

RADIATION EMERGENCY PROCEDURES – BRIT Facilities, Vashi

A **radiation emergency** is defined as – ‘**Abnormal situation following an incident or accident**’ involving –

- a) Unusually high radiation field in any area inside / outside around the laboratory complex.
- b) Unusually high release of air-borne radioactivity or a radioactive liquid spillage leading to wide spread contamination.

On the basis of nature and severity of incident / accident radiation emergency is classified as –

i) Local Incident **Type A situation**

It may arise due to deviations from procedures / operational conditions or from unforeseen incidents or circumstances that may result in the release of radioactive materials, wide spread contamination and / or high radiation fields – that are confined to only to a section of laboratory.

It is dealt with, appropriately, by the respective Sr. General Manager / safety officers in consultation with the lab Health Physicist-in-charge / Health Physicists.

Examples of Local Incidents –

Ventilation / Power Failure – All laboratory operations would be stopped, Fume hood shutters would be closed, personnel in the laboratory shall vacate the green and amber area. After power supply has been restored, Health Physicist on duty shall clear the laboratory for personnel entry.

High Radiation Levels – If the radiation field exceeds 10 mR/h from any unlocated source the occupants shall vacate the area and report the same to the respective lab-in-charge and he/she shall investigate the cause in consultation with the Health Physicist on duty.

High Air-borne radioactivity – The lab air activity exceeding 10 DAC-h $\beta\gamma$ activity. The cause of higher air activity would be investigated by safety officer / lab-in-charge in consultation with the Health Physicist on duty.

Spillage of Radioactivity / Spread of Contamination – Local contamination of 20 DWL (74 Bqcm⁻² for $\beta\gamma$) or spread of contamination covering area of a lab of 10 DWL. Occupants of the area where spillage / contamination has occurred shall inform the respective lab-in-charge and the decontamination work would be carried out in consultation with the Health Physicist on duty, after filling up Special Work Permit, if required.

Fire incidents – An event of minor fire should be doused / localized according to the approved procedures. Local Health Physicist shall be informed immediately, further sequence of action to be initiated in accordance to the standing fire order procedures.

ii) **Stay – in emergency**

iii) **Evacuation emergency**



Type B situation

Stay – in emergency may arise when the source of radiation hazard is external to the laboratory, or is an abnormal situation demanding alertness during investigations, may precede an evacuation emergency.

Evacuation emergency situation may arise due to the severity of the radiation hazard existing in the laboratories, wherein all personnel except those specially designated shall be evacuated from the laboratory.

Type B situations are more serious in nature, arises out of –

i) Breach of containment of a glove box / hot cell due to any incident

ii) Unusual incident in the laboratory affecting personnel corridors / inactive areas with –

a) Air activity > 20 DAC-h

b) Surface contamination > 200 DWL admeasuring 50 m²

c) Radiation field > 20 mR/h from un-located source.

iii) Fire of major nature / Explosion

Incidents of **i)** and **iii)** are overt in nature while incident **ii)** may be overt or covert. (20 DAC-h is 1 % of annual permissible exposure for occupational exposure). 200 DWL level of contamination over an area of 50 m² corresponds to a total of 2200 µCi of βγ activity.

Various Local Event (Type – A Emergency) Situations –

a) Power / Ventilation Failure

Evacuation of lab personnel from the radiochemical labs becomes necessary in case of ventilation failure of more than 5 minutes duration.

After the restoration of ventilation, personnel re-entry to the labs is permitted after radiological survey and clearance by the HP unit.

In case of a partial power failure (i.e. the ventilation remains unaffected), no HP survey shall be required for the personnel re-entry to labs, when power is restored.

b) Non – availability of Service Water in Processing Lab

Information regarding non-availability of water shall be communicated to the lab personnel, by the Engineering Services Section. During the non-availability of water, following procedures shall be adopted:

- If the stoppage of water supply was planned, no radio-active work shall be carried out during the period.

- During any unplanned stoppage of water supply, all the radioactive work in progress in labs shall be suspended.
- Equipment (working at high temperature), that cannot be stopped immediately, shall be cooled with emergency water supply.

c) Radiation / Area Alarm in the Lab

During an alarm indication in any of the area / air monitors in the labs, the staff shall immediately evacuate the laboratory and inform the H P unit.

Health Physicist shall survey the affected area with survey meters / air samplers and assess the Radiological situation.

In case the alarm indication is found to be genuine, HP shall suggest appropriate measures

- a) to bring down radiation / air activity / surface cont. levels, or
- b) to continue work under those conditions if absolutely essential. Causes of high radiation / air activity / surface contamination levels shall be investigated and remedial action taken at the earliest by the HP unit and the lab personnel.

d) Spillage of Activity on Surface

In case of any spillage of Radioactive Solution on the surface of equipment / floor / personal cloth or otherwise, the affected area needs thorough Decontamination.

