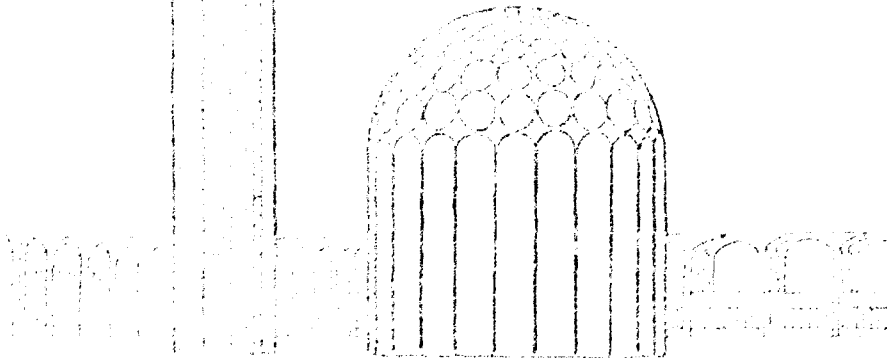


# **SECTOR EMERGENCY PROCEDURES FOR PAKISTAN RESEARCH REACTOR-1 (PARR-1), PINSTECH**

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**\* Directorate of Nuclear Safety and Radiation  
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**( December, 1992 )**

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(December, 1992)**

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**SECTOR EMERGENCY PROCEDURES FOR  
PAKISTAN RESEARCH REACTOR-1 (PARR-1), PINSTECH**

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## 1. INTRODUCTION

Pakistan Research Reactor (PARR-1) has many operational safety features against any accidental failure of its control system. Nevertheless the risk, how-so-ever remote, of any accidental excursion that may lead to the release of radioactive material from the core resulting in the possible contamination of the premises and the environment and the exposure of the workers and the population cannot be ruled out. An advance planning to effectively meet such a situation in order to mitigate the adverse consequences of an accident is an indispensable necessity for the general safety of the workers, population and the environment.

A plan for handling of the radiation emergency situation prevailing outside PINSTECH has been incorporated in the publication entitled "Sector Emergency Plan for PARR-1, PINSTECH" (Ref.1). There may as well be emergency conditions simultaneously existing within PINSTECH. Handling of such a situation is described in another publication entitled Revised Radiation Emergency Procedures at Pakistan Research Reactor, (Ref.2). For the implementation of the Sector Emergency Plan, detailed procedures have been prepared defining the role and responsibilities and appropriate actions to be taken by various individuals and organisations.

This report outlines the detailed procedures and individual and collective responsibilities and actions to be undertaken for meeting the emergency situation. These procedures include announcement/notification of emergency, evaluation of emergency, radiological monitoring and surveillance, protective measures, control of access and egress, personnel monitoring and internal dosimetry, medical care of the injured etc. For the guidance of the personnel of the other PAEC projects at Nilore instructions on "Response and Action by the Personnel at the PINSTECH Complex during Emergency Situation" have been added as a separate section. Procedures for the "Evacuation of PINSTECH Complex Employees" have also been added.

A summary of "The Role and Responsibilities of PINSTECH and the Public Organisations during a Sector Emergency at PINSTECH" has been included as an appendix. A "Summary of Sequential Action" required to be undertaken during an "Emergency Alert" and a "Sector Emergency" is given in the Annexure.

The "Radiological Response Organisational Structure for a Sector Emergency at PINSTECH is given in Figure (1). The Role and Responsibilities of various organisations during a sector emergency are given in Figure (2)

## 2. DEFINITIONS

### 2.1 Site Emergency:

An emergency involving uncontrolled release of serious quantities of radioactive material within the Institute's Phase-I building.\*

### 2.2 Sector Emergency:

An emergency involving air-borne release of radioactive materials from the reactor associated systems either at ground level or through the stack.\*\*

### 2.3 Abbreviations:

AC	:	Advisory Committee
CD	:	Computer Division
CEPP	:	Co-ordinator Emergency Planning & Preparedness
CNS	:	Centre for Nuclear Studies (PINSTECH)
DC	:	Deputy Commissioner
DG	:	Director General
DNSRP	:	Directorate of Nuclear Safety & Radiation Protection
ECC	:	Emergency Control Centre
ED	:	Electronics Division
GSD	:	General Services Division
HPD	:	Health Physics Division (PINSTECH)
HPG	:	Health Physics Group (NLP)
I/C	:	Incharge
MRML	:	Mobile Radiological Monitoring Laboratory
MSSP	:	Micro Seismic Study Programme (PINSTECH)
NCD	:	Nuclear Chemistry Division
NIH	:	National Institute of Health
NED	:	Nuclear Engineering Division
NLP	:	New Labs Pinstech
NMD	:	Nuclear Materials Division
NORI	:	Nuclear Medicine Oncology & Radiotherapy Institute (PAEC)
NPD	:	Nuclear Physics Division
PAEC	:	Pakistan Atomic Energy Commission
PARR-1	:	Pakistan Research Reactor-1 (PINSTECH)
PCD	:	Programme Co-ordination Division
PIMS	:	Pakistan Institute of Medical Sciences, Islamabad
PINSTECH	:	Pakistan Institute of Nuclear Science & Technology

(Continued on the next page)

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\*Release of serious quantities of radioactive material will be subsequently defined in terms of the specific limits of the exposure rates.

\*\*Air-borne release of radioactive material will be subsequently defined in terms of the specific limits of the reading of the stack monitor.

R.E.D : Radiation Emergency Director  
RIAD : Radio-isotope Applications Division  
ROE/S : Reactor Operations Engineer/Supervisor  
ROG : Reactor Operations Group (PINSTECH)  
RPO : Radiation Protection Officer  
SID : Scientific Information Division  
SSP : Senior Superintendent Police  
T.M : Technical Manager

\*\*\*\*\*



### 3. RADIATION EMERGENCY ORGANISATION

According to the "Sector Emergency Plan" for PARR-1 a "Radiation Emergency Organisation" has been constituted to handle the "Sector Emergency" arising on account of any offsite emergency situation at PARR-1. Director PINSTECH (or in his absence the Associate Director, PINSTECH) shall be the Radiation Emergency Director (RED) having an executive authority for the overall direction and conduct of the emergency operations. RED will be assisted by his Advisory Committee (AC) in the decision making and by the Technical Evaluation Committee (TEC) in the assessment of the emergency situation (kef 1). Individual and collective responsibilities of the Radiation Emergency Organisation have been outlined in reference 1 which also gives the details of the "Emergency Protective Measures" to be undertaken for the handling of the emergency situation. It has been agreed between PINSTECH and the Directorate of Civil Defence, Islamabad that handling of the emergency situation and execution of the protective measures within a distance of 1km from the PINSTECH site will be the responsibility of the Director, PINSTECH where as between a distance of 1 to 10km the same will be undertaken by the Director General Civil Defence, Islamabad.

The role and responsibilities of the PINSTECH and the Public Authorities during a Sector Emergency at PINSTECH are summarised in Appendix III. The "Emergency Response Measures" and corresponding "Responsibilities" of PINSTECH and Public Authorities during any Sector Emergency at PINSTECH are shown in the Figure (1).

The following individuals, Committees & Organisations are directly or indirectly involved in the execution of the Emergency Response Measures during any Sector Emergency at PINSTECH:-

#### A. PINSTECH

1. Radiation Emergency Director (RED)
2. Advisory Committee (AC) (Annexure I)
3. Technical Evaluation Committee (TEC) (Section 6.1)
4. Radiation Protection Officers (RPOs)
5. Pr. Administrator
6. Sr. Security Officer
7. Medical Officer/ Sr. Medical Officer (MO/SMO)

#### B. Public Organisation (Co-ordination by D.G (Civil Defence))

1. Director General Civil Defence, Islamabad
2. Ministry of Health, Executive Director PIMS, Islamabad
3. Chief Nutrition Division, NIH, Islamabad
4. Civil Authorities i.e DC Islamabad/Rawalpindi
5. Police Authorities i.e SSP Islamabad/Rawalpindi

#### 4. EMERGENCY ALERT

##### 4.1 Announcement

EMERGENCY ALERT shall be declared when specific conditions arise which may lead to an emergency situation, but it appears that there is still time to take precautionary and constructive steps to prevent the emergency situation or mitigate its consequences.

