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Welsh Health Building Note

Cancer Treatment Facilities

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This guidance is based on Health Building Note 02-01 *Cancer treatment facilities*, published by the Department of Health in 2013.

It replaces HBN 54:2006 *Facilities for cancer services.*

This publication can be accessed from the NHS Wales Shared Services Partnership – Specialist Estates Services website **www.wales.nhs.uk/ses**

Welsh Health Building Note 02-01 - Cancer treatment facilities

Overview

This Welsh Health Building Note covers the policy, service context, and planning and design considerations for cancer treatment facilities.

It covers specific planning and design considerations for chemotherapy and radiotherapy units and describes spaces that are unique to those units. It also describes any variations to common hospital spaces and clarifies requirements for these spaces, where necessary.

For a full list of space components, see the example schedules of accommodation in **Appendix 1** for a chemotherapy unit serving a population of 400,000 and for a two and four-linear accelerator radiotherapy unit.

Key changes since Health Building Note 54 (2006)

The major differences this publication, WHBN 02-01:2016 *Cancer treatment facilities,* compared with previous guideline, HBN 54:2006 are:

1 A dedicated cancer outpatients department is no longer included, as it is assumed that the same functions can take place in a general outpatients department, within either a hospital or a primary care setting.

2 A suite of entrance facilities is not included, however if these are required then guidance should be sought in WHBN 00-03:2013 *Clinical and clinical support spaces.*

3 The guidance now includes the addition of radiotherapy medical physics and technology accommodation, with some specific core rooms, and some optional rooms depending on the proximity of the main medical physics department.

4 It also now includes an on-treatment review suite for both chemotherapy and radiotherapy (two separate areas). This provides clinicians with appropriate facilities for reviewing patients at the same time that they attend for their treatment.

5 It is assumed that radiotherapy units will be accommodating radiotherapy equipment with an output of no more than 10 MV, as this was felt by the expert group to be the likely maximum requirement. Units operating equipment at higher output levels than this are advised to seek specific advice on radiation protection requirements.

6 The guidance includes the superficial/orthovoltage radiotherapy treatment room only as optional provision.

7 It includes a facility associated with both imaging and treatment rooms for radiotherapy staff to undertake data preparation, calculations and image review in a separate area to the control areas – to provide a quiet, uninterrupted environment for this work to take place.

8 It assumes that staff will make use of shared central changing facilities and no longer includes local provision for staff changing (although this has been included as an optional facility).

Acknowledgements

WHBN 02-01:2016 *Cancer treatment facilities*, is based on the Department of Health HBN 02-01:2013, *Cancer treatment facilities.* NHS Wales Shared Services Partnership – Specialist Estates Services is grateful to the Department of Health for permission to adapt the original guidance for application in Wales. The contents of the original document were reviewed by NHS Wales Shared Services Partnership – Specialist Estates Services, the Clinical Oncology Sub Committee of the Welsh Scientific Advisory Committee [COSC] and by representatives of health boards in Wales and Welsh Government.

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Chapter 1

Policy and context

Background

1.1 The Welsh Government published *Together for Health – cancer delivery plan*, which set out the first-ever comprehensive strategy to tackle cancer in Wales. It was updated in 2015 and all associated documentation can be found on the Welsh Government website at:
http://gov.wales/topics/health/nhswales/plans/cancer/?lang=en

1.2 A list of standards for cancer services in NHS Wales is maintained by the Cancer National Specialist Advisory Group and may be viewed at its website at:
http://www.wales.nhs.uk/sites3/page.cfm?orgid=322&pid=23968

Quality of environment

1.3 Project teams should seek the views of all users from the onset of the planning and design process.

1.4 Whatever the setting or basis of treatment delivery, the privacy, dignity and comfort of patients are key.

1.5 Important features of the environment include: external views and access to gardens where possible; positive distractions, for example with interesting artwork; the ability to control temperature locally (some patients are very sensitive to temperature), especially in the treatment suites; control over noise and lighting; and control over privacy.

1.6 Project teams may wish to review the research literature available regarding colour schemes in chemotherapy facilities.

1.7 Macmillan Cancer Support is working hard to improve cancer care environments. It has developed the Macmillan Quality Environment Mark (MQEM), a national evidence-based benchmark for the patient experience in cancer facilities. All cancer services are recommended to adopt MQEM, either as part of their service improvement process or in the course of developing new facilities. The Macmillan website includes a useful section on cancer environments (Macmillan 2016).

1

Delivering same-sex accommodation

1.8 See 'Delivering same-sex accommodation' under 'Functional design issues' in WHBN 00-01:2013 *General design principles*. Guidance applying to generic recurring accommodation such as inpatient accommodation is included in the relevant section.

1.9 Sometimes, patients who have frequent, short admissions – for example, patients undergoing chemotherapy – may prefer to be cared for with others with the same condition, irrespective of their gender. This is acceptable as long as it is the decision of the whole group and does not adversely affect the care of others. It is not acceptable where the only justification is frequent admission, and there is no recognisable group identity. Nor is it acceptable where the main justification is organisational convenience.

Bariatric patients

1.10 Health boards and Trusts should have policies and procedures in place for the treatment and manual handling of bariatric patients. These should ensure privacy and dignity and comply with the *Equality Act 2010*.

1.11 The physical environment should be considered by health boards and Trusts when making provision for bariatric patients. This will depend upon local circumstances. Bariatric patients will require additional facilities over and above normal provision including: corridor widths, door widths, room sizes, sanitary facilities, manual handling equipment, bed and trolley sizes, diagnostic imaging equipment etc.

1.12 The location of rooms to accommodate bariatric patients should be carefully considered to keep horizontal and vertical circulation for the patient to a minimum.

2

Chapter 2

Diagnosis

2.1 Following an outpatient consultation, the patient will undergo investigations (usually imaging and pathology). They will then return to an outpatient setting for the results and to discuss possible treatment plans. Oncology outpatient facilities are assumed to form part of the general outpatients department, with generic rooms used on a sessional basis.

2.2 Diagnostic imaging/pathology services will usually be provided from a central facility.

2.3 Spaces will be required for multidisciplinary team meetings, which are an integral part of the pathway prior to patients returning for results. These meetings can take place within generic seminar/meeting rooms provided that there are suitable facilities for teleconferencing, accessing patient records, and viewing PACS images and pathology slides, where necessary.

3

Chapter 3

Overview of treatment

3.1 An overall treatment strategy may involve surgery, chemotherapy and/or radiotherapy, alongside hormone therapy and tumour-suppressive drugs. Some patients may receive chemotherapy and radiotherapy concurrently. Where chemotherapy and radiotherapy facilities are provided from the same location, they should be co-located for the patient's convenience and to enable efficient working practices. The working pattern of clinical oncologists means that they need to access both areas and their administration bases.

3.2 Chemotherapy and radiotherapy facilities are largely self-contained, and they require good access to diagnostic, surgical, inpatient, critical care, accident and emergency (A&E), and rehabilitation facilities, along with the main medical physics, pharmacy and pathology facilities, which may not be available at all locations delivering chemotherapy nevertheless consideration should be given to appropriate and timely access to such services should they be required.

3.3 Patient support services – such as wig fitting and prostheses services, information services, and complementary therapies – are essential. They may be provided from the general outpatient departments, ideally located close by; if not, consideration of provision should be made within the oncology unit itself.

4

Chapter 4

Chemotherapy

4.1 Chemotherapy is the use of systemic anti-cancer (or cytotoxic) drugs that destroy cancer cells. The types of chemotherapy used will depend on a number of factors including where the cancer started (primary) and/or whether it has spread (secondary or metastatic).

4.2 It is being used increasingly widely, including in a wider range of solid cancers than previously, and new drugs are being developed.

4.3 Patient-specific treatment protocols/regimens will be prescribed, and drugs may be given over a period of one or two weeks, or two or more drugs may be administered over a period of one day. A typical regimen may last over six months, with the patient returning at frequent intervals for treatment.

4.4 The drugs are usually given by the intravenous route, either as a bolus over minutes (on an outpatient basis) or as an infusion over hours (as a day case), but may be taken orally as a tablet or capsule. Some patients will be admitted for elective chemotherapy owing to the administration times/length of the regimen. These patients would receive their chemotherapy on the ward, whether bolus or infusion.

4.5 The patient will undergo regular imaging investigations and pathology tests to monitor the success of the treatment.

4.6 Post-chemotherapy supportive therapies may include the prescribing of anti-emetic drugs, which will require collection from a pharmacy facility located close by.

Intrathecal chemotherapy

4.7 Compliance with the CMO's letter published by the Welsh Assembly Government, 6 August 2008, *A guide to the safe handling and administration of intrathecal chemotherapy* requires that new or updated chemotherapy facilities include a *'permanently designated area for intrathecal chemotherapy for organisations wishing to provide this service'* (pg 4). It is recommended that this should take the form of a dedicated treatment room or rooms.

4.8 It is not desirable to store intrathecal chemotherapy drugs outside the pharmacy between issuing and administration, and emergency stocks should never be held on the ward. However, if the drugs have to be issued and there will be a short delay before administration, they should be stored in a dedicated container/refrigerator reserved for this purpose alone.

4.9 See also **Chapter 9**, 'Chemotherapy unit'.

5

Chapter 5

Radiotherapy

5.1 Radiotherapy is the use of ionising radiation to damage and kill diseased cells. Its main use is for cancer treatment where it can be used on its own, with curative or palliative intent, or as part of a wider treatment of the cancer, which might also involve surgery or chemotherapy.

5.2 Radiation exposure can damage cell DNA and this can lead to the cell being unable to reproduce, or to cell death. Healthy cells are generally more able to repair this kind of damage than cancerous cells and, by splitting radiotherapy treatments into treatment fractions, it is possible to take advantage of this repair mechanism and inflict damage on the cancer while reducing the effect on healthy tissues. The precise fractionation of the radiotherapy is therefore a crucial part of the prescription.

5.3 Individual patient treatment plans are produced to enable the delivery of prescribed radiation doses to the disease. The planning process involves some form of imaging (usually a CT scan) and the outlining of various structures, such as the tumour and other organs, within the images. Certain organs, generally close to the tumour, are designated 'organs at risk' (OARs) and need to receive low radiation doses to avoid long-term, undesirable side-effects. Radiotherapy treatments are always, then, a careful balance of clinical risk between the probability of controlling the tumour and the probability of causing harm to normal tissues.

5.4 Once a plan has been produced, approved and verified using further imaging, the patient can receive treatment.

Radiotherapy staff groups

5.5 Clinical oncologists, physicists, dosimetrists, radiographers and technologists are all required to work together to provide high quality radiotherapy treatment.

5.6 **Clinical oncologists:** take overall responsibility for the patient's treatment. They are involved in diagnosing and determining the staging of the cancer, deciding on a course of treatment and prescribing the radiation dose. The process of prescribing is complicated and involves the definition of the target volume as well as determination of the radiation dose to be delivered.

5.7 **Physicists:** develop and oversee the scientific infrastructure of the oncology centre. They are responsible for ensuring the proper commissioning, calibration and safe use of equipment for the planning, delivery and verification of radiotherapy and the safe use of radiation, protecting the patients, staff and members of the public in compliance with the relevant legislation.

5.8 **Dosimetrists:** plan radiotherapy treatments based on the requirements of the oncologist. They require good knowledge of human anatomy and equipment capabilities to produce practical, successful treatment plans. Dosimetrists also check certain radiotherapy plans and help with the development of new types of treatment.

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5.9 **Radiographers:** take the patient through the treatment process. Radiographers are involved in scanning the patient before the treatment plans are created and in producing an accurate daily patient set-up on the day of treatment. They operate the therapy equipment to deliver the radiation dose and have an important role in providing advice and counselling for the patient and their family.

5.10 **Clinical technologists:** provide on-site technical expertise for radiotherapy equipment. Technicians carry out repair work on the machines as well as doing routine maintenance to prevent breakdowns. They also carry out aspects of equipment quality assurance.

5.11 **Nursing staff:** provide support to patients and on-treatment reviews, where they may assess patients and prescribe supportive drugs to reduce treatment toxicities.

5.12 See also **Chapter 10,** 'Radiotherapy unit'.

External Beam Radiotherapy

5.13 This is the most frequently used form of radiotherapy. A radiation beam is generated by a machine source of radiation external to the patient and at a distance from the body. The two most important characteristics of treatment are:

a. the localisation of the beam relative to the target volume; and

b. the level of dose deposited in the tumour. In the planning process, radiation beams/sources are simulated in order to calculate and assess the optimum treatment geometry and dose delivery by the radiation.

5.14 Patients usually attend the radiotherapy unit on an out-/day-patient basis, or they may attend as an inpatient coming from the ward to receive their treatment. External beam radiotherapy is delivered by large machines (usually linear accelerators) situated within shielded facilities – known as bunkers – with very particular requirements, as described below.

Linear accelerators (linacs)

5.15 The linear accelerator is the primary and mostly widely used treatment unit for radiotherapy (external beam radiotherapy). Radiation beams are produced by accelerating electrons to very high energies and, depending on the type of radiation beam required, directing the accelerated electrons onto a metal target.

5.16 The radiation beams are shaped by Multi-Leaf Collimators [MLC] in the linac head in order to precisely shape and direct a defined radiation fields into the target volume within the patient.

5

5.17 This guidance assumes the provision of linacs operating at up to 10 MV. Linacs operating above this level would be an exception in NHS Wales and designers should seek specialist advice, as additional radiation protection considerations will be required.

Image-guided radiotherapy (IGRT)

5.18 Image-guided (IGRT) radiotherapy achieves localisation of the beam to within the target volume by imaging the patient once they are on the treatment couch in the treatment position. This means that if the tumour has moved since the previous treatment, the patient can be repositioned so that the radiation targeting is improved.

5.19 IGRT can potentially be implemented in a number of ways. The most commonly used method is to perform 'cone-beam CT' scans by use of an X-ray tube and detector mounted onto the linac gantry. A comparison is made between the CT scan from the treatment planning process and the scan made with the patient on the treatment couch at treatment delivery. A decision can then be made about whether the patient position should be adjusted.

Intensity-modulated radiotherapy (IMRT)

5.20 Conventional radiotherapy is often limited in terms of its ability to avoid certain organs and to deposit the dose within the confined tumour region. Intensity-modulated radiotherapy (IMRT) is a way of improving these abilities by creating radiation fields with varying intensities. Different methods are used by linac manufacturers to achieve these intensity-modulated fields, such as 'step-and-shoot', where individual 'beamlets' are created by the MLC in sequence, or 'sliding window', where the MLC moves across the field throughout treatment to vary the beam intensity.

5.21 While the technical performance of modern linear accelerators is such that IMRT is achievable, the challenge often lies in producing treatment plans. Instead of manually changing dose contributions from each beam, new planning software can 'optimise' beam arrangements and dose contributions to give the best possible dose distributions ('inverse planning'). A balance is often required between the dose delivered to critical organs and that delivered to the target volume. IGRT is an essential part of IMRT as sharper dose gradients are used, requiring more accurate positioning.

Rotational IMRT

5.22 IMRT can be performed either with the linac gantry at fixed angles or by treating while the gantry is rotated around the patient. Often, two or more rotations of the gantry are required to give the desired dose distributions. Rotational IMRT can often be delivered with lower total dose than conventional IMRT and tends to deliver lower doses to volumes outside the target organ.

5

5.23 Tomotherapy is another rotational IMRT solution; unlike conventional linacs, it is designed to perform only rotational IMRT. Tomotherapy does not use MLCs but has a series of shutters which can open and close very quickly. As the radiation beam is rotated around the patient, these shutters are used to shield parts of the patient, so creating dose distributions which can be designed to conform tightly to the treatment regions.

Stereotactic radiotherapy/radiosurgery

5.24 Stereotactic radiosurgery [SRS] (a single fraction treatment) and radiotherapy (more than one fraction) deliver an ablative (or destructive) dose of radiation to a small target volume. The doses delivered per fraction are significantly larger than a conventional radiotherapy treatment, but the total biologically effective dose over the course of treatment is generally the same. The aim is different from conventional radiotherapy and IMRT in that the radiation dose per fraction is sufficient to destroy, rather than to damage, tumour cells. Suitable tumour targets tend to be very small, and many beams are used to maximise the dose delivered to the tumour while minimising high dose delivery to healthy tissues.

5.25 The high doses per fraction mean that geometric precision is extremely important. IGRT therefore plays a very important role in radiosurgery in making sure that the tumour is properly targeted. In regions where the target might be moving (that is, in the lungs, abdomen etc), techniques such as gating or chest compression are often employed to achieve superior targeting.

5.26 There are many stereotactic delivery systems available, including conventional linear accelerators. While linacs can be used to perform radiosurgery, other pieces of equipment are increasingly being specifically designed for this purpose. Robotic radiosurgery can be performed with a linear accelerator attached to a robotic arm. The patient is positioned either sitting or lying down while the arm moves around, exposing the patient to many small beamlets (hundreds per treatment). It makes use of a number of imaging techniques to locate the tumour throughout treatment, including respiratory and bone anatomy tracking.

Brachytherapy

5.27 This is internally delivered radiotherapy where a radioactive source is positioned in the patient's body, inside or next to the tumour, either permanently or temporarily. This can be advantageous in some clinical cases as the radiation dose is more restricted to a short distance from the source and can reduce the irradiation of normal tissue. Patients attend as day case patients or are admitted as inpatients, depending on the type of treatment approach.

5.28 Brachytherapy is performed either by the insertion of radioactive wires and seeds directly into the tumour or, more commonly, by driving a single highly radioactive pellet down a transfer tube placed inside or next to the tumour. It is routinely used for gynaecological, prostate, breast and skin cancers. As an example of a modern development in breast brachytherapy, a small balloon and catheter can be inserted, intraoperatively, into the tumour excision site. A radioactive source is then driven into the centre of the balloon to treat the surrounding tissues.

5

Temporary implants

5.29 Before temporary radioactive sources are placed in a patient's body, applicators or catheters have to be inserted into the patient, usually in a standard operating theatre. The patient is then taken on a trolley from the operating theatre to an imaging suite, where the applicator's/catheter's precise position and geometry is determined with respect to the patient's anatomy.

5.30 The patient is then transferred to the brachytherapy suite, which contains a shielded source container built into an after-loading machine. The shielded source container will house a single, highly radioactive source, usually iridium-192. The applicators/catheters within the patient are connected to the after-loading machine via transfer tubes. Using a computer control unit, the radioactive source is then mechanically transferred to the applicators to deliver the treatment. At the end of the treatment, the applicators/catheters are removed from the patient.

5.31 Certain insertions may be undertaken in the brachytherapy suite, provided that it is suitably equipped for surgical procedures, including anaesthesia, and has suitable imaging facilities.

High dose rate (HDR) brachytherapy

5.32 A single, highly active source of iridium-192 is transferred mechanically from the source container to the first applicator tube and stepped along the treatment length. It is then retracted and placed into the next applicator. The dose required is delivered in a single treatment lasting typically 10 to 20 minutes.