Extent of the spread of activity should be assessed prior to the planning of the sequence of cleaning operations.

Entry to the lab personnel would be restricted only for decontamination operations, such lab personnel in salvage operations shall use Personnel Protective Equipments.

The equipment / floor surfaces can be decontaminated with chemical reagents, while the decontamination of personnel / body surfaces shall be done only with water & mild reagents.

Air activity assessment and contamination check in the lab after the decontamination operations shall lead to clearance for entry to lab personnel to resume work.

The possible internal exposure of lab personnel due to intake be assessed by bio-assay sampling.

e) Fire Incident

Fire incident involving equipments is categorized as less hazardous, while fire incidents involving some Radioactive material can be more hazardous (Type B). The personnel should switch off electrical supply to the location near the fire, suspend the radioactive jobs. HP Unit, Facility Manager, Fire fighters shall be informed, while the entry to the lab is restricted.

The Radiological status is assessed by HP and the entry to fire fighting personnel to control / douse the fire is arranged.

Fire Extinguishers – are checked periodically – kept for use, readily, during any such event.

The affected personnel shall be monitored for the body surface contamination and immediately referred to Dispensary with a note about their Radiological status.

The radiological status of lab would be assessed after the fire extinction and based on the results of survey the sequence of cleanup operations would be drawn.

Cause for the fire event would be identified and suitable modifications should be carried out to prevent recurrence of the fire event.

Fire Safety manual and team of trained fire fighting personnel to meet such exigencies would be kept ready to minimize the effect during such incidents.

Duties of Person who first notices fire / flame

- The person shall alert the persons in the vicinity of the incident by shouting “fire, fire...” Specifying the location, in case of a fire / flame.
- The person shall direct persons to inform the incident to Duty Officer, Head of the Division, Safety Coordinator and Health Physicist.
- The person shall try to contain the emergency by taking suitable measures.

Various type – B Emergency Situations – of Higher Radiological Hazardous Nature / Major events / Incidents

Emergency situations of hazardous nature may be caused due to large scale release of radioactive materials, major fire or explosion.

Emergency Alarms

- Stay-in: Short intermittent signals for a period of 2 minutes -- 5 sec. on, 5 sec. off.
- Evacuation: Long intermittent signals for a period of 2 minutes -- 15 sec. on, 5 sec. off.
- All clear: Continuous signal for 2 minutes.

Emergency signals shall be operated by the nominee of the Plant Emergency Director (PED) or Safety Officer or the Health Physicist.

STAY – IN (ALERT) EMERGENCY

- A Stay in (Alert) emergency situation is during which the source of the hazard is external to the radiochemical lab premises / nuclear plant building.
- SGM, RPhL, would act as the PED, in consultation with the HP and the Safety Committee will decide to declare Stay-in Emergency.
- During such an event all the lab persons shall stay assembled at a designated place within the building, shall adhere the safety instructions.

On hearing the Stay-in emergency signal / announcement,

- a) All external windows and doors shall be closed immediately.
- b) All the operating equipments will be brought to safe shut down condition.
- c) All personnel outside the building shall hold hand kerchiefs over their nose, keep their mouth closed and enter the Radiochemical lab. building.
- d) All personnel inside the labs shall hold hand kerchiefs over their nose, keep their mouth closed and come out of the laboratory through the normal exit routes. They shall assemble in the corridor near the security and await further instructions from Sr. General Manager or his nominee.
- e) Sr. General Manager / Lab in charge, on being informed about the Stay-in-emergency, will ensure that ventilation systems are immediately shut down. Health Physicist / RSO shall provide necessary monitoring facilities for all personnel entering the building from outside, will also arrange for any additional monitoring as required under the prevailing conditions.
- f) As soon as radiological emergency is over, the HP team shall monitor all personnel, areas and equipment for any contamination. Only after these checks get over and ventilation is restored, lab persons shall be allowed to move into their work-places / office room.

EVACUATION EMERGENCY

- Evacuation Emergency situation is an event in which the Radio Pharmaceutical Lab (RPhL) building is the source of radiation hazard.
- SGM, RPhL would act as the PED, in consultation with the HP and the Safety Committee will decide to declare Evacuation Emergency.
- During such event all lab personnel except those otherwise designated shall leave the RPhL building and assemble at a designated assembly point, far away.
- On hearing the emergency signal, the operating equipments will be brought to safe shut down condition. All personnel unless otherwise permitted shall, hold handkerchiefs over their nose, keep their mouth closed and leave the RPhL lab area through the nearest EMERGENCY DOOR / EXIT.
- All personnel after coming out of the lab area shall assemble near the main entrance of the RPhL building – foyer (near Security) and await further instructions.