Although a determination will be made that the emergency can be corrected and controlled by plant personnel, DNSRP, Public Authorities and other PAEC/non-PAEC establishments at Nilore will be notified and placed on emergency standby according to the following scheme.

##### RED

- CEPP
- Advisory Committee
- TM, NLP, Director, CNS, TM, K-Block, TM, R-Block, I/C MSSP,
- VIP Guest House, Local Army Battery Commander,
- Local College/School Principal/Head mistress
- Director DNSRP (He will co-ordinate activities with NORI)
- PAEC HQS (Member Technical/Secretary PAEC)
- Director General Civil Defence (He will co-ordinate activities with Civil Authorities i.e Police, District Management, Ministry of Health and Hospitals.)

The initial notification message shall be short, followed up later, if necessary by supporting details. The initial message out-side PINSTECH will be given by telephone and shall be:

"SECTOR GROUP IS ALERTED"

At PINSTECH announcement will be made by Head ROG on Public Address System and shall be:

"ATTENTION! THIS IS AN EMERGENCY ALERT; WAIT FOR THE NEXT ANNOUNCEMENT"

توجہ فرمائیے۔ ایمرجنسی الرٹ کی صورت حال پیدا ہو گئی ہے۔ ہمارے اگلے اعلان کا انتظار فرمائیے۔

##### 4.2 Responsibilities :

i) Members of the Advisory Committee and Technical Evaluation Committee shall proceed to the RED office and Emergency Control Centre respectively. Heads of PAEC projects at Nilore, local army BATTERY COMMANDER, Pr. Administrator and SENIOR SECURITY OFFICER shall remain in emergency standby condition in their offices and shall wait for the next announcement.

ii) The individuals on knowing about emergency alert should remain calm and avoid creating panic among other colleagues. The persons who are outside their laboratories will stop moving outside within the complex and will go into the nearest building.

The workers who are busy in their laboratories will secure their equipments/instruments and will wait in their laboratories for further announcement. However utilities will remain operational.

iii) The public authorities will remain in a state of readiness to play their role during emergency and remain on emergency standby conditions until the termination of emergency alert or declaration of emergency as the case may be.

#### 4.3 Termination of Emergency Alert

When plant control systems are fully under control and normal conditions are restored the emergency alert will be terminated by RED or his designate as below

i) The public authorities and other organizations which were informed for emergency alert will be informed by telephonic message for the termination of emergency alert. The message outside PINSTECH shall be :-

"SECTOR GROUP ALERT IS TERMINATED"

ii) At PINSTECH, the termination of emergency alert shall be declared by Head ROG through public address system and message shall be

"ATTENTION! EMERGENCY ALERT IS TERMINATED"

توجہ فرمائیے - ایرجنسی الرٹ ختم ہو گئی ہے۔

After the termination of emergency alert, the employees will assume their normal activities.

\*\*\*\*\*

## 5. SECTOR EMERGENCY

### 5.1 ANNOUNCEMENT AND NOTIFICATION

Sector Emergency will be declared if the gamma monitor in the stack shows significant release of the radioactive material and gives alarm. RED or his designate will carry out the announcement and notification according to the following scheme.

#### (a) Announcement

RED or his designate shall declare the existence of emergency (in consultation with Head ROG & CEPP) first by operating a 20 seconds up and down emergency siren signal through public address system within the PINSTECH and there after making the following announcement over the public address system.

"ATTENTION! -THIS IS A RADIATION EMERGENCY. ALL PERSONNEL PROCEED TO THE NEAREST ASSEMBLY AREA IMMEDIATELY. COMMAND POINT IS \_\_\_\_\_"

Announcement shall be made in slow and clear voice. Urdu translation as given below shall be announced immediately after the English version.

توجہ فرمائیے۔ ریڈی ایشن ایمرجنسی کا اعلان کیا جاتا ہے۔ تمام حضرات فوراً قریب ترین اسمبلی ایریا پہنچ جائیں۔

#### (b) Notification

کمانڈ پوائنٹ ..... ہے۔

RED will notify as under:

RED

- CEPP
- Advisory Committee
- TM NLP, Director CNS, TM K-Block, TM R-Block, I/C MSSP,
- VIP Guest House, Local Army Battery Commander, Local College/School Principal/Head mistress
- Director DNSRP (He will co-ordinate activities with NORI)
- PAEC HQS (Member Technical/Secretary PAEC)
- Director General Civil Defence ( He will co-ordinate activities with Civil Authorities i.e Police, District Management, Ministry of Health and Hospitals.)

The initial notification message shall be short, followed up later, if necessary by supporting details as given in Appendix-I. The initial message outside PINSTECH will be given by telephone and shall be:

"SECTOR GROUP IS CALLED"

### 5.2 RESPONSIBILITY:

i) Radiation Protection Officers (RPOs) in each Division will ensure that all members of their Divisions have assembled in the assembly areas (Assembly areas are identified in Subsection 8.1(iii))

ii) The individuals hearing about emergency should remain calm and quiet and avoid creating panic among other colleagues and should assemble in the specified assembly area and follow the instructions given by RPO/Hd of Division.

iii) Nobody should leave assembly area until announced by RED.

iv) The security staff will control the access and egress to PINSTECH.

### 5.3 TERMINATION OF EMERGENCY

As soon as, the emergency situation has been brought under control and normal conditions are restored, the RED in consultation with advisory committee will terminate the emergency as below

i) The public authorities which were notified for emergency will be informed by telephonic message for the termination of emergency. The message shall be

"SECTOR GROUP IS DISPERSED"

ii) At PINSTECH emergency shall be terminated by operating 30 seconds continuous emergency signal and thereafter making the following announcement over the public address system.

"ATTENTION! RADIATION EMERGENCY IS TERMINATED"

توجہ فرمائیے - ریڈی ایشن ایرجنسی ختم ہو گئی ہے -

After the termination of emergency, the employees will resume their normal activities.

\*\*\*\*\*

## 6. Evaluation of Emergency

The Technical Evaluation Committee (T.E.C) comprising of the following members will meet in the Emergency Control Centre - ECC (located opposite to the PINSTECH Model School, NLP Colony) for the evaluation of the Emergency:

- i) Co-ordinator Emergency Planning & Preparedness - CEPP
- ii) A Senior Scientist from HPD, PINSTECH associated with the offsite emergency
- iii) A Senior Scientist from HPG, NLP associated with the offsite emergency
- iv) One Reactor Operations Engineer from ROG, PINSTECH

In the absence of CEPP the next in seniority will act as CEPP. Following actions will be taken at the ECC;

1. Incharge Mobile Radiological Monitoring Lab(MRML) will be alerted to keep ready the staff and equipment of MRML for the off site operations in accordance with the "check List"
2. TEC will receive initial emission data from Reactor Operations Engineer-ROE/S (shift Incharge) with precise time of occurrence on telephone/wireless.
3. TEC will obtain latest meteorological data from NLP meteorological Lab on telephone/wireless.
4. "Sector Emergency Dose Calculation Programme" will be initiated immediately on the computer at ECC. The initial emission and meteorological data will be fed into the " Programme" to identify the affected sector(s) around PINSTECH on its display/print out. A map of the area within 12 Km radius around PINSTECH will be available to help identification of the affected areas.
5. CEPP will convey to the Radiological Emergency Director (RED) of the affected area(s) with the name(s) of the places and recommend the appropriate protective measures i.e. sheltering, adhoc respiratory protection, use of prophylaxis, restriction on open (uncanned) eatables or evacuation etc., on the basis of the projected doses to the population as estimated by the computer programme and with reference to the PAEC adopted "Intervention Levels".

6. TEC will instruct I/C MRML to carry out the radiological surveys/measurements at the affected places and simultaneously transmit (on two-way wireless system) the initial findings to the T.E.C. (The detailed functions of the MRML are given in section 7).
7. TEC will continue to remain in touch with the ROE/S, NLP meteorological Lab., R.E.D and MRML in order to review any changes in the emergency situation (due to changes in the emission rate and in the meteorological conditions) and recommend any modifications in the protective/remedial measures in the affected area(s).

\*\*\*\*\*

## 7. Radiological Monitoring & Surveillance

### 7.1 On-Site

Radiological Monitoring & Surveillance will be carried out as given in the "Revised Radiation Emergency Procedures at Pakistan Research Reactor, PINSTECH/ HPD-115, PINSTECH, P.O. Nilore, Rawalpindi (1984).

