

Appendix 3.1

Protocol for Radon Measurement for Non-Residential Building

A. Selection of Potential Study Tiles

1. The Study Area should include all confined areas inside the building but exclude areas where full-time occupancy is not anticipated eg. public hallway, car park, storage area, stairwell, lift lobby, washroom, machine room, utility space and access, etc.
2. To establish the Potential Study Tiles (PST), divide the Study Area into square tiles of 5m x 5m each as far as possible. Irregular-shaped areas should be divided into smaller portions of 25 sq.m. each while any odd area of less than 25 sq.m. should be considered as one PST.
3. To number the PST, start with the PST at the northernmost corner of the lowest floor of the building and label it as PST No.1. In a clockwise and a general inward spiral direction, assign the PSTs sequentially until all the PSTs on the lowest floor have been properly numbered. Move on to the next upper floor and assign the PST at the northernmost corner with the next higher integer and so on until all the PSTs in the building block have been numbered. Repeat these steps for the second building and so on, starting with the next higher integer.
4. Radon measurement shall be taken in 5% of the labelled PSTs, or 3 numbers, whichever is more. Any decimals will be rounded up to the next higher integer in determining the number of PSTs to be measured.
5. Randomly select a number from the total number of labelled PSTs of the building block(s). Select those PSTs to receive radon measurement by spreading out evenly the number based on the one worked out in paragraph 4 above.
6. Take radon measurement according to the Measurement Protocol and Measurement Criteria as set out below.
7. Should any of the selected PST, say the n^{th} PST, be found not suitable for measurement, a replacement should be used by trying the $(n-1)^{\text{th}}$, $(n+1)^{\text{th}}$, $(n-2)^{\text{th}}$, $(n+2)^{\text{th}}$ and so on until a suitable PST is identified.

B. Measurement Protocol

1. a) For premises with mechanical outside air supply system

The mechanical outside air supply system (and other related Mechanical Ventilation & Air Conditioning System) covering the selected PST to receive radon measurement should be operated at the design conditions, including design outside air flow rate, on a normal operating schedule for 24 hours prior to and during the measurement.

b) For other premises

The PST to be measured should be maintained at 1.5 to 2 air changes per hour (ACH) for a period of 24 hours prior to and during the measurement.⁽¹⁾

2. The PST should be kept clean and dry throughout the measurement period. One radon monitor should be positioned in each of the selected PSTs according to the Measurement Criteria given below.
3. Electronic real-time radon monitors complying with the competence test of the US Environmental Protection Agency or equivalent are to be used for the measurement. The radon monitor should be calibrated and operated in accordance with the manufacturer's recommendation.
4. The duration for any of the measurement should be 48 hours continuously. Each reading should be averaged over a 30-minute interval.
5. The average radon concentration of the selected PSTs during the measurement period should preferably be lower than the territory-wide mean concentration of 100 Bq/m³ and in any case, any individual measurement must not exceed 200 Bq/m³.

C. Measurement Criteria

1. The location of the radon monitor should be:
 - more than 0.9m from any corner, window, wall, partition or other vertical surface; and
 - at a height of approximately 1.1m above the floor.
2. The radon monitor should not be:
 - directly under any air diffuser or in front of any electric fan and heater, etc.;
 - affected directly by the draft of exhaust fan/air conditioning unit;
 - under direct sunlight;
 - within 1m from any polluting source such as photocopier and printer; and
 - obstructive to the traffic of users of the premises under normal or emergency situation.

D. Report and Documentation

1. The radon measurement should be conducted under the supervision of a recognized professional in related fields.
2. All measurement report and documentation should be certified by the professional.
3. A full set of the measurement report and documentation including radon monitor calibration records should be kept for a period of three years from the completion of the measurement.

- (1) An air change rate of 1.5 to 2 ACH is deemed to have been achieved when exhaust fan(s) of suitable capacity is installed and operated in a closed environment in the PST. The number of exhaust fan to be used would base on the capacity of the individual fan(s) and the total air volume of the PST. Flexible air ducts should be installed if necessary to ensure even air extraction throughout the PST. An air change rate in an apartment with all the windows closed and the room air-conditioner(s) operating at high fan with the vent closed would be approximately in the range of 1.5 to 2 ACH.
Source : 'Study of Effectiveness of Various Finish Materials in Reducing the Indoor Radon Level' by the Hong Kong Polytechnic University 1995.