

# Radiosafety at the CIG

The use of radionuclides is governed by the federal law on radioprotection (LRaP) and by the ordinance on radioprotection (ORaP). The present document provides an extract of these rules and does not exempt users from familiarizing themselves with all sections of the LRaP and ORaP.

## Article 1: General rules

**General and experiment-specific authorizations:** Users needing to work with radionuclides at the CIG must first receive an accreditation and a badge access to a controlled zone (4039.1 and 5016.1), upon completion of a radiosafety training with a certified radioprotection expert (see [Emergency Phone Numbers Table](#)). Users must also receive prior approval for each new radionuclide.

**Unauthorized people** are legally considered as public and must be accordingly protected from the irradiations. They do not have access to the controlled zones.

**Authorized users:** An expert will instruct every new radionuclide user on the appropriate work and storage places as well as on specific radioprotection procedures, according to the particular radiation and dose for which the user seeks authorization.

## Article 2: Hygiene rules

Each controlled zone dedicated to the use of radionuclides (laboratories 4039.1 and 5016.1) is equipped with devices to avoid active and passive contamination (elbow action taps and soap dispensers, watertight absorbent paper, etc.) and with radiation detectors (surface contamination monitor and Geiger-Müller counters).

**Personal protection:** The wearing of protective clothes (e.g. labcoat, closed shoes), gloves and glasses is mandatory within controlled zones.

**Working areas:** The benches must be covered with an appropriate protective absorbent paper (with the waterproof layer facing down) to be changed whenever it gets contaminated.

**Control:** Working surfaces, instruments or material as well as the user's hands, clothes, etc. should be regularly monitored for contamination during a working session.

## Article 3: Rules for accessing the controlled zones

**Location:** The manipulation of radioactive doses  $> 1$  LA (see the table below) must be performed within controlled zones, using appropriate protection screens in order to limit and control radiation exposure. The controlled zones (laboratories 4039.1 and 5016.1) are clearly delimited and sign posted by the pictogram "danger : radioactivity"; security instructions are clearly displayed. Access to the controlled zones is strictly limited to authorized persons.

**Training and access:** Each new user receives the "*Radiosafety at the CIG*" guide. Once trained by an expert, new users must sign the statement that they have fully understood the instructions and agree to abide by the rules and regulations. This attestation must be validated by the signatures of (1) the group leader and (2) one expert (see [Emergency Phone Numbers Table](#)).

Upon submission of a completed document, the campus card of the new user will be validated for access to the controlled zones. This access is strictly personal and the card is not transferable. Lending the card to an unauthorized colleague or any other violation of the rules herein will be reported to the PI and in case of recidivism would void the controlled zones access of the offender.

#### **Article 4: Working procedures**

**Ordering of radionuclides:** Orders can be signed either by an expert or by the user's PI. An expert should be consulted prior any order exceeding 1 mCi (37 MBq) of any authorized radionuclide (see the table below) in order not to reach the maximal authorized dose that can be stored at the CIG (100 LA).

**User sign-up:** Before starting an experiment, each user must log his name/lab ID and the radionuclide used, on the logsheet provided at the entrance to the controlled zone (blank logsheets can be printed from the cig server: `ciggen/cig/Share folder/Radioactivité/Sign-up sheet C-lab`).

**Radionuclide record:** For each new radionuclide batch a dedicated logsheet must be printed (from the cig server: `ciggen/cig/Share folder/Radioactivité/Radionuclide batch logsheet`) and displayed in the controlled zone. Upon each sampling of a radionuclide the experimenter must log the quantity on the logsheet. Once a batch is finished or expired, it must be disposed of in the appropriate bin and the related *Radionuclide batch logsheet* given to the person in charge of the waste disposal (see below: [Radioactive waste person in charge](#)).

**Radioprotection during radionuclide handling:** Non-sealed sources should be handled behind radionuclide-specific protection shields (e.g., lead screens for I125 and Plexiglas screens for P32, see table below).

**Source storage:** Every radioactive source must be stored in a fridge or freezer located in one of the controlled zones.

**Contamination control:** As a last control before leaving the controlled zones, users must perform a final contamination check with the contamination monitor to ensure that the benches and any item to be taken out of the laboratory (pipettes, labcoat, pens,...) is non-radioactive, i.e. reads <50cps.

