

**IAEA Training Course for
Research Reactor Emergency Response**

**RADIOLOGICAL EMERGENCY AT
RESEARCH REACTOR**

EXERCISE MANUAL

Section 1

Participant Instructions



IAEA

International Atomic Energy Agency

1. GENERAL INFORMATION AND GUIDE FOR PARTICIPANTS

1.1. Introduction

This manual contains information for the participants of the tabletop exercise. Section 1 contains information on the background and situation for the scenario; **it should be distributed to all participants**, who should familiarize themselves with its content prior to the exercise. Sections 2 and 3 contain the scenario and exercise team instructions; **it should be distributed ONLY to the controllers and exercise organizers**.

1.2. Aims and Objectives

The aim of this exercise is to put into practice the theoretical lessons learned during a course on emergency planning for research reactors. The specific objectives are to:

- i. familiarize the participants with the practical aspects of emergency assessment and decision-making;
- ii. allow the participants to exercise the concepts learned in a course on emergency planning and procedures
- iii. emphasize the need for emergency planning.

1.3. General Conduct of the Exercise

This is a tabletop exercise. The participants will be divided into groups with distinct roles and responsibilities covering on-site and off-site response. Inputs will be presented to each group and the participants will be asked to respond while considering all aspects of the response and all possible resources at their disposal.

Two groups will be formed, the reactor organization and the off-site organization. The reactor organization will consist at first of a small operating group and a facility Emergency Response Team. The off-site organization will have people representing the off-site interests. Depending on the number of class participants, other individuals may be available for assistance or for other tasks.

1.4. References Required

IAEA EPR-RESEARCH REACTOR, Generic Procedures for Response to a Nuclear or Radiological Emergency at Research Reactors , Vienna (2011)

1.5. Context

The scenario takes place at a research reactor facility.

The reactor facility is located inside a concrete building with dimensions 40×40 m and 10 m height hall, named the main reactor hall. The building cannot be treated as containment but it is able to be isolated by closing the entry door and operating the ventilation in emergency mode. In this mode the air is not released to the exterior, but is recirculated through particulate filters and activated charcoal..

In the central part, inside the hall, a heavy concrete reactor block has been located. The block is a water filled pool divided into two parts by a water gate: the first one is an 8 m deep and contains the reactor core and the second is a 6 m deep for storage and other operations. On one side, outside the storage pool, there are four hot cells each equipped with pair of tele-manipulators master-slave type and with the protected windows.

The reactor has also three horizontal beam tubes for experimentation in neutron physics. Inside the reactor hall there is a 10 Ton crane.

The reactor core consists of an MTR (Material Testing Reactor), 60 cm high, plate type nuclear fuel elements (LEU) and a beryllium reflector 20 cm thick on each side of the core in which there are vertical channels (vertical holes) to position aluminium irradiation cases with target materials to irradiate them for isotope production and for experimentation. The reactor is operated at 10 MW thermal power. Automatic scrams are activated only for high power or fast period.

The main reactor hall is ventilated in the normal mode of operation (6 air exchanges per hour) and some 0.8 milibar under-pressure in comparison to the outside atmospheric pressure. Exhaust to the atmosphere is through a stack. This ventilation mode has no filtration. In the emergency mode of operation, reactor hall ventilation flow is recirculated through filters at a flow rate of 1 air exchange per hour. The filters remove 99.99% of the particulate material and 90% of gaseous contaminants. There is no under-pressure when operating in the emergency mode.

There is one entrance/exit from the hall for personnel entry. The reactor hall is equipped with radiation protection systems consisting of gamma dose-rate meters, with acoustic signals thresholds at $25 \mu\text{Sv/h}$ and manual ventilation mode control. The reactor control room is inside the reactor hall.

The site has an Emergency Center located in a building adjacent to the reactor building. This building also contains administrative offices and offices for researchers and other technical staff. About 30 people are in the building at the time of the emergency. Other buildings on the site include a warehouse, visitor entry building at the main gate, a medical clinic, and a machine shop. The site boundary is about 100 m in all directions from the reactor building. It is on the edge of an industrial area with homes and apartment buildings on two sides, and light industry and a scrap yard on the other two sides.

The facility has arrangements with the local fire department, but no agreement for treating contaminated patients has been established with the only hospital in the city. The nearest medical center able to handle contaminated patients is near a nuclear power plant, several hours from the research reactor site, and in another country.

