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Replacement Research Reactor Project

SAR CHAPTER 20
EMERGENCY PLANNING AND PREPAREDNESS

Prepared By

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For

Australian Nuclear Science and Technology Organisation

1 November 2004

ANSTO		Document N°: **RRRP-7225-EBEAN-002-Rev0-CHAPTER-20** Revision: 0		
Replacement Reactor Project		Document Title: SAR - CHAPTER 20, Emergency Planning and Preparedness		
REVISION SHEET		Ref No:		
		Print name, date and sign or initial		
Revision	Description of Revision	Prepared	Checked/ Reviewed	Approved
0	Original Issue for public release	KJH	DW	GW
Notes: 1. Revision must be verified in accordance with the Quality Plan for the job.				

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20 EMERGENCY PLANNING AND PREPAREDNESS

20.1 INTRODUCTION

The objectives for this chapter are to:

a) Identify the requirements applicable to the emergency planning for the Replacement Research Reactor Facility (Reactor Facility), and

b) Provide a summary description of the emergency plan and emergency arrangements for the operation of the Reactor Facility.

The areas discussed are as follows:

a) The emergency organisation including identification of roles and responsibilities

b) The emergency actions to be taken in the event of an incident including:

   (i) The identification and classification of emergencies;

   (ii) The notification of on-site and off-site personnel and other organisations, including the communication routes;

   (iii) The protective measures to be taken.

c) The availability and adequacy of emergency equipment and personnel.

d) The training of personnel and the organisation of emergency exercises and drills.

The specific systems associated with this chapter (eg the communications system) are discussed in other chapters of this document.

Referenced documents for Emergency Planning and Preparedness are listed in section 20.10.

20.1.1 The ANSTO Response Plan

Emergency planning at the Lucas Heights Science and Technology Centre site is covered by the Response Plan for Accidents and Incidents at ANSTO/LHSTC (hereafter 'ANSTO RP'). The ANSTO RP identifies responsibilities of ANSTO staff and emergency services organisations in responding to accidents and incidents at the site. Response to the on-site component of any accident or incident is considered in the plan together with the support from ANSTO to the emergency services organisations.

ANSTO personnel provide full technical support to the plan.

The ANSTO RP incorporates a graded approach in the planning and response to events depending on their emergency category and the potential for escalation from one category to the next. As such it forms part of, and is consistent with, the hierarchy of DISPLANS.

The ANSTO RP includes:

a) Identification of the emergency organisation including the authority and responsibilities of key individuals.

b) Responsibilities of off-site agencies which may be requested to help in an emergency.

c) Site action to limit the extent of any radioactive release and the spread of contamination.

d) The chain of command and communication, defining clearly the responsibilities and duties of persons and organisations concerned.

e) Provisions to ensure the reliability of communications on site.

f) Notification requirements for informing authorities.

g) The actions to be taken by persons and organisations involved in the implementation of the plan.

20.1.2 The Reactor Facility Emergency Plan

The emergency arrangements in place at the Reactor Facility feed into, and are consistent with, the ANSTO RP. The arrangements take account of the Reactor Facility's self-response capabilities in accident conditions and its emergency equipment and staffing.

The Reactor Facility Emergency Plan (EP) and its supporting documentation cover foreseeable radiological and non-radiological accidents and incidents at the Reactor Facility. They include those accidents analysed in Chapter 16 as well as other, non-nuclear, events for which emergency planning is needed.

