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Implementation Of An Installation For The New Activimeter Calibration Methodology

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ABSTRACT

Considering the frequent development of research projects and the services provided by the Instrument Calibration Laboratory (LCI), to implement the calibration of activity measuring instruments, it was necessary to build a new dedicated laboratory for this purpose. After the layout project carried out, the physical installations were started, following the radiological protection service plans according to the National Nuclear Energy Commission rules . In order to ensure greater reliability in the measurements and to facilitate the transport of radioactive sources, a new methodology of in situ calibration and quality control of activimeters was developed. This paper presents the implementations made in the new LCI installation for the implementation of the new activitymeter calibration methodology operationalization.

Keywords: **calibration, activimeters, "in situ"methodology, laboratory,**

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1. INTRODUCTION

In the last years the Instrument Calibration Laboratory (LCI) developed three “in situ” calibration methodologies for activity meters using the radiopharmaceutical ^{99}Tc which is used in more than 80% of nuclear medicine procedures in Brazil [1]. The difference between the methodologies is the origin of the radiopharmaceutical to be used as a reference source. Two of these can be applied to nuclear medicine services and the third will be exclusively for the control and calibration of activimeters belonging to the radiopharmaceutical production sector of the Institute for Energy and Nuclear Research (IPEN). The advantage of these methodologies is that unlike the other calibration procedures provided by LCI, instruments to be calibrated do not need to be shipped to the lab as they are often located in hot cells or inside heavy shields making impossible to send them to the calibration laboratory. To enlarge the methodology, including others radiopharmaceuticals of interest to the IPEN radiopharmaceutical production sector it was necessary to build a new laboratory facility dedicated only to research projects and the development of methodologies that involve radiopharmaceuticals manipulation. .

The objective of this work is to implement the new installation for the operationalization of calibration and testing of activimeters.

2. MATERIALS AND METHODS

Tthe dimensions of the new activity calibration laboratory tests of activimeters are 4.95m x 3.80m and it is mounted inside the installation of new Instrument Calibration Laboratory of IPEN (Annex I).

For the implementation of the physical facilities of the laboratory in question, the IPEN Radioprotection Supervisor presented the operational requirements recommended by the National Nuclear Energy Commission Standard 3.05 (CNEN) [2],described below:

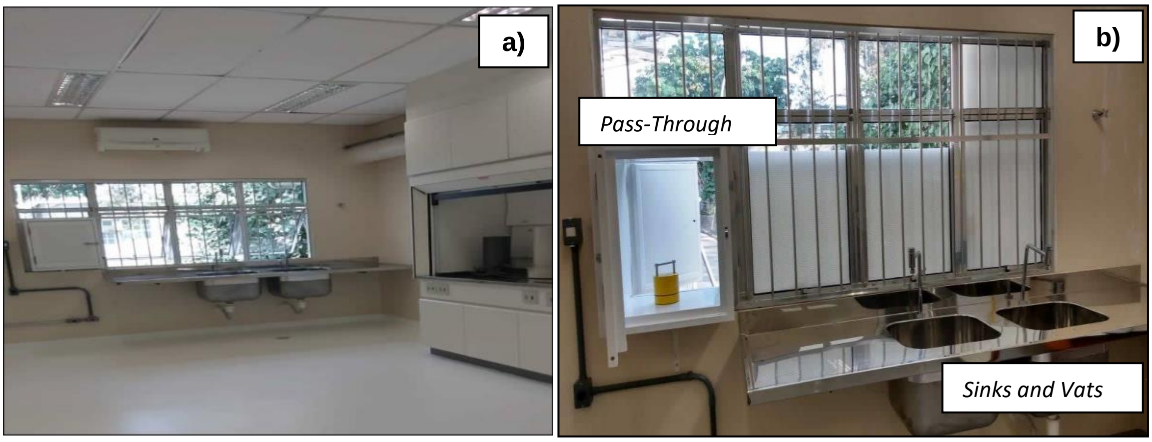
1. Walls and smooth doors, not slots, painted with washable paint;
2. Stainless steel sink containing two 40cm deep wells (without seams) in stainless steel;
3. Lead cabin for radioactive material passage (Pass-Through);

4. Chapel with exhaustion system and activated carbon filter (chapel about 2 m long, with four 110 V and two 220 V outlets);
5. Self-acting faucet (polypropylene tubing and tanks of the same material for storage and decay of radioactive material);
6. Temporary storage area for radioactive material, with sufficient space to accommodate all samples, lined with plastic and absorbent paper, suitably shielded and marked with the radiation risk symbol;
7. Compactable radioactive waste collection container, marked with the radiation risk symbol, at a location away from the operators' position and suitably shielded;
8. Surface contamination detector (Geiger Müller);
9. Door with lock and signaling with the international radiation risk symbol and the words "Controlled Area".

