Part B – Health Facility Briefing & Design

335 Oncology Unit – Proton Therapy

iHFG

International Health Facility Guidelines

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335 Oncology Unit – Proton Therapy

1 Introduction

Proton therapy, also known as proton beam therapy or proton radiation, is a type of particle therapy that involves irradiating diseased tissue with a beam of protons, most commonly to treat cancer. Proton treatment has a significant benefit over other conventional methods of external beam irradiation in that the dose of protons is deposited over a small depth range, resulting in less entry, exit, or dispersed radiation exposure to healthy adjacent tissues.

This Functional Planning Unit (FPU) covers the requirements of Proton Therapy Oncology Unit. The purpose of the Proton Therapy Oncology Unit is to provide facilities and equipment for proton therapy treatments using high energy and focused proton beams to eliminate cancer cells.

Proton therapy is a type of radiation therapy for cancer treatments. A cyclotron or synchrotron is used to accelerate protons from which a high energy proton beam is produced and supplied to a proton therapy bunker (or gantry) where patients receive treatment.

The management and administration of oncology treatment is complex and can potentially have detrimental health impact for patients including immunosuppression and infection. Design aspects the Unit will need to accommodate these factors accordingly as well as the fact that the Unit will cater to patients that may be of all ages, acuity and levels of disability.

Proton therapy may be used in conjunction with other forms of cancer treatments including chemotherapy, conventional radiotherapy and cancer surgery.

Also refer to separate FPU's, Oncology Unit – Radiation, Oncology Unit – Medical (Chemotherapy) and Medical Imaging – Nuclear Medicine Unit for further information.

The typical unit Schedule of Accommodation is provided using Standard Components (typical room templates) and quantities for a typical Unit with 2 Bunkers at Role Delineation Levels (RDL) 5 and RDL 6.

Further reading material is suggested at the end of this FPU but none are mandatory.

Users who wish to propose minor deviations from these guidelines should use the **Non-Compliance Report** (**Appendix 4 in Part A**) to briefly describe and record their reasoning based on models of care and unique circumstances.

The details of this FPU follow overleaf.

Description

The Proton Therapy Unit contains spaces to support patient consultation, treatment simulation and planning, and the administration of treatment. A Simulation Room, whether using CT or MRI Scanning, is used for planning of a patient's treatment to ensure proton beams are targeted with the utmost precision and accuracy during therapy sessions.

Room sizes and specifications should accommodate the equipment based on the manufacturers' recommendations, as space requirements and design of the bunkers may vary from one machine to another and one manufacturer to another. This should be considered from the beginning when planning a new Proton Therapy Unit.

2 Functional & Planning Considerations

Operational Models

The Proton Therapy Unit will typically operate from 8 am to 6 pm on weekdays; however, depending on the unit's operational policy, extended hours of operation may be necessary. Operation is permitted 24 hours a day, seven days a week.

Models of Care

Radiation Oncology patients prefer a model of treatment in which oncology services, such as outpatients, chemotherapy, and cancer surgery, are co-located and delivered in a purpose-built facility. This is typical in a Caner Care Specialised Hospital. The advantages of this model include greater communication among all members of the team, which leads to better clinical management, efficiency, and patient outcomes. It is not advisable to separate planning and therapy.

Unit Planning Models

Location

A Proton Therapy Oncology Unit may only be provided as part of a RDL 5 or 6 facility. This does not imply that the facility must be a General Hospital. The Proton Therapy Oncology Unit may be provided as part of:

- A Specialised Oncology Hospital
- A Specialised Oncology Outpatient Clinic
- A conventional Radiotherapy Unit
- As a stand-alone facility

Considering the weight of the equipment and required shielding, the Proton Therapy Oncology Unit is commonly positioned on the ground level for ease of installation and replacement of specialised equipment. Alternatively, it is also acceptable to place the Unit in the basement, preferably just below the ground level.

The Unit should be located with ready access for people with disabilities, people arriving by patient transfer services and ambulances, and for inpatients (if attached to a hospital) in wheelchairs and on beds/ trolleys. If the Unit is in a separate building but on a hospital campus, covered links between the Unit and the main hospital should be considered, especially for transfer of inpatients on beds/trolleys, delivery of commodities and supplies, and access to other departments such as Medical Imaging or Pathology.

Functional Zones

The Proton Therapy Unit should have the following standard rooms/areas:

- Entry/ Reception area including:
  - Reception
  - Waiting areas, separate for Males and Females and sized to accommodate family members, with access to public amenities
  - Interview/ Meeting Room
- Patient Consultation area:
  - Consult rooms
  - Interview room
  - Specimen collection and access to patient toilets
- Treatment Planning and Appliance areas:
  - Simulator rooms with Control and Equipment rooms
  - Mould Room; which includes a fitting room and a workshop
  - Patient holding bay for patients on a bed or trolley
  - Support rooms including Change cubicles, stores for consumables and equipment, patient toilets and sub-waiting areas
- Medical Physics:
  - Offices and workstations for Physicists
  - Physics laboratory and storage for technical equipment
- Proton Therapy Treatment areas:
  - Cyclotron (or Synchrotron) Vault (one can serve 1 to 4 treatment bunkers)
  - Treatment bunker(s) (or Gantries) with control room(s)
  - Change cubicles
  - Patient sub-waiting, locker area, and access to toilets
  - Ready access to interview rooms
  - Procedure room
  - Technical Rooms specific for the selected model
- Support Areas including:
  - Bays for Handwashing/PPE, Linen, Resuscitation trolley, holding of mobile equipment and wheelchairs

  - Clean and Dirty Utilities with waste holding areas
  - Cleaners Room
  - Staff Station
  - Store rooms for equipment and consumables

- Administration / Office Areas:
  - Offices and workstations for key personnel according to the approved service plan
  - Meeting room
  - Dedicated work area (with restricted access) support area may be required for the team who operates the proton therapy equipment

- Staff Areas:
  - Staff Room
  - Locker area
  - Toilets and Showers, gender separated

The above zones are briefly described below.