The Reactor Facility EP and its supporting documentation include:

a) Identification of the local emergency organisation including the authority and responsibilities of key individuals.

b) Identification of emergency situations in a manner that is consistent with the ANSTO RP.

c) The conditions under which an emergency is declared, a list of persons empowered to declare it, and a description of suitable warning facilities. To this end, the staff members designated to understand the nature of the emergency, trigger the response/recovery actions, and declare the emergency terminated are also identified.

d) The organisational arrangements and staff responsibilities in the execution of emergency procedures.

e) The arrangements for initial and subsequent severity assessment, including environmental monitoring of the radiological conditions.

f) Measures for ensuring medical treatment of casualties.

g) The chain of command and communication, defining clearly the responsibilities and duties of persons and organisations concerned.

h) Provisions to ensure the reliability of communications between the MCR, the ECC, the SCC, the ASCC, and inside and outside locations. This includes the establishment of communication channels between reactor operators, facility personnel at the site, and external support.

i) A description of emergency facilities, equipment and procedures.

j) Notification requirements for calling for additional resources.

k) Provisions for termination of and recovery from the emergency.

20.1.3 Radiological Emergency Planning Considerations

Emergency planning is one component of the defence in depth principles applied to the Reactor Facility. The ANSTO RP and Reactor Facility EP cover predefined actions and countermeasures to:

a) Respond to an accident or incident.

b) Mitigate the consequences of an accident at its source.

c) Prevent adverse health effects by preventing or minimising radiation exposures.

d) Recover from an accident or incident and ensure the facility is placed in an stable and safe condition.

Co-ordination links with site resources and with off-site organisations are consistent with those previously established and tested. The ANSTO RP organises the site operational structure to respond to accident scenarios within its own resources and also describes the support to be given to the NSW Emergency Services.

For the purposes of emergency planning, three Emergency Planning Zones are defined in accordance with IAEA practice. These are:

1. Precautionary action zone (“PAZ”) is a predesignated area around the reactor where pre planned urgent protective actions would be implemented immediately an emergency is declared. It is the local area in the vicinity of the reactor that would be evacuated if warranted.

2. Urgent protective action planning zone (“UPZ”) is a predesignated area around the reactor where pre planned urgent protective actions would be implemented based on environmental monitoring. It is the area around the reactor where down wind air plume monitoring is required to determine whether countermeasures such as sheltering, iodine prophylaxis or evacuation is required. This would occur within hours with assistance from on-call personnel.

3. Longer term protective action planning zone (“LPZ”) is a predesignated area around the reactor where pre planned longer term protective actions would be implemented based on environmental monitoring. It is the area around the reactor where monitoring of ground deposition and food chain pathway monitoring is required to determine agricultural and foodstuff controls. This would occur within days.

Emergency responses in the PAZ and UPZ are covered by the Reactor Facility EP and ANSTO RP respectively. The results of dose calculations reported in Chapter 16 show that no countermeasures are necessary in the LPZ since values are under the IAEA generic intervention levels (see Tables 20.1/1 and 20.1/2).

20.1.4 Supporting Plans

Chapter 3 of the SAR describes the site characteristics for the Reactor Facility, including the surrounding community. The plans and arrangements for dealing with any off-site response are included under the following plans, which would be activated progressively in the event of an accident or incident with off-site consequences:

The Sutherland Shire Local Disaster Plan (DISPLAN)

The NSW State Hazardous Materials Emergency Sub-Plan

The Georges River District Disaster Plan (DISPLAN)

The NSW State Disaster Plan (DISPLAN)

Together with associated supporting plans

The scope of these plans and their supporting plans (Sub Plans) includes the arrangements for evacuation of areas within the Urgent Protective Action Planning Zone, if necessary. Provisions are made for the evacuation of 'special needs' groups such as the elderly, pre-school and school children.

20.1.5 Identification of Hazards and Emergencies

The potential hazards arising from the operation of the Reactor Facility may be summarised into two categories:

a) Conventional workplace hazards (fires, manual handling, electrical, mechanical and chemical)

b) Radiological (radiation and contamination)

The Reactor Facility is equipped with systems designed to aid in the identification of accidents or incidents. The EP is supported by Response Actions to assist the Shift Manager in identifying and responding to foreseeable accidents and incidents.

