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**NATIONAL OCCUPATIONAL HEALTH STANDARD OF THE  
PEOPLE'S REPUBLIC OF CHINA**

**GBZ/T 201.1-2007**

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**Radiation shielding requirements in room of radiotherapy  
installations - Part 1: General principle  
(English Translation)**

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## Table of Contents

|                                                                       |    |
|-----------------------------------------------------------------------|----|
| Foreword...                                                           | 3  |
| 1 Scope...                                                            | 4  |
| 2 Terms and definitions...                                            | 4  |
| 3 Dose reference control level of therapy room radiation shielding... | 6  |
| 4 General shielding requirements for therapy room...                  | 8  |
| 5 Verification rules for therapy room radiation shielding...          | 14 |
| Annex A (Informative) Occupancy factor at different place...          | 16 |

### Foreword

This Standard was drafted based on Law of the People 's Republic of China on Prevention and Control of Occupational Diseases.

GBZ/T 201 Radiation shielding requirements for radiotherapy room was issued in parts. It consists of the following five parts.

- Part 1. General principle;
- Part 2. Radiotherapy room of electron linear accelerators;
- Part 3. Radiotherapy room gamma-ray sources;
- Part 4. Radiotherapy room of  $^{252}\text{Cf}$  neutron after loading;
- Part 5. Radiotherapy room of proton accelerators.

This Part is the first part of GBZ/T 201.

Annex A, Annex B and Annex C of this Part are informative.

This Part was proposed by Ministry of Health Radiation Health Protection Standards Professional Committee.

This Part was approved by Ministry of Health of the People 's Republic of China.

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Radiation shielding requirements in room of  
radiotherapy installations - Part 1. General principle

## **1 Scope**

This Part specifies the dose reference control level, general shielding requirements and radiation shielding evaluation requirements for radiation shielding of room of radiotherapy installation (hereinafter referred to as therapy room).

This Part is applicable to the room of external irradiation source treatment device.

This Part is not applicable to the radiotherapy room of human body implantation of radionuclide particle source and the room of radionuclide source applicator therapy.

## **2 Terms and definitions**

For the purposes of this document, the following terms and definitions apply.

### **2.1 controlled areas out of radiotherapy room**

radiation staff working area directly connected with the radiotherapy room and related to the treatment device in the room, such as treatment device control room, treatment device auxiliary room, etc.

### **2.2 uncontrolled areas out of radiotherapy room**

outside the radiotherapy room, other area except the controlled area out of radiotherapy room, including radiation oncologist clinic, waiting room, etc.

### **2.3 T occupancy factor**

within the start time of radiation source, the share of the average time spent on the maximum exposure of the radiated person occupying the start time within the area

## **2.4 U use factor**

the share of the time at which the primary radiation beam (useful beam) is irradiated in a direction of beam shielding occupying the total exposure time  
 $\leq 2.5 \mu\text{Sv/h}$  (staff total occupancy place,  $T > 1/2$ )  
 $\leq 10 \mu\text{Sv/h}$  (staff partial and occasional occupancy place,  $T \leq 1/2$ )

## **3.2 Radiation dose rate reference control level of therapy room roof shield**

**3.2.1 At the built, to-be-built two-storey building above therapy room or**  
 when the height of neighboring building near therapy room exceeds the area from radiation source point to the solid angle area of surface edge inside the room roof, at the place 30 cm from therapy room roof external surface or at the staff stay location in the high-rise building within this solid angle area, the radiation dose rate reference control level shall be the same with 3.1.

**3.2.2 In addition to 3.2.1 conditions, it shall consider the radiations of**  
 skyshine radiation and side-scattered radiation to the public near the ground and in the building outside the therapy room, as well as the illumination of the radiation getting through the therapy room roof to the staff who occasionally reach the top. Use equation (1) and take  $H_c = 5 \mu\text{Sv/week}$ ,  $T = 1/40$ . Use the ambient dose equivalent rate determined at the place 30 cm from the therapy room external surface as the radiation dose rate reference control level of therapy room roof shielding.

## **3.3 Procedures for determination of ambient dose equivalent rate reference control level**

**3.3.1 Ambient dose equivalent rate reference control level of therapy room**  
 wall and at the place 30 cm from entrance door external surface  
 (1) select the assessment points and identify the partitions where the

assessment points are located (controlled areas out of radiotherapy room and uncontrolled areas out of radiotherapy room);

(2) according to the radiotherapy workload given by the radiotherapy organization, determine the week workload (W) of radiotherapy device used, and refer to the method in Annex B to estimate the maximum illumination time (h) of therapy device;

(3) estimate ; compare it with the dose rates in 3.1 and 3.1.2 and take the smaller one as the ambient dose equivalent rate reference control level.

### **3.3.2 Ambient dose equivalent rate reference control level of larger**

occupancy factor ( $T > 1/4$ ) of neighboring therapy room

### **4.3.6 Secondary shielding radiation might contain the compound effect of**

leakage radiation and scattered radiation. Usually, it shall respectively estimate the leakage radiation and each scattered radiation. When the difference between their shielding thicknesses is one layer (TVL) or more, it shall use a thicker shielding. When the difference is less than one TVL, it shall add half a layer (HVL) of thickness on the thicker shielding.

### **4.4.1 In a choice of therapy conditions for radiotherapy device, it shall take**

radiant matter of which the penetrating ability is relatively strong and commonly used highest therapeutic output as radiation source parameters. It shall also consider all the primary and secondary radiation factors of each shielding locations.

### **4.4.3 Week maximum workload and week therapy illumination time of**

therapy device application

### **4.4.4 Use factor (U) of possible useful beam illumination direction during the**

use of wide beam therapy device