drop tutorial
  o Table of Contents menu
  o Student Notes
  o Printable lesson summaries
• Reorganized and re-worded content throughout to improve student comprehension.

DECEMBER 22, 2009
Technical Content Correction: Changed the annual occupational dose from 310 mrem to
180 mrem, based upon NUREG 0713 most recent data. Changed version number, content on affected screens, and lesson/chapter summary.

APRIL 2, 2010

The following is a summary of changes to the course.

**Content**
- Clarified Chemical Testing Summary statement about confirmatory tests with negative results.
- Added FFD Staff to “The Players” page.
- Added minor clarifying details on various elements of FFD program based on student feedback.
- Corrected explanation of insomnia and sleep apnea.
- Revised text in Fission video.
- Added Exit Portal Contamination Monitor to Summary page in Accessing the Plant.
- Clarified occupational and general public dose.
- Clarified radiation terms.
- Updated glossary items.
- Fixed typos and replaced some graphics based on student feedback.

**Navigation Changes**
- Changed coding in PAT to fix completion errors on exercises.
NANTeL Generic Plant Access Training

Fitness-For-Duty and Behavioral Observation Lesson

Estimated Time to Complete: 1.2 Hours

Revision 9.02

April 2, 2010

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Purpose

This lesson provides information about Access Authorization, Fitness-for-Duty, and Behavioral Observation Program requirements as outlined in the Code of Federal Regulations Part 26. The material meets the Nuclear Energy Institute’s generic objectives for training of all nuclear plant workers according to NEI 03-04 Revision 7, “Guideline for Plant Access Training.” Individual stations must supplement this generic training with additional site-specific training as required by NEI 03-04. Site-specific courses for each utility are available on NANTeL.

Objectives

- State methods used to implement the basic Access Authorization (AA) and Fitness-for-Duty (FFD) requirements for all workers who have unescorted access to the Protected Area, assigned duties at the Technical Support Center or Emergency Operations Facility in support of the emergency plan, or FFD administrative personnel.
- Recognize the personal and public health and safety hazards associated with the abuse of legal and illegal drugs and alcohol.
- Identify the Employee Assistance Program (EAP) services available to the individual.
- State the effects prescription drugs, over-the-counter drugs, dietary factors (e.g., food products such as poppy seeds or hemp oil) may have on drug and alcohol test results.
- State the roles and responsibilities of the Medical Review Officer (MRO) and the Human Resources FFD and EAP staffs in the FFD program.
- State individual roles and responsibilities under the Access Authorization and Fitness-for-Duty program.
- Recognize indicators of or precursors to aberrant behavior and that behavior may change quickly.
- Recognize illegal drugs and indications of the illegal use, sale or possession of drugs.
• Describe BOP techniques for detecting performance degradation, impairment, or changes in individual behavior including work performance, social interactions, and personal health.
• Recognize behaviors adverse to the safe operation and security of the facility including an unusual interest in or predisposition towards security and/or involvement in operations activities outside the normal work activities' scope.
• State individual responsibility and process for handling and reporting behavioral problems and Fitness-for-Duty concerns.
• State the supervisor's role and responsibilities under the Access Authorization and Fitness-for-Duty program.
• Describe the procedure for the timely removal of a potentially untrustworthy or unreliable person from the Protected Area.
• State the individual's responsibility and process for referral to the Employee Assistance Program.
• Demonstrate understanding of the requirement to report all legal actions that could impact an individual's reliability and trustworthiness.
• State the symptoms of worker fatigue and contributors to decreased alertness in the workplace.
• State the contributors to worker fatigue.
• State the contributors to circadian variations in alertness and performance.
• State shift work strategies for obtaining adequate rest.
• State the NRC-mandated sanctions with regard to FFD program violations.
• State the role of the Reviewing Official in the processing of FFD concerns.
• State the indications and risk factors for common sleep disorders.
• State the effective use of fatigue countermeasures.
• State individual rights regarding the Access Authorization and Fitness-for-Duty program.
• State the potential adverse effects on job performance of prescription and over-the-counter drugs, alcohol, dietary factors, illness, mental stress, and fatigue.

Why Take This Training

You have probably read or heard news stories over the years about what happens when people abuse drugs and alcohol on the job. Accidents happen. People get hurt.

Now, imagine if any of these people were working on a critical task at a nuclear power plant. The consequences could be severe.

This is why federal law (10 CFR 26) requires nuclear plant personnel to report to work free from the effects of drugs, alcohol, fatigue, dietary factors, illness, and mental stress.

Because of the unique nature of nuclear power, workers must be reliable and trustworthy to do their jobs safely at all times.
Introduction

Each nuclear utility is required to establish a Fitness-for-Duty (FFD) program. Everyone with unescorted access to the Protected Area of the plant must be trained on this program and re-tested yearly. Others who don’t access the Protected Area but who staff emergency response facilities and FFD Program Personnel must also be trained.

This lesson covers the importance of being fit for duty and what is expected of you as part of the program. Specifically, you will learn about the factors that affect fitness-for-duty; the potential consequences of substance abuse; the chemical testing process; and how to identify and respond to behavioral problems.