### 7.2 Off-Site

On the announcement of "Emergency Alert", Incharge Mobile Radiological Monitoring Laboratory (MRML) will immediately assemble all the on-duty members of MRML team. Each team will include:

- i) I/C MRML - (Health Physicist)
- ii) One Scientific Assistant (SA)
- iii) One Technical Assistant (TA)
- iv) One Attendant
- v) One Driver/Mechanic

Note: If supporting vehicle is also accompanying MRML then one Health Physicist and one driver/mechanic will also be required.

Following actions will be taken at MRML;

1. I/C MRML will ensure that the MRML and its equipment is ready as per "Check List" (Ref. Annexure -III)
2. T.E.C. will instruct I/C MRML to proceed to the sampling point of specified affected areas for radiological survey. T.E.C. will also provide preliminary projected dose level information to I/C MRML.
3. I/C MRML will instruct the monitoring team to proceed to the affected area(s) for radiation survey.
4. I/C MRML will register the departure of his team with the T.E.C. He will turn on the background monitor.
5. I/C MRML will ensure that MRML is all the time kept in touch with T.E.C. on two-way wireless communication system.
6. I/C MRML will continuously observe the indications of the background monitor throughout the route.
  - i) As soon as any significant rise in the background activity is detected he will immediately inform TEC of the location and the extent of the rise in background activity.



- ii) If no abnormal rise in the background radioactivity is observed on reaching the sampling point of the specified affected area, the I/C MRML will inform CEPP/TEC at the Emergency Control Centre for further instructions and act accordingly.
7. I/C MRML will direct the driver to stop the MRML as soon as an abnormal rise in the background radioactivity is detected.
8. I/C MRML will direct his Scientific Assistant to carry out the preliminary survey of the surrounding area with portable survey meters.
9. The SA in protective clothing will carry out the instructions of the I/C MRML.
10. The SA will report to I/C MRML the direction in which the background radioactivity is increasing which will identify the affected area.
11. I/C MRML will report to the TEC of the identification of the affected area.

### 7.3 Radiation Monitoring Schedule:

The following radiation monitoring schedule will be followed in the affected area.

#### i) Dose Rate Monitoring

Ambient dose rates at one meter height at various points in the affected area within a radius of 200 meters from the pre-selected sampling point will be measured.

#### ii) Airborne Particulate and Iodine Monitoring

Air sampling will be carried out for a period of half an hour to one hour initially followed by gamma spectrometric analysis.

#### iii) In-situ Gamma Spectrometry

In-situ gamma spectrometry at one meter height above the ground level will be carried out for the identification of the radionuclides.

#### iv) Soil Sampling

The soil sampling will be carried out within a radius of 200 meter from the prescribed sampling point. At least two areas of one square meter will be selected and three samples will be taken from each area for radiometry.

v) Water Sampling

Surface water samples if available within a radius of 200m from the selected sampling point will be taken in one litre bottles from different locations for gamma spectrometry.

vi) The results of the radiation monitoring will be transmitted to the TEC/CEPP.

\*\*\*\*\*

8. Protective Measures At The Assembly Areas.

The following instructions should be followed by the individuals and the Radiation Protection Officers (RPOs) at the Assembly Areas:-

1) Individuals:

Individuals on hearing emergency alarm should:-

1. Remain calm and avoid creating panic.
2. Shut down/leave equipment in safe condition.
3. Immediately proceed to the nearest Assembly Area.
4. Help/guide others towards the nearest Assembly Area.
5. Help injured/suffering persons.
6. Follow the instructions of Radiation Protective Officer(RPO).

2) Radiation Protection Officers:

RPO shall;

1. Secure entries to the Assembly Area after the individuals are assembled and counted.
2. Ensure that nobody leaves assembly area without his written permission.
3. Arrange contamination monitoring of individuals and notify any contaminated/injured person to the Radiation Emergency Director (RED). Arrange air sampling if air contamination is suspected.
4. Advise respiratory protection, if required.
5. Arrange distribution of iodine tablets for oral intake when necessary on the instructions of RED.
6. Contact RED in case of area contamination.
7. Contact Number for Radiation Emergency Director is 843496 and Ext.4302 and intercom No.11.

3) Assembly Areas (Ref. Annexure II)

The locations of the Assembly Areas within PINSTECH premises are as follows:-

<u>Sr.No.</u>	<u>Location of Assembly Area</u>	<u>Telephone Ext.</u>
1.	Corridor in the Basement of NCD Building.	4116,4106
2.	Corridor in the Basement of NMD Building.	4215
3.	Corridor in the Basement of NPD Building.	4305
4.	Corridor of the C.D	4402
5.	Corridor of the SID Building (Covered)	4452
6.	Corridor of the PCD Building	3555
7.	Corridor of GSD	3402
8.	Corridor of the NED/RIAD Building	3432
9.	Corridor in the Basement of E.D	3211
10.	Corridor of Phase-I	3155

\*\*\*\*\*

## 9. CONTROL OF ACCESS AND EGRESS

### 9.1 On-Site:

- 1) Upon hearing about emergency alert Senior Security officer or his designate will instruct his security staff to be ready to meet the radiation emergency situation.
- 2)a. As soon as the Sector Emergency is declared, the Senior security officer will instruct the security staff on duty to ensure that the Reception Gate, Gate No. 2 and VIP Gate are closed and no body should be allowed to enter or leave the premises without authorisation of RED.  
  
b. Senior Security officer will also inform the security staff at the check post at barrier No. 1,2 & 3 to close the entries/exits leading to PINSTECH.
- 3) Only those persons who have proper authorization from RED or his designated (RPOS) will be allowed to leave or enter the area.
- 4) The security supervisor will indicate the open/alternate routes to be followed in the PINSTECH premises as per instructions of RED or his designate and in this regard written sign boards with arrows be displayed by his staff.
- 5) The security guard(s) will take following safety measures for their protection:
  - i) He will stand in the check post cabin.
  - ii) He will use mask, apron, overshoes, iodine tablets if advised.
  - iii) He will not leave his place of duty until advised by Senior Security officer; while leaving he will get himself monitored.
  - iv) The personal protective clothing if found contaminated should be wrapped in polythene sheet and stored at a proper place for subsequent disposal as Radwaste.

### 9.2 Off-Site:

Control of Access and Egress will be arranged by the Police Authorities as advised by the RED and co-ordinated by the Director General Civil Defence Islamabad.

## 10. PERSONAL MONITORING AND INTERNAL DOSIMETRY

### 10.1 On-Site:

1. Personal monitoring within PINSTECH will be carried out by HPD Staff/RPO by;
  - i) Collecting personal dosimeters (pocket dosimeters, TLDS at assembly points) and reading/evaluation of external doses.
  - ii) Contamination check up of the body/clothings.
  - iii) Personnel performing emergency duties will be provided with dosimeters.
2. Internal dosimetry will be conducted by whole body countings and bioassay. Only the persons in the affected areas and the personnel performing emergency jobs will be required for internal contamination check ups.

### 10.2 Off-Site:

Personal monitoring of the duty staff and Civil Defence personnel will be arranged by the Director General Civil Defence, Islamabad in collaboration with the District Administration, Police, Ministry of Health etc. For internal dosimetry, RED will collaborate with the DG Civil Defence, Islamabad.

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**11. MEDICAL AID FOR THE INJURED AND RADIOLOGICALLY  
EXPOSED/CONTAMINATED INDIVIDUALS AT  
PINSTECH COMPLEX**

**11.1 HANDLING**

- 1) An individual who is seriously injured and contaminated will be taken to Medical Centre by covering with polythene sheet/bed sheet or paper sheet to avoid the contamination of vehicle during transport.
- 2) General wounds, whether contaminated by radioactive substances or not, shall be treated in conformity with the principles of first aid (at the PINSTECH Medical Centre)
- 3) Preference for decontamination or treatment first or both simultaneously will depend upon the condition of the patient. However, before starting decontamination/treatment following safety measures should be taken by the personnel involved in decontamination/treatment.
  - i) Should wear protective clothing/apron, cap, gloves and overshoes.
  - ii) Should wear mask/respirator if considered necessary by health physics personnel.

