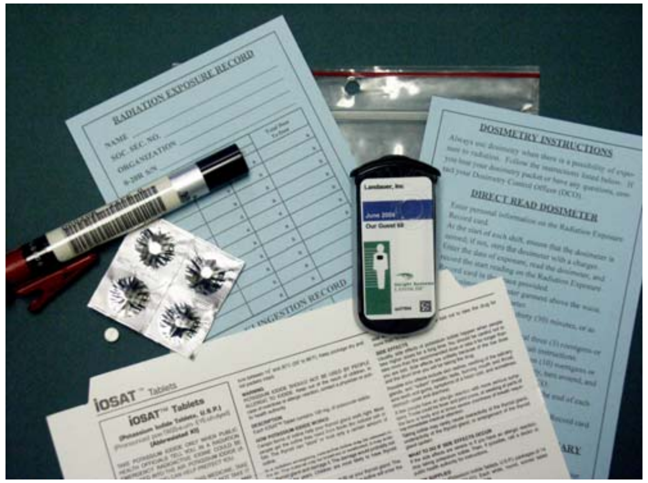
DETECTING IONIZING RADIATION

IONIZING RADIATION CANNOT BE DETECTED BY ANY OF THE FIVE SENSES.

Since ionizing radiation cannot be detected by human senses, special equipment is needed to detect and measure it. Emergency workers are furnished with instruments and devices that record exposure to radiation. One type, the direct-read dosimeter, enables the emergency worker to readily obtain readings that relate to the United States Environmental Protection Agency (U.S. EPA) and Illinois Plan for Radiological Accidents (IPRA) exposure limits. A second type, a luminescent dosimeter badge (LD), though not directly readable, provides a permanent record of the emergency worker's exposure.

DOSIMETRY KITS

Dosimetry for emergency workers is prepackaged to accelerate and simplify the issuing process during emergency situations.



INTRODUCTION

An emergency is an unexpected situation or occurrence of a serious nature that demands immediate action. Because accidents involving radiation may occur at nuclear power stations, we need to prepare ourselves for this type of emergency. This section of the training guide provides information on radiation and how emergency workers may protect themselves from its potentially harmful effects.

RADIATION BASICS

WHAT IS RADIOACTIVITY AND RADIATION?

Radioactivity is the natural process of unstable atoms releasing their excess energy. This emission, or giving up energy, is called radiation.

Radiation can be either man-made or occur naturally in the environment. It is divided into two types: non-ionizing and ionizing. Non-ionizing radiation is the type of radiation associated with the operation of many of the conveniences that we use in our daily lives: for example, the energy that microwave ovens emit to cook our foods and the waves of energy that transmit our radio and television signals.

Ionizing radiation is the type of radiation associated with nuclear power generation. Because of its ability to cause damage to any organism, it is important to understand how to protect yourself from unnecessary exposure. There are many additional uses of ionizing radiation, which include: medical x-ray, radioactive material used in medical diagnosis and treatment, industrial manufacturing, and in the production of many consumer products such as cigarettes, smoke detectors and some gas lantern mantels.

Besides the radioactive materials that are man-made, ionizing radiation occurs naturally in rocks and eventually works its way into the soil, trees, plants, ground water, and even into materials in the human body. Another important source of naturally occurring ionizing radiation is the sun and outer space, which produces a continuous exposure to all living organisms on this planet. We call naturally occurring radiation *background radiation*.

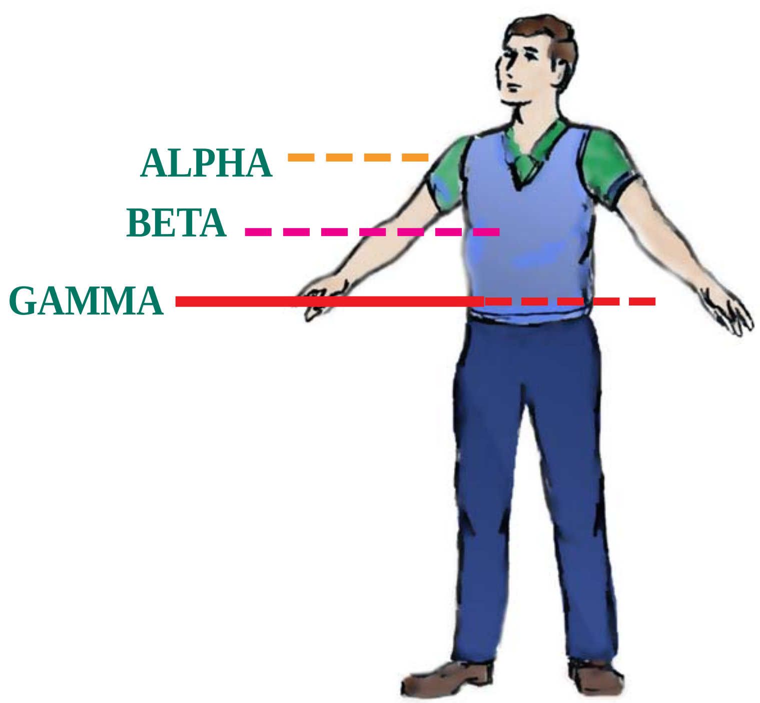
TYPES OF IONIZING RADIATION

There are four basic types of ionizing radiation: alpha particles, beta particles, gamma rays, and x-rays. While all types of radiation are potentially harmful, they differ in the manner in which they affect us.

Alpha Particles have a very low penetrating ability and can be stopped by a very thin sheet of paper or the outer layer of skin. They are not an external hazard, but once they are inhaled or ingested, they become very hazardous.

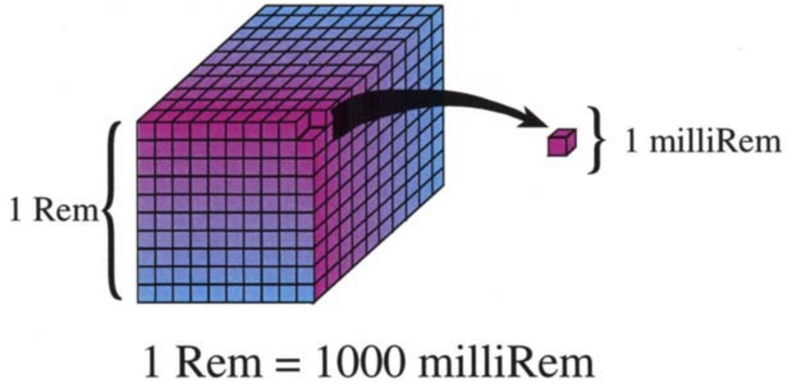
Beta Particles have a low penetrating ability and can be shielded or stopped by thin sheets of metal or thick plastic. Depending on the energy of beta particles, it can cause burns ranging in severity from minor (similar to a sunburn) to extreme (blistering similar to third-degree burns from fire). Because beta particles are also harmful if inhaled or ingested, they are both an internal and external hazard.

Gamma Rays and X-rays are waves similar to light waves, but have higher energy levels. Lead, steel, concrete or water are commonly used to shield this type of ionizing radiation. Although scientists make a distinction between x-rays and gamma rays, the important difference is that gamma rays are usually more energetic and therefore more penetrating.



FRACTIONAL UNITS

The fractional units, milliroentgen, millirad, and milliRem, are used to measure and describe small quantities of radiation. The prefix, "milli," means 1/1000th of a roentgen, rad, or Rem. For example, 1,000 mR equals 1 R.



To simplify communications and the reporting or exchange of information, the terms R and mR are used instead of the scientific terminology.