DECONTAMINATION of LAB PERSON

- Contaminated person, if any, parts of body shall be decontaminated in the personnel decontamination room.

- Water from the decontamination operation shall be collected in a separate sump tank and will be transferred to the waste tank only after ascertaining its activity level.
- Clothes worn by the person who is decontaminated shall be packed in PVC bags and shall be tagged before sending for disposal.
- Decontamination will be continued till the contamination level is brought down to acceptable levels.
- A cupboard having decontamination materials is provided near Health Physicist room.
- If it is not possible to decontaminate the person by normal procedure, necessary medical help shall be sought for.

Duties of the Plant Emergency Director (PED)

- On receipt of information emergency arising at RPhL facility, the PED will inform Safety Officer/Coordinator.
- He shall proceed to the scene of incident and shall in consultation with the HP and the Safety Committee will decide to declare Evacuation emergency.
- In case of fire, he shall inform Safety Officer and ask for follow up. He shall guide the duty officers and squad members in fire fighting and salvaging operations.
- He shall set up an emergency post at assembly area and direct all operations in consultation with the Health Physicist.
- He shall inform Head, ESS or his shift supervisor to cut off ventilation to the affected area, if necessary.
- He shall ensure that evacuation of personnel from the affected area is done properly.
- He shall at the earliest opportunity inform the details of the incident to the CE, BRIT.
- After radiological normalcy, in consultation with Health Physicist he shall decide to call off the emergency.

Responsibilities of the Engineer-in-charge, ESS

- ❖ On hearing of the emergency, the engineer in charge shall immediately proceed to the emergency post. He shall ensure that ventilation systems are shutdown as required by PED.
- ❖ He shall remain near the emergency post and assist PED, Safety officer or their nominees in directing the salvage of emergency operations.

Responsibilities of Safety Officer

- The Safety Officer shall take charge of any emergency arising in the facility. He shall work in close liaison with the General Managers on receipt of information of emergency at the various facilities governed within the site.
- He shall proceed to the scene of incident and shall guide the Duty Officers and Emergency Squad Members in fire fighting and salvaging operations.
- He shall inform Head, ESS or his shift supervisor to cut off electric power of the affected area.
- He shall inform the Security Officer, advising to carry out further intimation to the listed agencies.

Responsibilities of the Health Physicist

As soon as any emergency is declared, the Health Physicist shall:

- Immediately alert the personnel from the affected area by switching on appropriate emergency alarm and make necessary announcement.
- Make himself, along with the other health physics staff, available to the PED with all the necessary safety and monitoring systems equipments.
- Take necessary steps to contain the contamination.
- Organize segregation of contaminated or over exposed persons and make arrangements for their decontamination.
- Refer the person to the Medico, for medical follow up.
- Assess the radiological status during the event and give necessary advice to the PED.
- Give "all clear" signal as soon as the emergency is over.

Responsibilities of the Medical Officer

When an affected person is referred to Medico –

- ▶ He would advice / expedite action on the personnel decontamination based on the contamination status of the lab personnel.
- ▶ He would carry out the general check up, check for symptoms of any radiation injury.
- ▶ He shall administer counter measures – stable Iodine tablets / Chelating agents in Intra Venous mode to reduce the internal hazard.
- ▶ He shall advice / arrange for whole body / thyroid counting of the personnel on urgent basis.

Responsibilities of the Security Officer

- Shall immediately inform Centralized Fire Station giving location of the fire in case of a fire incident.
- Shall ensure that all listed services and officers are informed about the incident on phone.
- He / She shall carry out the instructions to organize the evacuation and rescue of personnel and to arrange for medical aid to the affected persons.
- He / She shall control the movement of personnel and see that only authorized persons are allowed to enter the affected area.

Planning for emergency

- Safety Officer shall ensure, by constant inspection that shower, emergency exits, announcement system, the emergency signals and the fire protection systems are in working condition.
- He shall in consultation with the HP unit conduct emergency exercises for training the personnel.
- The HP unit shall ensure that emergency equipment including monitoring instruments is always available in ready to use condition.
- HP unit shall conduct familiarisation courses in radiation protection for staff of Radio Pharmaceutical Lab, BRIT.

Materials for use during emergency

Materials for use during emergency are stored separately in emergency cupboards located in corridor near HP Room. The materials taken from this cupboard for any emergency use should be replaced as soon as possible and also inform Health Physicist / Safety Officer about the same.