**11.2 TREATMENT**

When a wound is or is suspected of being contaminated, the following procedure will be followed after vital first aid treatment such as control of brisk bleeding, artificial respiration etc. have been carried out:

- a) All contaminated clothing around the wound shall be quickly removed. While this is being done, the wound itself shall be protected with a sterile dressing to prevent further contamination with radioactive materials.
- b) Monitoring shall be carried out at the wound itself, in an attempt to gauge the degree of contamination. This shall be done and recorded both before and after decontamination.
- c) If the wound is not extensive, does not appear to be very deep and does not appear to be penetrating into one of the body cavities such as the skull, chest, or abdomen, it shall be washed thoroughly with soap and copious amounts of water. Following this it shall be monitored again and the change in activity level noted. It shall then be covered with a clean dressing.

- d) If heavy contamination of the surrounding skin is present, it shall be washed thoroughly using soap and water and, if necessary, a soft brush. All washing shall be conducted away from the wound which is kept covered to prevent further contamination. The person giving the first aid will wear protective gloves. Decontamination procedure shall not be too energetic for fear of destroying the natural skin.
  - e) When the wound is extensive or is very deep or penetrates through the bone of the skull or into the chest or abdomen or where there is an associated compound fracture, NO attempt at decontamination shall be made. If activity is high around such a wound, the surrounding skin will be decontaminated as in (d) above, the wound itself being carefully protected with a sterile dressing.
- 4) After necessary first aid treatment patient will be transported to the recommended hospitals for further necessary treatment in the supervision of Medical Officer. If considered necessary a health physicist will also go with the patient.
- 5) Other safety precautions:
- a) Floor of the operation room should be covered with polythene/plastic disposable sheet.
  - b) Contaminated clothes of the individual should be wrapped in polythene sheet and should be disposed off in radioactive waste area.
  - c) Splashing of decontamination solutions should be avoided.
  - d) The patient should be monitored for contamination before transfer from the Medical Centre to the recommended hospitals.
  - e) Liquid wastes generated during decontamination operation should be dealt with as radioactive waste.
  - f) Monitoring of personnel involved in decontamination/treatment should be performed.

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**12. RESPONSE AND ACTION BY THE PERSONNEL  
AT THE PINSTECH COMPLEX**

1. On the announcement of "Sector Emergency at PARR-1" by the RED all persons at PINSTECH COMPLEX at Nilore will be instructed by their Heads to assemble in the covered assembly points or offices and wait for the next announcement.
2. No one should move in the open.
3. If the premises of any Institute/Project falls within the affected areas as announced by the RED, they will be instructed by their Heads to take protective measures i.e closing of doors/windows of assembly areas/offices, use of prophylaxis, respiratory protection etc. They will wait for the next announcement.
4. If the premises of any Institute/Project do not fall within the affected areas, they will be instructed to remain within the assembly points/offices till the next announcement.
5. When the emissions from PARR-1 are under complete control as announced by the RED, there are the following two possibilities:-
  - i) Persons of the Institute/Projects that do not fall within affected areas will be transported out side the premises following the routes that donot fall within affected areas (The access and egress of the affected areas will be controlled by the Civil Defence/Police/Security).
  - ii) Persons of the Institute/Project that fall within the affected areas will be guided outside the affected area by the radiological survey team after ensuring that they donot carry any contamination on their persons and clothing. They will also be checked for internal contamination (if considered necessary) through the bioassay and the whole body counting before they are transported out side PINSTECH site following clear routws.
6.
  - i) Essential staff including telephone operators, drivers GSD personnel, HPD personnel, fire brigade personnel will remain at assembly points/places of duty and wait for any instructions by the RED.
  - ii) Pr. Administrator, Transport officer, PAs to the Director & Pr. Administrator will remain at respective assembly points ready for any instructions.

### 13. EVACUATION OF PINSTECH COMPLEX EMPLOYEES

1. During emergency, preference will be given to sheltering instead of evacuation.
2. Evacuation will not be carried out unless it is sure that there is no more release from the reactor.
3. PINSTECH employees who are not in the affected area will be transported to Rawalpindi/Islamabad through clear routes.
4. During evacuation heads of divisions will ensure that skeleton staff required for emergency handling is available at the site.
5. Persons in the affected area will be thoroughly checked for internal and external contamination before leaving.
6. Casualties in the affected area will be sent to medical centre for proper treatment.
7. The adoption of the routes will depend mainly on the wind direction i.e. the evacuation route should be opposite to the wind direction as far as possible. The following are the possible routes proposed to be used during the evacuation;

PINSTECH-CDA road leading to Bharakao.

PINSTECH-Karore road leading to karore and to Murree.

PINSTECH-Lehtrar road leading to Lehtrar.

PINSTECH-Cherah road leading to karal (Islamabad Highway).

PINSTECH-Lehtrar road leading to Rawalpindi/Islamabad.

8. During evacuation following safety measures should be taken:
  - i) Specified routes should be followed strictly.
  - ii) Number of passengers in a vehicle should not exceed the seating capacity in any case.
  - iii) Any contaminated clothing should not be taken home and should be handed over to RPO/Health Physicist.
  - iv) RPO/Health Physicist will be the last to leave.

9. The following standing instructions for the drivers are recommended to be followed by the Transport Section(s) of PINSTECH/PINSTECH Complex:-

i) Transport Section will maintain the directory of addresses of drivers working in their respective establishments.

ii) At least 25% of the drivers will be put on full alert as a routine to meet any eventuality. These drivers will be supposed to be present at their residences all the time after office hours during their turn.

iii) All drivers will inform their departure from Rawalpindi/Islamabad on closed days & holidays and will inform about their contacts.

iv) All drivers will be instructed to contact transport office(s) during their out station stay if an emergency announcement is made on radio/T.V.

v) Random exercises should be conducted once or twice a year to ensure the availability of the drivers during emergency.

vi) One to two Vans at each establishment of PINSTECH Complex will be made available particularly during off hours to collect drivers and other concerned officials during emergency situation.

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## 14. RESPONSE OF GENERAL PUBLIC TO THE EMERGENCY SITUATION

The decision to inform the members of the general public about an "Emergency Alert" situation at the PINSTECH Complex will be a judgement based on the possible consequences of the prevailing situation at the plant and involves both the merits and de-merits. Therefore, the decision to inform the public in the surrounding area will be made by the RED in consultation with other Civil Authorities in this regard.

On getting information regarding "Emergency Alert" or, "Sector Emergency" at the PINSTECH complex, the members of the general public living in the surrounding villages of the PINSTECH complex will be required to adopt the measures given in the section 14.1 or in section 14.2 respectively for the safety of their families and property i.e., live stock etc.

-The responsibility for the education of the public and adoption of the safety measures rests with the PINSTECH authorities (Within a radius of 1km distance from the PINSTECH complex), Where as, between a radius of 1-10km distance, this responsibility lies with the Directorate General Civil Defence, Islamabad.

### 14.1 Emergency Alert

#### 14.1.1 Individual Response

1. On knowing about "Emergency Alert", remain calm and avoid creating panic among other fellow citizens. Individuals should also inform/notify this information to others in their close proximity so that more and more people in the locality could be informed in the least possible time.

2. Do not try by any means to go to the PINSTECH complex area to know/learn about the status/condition of the site/complex.

3. Immediately adopt appropriate measures to take shelter (cover) for the whole family, preferably in the inner most room of the house. Avoid taking unnecessary items into the sheltering space. Such a practice will reduce the volume of the shelter area.

4. Count all family members in the shelter area. Call for those who are still in the open to come inside the shelter area.

5. Once in shelter, make sure to collect and store as much edible items as can be from within the house. Also store sufficient potted water/milk in the shelter area. In the case of "Sector Emergency", which may follow, only covered potted water will have to be utilised during the length of the "Sector Emergency".

6. Collect materials like towels, bed sheets, blankets etc. to block or close the openings of doors, windows and ventilators etc. Blocking or closure of openings will avoid the possibility of diffusion of radioactive substances/gases into the shelter area.

7. During "Emergency Alert", try not to leave the shelter area unnecessarily. If unavoidable then spend minimum time outside the shelter.

8. If children are in school, go and bring them by the shortest possible route to home. Do not bring your children with you without the intimation/information to the school teachers/staff/administration. Such a practice could cause misunderstanding for the the school administration about the status/welfare of their students.

9. Take your radio or T.V. sets (which ever is available) into the shelter area and turn it "ON" to listen to any special bulletins/news regarding the "Emergency Alert". This practice will keep you in touch with the latest situation.