Entry/ Reception Area

Ambulances, employees, and patients should all have access to sufficient parking. Patients should ideally be assigned parking closest to the department, and it is important to remember that, while there may be a small number of patients being actively cared for in the Unit at any given time, patients spend a significant amount of time inside the department when having consultation, planning or treatment.

The Reception area will handle administrative activities including scheduling appointments and maintaining records, as well as welcoming and guiding patients to the proper zone for consultations, treatment planning, and radiotherapy treatment. The waiting area should be able to accommodate a variety of patients and visitors of all abilities, as well as provide clear access to public and patient facilities.

Where appropriate, waiting areas may be structured with separation to satisfy cultural needs. Incorporate a children's play area within the main waiting area. In this region, volunteers and transportation workers may be accommodated.

Patient Consult Areas

The Consultation Area should include individual consultation rooms as well as accommodating multidisciplinary teams for patient consultation, follow-up and case review. Patients are generally assessed weekly by a Radiation Oncologist throughout the course of their treatment and will be referred to other specialists and allied health personnel as required including Dieticians, Physiotherapists, Occupational Therapists and Social Workers. Interview and conference rooms are required for patient and family education which may include computers for review of treatment programs.

The Consultation Area should be located with easy access for outpatients without entering radiation treatment zones. The Consultation Area should have access to blood collection rooms and patient toilets for specimen collection and the area may include Procedure rooms for minor procedures including endoscopic examinations, pleural taps and peritoneal drains.

It should be noted that according to best practice, it is recommended that 'on treatment visits' should occur at least once every week. This should be carried out in either a consultation or examination room.

Treatment Planning and Appliance Areas

Treatment planning requirements include:

- Treatment planning rooms with computer workstations
- Simulator: MRI or CT suite. In a smaller Unit, it is possible to utilise services in Medical Imaging Unit or the Radiotherapy Unit (if available at the facility) for simulation purposes but not ideal.
- Patient and visitor amenities (change cubicles, toilets, sub-waiting, patient holding, etc.)
- Offices and workstations for radiation therapists, trainees and students
- Offices for data checking and transfer in a quiet and discreet area

The Appliance area allows for the selection of pre-made moulds and customisation as required. The mould room should have adequate storage space for moulds and equipment.

Medical Physics/ Biomedical Engineering

Medical Physicists supervise the physical aspects of radiation treatment and radiation safety of staff, patients and visitors. They provide scientific support for all treatment machines, simulators – CT and/or MRI, computer planning systems and equipment as well as dosimetry, quality assurance and radiation safety.

Biomedical Engineering services may be provided in-house or by external contractors. The service provides maintenance and service support to an extensive range of treatment and non-treatment equipment in Proton Therapy Oncology. Biomedical engineers work closely with Medical Physicists to provide regular calibration and compliance checks of all treatment delivery and diagnostic machines.

Biomedical facilities may be central (serving the whole facility) or dedicated to the unit.

Facility requirements include:

- Offices and workstations for physicists, physics assistants and biomedical engineers
- Physics laboratory to manufacture equipment not available commercially for patient treatment such as installation of rigid attachments for patient hoists, calibration jigs for physics, mask creation appliances
- Storage for Medical Physics equipment including bulky water tanks and phantoms
- Technical support (IT office and work area / equipment storage)
- Electronic / biomedical engineering workshop

Proton Therapy Treatment Area

The proton therapy treatment area includes:

- Bunkers with entry/ exit maze where shielding requirements are calculated by a qualified physicist/ radiation shielding consultant and must be approved by the Federal Authority for Nuclear Regulation (FANR), they are required for both cyclotron (or synchrotron) and treatment areas
- A Control room is required for each treatment area
- Change cubicles and patient toilets immediately adjacent to radiation treatment areas
- Sub-waiting areas located conveniently to each bunker and access to Interview rooms
- Support areas including patient bays, utilities, staff station, preparation and storage areas
- Procedure Room for administering anaesthesia, especially to younger patients
- Technical Rooms as per Manufacturer's requirements; they may include a power supply room, water cooling room, server room and other ancillary areas.

Support Areas

Support Areas include the following provisions:

- Handwashing, Linen and Equipment bays
- Clean Utility, Dirty Utility and Disposal Rooms
- Beverage Bays and/or Pantries
- Store rooms for equipment and consumables
- Meeting Room/s and Interview rooms for education sessions, interviews with staff, patients and families and other meetings

Administration / Offices

Offices should be provided for the clinical director of the unit, radiation oncologists, and radiation therapy managers, nursing managers, allied health professionals, cancer care co-ordinators and specialist nurses. In a stand-alone facility, additional offices/ workstations may be required for human resources, finance, legal services, public relations and information technology professionals. Quantities and configuration of offices is according to needs analysis.

Adequate access to meeting rooms should be provided to facilitate education, training, and research activities within the Unit.

Depending on the arrangement with the selected Manufacturer of the Proton Therapy Equipment, dedicated work areas including an office, meeting room and other support services may be required in addition to the above.

Staff Areas

Staff Areas will consist of:

- Staff Room
- Toilets, Shower and Lockers

Staff Areas may be shared with adjacent Units where appropriate.

Optional Area

Medical Imaging

Computed tomography (CT), magnetic resonance imaging (MRI), ultrasound (US), positron emission tomography (PET) and general x-ray imaging may be used for the visualisation of bone or soft-tissues during planning and review of all types radiotherapy treatment including proton therapy.

