Part B – Health Facility Briefing & Design

145 Laboratory Unit

International Health Facility Guidelines

Version 6.0, December 2022

Table of Contents

145 Laboratory Unit

1 Introduction

Description

The Laboratory Unit provides facilities and equipment for the examination of body tissues and fluids, involving receipt of patient specimens, testing and issue of reports.

The Laboratory Unit may be divided into specialist disciplines including but not limited to:

- **General Pathology** involves a mixture of anatomical and clinical pathology specialties in the one Unit.
- **Anatomical Pathology** involves the diagnosis of disease based on the microscopic, chemical, immunologic and molecular examination of organs, tissues, and whole bodies (autopsy). Anatomical pathology is itself divided into subspecialties including Surgical Pathology, Cytopathology and Forensic Pathology.
- **Clinical Pathology** involves diagnosis of disease through the laboratory analysis of blood and bodily fluids and/or tissues using the tools of Chemistry, Microbiology, Haematology and Molecular Pathology.
- **Chemical Pathology** involves the biochemical investigation of bodily fluids such as blood, urine, and cerebrospinal fluid.
- **Haematology** is concerned with diseases that affect the production of blood and its components, such as blood cells, haemoglobin, blood proteins, bone marrow and the mechanism of coagulation.
- **Blood banking** involves processes in the lab that ensure that donated blood or blood products are safe for blood transfusions. Blood banking includes typing crossmatching the blood for transfusion and testing for infections.
- **Microbiology** is concerned with diseases caused by organisms such as bacteria, viruses, fungi and parasites. The clinical aspects involve control of infectious diseases and infections caused by antibiotic-resistant bacteria.
- **Genetics/ Clinical Cytogenetics** is a branch of genetics concerned with studying the structure and function of the cell, particularly the microscopic analysis of chromosomal abnormalities; molecular genetics uses DNA technology to analyse genetic mutations.
- **Immunology** is a broad discipline that deals with the physiological functioning of the immune system and malfunctions of the immune system such as autoimmune diseases, hypersensitivities, immune deficiency, and transplant rejection.

2 Functional and Planning Considerations

Operational Models

Laboratory services may be provided according to the following service delivery models and will be dependent on the size, the Role Delineation and the Operational Policy of the facility:

- On-site laboratory providing a wide range of tests and services
- On-site provision limited to Point of Care Testing (POCT) for a limited range of urgent tests
- Off-site laboratory with services provided by an external laboratory on a contracted or other basis; the external laboratory may be a separate private business unit.
- Networking of hospital laboratories across an area or region with varying arrangements for specialisation between laboratories.

In hospitals RDL 3 to 6, the minimum lab services must be Blood Bank for Surgery support plus:

- Haematology
- Chemical Pathology
- Microbiology

Hours of Operation

The Laboratory Unit will generally operate seven days per week with core services available from 8 am to 6 pm daily and emergency or urgent services available on a 24-hour basis. The exact hours of operations should be determined by the Operational Policy.

3 Unit Planning Models

Location

The Laboratory Unit may be located in a service zone within the healthcare facility with consideration of:

- Travel distances and the amount of time taken to receive specimens and for staff travelling between various key departments
- Ease of access for patients attending the Unit for specimen collection (if convenient)

With automated delivery methods such as pneumatic tube systems and satellite specimen collection zones within the facility, the location of the Unit becomes less critical.

It is recommended that the laboratory be located for easy staff access, away from public areas.

Ideally the laboratory location should not be based primarily on the public access for specimen collection. Instead, specimen should be collected in one or more locations which are convenient to the patients such as the Outpatient Department, Emergency Unit, Blood donation centre, Inpatient Units, satellite facilities and elsewhere. The specimen collected should then be transferred to the laboratory by the staff using internal couriers or a pneumatic tube system.

Nothing in these guidelines prohibits the location of the Laboratory on a specific floor level of the building including the basement. However, designers and operators are advised to fully consider the implications of a location within the basement against the requirements of fire evacuation and fire safety. This will particularly affect existing buildings being refurbished for laboratory use. To be clear, there are no shortcuts or relaxation of fire safety requirements, when a Laboratory is located within the basement or within an existing building. All safety requirements must be provided and standards achieved regardless of the building restrictions.