10. If radioprotective prophylaxis i.e., potassium iodide or potassium iodate tablets, for each member of the family is not available or have not been provided/distributed by the Civil Defence volunteers/wardens/local councillors etc., then make sure to get those as and when its distribution is made. Also learn/inquire about the use and dosage for the children and adults.

11. If radioprotective prophylaxis have already been distributed or are available in the shelter area, then do not consume those until instructed by the civil administration through civil defence volunteers/wardens/local councillors etc. Untimely and unnecessary consumption of these tablets may not be effective for their actual purpose. Once instructed, immediately take as per recommended dosage.

12. Take all live stock i.e., cattle and pet animals etc., into the barns or in covered areas to avoid their exposure to possible radioactive cloud/plume.

13. Make sure that suffiicient fodder and water is available for the animals inside the barn for a period which may extend up to days in certain conditions. Under such circumstances the animals will have to be fed on stored fodder and covered water for a certain period of time to avoid exposure from the contaminated fodder.

14. Individuals working in the fields e.g. ploughing, irrigating the fields etc., should try to reach as early as possible to a safe shelter area which may either be their own houses or some community places like "Derrahs" etc. Ploughing animals should also be properly sheltered in the barns etc.

#### 14.1.2 Response of the Masses

1. For children in schools/colleges, the Headmaster/Principal /teachers should make sure that panic is not created/generated among themselves and the children/students and discipline is maintained at all levels.

2. The Headmaster/Principal of the schools/college should make sure that students are taken inside the class rooms or the school/college hall and proper counting of the students by calling their roll numbers is done and compared/checked with the morning attendance.

3. Class teachers/teachers assigned the duty will make sure that students are kept disciplined afterwards and until the arrival of any of their parents or any other relative so that they could be safely handed over.

4. If any one of the parents or relatives do not arrive at the school to collect the child, then on sensing the urgency of the situation the Headmaster/teacher should decide to send the child safely to his home either independently or under the guidance of some other parent/teacher who knows the child's parent or family or in the form of a group of children of the same locality.

5. Children in all cases be advised to go straight to their homes and stay indoors even if their parents are not already in the house or have left the house for the time being.

6. If visitors are in the area from other villages to carry out some business like the trade/selling of live stock etc., in the "Cattle Market", then local individuals should inform them to either leave the area alongwith their cattle or locate proper sheltering for themselves and the live stock.

7. For the patients/sick people either admitted in the Basic Health Centres (BHUs)/dispensaries or being treated as out-door patients, the doctor incharge/dispenser should make sure that the patients are informed well on time about the "Emergency Alert". They may also recommend the patients to go home on sensing the severity of the situation or condition of the patient.

8. Only after normalisation of the "Emergency Alert", condition, masses should resume their normal day to day working.

9. Keep close contact with your local area councilors or the civil defence volunteers/wardens working in your area to be familiar with the activities being carried out in your area after the termination of the "Emergency Alert".

## 14.2 Sector Emergency

### 14.2.1 Individual Response

On getting information regarding "Sector Emergency", at the PINSTECH complex (which means that the emergency has now actually happened), the members of the general public living in the surrounding villages of the PINSTECH complex who have already adopted emergency procedures/measures associated with the "Emergency Alert" condition will be required to adopt the following criteria for the safety of their families and property i.e., live stock etc.

1. When informed about "Sector Emergency", at the PINSTECH complex, remain calm and also keep family members from getting panic.
2. Keep listening to your radio or T.V. set (which ever is available) to know about any special bulletins/news regarding the "Sector Emergency". This practice will keep you in touch with the latest situation regarding the sector emergency at PINSTECH and of appropriate protective measures to be taken on the instructions of the civil administration Rawalpindi/Islamabad.
3. If radioprotective prophylaxis i.e., potassium iodide or potassium iodate tablets, for each member of the family have already been distributed or are available in the shelter area, then on instructions of the civil administration through civil defence volunteers/wardens/local councillors etc., take as recommended for dosage. Timely utilisation/consumption of these tablets in prescribed dosages will be effective for the actual purpose of its administration.
4. If radioprotective prophylaxis is not available or could not be collected when actually distributed or have not been provided/ distributed by the Civil Defence volunteers/wardens /local councillors etc., then make sure to get those as early as possible.
5. Immediately take appropriate measures to block or close the openings of doors, windows and ventilators etc., by utilising the already collected materials like towels, bed sheets, blankets etc. Blocking or closure of openings will reduce the possibility of diffusion of radioactive substances/gases into the sheltered area.
6. Once instructed to remain in shelter during the length of "Sector Emergency", make sure that only the already stored edible items are utilised. Similarly use only the stored potted water in the shelters.
7. Every individual should adopt two forms of protective measures namely, the respiratory protection and secondly the use of protective clothings. These measures offer protection against

the airborne and deposited radioactivity. Respiratory protection involves the use of handkerchiefs, soft absorbent paper (tissue paper) and other items which can be used to cover the mouth and nostrils. Generally all forms of clothing will provide a degree of protection against contamination from any kind of radioactive source.

8. During "Sector Emergency", under no condition an individual should leave the shelter unnecessarily. If unavoidable and some life saving activity is involved then least time should be spent outside the shelter. Also the protective measures mentioned in para 14.2.7 should be undertaken.

9. Stay away from the windows and glass doors to avoid direct exposure from the passing radioactive plume.

10. Animals within the barn should be fed only on stored fodder and covered potted water from the already available stored supplies for a period which may extend up to days in certain conditions.

11. Individuals working in the fields e.g. ploughing or irrigating the fields etc., should reach as early as possible to a safe shelter area which may either be their own houses or some community places like "Derrahs" etc. Ploughing animals should also be properly sheltered in the barns etc.

#### 14.2.2 Response of the Masses

1. For children in schools/college, the Headmaster/Principal /teachers should make sure that panic is not created/generated among themselves and the children/students and discipline is maintained at all levels.

2. The Headmaster/Principal of the schools/college should make sure that students are taken inside the class rooms or the school/college hall and proper counting of the students by calling their roll numbers is done and compared/checked with the morning attendance.

3. Class teachers or teachers assigned the duty should make sure that their students are kept disciplined afterwards and until the arrival of any of their parents or any other relative so that they could be safely handed over to them.

4. If any one of the parents or relatives do not arrive at the school to collect the child, then on sensing the urgency of the situation the Headmaster/teacher should decide to send the children safely to their homes either independently or under the guidance of some other parent/teacher who knows the child's parent or family or in the form of a group of children.



5. Children in all cases be advised to go straight to their homes and stay indoors, even if, their parents are, already, at home or have left the house for the time being.

6. If visitors are in the area from other villages to carry out some business like the trade/selling of live stock etc., in the "Mandi", or "Cattle Market", then the local individuals should inform them to either leave the area alongwith their goods/cattle or locate proper sheltering for themselves and the live stock etc.

7. For the patients/sick people either admitted in the Basic Health Units (BHUs)/dispensaries or being treated as outdoor patients, the doctor incharge/dispenser should make sure that the patients are informed well on time about the "Site Emergency". They should also make sure that the patients go to their homes or into shelters on sensing the severity of the situation or the condition of the patient.

8. When instructed to vacate the area on radio/T.V. or through the civil defence volunteers etc., cooperate with the authorities for your own safety. leave the area through the instructed route either by your own conveyance and if not available then through the vehicles provided by the civil administration as early as possible.

9. In no case travel farther than necessary. roads/tracks may get jammed as traffic may emerge from all directions. A stranded vehicle/cart etc., may become a trap and lead to an awkward situation. Travel only upto the nearest safety spots as announced by the civil administration on radio/T.V.

10. Make sure that you have locked all your doors/windows before you leave the premises to protect your property from damage and loss. Only take your valuable belongings like jewelry, cash, important papers etc., with you. The civil administration will be responsible for the protection of your property during your absence.

11. Make sure that before leaving your house, all the electricity switches are switched off from the main switch. Similarly all gas points are also closed to avoid any damage to your property in your absence.

12. Try to take as much as possible the emergency supplies including warm protective clothings (if winter season), family medications, stored food, potted water and dried provisions etc.

13. Once in the Evacuee Centres (which will be arranged by the civil administration in schools etc. in non-contaminated areas), do not panic and try to accommodate/help the others who are also temporarily stationed alongwith you.