The Players

**You:**
Each individual is responsible for coming to work fit for duty and watching for behaviors in others that might indicate a fitness-for-duty concern.

**Supervisor:**
Supervisors are responsible for observing behavior and managing any fitness-for-duty concerns that arise.

**EAP Counselor:**
The Employee Assistance Program provides support and counseling to workers dealing with fitness-for-duty concerns.

**Medical Review Officer:**
The Medical Review Officer is the licensed physician who evaluates all positive test results and is responsible for the administration of the FFD program.

**Human Resources:**
The Human Resources staff coordinates personnel actions associated with FFD policy violations.

**FFD Program Personnel**
The FFD staff conducts all chemical testing. They collect and process specimens and notify management of test results.

Defining Fitness-for-Duty

An individual is fit for duty when he or she is not impaired mentally or physically in any way that could interfere with safe, competent job performance. Impairment could be caused by any of the following:
• substance abuse
• mental stress
• illness (physical or mental)
• fatigue
• prescription and over-the-counter drugs
• alcohol
• dietary factors

Substance Abuse

When people think of substance abuse, they usually think of illegal drugs. Of course you may not buy, use, or keep illegal drugs either on or off company property. But illegal drugs are only part of the picture.

Alcohol, prescription drugs, over-the-counter drugs, and other chemicals are legal, but they can easily be abused. Never take someone else’s prescription drugs and don’t abuse your own.

Even when taken properly, legal drugs can affect your job performance. They can impair your vision, cloud your thinking, and slow your reflexes. Tell your supervisor if you are taking any medications that could affect your ability to work safely.

Substance Abusers at Work

Substance abusers have a much more negative effect on the world than do nonabusers.

**Substance Abusers**

- Five times as many Workers’ Compensation claims
- Two times as many absences
- Two times as many mistakes
- Three times as many sick benefits
- Four times as many accidents

Substance Abusers in Cars

One area where substance abuse is most apparent is on the roads.

- Substance abusers cause 500,000 serious injuries from auto accidents each year.
- Half (50%) of all traffic accident deaths are due to substance abuse.

Ready to Begin

The content is divided into three main sections.

**Things that Affect Fitness for Duty**
This section addresses the different substances and physical factors that can impair your ability to work safely and competently.

**Roles and Responsibilities**
This section covers the general expectations for every worker with unescorted access to a nuclear plant, whether they are individual contributors or supervisors.

**How the FFD Program Works**
This section describes the Employee Assistance Program, the Behavioral Observation Program, and the chemical testing process.

**THINGS THAT AFFECT FITNESS FOR DUTY**

**Drugs and Alcohol**

The following screens will introduce you to the types of substances that are most often abused.

You will learn the physical signs of people who are abusing them and how to recognize when a drug sale might be happening.

**Drug Sales**

Drug dealers cannot be stereotyped. They come from all walks of life. Drug sales can occur anywhere and may take as little time as a handshake. All plant workers must be aware of places where drugs can be hidden:

- shoes
- pens, flashlights
- cigarette packs
- chewing tobacco packs
- chewing tobacco packs
- headbands of caps, hard hats
- purses, briefcases, lunchboxes

Pay attention to anyone who appears nervous, as if hiding something. If you suspect that drugs are being sold, used, or kept on company property, report this to Security immediately. The following pages will help you recognize the signs of alcohol and drug abuse.

**Cannabis**

Uses: Relaxes mind, reduces pain

Examples: Hashish, hashish oil, and marijuana

Physical signs:
- rolling papers
- pipes
- dried green plant material
- odor of burnt hemp rope
- marijuana cigarette clips
- bloodshot eyes
- wide pupils

Behavioral signs:
- euphoria
- disorientation
- lowered inhibitions
- increased appetite

### Depressants

Uses: Relieves anxiety, irritability, tension, and insomnia

Examples: Alcohol, barbiturates, Valium, Quaaludes, and some over-the-counter medications

Physical signs:
- capsules, pills, and tablets
- alcoholic beverage containers in unusual places
- bloodshot, watery, or glazed eyes
- alcohol odor on breath or clothes
- hangovers

Behavioral signs:
- slurred speech
- disorientation/confusion
- loud talking
- exaggerated motions
- lowered inhibitions
- sleeping longer

### Narcotics

Uses: Reduces pain, treats insomnia

Examples: Opium, heroin, codeine, morphine, and paregoric

Physical signs:
- needle marks on arms or hidden locations
- needles/syringes
- spoons
- narrowed pupils, droopy eyelids
- cold, moist skin

Behavioral signs:
- euphoria
- drowsiness
- nausea

**Stimulants**

Uses: Treats narcolepsy, obesity, and hyperactivity in children

Examples: Cocaine, amphetamines (speed), methamphetamines, caffeine, nicotine, and some diet pills

Physical signs:
- capsules, pills
- white powder or chunks
- glass vials, pipes
- razor blades
- spoons, straws
- weight loss
- narrow pupils