Pulsed dose rate (PDR) brachytherapy

5.33 This is similar to high dose rate brachytherapy but the source is only a tenth of the activity of a high dose rate source, and instead of a single treatment lasting 10 to 20 minutes, several treatments are delivered, each lasting about 10 minutes and repeated at regular intervals for up to 48 hours. The patient remains within the brachytherapy suite, provided as a specialist facility within the inpatient accommodation, and requires nursing facilities.

Permanent implants

5.34 Small radioactive sources are inserted or implanted directly into the tissue in a standard operating theatre, although specialist equipment is required during the procedure. Due to the low activity and low energy of the radiation used in these implants, the patient can be nursed for the duration of their stay in an ordinary single room where they are monitored for potentially expelled sources.

5

Unsealed radioactive sources

5.35 The source is usually administered to the patient in the form of a liquid (taken as a drink), capsule or by intravenous injection.

5.36 Where the source is injected, aseptic and sterile conditions are required. Some therapeutic radiopharmaceuticals arrive from the manufacturer ready to use, while others must be prepared in the hospital radiopharmacy (due to limited stability after preparation). Consideration should be given to the location of radiopharmacies within a centre and where radiopharmaceuticals are prepared on-site, they should be transported on an appropriately shielded trolley.

5.37 The patient will be accommodated in a specialist shielded single room associated with the inpatient accommodation, and will remain there until the radiation level drops below a defined threshold.

5.38 See also **paragraph 10.113,** 'HDR brachytherapy suite (optional)' and **paragraph 11.7**, 'Specialist inpatient accommodation'.

6

Chapter 6

Surgical oncology

6.1 Most curative patients will have some form of surgery at some point in their treatment. Surgical oncology is undertaken in standard operating theatres, which will usually form part of the main operating theatre suite. Guidance on the design of surgical facilities for inpatients is provided in HBN 26:2004 *Facilities for surgical procedures: Volume 1* and HBN 10-02:2007 *Day surgery facilities* provides guidance on facilities for day case surgery.

7

Chapter 7

Emergency care

7.1 Non-surgical oncology patients do sometimes suffer acute complications from their cancer and its treatment, and may require emergency care. Local cancer networks should have clear policies and pathways on the management of complications. All hospitals that might receive these patients should develop an 'acute oncology' service to respond effectively, or otherwise have 'treat and transfer' arrangements in place.

7.2 If a dedicated urgent assessment facility is provided, it is usually part of the oncology inpatient accommodation. Where this facility is not available, patients will be seen in the main A&E department. If a patient becomes unwell on the oncology unit itself, clinical spaces within the on-treatment suites in the chemotherapy/radiotherapy units will be used for their assessment. These patients may subsequently be admitted to the main ward via a discreet route.

8

Chapter 8

Inpatient care

8.1 Patients may be admitted electively for chemotherapy or brachytherapy treatment. Some patients who become acutely ill may also require admission.

8.2 Ward accommodation for cancer patients does not differ from ward accommodation for other patient groups. Depending on the scale of the facilities, designated oncology beds may be provided within the main surgical and medical wards, or there may be dedicated oncology wards, including wards/beds for haemato-oncology.

8.3 Dedicated beds for palliative care may also be provided, possibly located in a quiet area of the ward.

8.4 See also **Chapter 11,** 'Inpatient facilities'; and the King's Fund 2008 publication *Improving environments for care at end of life.*

Critical Care facilities

8.5 Critical Care Units (CCUs) for cancer patients do not differ from CCUs for other patient groups. Guidance on critical care facilities is provided in WHBN 04-02:2016 *Facilities for critical care.*

9

Chapter 9

Chemotherapy unit

9.1 This section describes a chemotherapy unit for the delivery of intravenous and intrathecal chemotherapy, including the management of patients.

9.2 It includes specific planning and design considerations and space information for an on- treatment suite and a chemotherapy treatment suite.

Planning and design considerations

9.3 See **Chapter 1**, 'Policy context' regarding quality of environment.

9.4 The equipping of generic clinical rooms may depend on the patient groups attending on a local basis; for example, tumour site-specific teams may have particular requirements.

9.5 If staff on the unit are going to take blood sample for analysis then the transportation and storage of such a sample should be given due consideration and may involve the use of a pneumatic tube system.

Children's facilities

9.6 The provision of dedicated chemotherapy facilities for children and young people is recommended. However, where there is some shared use of facilities, the patient pathways should be kept separate as far as possible and, depending on local need, some clinic spaces should be designated for paediatric use, and decorated appropriately . For further guidance see *Improving outcomes in children and young people with cancer* (NICE 2005).

Clinical trials

9.7 The following accommodation is assumed to be provided elsewhere as part of an organisation site-wide clinical trials service and is outside the scope of this guidance:

1 consulting/examination room(s);

2 interview and counselling room(s);

3 dedicated inpatient accommodation, where drugs trials involve overnight stays.

Functional relationships

Internal functional relationships

9.8 **Figure 1** outlines the relationship between the various functions within a chemotherapy unit.

9

Relationships with other departments

9.9 The chemotherapy unit should be located with good access to imaging facilities, and to a pharmacy dispensary and multi-disciplinary team facilities if these are not provided on the unit.

Pharmacy aseptic preparation

9.10 Injectable cytotoxic drugs for use in chemotherapy must be prepared in a dedicated pharmacy aseptic unit – this may be located within a central pharmacy facility or as a pharmacy outpost/'satellite' adjacent to the chemotherapy unit. This guidance assumes the former, and therefore the schedule of accommodation does not provide an allowance for these facilities.

Drugs storage and disposal facilities

9.11 Cytotoxic drugs are hazardous, and should be stored in locked and alarmed facilities. The discharge of cytotoxic materials into the environment is regulated. Accordingly, specific routes for disposal must be agreed and described in local rules and protocols. The means of delivery must be safe, secure and traceable. It is not appropriate to deliver cytotoxic drugs by pneumatic tube owing to the risks involved. Drugs should be stored in accordance with the manufacturers guidance which may require temperatire controlled stores.

9.12 See WHBN 14-01: 2014 *Pharmacy and radiopharmacy facilites* for further guidance on the design of an aseptic unit.

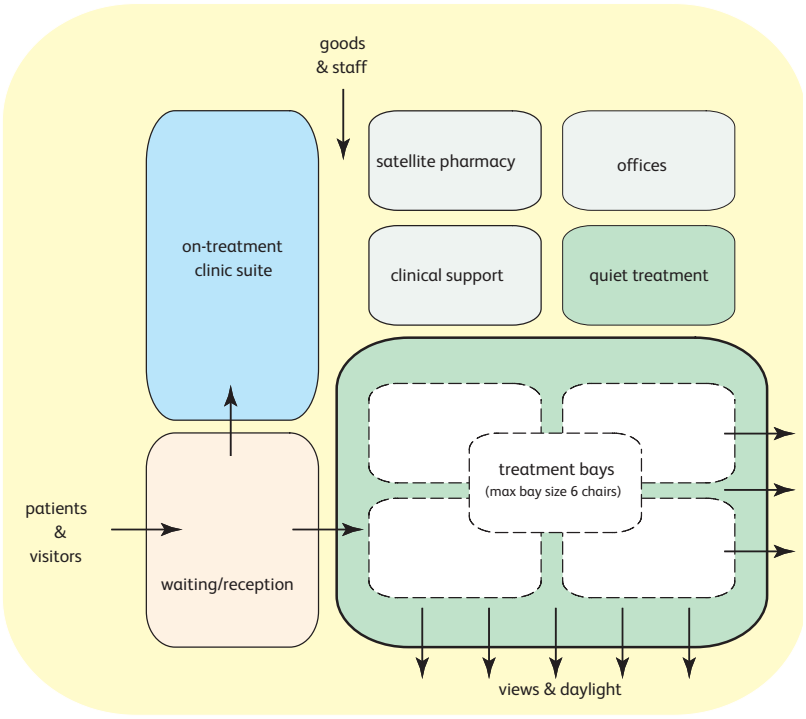

Figure 1 Chemotherapy unit: internal functional relationships

9

On-treatment suite

Function of the suite

9.13 The on-treatment suite may provide for the following functions:

- pre-treatment consultations;
- delivery of oral chemotherapy;
- phlebotomy; and
- the education, assessment and management of patients during the course of their chemotherapy treatment.

9.14 It comprises the following core clinical accommodation:

- examination/therapy rooms, for general nursing procedures;
- consulting/examination rooms;
- interview and counselling.

Note
If the unit is providing intrathecal treatments (not all providers do), one room must be designated for this purpose. This guidance assumes that one of the exam/ therapy rooms in the on-treatment suite will be designated. Some organisations may opt to provide this room elsewhere.

9.15 This guidance assumes that phlebotomy takes place in these clinical rooms rather than in separate designated rooms.

9.16 This guidance also assumes that wig/prostheses fitting, complementary therapies, information services and other patient support functions will be delivered from generic rooms in the general out-patients department. If the outpatients department is not close by, these services should be delivered from generic rooms in this suite.

Specific space considerations

9.17 If project teams opt to provide a waiting area that serves the entire unit, a separate waiting area would not be required within the on-treatment suite.

9.18 The interview room should be located to allow discrete egress without passing through the public areas.

9

9.19 Separate storage is required for intrathecal drugs, as directed by the updated national guidance on the safe administration of intrathecal chemotherapy.

9.20 See the CMO's letter published by the Welsh Assembly Government, 6 August 2008, *A guide to the safe handling and administration of intrathecal chemotherapy* .

Chemotherapy treatment suite

9.21 The overall size of the treatment suite will depend on patient throughput. A mixture of open-plan and individual treatment spaces is recommended.

9.22 Patients requiring central venous catheters (CVCs) may need to visit the central diagnostic imaging facility. Some patients will have CVCs inserted in the individual treatment areas in the chemotherapy suite.

9.23 Cytotoxic drugs have a deleterious effect on the patient's immune system, and great emphasis should be placed on designs and finishes that enable staff to keep the treatment unit clean and as free from infection as is reasonably possible while providing a comfortable environment. The design of treatment areas should facilitate easy cleaning and decontamination. The storage of the cytotoxic drugs should be considered in the design and consideration given to the environmental conditions needed for drug storage prior to use use.

Chemotherapy treatment area

9.24 Open-plan areas should be divided into smaller zones of no more than six chairs. This flexibility in design will enable teams to manage the area according to patients' preferences at any given time, including to create gender separation if required.

9.25 Patients may have adverse reactions to the treatment. Medical oxygen and medical vacuum outlets should be provided, which may be shared between two bays, plus an emergency box with good access to resuscitation facilities.

9.26 Patient entertainment facilities should be provided.

Chemotherapy treatment: Single room

9.27 There should also be a 'quiet' zone of single rooms with en suite sanitary facilities; these could be used for patients who require clinical seclusion, who wish to receive their treatment in private, or who require the use of scalp cooling devices.

9

Chemotherapy preparation room

9.28 Facilities are required for storing and preparing sterile packs, lotions and drugs for immediate use, and for preparing/storing trolleys. This provision may be provided as a central facility (16 m^2 would serve 24 patients) or as smaller devolved rooms (9 m^2 per six-chair bay). A local decision will be required as to whether to provide a computer workstation within this area.

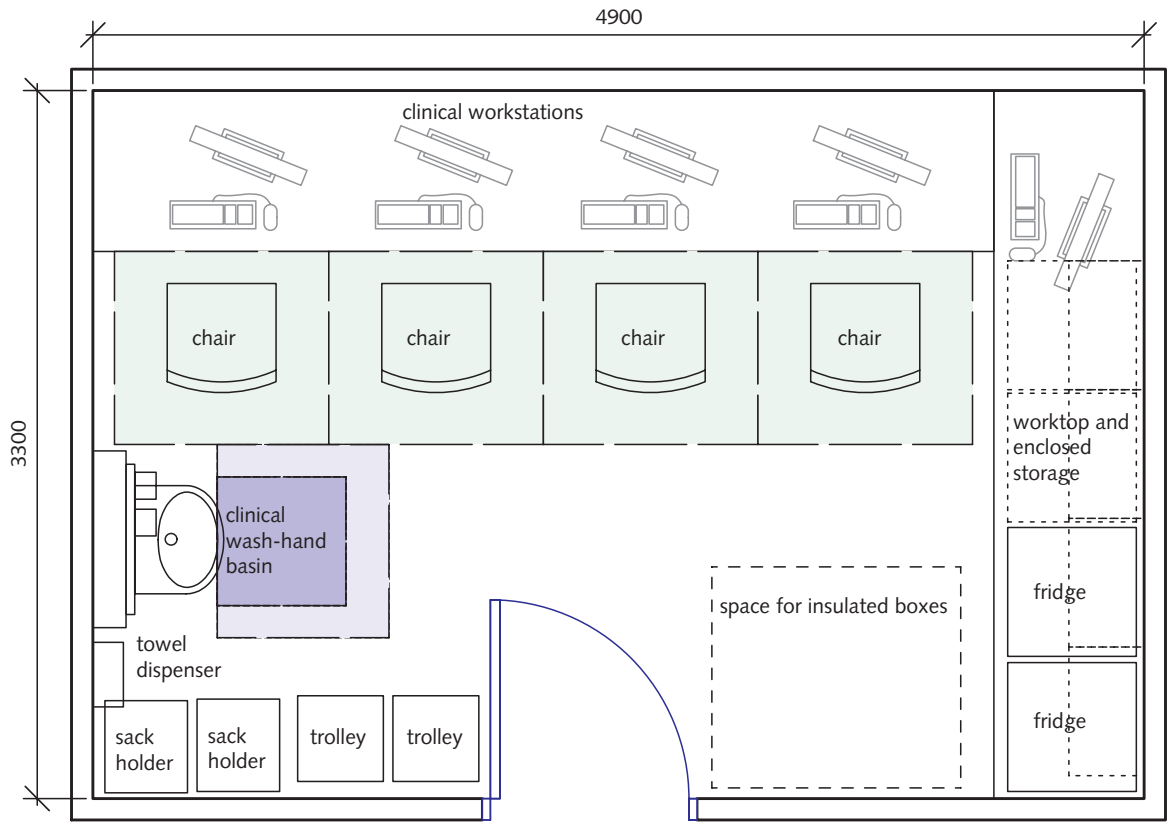

Figure 2 Chemotherapy prep room 16 m^2: example layout

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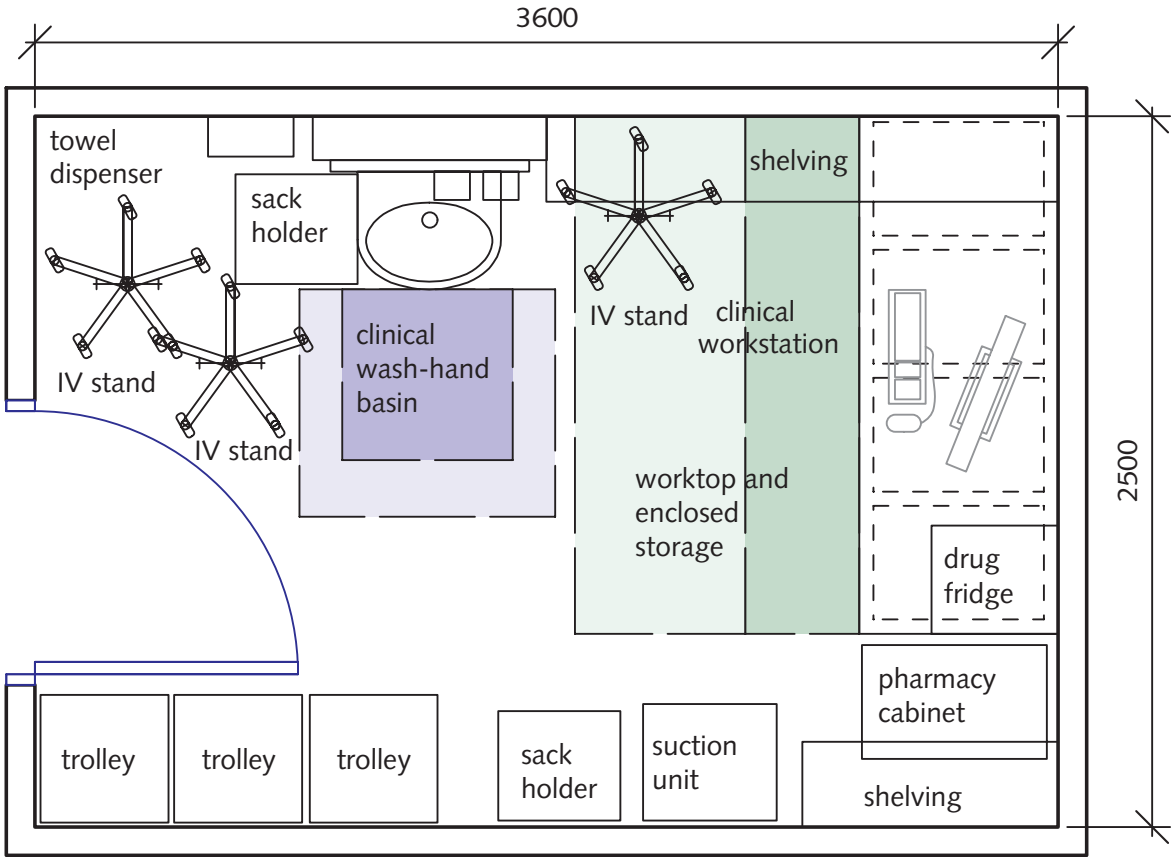

Figure 3 Chemotherapy prep room 9 m²: example layout

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Chapter 10

Radiotherapy unit

10.1 This section describes the specific planning and design considerations and space information for a main radiotherapy unit that includes the following accommodation:

- On-treatment review suite;
- Radiotherapy treatment suite, superficial/orthovoltage radiotherapy treatment facilities may be provided in this suite;
- Imaging suite;
- Optional mould suite;
- Radiotherapy physics and technology accommodation.

10.2 A brachytherapy suite may be provided and is also covered in this section.

10.3 A satellite radiotherapy unit may be provided with close links to the main unit – two radiotherapy treatment rooms are the usual minimum viable provision. The actual requirements for a satellite unit will be determined by local policy. The schedule of accommodation includes an example for a satellite unit (two bunkers). Additional facilities may also be required eg treatment planning and simulation systems.

Planning and design considerations

Future flexibility

10.4 The planning and design of radiotherapy facilities should be flexible enough not only to respond to changes in the clinical service, but also to enable equipment servicing and replacement and to accommodate new emerging technologies. The design should ensure that access is sufficient to allow new equipment to be installed with minimal disruption to clinical services. Good external access is required for delivery of equipment by large vehicles.

10.5 Since the treatment room will outlast the linear accelerator, it is prudent to design the shielding to allow for the machine that uses the most energy and the widest beam that are likely to be installed in the future. It is therefore recommended that all treatment rooms be designed to house at least 10 MV machines. The design may also need to allow for neutron protection to be added, if and when required.