COLLECTION OF RADIOLOGICAL SAMPLES

- Escort radiological monitoring teams
- Escort and/or assist sample collection personnel

DECONTAMINATION OF EQUIPMENT AND STREETS

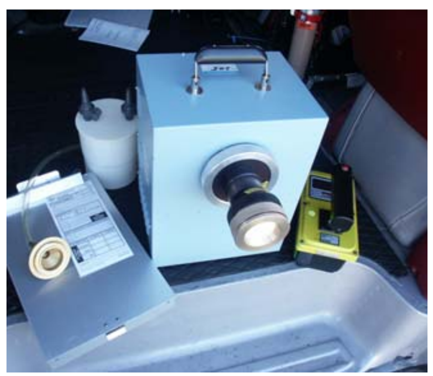
- Set up monitoring stations on perimeter of affected areas
- Wash down vehicles, streets, etc. upon recommendation of IEMA
- Wear normal protective gear for personal contamination protection

CONTINUATION OF ROUTINE PUBLIC SERVICES

- Law enforcement and crime prevention
- Emergency medical services
- Fire/rescue services in affected areas

Part II

Radiological Hazard & Exposure Control



UNITS OF MEASUREMENT

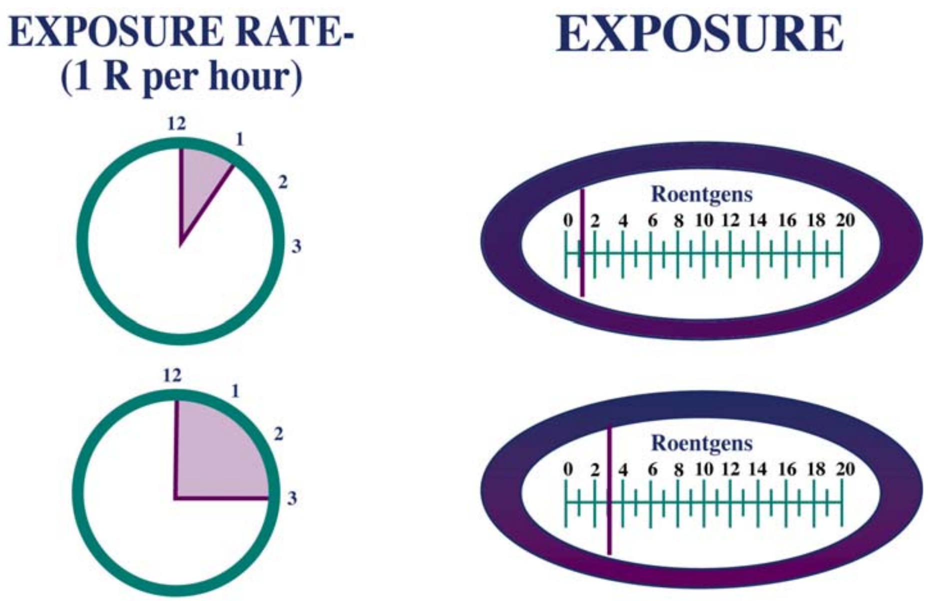
RADIATION IS MEASURED IN THREE BASIC UNITS:

UNIT	DEFINITION
ROENTGEN (R) —	The roentgen is the unit of exposure and is a measure of the ionization produced in air by gamma rays and x-rays. Direct-read dosimeters record exposure in roentgens.
RADIATION ABSORBED DOSE (rad) —	The rad is the unit of absorbed dose and is a measure of the energy deposited in matter by ionizing radiation.
ROENTGEN EQUIVALENT MAN (Rem) —	The Rem is the unit of dose equivalent and is the measure that accounts for the varying effects of different types of ionizing radiation on the human body.

An understanding of the differences in these units is important in the scientific study of ionizing radiation. In nuclear power station accidents or radiation emergencies, however, the terms roentgen, rad, and Rem are used interchangeably. Therefore, for this purpose, a roentgen is equal to a rad is equal to a Rem.

EXPOSURE RATE AND EXPOSURE

Exposure rate is a measurement of the rate of exposure over some period of time, usually an hour. For example, if a reading from an exposure rate meter was 1 R/hr and an individual remained in the area where this reading was taken for one hour, the direct-read dosimeter would register an exposure of 1 R.



Environmental teams will be deployed throughout areas affected by a radiological accident at a nuclear power station. These teams will be equipped with a variety of instruments for measuring exposure rates. The readings obtained from these instruments will be relayed to an IEMA representative at each affected county Emergency Operation Center. This information will be distributed to all Dosimetry Control Officers (DCO) responsible for controlling the exposure of emergency workers.

RECOVERY, RE-ENTRY AND RETURN

Onsite recovery operations consist of all the steps taken to return the nuclear power station to an operational status. Due to the fact that recovery plans will be based on the specific on-going events, much of the recovery planning will take place during the emergency. Exelon will formulate the onsite recovery plans.

Offsite recovery involves the process of determining when radiation exposure rates and concentrations of radioactive material in the environment have returned to acceptable levels for the return of the general public for unconditional occupancy or use.

Re-entry is the temporary entry of individuals into a restricted zone under controlled conditions. Re-entry is allowed so that necessary functions can be performed in the restricted area.

Return is defined as the return of the general population to an evacuated area. This includes provisions for notification and transportation of evacuees. The emergency situation must be ended prior to return, and the evacuated area determined safe by IEMA.

FUNCTIONS OF THE EMERGENCY WORKER

The IPRA coordinates the efforts of Federal, State and local governmental agencies. These governmental agencies are made up of personnel referred to as "Emergency Workers". The role played by these emergency workers is vital to the successful implementation of the IPRA, and more importantly to the safety and welfare of the EPZ population.

Emergency workers may be assigned to perform one or more of the following tasks:

PUBLIC NOTIFICATION

- Utilize squad cars or vehicles equipped with mobile PA systems
- Inform citizens of recommended protective actions

TRAFFIC AND ACCESS CONTROL

- Staff traffic and access control posts
- Direct traffic
- Monitor traffic conditions
- Maintain access control into affected areas
- Deliver and erect barricades
- Provide roving security
- Maintain clear roads

EVACUATION OF GENERAL POPULATION, SCHOOLS AND SPECIAL CONCERNS

- Notify individuals in affected areas
- Provide bus transportation
- Provide special transportation for disabled citizens, shut-ins, etc.
- Register evacuees at Reception Centers

PROTECTING YOURSELF FROM IONIZING RADIATION

EFFECTS OF TIME, DISTANCE, AND SHIELDING

Time, distance, and shielding, when used effectively, will help protect you from ionizing radiation.

Time — **The less time you spend in a radiation area, the less exposure you will receive.**

- For example, if you were working in an area where the exposure rate was 100 mR/hr and you stayed there for one hour, you would receive an exposure of 100 mR. If you remained there for only 30 minutes, you would receive an exposure of 50 mR.

Distance — **The farther away you are from a source of ionizing radiation, the less exposure you will receive.**

- When assigned tasks in a radiation area are completed, emergency workers will be reassigned to unaffected locations.

Shielding — **The use of shielding between you and a source of ionizing radiation will reduce your exposure.**

- The amount of reduction depends on the type and density of the shielding material.
- When possible, emergency workers in radiation areas should take advantage of shielding behind buildings, automobiles, trucks, or any other means of shelter to reduce their exposure.

LEVELS OF EXPOSURE

BIOLOGICAL EFFECTS OF IONIZING RADIATION

The fact that ionizing radiation can cause biological damage is well documented, but determining its effect is extremely difficult. Many factors such as the type of radiation, the energy of the radiation, the amount of exposure, and the time it took to receive the exposure must be considered in determining what effects may be seen. Scientists have, however, established some general guidelines for relating amounts of exposure to biological effects.

BIOLOGICAL EFFECT	EXPOSURE (REM)
Minor red blood cell changes	20 R-50 R
Clinical symptoms (POSSIBLE) (nausea, vomiting, and malaise)	50 R-100 R
Clinical symptoms (PROBABLE) (nausea, vomiting, and malaise)	100 R-300 R
Lethal dose for 50% of exposed group within 30 days	450 R +

NUREG-1250, Rev. 1 "Report on the Accident at the Chernobyl Nuclear Power Station."

PROTECTIVE ACTIONS

Protective actions are the specific actions implemented by Federal, State, county and local emergency response organizations to minimize radiation exposure during an accident at a nuclear power station.