14. On termination of the "Sector Emergency", which will be notified on radio/T.V., return to the area if and only if allowed/permitted by the civil administration.

15. Keep close contact with your local area councillors or the civil defence volunteers working in your area to be familiar with the activities being carried out in your area after the termination of the "Sector Emergency".

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APPENDIX I

ACCIDENT NOTIFICATION PROFORMA

1. Name of facility where accident occurred \_\_\_\_\_
2. Time & Date at which accident occurred \_\_\_\_\_
3. The nature of the accident (e.g. lost source, stuck source, release of radioactive material) \_\_\_\_\_
4. The radionuclides involved if possible (e.g. I-131, Cs-137, Sr-90 etc.) \_\_\_\_\_
5. Amount of activity involved in Bq. \_\_\_\_\_
6. Wind direction \_\_\_\_\_
7. Physical form of release (e.g. gaseous, liquid, solid)  
\_\_\_\_\_
8. Results of radiation or contamination measurements carried out \_\_\_\_\_
9. Information on injuries - radiological and non-radiological  
\_\_\_\_\_
10. Whether any members of the public are at risk from the incident \_\_\_\_\_
11. Assistance required \_\_\_\_\_
12. Any other remarks \_\_\_\_\_

Radiation Emergency Director

APPENDIX II

DISTRIBUTION OF PROPHYLACTICS (STABLE IODINE)

AVAILABILITY

The availability of Prophylactics/stable iodine tablets in the Assembly Area of each division will be ensured by the Radiation Protection Officer (RPO) of that Division. These tablets will be available from HPD. PINSTECH.

DISTRIBUTION

i) The stable iodine tablets will be distributed for oral intake by the PINSTECH employees as protection of thyroid exposure against the uptake of radio-iodine, by radiation protection officer in assembly areas upon the recommendations of RED.

ii) The stable iodine tablets will be distributed to the general public by civil defence personnel on the recommendations of RED/DNSRP.

DOSE AND ADMINISTRATION

The recommended dosages of these stable iodine compounds are as follows:

- i) All individuals above age of 1 year:  
130 mg KI or 170 mg KI03 - during the first 24 hours (100 mg iodine equivalent);  
65 mg KI or 85 mg KI03 - every day following first 24 hours (50 mg iodine equivalent) ( Upto a maximum quantity of 1 gm )
- ii) Infants under age of 1 year:  
65 mg KI - every 24 hours ( Upto a maximum quantity of 0.5 gm )

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APPENDIX III

THE ROLE AND RESPONSIBILITIES OF PINSTECH AND THE PUBLIC ORGANISATIONS DURING A SECTOR EMERGENCY AT PINSTECH

S.No.	Role/Responsibility	Head & Organisation
1.	Assessment of the off-site Radiation Emergency Situation	Radiation Emergency Director (RED) PINSTECH Complex Director, PINSTECH
2.	Notification of "Emergency Alert," and "Sector Emergency," to the Director, DNSRP, Islamabad.	RED
3.	Notification of "Emergency Alert", and "Sector Emergency", to the Director General (Civil Defence) Islamabad.	RED
4.	Announcement of the Radiation Emergency in the potential affected areas within 1 km radius of PINSTECH	RED
5.	Announcement of Radiation Emergency situation to the public in the potential affected areas between 1 to 10 km radius of PINSTECH	Director General Civil Defence, Islamabad
6.	Initiation of "Protective Measures" (as intimated by the Radiation Emergency Director (RED), PINSTECH These "Protective Measures", may include adhoc respiratory protection, indoor sheltering, use of iodine tablets etc.	D.G. (Civil Defence) Islamabad.
7.	Provision of Personal Protective equipment, sampling & monitoring equipment & Surveymeters etc. for Civil Defence Volunteers, Rescue workers.	D.G. (Civil Defence) Islamabad.
	-Technical advice for the above	RED
8.	Establishment of a "Report Centre", at Nilore by the Civil Defence.	DG. (Civil Defence) Islamabad.
9.	"Public Awareness Programme" for the public education in response to reactor emergencies between 1 to 10km distance from PINSTECH.	DG. (Civil Defence) Islamabad.

10. i) Establishment of First Aid Treatment Centre & Personal Decontamination Facilities within 1-10 km radius from PINSTECH at preselected sites. -Ministry of Health  
Coordination:  
DG. (Civil Defence)  
Islamabad.
- ii) Centralised facility with a decontamination room for the treatment of contaminated casualties at PIMS and other teaching hospitals at Rawalpindi-Islamabad. -Ministry of Health  
-Executive Director PIMS  
Coordination:  
DG. (Civil Defence)  
Islamabad.
11. Screening equipment for the mass scale analysis of food for radioactivity
- Technical assistance for the selection of equipment. RED
- Procurement operation and maintenance of Equipment Chief Nutrition Division  
National Institute of Health (NIH)  
Coordination:  
D.G. (Civil Defence)  
Islamabad.
12. Control of Access & Egress in the potential affected area between 1-10 km distance from PINSTECH. -SSP. Islamabad  
-SSP Rawalpindi  
Coordination:  
DG. (Civil Defence)  
Islamabad.
13. Evacuation of the Population from highly affected areas (As advised by RED - this is extremely rare possibility)
- DC. Islamabad.  
-DC. Rawalpindi.
- Provision of Evacuee Reception Centres Coordination:  
DG. (Civil Defence)  
Islamabad.
14. Decontamination of affected areas (Fire fighting & industrial equipment will be required). -DC. Islamabad.  
-DC. Rawalpindi.  
Coordination:  
DG. (Civil Defence)
15. Technical assistance to civil authorities regarding decontamination of affected areas. RED

It may be stressed that annual meetings between the Directorate of Civil Defence & the PAEC should be held for the review and evaluation of the progress made towards the fulfillment of the role and responsibility assigned to various public organisations.

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ADVISORY COMMITTEE (AC.)

The Advisory Committee (AC.) will assist the Radiation Emergency Director (R.E.D) in Consultation, Advice and Decision Making during the conduct of emergency response operations. The AC. comprises the following members:-

	<u>Off.</u>	<u>Telephone No.</u>	<u>Res.</u>
1. Associate Director	-Direct Ph:	828731	852614
	-PINSTECH Ex:	847601-09	
	ext:	4321	
		4322	
2. Head Nuclear Chemistry Division.	-Direct Ph:	843806	847916
	-PINSTECH Ex:	847601-09	
	ext:	4101	
		4102	
3. Head Nuclear Engineering Division.	-Direct Ph:	843530	813435
	-PINSTECH Ex:	847601-09	
	ext:	3301	
		3302	
4. Head Nuclear Materials Division.	-Direct Ph:	840103	281088
	-PINSTECH Ex:	847601-09	282531
	ext:	4201	
		4202	
5. Head Health Physics Division.	-Direct Ph:	844879	858497
	-PINSTECH Ex:	847601-09	
	ext:	3151	
		3152	
6. Head Reactor Operations Group.	-Direct Ph:	845441	840185
	-PINSTECH Ex:	847601-09	
	ext:	3101	
		3102	
7. Head General Services Division.	-Direct Ph:	843479	413124
	-PINSTECH Ex:	847601-09	
	ext:	3401	
		3402	
8. Head Applied Health Physics Group	-PINSTECH Ex:	847601-09	-
	ext:	3156	
9. Co-ordinator Emergency Planning at PINSTECH site.	-Direct Ph:	828838	413921
	-New Labs.Ex:	822196-99	
	ext:	2213	



ASSEMBLY AREAS AT PINSTECH

The locations of the Assembly Areas within PINSTECH Premises are as follows:-

<u>Sr. No.</u>	<u>Location of Assembly Area</u>	<u>Telephone Ext.</u>
1.	Corridor in the Basement of NCD Building.	4116, 4106
2.	Corridor in the Basement of NMD Building.	4215
3.	Corridor in the Basement of NPD Building	4305
4.	Corridor of the CD.	4402
5.	Corridor of the SID Building (Covered)	4452
6.	Corridor of the PCD Building	3555
7.	Corridor of GSD	3402
8.	Corridor of the NED/RIAD Building	3432
9.	Corridor in the Basement of ED	3211
10.	Corridor of Phase-1	3155

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## (CHECK LIST)

## MOBILE RADIATION MONITORING LABORATORY

Exercise/Emergency No.-----

Dated: -----

1. Members of the Team: (-----)
  - Mr. -----(Incharge Health Physicst)
  - Mr.-----(Health Physicst)
  - Mr.-----(Scientific Astdt.)
  - Mr.-----(Technician)
  - Mr.-----(Attendant)
  - Mr.-----(Driver)
2. Condition of the Van.(Please mark "Yes" or "No" as the case may be)
  1. Gasoline (----) 2. Tyres (----) 3. A.C. (----)
  4. Warning Light/hooter (----)
3. Equipment. (Please mark "Yes" or "No" as the case may be)

A) Gamma Spectroscopy Systema) Fixed HPGe detector

1. Fixation: (----)
2. Liquid Nitrogen: (----)
3. Detector Bias to HVPS 3105 at J1: (----)
4. Preamp Power to rear of Amplifier 2020: (----)
5. Energy to Amplifier 2020 at INPUT: (----)
6. Unipolar output to MCA S-35 at ADC IN: (----)
7. Toggle switch of MCA at EXT: (----)
8. J101 of S-35 to slot #1(top) of computer: (----)
9. Power cables to switch board: (----)

b) Portable HPGe detector.

