GUIDELINES FOR STARTING RADIOISOTOPE LABORATORY

Radioisotopes in India can be procured and handled only by the users duly authorised by Radiological Safety Division (RSD), Atomic Energy Regulatory Board (AERB). This authorisation is based on the radiological safety status of the institution intending to establish a radioisotope laboratory. For this purpose it is mandatory that the plan of the radioisotope laboratory is approved by RSD from radiation safety standpoint. The planning of the radioisotope laboratory depends upon the type of the radioactive material to be used, its physical from, activity and the type of experiments to be carried out using the radioactive materials, etc.

Based on the above, user has to submit the architectural layout of the radioisotope laboratory clearly indicating there in the rooms meant for storage and handling of radioisotopes, counting of radioactive samples and storage of radioactive waste through e-Licensing of Radiation Applications (e-LORA) system. It should also indicate the dimensions of the rooms, positions of the doors, windows, exhausts, fume hoods, workbenches and other fixtures. The enclosed typical layout of radioisotope laboratory **AERB/RSD/RES-FIG** will be of guidance to the user in planning the radioisotope laboratory as per the current requirements. A site plan, of the building should also be sent marking clearly therein the location of radioisotope laboratory and the occupancies around it including those above the ceiling and below the floor, if any.

Further, the radioisotope laboratory has to be classified for regular procurement of handling of radioisotopes. The classification will depend upon the quantity of radioisotope used and the required handling facilities. The enclosed note **AERB/RSD/RES-CLASS** provides the necessary details in this regard. For this purpose, the user may kindly fill in the enclosed Performa **AERB/RES/QN** in all respects and submit the same duly signed to AERB trough e-LORA.

Kindly that one of the staff of the laboratory has to be deputed to attend a ten day training course entitled “Radiation Safety Aspects in Use of Ionising Radiations for Research”, conducted by RP&AD, BARC. The details of the course may be obtained by writing to the Head, RP&AD, BARC, CT&CRS Building, Mumbai-94. The staff after successful completion of the course shall be nominated to be approved as Radiological Safety Officer by AERB

After approval of the said plan and approval of RSO nomination, the institution shall submit duly filled in application form for handling radioisotopes and for issuance of authorisation/NOC for procurement of radioisotopes. After the laboratory is commissioned, user has to submit the annual report on status of radiation safety of the laboratory through e-LORA.

NOTE ON CLASSIFICATION OF RADIOISOTOPE LABORATORIES

AERB proposes to classify institutions using unsealed radioisotope for non clinical applications in the country and to specify the activities of the radioisotopes which can normally be handled by each user institution.

This classification will be broadly based on the relevant recommendations of the International Commission on Radiological Protection (ICRP) and International Atomic Energy Agency (IAEA). Accordingly the radioisotopes have been arranged in four groups based on their radio-toxicity as per **Annexure-I**.

Based on the facilities available as per **Annexure-II** the institution using radioisotope will be divided into three types, namely **TYPE-I**, **TYPE-II** and **TYPE-III** laboratories. The maximum authorised limits of activities that can be procured routinely will depend on the classification of the laboratories and radionuclides which can be handled at a time will also depend on whether the operations are (i) simple wet, (ii) complex wet, (iii) simple drying and (iv) dry and dusty.

The table giving maximum activities of radionuclides of different group that can be procured and handled by each type of laboratories is enclosed in **Annexure-III.** If two or more radionuclides from the same group or different group are ordered, the quantities ordered should be so adjusted that the overall limits are not exceeded.

ANNEXURE-I

CLASSIFICATION OF RADIOISOTOPES
(According to Relative Radio-toxicity per Unit Activity)