If a facility is a stand-alone entity or does not have an efficient functional or contractual relationship with a medical imaging department it may need to accommodate medical imaging facilities.

CT and MRI are the most commonly used imaging facilities for treatment planning. However, there are certain conditions under which ultrasound and PET may be used. The types of imaging facilities required will be determined by the service plan.

3 Functional Relationships

A Functional Relationship can be defined as the correlation between various areas of activity whose services work together closely to promote the delivery of services that are efficient in terms of management, cost and human resources. Oncology Units, due to its makeup of several components and the need for patients to utilise more than one service per visit efficient functional relationships in the Unit is imperative.

The Proton Therapy Oncology Unit should be located with ready access for ambulant outpatients as well as inpatients arriving by wheelchairs and beds. If the Unit is part of a hospital, it may be co-located with Radiation Oncology (Radiotherapy) Unit, Medical Imaging Unit, Chemotherapy Unit and related Inpatient and Outpatient Units to increase efficiency.

On-grade location is preferred due to the weight of the equipment and shielding requirements, and for ease of installation and replacement. Equipment will be loaded from the top of the bunkers and sufficient openings should be allowed for meeting the manufacturer's requirements. These openings will be closed with concrete beams after equipment is delivered.

A crane will be used to lift and drop the equipment inside the bunkers. Therefore, access to ample external space for installation of the equipment adjacent the bunkers should be considered. There will also be a restriction on the type of departments located above the Unit with no habitable space permitted directly above the Proton Therapy bunkers.

External Relationships

The principal relationships with other Units may include ready access to:

- Radiation Therapy and Chemotherapy Units (if present within the campus)
- Diagnostic facilities such as Medical Imaging and Nuclear Medicine (if incorporated in the facility or present on the campus)
- Emergency and Critical Care Units (if attached to a hospital)
- Clinical Laboratories (if available on the campus)
- Pharmacy (if available on the campus)
- Outpatient Rehabilitation and Complementary Medicine facilities (if available on the campus)
- Material Management and Housekeeping (either shared or provided as dedicated facilities)

- Operating/ Day Procedures Units (if attached to a Hospital)
- Public amenities and cafeteria (either shared or provided as dedicated facilities)
- Patient and Staff parking

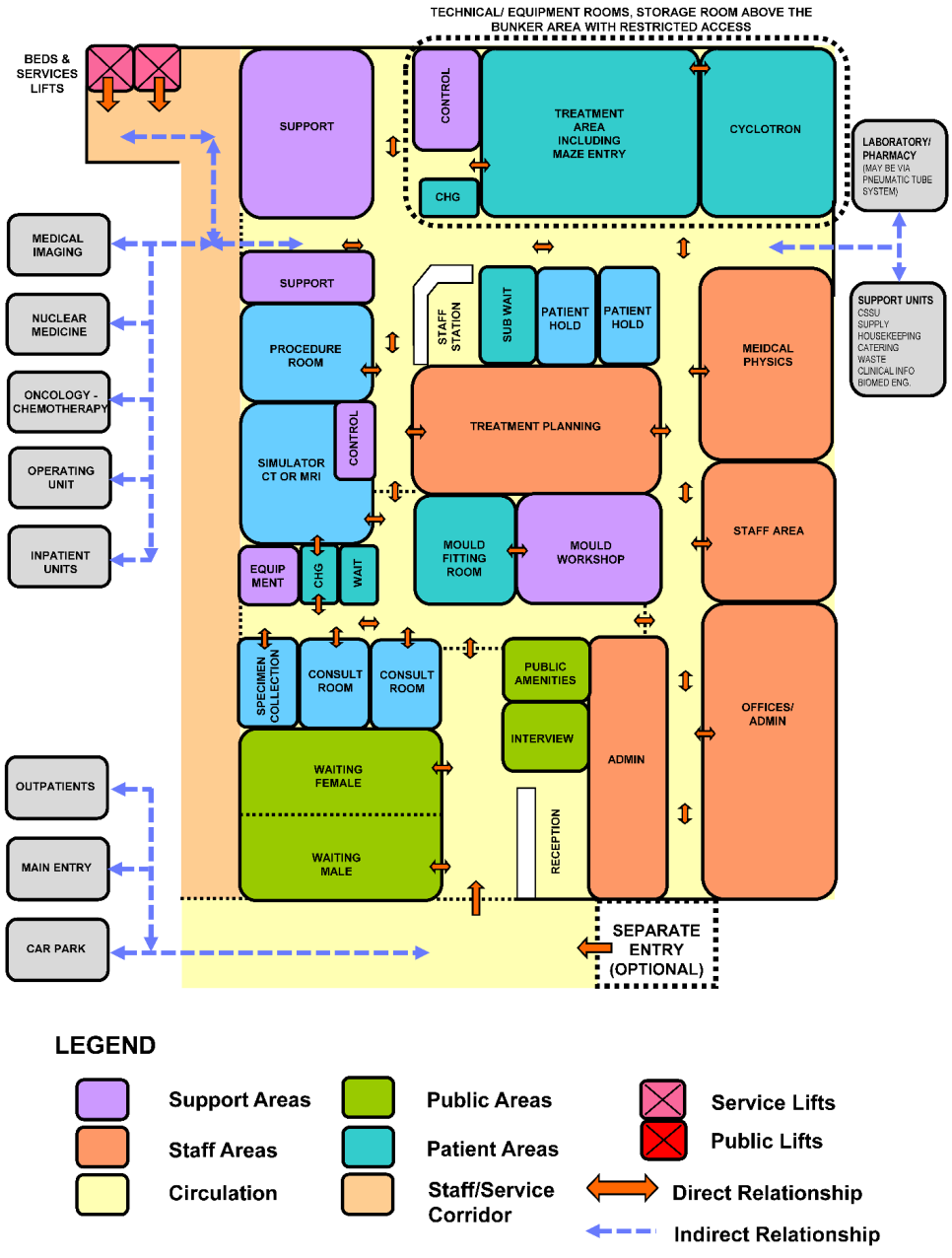
Internal Relationships

Optimum internal relationships include:

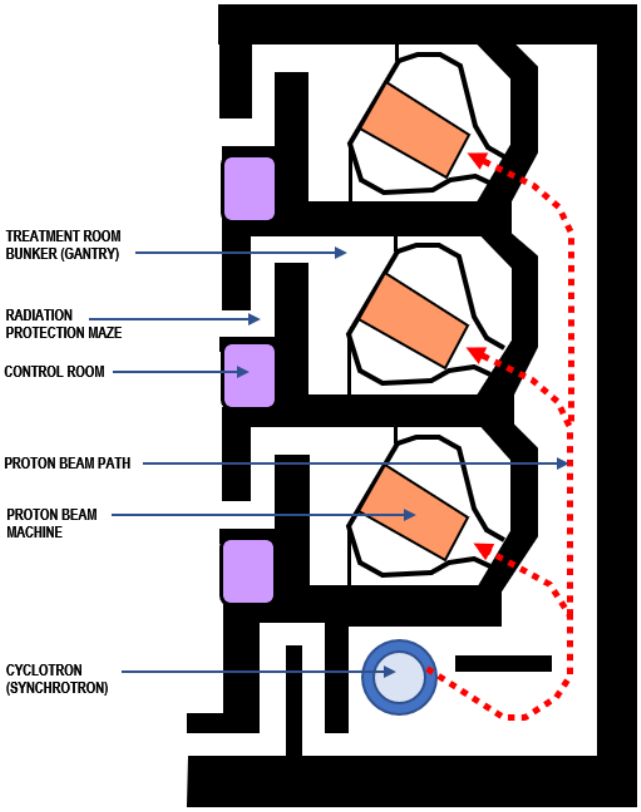
- The Staff Station and associated areas need direct access and observation to patient holding areas, flowing progressively towards the following areas:
- Consultation areas
- Treatment planning areas
- Treatment areas

Functional Relationship Diagram

The Functional Relationship of a typical Proton Therapy Oncology Unit either as a stand-alone unit or integrated with a hospital is best demonstrated in the diagram below.



PROTON BEAM BUNKERS (GANTRIES) AND CYCLOTRON
(ONE OR MORE BUNKERS CAN BE SERVED BY ONE CYCLOTRON)



4 Design Considerations

Refer to Part C for Ergonomic issues, Part D for Infection Control, and Part E for Engineering requirements.

Construction Standards

The flooring for a Proton Therapy Oncology Unit shall be adequate to meet the load requirements for equipment, patients and personnel. Provision for cable ducts or conduits should be made in the floors and ceilings as required. Ceiling mounted equipment should have properly designed rigid support structures located above the finished ceiling. The minimum recommended ceiling height is 3 metres. A lay-in type of ceiling should be considered for ease of installation and service.

The linear accelerator installation may require an opening in a wall and co-ordination of the entry door size to also allow for future servicing of the equipment.

Radiation Oncology Units should be designed to avoid exposing patients, staff and visitors to risks such as injury or radiation hazard.

Environmental Considerations

Acoustics

The Proton Therapy Unit should be designed to minimise the ambient noise level within the unit and transmission of sound between patient areas, staff areas and public areas.

Acoustic treatment will be required for the following:

- Family/ case conference/ interview rooms
- Isolation of noisy areas such as waiting rooms from clinical areas e.g. clean and dirty utilities
- Staff discussions regarding confidential matters in meeting rooms
- Noise sources arising both within and from outside the Unit such as:
  - Sanitary Facilities

- Equipment
- Patients/ Clients
- Staff Activities
- Traffic through the unit e.g. visitors, food, linen or other trolleys.

Solutions to be considered include:

- Location of the unit away from noisy hospital areas
- Use of sound isolating construction and selection of sound absorbing materials and finishes
- Planning to separate quiet areas from noisy areas
- Review of operational management and patient/client flows; this may include separate areas for patients with special needs
- Provision of television systems with headphones to reduce ambient noise levels.

Refer to **Part G – Acoustics** of these Guidelines for more information.

Natural Light/ Lighting

Natural light and views are desirable but not required from the Unit for the benefit of staff and patients. Every effort should be made to provide a view to all treatment areas either by locating treatment bays/ cubicles/ bedrooms adjacent to a window or by locating chairs and beds to have an external view from each patient space.

High quality task lighting is essential to ensure complex medical and pharmacological tasks can be safely achieved.

Colour corrected lighting is also essential to ensure patient assessment can be conducted effectively.

Privacy

The design of the Proton Therapy Unit needs to consider the contradictory requirement for staff visibility of patients while maintaining patient privacy. Unit design and location of staff stations will offer varying degrees of visibility and privacy.

Each treatment bay shall be provided with bed screens to ensure privacy of patients undergoing treatment in both private and shared inpatient rooms. Refer to the Standard Components for examples.

Confidentiality for patients receiving treatment is a highly important consideration to be addressed. The Unit should be designed to:

- Ensure confidentiality of personal discussions and medical records
- Provide an adequate number of rooms for discreet discussions and treatments to occur whenever required
- Enable sufficient space within each Treatment Bay to permit curtains to be easily drawn whenever required.

Accessibility

Design should provide ease of access for wheelchair bound patients in all patient areas including Reception desk, Consult, Interview, Mould fittings rooms and Radiation Treatment bunkers. Waiting areas should include spaces for wheelchairs and suitable seating for patients with disabilities or mobility aids.