End of Section

Table 20.1/1 Generic Intervention Levels for Urgent Protective Actions

Protective Action	Generic intervention level (dose avertable by the protective action)
Sheltering	10 mSv effective dose (whole body)
Evacuation	50 mSv effective dose (whole body)
Iodine prophylaxis	100 mGy committed absorbed dose to the thyroid

Table 20.1/2 Generic Intervention Levels for Temporary Relocation and Permanent Resettlement

Protective Action	Generic intervention level (dose avertable by the protective action)
Temporary Relocation	30 mSv in first 30 days 10 mSv in the subsequent 30 days
Permanent Resettlement	1 Sv in lifetime

End of Tables

20.2 ORGANISATION

The general organisation of the Reactor Facility is discussed in Chapter 13. In this section, the organisation in place for emergency responses is addressed.

20.2.1 Site Emergency Organisation

The organisation that executes and co-ordinates response actions to emergency conditions depends on the emergency classification, the potential for escalation of the emergency and the arrival of external support to the site.

In the event of any accident conditions arising in the Reactor Facility, the primary actions are coordinated by the Shift Manager. Depending on the nature of the accident, further response actions may be coordinated by a designated person in charge of a local incident control point (small incidents), or executed by the Duty Safety Coordinator (DSC) (escalating events), or the ANSTO Emergency Management Officer (AEMO). These people have the authority to call for support from a range of experienced safety personnel.

In an extremely unlikely event that requires evacuation of the Reactor Facility, the reactor operator in the Main Control Room would carry out required responsibilities. The Main Control Room is designed to remain habitable in such cases. Arrangements are in place to account for personnel evacuating the Reactor Facility.

Should the Main Control Room become uninhabitable, the reactor operators would relocate to the Emergency Control Centre after the reactor is shutdown.

In addition, the Site Alarm Monitor (SAM) can also receive indication of an accident situation via phone or the intercom in the Site Control Centre (SCC) and the Alternative Site Control Centre (ASCC). The SAM would then follow pre-planned responses and action texts.

Figure 20.2/1 shows the interaction of Reactor Facility personnel with ANSTO site personnel.

20.2.2 Agreement with Off-site Supporting Agencies and Compatibility with Other Plans

In the case of activation of the ANSTO RP, the AEMO will act as liaison officer providing consultation with the Site Controller, a NSW Police Officer. The Site Controller will operate from the Emergency Operations Centre from where liaison with NSW Emergency Services and support organisations will be maintained.

The emergency services and support organisations foreseen as likely to be called upon are:

a) NSW Police: provides initial reconnaissance of the area affected by an emergency, traffic and crowd control, control of evacuations.

b) Ambulance Service of NSW: provides ambulance transport and pre-hospital care, and transportation of designated medical teams to appropriate sites.

c) NSW Fire Brigades: is the combat agency for fire and land based hazardous materials incidents and emergencies.

d) Health Department: co-ordinates and controls the mobilisation of all health responses to emergencies when ANSTO RP is activated.

20.2.3 Evacuation and Roll Call

An evacuation of the Reactor Facility occurs when:

a) the Reactor Facility evacuation alarm is activated, or

b) a fire alarm in the Reactor Facility is triggered

Clearly signposted exit routes exist throughout all levels of the Reactor Facility.

The MCR is the designated area from which response actions would be carried out by the reactor operators. In the unlikely event that the MCR were uninhabitable, the reactor operators would relocate to the ECC and coordinate response actions from there.

There are two fire evacuation muster points outside the Reactor Building at which personnel would gather and remain while a roll call was carried out. The locations are:

a) Auxiliary Building

b) Entrance Foyer to the Reactor Facility

20.2.4 Communications During Emergency Conditions

Communications provisions are in place to facilitate information transfer between all parties involved in the management of an accident or incident. These provisions include:

a) Immediate notification of personnel by means of:

   (i) The Reactor Facility paging system and Site Public Address systems

   (ii) An Evacuation alarm, triggered from the MCR (or the ECC). The evacuation alarm system consists of visual and audible alarms sounded at different points in the Reactor Facility to ensure that it is received by all personnel.