10.6 Where a treatment room is being upgraded to take a higher-energy machine, walls may need to be upgraded. Care should be taken to prevent the generation of secondary radiation. Full consultation should be undertaken in conjunction with the local radiation protection advisor [RPA]

10

UK legislation

10.7 There are three major items of UK legislation that affect the design and operation of radiotherapy facilities:

- the *Radioactive Substances Act 1993;*
- the *Ionising Radiation Regulations 1999* [IRR99]; and
- the *Ionising Radiation (Medical Exposure) Regulations 2000.*[IR(ME)R]

10.8 The Health and Safety Executive has produced an approved code of practice on the *Ionising Radiations Regulations 1999* for those with duties under the Regulations, called *Work with ionising radiation (2000).*

Use of radiation

10.9 When planning and designing radiotherapy services, project teams must seek radiation protection advice early on from the local RPA and external advisors. A prior risk assessment is mandatory at the building design stage.

10.10 Every operational radiotherapy facility will employ one or more radiation protection supervisors [RPS]. The RPS will be a good source of information on local practices and safety rules but the RPA must be consulted on all aspects of design and construction, and must sign off all plans where the suite involves the production or use of radiation.

10.11 Under the IR(ME)R, a medical physics expert [MPE] needs to be involved in all procedures involving radiotherapy. The MPE is specifically required under IR(ME)R to advise on optimisation of patient exposure. Design of new facilities falls under IRR99 and is a role for the RPA. The MPE could help the RPA since he/she may have a better understanding of the exposure factors involved, particularly in radiotherapy and nuclear medicine.

10.12 Early consultation with manufacturers of radiotherapy equipment is also necessary.

Security of radioactive materials

10.13 The planning and design team should also consult the local counter terrorism security adviser (CTSA) at the earliest opportunity for specialist advice in relation to the secure storage and use of radioactive materials.

10

Radioactive discharge

10.14 Wherever practical and permitted by law, radioactive materials will be dealt with by leaving them to decay until they have reached a safe or non-radioactive state. This requires the construction of storage facilities known as 'decay stores'. For longer-lived materials, some discharge into the drainage system of the hospital or into the air as a result of disposal by burning, in approved incinerators, will be necessary. Discharge to drains or into the air may also occur routinely in the use of radioactive materials or as a result of accidents.

10.15 The design of buildings within which radioactive materials are used must constrain their release into the outside environment to levels at or below predetermined levels agreed with Natural Resources Wales [NRW]. NRW has the responsibility for licensing such disposals under the *Radioactive Substances Act 1993*.

Environmental impact

10.16 The International Commission for Radiation Protection (ICRP) states that radioactive materials should only be used where there is no viable alternative. However, where their use cannot be avoided, the level of radioactive contamination of the environment, particularly watercourses into which radioactive fluids are discharged, must be monitored.

10.17 Dilution factors are critically important; if a discharge can be rapidly diluted by enabling a drain to join with others of larger flow and capacity, this will minimise radioactive concentrations and the associated hazards.

10.18 The RPA will give advice on the environmental impact and will be responsible for generating environmental impact models as needed.

10.19 When undertaking building design, the environmental impact of radioactive discharges should be considered at an early stage. Patients who have received unsealed radioactive materials will discharge these in the form of urine and other body fluids. Accordingly, the radioactive materials administered will be discharged over a short period of time, a few hours, into the drainage system.

10.20 Local limits for discharge will exist, and these should be carefully observed.

Decommissioning of facilities

10.21 Unsealed radioactive sources may give rise to chronic contamination of the rooms within which the sources are used, particularly the drainage system from those rooms (if discharge to drains is permitted). In this case, the RPA should be consulted and records examined to determine the nature of the radioactive materials present.

10

10.22 If the half-life is short, it may be wise to delay dismantling pipework etc for an appropriate period of time so that radioactive decay can effectively remove the hazard. Where the half-life is long or such delay cannot be accommodated, special precautions will be necessary and the pipework itself may constitute solid radioactive waste. Should this be the case, the RPA will write a decommissioning scheme of work and will also undertake to work with NRW to ensure appropriate ultimate disposal of the materials.

10.23 In respect of the decommissioning of contaminated sinks, drains etc there is a need for care if chemical agents, including bleach, are used to reduce the radioactive burden, since these may oxidise some radioactive materials in solution, rendering them insoluble. This may result in radioactive gases being released into the immediate environment – increasing the hazard to workers. Detailed professional advice must be obtained for each specific situation.

10.24 Most linear accelerators do not generate radioactive induction in the built environment or structures around them. Accordingly, for the majority of such installations, there are no special decommissioning criteria, and no special precautions need be taken in respect of radioactivity for the room, however the decommissioning of the linac should only be undertaken once the RPA has confirmed any latent activity has decayed

10.25 Linear accelerators operating at above 8.5 MV are capable of inducing radioactive activation in their own structures, most notably the collimators or jaws as well as parts of the couch. In very unusual instances, this activation may extend to the bunker shielding that surrounds the machine. Good design can virtually eliminate this problem.

10.26 When high-energy linear accelerator treatment rooms are being decommissioned, a radioactivity site survey should be conducted and the RPA should be consulted as to whether or not special precautions are needed. It is unlikely that the move toward materials such as Ledite will materially affect radioactive activation, though the potential reuse of Ledite is a factor (see 'Decommissioning costs' below).

Decommissioning costs

10.27 The decontamination and radiation control issues mentioned above are unlikely to add severely to decommissioning costs in radiotherapy facilities. However, the issue of disposing of large amounts of shielding does have a potential impact. There may also be issues associated with the disposal and removal of large items of equipment like linacs, consultation with the RPA should be considered prior to equipment disposal. In addition, consideration will need to be given to the *Waste Electrical and Electronic Equipment Regulations 2013* [WEEE].

10.28 Reinforced concrete structures can only be removed following on-site breakage and demolition. Waste materials are then removed using heavy vehicles and disposed of by landfill or recycling, which involves crushing the material. Some shielding materials, for example Ledite, can be re-used by simply dismantling and returning to the supplier or redeploying in new buildings. Demolition costs should be considered as part of the business case for any new facility.

10

IT infrastructure

10.29 A robust IT infrastructure is essential to provide high-speed links capable of transferring large data files between the different pieces of equipment in the radiotherapy department. Access to secure data storage facilities is also essential.

10.30 Consideration should be given to the location of the Clinical IT Services and associated infrastructure e.g. servers within a Centre. Cancer facilities generate very large amounts of data and the network infrastructure should be designed and configured so as to make efficient use of the systems therein with minimal effect on the rest of the facility. Whilst centralised IT data rooms might be suitable, it may well be clinically appropriate for a local facility to be provided within the radiotherapy unit due to the time critical nature of the radiotherapy service and the integration of IT and the linacs and other critical systems within the facility. This could also ease the support functions offered by the radiotherapy clinical engineering departments of most units.

Children's radiotherapy facilities

10.31 Only specialist designated centres will provide services for children.

10.32 Although throughput may not justify the provision of dedicated radiotherapy facilities, radiotherapy treatment rooms designated for paediatric use should be decorated to appeal to children.

10.33 If there is no local provision for the review of children, dedicated accommodation will be required within the radiotherapy unit.

10.34 A separate recovery room should be provided, in close proximity to the treatment room, for children treated under general anaesthetic or sedation.

10.35 'Play therapy' can reduce the need for sedation. This involves using toys and games, safely and in a friendly fashion, to reflect treatments the child may encounter. This should take place in a play therapy room, close to the treatment area.

10.36 In dedicated units, consideration should be given to the use of permanently-installed monitoring. CCTV observation is essential. Colour equipment must be used. Voice communication with the patient, accessible to parents/nurses etc, is very useful in reducing fear and gaining patient co-operation.

10.37 Children require access to HDR brachytherapy facilities so infrequently that the adult facility will always be used.

10

10.38 Unsealed source treatments present a particular challenge, given the need for a child-friendly, yet specialised, side ward environment which cannot be used for other purposes for much of the time due to radioactive contamination. The use of adult facilities is feasible but difficult in both nursing and social terms. Provision of such treatments on the open ward is unlikely to be lawful under the IRR99. When the mandatory prior risk assessment is undertaken at the building design stage in conjunction with the RPA, specific intended treatments must be taken into account to determine whether such treatments are appropriate for an open ward environment or whether a side-room is required.

10.39 See **paragraph 10.9**, 'Use of radiation'; *Improving outcomes in children and young people with cancer* (NICE 2005); and *Key messages for commissioners of cancer services for young people* (Children & Young People's Implementing Outcomes Guidance Advisory Group 2008).

Storage

10.40 Storage is required for the wide range of materials and tools used (for example: plaster models, bandages and acetate) dependent on local requirements. Storage facilities should either be out of sight of patients or have doors. Items such as head and neck moulds that may be distressing for patients should not be stored on open shelves.

10.41 Body stereotactic radiotherapy generates a considerable demand for storage of body shells, which will require labelling and cataloguing. Early consultation with the project team will be essential to assess storage needs if stereotactic radiotherapy is proposed. The body shell will need to be kept for as long as the patient is receiving treatment and may, during this period, need replacing to allow for changes in the patient's body shape.

Functional relationships

Internal functional relationships

10.42 **Figure 4** outlines the relationship between the various functions within a radiotherapy unit and reflects the care pathway set out above.

10.43 Interview and counselling room(s) should be located near to the entrance/exit of simulator and treatment rooms.

Relationships with other departments

10.44 A radiotherapy physics service is integral to the delivery of radiotherapy treatment. This Welsh Health Building Note describes the specific facilities required within the radiotherapy unit itself. However, good access is also required to the general medical physics/clinical engineering services which may well be housed elsewhere, within the medical physics department:

10

Medical physics (other than radiotherapy physics, including clinical engineering)

10.45 Radiotherapy facilities require good access to mechanical and electronics workshops for equipment maintenance undertaken in-house. Bespoke engineering devices may be required (for example plastic immobilising shells and supporting devices – which should be related to and incorporated in the mould room facilities).

Radiopharmacy unit

10.46 Some medical physics departments include a radiopharmacy unit. For guidance on the design of a radiopharmacy unit see 'Medicines management' in WHBN 14-01:2014 *Pharmacy and radiopharmacy facilities* and **paragraph 10.175** of this document 'Radiotherapy physics and technology accommodation'.

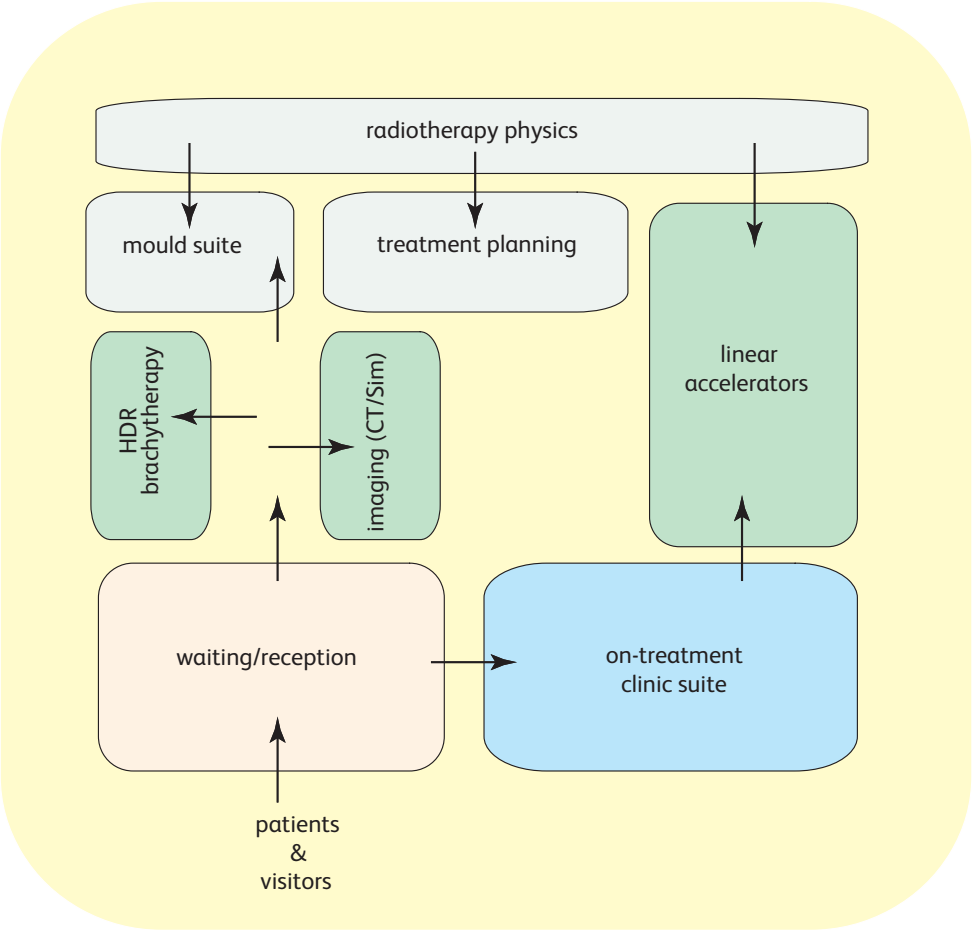

Figure 4 Radiotherapy unit: internal functional relationships

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Public spaces

Reception/waiting area

10.47 The waiting area may need to accommodate inpatients arriving for treatment on beds and in wheelchairs with or without drip stands/oxygen cylinders attached, although experience in many recently built schemes indicates that this should be a project option as operational procedures may render it unnecessary.

10.48 See also 'Entrance, reception and waiting' in WHBN 00-03:2013 *Clinical and clinical support spaces.*

On-treatment review suite

10.49 The on-treatment review suite comprises multi-purpose clinical rooms for the review and management of patients undergoing radiotherapy treatment, for example dietetic activities and discussions. The suite may also be used for the assessment of emergency patients.

10.50 Since patients may be attending on hospital trolleys, a trolley bay/waiting area should be provided.

10.51 An anaesthetic room is required if children are being treated on the unit.

Radiotherapy treatment suite

10.52 External beam radiotherapy is delivered by large machines (usually linear accelerators) situated within shielded facilities, the requirements for which are described in this section. Superficial/orthovoltage facilities may be provided as part of this suite and are also described here.

10.53 For guidance on the design of facilities for brachytherapy (internally delivered radiation treatment), see **paragraph 10.114,** 'HDR brachytherapy suite (optional)'.

Radiotherapy treatment rooms (linear accelerators)

10.54 Linear accelerators must be installed in purpose-designed treatment rooms (known as bunkers) with the appropriate radiation shielding built into the construction.

10.55 These rooms should be large enough to allow easy access and movement of a patient on a bed, hoist, trolley or wheelchair. The design must also allow full clinical use and setup of all machines. The entrance to the room should be wide enough to allow for the delivery of the linear accelerators, large heavy components and subsequent replacement machines. Corner/wall protection against damage by equipment, wheelchairs, stretchers, beds etc should be considered.

10

10.56 The entrance will usually comprise a shielded corridor or maze to ensure there is no radiation risk to the adjacent environment. Some designs feature heavy protective doors without the provision of a maze (usually because of space restrictions). Another option is to install a short maze with a half door (which will open more quickly than a full door).

10.57 The width of the primary barrier, the design of the entrance to the room, and the level of shielding above and below the linear accelerator, all depend on the design of the machine to be used, and the usage of adjacent rooms.

10.58 Access control gates and/or infrared beams/photoelectric cells must be provided to cut off/interlock to the machine.

10.59 Privacy and dignity issues should be considered, including siting of doors and/or entrances into treatment rooms.

10.60 Environmental services usually gain access to the treatment room via the ceiling void of the entry route into the treatment room, often referred to as the maze. The effectiveness of shielding in the maze is often increased by concrete baffles. These should overlap to stop the direct path of radiation, but should be offset from each other and positioned in such a way as to allow services to weave through them.

10.61 The ceiling should be sufficiently strong, and there should be sufficient space above the false ceiling to allow for electrics for back-lit images and other technologies.

10.62 Trenches and floor chases for hidden cables and support frames will be extensive and will vary from one manufacturer to another. It may be possible to establish, through consultation with manufacturers, the extent and critical dimensions of these features. This information should be available to the design team at an early stage in the design process to allow the features to be incorporated into relevant drawings and to ensure that the integrity of fire compartmentation is not breached.

10.63 A duct(s) will pass between the treatment room and the control area. The ducts should not compromise the radiation shielding offered by the shielding walls or floor (in the case of a treatment room with radiation-sensitive areas beneath).

10.64 Radiotherapy treatments must be precise and accurate in terms of aiming the beam at the intended target. This requirement means that almost all linear accelerators use a base frame set into the floor that links the accelerator gantry to the patient support device or couch.

10.65 A recess may be needed for the base frame; this will need to allow service connection back to the treatment machine base and floor trench.

10.66 A lifting beam may be required over the centre of the linear accelerator, or an A-frame crane could be used instead.

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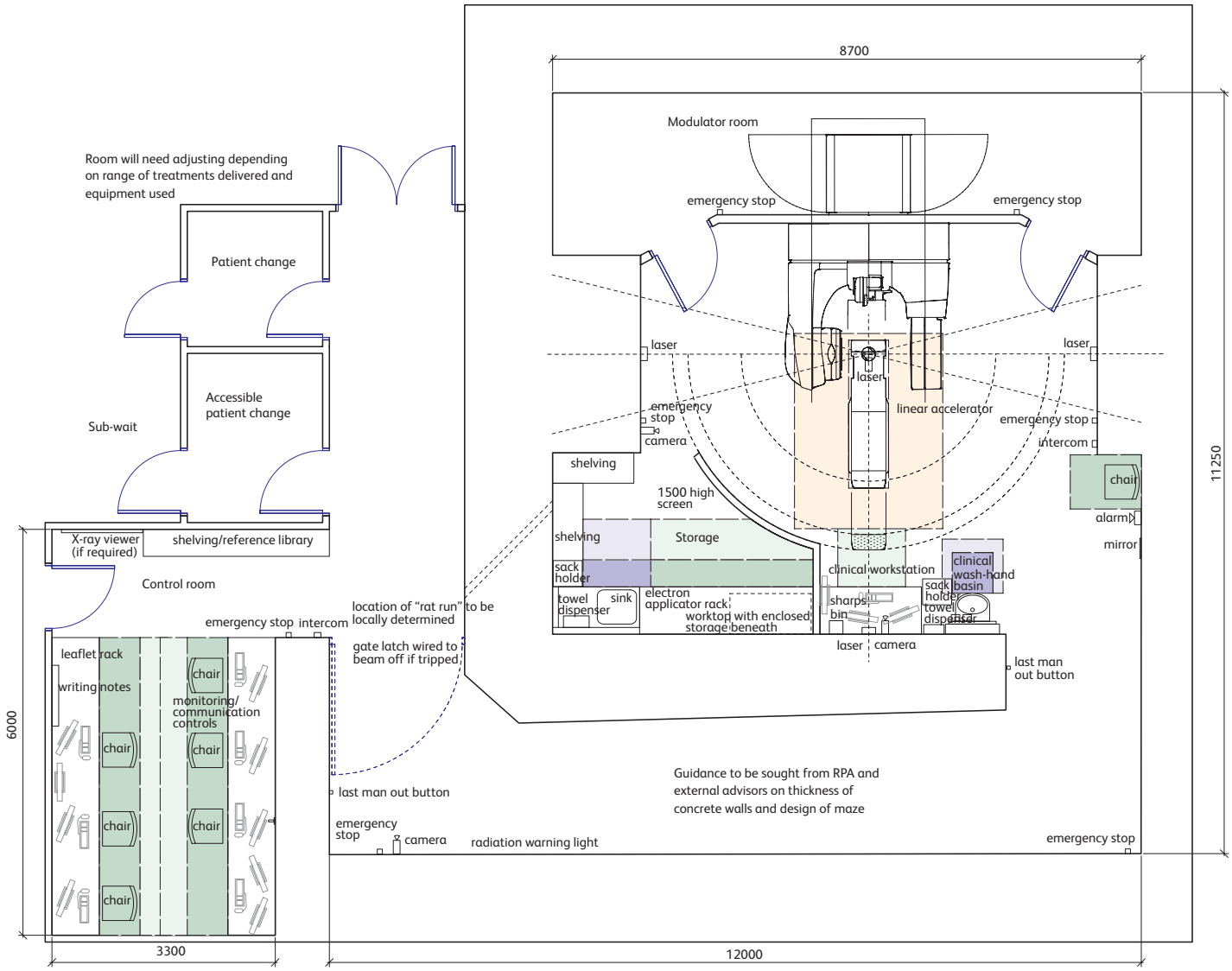
10.67 Structural supports are required for heavy ceiling-mounted equipment such as the frames of data monitors. Rigid support is needed for wall-mounted alignment lasers and ceiling lasers.