Group-I									
Pb-210	Po-210	Ra-223	Ra-226	Ac-227	Th-227	Ra-228	Th-228	Th-230	U-230
Pa-231	U-232	U-233	U-234	Np-237	Pu-238	Pu-239	Pu-240	Pu-241	Am-241
Pu-242	Cm-242	Am-243	Cm-243	Cm-244	Cm-245	Cm-246	Cf-249	Cf-250	Cf-252
Group-II									
Na-22	Cl-36	Ca-45	Sc-46	Mn-54	Co-56	Co-60	Sr-89	Sr-90	Y-91
Zr-95	Ru-106	Ag-110m	In-114m	Cd-115m	Sb-124	Sb-125	I-124	I-126	Te-127m
Te-129m	I-131	I-133	Cs-134	Cs-137	Ba-140	Ce-144	Ba-152	Ba-154	Tm-170
Hf-181	Ta-182	Ir-192	Tl-204	Bi-207	Bi-210	At-211	Pb-212	Ra-224	Ac-228
Pa-230	Th-234	U-236	Bk-249	Tb-260					
Group-III									
Be-7	C-14	F-18	Na-24	Cl-38	Si-31	P-32	S-35	A-41	K-42
K-43	Ca-47	Sc-47	Sc-48	V-48	Cr-51	Mn-52	Fe-52	Fe-55	Mn-56
Co-57	Co-58	Fe-59	Ni-63	Cu-64	Ni-65	Zn-65	Zn-69m	Ga-72	As-73
As-74	Se-75	As-76	As-77	Br-82	Sr-85	Kr-85m	Kr-87	Rb-86	Y-90
Sr-91	Y-92	Y-93	Nb-93m	Nb-95	Tc-96	Zr-97	Tc-97	Ru-97	Tc-97m
Tc-99	Mo-99	Ru-103	Pd-103	Ru-105	Rh-105	Ag-105	Pd-109	Cd-109	Ag-111
Sn-113	Cd-115	In-115m	Sn-125	Sb-122	I-125	Te-125m	Te-127	Te-129	I-130
Cs-131	Ba-131	Te-131m	Te-132	I-132	I-134	I-135	Xe-135	Cs-136	La-140
Ce-141	Pr-142	Ce-143	Pr-143	Nd-147	Pm-147	Nd-149	Pm-149	Sm-151	Bu-152m
Sm-153	Gd-153	Bu-155	Gd-159	Dy-165	Dy-166	Ho-166	Er-169	Er-171	Tm-171
Yb-175	Lu-177	W-181	Re-183	W-185	Os-185	Re-186	W-187	Re-188	Ir-190
Os-191	Pt-191	Os-193	Pt-193	Ir-194	Au-196	Pt-197	Au-198	Au-199	Hg-197
Hg-197m	Tl-200	Tl-201	Tl-202	Hg-203	Pb-203	Bi-206	Bi-212	Rn-220	Rn-222
Th-231	Pa-233	Np-239							
Group-IV									
H-3	O-15	A-37	Co-58m	Ni-59	Zn-69	Ge-71	Kr-85	Sr-85m	Rb-87
Y-91m	Zr-93	Nb-97	Tc-96m	Tc-99m	Rh-103m	In-113m	I-129	Xe-131m	Xe-133
Cs-134m	Cs-135	Sm-147	Re-187	Os-191m	Pt-193m	Pt-197m	Th-232	Th-Nat	U-235
U-238	U-Nat								

ANNEXURE-II

CRITERIA FOR GRADING LABORATORIES USING UNSEALED RADIOISOTOPES

TYPE-I (SIMPLE)

- A simple chemical laboratory with good ventilation
- Two rooms, one for handling and one for counting
- Contamination Monitor
- Ordinary storage (with security)
- Sink – ordinary
- Table surface to be covered with smooth non-absorbent material
- Remote handling tongs
- Propipettes / Remote pipettes
- Foot operated dustbins

TYPE-II (MEDIUM)

- Three rooms/more – storage, preparation and one/more handling rooms
- Special table, floor and wall surfaces
- Proper ventilation
- Storage safe – concrete/steel/lead
- Stainless steel sink (elbow/foot operated tap)
- Fume-hood with special exhaust system
- Contamination Monitor & Radiation Surveymeter
- Personnel Monitoring Badges
- Planned radioactive waste disposal methods
- Face mask, Glove box, Surgical gloves
- Remote handling tongs
- Propipettes / Remote pipettes
- Foot operated dustbins

Contd.