Configuration

The Laboratory Unit may be planned as a series of modular pods or zones, providing flexibility for change of function and equipment as necessary. Each module may be sized to accommodate a specific specialty and the equipment required, with the ability to adapt and reconfigure modules.

Specimen Collections may be located adjacent to the Laboratory Unit or at satellite collection areas within other Units of a facility. Travel distances between the Unit and the point of specimen collection should be considered when determining their locations.

If an automated delivery system such as Pneumatic Tube System (PTS) and satellite specimen collection zones are provided within the facility, the location of the Unit will not be critical.

Functional Areas

The Laboratory Unit will comprise the following Functional Zones in accordance with the service plan of the Facility:

- Central Specimen Reception (CSR) including:
  - Specimen registration, data entry
  - Specimen sorting and preliminary processing prior to delivery/ dispatch to various specialty laboratories
- Laboratories, which may include:
  - Automated laboratories that perform a range of tests across a variety of specialties
  - Specialist laboratories such as Clinical Chemistry, Anatomical Pathology, Microbiology, Haematology, Immunology
- Blood Bank including
  - Storage of blood and blood products in refrigerators and freezers
  - Testing laboratory
- Support areas may be centralised to serve all subspecialty laboratories and may include:

  - Clean-up room/s
  - Sterilisation area
  - Storage areas for reagents, appropriate storage for flammable liquids, corrosive chemicals general supplies, refrigerated storage for slides and reagents
  - Disposal facilities for contaminated waste
- Specimen Collection area (this may be located remotely to the Laboratory Unit or in Outpatient areas):
  - Reception and Waiting area
  - Patient toilets
  - Specimen collection cubicles with a workbench, space for patient seating and hand washing facilities
- Staff Areas including:
  - Offices and workstations
  - Meeting Rooms
  - Staff Room
  - Change Rooms with Toilets, Shower and Lockers.

Specimen Reception

The Central Specimen Reception (CSR) area is where specimens for analysis are received, sorted and held temporarily prior to dispatch into each specialty laboratory. In the case if this Unit is a part of a larger Facility, specimens collected from other Units may be transported by Pneumatic Tube System (PTS) or by delivery staff. For a stand-alone laboratory facility, delivery will be by courier.

For large facilities and matching large laboratories, it may be necessary to provide more than one PTS station to be able to handle the volume of specimen deliveries.

The Specimen Reception should handle all registration of specimens, such as through the provision of a computerised/ barcode systems, sorting benches as well as a specimen holding area including refrigerated holding.

Once specimens are registered and sorted, they will be delivered to the relevant laboratory area for processing, testing and reporting.

Waiting Areas should be provided if Specimen Collection Area is available and attached to the Unit. Such a waiting area may be gender separated according to the operational policies of the facility.

Laboratories

Access to the Laboratories should be strictly limited to laboratory personnel.

Laboratories can be configured as open plan or as enclosed specialist laboratories (and a mix of the two) in accordance with the service plan.

- **Open Plan Laboratories** - these usually makes up the core of a Laboratory Unit for mainstream processing. These may include Clinical Chemistry, Haematology etc.
- **Enclosed Specialist Laboratories** – a controlled, and segregated environment is required where hazardous materials will be processed including Microbiology, Anatomical Pathology or Virology/ Serology. Special air-conditioning and exhaust arrangements from open plan areas are common requirements to these enclosed specialist laboratories.
- **Additional Special-purpose Laboratories** – certain special-purpose laboratories may be plugged into the general laboratory depending on the facility service plan and the purpose of the facility. For example, a Molecular Pathology/ Genetics Laboratory may be plugged into the general laboratory, taking advantage of certain common services whilst being semi-autonomous and otherwise self-contained. This FPU does not cover such special-purpose laboratories such as Molecular Pathology/ Genetics Labs.

The specimen workflow proceeds in an orderly path from Specimen Reception to Sorting and initial processing, and then to specific laboratories for testing, analysis and reporting. Results may be automated and matched to the patient's electronic medical record or printed and delivered to the various units by courier or automated delivery system.