SHELTER-IN-PLACE

This recommendation advises the public to remain inside of the building where they are located (i.e. school, office, home) and remain there until it is safe to go outside. Evacuation may be recommended for special cases within the affected area.

EVACUATION

An evacuation involves recommending the public leave a potentially affected area of the EPZ. Evacuees will be advised by commercial radio stations where shelter locations are established. Evacuees will remain away from their homes until it is safe to return.

TRAFFIC AND ACCESS CONTROL

This is a two-part process: controlling the traffic leaving an affected area and preventing traffic from entering the sheltered and/or evacuated area.

FOOD, WATER AND MILK CONTROL

Provisions are made for the sampling, testing for radioactivity and restriction of the distribution of food, water and milk until a determination is made that it can be safely consumed.

PARALLEL ACTIONS

Parallel actions are taken in conjunction with or after protective actions are implemented.

PUBLIC INFORMATION

As is the case in any major emergency, the public must be kept informed of the situation. A designated spokesperson for the State, Counties and each municipality will be responsible for issuing statements to the media.

RADIATION EXPOSURE CONTROL

IEMA is responsible for assessing offsite radiation levels and determining appropriate actions based on the severity of these radiation levels. Steps are taken to control individual activities in order to reduce or prevent unnecessary radiation exposure or contamination and keep accurate records of the exposures incurred by evacuees and emergency workers.

LAW ENFORCEMENT AND CRIME PREVENTION

This action provides for the maintenance of civil order during and after an accident.

FIRE AND RESCUE

This action provides for the deployment of resources for fire prevention and suppression as well as emergency rescue operations.

EMERGENCY MEDICAL SERVICES

This action ensures the provision of emergency life support during an accident.

SOCIAL SERVICES

This action ensures the provision of food, clothing, shelter and routine medical services for evacuees.

EXPOSURE LIMITS

The U.S. EPA has established guidelines for exposure limits during emergency situations. The IPRA uses an EXPOSURE NOTIFICATION LIMIT and a TURN-AROUND LIMIT to conservatively regulate emergency worker exposures.

During a NPS incident, if an emergency worker's cumulative exposure reaches 3R or more, they are instructed to report to the DCO and await further instruction. The DCO will confer with a representative of IEMA to evaluate the situation and furnish instructions to the emergency worker. When an emergency worker's cumulative exposure totals 10 R or more, they should immediately contact their DCO. The DCO will provide specific directions to protect the emergency worker from additional exposure as they leave the area. 10 R of exposure is a life time limit, not a per-incident limit.

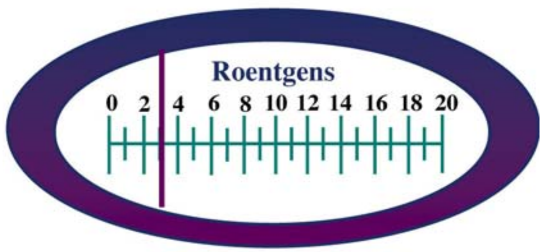
U.S. EPA (REM)	IPRA (REM)
10 R Whole Body (non-lifesaving)	3 R Whole Body Notification Limit
25 R Whole Body (lifesaving)	10 R Notification/ Turn-Around Limit

These values were developed to promote the practice of ALARA (As Low As Reasonably Achievable). By working together and using active communication, the ability to limit exposure(s) can be achieved.

DIRECT-READ DOSIMETER (DRD)

Emergency workers are issued one direct-read dosimeter along with a Radiation Exposure Record/Instruction Card. The dosimeter has a range of 0-20 R. If the dosimeter has not been set at zero on the scale, return it to the DCO for recharging.

0 - 20 R



The direct-read dosimeter is a small, cylindrical device equipped with a clip to fasten to the wearer's clothing. It is fairly accurate and rugged, and can be read directly by the user. The dosimeter contains a fixed horizontal scale of exposure measured in roentgens (R), a movable vertical hairline, and a built-in lens that enlarges the scale and hairline for easy viewing. When the hairline is set on the zero point of the scale, it is said to be fully charged, or **zeroed**. If the dosimeter is exposed to ionizing radiation, the hairline moves along the scale to indicate the amount of exposure.

The overall purpose of an EOC is to reduce confusion among the operational departments, eliminate the duplication of efforts, coordinate the response to the overall situation and ensure maximum utilization of manpower and equipment.

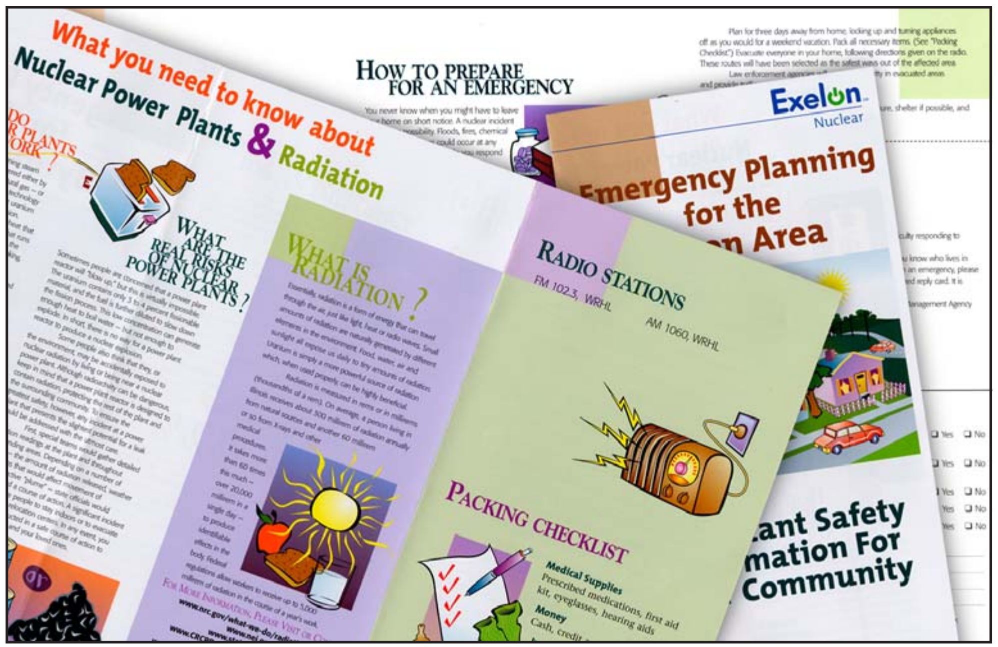
In addition to serving as a center for the coordination of response operations, each EOC serves as a coordination point for news statements within the jurisdiction. News statements to the media may be issued at a site established within the local jurisdiction or at the Joint Information Center (JIC). The JIC will be activated during the emergency at an Exelon facility to provide the media with a single point of contact with Exelon and Federal and State agencies. Any news statements from the county EOCs should be closely coordinated with the JIC to avoid confusion.

Emergency workers may be approached by a member of the media inquiring about what they are doing or what is going on at the Nuclear Power Station. If this situation occurs, the media should be referred to the local media briefing location or to the JIC. At no time should an emergency worker discuss issues with the media in which they do not have firsthand knowledge.

NOTIFICATION OF THE PUBLIC

Outdoor warning sirens have been installed throughout all of the Nuclear Power Station EPZs. These sirens are activated to alert EPZ residents of an emergency situation. Upon hearing the warning signal, EPZ residents should tune their radios to the designated local radio stations for information and official instructions. Vehicles with mobile public address systems can be used as backup in the event of a siren malfunction. The outdoor warning sirens can also be used to warn residents of severe weather.

The emergency broadcast radio stations designated for the Nuclear Power Station EPZ is located in the Exelon "Emergency Planning" Brochure. County officials provide instructional messages to these radio stations. These messages are then broadcast to the public.