1. Liquid Nitrogen: (---)
2. Battery of MCA S-10: (----)
3. Stand: (----)
4. Detector Bias to MCA S-10 at J107: (----)
5. Preamp power to MCA S-10 at J108: (----)
6. Energy to MCA S-10 at J101: (----)
7. J104 of S-10 to slot #1(top) of computer (opt.)
8. Charger to MCA S-10 at J105 (opt.)
9. Power cable from switch board to Charger (opt.)

...continued.

ANNEXURE-III (continued)

c) NaI detector.

1. Detector Bias to HVPS 3102 at J1: (----)
2. Preamp power to Amplifier 2012: (-----)
3. Energy to Amplifier 2012 at INPUT: (-----)
4. Unipolar output to ADC 8075 at ADC IN: (-----)
5. ADC data from J102 to slot #2 of computer: (----)
6. Power cables to switch board: (----)

B) Computer System (IBM PS/2)

1. REIN drive to computer's slot #3: (-----)
2. Monitor (VGS) to computer's slot #4: (----)
3. Plotter to computer's slot #5: (----)
4. Printer to computer's slot #6: (----)
5. Mouse to computer's slot #7: (-----)
6. Key board to computer's slot #8: (-----)
7. Power cables to switch board: (-----)
8. Diskettes: (----)
9. Ribbon: (----)
10. Pens: (----)

C) Radiation Monitoring Instruments.

Instrument	Battery	Gas	Calibration	Alarm	Probe	Cable	Adapter
1. LB 133	(---)	(---)	(-----)	(---)	(---)	(---)	(---)
2a. LB 1200	(---)	(---)	(-----)	(---)	(---)	(---)	(---)
2b. LB 1200	(---)	(---)	(-----)	(---)	(---)	(---)	(---)
3a. LB 1210C	(---)	(---)	(-----)	(---)	(---)	(---)	(---)
3b. LB 1210C	(---)	(---)	(-----)	(---)	(---)	(---)	(---)
4. LB 1210D	(---)	(---)	(-----)	(---)	(---)	(---)	(---)
5. 470 A	(---)	(---)	(-----)	(---)	(---)	(---)	(---)
6. H 13420	(---)	(---)	(-----)	(---)	(---)	(---)	(---)

D) Sampling Equipment.

1. Air sampler: (----)
2. Combination Filter: (----)
3. Filder Holder: (----)
4. Balance: (----)
5. Drying Oven: (----)
6. Beakers: (----)
7. PVC foil: (----)
8. Aluminium foil: (----)

..... continued

ANNEXURE-III (continued)

9. Scissors: (----)
10. Knives: (----)
11. Plastic bags: (----)
12. Colour Markers: (----)
13. Labels: (----)
14. Sample containers: (----)
15. Tissue papers: (----)

E) Personal Protective Equipment.

1. Rod Dosimeters (No.----- Charge ----- Test -----)
2. Breathing Apparatus: (-----)
3. Compressed Air Cylinder: (----)
4. Breathing Masks: (----)
5. Combined filters: (----)
6. Disp. Overalls: (----)
7. Disp. Over Shoes: (----)
8. Disp. Gloves: (----)
9. Radiation Warning signs: (----)
10. Waste bags: (----)
11. Protective Overall: (----)

F) Decontamination Equipment.

1. Soap: (----)
2. Detergent: (----)
3. Paper Towel: (----)
4. Brush: (----)
5. Sponge: (----)
6. Patches: (----)

G) Liquid Nitrogen Fill System.

1. Self Pressurizing Discharge Device:  
(Valves----- Gauge----- Tightener-----Surgical Tube---
2. Auto Fill System 7840: (----)
3. EKI Withdrawl: (----)
4. Sensors: (----)
5. Tubes: (----)
6. Solenoid Valve: (----)
7. Regulator: (----)
8. Air Compressor/Cylinder: (----)

IV) POWER SUPPLY.

1. Generator (Oil----- Ignition plug----- Starter-----)
2. Fuel Filled: (----lit.)
3. Fuel Reserved: (----lit.)
4. Output (voltage----- Current-----)
5. Cables (Gener. to VAN -----Gener. to Exten.board---
6. Plugs: (----)

.....continued.

ANNEXURE-III (continued)

V) DOCUMENTATION.

A. User/ Operator's Manuals.

1. Germanium Detectors: (----)
2. MCA series 35 plus: (----)
3. Spectran-AT V4 cise 526: (----)
4. PC Tool/kit Software cise 445: (----)
5. Spectran-F Lib. Edit. cise 521: (-----)
6. Spect. Amplifier 2020: (----)
7. Spect. Amplifier 2012: (----)
8. ADC 8075: (----)
9. System 100: (----)
10. IBM Quick Reference: (-----)
11. Microsoft Windows: (----)
12. IBM Proprinter: (----)
13. MCA series 10 plus: (-----)
14. LB 133: (----)
15. LB 1200: (----)
16. LB 1210 B/C: (----)
17. LB 1210 D: (----)
18. Panoramic 470A: (----)
19. Microcont: (-----)
20. Balance EK-12KA: (----)
21. LN2 Auto Fill System 7840: (----)
22. Air Sampler HV-1E: (-----)
23. Compressed Air Breathing Apparatus BD 83: (----)

B. Proformae.

C. Records.

D. Maps.

VI) ACCESSORIES.

A Stationery.

1. Writing pads: (----)
2. Ball points: (----)
3. Lead pencils HB: (----)
4. Paper Clips: (----)
5. Common pins: (-----)
6. Pelikan Rubber: (-----)
7. Sharpener: (-----)
8. Gum Bottle: (-----)
9. File Covers: (----)
10. Registers: (-----)
11. Measuring Foot: (----)
12. Scotch Tapes: (-----)

....continued

ANNEXURE-III (Continued)

B) Tools.

1. Measuring Tape (3M): (----)
2. Measuring Tape (30M): (----)
3. Screw Drivers: (-----)
4. Pliers: (-----)
5. Scissors: (-----)
6. Cutters: (----)
7. Nose Pliers: (-----)
8. White Glue: (----)
9. Sticking Bond: (-----)
10. Stop Watch: (-----)
11. Hammers: (-----)
12. Chisel: (-----)

VII) COMMUNICATION SYSTEM.

A) Base Station Radio.

1. Power Supply: (----)
2. Channel Frequency: (----)
3. Microphone: (-----)
4. Output Power set: (----)
5. HF-SSB antenna: (----)
6. Antenna tuner: (-----)

C) Important Telephones.

- |    |         |    |         |
|----|---------|----|---------|
| 1. | (-----) | 2. | (-----) |
| 3. | (-----) | 4. | (-----) |
| 5. | (-----) | 6. | (-----) |
| 7. | (-----) | 8. | (-----) |

VIII) METEOROLOGICAL STATION.