Behavioral signs:
- increased alertness, excitation
- euphoria
- irritability, anxiety
- mood swings
- risk taking, overconfidence
- loss of sleep or appetite
- hyperactivity

**Hallucinogens**

Uses: Distorts perception of reality

Examples: LSD, phencyclidine (PCP), mescaline, and psilocybin

Physical signs:
- capsules, tablets
- “microdots”
- blotter squares
- dried mushrooms, cacti

Behavioral signs:
• blank stare, rapid eye movement
• delusions, hallucinations
• poor coordination or perception of time, distance
• flashbacks

Summary: Drugs and Alcohol

• There are many different kinds of drugs. Mainly, they depress or stimulate the mind and body.
• Some drugs can distort a person’s perception of reality.
• Alcohol has the same effects as other types of depressants.
• You can usually see physical and behavioral signs of drug use.
• Drug dealers can come from all walks of life.
• Drug deals can happen quickly and anywhere.

Stress, Illness, and Fatigue

In this section you will learn about the effects of mental stress and illness on your ability to work safely.

You will also learn about fatigue, including the different types of fatigue, what causes it, how to recognize it, and how to manage it.

Mental Stress

Occasional stress is normal. It can be caused by many factors including family, finances, and work.

When stress occurs over a long period of time, it is called chronic stress. This can affect the quality of day-to-day living and job performance.

Signs of stress can include the following:
• increased irritability
• depression
• chronic fatigue
• overreacting
• impulsiveness
• alcohol or drug abuse
• constant worry

Illness

When you are sick, you can’t do your best work. Symptoms such as headaches, nausea, body aches, congestion, and fever make it hard to focus on the task at hand.
Medications used to treat illnesses can also affect your performance. Be sure you understand how a medication will affect you before taking it. Always follow the directions, and never take someone else’s prescription drugs.

Tell your supervisor if an illness you have or medication you are taking might affect your ability to work safely.

If you bring medications to work, you must keep them in the original containers.

**Fatigue**

Fatigue is a common health complaint that can affect anyone. It is generally defined as a lack of energy; it can also include drowsiness or apathy.

Fatigue impairs both mental and physical capabilities. Often, workers are unaware that fatigue is causing poor job performance.

Everyone is expected to manage the factors that contribute to fatigue in their daily lives. Take action to maintain alertness at work. Recognize and seek treatment for sleep disorders that might create fatigue or make it worse.

**Types of Fatigue**

**Acute:** Builds up normally within one waking period. Acute fatigue might occur after a long, hard day at work.

**Cumulative:** Builds up from getting too little sleep between major waking periods. Newborn babies often cause cumulative fatigue in their parents.

**Chronic:** Caused by weeks or months of cumulative fatigue. Symptoms include the following:
- apathy
- loss of short-term memory or concentration
- muscle pain
- multi-joint pain without swelling or redness
- headaches of a new type, pattern, or severity
- exhaustion more than 24 hours after exercise

**Physical Signs of Fatigue**

There are many ways to recognize when you or others are fatigued. Look for the following signs:
- sleepiness
- yawning
- red eyes
- unusual blinking
- irritability, annoyance
• difficulty with concentration or higher-level mental functions
• slower reaction time
• memory problems
• low energy
• apathy
• feeling of isolation
• task fixation
• increased errors

Contributors to Fatigue

Fatigue can be caused by many factors:
• hard physical activity
• long work periods, commutes
• shift work
• changing or rotating work schedules
• lack of rest during work breaks
• sleep/work schedule that conflicts with normal body rhythms
• sleep disruption
• little exercise
• poor diet
• environmental conditions (high temperature, low light, background noise, etc.)

Task Contributors

Tasks with the following characteristics are likely to contribute to decreased alertness and to increase worker fatigue:
• repetitive
• high demand for focus
• requirement to stay in one place or position for a long time
• limited social interaction

Take precautions when doing tasks like these. Examples include taking frequent breaks to prevent fatigue and using human performance tools to prevent error.

Circadian Variations

Your ability to remain alert and perform well is affected by natural changes in your body. These changes, called “circadian variations,” follow a daily pattern. The body’s high energy point is late in the day and the low energy point comes in the hours before dawn.

Humans are naturally designed to be awake during the day and to sleep at night. Disrupting the normal schedule can cause poor sleep quality, which can lead to fatigue. This often happens with workers on shift and night work.
Disrupting the Schedule

When the body has adapted to a certain schedule, changing it can lead to fatigue. Activities such as variable work schedules, crossing time zones or long hours of being awake can disrupt the body’s normal circadian variations. This can reduce alertness and degrade performance in many ways, such as the following:

- sleepiness while driving
- reduced attention and poor decision-making while monitoring equipment
- a wide range of performance problems that could affect plant safety

Sleep Disorders

Adequate sleep is essential to prevent fatigue. When deprived of sleep for too long, the human brain can force the body to fall asleep.

A common example of this occurs while driving long distances early in the morning or late at night, when your eyelids get “heavy.” It is never safe to continue with critical tasks if you are deprived of sleep.