TYPE-III (STRINGENT)

Large-scale laboratory – multiroom complex with clear segregation of areas based on use, scale and type of operation with the radioisotopes, the actual facilities required by the user will be determined. A general list is given below

- Special table, floor and wall surfaces
- Proper ventilation
- Storage safe – concrete/steel/lead
- Stainless steel sink (elbow/foot operated tap)
- Fume-hood with absolute filter incorporated near the junction of hood and ventilation duct
- Contamination Monitor & Radiation Surveymeter
- Air/Alarm monitor
- Foot, Hand and clothing monitor
- Pocket monitor
- Whole Body Counter
- Personnel Monitoring Badges
- Bio-assay
- Dilution & Distribution room
- Decontamination room
- Respirators
- Shoe barrier
- Master-Slave manipulator
- Planned radioactive waste disposal methods
- Foot operated dustbins

ANNEXURE-III

CLASSIFICATION OF RESEARCH INSTITUTIONS USING UNSEALED SOURCES

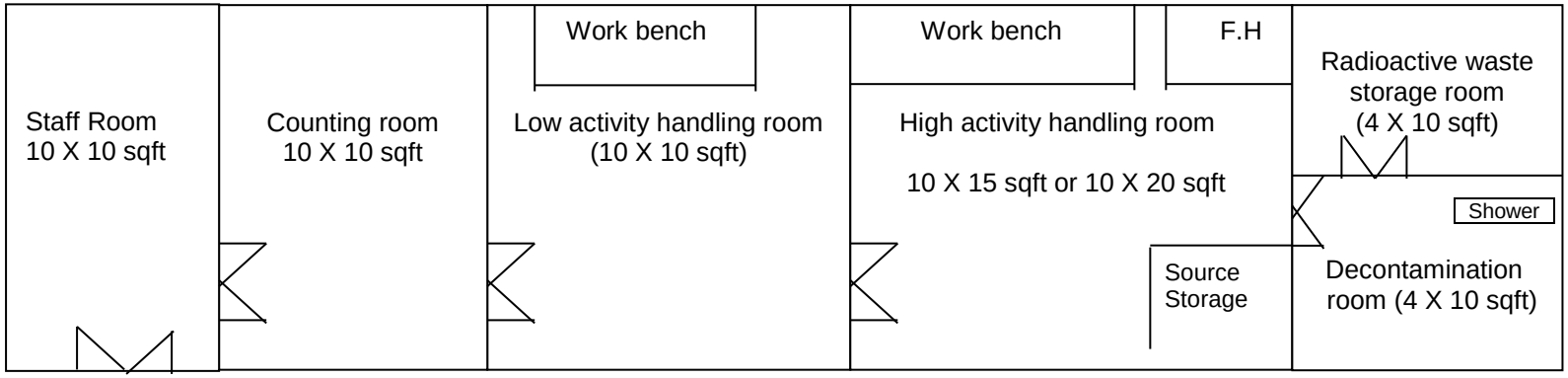
GROUP OF RADIONUCLIDE*	PRESCRIBED LIMIT FOR HANDLING RADIONUCLIDES		
	TYPE – I	TYPE - II	TYPE – III
I	≤ 5 μCi	≤ 5 mCi	> 5 mCi
II	≤ 50 μCi	≤ 50 mCi	> 50 mCi
III & IV	≤ 500 μCi	≤ 500 mCi	> 500 mCi

***** Group classification according to radio-toxicity

MODIFYING FACTORS ACCORDING TO TYPE OF OPERATION

Type of operation	Example	Modifying Factor
NORMAL CHEMICAL OPERATIONS	Analysis, simple chemical preparations	1.00
COMPLEX WET OPERATIONS	With risk of spills	0.10
SIMPLE DRY OPERATIONS	Manipulation of powders and volatile radioactive compound	0.10
DRY AND DUSTY OPERATIONS	Grinding	0.01

Layout of laboratory for handling open radioisotopes for research purposes (**TYPE II FACILITY**)