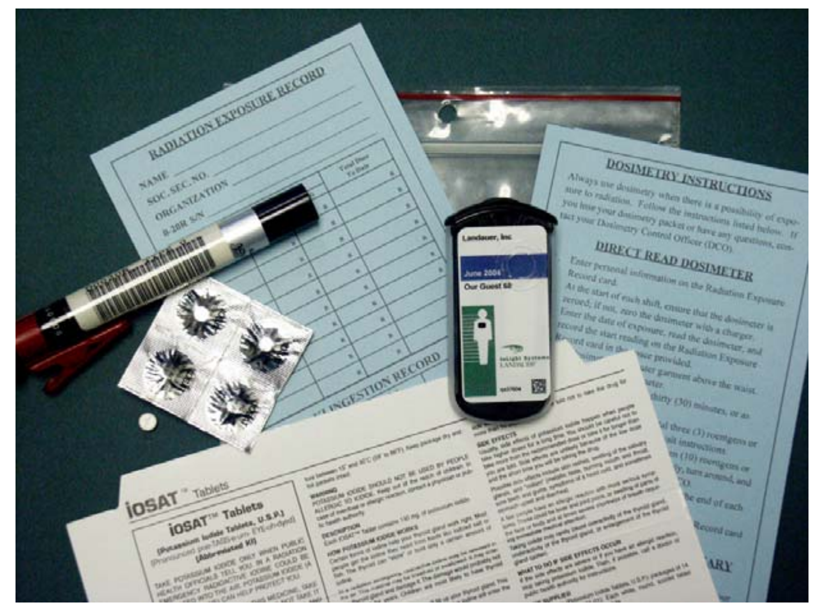
The contact information for emergency planning in your area is located in the Exelon "Emergency Planning" Brochure.

DETECTING AND MEASURING IONIZING RADIATION

DOSIMETRY KITS

Dosimetry for emergency workers is prepackaged and labeled by the DCO to accelerate and simplify the issuing process during emergency situations. Each dosimetry kit contains one of each of the following:

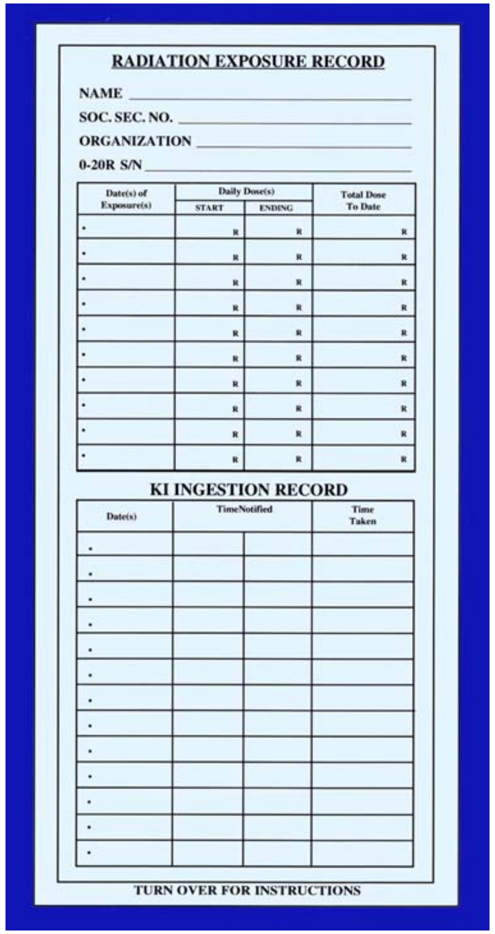
- 0-20 R direct-read dosimeter;
- Radiation Exposure Record/Instruction Card;
- Luminescent Dosimeter (LD) badge;
- foilpack of KI "IOSAT™" tablets;
- KI directions for use; and
- KI extension notice, as needed.



RADIATION EXPOSURE RECORD/INSTRUCTION CARD

DOSIMETRY INSTRUCTIONS

Emergency workers should review the dosimetry instructions on the Radiation Exposure/Instruction Card upon receipt of the dosimetry packet. Contact the DCO immediately if there are any questions.



RADIATION EXPOSURE RECORD

NAME ____________________

SOC. SEC. NO. ____________________

ORGANIZATION ____________________

0-20R S/N ____________________

Date(s) of Exposure(s)	Daily Dose(s)		Total Dose To Date
	START	ENDING	
•	R	R	R
•	R	R	R
•	R	R	R
•	R	R	R
•	R	R	R
•	R	R	R
•	R	R	R
•	R	R	R
•	R	R	R
•	R	R	R

KI INGESTION RECORD

Date(s)	TimeNotified		Time Taken
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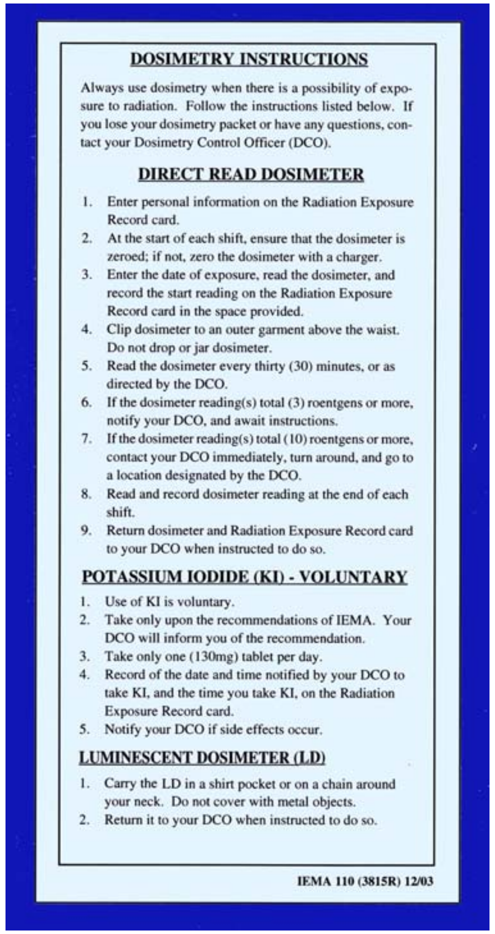
TURN OVER FOR INSTRUCTIONS



DOSIMETRY INSTRUCTIONS

Always use dosimetry when there is a possibility of exposure to radiation. Follow the instructions listed below. If you lose your dosimetry packet or have any questions, contact your Dosimetry Control Officer (DCO).

DIRECT READ DOSIMETER

1. Enter personal information on the Radiation Exposure Record card.
2. At the start of each shift, ensure that the dosimeter is zeroed; if not, zero the dosimeter with a charger.
3. Enter the date of exposure, read the dosimeter, and record the start reading on the Radiation Exposure Record card in the space provided.
4. Clip dosimeter to an outer garment above the waist. Do not drop or jar dosimeter.
5. Read the dosimeter every thirty (30) minutes, or as directed by the DCO.
6. If the dosimeter reading(s) total (3) roentgens or more, notify your DCO, and await instructions.
7. If the dosimeter reading(s) total (10) roentgens or more, contact your DCO immediately, turn around, and go to a location designated by the DCO.
8. Read and record dosimeter reading at the end of each shift.
9. Return dosimeter and Radiation Exposure Record card to your DCO when instructed to do so.

POTASSIUM IODIDE (KI) - VOLUNTARY

1. Use of KI is voluntary.
2. Take only upon the recommendations of IEMA. Your DCO will inform you of the recommendation.
3. Take only one (130mg) tablet per day.
4. Record of the date and time notified by your DCO to take KI, and the time you take KI, on the Radiation Exposure Record card.
5. Notify your DCO if side effects occur.

LUMINESCENT DOSIMETER (LD)

1. Carry the LD in a shirt pocket or on a chain around your neck. Do not cover with metal objects.
2. Return it to your DCO when instructed to do so.