LIST OF MATERIALS PRESENT IN EMERGENCY CUPBOARD

Sr no	Name of materials	Quantity
1	Radiation Caution tape	9 No.
2	Monsoon tape	1 unit
3	Cordon tape (50 meter)	1 unit
3	Radioactivity labels	40 No.
4	No entry and assembly area labels	5 No.
5	Neoprene gloves	4 pairs
6	Plastic shoe covers	2 pairs
7	Boiler suit	2 pairs
8	Fire protective clothings and shoes	01 No.
9	Half face particulate respirator	6 No.
10	Shoe covers	20 pairs
11	Plastic shoe	3 pairs
12	Cards for emergency response team	24 No.
13	Staplex Air sampler	1 unit
14	Glass fiber papers and charcoal filter papers	50 No.
15	Mini rad radiation survey meter	1 unit
16	Teletector (digital)	1 unit
17	Mega phone	1 unit
18	Extention board with plug and sockets	1 unit

Sr. No.	Name of chemical reagents	Quantity
1	Potassium iodate tablets	1 bottle (app.500Tablets)
2	EDTA Powder	4 bottles (100 gm each)
3	Sodium thiosulphate anhydrous	2 bottle (500 gm each)
4	0.5 M sodium thiosulphate solution	2 bottle (500ml each)
5	Activated Charcoal powder	1 bag (500gm)
6	Detergent Powder	1 bag (500gm)

Annexure – 1

List of BRIT Complex persons to be intimated after declaration of Evacuation Radiation Emergency Exercise at RPhL by Plant Emergency Director, BRIT Complex, Vashi.

Sr.No.	Name of person and designation	Office Contact No.
1.	Shri G. Ganesh CE, BRIT	7001/7002/27840000
2.	Dr. Rajan M.G.R. Dy CE, BRIT	2415 7098 2417 1872
3.	Shri Harish Chander, GM, LCO	7500
4.	Shri. A. C. Dey, DGM, Engg. Services, RPhL	7202
5.	Shri N. Jaychandran, OIC, RAL	7418
6.	Shri Ranjeet Singh, OIC, RPP	7411
7.	Shri P. Srivastava, SGM, Engg. & CP	7300
8.	Shri Ramakrishnan P., Chief AO	7012
9.	Shri Jagasia Manoj M., AO-III	7014
10.	Shri K.P. Singh, Sr. Manager, ES	7306
11.	Head, PMD, BARC, Vashi	7150
12.	Dr. K.S.S. Sarma, SGM, EBPS, BRIT, Vashi	7340
13.	Medical Officer-in-Charge, BRIT, Vashi	7114
14.	Security Officer, BRIT, Vashi	7599
15.	Assistant Store Officer	7115

Annexure – 2

List of BARC, Trombay persons to be intimated after declaration of Evacuation Radiation
Emergency Exercise at RPhL by Health Physicist, BRIT Complex, Vashi.

Sr.No.	Name of person and designation	Office Contact No.
1.	Dr Pradeep Kumar K. S., AD, HS&EG and Head RSSD, BARC	25593717
2.	Dr. A.U. Sonawane, Head, RSD, AERB	25574287
3.	Dr. R.K. Gopalakrishnan, Head, RHCS, RSSD, BARC	25595041
4.	Dr. Rajveer Singh, Head, ERSMS, BARC	25593201
5.	Dr. S. Murali, OIC, SECC, BARC	25595333
6.	Dr. P.N. Bhat, Health Physicist, PMD, Vashi	7155
7.	Smt. Jain Regi George, RSO,RPP, BRIT	7307 / 7382

Annexure – 3

List of BRIT Complex persons to be intimated after declaration of Evacuation Radiation Emergency Exercise at RPhL by Security Officer, BRIT Complex, Vashi.

Sr.No.	Name of person and designation	Office Contact No.
1.	Shri Harish Chander, DGM, LCO	7500
2.	Shri N. Jaychandran, OIC, RAL	7418
3.	Shri Ranjeet Singh, OIC, RPP	7411
4.	Shri P. Srivastava, DGM, Engg. & CP	7300
5.	Shri Ramakrishnan P., Chief AO	7012
6.	Shri Jagasia Manoj M., AO-III	7014
7.	Shri K.P. Singh, Sr. Manager, ES	7306
8.	Head, PMD, BARC, Vashi	7150
9.	Dr. K.S.S. Sarma, SGM, EBPS, BRIT, Vashi	7340
10.	Assistant Store Officer, BRIT, Vashi	7115
11.	Canteen Supervisor	7117