Sleep apnea and insomnia are common disorders that can result in going without sleep for a long time. Several factors can contribute to these disorders:

- stress
- illness
- improper diet (caffeine, alcohol)
- medications

Preventive Strategies

Preventive strategies are used before work and during rest periods. They address the physical causes of fatigue to minimize sleep loss. Here are a few examples:

- good sleep habits
- sufficient rest
- effective use of days off and rest periods
- proper consumption of food, alcohol, caffeine, and medications
- correct timing of exercise

These strategies can be especially helpful in preventing the sleep disruptions that are normally caused by shift and night work schedules.

Fatigue Countermeasures

Fatigue countermeasures are actions taken on the job and at home to fight fatigue. They can help improve workplace performance and alertness.
In general, countermeasures do not address the underlying causes of fatigue. Instead, they enhance alertness and performance temporarily so that safety and efficiency are maintained.

Examples of countermeasures include the following:
- social interaction
- physical activity
- caffeine consumption

**Summary: Stress, Illness, and Fatigue**

- Mental stress, illness, and fatigue can impair your job performance.
- Fatigue can be acute, cumulative, or chronic.
- Circadian variations are the natural high and low energy patterns in daily life. These patterns cause us to prefer being awake during the day and sleeping at night.
- Anything that disrupts the normal sleep/wake pattern (such as shift work) can cause fatigue.
- Preventive strategies are used before work and during rest periods to help prevent fatigue.
- Fatigue countermeasures are things you can do on the job and at home that help keep you alert.

**ROLES AND RESPONSIBILITIES**

**Individual Roles and Responsibilities**

After completing this section, you will understand your individual responsibilities under the FFD program.

You will learn about the expectations to come to work free of alcohol and other substances and to report anything in your history that reflects on your trustworthiness.

Your responsibility to report any conditions that might affect your own or someone else’s fitness-for-duty will also be covered.

**Arriving Fit for Duty**

Every worker is responsible for arriving at work fit for duty and helping to maintain a workplace free of alcohol and drugs.

According to FFD policies, you must abstain from alcohol at least five hours before a scheduled work shift. This time may need to be longer (depending on your size and the amount of alcohol consumed) to ensure that your blood alcohol concentration (BAC) is less than 0.04 percent when you report for work.
If your BAC is 0.04 percent or greater, you are not fit for duty according to fitness-for-duty policies.

Remember that any violation of FFD policy can result in denial of your unescorted access authorization.

**Unscheduled Call-Outs**

If you receive an unscheduled call-out, you must advise the caller of any of these conditions:

- you have consumed alcohol within the past five hours
- you are under the influence of alcohol
- you are not fit for duty for any reason such as fatigue, mental stress, or illness

Report for alcohol testing if you are called to work and have consumed alcohol within the past five hours.

**Reporting Your History**

Follow plant procedure to advise the proper personnel if you have ever been denied unescorted access, tested positive for a chemical substance, or participated in a substance abuse treatment program involuntarily.

If you become involved in any of the following situations, report them to your supervisor and Security before entering the Protected Area:

- arrest/indictment
- criminal charges (excluding minor traffic or civil violations that don’t involve drugs/alcohol)
- any incident that may impact your trustworthiness

Failure to report this information could result in the denial of your unescorted access.

**Reportable Offenses**

Legal Actions must be reported to your supervisor, Security, Access Authorization, or other designated individual in accordance with site procedures. Typically, this is when the individual reports for the next work period after an incident. Failure to report formal actions taken by a law enforcement authority or court of law could result in denial of unescorted access.

Legal actions include, but are not limited to, being held, detained, taken into custody, charged, arrested, indicted, fined, forfeited bond, cited, or convicted for a violation of any law, regulation or ordinance. This includes felony, misdemeanor, serious traffic offenses, serious civil charges or military charges and the mandated implementation of a plan for treatment or mitigation in order to avoid a permanent record of an arrest or conviction in response to the following activities:

- Use, sale or possession of illegal drugs
- Abuse of legal drugs or alcohol
- Refusal to take a drug or alcohol test

Minor misdemeanors such as parking tickets or minor civil actions such as zoning violations or
minor traffic violations such as moving violations when the individual was not physically taken into custody do not require reporting unless they are alcohol or drug related.

Issues Affecting Your Performance

Tell your supervisor if you are:

- taking any medications that may affect your performance
- experiencing any significant personal problems such as stress, illness, or fatigue
- receiving help for any problems that may affect your fitness-for-duty

Behavioral Problems in Others

Notify your supervisor, Security, Access Authorization, or FFD personnel if you notice any of the following in others:

- strange or changing behaviors that could eventually affect public health and safety
- use, sale, or possession of illegal drugs or alcohol on the job
- indications that a co-worker may not be fit for duty
- visitor behavior that could affect your ability to perform tasks as an escort

Do not try to diagnose the behavior. Your primary responsibility is to prevent actions that could be harmful to the individual, other workers, or plant safety.