   (iii) Fire alarms, automatically triggered by detectors distributed throughout the Reactor Facility.

   (iv) Local alarms of Area Radiation Monitoring (ARM) detectors when a dose rate value is exceeded.

b) Communications with emergency services and support organisations whose presence at the Reactor Facility may be required to participate in response actions (e.g. ambulance, fire fighters, etc).

   (i) Lists of phone numbers, radio frequencies and established communication links with relevant individuals and institutions is available for immediate use in the MCR, ECC, SCC and ASCC in accordance with standing operating procedures.

   (ii) A set of Pre-Programmed Alarm Responses (PPAR) are available in the SCC and ASCC for execution by the SAM.

c) Post-recovery notification to Authorities.

   (i) Information on abnormal situations, describing response actions, countermeasures adopted to prevent repetition of the event, and experience learned is provided by the Reactor Manager to ANSTO and to ARPANSA.

The MCR and ECC are fully equipped to allow efficient communication with on-site personnel. The Reactor Facility paging system and the telephone network covers the

foreseeable communication needs for all accidents or incidents. The Reactor Facility paging system is designed to be PAM conformed.

In addition to full occupancy areas, other communication points are located at key points throughout the facility.

The communication between the Reactor Facility MCR (or ECC) and the SCC (or ASCC) can also be performed through an intercom system. The RCMS data, including selected PAM instrumentation, can be displayed in the SCC (ASCC) via a one-way link from the RCMS to the ANSTO Local Area Network (LAN). The Site PA (public address) system can be used by the SAM to inform and direct staff.

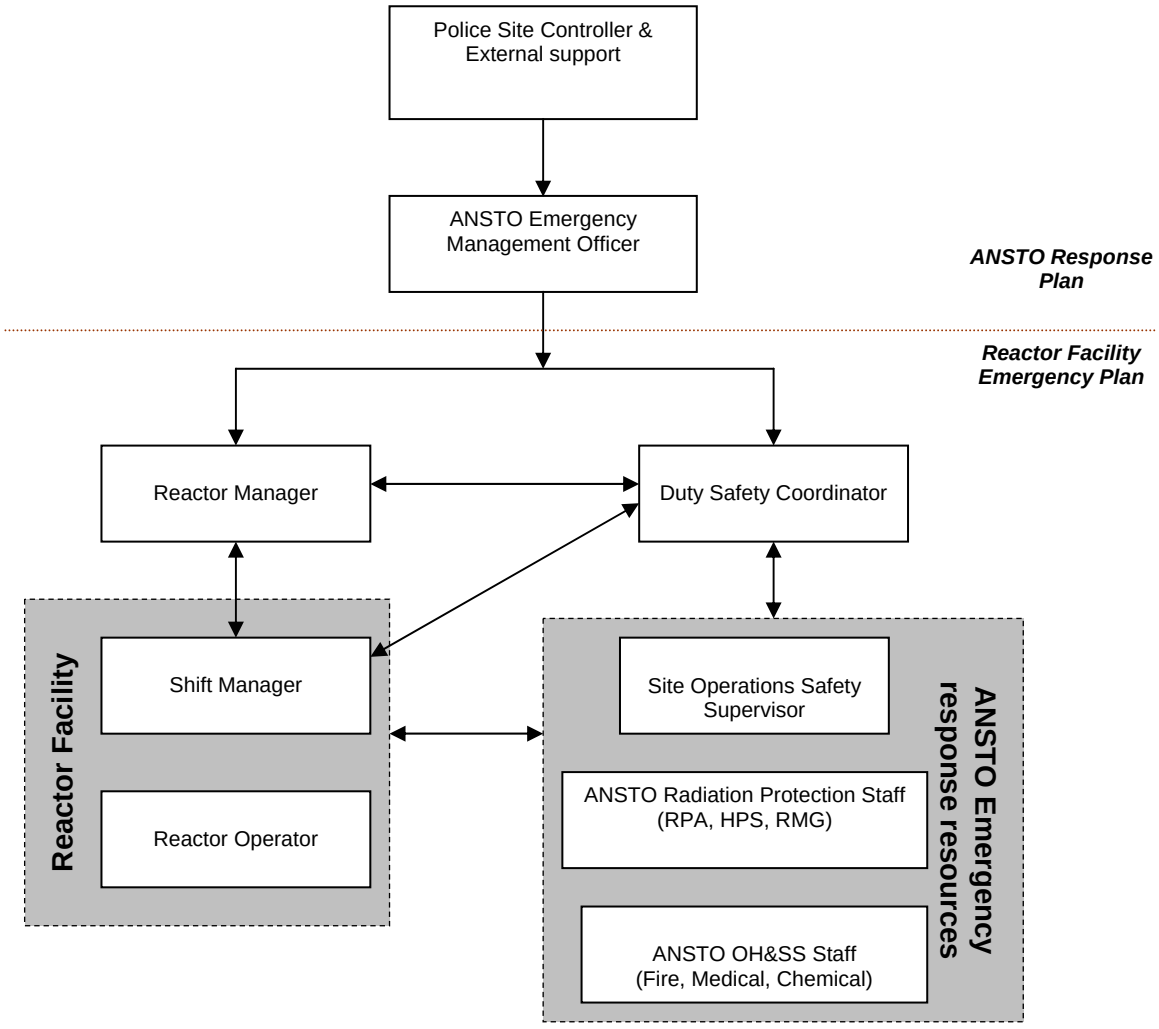
In addition, mobile phones and radios are also available for use by ANSTO Emergency Response personnel.