Storage facilities

10.68 Storage will be required for a wide range of medical equipment, the requirements to be determined in consultation with users and machine specialists. RPA advice on the suitability of storage facilities is essential; for example, metallic shelves may not be appropriate in some circumstances.

10.69 Bespoke storage facilities, repeated in each treatment room, will allow staff to move between rooms and work more efficiently as they will be familiar with storage arrangements in each room.

10

10.70 Specialised storage is needed for immobilisation devices, vacuum bags and body casts.

10.71 Accessory equipment (for example: breast boards, lung boards, electron applicators and their lead end pieces) should have dedicated storage, either in cupboards, on shelves or hanging.

10.72 Storage should be provided for total body irradiation (TBI) and stereotactic body radiation therapy (SBRT) equipment.

Other design features

10.73 The following facilities should also be provided in treatment rooms:

1. wall mounted dispensers for paper towels, paper cups, soap, paper sheets etc;
2. wash-hand basin, shelf and mirror;
3. chair for patient;
4. coat hooks;
5. alignment lasers firmly bolted to structure, linked to the laser generator using fibre-optic cable;
6. last-man-out button, located near the entrance to the maze (advice to be sought from the RPA and HSE);
7. a safety sign and warning light at the entrance to the treatment room and within the room;
8. emergency stops for the linac;
9. music facilities;
10. CCTV cameras mounted at high level to monitor the patient during unaccompanied periods;
11. a two-way communication system between the control area and treatment room;
12. access to IT, workstations and wireless connectivity.

10.74 The number of CCTV cameras required will depend on local practice. Closed-circuit televisions should have pan and zoom facilities and secrecy switches. They may be interlocked to the entry system to the maze provided that the interlock can be overridden from the control area.

10

Interior design of treatment rooms

10.75 The dominating nature of a linear accelerator and the mass of high-tech equipment presents a daunting experience for patients. Every opportunity should be taken with the interior design to create a pleasant, non-intimidating environment with a sense of order and reassurance. Lighting will play an important role.

10.76 Murals and paintings on walls and ceilings may provide welcome distraction. Consultation on artwork should begin at an early point in the design process. Care should be taken when positioning artwork to avoid obstructing patient support aids and the sightline of lasers. Artwork must not cover radiation warning lights or emergency stops.

Environmental and engineering considerations

10.77 Lighting will need to vary from subtle and non-glaring (for patient relaxation) to high-level (for maintenance tasks). It should be possible to dim the lighting. A spotlight may be required at the foot of the couch/bed. Ventilation (number of air changes per hour) must be designed in accordance with HTM 03.01:2007 and consideration should be given, not only to the presence of airborne contaminants but also, to the cooling requirements of the system. Local variable temperature control is required. Access to chilled water is required for the operation of the linacs.

10.78 Particular consideration should be given to fire protection systems in linear accelerator treatment rooms, where patient movement may be compromised.

Other radiotherapy treatment suite spaces

Waiting area (optional)

10.79 Waiting areas may be provided either as sub-waits associated with a single or a pair of linacs or centralised within one area, depending upon the size and layout of the unit.

10.80 If the organisation's operational policy requires supervision/observation of the sub-wait areas, this may be provided from the linear accelerator control room, where the design solution permits.

Trolley waiting area (optional)

10.81 Where necessary, a trolley bay can be provided in an area easily observed by clinical staff and not closed off. Every effort should be made to ensure privacy and dignity; however, patient safety is of paramount importance.

10

Patient changing

10.82 Patient changing facilities should comprise separate lockable changing rooms adjacent to treatment/imaging rooms and positioned so others cannot see patients while changing or once they have changed.

10.83 A minimum of two changing rooms is required. One should be of sufficient size to permit changing for patients with a disability and those on stretchers/beds.

10.84 Ideally, patient changing rooms should be 'pass through', with the patient entering on one side and exiting on the other into the imaging room. If a separate waiting area is provided for changed patients, gender separation should be ensured.

10.85 See also 'Changing facilities' in WHBN 00-02:2013 *Sanitary spaces.*

Linear accelerator control areas

10.86 The number of computers, printers, keyboards, workstations etc will depend on local practice and choice of manufacturer.

10.87 Early consultation is recommended to establish equipment requirements and the equipment's position relative to the maze entrance and patient areas. Efficiency of patient observation, ease of staff movement, data protection and staff training requirements are key considerations.

10.88 Staff require easy access to the treatment room maze. They also need to be able to see members of the public approaching the maze entrance, while shielding from view the monitors displaying patient information.

10.89 The minimum depth of worktops should be 800 mm to accommodate large computer monitors.

10.90 Each linear accelerator control room will require sufficient worktop space to accommodate all of the necessary equipment to safely operate the linac. The design and layout of the control area workspace will require detailed discussions with the selected supplier and the clinical end users. There should be sufficient space to allow radiographers to pass each other safely.

10.91 Daylight in the control area is highly desirable, but monitors should not be subject to glare from direct sunlight.

10.92 A large number of sockets, computer network and telephone points will be required in the control areas. Cable containment systems that offer flexibility and change may be appropriate.

10

10.93 Dosimetry and QA monitoring cables should run through tunnels or 'rat runs' and be terminated in suitable places in the control area and in the treatment room. The dimensions of the 'rat run' route will require consultation with the local medical physics department. The tunnel should be angled to ensure that it does not provide a direct path for any radiation.

Radiographer preparation room

10.94 There should be separate rooms adjacent to each control area where the following activities take place:

1. data preparation for treatment;
2. calculations;
3. image review and manipulation;
4. data transfer checking;
5. capturing initial set-up parameters.

10.95 If lack of space precludes the provision of a separate room, the control area should be large enough to accommodate these functions, although it should be borne in mind that this might prove distracting. Care should be taken to ensure that patients cannot hear clinicians' conversations or view screens with confidential information displayed.

Treatment planning room

10.96 Workstations should be located in quiet areas to enable medical staff to review portal images, treatment plans and outline volumes.

10.97 The workstations should be networked to the treatment planning system, PACS and the record and verify system. The system should have access to data from the imaging modalities and brachytherapy equipment.

10.98 Electronic communication links will be required from all IT systems to the suppliers for 'remote diagnostics testing' as part of service agreements.

10.99 Where paper treatment sheets are still used, these will be stored in the medical records department. Some storage may still be required for blank treatment sheets where these are written by hand.

10

Superficial/orthovoltage radiotherapy treatment facilities (optional)

Superficial/orthovoltage radiotherapy treatment room

10.100 An orthovoltage machine is more powerful than the superficial machine and gives out levels of energy that require concrete walls to protect the adjacent spaces, whereas a superficial machine only requires X-ray standard protection. Orthovoltage machines can be used at a lower output to deliver superficial treatments.

10.101 For full future flexibility, all rooms should ideally be sized and shielded to accommodate an orthovoltage machine. A small maze is a viable alternative to heavy door construction.

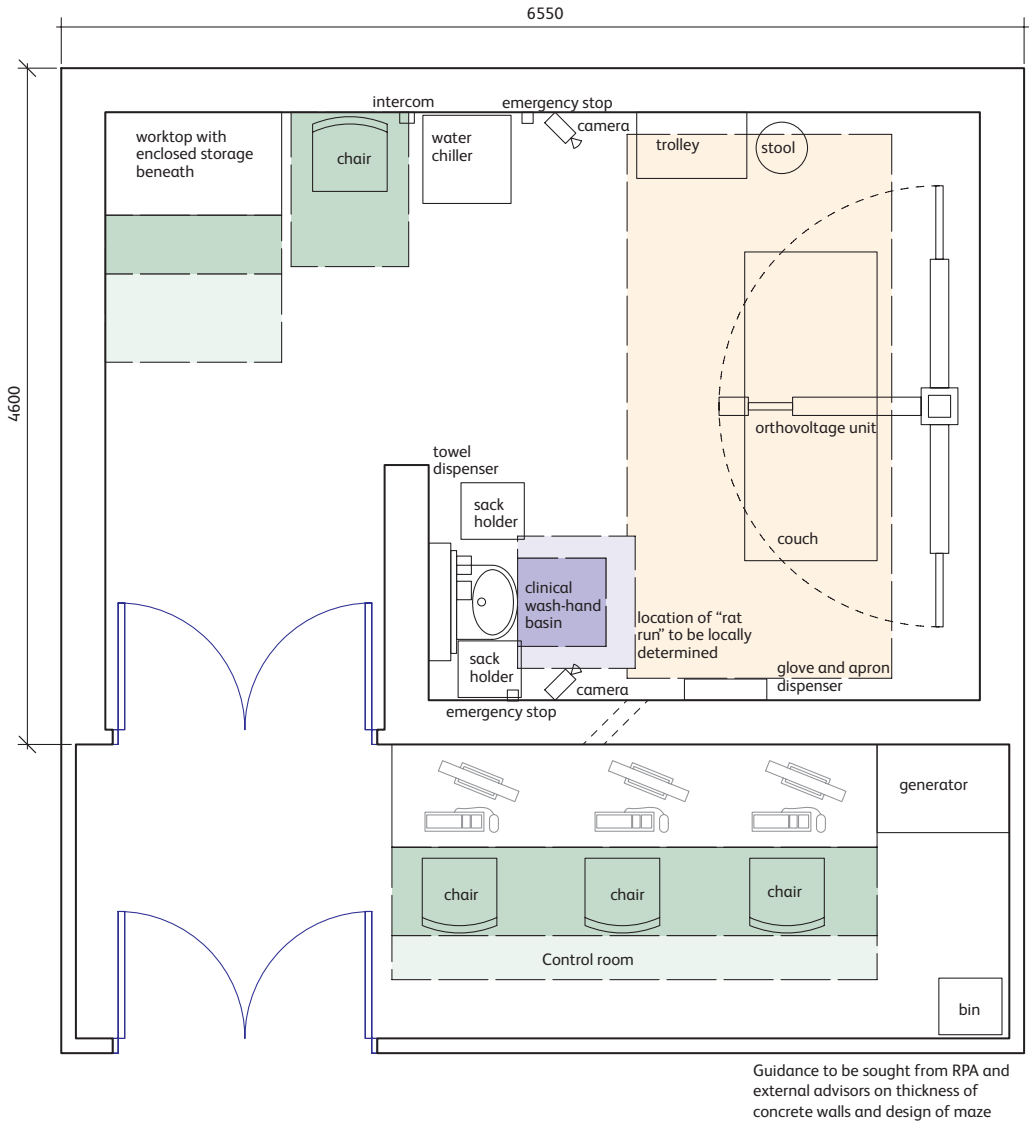


Figure 6 Superficial/orthovoltage radiotherapy treatment room:example layout

10

10.102 The X-ray tube should be mounted on a simple but robust floor or ceiling suspension and powered by a conventional X-ray generator system. Doors and viewing windows must be constructed with adequate radiation protection. CCTV may be used in addition, or as an alternative, to a window.

10.103 Rooms should be of sufficient size to allow all areas of the patient's body to be treated with the patient lying/sitting in a stable position.

10.104 They need to contain specialist shelving to house the beam-defining applicators.

10.105 Each room should contain a mobile treatment couch, spotlight, clinical wash-hand basin and a patient wash-hand basin.

10.106 There should be an interlocked door between the treatment room and the control area.

Machine room: Superficial/orthovoltage

10.107 The requirements for this room are specific to the equipment manufacturer.

Control area: Superficial/orthovoltage

10.108 The number of computers, printers, keyboards, workstations etc will depend on local practice and choice of manufacturer.

10.109 Early consultation is recommended to establish equipment requirements and the equipment's position relative to the maze entrance and patient areas. Efficiency of patient observation, ease of staff movement, data protection and staff training requirements are key considerations.

10.110 Staff require easy access to the treatment room maze. They also need to be able to see members of the public approaching the maze entrance, while shielding from view the monitors displaying patient information.

10.111 Daylight in the control area is highly desirable, but monitors should not be subject to glare from direct sunlight.

10.112 A large number of sockets, computer network and telephone points will be required in the control areas. Cable containment systems that offer flexibility and change may be appropriate.

10

10.113 Dosimetry and QA monitoring cables should run through 'rat runs' and be terminated in suitable places in the control area and in the treatment room. There should be provision for two sets of dosimetry cables to:
(a) provide some redundancy; and
(b) facilitate cross-calibration of ion chambers against each other.
The tunnel should be angled to ensure that it does not provide a direct path for any radiation.

HDR brachytherapy suite (optional)

10.114 Prior to delivery of brachytherapy, an applicator or tube is inserted or implanted in the patient, often in a treatment room which has been constructed to undertake surgical procedures as well as brachytherapy. Where the implantation is performed in an operating theatre suite separate from the treatment room, the patient is taken on a trolley from theatre to either an MR or CT scanner and thence to the HDR suite.

10.115 This guidance assumes that the patient would be changed already from theatre, so patient changing facilities are not required as part of the suite.

10.116 A recovery room is required.

Functional relationships

10.117 **Figure 7** outlines the relationship between the various functions forming a HDR brachytherapy suite.

HDR brachytherapy treatment room

10.118 HDR treatment must be undertaken in a shielded room incorporating a small maze and/or a protective door. A dedicated treatment room may be located in the radiotherapy unit or may be associated with an operating theatre suite. Alternatively, treatment may be delivered in a linear accelerator treatment room within the radiotherapy unit. This reduces building and maintenance costs but interrupts the use of the linear accelerator.

10.119 Ideally, access to the room should be through the control room (see **Figure 7**). The security features required by the *High-activity Sealed Radioactive Sources and Orphan Sources Regulations 2005* (the 'HASS Regulations') must be incorporated into the treatment room design. Two physical barriers are required: this can be achieved with a secure inner door and steel roller shutter outer door. A source exposed indicator should be sited on the rear wall of the room where it can be seen as the door opens.

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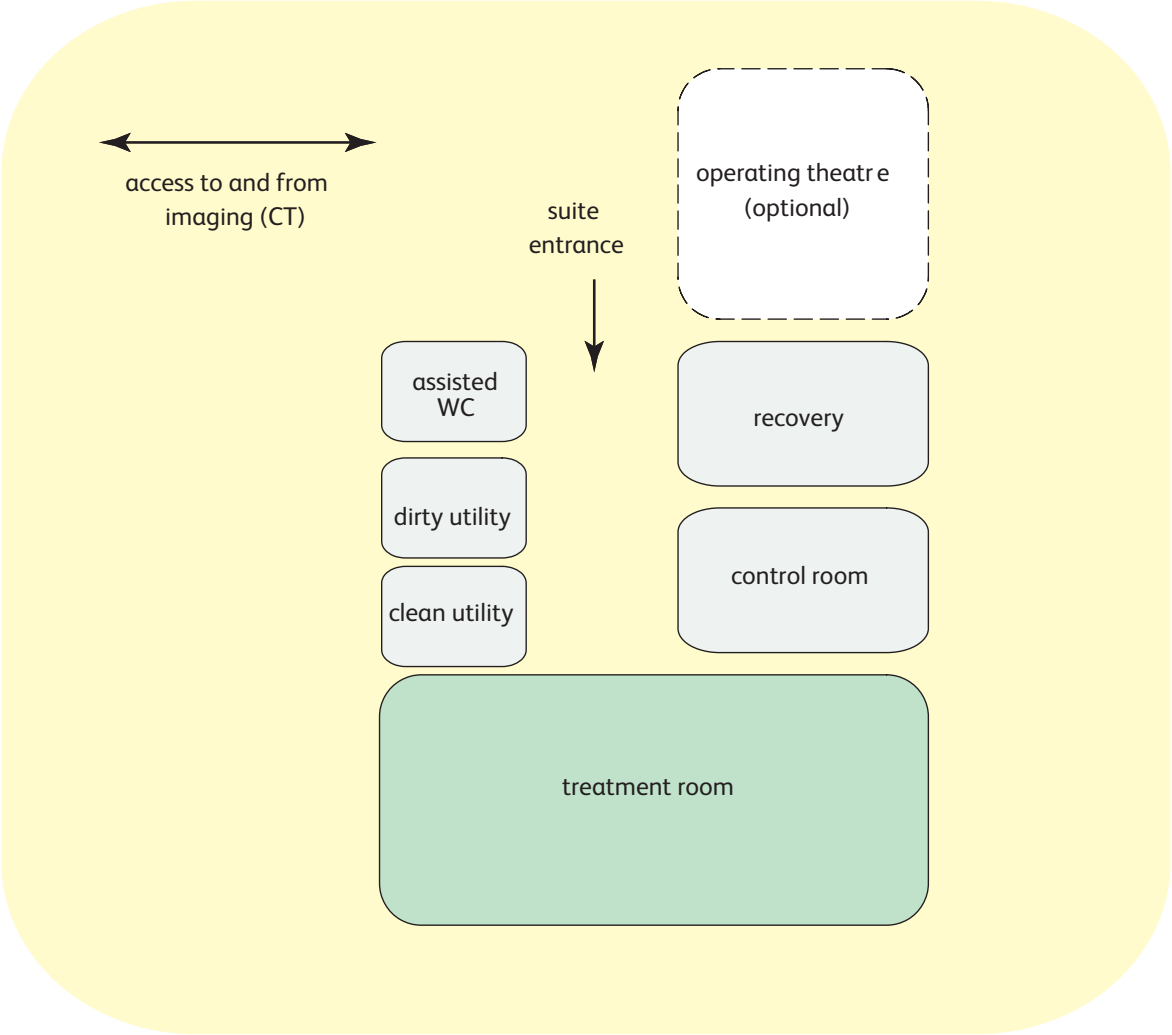

Figure 7 HDR brachytherapy: internal relationships

10.120 The size and design of the room should be appropriate for the procedures that are to be performed in the room. Procedures requiring extensive pre-cleaning and post-cleaning should be performed elsewhere, and the room should be used for treatment delivery only. If insertions are undertaken in the brachytherapy treatment room itself, it must be appropriately equipped for surgical procedures. The room should be large enough to allow access for fluoroscopy equipment and crash trolley if required. Space requirements for new procedures and technological developments should be considered.