Unusual Behaviors

Workers should report any unusual behaviors that could pose a threat to the safe operation or security of the plant. There are some key things to look for:

- unusual interest in plant security
- operations activities outside a worker’s normal job scope
- frequent unexplained absences
- strange or inadequate response when asked about being someplace outside the normal work area
- unusual opinions that could imply a threat to a nuclear facility

If you observe unusual behavior, do not confront the individual. Report it immediately to a supervisor or Security personnel.

Designated Individuals

Each utility identifies people to receive FFD concerns. This always includes supervisors and the Reviewing Official, and can also include other members of the plant staff.

If you have FFD concerns, report them to one of these designated individuals according to your station procedure.
Summary: Individual Roles and Responsibilities

- Every worker must report to work fit for duty.
- You must abstain from alcohol at least five hours before coming to work, maybe longer depending on your size and other factors.
- A blood alcohol content level of 0.04 percent or greater means you are not fit for duty.
- If you are called in for unscheduled work, you must tell your supervisor if you are not fit for duty for any reason.
- You must report anything in your history that reflects on your trustworthiness (such as legal actions).
- Watch for strange or changing behavior in others and report it appropriately.
- Know the correct individuals designated by your station to receive FFD concerns.

Supervisor Roles and Responsibilities

Supervisors and individuals acting in a supervisory role have additional responsibilities in the FFD program. This section describes the expectations for supervisors to observe, document, and manage behavioral issues.

Observing and Documenting

Managers and supervisors are in the best position to observe worker behavior over time and notice changes that might be cause for concern. For this reason, they are required to watch for behavior changes in their assigned workers as well as among the general workforce.

Documentation is an important part of a long-term observation process. Supervisors should record facts as they occur. This helps create accurate records that are vital when addressing the cause of a problem.

Records are also essential if discipline becomes necessary.

Addressing Behavior Problems

A supervisor’s responsibility is to recognize when behavior problems are causing job performance to decline. Catching the decline in its early stages allows for a prompt and constructive response.

If a supervisor suspects someone is unfit for duty, he should report the concern to Security as well as to the appropriate supervisor, the access authorization staff, or the FFD staff. The individual should be relieved of duty if appropriate.
If possible, the supervisor should ask another supervisor or utility employee to act as a witness.

Conducting Annual Reviews

Managers and supervisors complete an annual review for any individual who held unescorted access for 365 consecutive days.

The review is conducted by the individual’s immediate supervisor. It is based on interactions during the review period and covers the following:

- occasions when the employee behaved in an unusual manner
- circumstances that indicate the individual should be referred for an additional medical or psychological review
- observations or reports about changes in normal behavior

These evaluations go to a reviewing official to determine any additional action needed regarding the individual’s trustworthiness, reliability, and fitness-for-duty.

Acting on Suspicions

Take immediate action to remove access to the Protected Area if you feel a worker's behavior could cause safety or reliability problems. If you suspect substance abuse, arrange for the appropriate drug testing.

If an individual’s actions may present a danger to himself or others, or risks the safety of the site, intervene immediately. Do not delay taking action by trying to diagnose the problem.

If safety is not threatened, request another supervisor or other utility employee to observe the behavior.

If the worker continues to show signs of behavioral problems, contact the Employee Assistance Program staff to make a supervisor referral.

Reporting Illegal Drugs, Alcohol

Notify Security immediately if you suspect that illegal drugs or alcohol are being sold, used, or kept on site by a worker.

If possible, get another individual to validate your observations and assist in securing the area. Keep the suspected individual(s) under observation at all times until the searches and interviews are complete.

After the incident, write down everything that happened. Include statements, dates, times, witnesses, and relevant facts.

Notify your management of the incident as soon as possible.
Dealing with Hostility

People can get hostile when confronted about their behavior. This could lead to injury or plant damage.

If you feel an encounter might become physical, request that Security is present to assist with the situation. Wait for Security to arrive and then ask the individual to explain his behavior.

If the individual refuses chemical testing or appears threatening, prevent the individual from going into the Protected Area.

Summary: Supervisor Roles and Responsibilities

- Supervisors must observe the behavior of their own assigned workers as well as the general workforce.
- It is important to document all behavioral issues thoroughly.
- Behavioral problems are best caught and reported in the early stages of decline.
- An annual review is conducted for all individuals who held unescorted access for 365 consecutive days.
- Immediate action should be taken to remove a worker’s access to the Protected Area if his or her behavior presents a risk to plant safety.
- Contact Security if you feel an encounter could become physical.

HOW THE FFD PROGRAM WORKS

EAP and BOP

On the following screens you will learn about the services available from the Employee Assistance Program (EAP).

You will also learn about the Behavior Observation Program (BOP) and how to recognize aberrant behavior. These behaviors are commonly seen by noticing changes in personal health, social interaction, and work performance.

Employee Assistance Program

The Employee Assistance Program (EAP) evaluates workers for issues about their fitness-for-duty. The program offers assessment, short-term counseling, and treatment monitoring for a variety of issues such as stress, family relationships, depression, job burnout, death/dying, financial concerns, and compulsive behaviors such as gambling and overeating.