IEMA 110 (3815R) 12/03

INITIAL NOTIFICATION

A major concern during an emergency is receipt of accurate information in a timely manner. Another concern is ensuring that the information is authentic. The solution to both of these concerns was the creation of the Nuclear Accident Reporting System (NARS), a dedicated phone system linking Exelon, the State EOC, REAC and the affected counties. This communications system allows parties involved with the accident to receive timely and factual information simultaneously, thereby eliminating possible misinterpretation of vital information. The NARS will be utilized throughout the accident to provide continual status updates and protective action recommendations. In the event of a malfunction of the NARS, two backup systems are available: commercial telephone and radio. County officials, also forward information by fax and/or commercial telephone to the municipalities and the support Counties in the EPZ.

EMERGENCY OPERATIONS CENTERS

Effective response to an accident at a Nuclear Power Station requires a great deal of coordination and cooperation among agencies. To ensure maximum effectiveness, facilities known as Emergency Operations Centers (EOCs) have been established for the affected counties and the municipalities located within the EPZ. The purpose of these facilities is to allow the chief executives, ESDA coordinators/EMA directors and operational department heads to collectively analyze the situation, coordinate the appropriate response and maximize the use of available manpower and equipment.

During an accident at a Nuclear Power Station, the counties and communities will be faced with requests for normal governmental services in addition to the response generated by the nuclear power station accident, such as fire fighting, law enforcement and emergency medical services. Normally telecommunicators automatically dispatch these responses; however, during a major emergency, resources may be scarce and responses may have to be prioritized. The decision, as to which call receives the highest priority and, therefore, the available resources, must be made by the appropriate department head in the EOC.

Additional resources from other municipal, county or State departments can be committed to an emergency response through coordination in the EOC.

WHEN USING THE DIRECT-READ DOSIMETER, FOLLOW THESE KEY POINTS:

- the dosimeter is read by viewing the scale and hairline through the lens at the clip end when pointed at any light source;
- when reading the dosimeter, always keep the scale in a horizontal position to ensure an accurate reading, and avoid rough handling or excessive jarring;
- when you receive the dosimeter, read it to ensure it is fully charged, or zeroed, then enter the appropriate personal identification data on the Radiation Exposure Record;
- at the beginning and end of each shift, record the start and ending dosimeter readings on the Radiation Exposure Record/Instruction Card;
- while performing the tasks of an emergency worker, read the dosimeter every 30 minutes unless otherwise directed;
- immediately report a cumulative reading of 3 R or more to the DCO and await instructions;
- immediately report a cumulative reading of 10 R or more to the DCO, turn around, and go to the location designated by the DCO;
- at the end of each shift, calculate the total dose to date by adding the previous shift's total to the current shift's ending dosimeter reading.

LUMINESCENT DOSIMETER (LD)

The LD badge is a second form of dosimetry issued to emergency workers and is used to confirm any exposure received while responding to an off-site nuclear power plant release.

The LD badge contains an aluminum oxide detection material that when optically stimulated with a laser assisted device, gives off light in proportion to the amount of radiation exposure recieved. LDs are extremely accurate and cover a broad range of exposure from one millirem to 1000 rem.

In the event of a radiological accident, the badges can be read at any time by IEMA staff. To ensure their accuracy and effectiveness, IEMA will replace LD badges bi-annually.

UNUSUAL EVENT

An Unusual Event is a situation with a potential for the degradation of the level of safety at the nuclear power station. The situation may or may not have caused damage to the station, and if there is damage, it does not necessarily require an immediate change in station operating status. No releases of radioactive material requiring off-site response or monitoring are expected unless further degradation of safety systems occurs. Examples of an Unusual Event are:

- A Reactor Coolant System leak rate greater than ten gallons per minute, if the source of the leak is not identified, or leak rate greater than 25 gallons per minute if the source of the leak is known.
- Any earthquake felt in the station.
- Any fire within the restricted area that cannot be extinguished within 15 minutes by the fire brigade.

ALERT

An Alert is declared when events involve potential or actual degradation of level of safety at a nuclear station. An Alert situation may be brought on by either man-made or natural phenomena and can reasonably be expected to occur during the life of the station.

An Alert condition initiates a rapid transition to a state of readiness by station personnel, and if warranted, by off-site emergency support organizations. Protective evacuation or isolation of certain areas within the plant may be necessary. Examples of an Alert are as follows:

- A Reactor Coolant System leak rate equal to or greater than makeup capacity.
- Any severe earthquake felt in the station with sufficient magnitude for suspected structural or equipment damage.
- A fire in a critical area, which could affect station operations.

SITE AREA EMERGENCY

A Site Area Emergency includes events, which are in progress involving actual (or likely) major failure of station functions needed for the protection of the public, which may result in releases of radioactive materials to the environment. These releases would be of sufficient magnitude to warrant assessment actions off-site to determine potential health hazards. However abnormal levels of airborne radioactive materials beyond the site boundary are not expected. Examples of a Site Area Emergency are as follows:

- Loss of all offsite and onsite AC power to the safety buses for > 15 minutes.
- Loss of annunciators, computers and indications during a unit power change.
- Security event in a vital area.

GENERAL EMERGENCY

A General Emergency indicates events, which are in progress or have occurred that involve actual or imminent substantial reactor core damage with the likelihood of a related release of large quantities of radioactivity to the environment. This classification is characterized by off-site consequences possibly requiring protective actions as a matter of prudence or necessity. Examples of situations, which would initiate a General Emergency, are as follows:

- Loss of all offsite and onsite AC power to the safety buses for an extended period of time.
- Security event, which results in loss of physical control of station.
- Conditions indicate imminent fuel damage and a release from the station affecting the public.

DOSIMETER CHARGER

CHARGING THE DIRECT-READ DOSIMETER

Direct-read dosimeters furnished to emergency workers are zeroed by the DCO prior to being issued. Dosimeter chargers are used to zero the direct-read dosimeters.

KI INGESTION RECORD

Date(s)	Time Notified		Time Taken
•			
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TURN OVER FOR INSTRUCTIONS

POTASSIUM IODIDE (KI) - VOLUNTARY

1. Use of KI is voluntary.
2. Take only upon the recommendations of IEMA. Your DCO will inform you of the recommendation.
3. Take only one (130mg) tablet per day.
4. Record of the date and time notified by your DCO to take KI, and the time you take KI, on the Radiation Exposure Record card.
5. Notify your DCO if side effects occur.

DIRECTIONS FOR USE OF KI

iOSAT™ Tablets

iOSAT™ Tablets

(Potassium Iodide Tablets, U.S.P.)
(Pronounced poe-TASS-e-um- EYE-oh-dyed)
(Abbreviated KI)

TAKE POTASSIUM IODIDE ONLY WHEN PUBLIC HEALTH OFFICIALS TELL YOU. IN A RADIATION EMERGENCY RADIOACTIVE IODINE COULD BE RELEASED INTO THE AIR. POTASSIUM IODIDE (A FORM OF IODINE) CAN HELP PROTECT YOU.

IF YOU ARE TOLD TO TAKE THIS MEDICINE, TAKE IT ONE TIME EVERY 24 HOURS. DO NOT TAKE IT MORE OFTEN. MORE WILL NOT HELP YOU AND MAY INCREASE THE RISK OF SIDE EFFECTS. DO NOT TAKE THIS DRUG IF YOU KNOW YOU ARE ALLERGIC TO IODIDE (SEE SIDE EFFECTS BELOW).

INDICATIONS
THYROID BLOCKING IN A RADIATION EMERGENCY ONLY

DIRECTIONS FOR USE
Use only as directed by State or local public health authorities in the event of a radiation emergency.

DOSE
ADULTS AND CHILDREN ONE YEAR OF AGE OR OLDER: One (1) tablet once a day. Crush for small children.

BABIES UNDER ONE YEAR OF AGE: One-half (1/2 tablet once a day. Crush first.

DOSAGE: Take for 10 days unless directed otherwise by State or local public health authorities. Store at controlled room temperature between 15° and 30°C (59° to 86°F). Keep package dry and foil packets intact.

WARNING
POTASSIUM IODIDE SHOULD NOT BE USED BY PEOPLE ALLERGIC TO IODIDE. Keep out of the reach of children. In case of overdose or allergic reaction, contact a physician or public health authority.