The following considerations for laboratory planning:

- Provide adequate workbench space for laboratory equipment including microscopes, incubator/s, centrifuge/s, chemistry analysers etc.
- Provide vacuum, gases, electrical and data outlets at workbench and on the walls for free-standing equipment.
- Provide sinks with access to hot and cold water to be used for the disposal of non-toxic fluids.
- Provide basin/s with paper towel and soap dispensers for staff handwashing.
- Provide one or more emergency showers and eye wash stations. Drainage from these is to be connected to a separate holding area. Adequate numbers should be provided based on the assessment of hazards within the lab. For example, microbiology, histology, haematology should have stations within a maximum distance of 16 meters (also see support areas below).
- The size of the laboratory needs to be appropriate to the functions defined in the service plan as well as providing a safe working environment for the staff.

Blood Bank

In general, blood and blood products are produced in a dedicated facility by a separate service provider, delivered to health institutions as needed and stored in the Blood Bank area. In tertiary care facilities such as RDL 5 & 6 there may be bulk storage facilities, including testing and cross-matching and internal distribution. Blood donation, however is centrally controlled and organised by Government facilities.

The Blood Bank area should be located in close proximity to Haematology for convenient processing.

Blood and blood products must be stored in a secure, strictly controlled environment according to local and international standards. The area will contain temperature-controlled refrigerators and freezers under the supervision of laboratory staff.

Support Areas

Support areas may be located centrally to serve all laboratory areas and avoid duplication of support rooms. Support areas will include:

- Cleaner's room
- Clean-up room/s for washing glassware, re-usable equipment and utensils used in processing and analysing specimens
- Personal Protective Equipment (PPE) Bay(s) with eye protection, personal protective clothing and equipment. These should be distributed within the Unit where they are readily accessible from all processing areas
- Sterilisation area for sterilising dishes and glassware
- Storage areas for reagents, flammable liquids, general and consumable supplies, refrigerated storage for slides and reagents. Ideally, there should be multiple storage areas distributed within the Unit
- Disposal facilities for contaminated waste that may include cytotoxic waste and radioactive waste if radioactive reagents are used
- Handwash Basin(s), emergency shower(s) and eyewash station(s), located with ready access to all processing areas.

Specimen Collection Area

This area is where collected specimens are taken for laboratory testing. This is generally for outpatients. For inpatients, specimens are often collected at the point of care. There should be an enclosed room with toilet and handbasin provided.

The collection area should be divided into individual patient bays or rooms for privacy at the time of collection.

Facilities should allow for collection at point of care anywhere, including at the Outpatient Unit.

Staff Areas

Staff Areas will consist of:

- Offices and/or workstations for clerical/ administrative procedures. Ideally this area should be away from the main operational area of the Unit where visitors do not need to transit through

the laboratory area
- Meeting Room for staff meeting and training purposes (can be shared with adjacent Unit)
- Staff Room for refreshments, meals and breaks
- Change rooms including toilets, showers, basins and lockers

4 Functional Relationships

External Relationships

The Laboratory Unit will have a close relationship with the following units for urgent tests and results unless point of care testing facilities are provided within critical units or a rapid transport system such as PTS is in place:

- Emergency Unit
- Intensive Care Unit (ICU)/ Paediatric Intensive Care Unit (PICU)
- High Dependency Unit (HDU)
- Neonatal Intensive Care Unit (NICU)
- Coronary Care Unit (CCU)
- Operating Unit and Day Surgery/ Procedures Unit
- Birthing Unit
- Inpatient Unit(s)
- Outpatient Unit
- Oncology Units including Radiotherapy and Chemotherapy
- Day therapy areas such as Renal Dialysis, Chemotherapy and medical day chairs.