Communications with off-site authorities (e.g. Ambulance Services or Fire Brigades) are performed through the SCC facilities (e.g. direct line to NSW Fire Brigade Control Centre at Alexandria). Communications with off-site authorities are performed by the DSC and/or AEMO. Communications with the Media and the Police Media Liaison Unit are performed by the ANSTO Communications Manager.

The Emergency Operations Centre communications systems that would be set up in the event of a major emergency will be prioritised and will have enough channels to deal with internal and external links.

End of Section

Figure 20.2/1 Interaction of Reactor Facility and Site Emergency Personnel



End of Figures

20.3 EMERGENCY CONTROL

20.3.1 Local Incident Control

The control of an emergency is performed as close as practicable to the affected area. For example, for incidents involving the spread of radioactive contamination, local control would be set up in one of the access routes to the affected area, with other entrances closed.

The MCR will be occupied for almost all emergencies and, from there, response actions will be taken. In the unlikely event of the MCR becoming uninhabitable, local control would be exercised from the ECC.

The Shift Manager is the person in charge. He/she co-ordinates and executes the Reactor Facility Emergency Plan and response actions. The Duty Safety Coordinator and/or ANSTO Emergency Management Officer will assist by coordinating additional support needs as necessary.

20.3.2 Incident Control Points

The Reactor Facility building design includes space allocated at key points for the performance of local control actions for several kinds of incidents.

For example, on every level an area has been allocated to store protective equipment to cope with contamination incidents. From these areas, suitably trained staff are able to institute radiological control of the incident and perform the first response actions.

For incidents involving more complex actions, the control of response actions would be directed from the MCR (ECC). In the highly unlikely event of an accident that required evacuation of the Reactor Facility, the response actions would be coordinated from the Emergency Operations Centre.

The ability to display data received from Post Accident Monitoring (PAM) instrumentation in the MCR, ECC, (hardwired) and other points (via the RCMS) allows the tracking of key variables as well as facilitating the taking of decisions to execute response actions such as re-entry.