3. RESULTS AND DISCUSSION

In compliance with the IPEN Radioprotection Supervisor's guidelines and following the recommended requirements described in the Radiological Protection Plan it was possible to implement the the items 1, 2 e 3 shown in Figure 1.

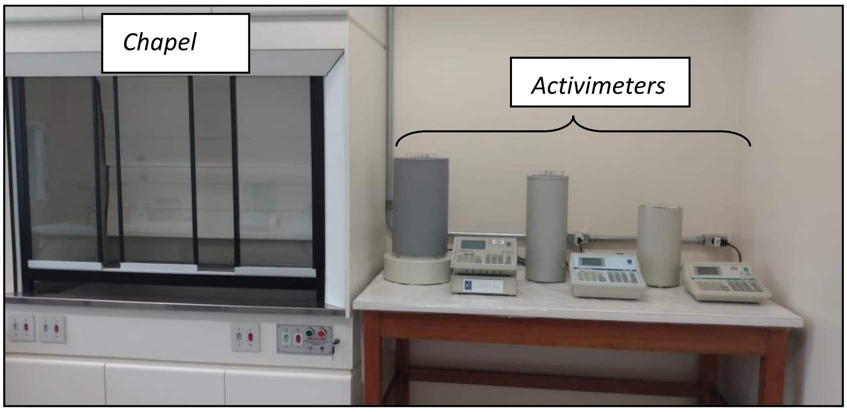
Figure 1: *a) Full view of the laboratory painted with epoxy paint / b) Sink with vats and passage*



Source: Martins, E. W.

The installation of exhaustion chapel (1.500 x 755 x 2.630mm) was made with lead shield at the base, bottom and sides and next to it a wooden bench with plastic coated surface and waterproof material. Three activity meters including the reference meter have already been installed on the bench, as shown in Figure 2.

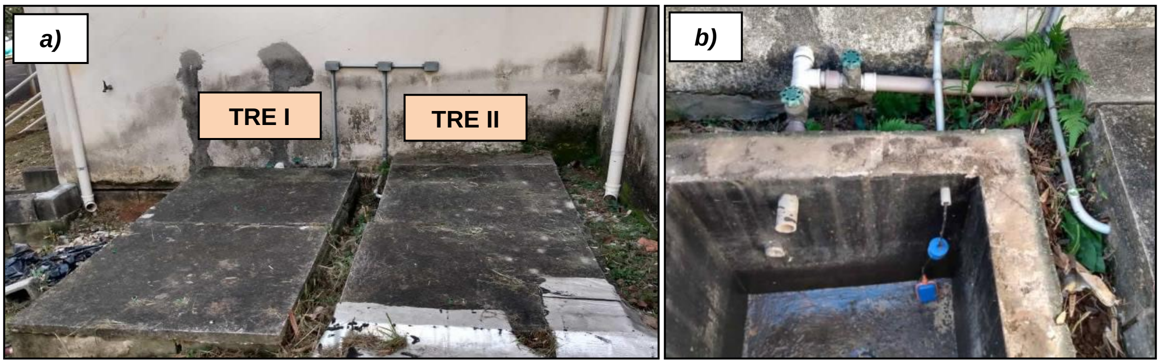
Figure 2: *Chapel and Activimeters*



Source: Martins, E.W.

Only an automatic faucet will be installed as only one tank will be dedicated to the dispose of radioactive waste in the decomposition concrete retention tank. In Figure 3, it is shown the two tanks for storage and decomposition of liquid radioactive material.

Figure 3: ***a)*** *Effluente Retention Tanks (TRE)*
(200 x 100 x 55cm capacity of 967 liters)/ ***b)*** *Internal view of TER I*



Source: Martins, E.W.

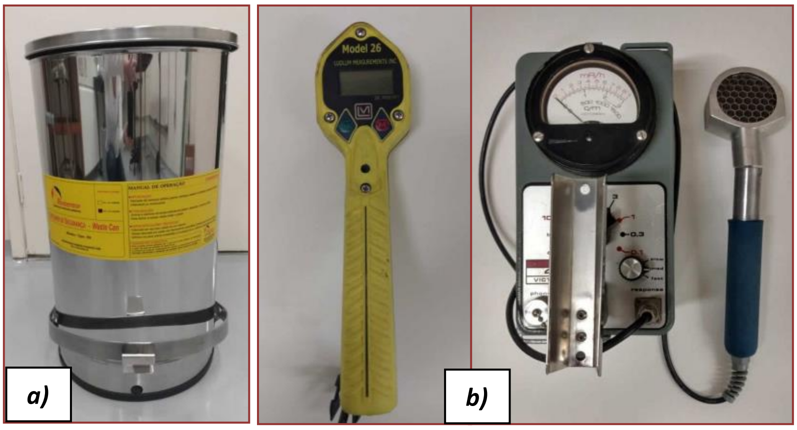
The reference sources used for the quality control tests are stored in their respective lead castles, shown in Figure 4.