Doors

All entry points, doors or openings requiring bed/trolley access including Radiation Therapy and Procedure Rooms are recommended to be a minimum of 1400mm wide, unobstructed. Larger openings may be required for special equipment, as determined by the Operational Policy, to allow the manoeuvring of equipment without manual handling risks and risk of damage.

Within workshop and appliance room areas, the number of doors should be kept to a minimum to facilitate the movement of equipment; double doors should be provided to all workshop areas.

Also refer to **Part C – Access, Mobility, OH&S** of these Guidelines.

Ergonomics/ OH&S

Heights and depths of benches and workstations in the proton therapy treatment area need to allow staff to efficiently work from standing and seated positions.

Refer to **Part C – Access, Mobility, OH&S** of these Guidelines for more information.

Size of the Unit

The size of the Proton Therapy Oncology Unit will be determined by the Clinical Services Plan establishing the intended services scope and complexity. In a satellite facility, where cancer services are collocated, two Radiotherapy Treatment rooms (bunkers) is the minimum viable number.

Schedules of Accommodation have been provided for a typical unit with 2 Proton Therapy Bunkers.

Safety and Security

A high standard of safety and security can be achieved by careful configuration of spaces and zones to include:

- Controlled access/ egress to and from the unit
- Optimal visual observation for staff to access points and patient/ visitor areas
- Use of CCTV to entry and communication systems to enable contact after normal work hours
- Collocation of similar functions for ease of staff management

Access to public areas shall be considered with care so that the safety and security of staff areas within the Unit are not compromised.

Refer to the Federal Authority for Nuclear Regulation (FANR) for Radiation Shielding requirements and Radiation Monitoring systems.

Refer also to **Part C – Access, Mobility, OH&S** of these Guidelines for additional information.

Finishes

Finishes including building fabric, floor, wall and ceiling finishes, should be relaxing and non-institutional as far as possible. The following additional factors should be considered in the selection of finishes:

- acoustic properties
- durability
- ease of cleaning
- infection control
- fire safety
- movement of equipment

Refer to **Part C – Access, Mobility and OH&S** of these Guidelines for more information on wall protection, floor finishes and ceiling finishes.

Fixtures, Fittings and Equipment

Equipment such as the cyclotron or synchrotron, gantries and control equipment must be installed to the manufacturer's specifications and recommendations, in particular:

- Space requirements may vary according to equipment selection
- Doors will need to be sized to allow passage of equipment
- Structural assessment will be required for equipment weight loads
- Adequate space will be required for maintenance of major equipment ensuring adequate access to cabinets and control units.

Equipment, furniture, fittings and the facility itself shall be designed and constructed to be safe, robust and meet the needs of a range of users. All furniture, fittings and equipment selections for the Unit should be made with consideration to ergonomic and Occupational Health and Safety (OH& S) aspects.

Refer to **Part C – Access, Mobility, OH&S** of these Guidelines, the Room Layout Sheets (RLS) and Room Data Sheets (RDS) for more information.

Curtains / Blinds

Window treatments should be durable and easy to clean. Consideration may be given to use of blinds, shutters, tinted glass, reflective glass, exterior overhangs or louvers to control the level of lighting.

If blinds are to be used instead of curtains, the following applies:

- Vertical blinds and Holland blinds are preferred over horizontal blinds as they do not provide numerous surfaces for collecting dust.
- Horizontal blinds may be used within a double-glazed window assembly with a knob control on the bedroom side.

Privacy bed screens must be washable, fireproof and cleanly maintained at all times. Disposable bed screens may also be considered.

Building Services Requirements

This section identifies unit specific services briefing requirements only and must be read in conjunction with **Part E – Engineering Services** for the detailed parameters and standards applicable.

Information and Communication Technology

Unit design should address the following Information Technology/ Communications issues:

- Electronic patient records and patient information systems
- Electronic forms and requests for investigations, pharmacy, catering, supplies
- Telephones including cordless and mobile phones
- Picture archiving communications systems (PACS)
- Computers, laptops, hand-held tablets and other smart devices
- Patient call, nurse assist call, emergency call systems
- Paging for staff and emergencies
- Duress systems, personal mobile duress systems may be considered
- Supply and records management systems including bar coding for supplies
- Data and communication outlets, servers and communication room requirements
- Wireless network requirements for staff, patients and visitors
- Videoconferencing requirements.

Nurse Call

Patient and Emergency Call facilities shall be provided in all patient areas (e.g. Consult Room/s, Holding/ Recovery bays, Change Cubicles and Toilets) in order for patients and staff to request for urgent assistance.

The individual call buttons shall alert to an annunciator system. Annunciator panels should be located in strategic points visible from Staff Stations Staff Stations and audible in Staff Rooms, and Meeting Rooms, and should be of the “non-scrolling” type, allowing all calls to be displayed at the same time.

Heating Ventilation and Air-conditioning (HVAC)

The Unit should be air conditioned with adjustable temperature and humidity for patient comfort. Air conditioning systems should be designed with consideration to provision of appropriate air exchanges and exhaust. General air conditioning outlets should not be placed directly over patients on chairs, beds or trolleys.

Air conditioning systems should be designed with consideration to the following:

- Appropriate air exchanges and exhaust for chemicals and dust in the appliance workshop

- Sufficient cooling for heat generating equipment in radiotherapy treatment and computer equipment rooms.
- Smoke detectors in radiation treatment and simulator rooms must be of the type not sensitive to radiation (i.e. photoelectric) and require special consideration.

All HVAC units and systems are to comply with services identified in Standard Components and Part E – Engineering Services.

Medical Gases

The Unit will require:

- Oxygen and suction in all patient bays and procedure rooms, including proton therapy treatment areas
- Provision of medical air to patient recovery bays is optional as long as oxygen is provided.