The key external functional relationships are demonstrated in the functional relation diagram below including:

- Access from Outpatients and Day Patient units to Specimen Collection area through a public corridor
- Specimen Collection area may be located adjacent to Laboratories or in a remote location
- Indirect relationships between Laboratory Unit and all Inpatient and Critical Care areas through public corridors; specimen transit may be automated
- Access through a staff/ service corridor for Supplies and Housekeeping including waste

Internal Relationships

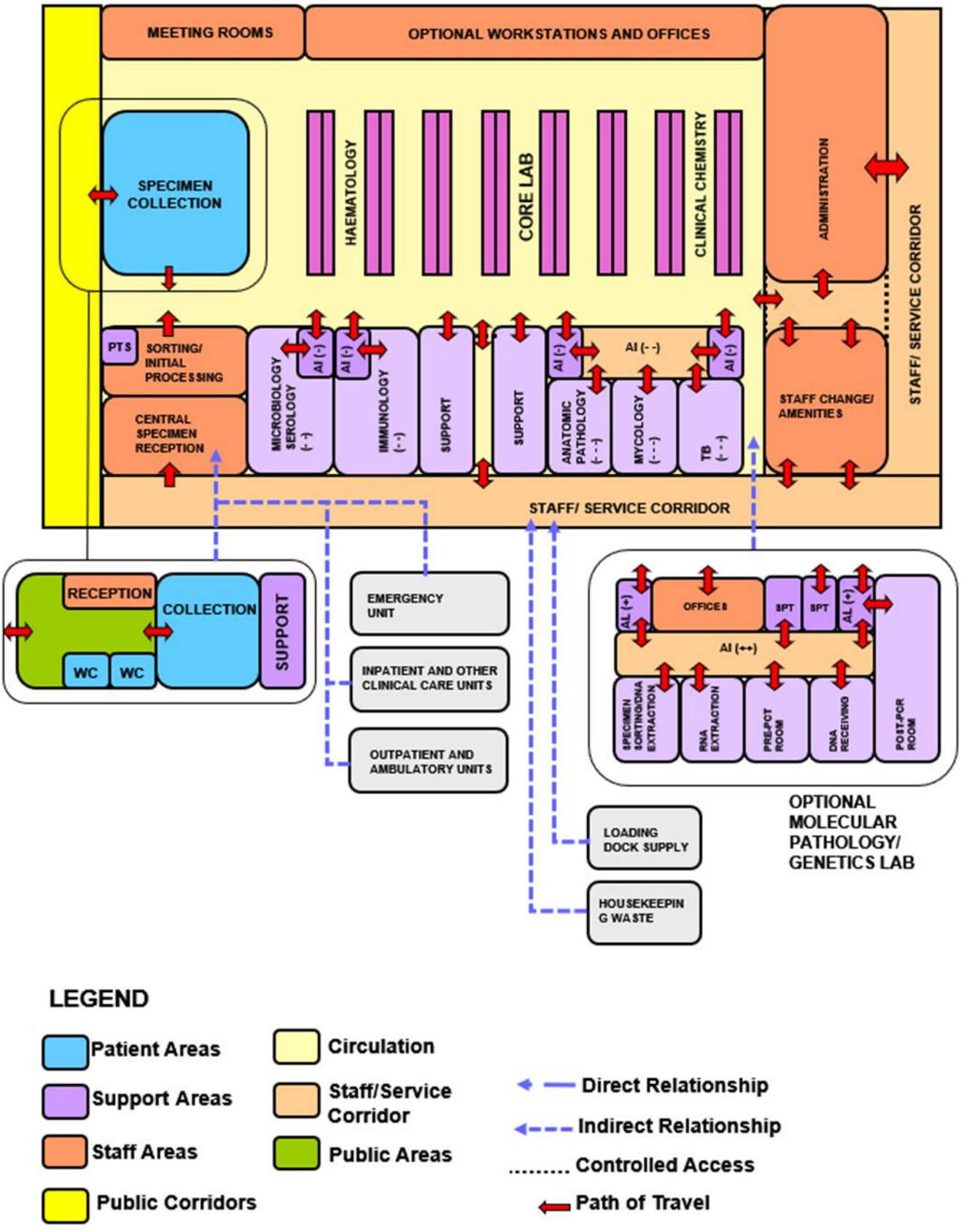
Internally, the Laboratory unit will be arranged in zones with a clear and easy flow of processing from Central Specimen Reception to the various Laboratory zones required for specific specimen testing. Support areas will be ideally located with ready access from all laboratory areas. Staff areas may be located in a discreet staff accessible zone, away from processing areas.