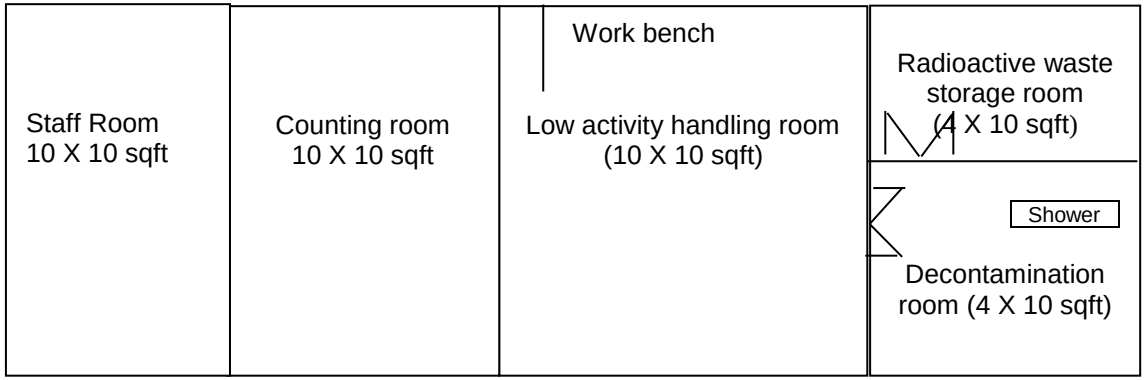
WINDOWS OR EXHAUST TO BE PROVIDED AS PER REQUIREMENT

Scale of drawing Wall material and thickness Floor location

Complete address of the facility

Note: Allthe walls should be made of brick/concrete only.

Layout of laboratory for handling open radioisotopes for research purposes (**TYPE I FACILITY**)



WINDOWS OR EXHAUST TO BE PROVIDED AS PER REQUIREMENT

Scale of drawing

Wall material and thickness

Floor location

Complete address of the facility

AERB/RSD/RES-QN

GOVERNMENT OF INDIA
ATOMIC ENERGY REGULATORY BOARD
RADIOLOGICAL SAFETY DIVISION

CLASSIFICATION OF RESEARCH LABORATORIES USING UNSEALED SOURCES

1. Name & Address of the Institution :

2. Head of the institution :

3. Department handling Radioisotopes :

4. Head of the Department:

5. Name of Qualified RSO (Radiological Safety Officer) :

6. Persons handling the radioisotopes : (1)
   (2)
   (3)
   (4)

7. Details pertaining to radioisotopes to be handled

Sl.No.	Isotope	Radioactivity Group	Max.Activity to be handled	Physical form	Type of operation with this isotope

8. Give a brief description of the experiments to be carried out with each radionuclide on a separate sheet

9. Furnish Particulars of sealed sources if available :

10. Availability of Personnel Monitoring Badges : Y/N

11. Availability of facilities, equipment, accessories, etc., for radiation work

A. Layout :

- No. of rooms :
- Total area in sq. Metre :
- Storage room : Y/N
- Preparation room : Y/N
- Handling room : Y/N
- Dilution and distribution room : Y/N
- Counting room : Y/N
- Auto-radiography room : Y/N
- Separate low, medium and high activity labs. : Y/N
- Linoleum covered floors : Y/N
- Walls with strippable paint : Y/N
- Work-surface covered with smooth lining : Y/N

B. Handling :

- Remote handling tongs : Y/N
- Foot-operated dustbins : Y/N
- Pro-pipettes/Remote pipettes : Y/N
- Stainless steel sink : Y/N
- Fume hood : Y/N
- Fume hood with filter : Y/N
- Glove box : Y/N
- Dual type glove box : Y/N
- Face mask : Y/N
- Surgical gloves : Y/N

C. Storage :

- Steel storage cupboard : Y/N
- Lead storage : Y/N
- Concrete storage : Y/N
- Storage safe : Y/N

D. Monitoring :

- G.M. Survey Meter : Y/N
- Contamination monitor : Y/N
- Air/Alarm monitor : Y/N
- Foot, hand and clothing monitor : Y/N
- Any other monitoring instrument(specify) :

E. Radioactive Waste disposal :

- Through sink : Y/N
- Through pits : Y/N
- Delay tanks : Y/N
- Any other mode(specify) :

F. Facilities for high activity handling (wherever applicable) **:**

- Shoe barrier : Y/N
- Shower for decontamination : Y/N
- Master slave manipulator : Y/N
- Bioassay : Y/N
- Whole body counting : Y/N

I hereby certify that the information furnished above is true to the best of my knowledge and belief. Any change in any of the information (eg. change of user/indenting officer/RSO) shall be duly intimated to RSD, AERB. I shall not transfer/sell/loan any radionuclide without obtaining prior permission from RSD, AERB. Any recommendation given by RSD, AERB to improve the radiation safety status of this laboratory will be duly implemented. I further understand that if unsafe work practices/conditions exist authorisation for radionuclides will be revoked.

Date:
Place:

(Signature of the head of the institution/department with seal)