1.6. Background to the simulated accident

Rupture of an irradiated tellurium dioxide case poses a risk to the reactor staff and to the environment in the vicinity: the area and the staff can become contaminated with I-131 and I-131 intake can become a serious problem.

Such an incident is taken as an example of potential radiological emergency at research reactor facility.

1.6.1. Exercise objectives

The exercise objectives are to verify the ability of the exercise emergency response organization to perform the following response functions:

Objective	Description
1	Activate promptly
2	Take immediate actions to protect on-site personnel
3	Take appropriate mitigating actions
4	Assess the off-site impacts
5	Make recommendations to and communicate effectively with off-site authorities
6	Make appropriate decisions regarding media communications

1.6.2. Exercise scope

The exercise will last about 4 hours. It will involve the participation of all workshop attendees. No outside organisation will participate.

1.7. Exercise organization

The players will be assigned to specific roles with specific responsibilities described on Table 1.

Table 1: Exercise group responsibilities

Group	Responsibilities
Operators	<ul style="list-style-type: none"> mitigation actions initial on-site and outside surveys, until relieved by additional health physics technicians source recovery when directed by the Emergency Director
Facility Emergency Response Team	<ul style="list-style-type: none"> decisions co-ordination of the response emergency workers protection overall accountable for the effectiveness of the emergency response media communications co-ordination with off-site group recovery planning
Health Physics Technicians	<ul style="list-style-type: none"> radiation monitoring , decontamination and assessment of injured individuals
Off-site	<ul style="list-style-type: none"> assessment of the on-site information decisions on off-site protective actions media communications public health

In addition, depending on the number of additional participants in this course, additional monitoring assistance or other tasks may be assigned.

1.8. Exercise management

The exercise will be conducted by an exercise team that consists of several controllers who are responsible for ensuring that the players receive appropriate inputs in accordance with the exercise scenario and objectives. They are allowed to interact with the players to the extent required to keep the exercise running smoothly. The IAEA controller is responsible for the co-ordination of all controllers and is the only one authorised to start, interrupt or stop the exercise. Controllers will also evaluate actions that they observe.

1.9. Exercise rules

All players must demonstrate a professional attitude throughout the exercise. This is particularly important for personnel who may come into contact or be observed by members of the public.

As for any exercise, some of the data needs to be simulated. It is the role of the controllers to provide the simulated data. However, players must well understand this information, i.e. the simulated data will only be provided to the players if appropriate actions are taken to obtain the data. Results from environmental surveys will not be provided unless a specific person or team is directed to obtain the information, and the results will be delayed as would normally be the case for field surveys. Players must ensure that the appropriate controller is aware of the actions taken, especially if someone is tasked to perform an action and the controller in the area is distracted by another situation.

1.10. Safety

Safety is paramount. All players, evaluators and controllers are responsible to ensure that actions taken do not pose real safety concerns. Players shall not deviate from normal safety procedures under any circumstances. If a play event causes safety concerns to the players, they must notify the appropriate controller. The exercise may then be allowed to proceed by simulating response actions, may be interrupted temporarily by the controller or may be stopped. In case of a real emergency, players must immediately notify the appropriate controller. The chief controller will then decide how to proceed with the overall conduct of the exercise.

1.11. Simulation

The controllers will simulate off-site support such as the fire brigade, police, or medical assistance. If you need to contact or get information from an outside agency, contact the controller assigned to your group.

1.12. Communications

Communications between players will take place through standard communication channels unless otherwise directed by the controllers. Due to the risk of those communications being inadvertently intercepted by individuals not involved in the exercise, and to avoid the perception that a real emergency is taking place, all telephone or radio communications between players must start with **“THIS IS AN EXERCISE”**.

1.13. Media

The media will be represented by other class participants for this exercise. In case of real media questions, refer the questions to the controllers.

1.14. Exercise briefing and debriefing

An exercise briefing will be held in the morning at the day of the exercise. An short exercise debriefing (exercise evaluation) will be held after the exercise, time permitting, and more details will be discussed in a critique the following morning. All players and controllers must attend.

1.15. Exercise contact list

The contact list to be used during the exercise can be found in the attachment. It includes the following persons and organizations:

- Facility Control Room
- Facility Emergency Center
- Call in off-duty staff
- Off-site Emergency Response Center
- National interest
- National Regulator Emergency Response office
- Standby Room
- Hospital and Ambulance
- Site Medical Clinic

Notification to off-site interests is accomplished by contacting the Standby Room. Whenever calling the Standby Room, be specific in asking for a particular organization so your request or information is directed to the appropriate person representing that organization.