20.3.3 Re-entry Procedure

Re-entry procedures are dependent on the nature of the initiating accident/incident and the associated hazards. The nature of actions, safety requirements and approval required being commensurate with the initiating event and hazards.

Unless an immediate action to rescue a person or prevent a major incident escalation is required to be taken, recovery actions will only be taken by suitably prepared personnel trained for the purpose following agreement by the appropriate responsible officers nominated in the relevant response actions.

20.3.4 Post-incident Recovery

The post incident recovery actions and responsibilities would depend on the particular incident/accident scenario. These actions would be determined on the basis of advice from suitably knowledgeable personnel and agreed by the appropriate responsible officer. The officer may be the Shift Manager, Reactor Manager, DSC, or AEMO. It would be dependent upon the particular incident/accident scenario. The recovery actions and responsibilities are described in the response action procedures that support the Reactor Facility EP.

The design of the Reactor Facility includes provisions to facilitate the recovery of safe conditions, for example:

a) Surface cover in possibly contaminated areas (epoxy cover).

b) Allocation of appropriate sumps to receive wash water.

c) Floor slopes to facilitate water collection.

d) Threshold system to minimise the spread of possible contaminated water.

e) Absolute and charcoal filters to clean the Containment atmosphere in re-circulation mode.

End of Section

20.4 ALARMS AND SECURITY SYSTEMS

Audible alarms are located in such a way that failure of a single annunciator will not affect the overall efficiency of the system, it still being possible to hear the warning message in every room in the Reactor Facility's buildings and adjacent areas.

Alarms announcing different conditions have a clearly recognisable and distinct sound. They are set off for long enough to warn the staff but without interfering with subsequent response actions.

The following alarms are in place:

a) High dose rate: the Reactor Facility includes analogue and digital fixed area radiation detector audible alarms at various locations throughout the Reactor Facility. Visual indicators are also provided in some areas, especially in rooms where hearing protection is required.

b) Fire alarm: is triggered by automatic sensors. Clear instructions through the PA system are provided from the MCR (or ECC). Manual fire alarm trigger devices are located in rooms and corridors. The fire alarm also alerts the SAM who triggers the pre-programmed alarm responses and directs external support using the available communication systems.

c) Evacuation alarm: warns all individuals in the Reactor Facility to evacuate the building using the designated exit routes. This alarm can be triggered manually from the MCR (or ECC) or automatically if the level of water in the Reactor Pool falls below a certain set value.

d) Intrusion alarm: To fulfil physical security requirements and protect the Reactor Facility from being accessed by unauthorised persons, an intrusion warning is triggered if any access is inappropriately opened.

Exit signs are located to indicate evacuation routes. They are powered by an Uninterruptible Power Supply (UPS) to guarantee proper functioning.

End of Section

20.5 EMERGENCY EQUIPMENT AND SUPPLIES

Emergency equipment is available in designated areas of the Reactor Facility. The equipment is checked periodically to review its operational status and, as necessary, to replace it with new equipment.

A set of emergency lights is in place to allow observation of personnel movements and area supervision through a Closed Circuit Television system.

The evacuation routes are clearly marked with signs.

Emergency showers and devices such as eyewash stations are located in key points of the facility.

Other equipment and resources are provided by the on-site support groups that would perform, for example, environmental surveys and special dosimetry procedures (e.g. internal contamination). These groups have a defined measurement routine to produce a survey appropriate to the occurring scenario and meteorological conditions. Arrangements to sample and measure parameters representative of the environment are in place. These arrangements include the participation of ANSTO Mobile Monitoring Teams composed of trained personnel who have equipment to measure dose rate, airborne contamination, wind speed and direction at different locations. The ANSTO Emergency Response Vehicles that allow a rapid response to an incident/emergency on site would also be available.

End of Section

20.6 MEDICAL FACILITIES

The ANSTO Medical Centre is located in Building 21A on the LHSTC site and is equipped with first aid and personnel decontamination facilities.