You may request help from the EAP (self-referral) or your supervisor can refer you.
If the EAP staff concludes that your behavior creates a hazard to yourself or others, federal law requires them to notify your management, even if you are a self-referral.

**Behavior Observation Program**

Management uses the Behavior Observation Program (BOP) as its primary tool for determining trustworthiness and reliability of workers with unescorted access. The BOP focuses on identifying and managing behaviors in three basic areas that could jeopardize safety:

- drug and alcohol abuse
- legal actions that result from worker behavior
- other behaviors that create a risk to the health and safety of the public

**Aberrant Behavior**

Aberrant behavior is any behavior that is not “normal” for an individual. Most people behave in a consistent manner. As you become familiar with your co-workers, you can determine what behavior is normal for them. Changes in normal behavior can occur quickly and can result from many causes, such as health, work, or family problems. These changes are normal when they happen occasionally and don’t last long. But sometimes, the changes persist and get worse.

**Signs of Aberrant Behavior**

Aberrant behavior can show up in many ways, including the following:

- inflexibility
- impulsiveness
- memory loss
- feelings of persecution, fear, or paranoia
- conversations with imaginary people or animals
- hearing voices, seeing visions, or smelling strange odors
- behavior that is dangerous, destructive, or inappropriate for the situation

**Types of Behavior Changes**

Changes can occur in several areas of our lives. Each of these areas can be broken down into several additional types of changes:

- personal health
- social interaction
- work performance
Personal Health Changes

Personal health changes can be seen in a person’s physical appearance or emotional state:
- very emotional
- bizarre or unusual ideas
- shaking/twitching
- weight loss/gain
- sweating
- nausea/stomachaches
- frequent trips to the bathroom
- poor color, blue/gray around lips
- shortness of breath
- difficulty sleeping
- stumbling
- changes in grooming

Social Interaction Changes

Changes in how people interact with others can often reveal fitness-for-duty issues:
- avoids social contact
- holds grudges
- changes friends
- ignores co-workers
- complains frequently
- fights (verbal or physical)
- brags
- lies
- talks about suicide, disasters, hopelessness, etc.
- dominates conversations
- plays pranks
- displays sexually inappropriate behavior

Work Performance Changes

Performance changes can be seen in a worker’s quality, attention to detail, adherence to policies, and cooperation with co-workers:
- works much faster or more slowly
- makes more mistakes
- steals or damages property
- breaks or ‘bends’ the rules
- forgets important things
- takes many or long breaks
- avoids part of the plant
• calls in sick frequently
• offers vague reasons for absence
• refuses to take direction
• refuses to give or receive help
• becomes overly cautious
• operates equipment carelessly

Behavioral Observation Period

If management has not had the opportunity to observe your behavior for more than 30 days, Security may deactivate your badge. This allows management an opportunity to ensure that no behavior changes of concern have developed during that time.

Summary: EAP and BOP

• The EAP evaluates workers for FFD issues and provides counseling services.
• The BOP helps identify and manage behaviors that could jeopardize safety.
• Aberrant behavior is any behavior that is not normal for a particular individual.
• Aberrant behavior can be seen in changes to personal health, social interaction, and work performance.

Chemical Testing

As a nuclear plant worker, you will be subject to chemical testing. This part of the lesson describes elements of the testing program that are important for you to know. They include the following:
• five types of chemical tests
• drugs you are tested for
• your right to privacy
• requirements for testing
• testing process, including how a positive result is determined
• effect on testing of legal drugs and food items
• role of the Medical Review Officer
• consequences required for violating FFD rules

Types of Testing

Chemical testing prevents substance abuse at work and finds it when it occurs. There are five types of tests.

Initial Testing

Initial (pre-employment/pre-access) testing must be conducted within 30 days before
getting unescorted access or being assigned to an Emergency Operations Facility or Technical Support Center.

**Random Testing**
All workers are subject to random testing any time they are at work, including weekends and holidays.

Because the test is random, some workers might be tested more than others.

If you are selected for a random test, your supervisor or point of contact will notify you of the scheduled test time.

You may not miss a scheduled test anytime you are on site. You may not request time off once notified of the test.

**For-cause Testing**
For-cause testing is done as soon as possible after a worker is seen behaving in a way that indicates possible substance abuse.

A supervisor might also arrange for-cause testing after receiving any credible information that an individual is abusing drugs or alcohol.

**Post-event Testing**
A worker who commits an error that leads to an event (as defined by station procedure) will be given chemical testing if the event involves any of the following conditions:

- an illness or injury that meets OSHA recordable criteria (below) within four hours after the event
- a radiation exposure or release of radioactivity that exceeds regulatory limits
- worker behavior that significantly degrades (actually or potentially) plant safety

**OSHA Recordable Criteria**
An injury or illness meets the OSHA general recording criteria if it results in any of the following:

- death
- days away from work
- restricted work or transfer to another job
- medical treatment beyond first aid
- loss of consciousness

An illness or injury also meets the general recording criteria if it involves a significant injury or illness diagnosed by a physician or other licensed health care professional even if it does not result in death, days away from work, restricted work or job transfer, medical treatment beyond first aid, or loss of consciousness.