Figure 4: *Quality control sources of* ^{133}Ba*,* ^{57}Co *and* ^{137}Cs

Source: Martins, E.W.

The waste container and the outboard surface contamination monitors with Geiger-Müller are shown on Figure 5.

Figure 5: ***a)*** *Container of radioactive material dispose /* ***b)*** *Geiger-Müller Detectors*



Source: Martins, E.W.

Identification signs and markings with the international radiation risk symbol and the words "Controlled Area".

4. CONCLUSION

LCI is located next to the Radioactive Waste Management Service, to the Radiation Technology Center, and the Radiopharmacy Center. The location of the control room facility and activimeter testing within the LCI, made it easier to transport radioactive sources into and out of the laboratory, making it unnecessary to move materials through the free areas of the facility. The worktable is designed to streamline the production, quality control and filling processes of radiopharmaceuticals. The installed exhaust hood was purchased from Braslab Furniture Company and Equipment for Laboratories Ltda, its sliding screen of the same armor including the lead screen offers protection and convenience to the operator to handle the materials used. With the installation of the reference activimeters, the quality control program was started.

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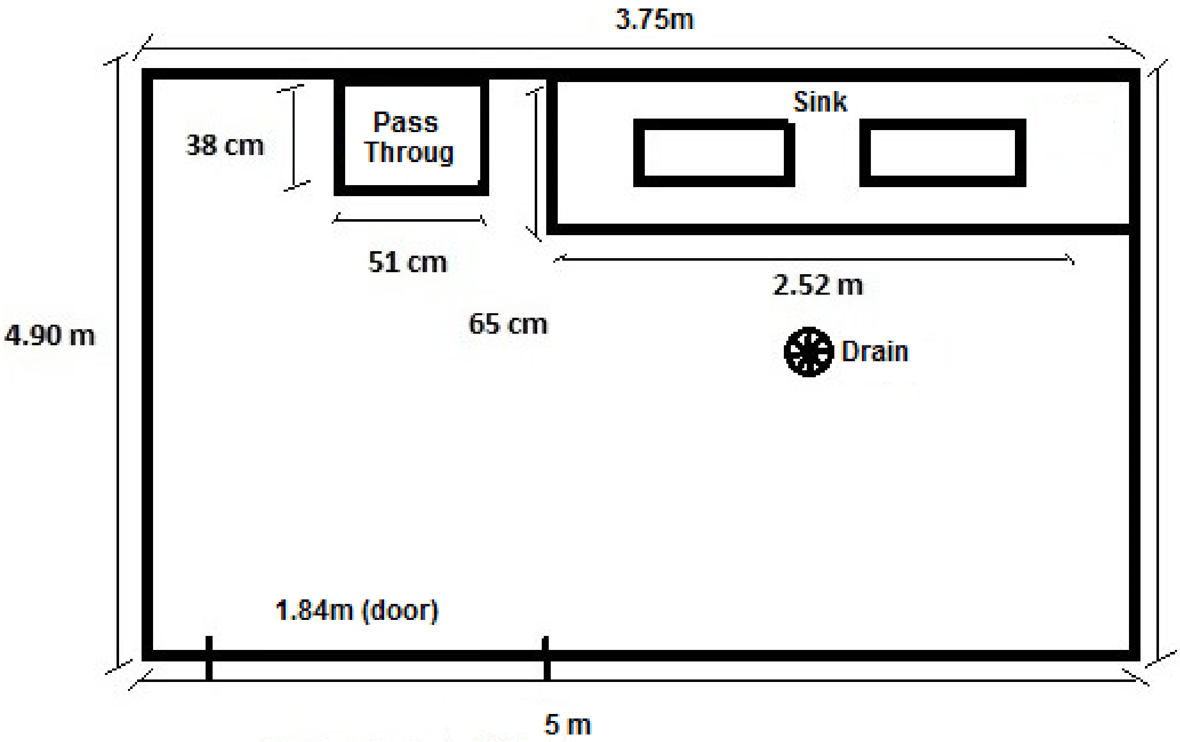
[2] Comissão Nacional de Energia Nuclear, **Requisitos de Radioproteção e Segurança para Serviços de Medicina Nuclear**. **CNEN-NN-3.05**, Rio de Janeiro, 1996.

Annex I


3.75m
Pass
Throug
38 cm
Sink
51 cm
2.52 m
4.90 m
65 cm
Drain
1.84m (door)
5 m