It is staffed by the Occupational Health Nurse during normal hours. At other times an ambulance off-site service is available and can be contacted through the SAM.

In addition, the Site Operations Safety Supervisors (SOSS) are trained to advanced first aid standards and provide additional response capability. First aid kits are available in the Reactor Facility and there are nominated first aid officers.

End of Section

20.7 PROCEDURES FOR EMERGENCY RESPONSE ACTIONS

The Reactor Facility EP is supported by a complete set of emergency response actions that cover the necessary actions to be taken in an incident/emergency in timely manner to minimise injuries to persons or damage to the environment and restore the normal operation of the Reactor Facility. The instructions in these procedures highlight essential actions. Copies are placed at key points around the Reactor Facility to have them available in different accident scenarios.

These procedures include appropriate checklists to facilitate collection of relevant information in order to facilitate the adoption of appropriate countermeasures.

To support these actions, clear knowledge of the evolution of main plant parameters will be available via the PAM. This PAM information is available at key points in the Reactor Facility to assist in the control of an emergency and includes the following:

a) Provision of information to operators to indicate whether the plant safety functions are being accomplished.

b) Indication of the successful operation of individual safety systems.

c) Alarms to alert operators to take safety actions or to initiate a system/function that is not automatic.

d) Indication to operators if barriers to fission product release have the potential to be breached or have been breached.

e) Estimates of the magnitude of release of radioactive materials.

For each type of hazard, the Reactor Facility EP summarises the applicable response. Specific response actions are provided for each accident condition that can lead to a hazard for individuals or the environment.

End of Section

20.8 EMERGENCY PLAN MAINTENANCE

The Reactor Facility EP is maintained current and applicable through ongoing review arising from initial and refresher training of personnel.

20.8.1 Documents and Records

The Reactor Facility EP supporting documents are the general and specific emergency procedures (also referred to as Response Actions). Copies of these procedures and related instructions are located in appropriate places to enable rapid access to them by users.

The records generated after a response action include:

a) Abnormal occurrence report: describes the causes that triggered the emergency status.

b) Response actions summary: describes the sequence and results of the response actions taken.

c) Consequence quantification: summarises radiation doses, activity released and other possible consequence produced.

d) Recovery Status: describes how the plant normal status was recovered and the status of related system (e.g. re-supply of disposable object used, etc).

e) Emergency Debriefing: summarises the lessons learned in the emergency and the corrective actions taken to prevent a repetition. Also includes any proposal for changes to the procedures and the Reactor Facility EP.

f) Communications: reports are submitted through ANSTO line management and to COMCARE and ARPANSA as required.

20.8.2 Training, Exercise and Drills

All Reactor Facility staff receive training on the Reactor Facility EP (emergency arrangements) and its supporting documentation and the basic skills to apply in emergency scenarios as appropriate.

Drills and exercises are used to complement the training and, at the same time, monitor the readiness of emergency equipment and response capabilities. Emergency exercises are held regularly and at least once every two years.

End of Section

20.9 EXTERNAL ACTIONS

Necessary external actions will be taken in the context of ANSTO RP arrangements. These actions include surveillance of atmospheric dispersion parameters and sampling and measurement activities to verify and quantify the impact produced by the emergency.

End of Section

20.10 REFERENCED DOCUMENTS FOR EMERGENCY PLANNING AND PREPAREDNESS

Australian Radiation Protection and Nuclear Safety Act 1998 and Regulations 1999.

NSW State Emergency and Rescue Management Act 1989.

Response Plan for Accidents and Incidents at ANSTO/LHSTC, ANSTO, May 2002.

IAEA, Safety Requirements for Research Reactors, Draft DS 272, September 2002.

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IAEA TECDOC 1092, Generic Procedures for monitoring in a nuclear or radiological emergency, July 1999.

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IAEA EPR-ENATOM (2000). Emergency Notification and Assistance Technical Operations Manual

End of Section