**Follow-up Testing**
Follow-up testing is conducted for an employee whose unescorted access has been reinstated after an earlier positive test. Follow-up tests are unannounced, which verifies
that the individual continues to be free from drugs and alcohol.

**Conducting the Tests**

The FFD staff conducts all chemical testing. They collect and process the specimens, and notify plant management of test results under the direction of the Medical Review Officer.

Medications that are legally prescribed or purchased over the counter (such as aspirin or cold medicine) can cause a positive test result. Inform your supervisor if you are taking any medications that might affect test results. Some foods and dietary supplements (like poppy seeds and hemp oil) can also affect testing results.

Every effort is made to ensure that drug test analyses are accurate. The FFD staff explores all possible causes for a positive test before confirming it.

**Substances Tested**

Chemical tests look for signs of the following substances:

- Amphetamines and Methamphetamines
- Phencyclidine (PCP)
- Opiates
- Cocaine
- Marijuana
- Alcohol

**Right to Privacy**

Personal information collected for the FFD program is only disclosed as required by procedure.

You have the right to privacy at the collection site unless either of two conditions exist:

- there is reason to believe that you will alter, substitute, or tamper with a specimen
- you have previously tested positive, which requires an observed collection before unescorted access authorization is granted

**Compliance with Testing**

Chemical testing is required for all workers who need unescorted access to a nuclear plant.

Refusing to comply with the program will have the same consequences as a positive test.

Failure to comply includes, but is not limited to, the following:

- refusing to provide urine specimens or submit to a breath test when required
- attempting to alter a specimen
Testing Procedure

Urinalysis will be used to test for all substances except alcohol. Anyone with a positive test result is considered unfit for duty.

Individuals with blood alcohol content (BAC) of 0.04 percent or greater are considered unfit for duty.

The initial alcohol test may be conducted using a breath alcohol content or oral fluid test. A confirmatory breath test for alcohol will be conducted if the first test result is 0.02 percent or greater, depending on how long the individual has been at work.

Confirming Test Results

The BAC level for a confirmed positive test depends on how long a worker has been on the job. The chart shows the criteria. You have the right to appeal any positive test result and any sanctions taken against you. Appeals must be in writing to licensee (plant) management.

<table>
<thead>
<tr>
<th>Blood Alcohol Content</th>
<th>Time at Work* (through test completion)</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.04</td>
<td>Any</td>
<td>Positive</td>
</tr>
<tr>
<td>0.03</td>
<td>One hour or more</td>
<td>Positive</td>
</tr>
<tr>
<td>0.02</td>
<td>Two hours or more</td>
<td>Positive</td>
</tr>
<tr>
<td>Between 0.01 and 0.02</td>
<td>Three hours or more</td>
<td>Negative, but inform FFD management and remove worker from covered duty temporarily</td>
</tr>
</tbody>
</table>

*includes all break periods

Role of the MRO

The Medical Review Officer (MRO) is a licensed physician with expertise in substance abuse disorders. The MRO has the appropriate medical training to evaluate all positive test results. When appropriate, the MRO will recommend individuals to the EAP.

The MRO is responsible for the overall administration of the FFD program.

To ensure your privacy, you may have to provide medical information directly to the Medical Review Officer in some cases.

NRC Sanctions

The Nuclear Regulatory Commission (NRC) requires certain consequences for FFD
violations.
The first violation must result in unfavorable termination of the individual’s access authorization for at least **14 days**.
Any attempt to subvert the testing process must result in immediate and **permanent** termination of the individual’s access authorization.

Subverting the process includes, but is not limited to, the following:
- refusing to provide a specimen
- attempting to substitute or adulterate a specimen
- violating drug and alcohol provisions of an FFD policy if access authorization was previously denied for five years

**Five-Year Sanctions**

Certain acts require an unfavorable termination of access authorization for at least **five years**:
- a repeat confirmed positive test result, (even during an assessment or treatment period)
- selling, using, or possessing illegal drugs or consuming alcohol in the Protected Area of a nuclear plant or while performing duties covered under the FFD program
- resigning or withdrawing an application for access authorization before it is terminated or denied for a first violation of the FFD policy involving a confirmed positive test result

**Summary: Chemical Testing**

- There are five types of testing conducted at different times for different reasons: initial, random, for-cause, post-event, and follow-up.
- Your medical information will be kept private and only disclosed as required by procedure.
- You must comply with testing to be included in the unescorted access program.
- Blood alcohol content of 0.04 percent or greater makes you unfit for duty.
- A confirmed positive test is based on your blood alcohol content and the length of time you have been at work.
- Confirmed test results between .01 and .02 percent BAC are considered negative, but require you to be removed temporarily from activities covered by the FFD program.
- Legal drugs and some food items can cause a positive test result.
- The MRO is a licensed physician who reviews all positive test results.
- The NRC mandates minimum consequences for FFD violations.
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- Southern Nuclear Operating Company
- STP Nuclear Operating Company
- Union Electric Company
- Wolf Creek Nuclear Operating Company
- Xcel Energy