Refer to Part E of these guidelines and to the Standard Components, RDS and RLS.

Radiation Shielding and Radiation Safety

Radiation Shielding and Safety will be subject to approval by the FANR. Proton Therapy bunkers require radiation protection that may include very thick concrete and/or lead shielding to walls floors and ceilings to specified thicknesses. Design of the bunker rooms commonly incorporate a maze entry to assist with radiation protection.

If there are any accessible spaces below the bunker, the floor also needs to be shielded; however, the provision of facilities below the bunkers is not recommended.

The radiation protection needs of the Unit shall be assessed by a certified physicist or appropriate agency. This assessment is to specify the type, location, and amount of protection to be installed in accordance with final approved departmental layout and equipment selection. The radiation protection requirements shall be incorporated into the final plans and specifications. Early consultation with the manufacturers of radiotherapy equipment is highly recommended as the design provisions tend to be different and highly specific to the requirements of the manufacturers and the equipment.

The lifespan of the facility and the need to upgrade technology should be considered when specifying the radiation shielding required. It is likely that the machines will be upgraded, and newer machines may or may not emit stronger radiation. Therefore, it is sensible to allow for the highest energy machine and widest beam that is likely to be used in the future.

Radiation safety monitoring devices such as radiation area monitors should be utilised in rooms with radiation safety. FANR shall be consulted as the authority for the verification of the radiation shielding.

Pneumatic Tube Systems

The Unit may include a pneumatic tube station, as determined by the facility Operational Policy. If provided the station should be located in close proximity to the Staff Station or under direct staff supervision.

Hydraulics

Warm water supplied to all areas accessed by patients within the Inpatient Unit should be ideally at 38 degrees Celsius and must not exceeds 43 degrees Celsius. This requirement included all staff handwash basins and sinks located within patient accessible areas.

For cold, warm & hot water technical details, refer to **Part E – Engineering Services** in these Guidelines.

Infection Control

Infectious and immune-suppressed patients may be sharing the same treatment space at the different times of the same day. The design of all aspects for the Unit should take into consideration the need to ensure a high level of infection control in all aspects of clinical and non-clinical practice.

Hand Basins

Hand washing facilities for staff within the Unit will be required in all patient treatment areas including bed bays for holding and recovery, Consult Rooms, Procedure Rooms and Proton Therapy Bunkers, Imaging rooms, and located conveniently to Simulator Rooms and Staff Stations. Where a hand wash basin is provided, there shall also be liquid soap and disposable paper towels provided and PPE equipment.

Hand basins are to comply with **Standard Components – "Bay – Hand-washing"** and **Part D – Infection Control**.

Antiseptic Hand Rubs

Antiseptic hand rubs should be located so they are readily available for use at points of care, at the end of patient beds and in high traffic areas.

The placement of antiseptic hand rubs should be consistent and reliable throughout facilities. Antiseptic based hand rubs are to comply with **Part D – Infection Control**, in these guidelines.

Antiseptic Hand Rubs, although very useful and welcome, cannot fully replace Hand Wash Bays.

5 Components of the Unit

Standard Components

Standard Components are typical rooms in a health facility, each represented by a Room Data Sheet (RDS) and Room Layout Sheet (RLS). Sometimes, there are more than one configuration possible and therefore, more than one room layout sheet can be found in the Standard Components for a room with same function. They may differ in room size and/or the requirement of FF&FE items.

The Room Data Sheets are presented in a written format, describing the minimum briefing requirements of each room type divided into the following categories:

- Room Primary Information; includes briefed areas, occupancy, room description, relationships and special room requirements
- Building Fabric and Finishes; describes fabric and finishes for the room's ceiling, floor, walls, doors and glazing requirements
- Furniture and Fittings; lists all the fittings and furniture typically located in the room; Furniture and Fittings are identified with a group number indicating who is responsible for providing the item according to a widely accepted description as follows:

Group	Description
1	Provided and installed by the Builder/ Contractor
2	Provided by the Client and installed by the Builder/Contractor
3	Provided and installed by the Client

- Fixtures and Equipment; includes all the serviced equipment commonly located in the room along with the services required such as power, data, water supply and drainage; Fixtures and Equipment are also identified with a group number as above indicating who is responsible for provision
- Building Services - indicates the requirement for communications, power, HVAC (Heating, Ventilation and Air Conditioning), medical gases, nurse/ emergency call and lighting along with quantities and types where appropriate. Provision of all services items listed is mandatory.

The Room Layout Sheets (RLS's) are indicative plan layouts and elevations illustrating an example of a good design. The RLS indicated are deemed to satisfy these Guidelines. Alternative layouts and innovative planning shall be deemed to comply with these Guidelines provided by the following criteria are met:

- Compliance with the text of these Guidelines
- Minimum floor areas as shown in the schedule of accommodation
- Clearances and accessibility around various objects shown or implied
- Inclusion of all mandatory items identified in the RDS.

- Standard Components have considered the required design parameters described in these Guidelines. Each FPU should be designed with compliance to Standard Components - Room Data Sheets and Room Layout Sheets, nominated in the Schedules of Accommodation in Appendices of this FPU.

Non-Standard Components

Non-standard rooms are rooms are those which have not yet been standardised within these Guidelines. As such there are very few Non-standard Rooms. These are identified in the Schedules of Accommodation as NS.

Cyclotron, Treatment Area and associated areas

Refer to the Manufacturer's requirements at the early stage of design as they will differ from one to another. Areas shown in the SOA are indicative only.

6 Schedule of Accommodation

The Schedule of Accommodation (SOA) provided in the Appendices of this FPU represents generic requirements for this Unit. It identifies the rooms required along with the room quantities and the recommended room areas. The sum of the room areas is shown as the Sub Total as the Net Area. The total area comprises of the sub-total areas of these rooms plus an additional percentage of the sub-total applied as the circulation (corridors within the Unit). Circulation is represented as a percentage is the minimum recommended target area. Any external areas and optional rooms/ spaces are not included in the total areas in the SOA.