10.121 Open worktop bench space should be provided, the length dependent on local requirements.

10.122 There may be a need for medical gases, consultation with the clinical users should be undertaken at the earliest opportunity.

10

10.123 A sink is required for the cleaning of equipment, along with a separate wash-hand basin for staff use.

10.124 Adequate storage should be provided outside the room for applicators, accessories and QA equipment so the room is easily cleanable and remains uncluttered.

10.125 Search (last-man-out) buttons should be positioned so that the whole room can be seen by the operator upon actuating it.

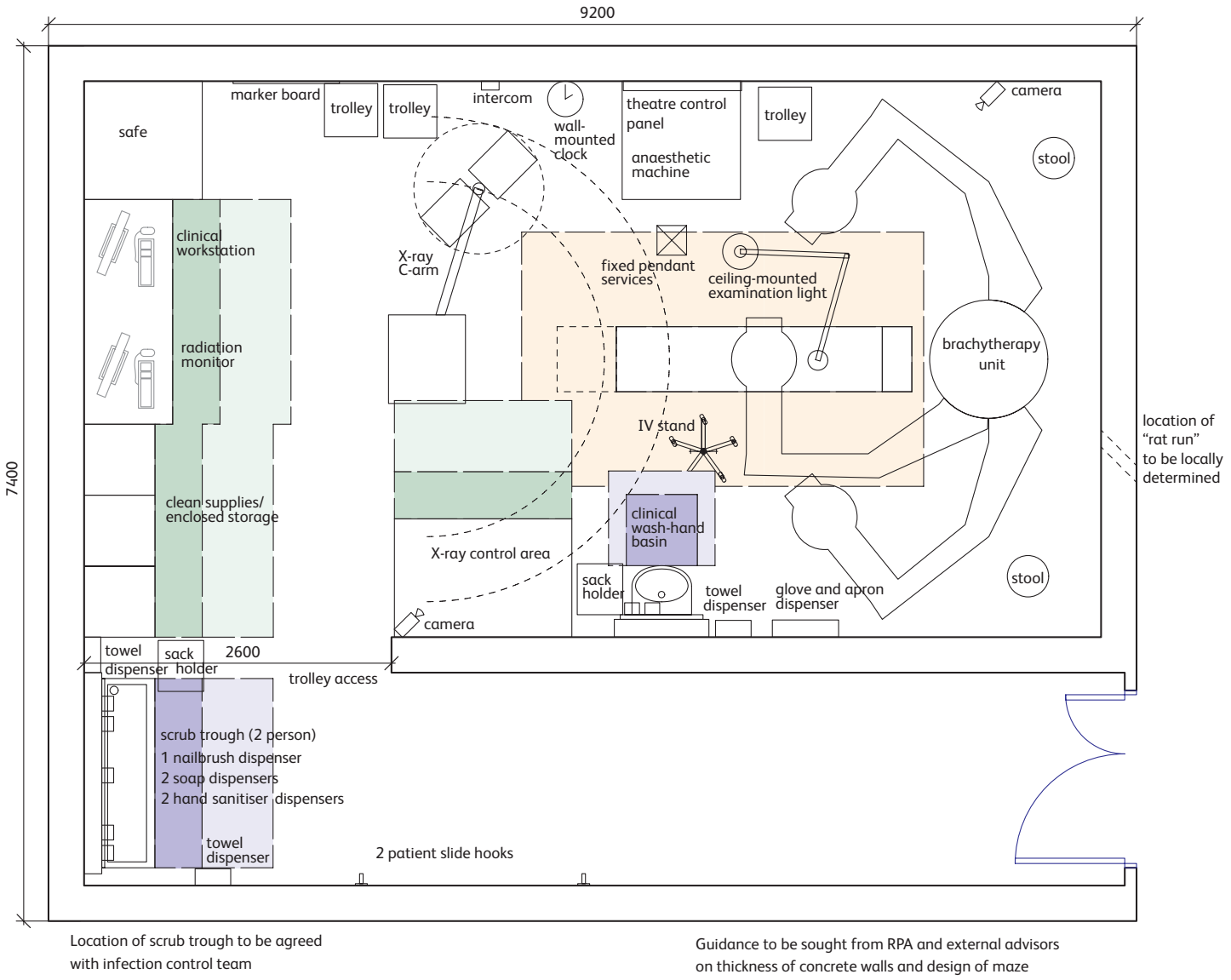

Figure 8 Brachytherapy room: example layout

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Control area: Brachytherapy

10.126 A remote protected observation/control area will also be required. This provides safe monitoring of the entrance to the room. CCTV will be needed for patient observation. Intercom facilities between the treatment room and control area are required to permit direct communication with the patient during the treatment. A 'rat run' should be provided between the treatment room and control area, as described for the linear accelerator control room.

10.127 The number of computers, printers, keyboards, workstations etc will depend on local practice and choice of manufacturer.

10.128 Early consultation is recommended to establish equipment requirements and the equipment's position relative to the maze entrance and patient areas. Efficiency of patient observation, ease of staff movement, data protection and staff training requirements are key considerations.

10.129 Staff require easy access to the treatment room maze. They also need to be able to see patients approaching the maze entrance, while shielding from view the monitors displaying patient information.

10.130 The requirement for X-ray image viewing will be determined locally.

10.131 Daylight in the control area is highly desirable, but monitors should not be subject to glare from direct sunlight.

10.132 A data safe should be used to store source and treatment records.

10.133 A large number of sockets, computer network and telephone points will be required in the control areas. Cable containment systems that offer flexibility and change may be appropriate.

10.134 Dosimetry and QA monitoring cables should run through 'rat runs' and be terminated in suitable places in the control area and in the treatment room. There should be provision for two sets of dosimetry cables to:
(a) provide some redundancy; and
(b) facilitate cross-calibration of ion chambers against each other.
The tunnel should be angled to ensure that it does not provide a direct path for any radiation.

10

Planning area: Brachytherapy

10.135 Space must be allocated for the treatment planning activities associated with the delivery of brachytherapy procedures. The number of computers, printers, keyboards, workstations etc will depend on local practice and choice of manufacturer.

Store: Sealed radioactive source

10.136 The function of this room is to provide a suitable environment for the receipt, storage and handling of solid or sealed radioactive materials. It should be located alongside the brachytherapy rooms.

10.137 The design must comply with the Health and Safety Executive's approved code of practice *Work with ionising radiation* (HSE 2000) and the HASS Regulations 2005.

10.138 An area will be needed for recording radioactive materials in stock and in transient use. Storage will be required for shielded containers used for transporting radioactive materials and for applicators and accessories in regular use.

10.139 If preparation and handling of radioactive sources takes place in the unit, a shielded work bench may be required, normally constructed using lead. Because of the weight of lead shielding needed, localised floor loading will be abnormal and will need to be taken into account, either by design of the structure or by siting.

10.140 A storage safe is required for the sealed sources. The preparation varies with the treatment requirement, but will always include an assay of the radioactivity present and may involve source sterilization.

10

Imaging suite

10.141 The exact number and makeup of the imaging facilities in a cancer unit will depend on the location and facilities already available from other departments, eg radiology. Cancer units will require ready access of some or all of the following imaging facilities.

- PET/CT Scanner,
- CT Scanner,
- CT Simulator,
- MRI Scanner,
- SPECT/CT,
- fluoroscopy,
- digital plain film imaging,
- ultrasound,
- surgical imaging systems,
- mammography imaging system.

Waiting area

10.142 If the organisation's operational policy requires supervision/observation of the sub-wait areas, this may be provided from the imaging control room, where the design solution permits. See also 'Waiting area' in WHBN 00-03:2013 *Clinical and clinical support spaces.*

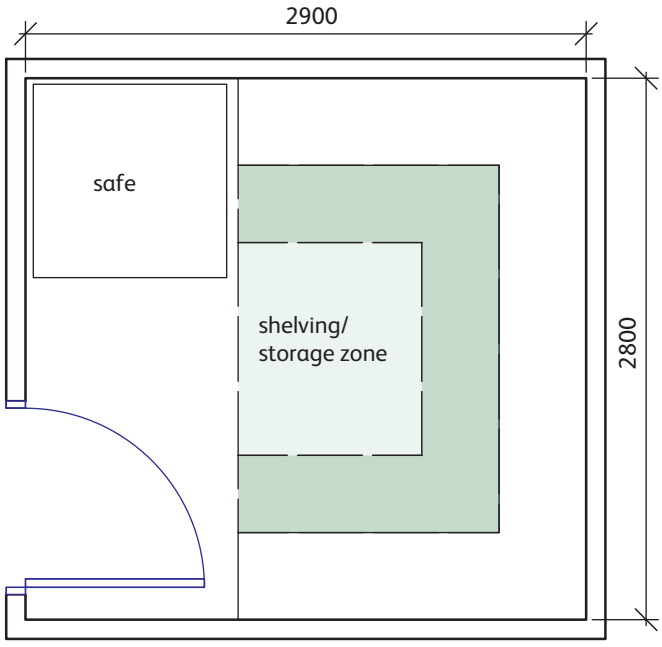

Figure 9 Sealed radioactive source store: example layout

10

Patient changing

10.143 Patient changing facilities should comprise separate lockable changing rooms adjacent to treatment/imaging rooms and positioned so others cannot see patients while changing or once they have changed.

10.144 A minimum of two changing rooms is required. One should be of sufficient size to permit changing for patients with a disability and those on stretchers/beds.

10.145 Ideally, patient changing rooms should be 'pass through', with the patient entering on one side and exiting on the other into the imaging room. If a separate waiting area is provided for changed patients, gender separation should be ensured. See also 'Changing facilities' in WHBN 00-03:2013 *Clinical and clinical support spaces.*

Imaging room(s)

10.146 The design of an individual room is dependent on the type of imaging device to be installed but must include adequate protection measures against hazards.

10.147 Orthogonal lasers may be required, local consultation should be undertaken as to the need for such systems in all rooms.

10.148 The orientation of the imaging device within the room will depend on the space and local preference, but easy access is required to the couch by trolleys, beds, a portable hoist and wheelchairs.

10.149 Facilities must include injection facilities and, depending upon local operational policies, anaesthetic gases.

10.150 Dedicated storage is required in cupboards, on shelves or hanging for accessory equipment (for example: phantoms, QA devices, immobilisation devices) and a range of couch tops.

10.151 The position of the viewing window should provide the best possible view of the patient during the imaging procedure and the equipment as it moves by remote control. CCTV should be provided to enable the patient to be viewed at all times during a procedure.

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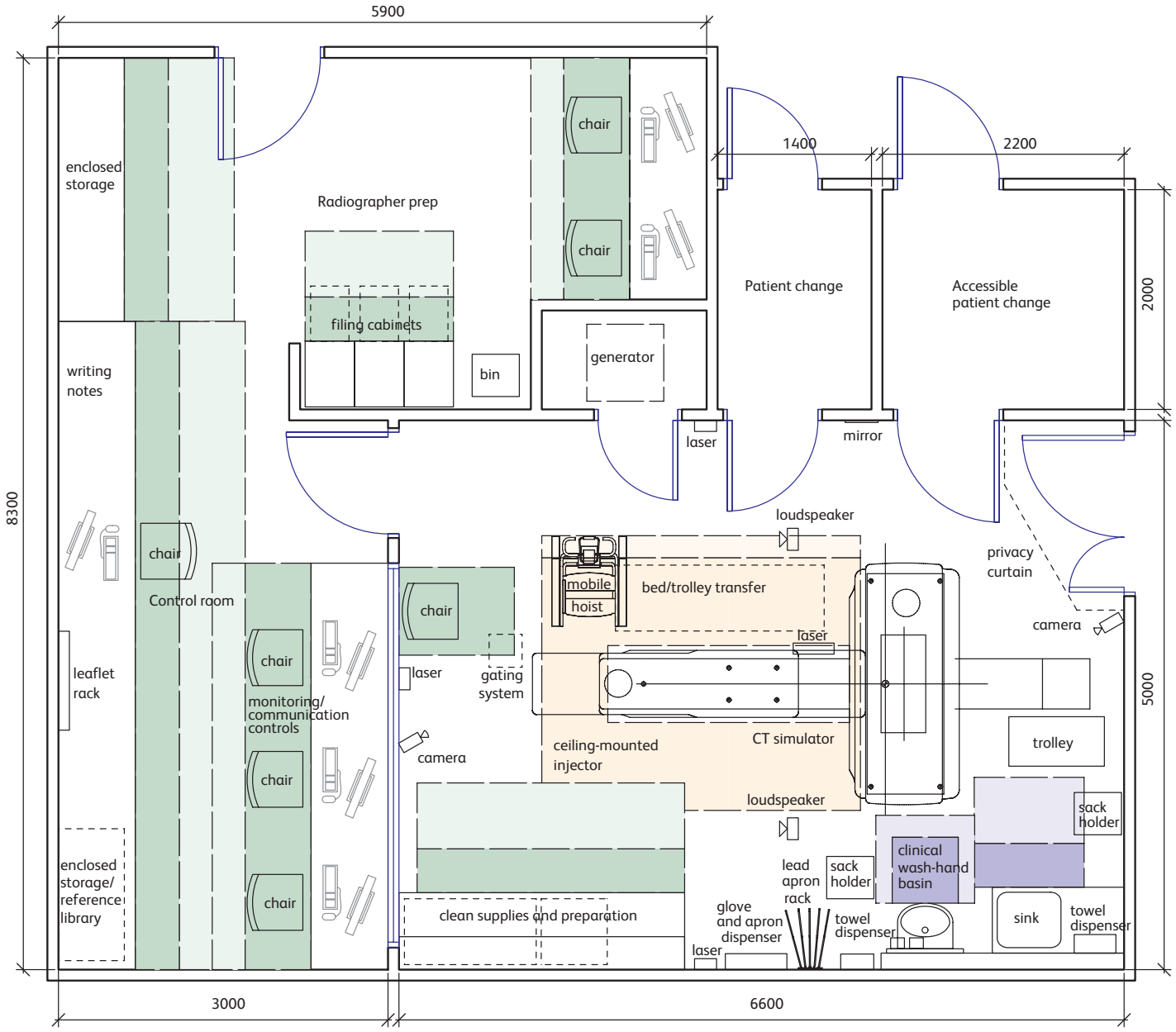

Figure 10 Imaging room: example layout

Imaging control area(s)

10.152 There should be a closed control area adjacent to each imaging room with access to the imaging room and patient changing facilities. The area should include an appropriately shielded viewing window. The design of the control area should be appropriate to the imaging modality and local practice.

10

10.153 Adequate workbench space with network points should be allocated for the workstations and imaging device monitors and to permit local clinical practice. This will include consideration of viewing of images and data from PACS systems, electronic patient management systems and manipulation of data acquired during individual imaging sessions.

10.154 Other requirements include a telephone, cupboards/drawers/shelving for storage, a lockable cupboard for drugs, and space for storage of contrast media in an appropriate temperature-controlled environment.

Radiographer preparation room

10.155 There should be separate rooms adjacent to each control area where the following activities take place:

a. data preparation for treatment,

b. calculations,

c. image review and manipulation,

d. data transfer checking,

e. capturing initial set-up parameters.

10.156 If lack of space precludes provision of a separate room, the control area should be large enough to accommodate these functions. Care should be taken to ensure that patients cannot hear clinicians' conversations or view screens with confidential information displayed.

Imaging clinical preparation room

10.157 A clinical room is required for the preparation of patients requiring barium, catheterisation and other pre-imaging clinical procedures. It should include facilities to store, prepare, dispense and clear away drinks etc.

Mould suite

Impression and fitting room

10.158 It will frequently be necessary to immobilise the patient to ensure the safe and accurate delivery of external beam radiotherapy. To achieve this, a mask is custom-made from various materials, for example thermoplastics or thin plastic sheets (PETG), to match the patient's features. This is fitted onto the patient and registered to the treatment couch, thus restricting patient movement during treatment.

10

10.159 To align the part of the body to receive radiation treatment, it may be necessary to support a particular limb or other part of the body. This may be achieved using vacuum bags or foam blocks, which are available as standard items or may need to be specially produced, to be decided locally.

10.160 A room is required for the manufacture of immobilisation shells or supporting devices, providing wheelchair/bed access. The patient will usually need to remove clothing, therefore changing facilities within an adjoining room area will be needed.

10.161 The process may be lengthy and unpleasant, and may involve taking impressions. To ease the process for the patient, the room should offer a light, airy environment and be as comfortable as possible. Ceilings may be designed with some point of interest to relieve patients' boredom. Background music may also be considered. Seating should be provided for relatives or carers accompanying patients. The provision of a WC in the vicinity of the mould suite should also be considered.

10.162 A dentist's chair and height-adjustable couch may be required. The dignity of the patient should be considered when locating the couch in relation to doors. Relocatable frames will be required when using stereotactic techniques instead of shells.

10.163 A wash-hand basin, mirror, shelf, seat and coat hooks will also be required.

10.164 If plasterwork is undertaken, a plaster sink with splash-back will be required in addition to the patient wash-hand basin. For guidance on the design of plaster sinks see WHBN 00-10 Part C:2014 *Sanitary assemblies.*

10.165 A hot-water bath, with filling and draining facilities, will be required for use of thermoplastics.

10.166 Locally adjustable heating and ventilation should be provided to control local heat gain and odours.

10.167 The floor covering should be non-slip linoleum or vinyl with coved skirting for ease of cleaning.

10.168 Alignment lasers should be fitted in the mould room at the same height as those in the linear accelerator treatment rooms.

10.169 Technicians will need to view imaging data and carry out clerical work and reporting. A workstation should be provided with a computer network point, sockets, telephone and filing cabinet.