Documents

NEI 03-04 Revision 7, "Guideline for Plant Access Training"
NANTeL
Generic Plant Access Training

*Plant Access Lesson*

Estimated Time to Complete: 1.5 Hours

Revision 9.02

April 2, 2010

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**Purpose**

This lesson provides general information that workers need to prepare for work at a nuclear power plant. It describes how a nuclear station operates, what is expected of each individual, and how to work safely at all times. The material meets the Nuclear Energy Institute’s generic objectives for training of all plant workers according to NEI 03-04 Revision 7, “Guideline for Plant Access Training.” Individual stations must supplement this generic training with additional site-specific training as required by NEI 03-04. Site-specific courses for each utility are available on NANTeL.

**Objectives**

**Making Nuclear Power**

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

**Understanding Radiation**

- 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**

- 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
• 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
• 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 26 electric utilities that run 104 nuclear reactors at 65 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. It is accepted at any nuclear plant in the United States. You will receive additional training specifically about your station.

If you are taking this course for the first time, you are required to view all the training content. If you are taking this course for requalification, you have the option of using the Table of Contents in the menu above to visit any information that you wish to review before taking the exam.

How Nuclear Power is Made

In a nuclear reactor, water, called reactor coolant, is circulated through the reactor core containing nuclear fuel assemblies. As the water passes around the fuel assemblies, it is heated from energy released during the fission process. This water is then pumped to a steam generator. A secondary water source, called secondary water, flows around the tubes containing the reactor coolant. The secondary water is turned into steam as heat is transferred from the reactor coolant.

The steam is used to turn the high pressure and low pressure turbine blades. This series of turbines is connected to a main generator rotor. The turning rotor creates electricity inside the generator and is ready for distribution to customers.
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.

<table>
<thead>
<tr>
<th></th>
<th>Pressurized Water Reactor</th>
<th>Boiling Water Reactor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary water/reactor coolant</strong></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>is heated in the reactor vessel but is kept under pressure so it <strong>never turns into steam</strong>. It runs continuously through a steam generator and back to the reactor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water is heated in the reactor vessel and turns into steam.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>As the primary water runs through the steam generator tubes, it heats the secondary water that surrounds them. <strong>The secondary water turns into steam.</strong></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Steam flows into the turbine, spins the generator, and produces electricity.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Steam leaves the turbine, changes back to water, and repeats the process.</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

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 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.

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**.

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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).

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.

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.

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.

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

Another Way to Look at Radiation & Contamination

Radiation is energy; contamination is material that gives off radiation.

A good comparison would be a skunk. The powerful liquid that is in the skunk’s body is like radioactive material. It gives off a terrible odor, just as the radioactive material gives off radiation. This nasty fluid is harmless to you as long as it stays where it belongs inside the skunk.

If the skunk sprays you with this liquid, you are contaminated with this material. You carry it with you wherever you go and continue smelling the odor until you get a good cleaning.

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 600 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 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 180 mrem (less than one third 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.

Background dose 620 mrem plus Radiation Worker Occupational Dose 180 mrem equals 800 mrem.


**Radiation Effects**
Research shows that exposure to certain 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 more than three times 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. Their cells are developing more rapidly, and radiation disrupts that process. Therefore, **unborn children** are at the greatest risk because they **are most sensitive** to the effects of radiation.
Comparison of Health Risks

The delayed effects from radiation exposure, such as contracting cancer, are not a certainty. These increased risks are described by how much they 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 (man-made 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

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.
Boundaries

Nuclear plants are divided into three areas with different levels of security.

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.

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.

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.

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. repellent sprays such as mace

**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 them open unless you first get permission from Security.
- Always make sure they 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.
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.

Exit Portal Contamination Monitor

The exit portal contamination monitor checks all employees for radioactive contamination as they leave the PA. 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
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
• 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.

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.

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.

Housekeeping
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. Your identity will be kept confidential. Federal law protects workers from retaliation by the company when they file an inspection request.

You will be notified in writing if the NRC rejects your request because it finds no reasonable grounds to pursue the issue.

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.

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 limit 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
Several types of radiation monitoring devices are used in a nuclear plant. Radiation workers wear a thermoluminescent dosimeter (TLD). This tracks the amount of radiation dose the individual receives, and it is used to create a permanent dose record.

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

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.

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.

Quality Assurance

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

Quality Control

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.

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:
- 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.
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:
  - 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
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.

- **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.

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.

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 or by rolling it (using the bottom of the cylinder as a rolling point).
• 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:
• not intended for continuous human occupancy
• limited means of getting in and out
• potential to accumulate a hazardous atmosphere or engulf occupants.

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.

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

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.

**Electrical Operating Experience**

A supplemental worker drilling into a concrete wall penetrated 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.

**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.

**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 awhile. 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.
Material Safety Data Sheets

Chemical companies create a Material Safety Data Sheet (MSDS) 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

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.

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.

**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.

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Documents
NEI 03-04 (Rev. 7), “Guideline for Plant Access Training”