DESCRIPTION
Each IOSAT™ Tablet contains 130 mg. of potassium iodide.

HOW POTASSIUM IODIDE WORKS
Certain forms of iodine help your thyroid gland work right. Most people get the iodine they need from foods like iodized salt or fish. The thyroid can "store" or hold only a certain amount of iodine.

In a radiation emergency, radioactive iodine may be released in the air. This material may be breathed or swallowed. It may enter the thyroid gland and damage it. The damage would probably not show itself for years. Children are most likely to have thyroid damage.

If you take potassium iodide, it will fill up your thyroid gland. This reduces the chance that harmful radioactive iodine will enter the thyroid gland.

WHO SHOULD NOT TAKE POTASSIUM IODIDE
The only people who should not take potassium iodide are people who know they are allergic to iodide. You may take potassium iodide even if you are taking medicines for a thyroid problem (for example, a thyroid hormone or antithyroid drug). Pregnant and nursing women and babies and children may also take this drug.

HOW AND WHEN TO TAKE POTASSIUM IODIDE
Potassium iodide should be taken as soon as possible after public health officials tell you. You should take one dose every 24 hours. More will not help you because the thyroid can "hold" only limited amounts of iodine. Larger doses will increase the risk of side effects. You will probably be told not to take the drug for more than 10 days.

SIDE EFFECTS
Usually, side effects of potassium iodide happen when people take higher doses for a long time. You should be careful not to take more than the recommended dose or take it for longer than you are told. Side effects are unlikely because of the low dose and the short time you will be taking the drug.

Possible side effects include skin rashes, swelling of the salivary glands, and "iodism" (metallic taste, burning mouth and throat, sore teeth and gums, symptoms of a head cold, and sometimes stomach upset and diarrhea).

A few people have an allergic reaction with more serious symptoms. These could be fever and joint pains, or swelling of parts of the face or body and at times severe shortness of breath requiring immediate medical attention.

Taking iodide may rarely cause overactivity of the thyroid gland, underactivity of the thyroid gland, or enlargement of the thyroid gland (goiter).

WHAT TO DO IF SIDE EFFECTS OCCUR
If the side effects are severe or if you have an allergic reaction, stop taking potassium iodide. Then, if possible, call a doctor or public health authority for instructions.

HOW SUPPLIED
IOSAT Tablets (Potassium Iodide Tablets, U.S.P.): packages of 14 tablets (NDC51803-001-01): Each white, round, scored tablet contains 130 mg. potassium iodide

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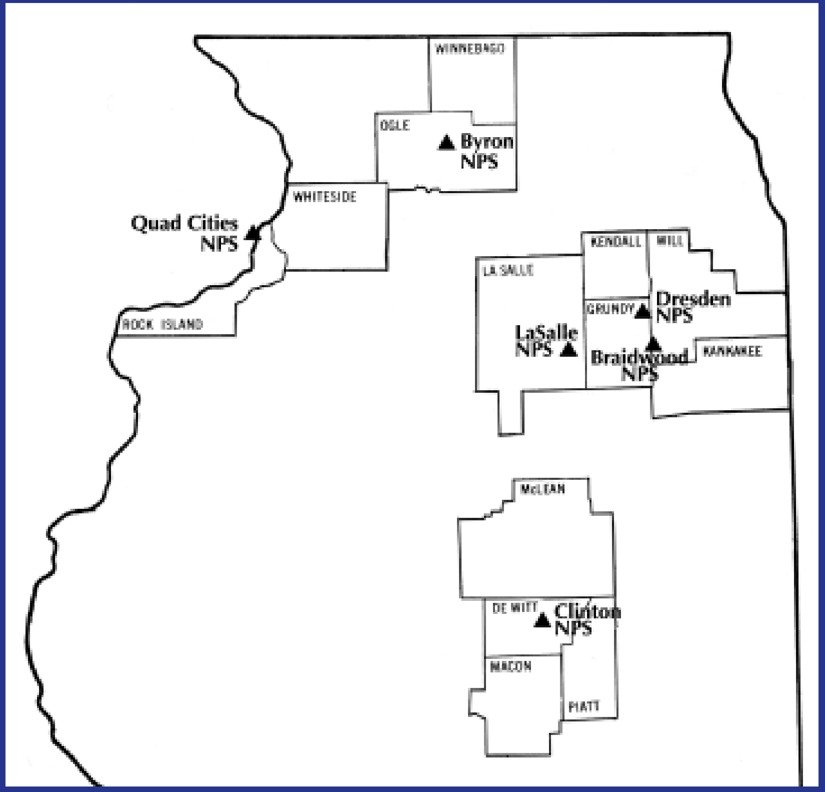
NUCLEAR POWER STATION EMERGENCY PLANNING ZONE

The Nuclear Power Station Emergency Planning Zone (EPZ) extends approximately ten miles outward in all directions from the Nuclear Power Station for the plume exposure pathway EPZ and fifty miles outward for the ingestion exposure pathway EPZ. In the event of an accident at the Nuclear Power Station, the plume exposure EPZ will be the area in which efforts will be made to protect the health and well being of the populace from the direct effects of radiation exposure. There are six EPZs in Illinois affecting 13 counties.



Ten Mile EPZ Zones

EMERGENCY CLASSIFICATIONS

During an emergency at a nuclear power station, conditions and parameters are compared with guidelines known as Emergency Action Levels (EALs) to determine an appropriate emergency classification level. Four nuclear emergency classification levels are used in Illinois:

Unusual Event
Alert
Site Area Emergency
General Emergency

The classification of accidents is essential in responding to a nuclear accident. Classifying an accident gives response personnel an idea of the potential consequences of the accident, and therefore allows for appropriate preparation and response.

The rationale for the **Unusual Event** and **Alert** classifications is to provide an early and prompt notification of minor events, which (if not resolved) could lead to more serious consequences or which might be indicative of more serious conditions, which are not yet fully realized.

The **Site Area Emergency** classification reflects conditions where some releases of radioactivity are likely, or are occurring, but where harmful levels of radiation are not expected beyond the plant boundary. In this situation, mobilization of emergency personnel in the EPZ may be appropriate, as well as the dispatch of radiation monitoring teams.

The **General Emergency** classification involves actual and/or imminent substantial core damage with the potential for a significant release of radioactivity to the environment. The appropriate actions for this classification will include either evacuation of the affected EPZ population, or sheltering in place if evacuation is not feasible.

USE OF POTASSIUM IODIDE (KI)

During a radiological emergency, DCOs distribute dosimetry kits to emergency workers. Each dosimetry kit includes a foilpack of KI, "IOSAT ™," containing fourteen 130-milligram tablets. Each tablet provides the daily dose of KI recommended by the U.S. Food and Drug Administration for maximum protection of the thyroid gland.

A nuclear power plant accident can release significant amounts of radioactive iodine which, if inhaled or ingested, is absorbed by the thyroid gland. To protect the gland – which regulates your body's metabolism – emergency workers should take a dose of KI to saturate (fill-up) the thyroid with stable non-radioactive iodine before any exposure occurs from radioactive iodine released to the environment.

- The use of KI by emergency workers is **VOLUNTARY**.
- When accident conditions warrant considering the use of KI, local DCOs will be notified by the County EMA.
- Emergency workers should take KI only when notified to do so by their DCO.
- Emergency workers will be instructed to record the date, the time notified, and the time KI was taken, on the Radiation Exposure Record Card included in each emergency worker packet.
- Emergency workers should take only one KI tablet during a 24-hour period, and should continue taking KI for the recommended duration.
- Exceeding the recommended dose of one tablet daily will NOT afford additional protection, but will increase the risk of side effects.
- **CAUTION: KI should not be used by anyone allergic to iodine.**

DOSIMETRY CONTROL LOG

A Dosimetry Control Log is prepared by each organization or facility DCO to document the issuance and recovery of dosimetry for assigned emergency workers. Each emergency worker is required to sign the Dosimetry Control Log to acknowledge receipt and verify serial numbers of dosimetry issued. For identification purposes, a copy of the Dosimetry Control Log accompanies emergency worker LD badges transmitted to IEMA for analysis and recording of any exposure. In addition, each Dosimetry Control Log indicates the date on which the Direct-Read Dosimeters passed an annual inspection conducted by the DCO. The annual inspection is a FEMA requirement for the IPRA program.