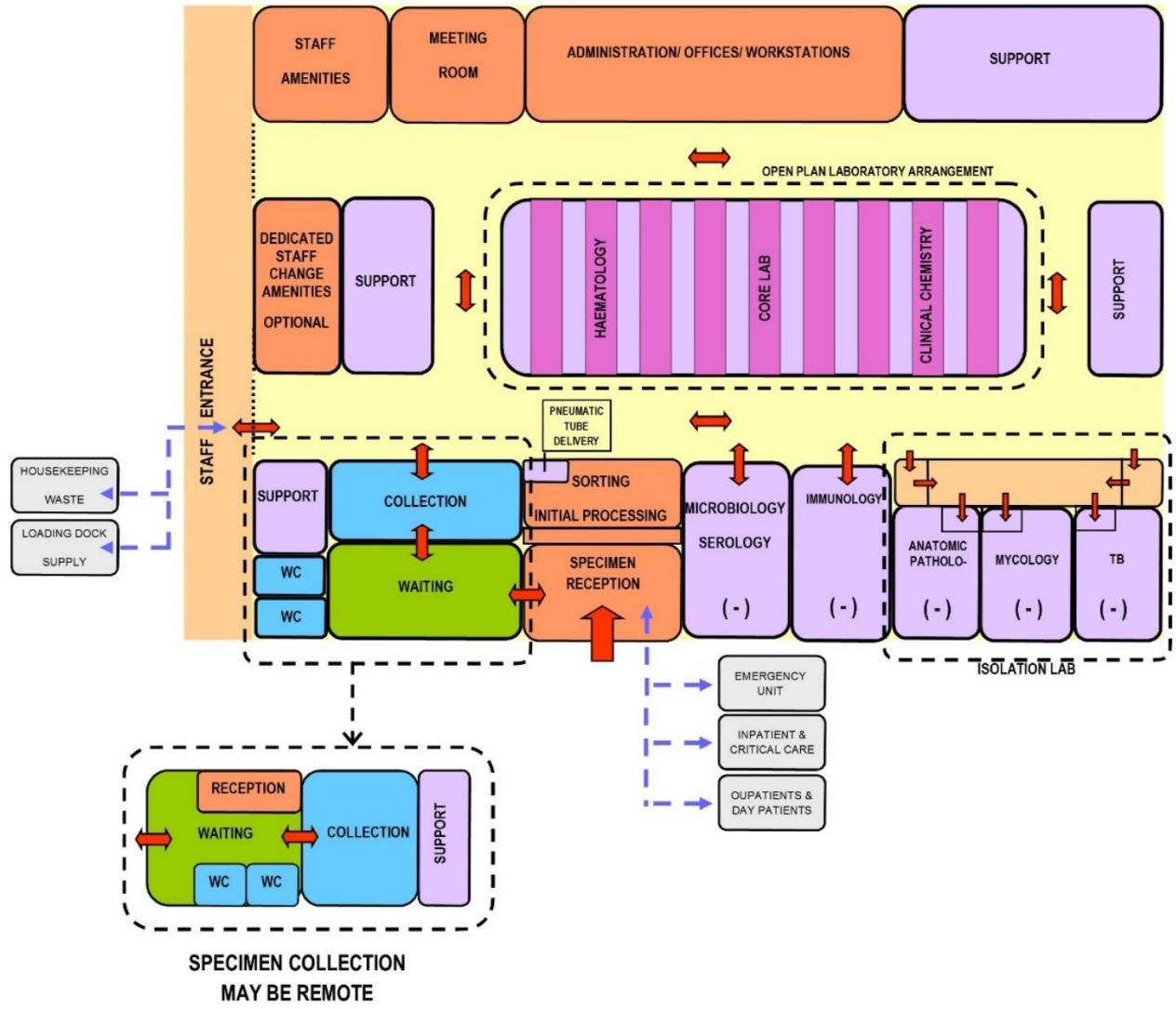
The preferred internal relationships are demonstrated in the functional relationship diagram below and include:

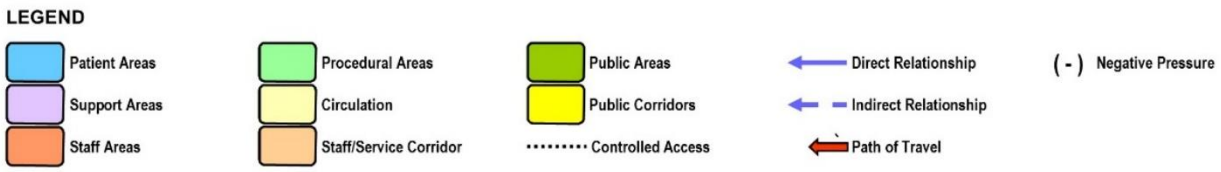
- Central Specimen Reception at the Entry
- Controlled access at entry points to staff and Laboratory areas
- A specimen workflow from Central Specimen Reception to Sorting/ Initial Processing, then to Laboratories
- Support areas located centrally to Laboratories at the point of use, and also at the perimeter for supplies and shared areas
- Staff areas including Offices and Meeting Room located in a staff zone accessible without traversing laboratory areas
- Staff Change Areas located closer to the entry to the Unit for staff to put on protective attire on entry and remove on exit

Functional Relationship Diagram

The functional relationship of a Laboratory with various zones is demonstrated in the diagram below. Some zones may not be applicable depending on the service plan. Specimen Collection zone may be decentralised and provided in the Outpatient Unit.




STAFF AMENITIES
MEETING ROOM
ADMINISTRATION/ OFFICES/ WORKSTATIONS
SUPPORT
OPEN PLAN LABORATORY ARRANGEMENT
DEDICATED STAFF CHANGE AMENITIES OPTIONAL
SUPPORT
HAEMATOLOGY
CORE LAB
CLINICAL CHEMISTRY
SUPPORT
STAFF ENTRANCE
PNEUMATIC TUBE DELIVERY
HOUSEKEEPING WASTE
LOADING DOCK SUPPLY
SUPPORT
COLLECTION
SORTING
INITIAL PROCESSING
MICROBIOLOGY
SEROLOGY
IMMUNOLOGY
WC
WC
WAITING
SPECIMEN RECEPTION
(-)
(-)
ANATOMIC PATHOLO-
MYCOLOGY
TB
(-)
(-)
(-)
ISOLATION LAB
EMERGENCY UNIT
INPATIENT & CRITICAL CARE
OUPATIENTS & DAY PATIENTS
RECEPTION
WAITING
COLLECTION
SUPPORT
WC
WC
SPECIMEN COLLECTION MAY BE REMOTE


LEGEND
Patient Areas
Support Areas
Staff Areas
Procedural Areas
Circulation
Staff/Service Corridor
Public Areas
Public Corridors
Controlled Access
Direct Relationship
Indirect Relationship
Path of Travel
(-) Negative Pressure

Notes on the Functional Relationship Diagram

Depending on the service plan for the facility, the following may be considered as options:

- Immunology can be part of core lab. This depends on the type of immunology tests. If more specialized immunology test are intended, a separate and larger immunoassay space may be appropriate.
- Serology can be in Microbiology for infectious diseases related serology tests. Serology which is not related infectious diseases eg. Autoimmune Diseases can be placed in the Core lab.
- Support areas may be distributed around the lab for easy access to all areas (not shown in the diagram).
- A waiting area may be provided adjacent the CSR for courier deliveries.
- Workstations may be incorporated into the core lab benches, or included as a separate area as shown in the diagram.
- Meeting rooms may be within the lab area (for use by the lab workers) or in the administration area.

5 Design Considerations

Environmental Considerations

Acoustics

Provide acoustic treatment for noise generating processing equipment including automated specimen analysers, washer/ decontaminators, sterilisers, refrigerators and freezers.

Consideration should be given to acoustic privacy in Offices, Staff Rooms and Meeting Rooms.

Acoustic provisions may include floor coverings, wall treatments, window coverings and ceilings selected for acoustic properties in addition to cleaning and maintenance attributes.

Natural Light/ Lighting

Natural lighting aids visual inspection and has positive impact on the on staff morale and is important in some laboratories and staff areas within the Unit. Where natural lighting is not possible, glazed panels should be considered. Automated specimen processing areas may be provided with glazed walls for open visibility.