10.170 See also WHBN 00-02:2013 *Sanitary spaces.*

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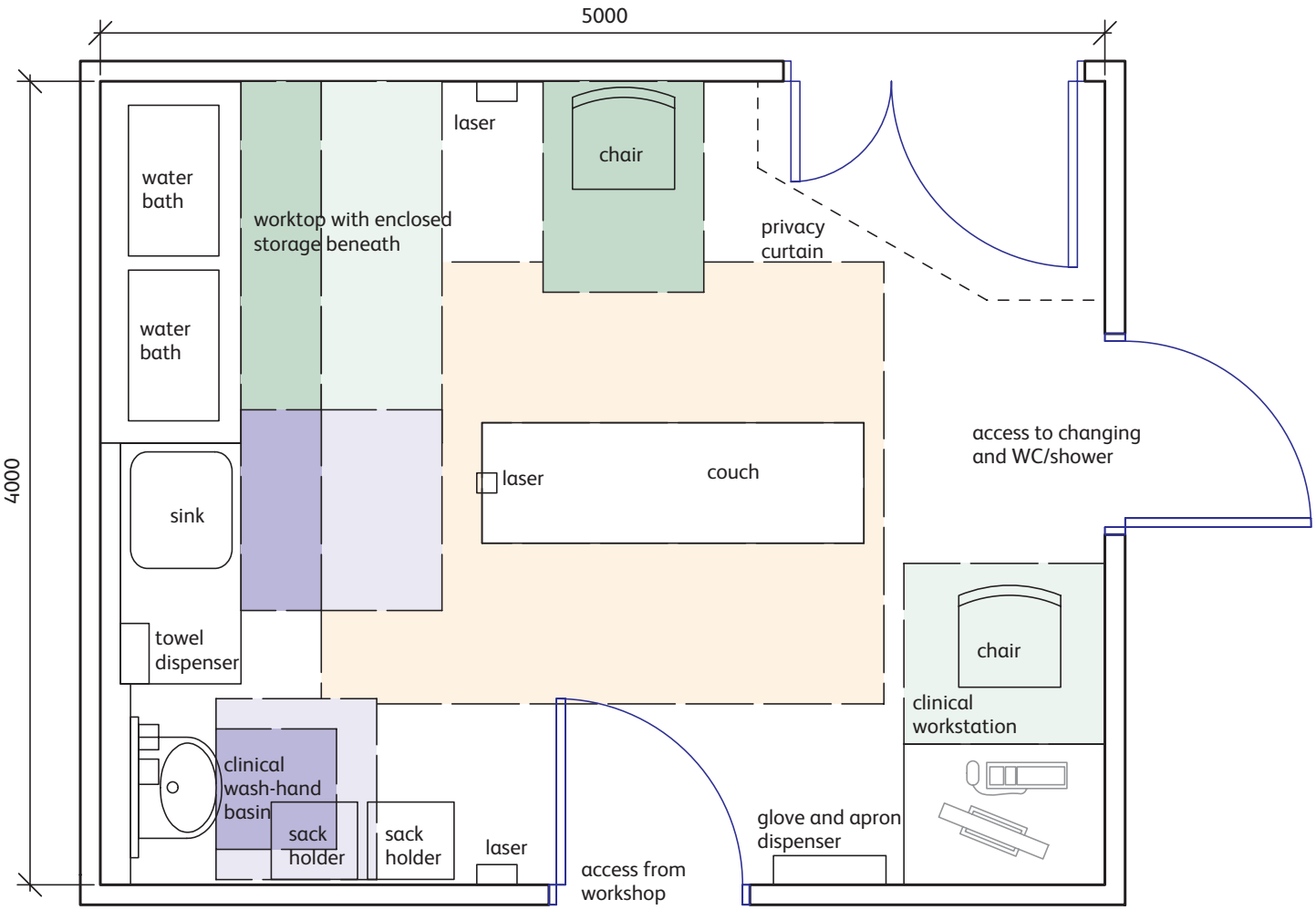

Figure 11 Impression and fitting room: example layout

Patient changing

10.171 Ideally, patient changing rooms should be 'pass through', with the patient entering on one side and exiting into the mould room. See also 'Changing facilities' in WHBN 00-03:2013 *Clinical and clinical support spaces.*

Workshop

10.172 The requirements for the workshop will depend on the range of immobilisation solutions provided by the centre. It should have adequate bench space and be divided into clean and dirty (plaster) areas. Open shelving/storage in the room should be kept to a minimum owing to dust levels in the workshop. A laboratory gas supply should be provided as the heat source for tools required for plastics work.

10

10.173 Where the range includes custom-made beam directional shells, a vacuum-forming machine, plaster sink and plaster work area will be required. Vacuum-formers produce significant heat, which should be considered in the planning. Where plasterwork is performed, local dust extraction should be provided. An equipment sink and a wash-hand basin are required and non-slip flooring should be used throughout.

10.174 A laser should be provided above a clean work area for setting up immobilisation devices.

Radiotherapy physics and technology accommodation

10.175 The following radiotherapy physics and technology accommodation should be provided within the radiotherapy unit itself, as a minimum, for undertaking equipment maintenance and repairs and contributing to quality assurance:

a. electronics workshop/laboratory;

b. office accommodation, desk space for two engineers as a minimum;

c. stores, including a bulky equipment store.

10.176 Optional facilities, depending on access to the main medical physics facilities, may include:

a. mechanical workshop and machine room;

b. dosimetry laboratory;

c. offices for radiation protection, research and imaging physicists, depending on the configuration of services in the individual organisation.

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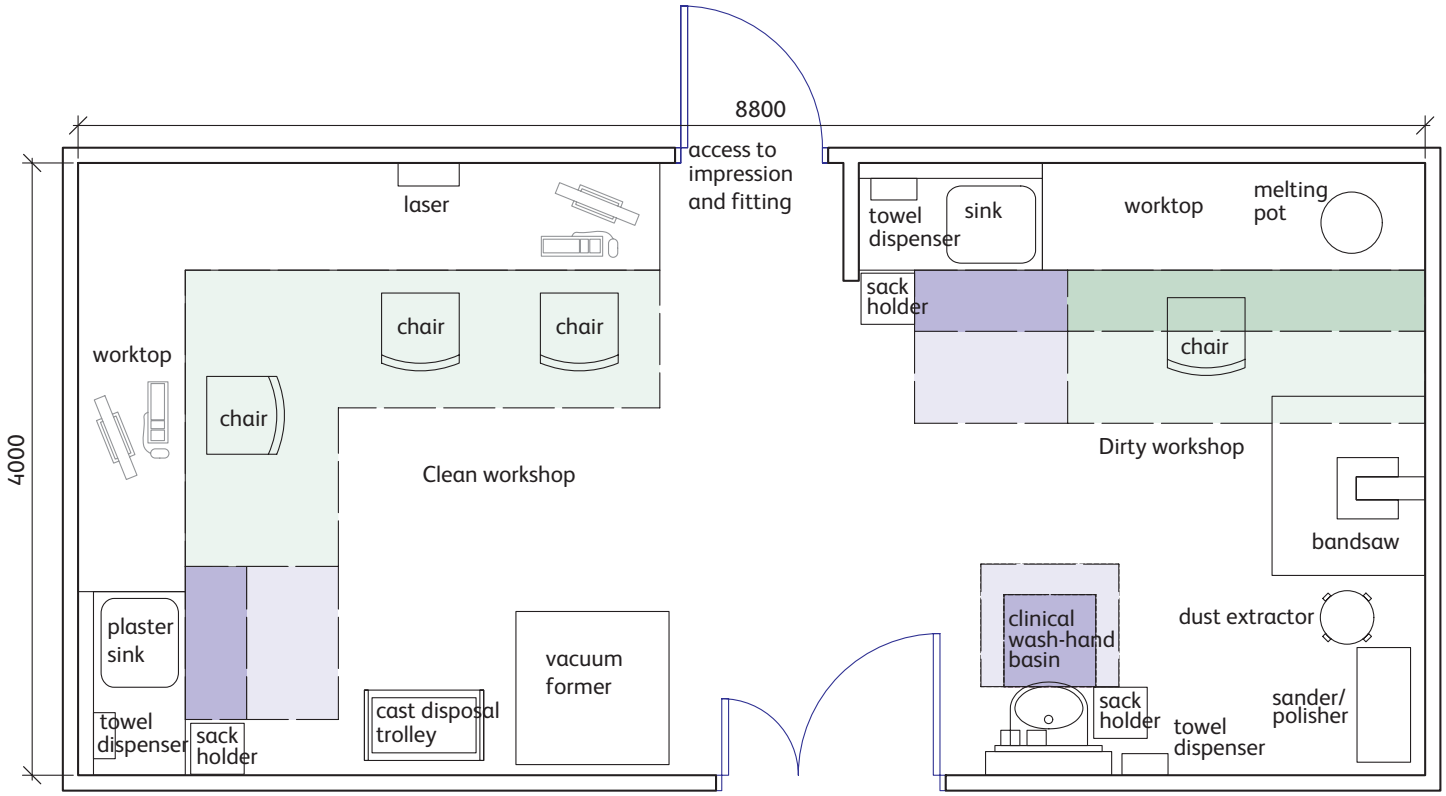

Figure 12 Workshop: example layout

Electronics workshop/laboratory

10.177 A clean, dust-free environment is important, as is good quality general lighting, with task lighting at workbenches. Natural lighting and ventilation is preferable, although solar control and mechanical ventilation may be needed to maintain suitable working temperatures.

10.178 Other requirements include:

a. generous benching with cupboards and drawers underneath;

b. bench-mounted cable containment to provide adequate power outlets;

c. desk space to perform record-keeping and logs;

d. shelves and bookcases for manuals and records;

e. telephone and computer workstation.

10

Offices

10.179 Consideration should be given to the tasks undertaken in offices, which will require access to the IT network for treatment plan review and approval, access to high-quality X-ray, CT/MR images through PACS or the radiotherapy archive, and access to the radiotherapy record and verify/scheduling system as well as standard NHS and office software. Standard telecommunications are required. Space is also required for QA equipment and mobile devices.

Stores

10.180 Storage facilities should be large enough to accommodate large items such as, dosimetry plotting tanks and other large QA and calibration equipment items, and A-frame lifting devices. They should also be provided with hooks and racking to store a range of spares, components and cables.

Mechanical workshop and machine room (optional)

10.181 Equipment will vary depending on local requirements, but is likely to include:

a. vacuum-forming machine with compressor;

b. contouring device;

c. electric furnace and oven;

d. saws (including bandsaws);

e. bench drill and grinder;

f. bench sander and polisher;

g. wax bath;

h. various hand-held tools;

i. bunsen burner;

j. workbenches;

k. storage cupboards;

l. compressed air outlet;

m. wall-mounted viewing boxes;

10

n. telephone and computer workstation;

o. plaster trap sink.

10.182 The construction and layout of equipment and work areas must meet the requirements of current health and safety regulations and Firecode (the WHTM 05 series of guidelines).

10.183 Storage will be needed for tools. Facilities will be required for lifting heavy objects, for example an overhead rail and hoist.

10.184 Flooring should be non-slip and oil-resistant. Wall finishes should be robust.

10.185 Good natural and artificial lighting is required, with task lighting at workstations. Solar control and mechanical ventilation will be needed. An air extract system should be provided to remove fumes and dust caused by welding, sanding etc.

10.186 Access for deliveries by lorry should be considered.

10.187 A floor gulley will be required.

10.188 Storage shelves for smaller devices, spares and phantoms should be incorporated – metal racking would be suitable. Electrical sockets are required for those items needing to be charged.

Dosimetry laboratory

10.189 Equipment will vary depending on local requirements, but is likely to include:

a. dosimetry system;

b. bench-mounted oven for dosimetry work;

c. safe;

d. laboratory workbenches;

e. storage cupboards;

f. telephone and computer workstations.

11

Chapter 11

Inpatient facilities

Assessment suite

11.1 Facilities may be provided for the assessment of patients for treatment-related toxicity and/or progression of disease symptoms. The patient's condition may have deteriorated while in the department or they may have been brought in as an emergency case. The patient may subsequently be admitted to a main ward.

11.2 The unit comprises a four-bed bay with workstations for medical and nursing staff and a controlled drugs cupboard.

11.3 Assessment units should be capable of delivering gender separation with the use of solid partitions as appropriate.

Ward accommodation

11.4 Project teams should refer to the generic guidance on adult inpatient accommodation in WHBN 04-01:2014 *Adult in-patient facilities.*

11.5 Patients suffering from cancer and undergoing cancer treatments often do not wish to eat at prescribed times. They may have very specific dietary requirements or difficulties with eating. Operational policies and the design of ward spaces and catering facilities should take this into account.

11.6 Rest rooms and refreshment facilities for visitors/carers should be located nearby. Overnight accommodation may be required.

Specialist inpatient accommodation

11.7 Treatment rooms for pulse dose rate brachytherapy and for unsealed source brachytherapy will be provided as part of the oncology inpatient accommodation, comprising specialised shielded bedrooms with shielded en suites.

11.8 The en suite facilities associated with these rooms must also feature a specially designed soil drainage system to cope with radioactive urine and faeces.

Pulsed Dose Rate (PDR) treatment room

11.9 The level of shielding required will depend on dose regimes. The nature and location of any windows must be the subject of a specific risk assessment at the planning stage, taking into account external adjacencies, occupation levels, and the intended scope and frequency of usage of the PDR equipment. The advice of local RPAs must be sought.

11

11.10 Intercom communication is required, along with CCTV for patient observation. Television monitors should be located so as to preserve privacy while permitting observation by nurses.

11.11 The control panel should be mounted in a secure location outside the treatment room and duplicated on the machine itself. The use of independent radiation monitors is advised.

11.12 See also **paragraph 10.9**, 'Use of radiation'.

Treatment room: Unsealed source brachytherapy

11.13 The enclosing structure should be heavily shielded to prevent radiation passing from the room into the surrounding areas. It will typically consist of concrete in the order of 500 mm thick, with shielding doors, alongside use of electronic patient monitoring.

1.14 Good design and use of shadow shields will allow patients to have visitors on a limited basis and will allow greater contact with nurses. Some advanced designs also incorporate a window and use external shielding as a garden feature. This may require controlled outside access.

11.15 Intercom communication with the patient is required.

11.16 A washing machine, washing-up sink and clinical wash-hand basin for use by staff are required to help prevent spread of contamination.

11.17 Surfaces should be impermeable and easy to clean, with careful attention to jointing. Sinks should resist permanent contamination, particularly if used for waste disposal. Wash-hand basins should be ceramic, with lever- or sensor-operated taps.

11.18 The risk of spillages (where radioactive drinks are used) and radioactive contamination influences the choice of surface finishes; for example, stainless steel is inappropriate due to the irremovable nature of iodine contamination.

11.19 Articles, materials or equipment that are contaminated with radiation will need to be collected in a shielded container and stored in a contaminated articles store until the radiation has fallen to a safe level.

11

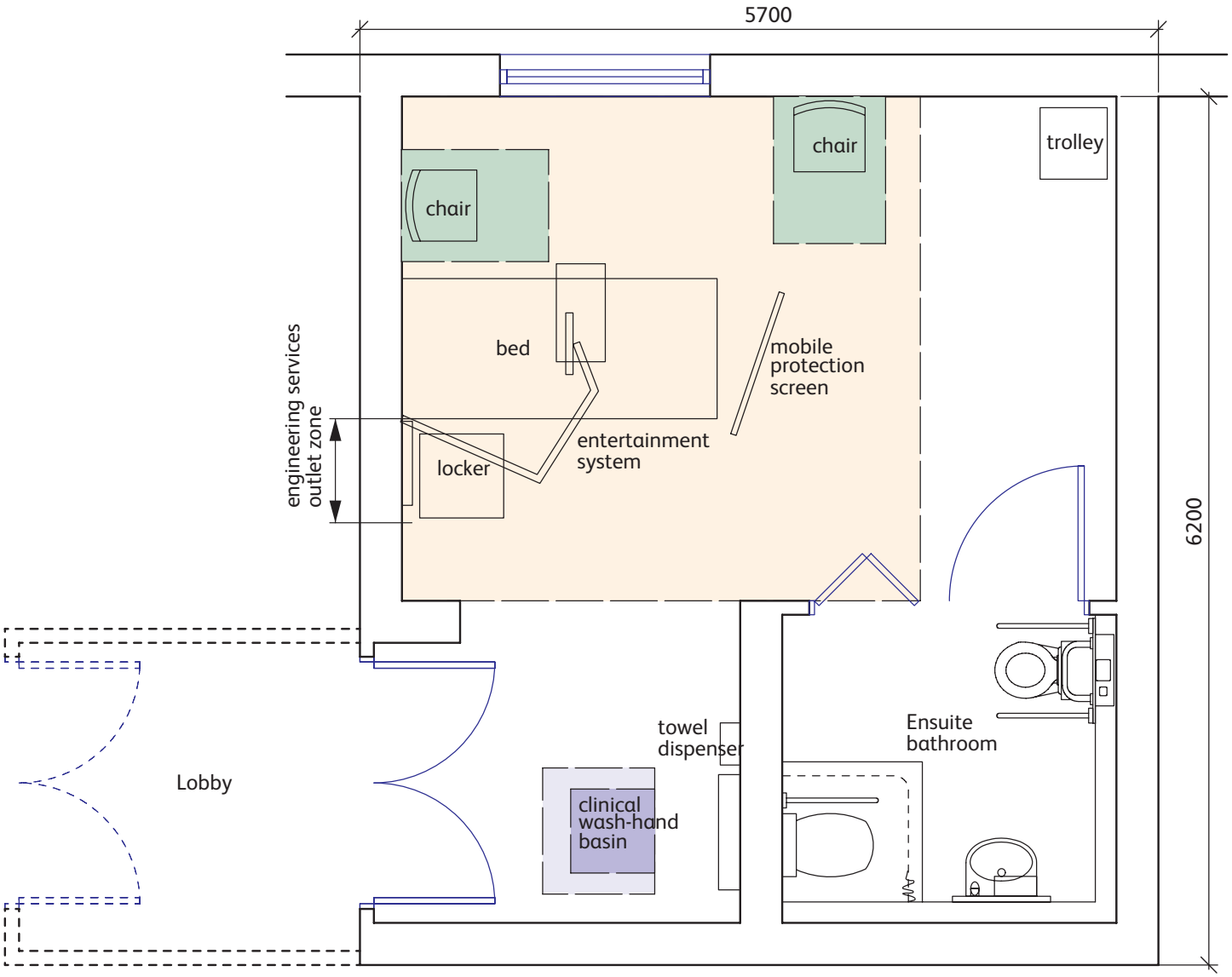

Figure 13 Treatment room – unsealed source brachytherapy: example layout

12

Chapter 12

Oncology operating theatres

12.1 Project teams should refer to the generic guidance on operating theatres (HBN 26:2004 *Facilities for surgical procedures: Volume 1)*.

12.2 Particular attention should be paid to the need for mobile imaging systems access and use. Special storage facilities for catheters, guide wires etc will be needed. These should be within or immediately adjacent to the operating room.

12.3 Where cervical and other Class 3 laser treatment procedures are undertaken, the guidance from the *Lasers, intense light source systems and LEDs – guidance for safe use in medical, surgical, dental and aesthetic practices* (MHRA 2015) should be followed. This includes special power supplies for laser equipment, reduced use or elimination of polished surfaces, and the provision of window blinds, laser safety signs etc. The laser protection advisor (LPA) must be consulted on theatre design, the declaration of a laser-controlled area and the provision of warning lights etc.

13

Chapter 13

Engineering considerations

13.1 Specific requirements should be formulated in discussion with both end-users and manufacturers of specialist equipment. Some issues, particularly those related to radiation safety, will require specific and detailed discussion with other professional consultants, including the RPA.

