Dose constraints – radiotherapy
The application of the principle of optimisation to the design of new radiotherapy facilities in which ionising radiation is to be used.

The Euratom Basic Safety Standards Directive, 96/29/Euratom encourages the establishment and use of dose constraints within the context of optimisation of radiological protection. A dose constraint is defined as “a restriction on the prospective doses to individuals, which may result from a defined source, for use at the planning stage in radiation protection whenever optimisation is involved”\(^1\) and represents an upper bound on the outcome of any optimisation procedure. It is important to note that dose constraints are intended to be used only during the design stage of any new build, and that once the facility is in operation the user must ensure that the dose limits as defined in S.I. No. 125 of 2000 are adhered to.

Having consulted with the Institute’s Medical Radiation Advisory Committee in relation to the application of the principle of optimisation to the design of new radiotherapy facilities, the Institute’s policy on the appropriate dose constraint to be applied is as follows:

<table>
<thead>
<tr>
<th>Category of Personnel</th>
<th>Dose Constraint mSv/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exposed worker</td>
<td>1.0</td>
</tr>
<tr>
<td>2. All others</td>
<td>0.3</td>
</tr>
</tbody>
</table>

The annual dose constraints detailed in the table must take account of both photon and neutron doses and can be determined using the Time Averaged Dose Rate (TADR)\(^2\) modified to take account of occupancy over a working year (2000 hrs). In order to use these dose constraints effectively it is important that all occupancy factors used are realistic.

Bearing in mind the definition of TADR an upper bound on the instantaneous dose rate (IDR)\(^3\) is warranted. As it is not practical to specify one figure for each facility each situation must be assessed on a case by case basis by the Radiation Protection Adviser in order to demonstrate compliance with the above dose constraint. However in general for areas that are occupied by exposed workers, or to which they have access, the IDR should be restricted to ensure that the annual dose constraint of 1 mSv per year is met, with an upper limit set at 20 µSv/hr. If the IDR is above this general value access to the area may need to be restricted or prohibited. For areas with uncontrollable access, in which members of the


\(^2\) The TADR is IDR multiplied by the expected daily beam on time averaged over an eight-hour day i.e. taking account of workload and usage factors.

\(^3\) IDR is defined as the direct reading of dose in µSv/hr, at a point of interest averaged over a minute to avoid potentially erroneous results due to (i) the pulsed nature of many radiation sources, (ii) their possible short duration, and (ii) the slow response time of many dose rate meters at low dose rates.
public may be present, the IDR should be restricted to ensure that the annual
dose constraint of 0.3 mSv per year is met, with an upper limit set at 7.5 µSv/hr.

Particular attention should be given to shielding requirements for the roof of the
bunker. In some cases, for example where it can be guaranteed that there will be
no future build above the bunker and where access to the roof can be restricted
all times while the linear accelerator is in operation, an upper bound on the IDR
will be set at 2 mSv/hr. While a dose rate on the roof of 2 mSv/hr should not
pose a protection problem due to skyshine it could still be a problem for a Nuclear
Medicine Department by raising the background radiation level4. Consideration
should also be given to the protection of areas of occupancy which may overlook
the roof.

Further information may be obtained from the Radiological Protection Institute of
Ireland.

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4 The Design of Radiotherapy Treatment Room Facilities, IPEM Report No. 75,
1997
Mission Statement

“To protect people from the harmful effects of ionising radiation, both natural and man-made, through effective regulation, monitoring of the environment and the provision of accurate and timely advice to the public and to Government”

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