DOSIMETRY CONTROL LOGS

DOSIMETRY CONTROL LOG

(A) NO. _____ OF _____

(B) ORGANIZATION ________________ (C) DCO ________________

(1) PACKET NO. & DATE ISSUED	(2) NAME & SOCIAL SECURTIY NUMBER	(3) KI (✔) or (R)	(4) RAD EXP O RCD (✔)	(5) LD SERIAL NUMBER	(6) DOSIMETER SERIAL NUMBER	(7) ANNUAL INSP DATE	(8) SIGNATURE	(9) TURN-IN (CIRCLE) & DATE	(10) DATE TO IEMA	(11) DCO INIT
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CONTROL LD SERIAL NUMBER ________________ SEE REVERSE FOR INSTRUCTIONS

IL 473-0217 (REV. 12/01/03)

The Illinois Emergency Management Agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Ill. Rev. Statute Ch. 111 ½. Disclosure of this information is VOLUNTARY, however, failure to comply may result in this form not being processed. This form has been approved by the State Forms Management Center.

DOSIMETRY CONTROL LOG – INSTRUCTIONS

Heading: (A) Enter the log (page) number sequentially.
(B) Enter the organization name.
(C) Enter the name of the Dosimetry Control Officer (DCO).

Column (1): Enter the dosimetry packet number and the date the dosimetry packet was issued DURING AN EVENT.

Column (2): Print the name and Social Security number of the packet recipient.

Column (3): If potassium iodide (KI) is issued and the packet recipient will VOLUNTARILY take KI when recommended, place a check mark in the space provided. If the packet recipient refuses to take KI, place an "R" in the space provided.

Column (4): When the Radiation Record/Instruction Card is issued, the packet recipient will complete the administrative portion of the card. When the recipient has read and understands the instructions, place a check mark in the space provided.

Column (5): Enter the Luminescent Dosimeter (LD) serial number in the space provided. The serial number for the LD is located on the back of the badge.

Column (6): Enter the direct-read dosimeter serial number.

Column (7): Enter the latest annual inspection date for the dosimeter.

Column (8): Obtain the signature of the packet recipient.

Column (9): Numbers permanently entered above the dividing line correspond to the column numbers describing items 3 through 6. Circle the appropriate item number, when the packet is returned. In the space provided below the dividing line, enter the date upon which these items were received. If discrepancies exist with the equipment listed in columns 3 through 6, the DCO should provide explanatory notes. These notes should also be forwarded to IEMA/DNS.

Column (10): Enter the date the Dosimetry Control Log, Radiation Record/Instruction Card, and LD badges were requested and turned in to IEMA/DNS.

Column (11): The DCO should place his/her written initials in Column 11 verifying that the items circled in Column 9 were turned in to IEMA/DNS.

THE ILLINOIS PLAN FOR RADIOLOGICAL ACCIDENTS

Illinois has a greater concentration of nuclear power stations than any other state in the nation. The 11 operating reactors in Illinois produce nearly half of the electricity consumed in the State. That's why it is vitally important that Illinois have a plan designed to ensure a proper rapid response to and recovery from a nuclear emergency. The Illinois Plan for Radiological Accidents (IPRA) was developed to meet State and Federal requirements for a plan that ensures Federal, State and local agencies can respond and cooperate to protect public health and safety when there is an accident at a nuclear power station. These organizations include: State agencies, county agencies, local agencies and volunteer groups such as the American Red Cross and Salvation Army. All these individual units coordinate their efforts in a unified and effective response.

The IPRA was developed with the following objectives in mind:

- To protect the citizens residing, working or visiting near the nuclear power stations within Illinois.
- To ensure that the response and recovery activities are organized and effectively coordinated.
- To ensure that resources and personnel are used efficiently.

Response to an accident at a nuclear power station will be a large-scale integrated effort, involving the Federal, State and local governments and private sector organizations. The Governor of Illinois is the ultimate State authority for the command and coordination of both the operational and technical functions outlined in the IPRA. The Illinois Emergency Management Agency (IEMA) will coordinate the operational response and recovery functions and activities associated with the implementation of protective actions through the State Emergency Operations Center (EOC) and the Unified Area Command (UAC). The technical functions such as monitoring, accident assessment and recommending

IEMA staff at the Radiological Emergency Assessment Center (REAC) and the Radiological Assessment Field Team (RAFT) Command Center.

Radiological accident classification begins with the utility and accident information is forwarded simultaneously to the State EOC and the REAC. Following a confirmatory assessment, the Governor is advised and makes a decision whether or not to recommend protective actions. The protective action recommendation is passed through the State EOC to the appropriate counties and municipalities located within the EPZ.

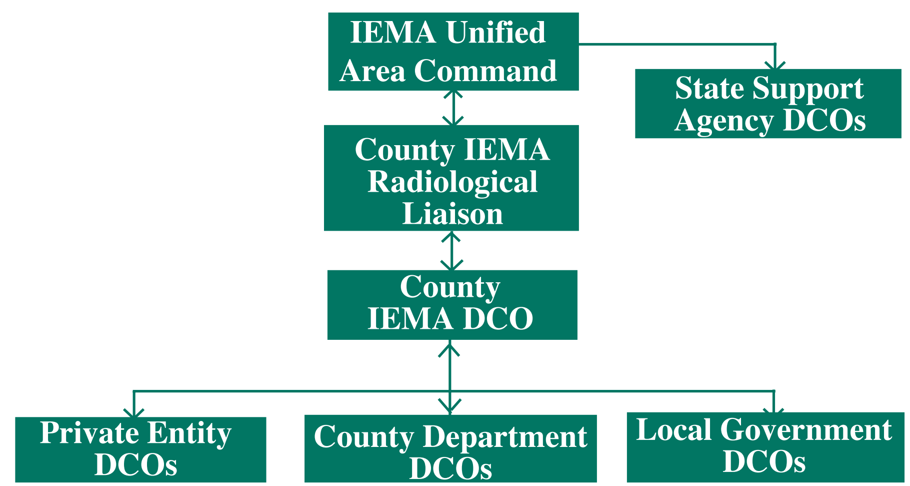
The principal executive officers (County Board Chairman, County Executive, Mayor or Village President) of the counties and the municipalities are authorized to take the necessary actions to protect the health, safety and welfare of the affected residents. The principal executive officer will also be responsible for the overall command of that jurisdiction's emergency response departments. As is the case in any emergency, the local government is responsible for approving and carrying out the protective actions required by the situation. State agencies will support local governments by answering requests for assistance in the way of personnel and resources.

DOSIMETRY CONTROL OFFICER

A DOSIMETRY CONTROL OFFICER (DCO) IS APPOINTED BY EACH ORGANIZATION OR FACILITY TO:

- issue dosimetry kits to emergency workers;
- ensure that emergency workers are properly trained;
- maintain a control log of dosimetry and KI issued;
- advise emergency workers of situations affecting their radiation exposure;
- control activities to keep emergency worker exposure as low as reasonably achievable (ALARA);
- recover dosimetry and exposure records at the conclusion of an incident;
- forward specified dosimetry items and records to IEMA for analysis and recording; and
- re-supply necessary dosimetry items during the post-accident phase of an emergency response.

Information Flow Chart



GLOSSARY

ALARA - An acronym for As Low As Reasonably Achievable. A principle of radiation exposure control.

Alpha Particle - A positively charged particle emitted from the nucleus of an atom.

Beta Particle - A negatively charged particle emitted from the nucleus of an atom.

Contamination - Radioactive material in a location where it is unwanted.

Decontamination - The removal of radioactive material from a location where it is unwanted.