13.2 All mechanical and electrical services entering rooms designed to contain radiation must be routed through specially-designed access ports so that shielding is not compromised. It may also be necessary to incorporate changes in the direction of ductwork, pipework and cable containment systems to provide protection against radiation breakout. In general, all services into linear accelerators will pass through the maze, with possibly an additional chicane for high-energy linear accelerators.

13.3 In treatment and simulation areas, plant and services access arrangements must not compromise the radiological protection provided for these rooms. Consideration should be given to the comfort and safety of patients as well as that of both clinical and maintenance staff.

13.4 In addition to any 'permit to work' system (see **paragraph 13.6**) it may be appropriate with low- level radiation hazard systems to use a 'double knock' system whereby attempted unauthorised access to service areas at first initiates an audible warning and only when the access attempt is continued is radiation-emitting equipment switched off.

13.5 The hazard levels present with therapy equipment require a more stringent approach in which any intrusion will trigger beam shutdown.

General

Space required for plant and distribution systems

13.6 Particular care should be taken to ensure that where maintenance areas are subject to the effects of radiation and are not fully protected, for example plant areas above radiotherapy treatment rooms, appropriate access control procedures including 'permit to work' and warning lights are incorporated as part of the maintenance procedure.

Design for safety

13.7 The *Ionising Radiation (Medical Exposure) Regulations 2000* and associated codes of practice place strict requirements upon engineering aspects of design and operational practices in cancer care facilities. There are additional requirements from the *Radioactive Substances Act 1993* in respect of storage, use and disposal of radioactive materials. The RPA and custodian of radioactive substances must be consulted.

13

Acoustics

13.8 Prolonged periods of silence or near-silence can be as distressing as noise to a patient undergoing cancer treatment. Consideration should be given to the provision of a source of low-level sound, for example background music, in treatment spaces such as radiotherapy treatment rooms.

Commissioning of engineering services

13.9 It will be necessary to commission engineering services for radiotherapy treatment rooms, particularly those related to ventilation, prior to the installation and commissioning of radiotherapy equipment. Accordingly, appropriate integration of the building services commissioning schedule with the equipment supplier's installation and commissioning schedule should be undertaken at an early stage.

Resilience of electrical supplies

Emergency electrical supplies

13.10 The emergency generator providing electricity in the event of a main supply failure should be capable of providing full (100%) back-up including air-conditioning and comfort cooling plant serving specialist equipment such as linacs. If a new generator is to be installed, this should be the solution of preference.

13.11 In the event of a main supply or local final circuit failure, linear accelerator treatment rooms and escape routes should be illuminated by self-contained, battery-powered luminaires charged continuously from the main supply and capable of providing illumination for a period of three hours.

Small power distribution systems

13.12 Systems in medical locations and associated areas should comply with the special requirements of BS 7671:2008 *Requirements for electrical installations. IEE Wiring Regulations* (17th edition) and the Institution of Engineering and Technology (IET) publication *Guidance Note 7: Special Locations* (2015). The electrical supply connections to all medical electrical equipment should comply with BS EN 60601-1-2 *Medical electrical equipment.* Particular requirements for the basic safety and essential performance of high frequency surgical equipment and high frequency surgical accessories'.

13.13 The earth connection at the power termination should be suitable for the functional earth requirements specified by the radiology equipment manufacturer and arranged to receive a direct connection from the earth reference terminal, which should be provided or designated in every radiotherapy treatment room.

13

Mechanical engineering services

Ventilation

13.14 The majority of areas within cancer facilities will require mechanical ventilation due to equipment heat gains, patient/staff numbers and for clinical/ radiology reasons.

13.15 The possibility of excessive heat emission from equipment such as linear accelerators, and the special and often prolonged nature of radiotherapy procedures, will usually require that the air supply to radiotherapy treatment rooms be mechanically cooled.

13.16 Designers should consult with users, manufacturers and engineers to ensure an appropriate temperature is achieved. Where deep-planning of other continuously occupied spaces (for example linac/simulator control rooms or linac bunkers) is unavoidable, there will also be occasions when acceptable levels of comfort can only be maintained by air-cooling.

Ventilation cooling systems

13.17 Refrigeration loads for ventilation systems should be met either by the hospital's central water chiller plant or by packaged, remotely located, water chiller plant dedicated to the cancer facility. Direct expansion systems are not advocated unless the refrigeration load is small, since they can only be controlled in steps, unlike chilled water, which can be continuously modulated. Such equipment may be provided by the manufacturers of specialist equipment and should be considered differently from general ventilation cooling.

Ventilation controls

13.18 The indicators for a system serving a particular space should be both immediately adjacent to the space and at a central staff base. For specialist equipment such as simulators/linacs, the indication should be located in the associated control room.

Steam

13.19 The requirement for steam within the facility will be limited to humidification equipment associated with special ventilation plant to equipment spaces. If available, steam from the hospital's main supply should be used, subject to the requirement for clean steam as set out in HTM 03-01 Part A:2007 *Specialised ventilation for healthcare premises.*

13.20 In the absence of a central steam supply, local steam generators, preferably powered from a firm gas supply, should be employed. Electrical generation of steam should only be considered in isolated instances where other forms of generation are unavailable.

13

Drainage requirements – chemical and radioactive contaminated effluent

13.21 Providing that there is adequate dilution and the silver content has been effectively recovered, effluent can be discharged into the internal drainage system. Project teams are advised to establish the acceptable levels for silver and other processing chemicals at the planning stage of a scheme, as these are subject to change.

13.22 At an appropriate early stage in the design process, the project proposals for the collection and discharge of chemical and radioactive contaminated effluent should be discussed and verified with the local RPA and the local utility company responsible for the local authority sewerage system. Appropriate restrictions on access to drains and sewers likely to be discharging radioactive material must be implemented through 'permit to work' type systems and locked drainage covers.

Lighting systems

13.23 Consideration should be given to dynamic lighting control systems that alter the visual quality (but not the intensity) of light over the day to mimic natural daylight patterns and improve wellbeing. This is of particularly importance in areas without good natural daylight.

Lighting (treatment rooms)

13.24 For linear accelerators and some other treatment machines, automatic switching to low-level room lighting will be needed to facilitate the use of field marker lights and low-power alignment lasers. Conversely, high levels of lighting are needed for equipment maintenance.

Illuminated warning signs

13.25 At the entrance to each radiotherapy treatment room (except entrances used only by patients under the direct control of staff already inside the room, for example those from walk-through changing cubicles), an illuminated safety sign and a warning lamp must be provided in order to comply with the statutory requirements for radiological protection.

13.26 A further warning lamp must be provided in the treatment room.

13.27 The warning lamps must give a clear indication in red when they are energised, and the illuminated signs should incorporate the legend 'Do not enter', visible only when illuminated.

13.28 Other illuminated signs may also be required within the facility. All such signs should be connected to essential supplies where necessary. For therapy equipment, where exclusion of persons other than the patient is essential, the warning systems must work with interlocks and be specifically approved by the RPA.

13

Fire detection and alarm systems

13.29 Ionisation type detectors are not suitable for use in Radiotherapy treatment rooms.

CCTV systems (medical)

13.30 CCTV should be provided where required to monitor patients undergoing treatment in restricted areas. The interference to which such equipment may be subject, such as radiation levels within the linac bunker, should be taken into account when it is specified, to ensure acceptable electromagnetic compatibility. Care should be taken in the positioning of monitors in order to preserve patient privacy.

Patient/staff and staff emergency call systems

13.31 Particular care should be taken when choosing and siting call systems for use whilst a patient is undergoing treatment, for example within a linear accelerator.

14

Chapter 14

Cost information

14.1 For all types of health building, it is important that building costs and revenue expenditure are kept as low as possible and consistent with acceptable standards. In applying the guidance in this document to determine a detailed design, the need for economy should always be of prime concern, and activities should be carefully considered so that, where appropriate, space can be shared for similar activities that are programmed to take place at different times. The solution should not be detrimental to the proper functioning of the spaces involved, nor to the needs of the users. Within this general context, Specialist Estates Services' guidance provides a synopsis of accommodation for health buildings that the NHS Wales recommends for the provision of a given service.

Departmental cost allowance guides

14.2 The costing methodology for strategic outline case (SOC) and outline business case (OBC) stages in Wales remain based upon departmental cost allowances (DCA) updated by Welsh Health Estates Notification 10/14 *Measures to update 2002/2003 DCAGs for changes in specification (i.e. changes not covered by MIPS), to 8th July 2010*. Updating of departmental cost allowances guides (DCAGs) for inflation is by BCIS PUBSEC. The BCIS (previously BIS) PUBSEC indices are available from the BCIS (there is a subscription charge for this service). The indices, reporting level and location factor are advised quarterly by NHS Wales Shared Services Partnership – Specialist Estates Services (NWSSP-SES), to NHS Wales Trusts and health boards and their framework cost advisors. This quarterly advice is based upon the quarterly NHS Capital Planning Newsletter issued by the RICS to user group members (Health Service Index Focus Group).

14.3 **There are no specific dedicated DCAGs for this WHBN as the costs for the different functional areas referred to vary significantly in cost per m² of floor area and the mix of spaces within each unit are likely to vary between treatment centres.** Costs for some spaces referred to within the WHBN refer to similarities to spaces in other WHBNs (such as WHBN 04-01:2014 *Adult in-patient facilities*) and in such cases the DCAGs applicable to those WHBNs can be used as a base for estimating costs. Other specific spaces not covered by any similar DCAG need to be estimated either by using approximate quantities (preferably presented in BCIS elemental format), and market rates (adjusted to the current reporting level PUBSEC index) or by using cost data from previously completed schemes (contact NWSSP-SES for further advice if no records are held by the health board, Trust or advisors).

14.4 DCAGs (if used) reflect the total building and engineering requirements and accommodation that departmental spaces will require when incorporated into an acute general hospital where the common use of services will be available. Costs are based on a typical two-storey new-build unit on a greenfield site with no planning constraints. Contact NWSSP-SES for further guidance if required. DCAGs are exclusive of VAT, building and planning fees and all local authority charges, and are based on a location factor of 1.00.

14

On-costs

14.5 Where DCAGs are used, an allowance for on-costs should be added to the DCAGs for all units, on-costs include, non-departmental space (refer 'communication space' below), external works, external engineering services and abnormals etc. The abnormals will largely be determined by the characteristics of the site, such as an inner-city location or poor ground conditions. 'Abnormals' also include additional costs brought about by changes in statutory regulations and design standards brought in after 8 July 2010 (ie after publication of WHEN 10/14). If not using DCAGs these costs should be presented as a part of the elemental estimate and clearly identified.

14.6 Project teams should assess at the earliest opportunity all the likely on-cost implications of individual sites and schemes.

14.7 Costing by DCAG and on-costs may not be appropriate on works of alteration or refurbishment, or to works which are not adequately covered by WHBNs. The best process for costing should then be discussed with NWSSP-SES. Providing sufficient information is available to the cost advisors it is recommended that costs produced using DCAGs and on-costs are supported by separate elemental estimates and an analysis made of any cost difference prior to submission of costs for funding approval.

Location factors

14.8 Location factor adjustments should be applied to works costs (that is, DCAGs plus established on-costs) to take account of local market conditions. It should be noted that the location factor to be used in Wales may vary from the PUBSEC location factor for Wales. If so, the rationale will be explained in the monthly advice from NWSSP-SES to health boards, Trusts and framework cost advisors.

Schedules of accommodation

14.9 The schedules of accommodation listed at the end of this section are given for guide purposes only and will alter depending on the design solution.

Dimensions and areas

14.10 In determining spatial requirements the essential factor is not the total area provided, but the critical dimensions, that is, those dimensions critical to the efficient functioning of the activities which are to be carried out.

14.11 Planning teams should have data available that will enable them to make an approximate assessment of the sizes involved.

14

14.12 It is emphasised that the areas in **Appendix 1** do not represent recommended sizes, nor are they to be regarded in any way as specific individual entitlements.

14.13 Efficient planning of the building may also necessitate variation of areas. For instance, in the refurbishment or conversion of older property:

a. rooms tend to be larger than the recommended area,

b. some rooms may be too small or in the wrong location for efficient use,

c. circulation space tends to form a larger than normal proportion of the total area.

Circulation

14.14 All internal corridors, small vertical ducts, spaces occupied by partitions/walls and other space for circulation, are costed in the DCAGs. Provision is also made for 5 % planning zone and 3 % engineering zone adjacent to the external walls.

14.15 Circulation figures included in the DCAGs are those anticipated for new-build facilities. Where constraints are encountered, for example in refurbishment/conversion of older types of property, this figure may increase.

Communications

14.16 Hospital 'streets', staircases and lifts (linking spaces) are not included in the DCAGs. Costs related to these elements, along with a suitable space allowance, should be made in the on-costs.

Land costs

14.17 DCAGs are exclusive of all land costs and associated fees. However, costs associated with land costs should be included in business case submissions, and may therefore have an important impact on the overall cost viability of a scheme.

Engineering services

14.18 Engineering services listed below are included in the DCAGs for inpatient accommodation and critical care cost allowances (should these be used to cost specific spaces within this WHBN). Primary engineering services are assumed to be conveniently available at the boundary of the department.

14

14.19 **Mechanical services**

a. heating – low-pressure hot water system;

b. ventilation – mechanical supply and extract to all clinical areas and areas requiring extract owing to type of room, that is, WCs, showers etc;

c. a share of the ventilation plant and central refrigeration is included in the cost allowance;

d. cold water service – centrally supplied to service points including drinking water, although storage tanks are excluded;

e. hot water service – supplied from a central system, storage and generation is excluded;

f. piped medical gases and scavenging to each bed;

g. water for dialysis and nitric oxide are not included in the costs.

14.20 **Electrical services**

a. departmental distribution boards;

b. general lighting as required by task;

c. emergency luminaires as appropriate;

d. socket-outlets and other power outlets for fixed and portable equipment;

e. UPS supplies and equipment;

f. fire alarm system;

g. television/radio wireways only;

h. staff/staff and patient/staff call system;

j. telephone internal cabling distribution and outlets – handsets are excluded;

k. data wireways only included.

14

14.21 **Equipment (Group 1)**

a. water boiler;

b. service beams with articulated medical supply units at each bed which incorporate medical gas and vacuum outlets together with electrical sockets and nurse call.

A1

Appendix 1

Example schedules of accommodation

Example 1: Chemotherapy service in an acute hospital serving a population of 400,000

ADB code	Room name/function	Quantity	Area	Total Area	Notes
Public spaces for chemotherapy unit (Entrance, reception and visitors' facilities)					
J0232	Reception desk (size based on number of places)	2	5.5	11	2 places per unit
J1155/ J1414	Waiting area: 25 places	25	2.25	56.25	Includes children's play area and 10% wheelchair places. 1 per treatment place (rounded to 25)
M0727	Interview room: 7 places	1	12	12	1 per unit
H1131	Information/resource area: 3 person	1	12	12	1 per unit
V1131	Nappy changing room	1	5	5	1 per unit
S0012	Infant feeding room	1	6	6	1 per unit
V1121	WC: semi-ambulant	2	2.5	5	1 per 12 waiting places
V0922	WC: independent wheelchair	1	4.5	4.5	1 per unit
Clinical spaces for on-treatment suite					
J1255/ J1414	Waiting area: 6 places	6	2.25	13.5	Includes children's play area and 10% wheelchair places.0.75 per clinical room
C0522	Examination/physical therapy room	4	12	48	1 per 100,000 population
C0237	Consulting/ examination room: double sided couch	4	16	64	1 per 100,000 population
	Dispensary: non-chemotherapy drugs	1	8	8	1 per unit

A1

T0535	Clean utility room	1	16	16	1 per unit
Y0431	Dirty utility room	1	8	8	1 per unit
T0211	Staff communication base (size based on number of places)	2	5.5	11	2 places per unit
M0727	Interview room: 7 places	1	12	12	1 per unit
W1594	Store: linen	1	3	3	1 per unit
W1584	Store: equipment and consumables	1	8	8	1 per unit
Clinical spaces for chemotherapy treatment suite					
	Chemotherapy treatment: multi-chair bay	20	10	200	1 per 20,000 population
X1500	Chemotherapy treatment: single room	4	12	48	1 per 100,000 population
	Chemotherapy preparation room	1	16	16	1 per unit
V0922	WC: independent wheelchair	4	4.5	18	En suite to chemotherapy treatment single rooms
J1264	Parking bay: trolley/bed	2	4	8	2 per unit
T0535	Clean utility room	1	16	16	1 per unit
Y0431	Dirty utility room	1	8	8	1 per unit
T0211	Staff communication base (size based on number of places)	2	5.5	11	One staff base of 2 places provided per 6 chairs, as the open-plan space is to be subdivided into bays of no more than 6 for privacy and gender separation
V1121	WC: semi-ambulant	4	2.5	10	1 per 6 treatment places

A1

ADB code	Room name/function	Quantity	Area	Total Area	Notes
V0922	WC: independent wheelchair	2	4.5	9	1 per 12 treatment places
V1635	Shower room: assisted	1	8	8	1 per unit
W1594	Store: linen	1	3	3	1 per unit
W1584	Store: equipment and consumables	1	12	12	1 per unit
W0274	Store: fluids	1	12	12	1 per unit
	Chemotherapy prep area	1	16	16	1 per unit
Staff spaces: shared support					
Y1510	Cleaners' room	2	8	16	2 per unit
P0625	Pantry/refreshment area	1	8	8	1 per unit
Y0646	Disposal hold: 3000 litres	1	12	12	1 per unit
G0180-01	Parking bay: resuscitation trolley	1	2	2	1 per unit
M0251	Office: 1-person	3	8	24	3 per unit
M0252	Office: 2-person	1	12	12	1 per unit
M0278/ M0281/ M0410/ M0731	Admin area: shared use (size based on number of workstations)	6	6.6	39.6	6 places per unit
H11304-01	Seminar room: 10 places	1	19	19	1 per unit
D0434-01	Rest room with mini kitchen (size based on number of seats)	10	1.9	19	10 place per unit
V1010	WC: ambulant	1	2	2	1 per unit

A1

	Net allowance			**851.85**	
	5% planning allowance			42.59	
	Total			**894.44**	
	3% engineering allowance			26.83	
	30% circulation allowance			268.33	
	Total allowance			**1,189.61**	
Optional accommodation					
Staff changing facilities (if not provided centrally elsewhere)					
V0554-03/ V0667/ V0725/ V1321	Changing area: staff (size based on number of lockers)	33	1.4	46.2	Includes uniform exchange area, showers and a number of individual changing rooms. Based on 30 staff who need a locker (allowing for shift changeover), plus a 10% contingency to allow for male/female split (suggested apportionment 2/3 female to 1/3 male)
V0725	Changing room: semi-ambulant	1	2	2	Additional individual changing room to allow for male and female segregation
V1321	Shower room: ambulant	1	2.5	2.5	Additional shower room to allow for male and female segregation
V1010	WC: ambulant	2	2	4	Additional WC to allow for gender segregation
	Net allowance			**54.7**	
	5% planning allowance			2.74	
	Total			**57.44**	
	3% engineering allowance			1.72	
	30% circulation allowance			17.23	
	Total allowance			**76.39**	