Within the SOA, room sizes indicated for typical units and are organised into functional zones. Not all rooms identified are mandatory, therefore, some rooms are found as optional in the corresponding Remarks. These Guidelines do not dictate the size of the facilities and the SOA provided represents a limited sample based on assumed unit sizes. The actual size of the facilities is determined by the Service Planning or Feasibility Studies. Quantities of rooms need to be proportionally adjusted to suit the desired unit size and service needs.

Any proposed deviations from the mandatory requirements, justified by innovative and alternative operational models may be proposed within the departure forms included in Part A of these guidelines for consideration by the health authority for approval.

Proton Therapy Unit

The following SOA is based on a Stand-alone facility.

ROOM/ SPACE	Standard Component Room Codes	RDL 5 -6 Qty x m2			Remarks
Unit Size		**1 bunker**			
Entrance/ Reception		**Qty x m2**			
Airlock	Airl-6-i	1	x	6	Optional; For standalone facilities or units with direct access from outside (recommended)
Waiting Area	wait-30-i	1	x	30	Divided into male/female areas. 1.2m^2 per chair, 1.5m^2 for wheelchairs. Area may be enlarged to increase seating capacity.
Reception/ Clerical	recl-10-i	1	x	10	
Bay – Beverage	bbev-op-i	1	x	5	Optional. May share with a collocated unit.
Bay – Vending Machines	bvm-3-i	1	x	3	Optional. May share with a collocated unit.
Bay – Wheelchair	bwc-4-i	1	x	4	Optional. May share with a collocated unit.
Toilet – Patient (Accessible)	wcac-i	2	x	6	Separate Male and Female. May be shared
Consult Area					
Consult/ Exam Room	cons-i	2	x	13	Quantity according to service plan
Interview Room – Family/ Large	intf-i	1	x	12	For up to 8 persons
Procedure Room	proc-20-i	1	x	20	
Specimen Collection Bay	specc-i	1	x	9	As required
Toilet – Accessible		shared			Shared with Entry/ Recpetion
Waiting		shared			Shared with Entry/ Reception
Treatment Planning, Appliance Areas					
Change – Patient (Accessible)	chpt-d-i	2	x	5	Enclosed Room
Clean-up Room	clup-7-i	1	x	7	Mould fitting/workshop clean up
Mould Room – Fitting	mld-ft-i similar	1	x	10	
Mould Room –Workshop	mld-ws-i	1	x	20	Noise reduction required
MRI Simulator	mri-42-i	1	x	42	Sized to suit equipment; facility to determine the type of imaging equipment to be used; optional if separate Medical Imaging Unit is available within the facility.
MRI Simulator Control Room	NS	1	x	12	If MRI Simulator is provided
MRI Equipment Room	coeq-i	1	x	8	If MRI Simulator is provided; size to Manufacturer's requirement; may be located within the Simulator Room
CT Simulator	mri-42-i	1	x	*	Alternative option to MRI Simulator; sized to suit equipment; facility to determine the type of imaging equipment to be used; optional if separate Medical Imaging Unit is available within the facility.
CT Simulator Control Room	ctcr-i	1	x	*	If CT Simulator is provided; min. 12m^2
CT Equipment Room	coeq-i	1	x	*	If CT Simulator is provided; size to Manufacturer's requirement; may be located within the Simulator Room
Radiotherapy Treatment Planning	rad-trp-i similar	1	x	35	Workstations for 6 & 10 staff respectively

ROOM/ SPACE	Standard Component Room Codes	RDL 5 -6 Qty x m2			Remarks
Unit Size		**1 bunker**			
Patient Bay – Holding	pbtr-h-10-i	1	x	10	if Inpatient Units are provided
Bay – Handwashing, Type B	bhws-b-i	1	x	1	At patient holding bay
Store – General/ Equipment	steq-20-i	1	x	20	
Store – Mould	stgn-8-i	1	x	8	Patient mould storage during treatment program
Toilet – Patient (Accessible)	wcac-i	2	x	6	Separate for M/F
Waiting – Sub	wait-10-i similar	1	x	5	Maybe shared between 2 simulator
Medical Physics					**May be shared with Radiation Oncology Unit**
Office – Single Person	off-s12-i	1	x	12	Chief Physicist
Office – Workstation	off-ws-i	1	x	5.5	Physicists. Quantity as per service plan
Office – Workstation	off-ws-i	1	x	5.5	Biomedical Engineer
Physics Laboratory	phlab-i similar	1	x	24	Required for larger facilities. Optional for smaller facilities
Store – Equipment (Parts & Maintenance)	steq-14-i	1	x	14	Physics equipment
Workshop – Biomedical	ws-bm-i similar	1	x	40	Can be centrally located and shared with other Units if in a hospital
Radiation Therapy Treatment Areas					
Change Cubicle – Accessible	chpt-d-i	1	x	4	1 per bunker
Proton Therapy Bunker Room (or Gantry)	NS	1	x	200*	See **Note 1**. Size and requirements as per manufacturers specifications
Proton Therapy Bunker Control Room	NS	1	x	18*	size and requirements as per manufacturers specifications
Cyclotron/ Synchrotron Bunker Room (or Vault)	NS	1	x	120*	Size to Manufacturer's requirement. One can serve from 1 to 4 Proton Therapy Bunders.
Technical Rooms	NS	1	x	80*	size to Manufacturer's requirement; may include server room, power suuply room, water cooling room etc and located above bunker area. Note this may varies from manufacturer to manufacturer.
Storage Room	NS	1	x	24*	size to Manfacturer's requirement; may be located above the bunker area
Maintenance Room	NS	1	x	20*	size to Manfacturer's requirement; may be located away from the unit but ideally adjacent
Clean-up Room	clup-7-i similar	1	x	15	1 per 2 bunkers
Staff Station	sstn-5-i	1	x	5	
Interview Room – Family / Large	intf-i	1	x	12	Optional. May be shared.
Procedure Room1	proc-20-i	1	x	20	Administer anaesthesia to patient when required prior to treatment
Patient Bay – Holding/ Recovery	pbtr-h-10-i	1	x	10	1 per bunker
Bay – Handwashing/ PPE, Type B	bhws-ppe-i	1	x	1.5	at Patient Holding Bay combined with PPE storage; 1 may shared between 2 bays
Property Bay	prop-3-i similar	1	x	2	Optional; Patient property. 1 per 2 bunkers
Toilet – Patient (Accessible)	wcac-i	2	x	6	Separate M/F
Waiting - Sub	wait-10-i similar	2	x	5	1 per bunker
Support Areas					