1. Battery/P.S.: (-----)
2. Starcards (SC84----- SC92-----)
3. Starcard reader: (-----)
4. Sensors (W.speed ----- W.dirac.----Temp./Humd.----  
R.fall 1----- R.fall 2-----)
5. Data from ----- to -----: (filename)-----
6. Tefrilog: (-----)

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SUMMARY OF SEQUENTIAL ACTIONS**(I) Emergency Alert**

1. Reactor Operations Engineer/Supervisor (ROE/S) reports to the Hd ROG of the malfunctioning of the reactor control system.
2. Hd. ROG informs the Radiation Emergency Director (RED) i.e. Director PINSTECH and Co-ordinator Emergency Planning & Preparedness, PINSTECH/NLP (CEPP) of the situation.
3. RED authorises Hd. ROG for the announcement of the "Emergency Alert". (Ref. Section 4.1)
4. Members of the Advisory Committee (AD) proceed to the office of the RED.
5. CEPP calls the meeting of the Technical Evaluation Committee (TEC).
6. ROE/S informs Hd ROG of the regaining of the control of the reactor instrumentation.
7. Before terminating Emergency Alert, Hd ROG consults Area Health Physicist to ensure that the radiation/contamination levels are normal.
8. Hd. ROG informs the RED of the situation.
9. RED authorises Hd ROG for the announcement of the termination of the "Emergency Alert". (Ref. Section 4.3)

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**(II) Sector Emergency**

1. Reactor Operations Engineer/Supervisor (ROE/S) reports to the Hd ROG of the malfunctioning of the reactor control system.
2. Hd ROG informs the Radiation Emergency Director (RED) i.e Director, PINSTECH and Co-ordinator Emergency Planning & Preparedness, PINSTECH/NLP(CEPP) of the situation.
3. RED authorises Hd ROG for the announcement of the "Emergency Alert". (Ref. Section 4.1)
4. Members of the Advisory Committee (AC) proceed to the office of the RED

5. CEPP calls the meeting of the technical Evaluation Committee(TEC)
6. ROE/S reports Hd. ROG of abnormal radiation levels and possibility of the uncontrolled release of radioactivity from the reactor.
7. Hd. ROG in consultation with the Area Health Physicist informs RED and CEPP of the uncontrolled release of radioactivity from the reactor.
8. RED authorises Hd. ROG for the announcement of "Sector Emergency" by "Public Address System".(Ref.Section 5.1)
9. RED notifies Member Technical, Director, DNSRP, D.G. Civil Defence, Islamabad, Incharge Medical Centre PIN-STECH of the emergency situation. (Ref. Section 5.1)
10. CEPP reports to RED of the affected area(s) outside PINSTECH after assessment of the situation by the Technical Evaluation Committee (TEC) on the basis of the following information (Ref. Section 6):
  - i) Radioactive release data from Hd ROG and/or ROE/S.
  - ii) Current meteorological data.
11. RED directs Hd ROG to take measures to meet "Site Emergency," situation within PINSTECH. (Phase 1 and other areas) in accordance with the provisions of the "Revised Radiation Emergency Procedures at Pakistan Research Reactor". (Reference 2)
12. RED informs the members of Advisory Committee(AC) of the Sector Emergency and the affected areas outside PINSTECH and gets their advice on the initiation of the protective measures.
13. CEPP after deliberations with his TEC. decides either:-
  - a) To recommend to RED to terminate the Sector Emergency, or
  - b) To initiate offsite protective measures as follows:-
    - i) To take adhoc respiratory protection by holding wet cotton cloths, handkerchiefs etc. against their noses for protection against toxic gases.
    - ii) To take shelter in the innermost rooms of their houses and close doors and window for protection against radioactive cloud.



iii) To swallow stable iodine tablets distributed by the volunteers.

14. RED authorises volunteers/security staff for the distribution of iodine and announcement of the protective measures as detailed in para 13 above and also arranges control of traffic across the affected areas within PINSTECH complex except the Lehtrar road. (Ref. Section 9)

15. RED will inform the Member Tech, Director DNSRP and Director General Civil Defence of the termination of "Sector Emergency". (Ref. Section 5.3)

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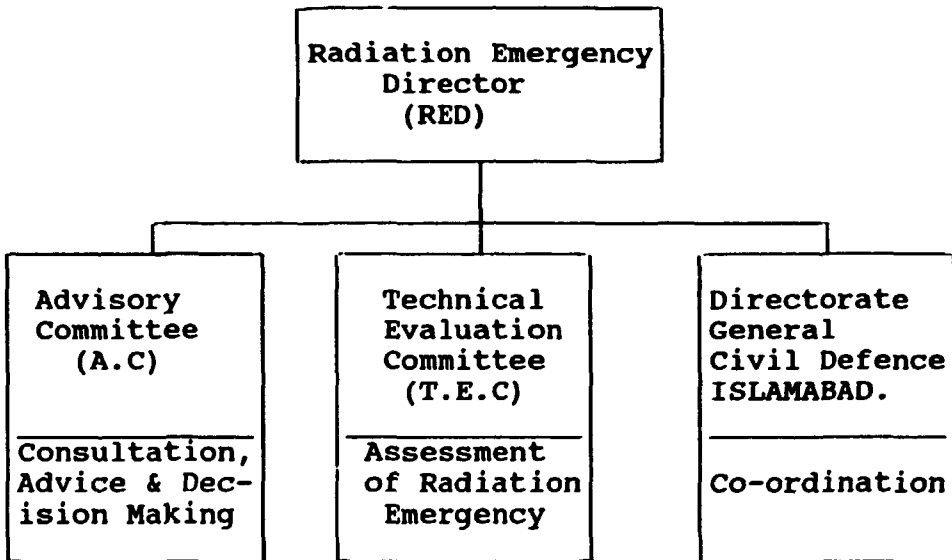
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2. Pakistan Institute of Nuclear Science & Technology, Revised Radiation Emergency Procedures at Pakistan Research Reactor, S.D.Orfi et al, PINSTECH/ HPD-115, PINSTECH, P.O.Nilore, Rawalpindi (1984).
3. International Atomic Energy Agency, Planning for Offsite Response to Radiation Accidents in Nuclear Facilities, Safty Series No.55,STI/PUB/580, IAEA, Vienna(1981).
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**FIGURE (1) RADIOLOGICAL RESPONSE ORGANISATIONAL STRUCTURE FOR SECTOR EMERGENCY AT PINSTECH, NILORE (ISLAMABAD)**

**Radiation Emergency  
Director (RED)**

**Director General Civil  
Defence, Islamabad**

**Protective Measures Within  
1km of PINSTECH**

**Protective Measures Between  
1 to 10km of PINSTECH**

Protective Measures	Role & Responsibility
-Assembly Areas Protection: Radio-prophylatic, Adhoc Respiratory Protection, -Personnel Monitoring, -Air Sampling	*Radiation Protection Office (R.P.O) *Supervision: I/C Applied Health Physics Group
-Control of Access & Egress	*Sr. Security Officer
-Radiological Monitoring & Surveillance of the affected areas	*I/C Mobile Radiological Monitoring Laboratory (MRML)
- Internal Dosimetry & Personal Monitoring	*Hd. HPD PINSTECH, *I/C HPG, NLP
-Medical Aid for Exposed/Contaminated Individuals	*(Sr) Medical officer SMO/MO, *I/C Applied Health Physics Group
-Evacuation of PINSTECH Complex Employees (extremely rare possibility)	*Sr. Security Officer, *Hd. Health Physics Div, *Pr. Administrator, *Director PINSTECH

Protective Measures	Role & Responsibility
-Sheltering Indoors, Radioprophylatic, Adhoc Respiratory Protection, Monitoring & Protective Equipment for Rescue Workers	*Director General Civil Defence, Islamabad
-Control of Access & Egress, Provision of Protective Equipment for Personnel	*SSP Islamabad *SSP R. Pindi
-Decontamination/ Treatment Facilities at PIMS/ other Hospitals	*Ministry of Health, Executive Director PIMS, Islamabad
-Screening Equipment for Analysis of Food for Radioactivity	*Chief Nutrition Division NIH, Islamabad.
i) Establishment of a "Report Centre" at Nilore. ii) "Public Awareness Programme" for the education of the masses	Director General, Civil Defence, Islamabad
-Decontamination of affected areas (fire fighting and industrial equipment will be required)	*D.C Islamabad *D.C R'pindi
i) Evacuation of population from highly affected areas (extremely rare possibility) ii) Provision of Evacuee Reception centre	Coordination: *Directorate General Civil Defence, Islamabad Supervision/ *Technical assistance RED

**FIGURE (2) PROTECTIVE MEASURES AND ROLE & RESPONSIBILITIES OF PINSTECH AND PUBLIC ORGANISATIONS DURING A SECTOR EMERGENCY AT PINSTECH.**