Direct-Read Pocket Dosimeter - A direct-read instrument for monitoring exposure from gamma or x-ray..

Dosimetry Control Officer (DCO) - A person appointed by each organization or facility to control radiation exposure of emergency workers.

Emergency Worker - An individual performing duties to protect the health and safety of the public during a radiological emergency (i.e., firefighters, police officers, medical personnel, etc.)

Exposure - The measure of the ionization produced in air from the decay of radioactive materials..

Exposure Rate - The measure of exposure over some time period, usually an hour (i.e., roentgen per hour (R/hr), milliroentgen per hour (mR/hr), etc.).

Gamma Ray- A type of radiation that is emitted from the nucleus of an atom.

IEMA - An abbreviation for the Illinois Emergency Management Agency

IPRA - An acronym for the Illinois Plan for Radiological Accidents.

Part II: Radiological Hazard and Exposure Control

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Part I

Plans for Protecting the Public

RADIOACTIVE CONTAMINATION CONTROL

Contamination is defined as the presence of radioactive material in a place where it is unwanted. Radioactive material is removed through the process of decontamination. Prompt removal of contaminants:

- prevents further spread of radioactive contamination to other persons or objects.
- prevents additional exposure to the emergency worker.

Contamination should not be confused with irradiation. When persons or objects have been exposed to ionizing radiation, they are said to have been irradiated. Irradiated persons or objects ***CANNOT*** irradiate or contaminate another person or object. An example of irradiation is the exposure received from a dental x-ray.

All emergency workers are recommended to go to a Relocation Center for radiological monitoring at the end of a work shift. The location of all centers that are open and staffed will be provided by your DCO.

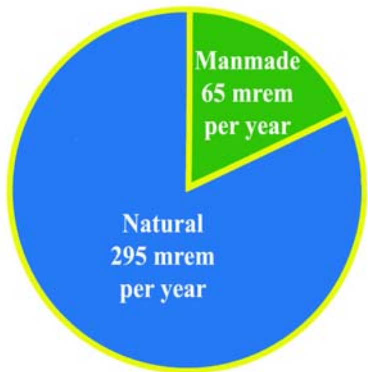
Emergency workers must contact their DCO prior to leaving the last assigned work location to inform him/her that tasks have been completed and to review all other assignments for the day. This is important because the emergency worker may have become contaminated during the completion of assigned duties.

Upon arrival at a Relocation Center, the emergency worker must inform staff of their work status. Relocation Center staff will register the worker and his/her vehicle and ask the worker to read his/her dosimetry. The emergency worker will be surveyed using a portal monitor. Should contamination be detected, the worker will be escorted to a shower area. Radioactive contamination is removable. The simple task of removing outerwear will usually remove most of the radioactive contamination. If skin surfaces are contaminated, washing with mild soap and water will normally be sufficient.

Upon completion of radiological monitoring, the emergency worker will be directed to American Red Cross staff for additional assistance. The emergency worker should contact their DCO and inform him/her of their status.

APPENDIX

SOURCES OF RADIATION



Natural

Radon	200 mrem per year
Other	40 mrem per year
Cosmic	27 mrem per year
Terrestrial	28 mrem per year

Manmade

Medical	53.0 mrem per year
Consumer Products	10.0 mrem per year
Occupational	0.8 mrem per year
Fallout	0.8 mrem per year
Nuclear Fuel Cycle	0.2 mrem per year
Miscellaneous	0.2 mrem per year

FOREWORD

Many emergencies and disasters have occurred within Illinois over the years, which have impacted the health, safety and property of the people. These disasters have resulted from natural hazards such as floods, tornados, and winter storms, and technological hazards created during the manufacturing, using, storing and the transporting of chemical substances. Illinois also is at risk from other hazards, such as earthquakes and nuclear power station accidents, although no major earthquake has impacted Illinois since the early 1800's, nor has there been an accident that threatened the population around one of the State's six nuclear power stations. The possibility of either of these two disaster events occurring exists. Therefore, Illinois has developed an emergency management program to provide a level of preparedness, the ability to respond to, and a plan to recover from a disaster resulting from any hazard that presents a risk to the people of Illinois.

The purpose of this training session and training manual is to provide information to State and local government personnel who have a response function to perform during a nuclear power station accident. The **Illinois Plan for Radiological Accidents (IPRA)**, has been developed to provide a plan for the State and local governments to follow should a major accident occur at a nuclear power station.

Emergency preparedness and response is the same for all types of disasters except that:

1. A site specific plan was developed
2. And the accident would involve a radiological hazard

Therefore, this training session has 2 parts –

Part I: Will discuss plans for protecting the public.

Part II: Will discuss radiological hazard and the use of dosimetry.

Part I: Plans for Protecting the Public

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Irradiation - Exposure to ionizing radiation.

Milli - A prefix meaning one-thousandth (1/1,000). It is denoted by 'm' (i.e., milliroentgen (mR), millirem (mrem), etc.).

Neutron- A type of ionizing radiation generated during the process of nuclear fission. Neutrons are of concern only in and around the core of the reactor. It is unlikely that they would become a hazard to an emergency worker.

Portal Monitor - A device, configured like a door-way, containing multiple detection instruments to monitor for contamination on an individual standing within the frame.

Potassium Iodide (KI) - A chemical form of stable iodine that can be used to block absorption of radioactive iodine by the thyroid gland.

RAD - An acronym for Radiation Absorbed Dose. It is a measurement of the energy deposited in matter.

Radioactive Material - Material that spontaneously emits ionizing radiation in an effort to expend excess energy.

REM - An acronym for Roentgen Equivalent Man. It is a measurement of the effect of all types of radiation on the human body.

Roentgen - A measurement of radiation effect in air from x-rays or gamma rays. Named for Wilhelm Conrad Roentgen, the man who discovered x-rays.

Luminescent Dosimeter (LD) - An extremely accurate device used to measure and provide a permanent record of exposure to radiation.

IOSAT™ - A trade name for potassium iodide tablets manufactured by ANBEX, INC.

X-ray- A type of radiation, similar to gamma rays, that originates in the atom's electron cloud rather than the nucleus. X-rays are commonly produced by machines (medical or dental x-rays), but they can also occur naturally in the environment.

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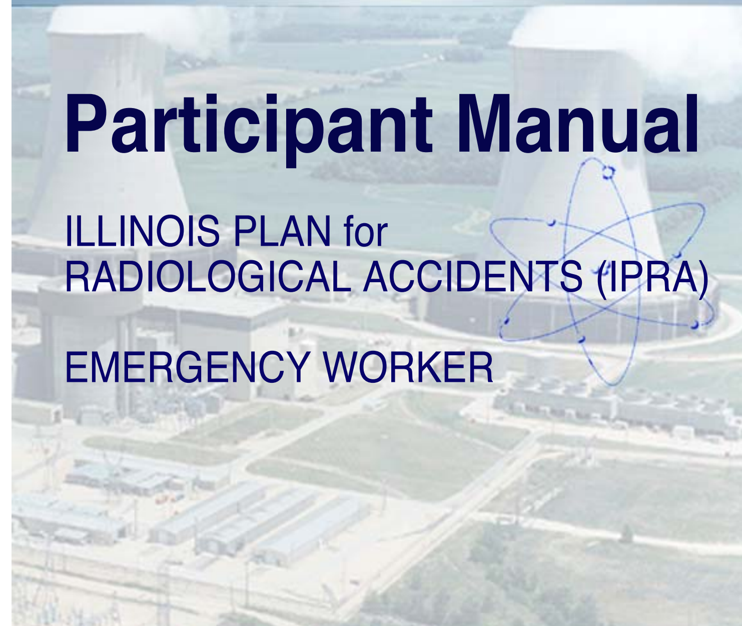
State of Illinois
Rod R. Blagojevich, Governor

Illinois Emergency Management Agency
William C. Burke, Director



Participant Manual

ILLINOIS PLAN for RADIOLOGICAL ACCIDENTS (IPRA)

EMERGENCY WORKER

IEMA