**In case of emergency or accident:** follow the procedure described in the laboratories. You'll also find there the emergency phone numbers (e.g. Firemen, police, ambulance, UNIL rescuers: **115** or **from a mobile phone: +41 21 692 2000**)

## Article 5: Individual dosimetry

People exposed to radiations at work must monitor their personal radiation exposure levels using dose monitoring procedures ("*mesures de tri*") appropriate for the radionuclides used, as indicated by an expert (e.g. monthly urine samples and individual dosimetry for P32, see table below).

## Article 6: Radioactive waste and contaminated objects

An expert manages waste elimination and has the authority to instruct and oversee the role of users in the safe packaging, storage and disposal of radioactive waste generated at the CIG.

**Containers:** Prior to any radionuclide manipulation, the experimenter must ensure the presence of appropriate trash containers to safely collect radioactive waste generated during the experiment. Radioactive liquids – except water used to wash hands and contaminated objects – must be collected in appropriate trash bottles, not poured into the sinks. Waste items must be disposed of according to the radionuclide they contain, into the dedicated waste bins clearly labeled with the radionuclide name. Mixed  $^3\text{H}$  /  $^{14}\text{C}$  waste must be trashed in a specific  $^3\text{H}$  /  $^{14}\text{C}$  bin.

### Radioactive waste elimination:

- **Controlled zones:** The person in charge of the elimination of the waste on each floor (see below: [Radioactive waste person in charge](#)), periodically collects the "*Radionuclide batch logsheets*" and fills the "*CIG\_decay\_calculation.xlsx*" (same folder). This calculation sheet will be saved in the "*Wastes (+year)*" folder as backup. The wastes will be carefully labeled and stored in room 1058.

- **CIG:** An expert eliminates the wastes stored in room 1058 according to the 100xLE limit for monthly disposal of radioactive waste into the regular trash. Every waste eliminated will be logged in the file "*Radioactive waste elimination (+year)*" (ciggen/cig/Share folder/Radioactivité/Wastes (+year)).

**Non-radioactive waste:** Before elimination, the non-radioactive waste must be checked with the contamination monitor. A non-contaminated waste (< 50 cps on the contamination monitor and/or < LE (see table below)) must be disposed of in the regular trash.

## Article 7: Control of monitors

**User's duty:** Before using a contamination monitor, users must control the battery level of the device. A weak battery will lead to false readings and must be recharged/replaced immediately.

**Expert's duty:** Every year, the contamination monitoring devices must be checked by an expert with the reference Sr90 and the values reported on the logsheet next to each device. If the deviation is too big, it has to be sent for calibration at IRA (CHUV-Lausanne).

## Practical information pertaining to the use of radionuclides at the CIG

$\beta^-$  : Plexiglass screen, NOT lead ;

$\gamma$  : Lead screen

**1 mCi = 37 Mbq**

Radionuclides Radiation, $E_{max}$	Period	Dosimetry	Max dose for use out of C Lab (LA)	Exemption limit (LE) (= not radioactive)
H-3 $\beta^-$ : 18.6 keV	12.5 years	No	100 MBq = 2.7 mCi	0.2 MBq = 5.4 $\mu$ Ci
C-14 $\beta^-$ : 156 keV	5730 years	No	9 MBq = 240 $\mu$ Ci	20 kBq = 0.54 $\mu$ Ci
P-32 $\beta^-$ : 1.71 MeV	14.3 d (~2 weeks)	Urine <sup>o</sup> Badge/Ring*	2 MBq = 54 $\mu$ Ci	4 kBq = 0.1 $\mu$ Ci
S-35 $\beta^-$ : 167 keV	87.4 d (~3 months)	No	40 MBq = 1 mCi	10 kBq = 0.27 $\mu$ Ci
I-125 $\gamma$ : 35.4 keV	60.14 d (~2 month)	No	0.7 MBq = 18.9 $\mu$ Ci	0.7 kBq = 18.9 nCi

<sup>o</sup> Mandatory

\* If requested by an expert

### Radioactive waste person in charge:

- 4th floor: Pascal Cousin (3976)
- 5th floor (I125): Wanda Dolci (3989)
- 5th floor (P32/S35): David Gatfield (4110)
- 5th floor (H3/C14): Frédéric Preitner (4143)