Internal and task lighting must be sufficient for safe operation of equipment, use of computer screens and provide good visibility for digital displays on equipment.

Privacy

Visual and acoustic privacy must be considered where confidential conversations are likely to take place in offices and meeting rooms.

Specimen and blood collection areas must provide privacy for patients in collection cubicles with screen curtains if they are not in an enclosed room with a single collection bay.

Space Standards and Components

Clearance:

Configuration of laboratory benches, furniture, fixtures and equipment must not impede emergency access to an exit. A pathway, leading to the face of an exit must have minimum 900mm clearance.

The space between laboratory benches and adjacent workstations should be 1.5m or greater to provide ease of access.

Sufficient space around laboratory equipment for maintenance must be considered during the design phase.

Accessibility

Reception, Offices, Meeting rooms, Waiting areas and Specimen Collection areas should be designed to provide access for people in wheelchairs that may include staff or visitors.

Refer to Part C in these Guidelines - Access, Mobility, OH&S and local Accessibility Guidelines for further information.

Doors

Doors to enclosed Laboratories must be adequately sized to accommodate equipment located in the laboratory such as fume hoods, automated processing analysers, refrigerators, freezers and incubators.

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

Ergonomics/ OH&S

Consideration should be given to ergonomic functionality in the Unit. Laboratory benches, sinks and processing workstations should be provided at suitable working heights and no less than 750mm deep. Typically benches for work in a sitting position should be at 750mm high. Benches for standing position or tall chairs/stools should be at 900mm high.

The following occupational health and safety issues should be addressed during planning and design for staff safety and welfare:

- Chemical agents used in analysers and cleaning/ decontamination processes and flammable liquids that involve specific chemical handling requirements (Refer to local regulations)
- Electrical and fire hazards related to equipment in use
- Biological hazards of contaminated material undergoing processing, which requires stringent infection control management.

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

Size of the Unit

The size of the Laboratory Unit will be dependent on the operational model adopted and the service to be provided by the Unit as determined by the Service Plan and Operational Policies of the Unit.

In very small laboratories, the functional relationship diagram is highly simplified.

Schedules of Accommodation have been provided for typical hospital-based units for Role Delineation levels 4 to 6 facilities.

Safety & Security

Safety provisions in the Laboratory Unit will include:

- Access control to prevent unauthorised entry to laboratory areas
- Security for staff working in the unit after hours particularly if the unit is located in an isolated position within the facility
- Emergency shower with eye-flushing device accessible from laboratory and specimen reception areas
- Safe storage and use for chemicals and reagents including flammable liquids
- Storage, handling and disposal for radioactive and cytotoxic materials including reagents and patient specimens, depending on the service provided
- Suitable non-slip floor finishes where water and chemicals are in use
- Equipment safety to prevent spills and accidents.

Finishes

Finishes should be selected with consideration to the following:

- Infection control and ease of cleaning
- Fire safety
- Durability

- Acoustic properties.
- Heat resistance
- Movement of the equipment

Provide smooth, monolithic, chemical resistant and impervious to moisture finishes to work surfaces. Standard laminated benchtops are not suitable. Benchtops should be seamless to prevent contamination from spillage. Splashback or coved upturns must be provided when the benchtop abuts a wall.

Floors

Floor should be anti-static, heat resistant, anti-bacterial, anti-fungal and chemical resistant. All joints in flooring must be sealed and coved at the edges (against walls or fixed joinery) where possible. Water and chemical resistant are also important characteristics of selected flooring. Light neutral colours are preferred so that spills can be seen easily.

Walls

Walls should be anti-static, heat resistant, anti-bacterial, anti-fungal and chemical resistant. Water and chemical resistant finishes are also important characteristics of walls. Walls shall be painted with lead free paint, or prefinished for easy cleaning. Light neutral colours are preferred.

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

Fixtures, Fittings & Equipment

Equipment, furniture and fittings 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.