ROOM/ SPACE	Standard Component Room Codes	RDL 5 -6 Qty x m2			Remarks
Unit Size		**1 bunker**			
Bay - Linen	blin-i	1	x	2	
Bay - Blanket Warmer	bbw-1-i	1	x	1	
Bay - Resuscitation Trolley	bres-i	1	x	1.5	
Cleaner's Room	clrm-6-i	1	x	6	
Dirty Utility	dtur-s-i	1	x	8	
Store - Equipment	steq-14-i	1	x	14	
Workroom - Proton Beam Therapy	NS	1	x	40	
Administration/ Offices					**See Note 2**
Office - Single Person	off-s12-i	1	x	12	Clinical Director
Office - Single Person	off-s12-i	1	x	9	Radiation Oncologist
Office - Single Person	off-s12-i	1	x	9	Manager - Radiation Therapy
Office - Single Person	off-s9-i	1	x	9	Radiation Therapist - Head of Planning
Office - Single Person	off-s9-i	1	x	9	Radiation Therapist - Head of Treatment
Office - Single Person	off-s9-i	2	x	9	Educator, Teaching Fellow, Quality Assurance manager, IT manager, etc.
Office - Single Person	off-s9-i	1	x	9	Nurse Manager. Located close to patient areas
Office - 2 Person Shared	off-2p-i	1	x	12	Clinical trials monitor, nurse coordinator.
Office - 2 Person Shared	off-2p-i	1	x	12	Biostatistician, data manager
Office - 3 Person Shared	off-3p-i	1	x	16	Allied health
Office - Workstation	off-ws-i	1	x	5.5	Nurse coordinator
Office - Workstation	off-ws-i	2	x	5.5	Cancer care coordinators, specialist cancer nurses and palliative care nurses.
Office - Workstation	off-ws-i	2	x	5.5	Administration staff
Office - Write up (Shared)	off-wis-i	1	x	12	Clinical reviews. Located close to patient areas.
Meeting Room - Medium / Large	meet-l-15-i	1	x	15	
Staff Areas					
Property Bay - Staff	prop-3-i similar	2	x	3	Separate M/F
Staff Room	srm-25-i similar	1	x	20	
Shower - Staff	shst-i	2	x	3	Separate M/F
Toilet - Staff	wcst-i	2	x	3	Separate M/F
Sub Total				**1251.5**	
Circulation %				40	
Total Areas				**1752.1**	

Note 1: Spatial allocation for an integrated bunker for bother Cyclotron and Treatment Area includes maze and radiation shielding wall. Bunker size depends on equipment selected and radiation shielding recommendation from radiation safety specialist.

Note 2: Offices to be provided according to the number of approved full-time positions within the Unit.

Please note the following:

- Areas noted in Schedules of Accommodation take precedence over all other areas noted in the Standard Components
- Rooms indicated in the schedule reflect the typical arrangement according to RDL and by KPU
- Exact requirements for room quantities and sizes will reflect Key Planning Units (KPU) identified in the Clinical Service Plan and the Operational Policies of the Unit
- All the areas shown in the SOA follow the No-Gap system described elsewhere in these Guidelines
- Room sizes indicated should be viewed as a minimum requirement; variations are acceptable to reflect the needs of individual Unit
- Offices are to be provided according to the number of approved full-time positions within the Unit.

7 Further Reading

In addition to Sections referenced in this FPU, i.e. Part C- Access, Mobility, OH&S, Part D - Infection Control, and Part E - Engineering Services, readers may find the following helpful:

- International Health Facility Guideline (iHFG) www.healthdesign.com.au/ihfg
- Federal Authority for Nuclear Regulation (FANR):

  https://fanr.gov.ae/en/operations/radiation-safety
- Gov.UK Health Building Note 02-01: Cancer Treatment Facilities (2013)

  https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/147860/HBN_02-01_Final.pdf
- American Institute of Architects, The Facility Guidelines Institute, Guidelines for Design and Construction of Hospitals and Outpatient Facilities; Available from: http://www.fgiguidelines.org/
- International Atomic Energy Agency (IAEA) Radiotherapy Facilities: Master planning & Concept Design Consideration (2014) http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1645web-46536742.pdf
- The Kings Fund; 'Future Trends and Challenges for Cancer Services in England, a Review of Literature & Policy'

  https://www.kingsfund.org.uk/publications/future-trends-and-challenges-cancer-services-england
- The Royal Australian and New Zealand College of Radiologists http://www.ranzcr.edu.au/
- The Building Regulation & Facilities for the Disabled United Arab Emirates Code

  https://www.moid.gov.ae/EPublications/The%20Building%20Regulation%20Facilities%20For%20the%20Disabled-en.pdf