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Example 2: Radiotherapy service in an acute hospital comprising two linear accelerators

ADB code	Room name/function	Quantity	Area	Total Area	Notes
Public spaces for radiotherapy unit (Entrance, reception and visitors' facilities)					
J0232	Reception desk (size based on number of places)	2	5.5	11	2 places per unit
J1155/ J1414	Waiting area: 15 places	15	2.25	33.75	Includes children's play area and 10% wheelchair places
H1131	Information/resource area: 3 person	1	12	12	
V1131	Nappy changing room	1	5	5	This space may be considered optional if facilities are provided centrally nearby
S0012	Infant feeding room	1	6	6	This space may be considered optional if facilities are provided centrally nearby
V1121	WC: semi-ambulant	2	2.5	5	1 per 12 waiting places. 2 provided for gender separation
V0922	WC: independent wheelchair	1	4.5	4.5	1 per unit
G0180-10	Parking bay: wheelchair	1	2	2	1 per unit
Clinical spaces for on-treatment review suite					
J1255/ J1414	Waiting area: 6 places	6	2.25	13.5	Includes children's play area and 10% wheelchair places
X0145	Treatment room	1	16	16	1 per unit
C0237	Consulting/ examination room: double sided couch access	2	16	32	1 per bunker

A1

T0538	Clean utility room without controlled drugs cupboard	1	8	8	1 per unit
Y0431	Dirty utility room	1	8	8	1 per unit
T0211-01	Staff communication base (size based on number of places)	1	5.5	5.5	1 place per 2 bunkers
M0727	Interview room: 7 places	1	12	12	1 per unit
W1594	Store: linen	1	3	3	1 per unit
W1584	Store: equipment and consumables	1	8	8	1 per unit
Clinical spaces for radiotherapy treatment suite					
	Radiotherapy treatment room (bunker) and maze	2	160	320	The overall size has been determined on the assumption that the walls are concrete. The size will be less if using a modular block system. 2 bunkers per satellite unit
	Control area serving radiotherapy treatment room	2	20	40	1 per bunker
H0105	Radiographer prep room	2	10	20	1 per bunker
V0725	Changing room: semi-ambulant	2	2	4	1 per bunker
V0726	Changing room: independent wheelchair	2	4.5	9	1 per bunker
V0922	WC: independent wheelchair	1	4.5	4.5	1 per unit
J1255/ J1414	Waiting area: 12 places	12	2.25	27	Includes children's play area and 10% wheelchair places. 6 places per linac
	Treatment planning room	8	5	40	4 places per bunker
	Radiotherapy physics room	1	12	12	1 per unit

A1

ADB code	Room name/function	Quantity	Area	Total Area	Notes
Clinical spaces for imaging suite					
J1255/ J1414	Waiting area: 6 places	6	2.25	13.5	Includes children's play area and 10% wheelchair places
V0725	Changing room: semi-ambulant	1	2	2	Dual access required. 1 per imaging room
V0726	Changing room: independent wheelchair	1	4.5	4.5	Dual access required. 1 per imaging room
V0922	WC: independent wheelchair	1	4.5	4.5	1 per imaging room
	Imaging room	1	33	33	1 per unit
	Generator room	1		0	Contained within engineering allowance
	Imaging control area	1	25	25	1 per imaging room
H0105	Radiographer preparation room	1	8	8	1 per imaging room
Staff spaces: shared support					
Y1510	Cleaners' room	2	8	16	2 per unit
P0625	Pantry/refreshment area	1	8	8	1 per unit
G0180-01	Parking bay: resuscitation trolley	1	2	2	1 per unit
Y0646	Disposal hold: 3000 litres	1	12	12	1 per unit
M0251	Office: 1-person	1	8	8	1 per unit
M0252	Office: 2-person	2	12	24	1.5 per bunker

A1

M0278/ M0281/ M0410/ M0731	Admin area: shared use (size based on number of workstations)	4	6.6	26.4	4 per bunker
H1313-01	Seminar room: 15 places	1	25	25	1 per unit
W1585-02	Store: general	1	8	8	En suite to seminar room for flexibility in use of room
D0434-01	Rest room with mini kitchen (size based on number of seats)	10	1.9	19	5 places per bunker
V1010	WC: ambulant	2	2	4	1 per bunker
K0915	IT server room	1	6	6	1 per unit
W1584	Store: equipment and consumables	1	24	24	Stationery, equipment etc. 1 per unit
W1594	Store: linen	1	3	3	1 per unit
	Net allowance			**937.65**	
	5% Planning allowance			46.88	
	Total			**984.53**	
	3% engineering allowance			29.54	
	30% circulation allowance			295.36	
	Total allowance			**1,309.43**	

A1

ADB code	Room name/function	Quantity	Area	Total Area	Notes
Optional accommodation					
Staff changing facilities (if not provided centrally elsewhere)					
V0554-03/ V0667/ V0725/ V1321	Changing area: staff (size based on number of lockers)	33	1.4	46.2	Includes uniform exchange area, showers and a number of individual changing rooms. Based on 30 staff who need a locker (allowing for shift changeover), plus a 10% contingency to allow for male/female split (suggested apportionment 2/3 female to 1/3 male)
V0725	Changing room: semi-ambulant	1	2	2	Additional individual changing room to allow for male and female segregation
V1321	Shower room: ambulant	1	2.5	2.5	Additional shower room to allow for male and female segregation
V1010	WC: ambulant	2	2	4	Additional WC to allow for gender segregation
Mould suite					
	Impression and fitting	1	20	20	
V0726	Changing room: independent wheelchair	1	4.5	4.5	
V1323	Shower room: semi-ambulant: standing use	1	5	5	
	Workshop	1	35	35	

A1

	Net allowance			**119.2**	
	5% planning allowance			5.96	
	Total			**125.16**	
	3% engineering allowance			3.75	
	30% circulation allowance			37.55	
	Total allowance			**166.46**	

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Example 3 Radiotherapy service in an acute hospital comprising four linear accelerators (main centre)

ADB code	Room name/function	Quantity	Area	Total Area	Notes
Public spaces for radiotherapy unit (Entrance, reception and visitors' facilities)					
J0232	Reception desk (size based on number of places)	2	5.5	11	2 places per unit
J1155/ J1414	Waiting area: 25 places	25	2.25	56.25	Includes children's play area and 10% wheelchair places
M0724	Interview room: 4 places	1	8	8	1 per unit
H1131	Information/resource area: 3 person	1	12	12	1 per unit
V1131	Nappy changing room	1	5	5	1 per unit
S0012	Infant feeding room	1	6	6	1 per unit
V1121	WC: semi-ambulant	2	2.5	5	1 per 12 waiting places
V0922	WC: independent wheelchair	1	4.5	4.5	1 per unit
G0180-10	Parking bay: wheelchair	1	2	2	1 per unit
Clinical spaces for on-treatment review suite					
J1255/ J1414	Waiting area: 12 places	12	2.25	27	Includes children's play area and 10% wheelchair places. The waiting areas may be combined together, design permitting
J1264	Parking bay: trolley/bed	2	4	8	1 per unit

A1

X0145	Treatment room	1	16	16	1 per unit
C0237	Consulting/ examination room	4	16	64	1 per bunker
T0538	Clean utility room without controlled drugs cupboard	1	8	8	1 per unit
Y0431	Dirty utility room	1	8	8	1 per unit
T0211	Staff communication base (size based on number of places)	2	5.5	11	1 place per 2 bunkers
M0727	Interview room: 7 places	1	12	12	1 per unit
W1594	Store: linen	1	3	3	1 per unit
W1584	Store: equipment and consumables	1	8	8	1 per unit
Clinical spaces for radiotherapy treatment suite					
	Radiotherapy treatment room (bunker) and maze	5	160	800	One room provided as a spare to facilitate flexibility and planned expansion. The overall size has been determined on the assumption that the walls are concrete. The size will be less if using a modular block system. 4 linacs per 100,000 population
	Control area serving radiotherapy treatment room	5	20	100	1 per bunker
H0105	Radiographer prep room	5	10	50	1 per bunker
V0725	Changing room: semi-ambulant	5	2	10	1 per bunker
V0726	Changing room: independent wheelchair	5	4.5	22.5	1 per bunker
V0922	WC: independent wheelchair	2	4.5	9	2 per unit

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ADB code	Room name/function	Quantity	Area	Total Area	Notes
J1255/ J1414	Waiting area: 12 places	12	2.25	27	Includes children's play area and 10% wheelchair places. One space planned between 2 bunkers if design permits; otherwise 1x6 person wait per bunker
J1255/ J1414	Waiting area: 6 places	6	2.25	13.5	1x6 person wait per bunker
	Treatment planning room	20	5	100	4 places per bunker
Clinical spaces for imaging suite					
J1255/ J1414	Waiting area: 12 places	12	2.25	27	The waiting areas may be combined together, design permitting
V0725	Changing room: semi-ambulant	1	2	2	Dual access required. 1 per imaging room
V0726	Changing room: independent wheelchair	1	4.5	4.5	Dual access required. 1 per imaging room
V0922	WC: independent wheelchair	1	4.5	4.5	1 per imaging room
M0727	Interview room: 7 places	1	12	12	1 per imaging room
	Imaging room	1	33	33	1 per unit
	Generator room	1		0	Contained within engineering allowance
	Imaging control area	1	25	25	1 per imaging room
H0105	Radiographer preparation room	1	8	8	1 per imaging room
X0145	Imaging clinical preparation room	1	16	16	1 per imaging room

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Mould suite					
	Impression and fitting	1	20	20	1 per unit
V0726	Changing room: independent wheelchair	1	4.5	4.5	1 per impression/fitting room
V1323	Shower room: semi-ambulant: standing use	1	5	5	1 per impression/fitting room
	Workshop	1	20	20	1 per unit
	Dirty workshop	1	15	15	The example drawing combines this with the clean workshop to maximise space. 1 per unit
W1584	Store: equipment and consumables	1	8	8	1 per unit
Radiotherapy physics and technology					
	Electronics workshop/ laboratory	1	16	16	1 per unit
M0251	Office: 1 person	2	8	16	2 per unit
M0278/ M0281/ M0410/ M0731	Admin area: shared use (size based on number of workstations)	4	6.6	26.4	4 per unit
W1584	Store: equipment and consumables	1	8	8	1 per unit
Staff spaces: shared support					
Y1510	Cleaners' room	2	8	16	2 per unit
P0625	Pantry/refreshment area	1	8	8	1 per unit
G0180-01	Parking bay: resuscitation trolley	1	2	2	1 per unit
Y0646	Disposal hold: 3000 litres	1	12	12	1 per unit

A1

ADB code	Room name/function	Quantity	Area	Total Area	Notes
M0251	Office: 1-person	2	8	16	2 per unit
M0252	Office: 2-person	2	12	24	2 per unit
M0278/ M0281/ M0410/ M0731	Admin area: shared use (size based on number of workstations)	6	6.6	39.6	1.5 per linac
H1304-02	Seminar room: 20 places	1	31	31	1 per unit
W1585-02	Store: general	1	8	8	En suite to seminar room for flexibility in use of room
D0434-02	Rest room with mini kitchen (size based on number of seats)	20	1.9	38	5 places per bunker
V1010	WC: ambulant	4	2	8	1 per bunker
K0915	IT server room	1	8	8	1 per unit
W1584	Store: equipment and consumables	1	32	32	Stationery, equipment etc. 1 per unit
W1594	Store: linen	1	3	3	1 per unit

A1

	Net allowance			**1923.25**	
	5% planning allowance			96.16	
	Total			**2019.41**	
	3% engineering allowance			60.58	
	30% circulation allowance			605.82	
	Total allowance			**2685.82**	
Optional accommodation					
N0317	Anaesthetic room	1	19	19	Required if children are attending
J1414-01	Play therapy room	1	20	20	Required if children are attending
J1264	Parking bay: trolley/bed	4	2	8	
	Assessment bay: 4 bed	1	64	64	
Radiotherapy treatment: superficial					
	Superficial/ orthovoltage radiotherapy room	1	30	30	It is recommended that this room is sized as an orthovoltage room; otherwise 21 sqm is required.
	Control area serving superficial/orthovoltage treatment room	1	12	12	
	Machine room				The generator can be located in the control room.

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ADB code	Room name/function	Quantity	Area	Total Area	Notes
HDR brachytherapy					
J1255	Waiting area: 6 places	6	2.25	13.5	Includes children's play area and 10% wheelchair places. With trolley wait depending on local practice.
J1264	Parking bay: trolley/bed	2	4	8	
T0535	Clean utility room	1	16	16	
Y0436	Dirty utility room	1	12	12	Based on a theatre dirty utility.
V0922	WC: Independent wheelchair	1	4.5	4.5	
	Brachytherapy treatment room and maze	1	68	68	
	Control area serving brachytherapy treatment room	1	12	12	
B2532	Recovery room: 2 patient	1	28	28	
Sealed source					
W0610	Store:sealed radioactive source	1	6	6	
T0529	Prep area: sealed radioactive source	1	6	6	This space may be required to provide for local operational procedures where the sealed source is prepared in an isolator.

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Radiotherapy physics and technology					
	Mechanical workshop and machine room	1	50	50	
	Dosimetry laboratory	1	28	28	
	Offices for radiation protection, research and imaging physicists.	1			Quantum of provision is determined locally.
	Total carried forward			**405**	
Staff support					
V0554-03	Changing area: staff (size based on number of lockers)	1.4	33	46.2	Includes uniform exchange area, showers and a number of individual changing rooms. Based on 30 staff who need a locker (allowing for shift changeover), plus a 10% contingency to allow for male/female split (suggested apportionment 2/3 female to 1/3 male).
V0725	Changing room: semi ambulant	1	2	2	Additional individual changing room to allow for male and female.
V1321	Shower room: ambulant	1	2.5	2.5	Additional shower room to allow for male and female segregation.
V1010	WC: ambulant	2	2	4	
Radiotherapy (PDR brachytherapy) facilities					
X2062	Radiotherapy treatment room: PDR brachytherapy	1	29.5	29.5	Size includes thickness of concrete walls.
V1631-01	Shower: WC and wash:radiation protective	1	5.5	5.5	

A1

ADB code	Room name/function	Quantity	Area	Total Area	Notes
Radiotherapy (unsealed source) facilities					
	Radiotherapy treatment room: unsealed radioactive source lobby	1	29.5	29.5	Size includes thickness of concrete walls.
	Lobby	1	5.5	5.5	
	Shower: WC and wash:radiation protective	1	5.5	5.5	
Y0661	Hold: disposal radioactive waste	1	2	2	
	Net allowance			**537.2**	
	5% planning allowance			26.86	
	Total			**564.06**	
	3% engineering allowance			16.92	
	30% circulation allowance			169.22	
	Total allowance			**750.20**	

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Acts and Regulations

Equality Act 2010 **http://www.legislation.gov.uk/ukpga/2010/15/contents**

High-activity Sealed Radioactive Sources and Orphan Sources Regulations 2005
http://www.legislation.gov.uk/uksi/2005/2686/contents/made

Ionising Radiations Regulations 1999 **http://www.legislation.gov.uk/uksi/1999/3232/contents/made**

Ionising Radiation (Medical Exposure) Regulations 2000
http://www.legislation.gov.uk/uksi/2000/1059/contents/made

Radioactive Substances Act 1993 **http://www.legislation.gov.uk/ukpga/1993/12/contents**

Waste Electrical and Electronic Equipment Regulations 2013
http://www.legislation.gov.uk/uksi/2013/3113/contents/made

British Standards

All standards were correct at the time of publication. The latest version of any standard should be used provided that it continues to address the relevant requirements of these recommendations.
http://shop.bsigroup.com/

BS 7671:2008+A3:2015 *Requirements for electrical installations. IET Wiring Regulations*

BS EN 60601-1-2 *Medical electrical equipment*

NHS Wales Shared Services Partnership - Specialist Estates Services

Health Technical Memoranda (HTMs) and Health Building Notes (HBNs) issued by the Department of Health in England are being superseded by specific Welsh editions which will be titled Welsh Health Technical Memoranda (WHTMs) and Welsh Health Building Notes (WHBNs) and which will use the same numerical coding. The guidelines referenced below were the most recent at time of publication; however, **the latest version should always be used, provided that it continues to address the relevant requirements of these recommendations.** All are available from the NHS Wales Shared Services Partnership – Specialist Estates Services websites:

Intranet: **http://howis.wales.nhs.uk/sites3/page.cfm?orgid=254&pid=39106**
Internet: **http://www.wales.nhs.uk/sites3/page.cfm?orgid=254&pid=6142**

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Welsh Health Building Notes (HBNs & WHBNs)

HBN 26:2004 *Facilities for surgical procedures: Volume 1.*

HBN 10-02:2007 *Day surgery facilities.*

WHBN 00-01:2013 *General design principles.*

WHBN 00-10 Part C:2014 *Sanitary assemblies.*

WHBN 00-02:2013 *Sanitary spaces.*

WHBN 00-03:2013 *Clinical and clinical support spaces.*

WHBN 04-01:2014 *Adult in-patient facilities.*

WHBN 04-02:2016 *Facilities for critical care.*

WHBN 14-01: 2014 *Pharmacy and radiopharmacy facilities.*

Welsh Health Technical Memorandum (HTM & WHTMs)

HTM 03-01Part A: 2007* *Specialised ventilation for healthcare premises, Part A: Design and validation.*

HTM 04-01Part A: 2006* *The control of Legionella, hygiene, 'safe' hot water, cold water and drinking water systems. Part A: Design, installation and testing.*

HTM 04-01Part B: 2006* *The control of Legionella, hygiene, 'safe' hot water, cold water and drinking water systems. Part B: Operational management.*

HTM 04-01 Supplement: 2016 *Performance specification D08 thermostatic mixing valves (healthcare premises).*

HTM 06-01Part A:2007 *Electrical services supply and distribution. Part A: Design considerations.*

WHTM 04-01 Addendum: 2014 *Pseudomonas aeruginosa – advice for augmented care.*

* Please note, at the time of publication these guidelines are being updated – always check you are using the most recent version of the relevant guidelines.

R

Welsh Health Estates Notification (WHEN)

WHEN 10/14:2010 *Measures to update 2002/2003 DCAGs for changes in specification (i.e. changes not covered by MIPS), to 8th July 2010*

Other Publications

CIBSE (2008). *Lighting Guide 2: Hospitals and healthcare buildings* (SLL LG2). London: Chartered Institute of Building Services Engineers.

Chief Medical Officer (2008). *A guide to the safe handling and administration of intrathecal chemotherapy.* Cardiff: Welsh Assembly Government.

Children & Young People's Implementing Outcomes Guidance Advisory Group (2008). *Key messages for commissioners of cancer services for young people.* London: DH
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