

## Radiological Emergency

Past few decades have seen an intensive increase in application of radioactive sources in industry, medicine, agriculture, research and development fields throughout the world. Radioactive material is also being used in nuclear installations for electricity production. The use of such sources has helped the mankind in many ways but the associated threats always remained a big concern. Although very rare but like any other field of life, there is always a little probability of occurrence of accidents at nuclear installations. There also exists some risk of radiological accidents at facilities possessing high activity sources. Medical centers having radiotherapy units, commercial facilities using high activity sources in radiography etc., and the nuclear installation may be the potential sources of radiological emergency in Pakistan.

Radiological emergencies may arise due to:

- Accidental releases from nuclear facilities.
- Exposure to general public due to stolen or lost radioactive sources.
- Malicious acts involving radioactive material.
- Accidents during transport of radioactive material.

The workers of emergency services are always the first ones to reach the scene of occurrence and are therefore the first responders. They may belong to rescue services, police, fire brigades and medical community etc. Mostly responders are trained in their respective field but generally have no knowledge and experience to deal with an emergency involving radioactive source. To deal with radiological emergencies, it would be most beneficial if first responders know how to protect themselves and the public from immediate health effects.

This brochure includes instructions for first responders that should be followed by them for personal and public protection.

## General instructions for members of response organizations

During the response to a radiological emergency, following steps must be considered.

- Ensure your own physical safety first. Make sure that open wounds or abrasions are properly covered in order to protect them from radioactive contamination.
- Do not eat, drink, or smoke while exposed to potentially radioactive dust or smoke. If required drink water from a closed container.
- If survey meters are available, cordon off the area where the dose rate is ten times the background level.
- In case of unavailability of survey meters, mark 500m radius area as cordoned off area. This area should be considered as a high dose rate area.
- Wrap the radiation monitoring instruments in plastic bags to prevent their contamination.
- Enter the cordoned off area only when necessary to save a life. In such situation follow the instructions by the facility management /concerned organization about personal protective clothing, radiation measuring instruments and time to stay in that area.
- While entering an area suspected to contain radioactive particles wear a mask to prevent inhalation of radioactive dust. Ideally the mask should be a full face mask with an appropriate filter. In case the mask is not available breathing through a wet handkerchief or cloth will prevent inhalation of such dust.



- Minimize the time spent in cordoned off area.
- In order to measure the personal dose you must wear a personal dosimeter. These dosimeters are provided by management of concerned facility / organization.



- After completion of work, if the contamination monitors are available, then get yourself monitored.



- If contamination monitors are not available, consider yourself contaminated. Remove and wrap outer clothing in plastic bag after completing the job and before leaving the area. Otherwise you may continue to receive radiation exposure and expose others if clothing is contaminated.

## Protecting the Injured and Exposed

- Evacuate the victims from suspected high radiation or highly contaminated area as soon as possible.
- Provide first-aid and deal with life threatening conventional injuries first.
- While providing first aid to stable victims, deal with radioactive contamination with care and make every possible effort to avoid spread of contamination.

- If contamination monitoring instruments are available, segregate the individuals into two groups i.e. Contaminated and clean.
- The contaminated individuals should be further split into three groups i.e. uninjured, injured & non-critical and critical victims.

- \* Uninjured should be decontaminated at the scene and sent **home**.
- \* Injured and non-critical should be decontaminated at the scene and sent to **hospital**.
- \* Critical victims should be tagged "contaminated" and straight away sent to the specified/ appropriate hospital for medical treatment.



- While handling critical and contaminated victims wrap the stretcher with plastic to protect it from contamination.
- Preferably use a blanket for wrapping the contaminated victim.
- Inform nearby hospitals to expect the arrival of contaminated and injured people.
- People experiencing nausea, vomiting, or reddening of skin should be advised to report to a hospital immediately and request a complete medical check up.

## Decontamination of Victims

- If contamination monitors are not available or a large number of individuals are suspected of contamination, assume that all of them are contaminated with radioactive dust.
- Decontaminate the contaminated individuals simply by washing with plenty of water. This water may be from fire brigade tankers.



- If possible, establish a facility where each person can remove and discard his outer clothing and wash as thoroughly as possible. This facility should be reasonably away from affected area.

## Instructions to be Communicated to Public

The following instructions should be communicated by the first responders to the public who are very close to high radiation area or area suspected to be contaminated.

- Move far away from the affected area.
- Cover your nose and mouth with handkerchief preferably with wet one.



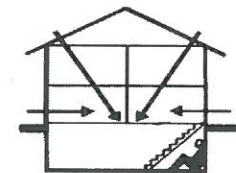
- Do not eat, drink, or smoke near affected area.
- Avoid touching possible contaminated surfaces.
- If a building or room is suspected to have contamination leave the building or room immediately and take shelter in some other place.
- If the affected persons are being monitored for contamination, do not leave the area without getting monitored.

- In case of unavailability of monitoring, assume the clothing and exposed parts (if coming from scene of occurrence) to be contaminated. Follow the following instructions:
  - \* Take a thorough shower with lukewarm water and soap at your home.
  - \* Remove outer layer of clothing and discard it after wrapping in plastic bag. If not possible to discard then thoroughly wash the contaminated clothes with lukewarm water and detergent.
- In case of releases from NPPs public may be requested to follow the following steps in addition to those stated earlier:
  - \* Try to move to a nearby shelter or building and stay in door.
  - \* Close all windows and doors and turn off ventilation systems, if any.

IN THE OPEN  
(No protection)



HOUSE WITHOUT BASEMENT  
(Slight Protection)



HOUSE WITH BASEMENT  
(Good Protection)

## What is Radiation?

Radiation is a form of energy that comes from both natural and man-made sources. Natural sources of radiations are sun, soil, building materials and food. Man-made sources include x-ray equipment, radiotherapy units, nuclear power plants etc. Like other things, radiation may be safe (e.g., visible light) or harmful if not used appropriately (e.g., x-rays). The effects of radiation are the same regardless of the source. Exposure to too much radiation can be harmful.

## Symptoms of Radiation Sickness

The initial symptoms of high radiation exposure are skin redness, vomiting, nausea, headache and fatigue. The severity of signs and symptoms of radiation sickness depend on how much radiation is absorbed. These symptoms may also be caused by some other means.

## What is contamination?

Residues of radioactive substances on some object or place e.g. on body, clothes, bags etc where their presence is unintended or undesirable is called contamination.

For additional copies / information please write to:

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“Response to a Radiological Emergency”

(Guide to First Responders)



Pakistan Nuclear Regulatory Authority