Equipment such as analysers, incubators, centrifuges, refrigerators, freezers, cool rooms and specialised laboratory equipment will require services and installation according to manufacturers' specifications, in particular:

- Space requirements may vary according to equipment selected
- Structural assessment may be required for large equipment items such as automated laboratory analysers
- Space requirements for maintenance of equipment must be considered

Window Treatments

Window treatment should be installed to external windows to control sunlight and glare to working areas of the Unit. There should be no curtains or horizontal louvers.

Building Service Requirements

Information and Communications Technology

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

- Electronic Health Records (EHR) which may form part of the Health Information System (HIS)
- Laboratory Information System (LIS)
- DECT and personal telephones replacing some aspects of call systems
- Intercom system between positively or negatively pressurised rooms and their adjacent spaces
- Data entry including results and reporting
- Bar coding of specimens collected within the Unit
- Data and communication outlets, servers and communication room requirements
- Optional availability of Wi-Fi for staff

Heating, Ventilation and Air conditioning

The Laboratory Unit shall have appropriate air conditioning that allows control of temperature and humidity for the proper handling of specimens and equipment functioning.

Some laboratories will require special air-conditioning such as negative pressure or positive pressure. Anatomical Pathology and Microbiology laboratories will require negative pressure air-conditioning and exhaust to minimise odours and prevent aerosol contamination of adjacent areas.

Offices, open plan workstation areas, Meeting Rooms and Staff Rooms should be air-conditioned for the benefit of staff and visitors to the Unit. The local or country specific mechanical requirements should be consulted.

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

Hydraulics

Warm water should be supplied to hand wash basins, eye-wash stations and emergency shower.

Hot and cold water should be supplied to sinks. Refer to Part E – Engineering Services for design requirements.

Shielding and Radiation Safety

If radioactive reagents and materials are used, they should be stored and disposed in appropriately shielded containers and room. No special provisions will normally be required for waste specimens from most patients receiving low level isotope diagnostic material.

Pneumatic Tube Systems

The Laboratory Unit may include a pneumatic tube station, connecting key clinical units with the main support units as determined by the facility Operational Policy. If provided the station should be located in the Specimen Reception under direct staff supervision.

Infection Control

Infection Control measures applicable to the Laboratory Unit will involve proper handling of specimens to prevent contamination of staff. Standard precautions apply to the Laboratory Unit areas and Personal Protective Equipment (PPE) including protective clothing, gloves, masks, and eye protection will be available close to all processing areas.

It is recommended that in addition to hand basins, medicated hand gel dispensers be located strategically at Specimen Reception and in staff circulation areas.

Hand Basins

Handwashing facilities shall be required in laboratories and other rooms as specified by the Standard Components. Taps to Hand Basins in laboratories should be either elbow-action taps or automatic taps (sensor/foot operated).

Hand-washing facilities shall not impact on minimum clear corridor widths.

Hand basins are required in the following area as a minimum:

- Specimen Collection areas
- At each laboratory subunit
- Automated processing areas
- Clean-up rooms

For further information refer to Part D – Infection Control in these Guidelines.

Emergency Shower and Eye-wash Station

Each laboratory unit must have access to at least one emergency shower and eye-wash station.

In areas where radioactive materials are being handled, there must be emergency shower and eye-wash station provided in close proximity.

Chemical Storage

Storage for chemicals and reagents should be physically separated from other storage in the Laboratory Unit with designated cabinets. Chemicals and reagents should not be stored in cabinets if they are fixed above a sink/s.

The storage of flammable materials must be subjects to the requirements of local Civil Defence or fire authorities.

Containment of Bio-Hazardous Materials

Where bio-hazardous materials are handled, Bio-Safety Laboratories (BSL) must be provided. BSL are divided into four levels from 1 to 4. Each BSL can be described as below:

BSL Level 1

Laboratories which handle low-risk microbes that pose little to no threat of infection to laboratories personnel. Basic level of containment that relies on standard microbiological practices with no special physical barriers.

BSL Level 2

Laboratories which work with human diseases including pathogenic and infections organisms that pose a moderate health hazard. Enhanced level of protection. Access doors into a BSL Level 2 laboratories must be self-closing, lockable doors. Bio-Safety Cabinets must be provided for procedures that can cause infection from aerosols or splashes.

BSL Level 3

Laboratories where indigenous or exotic microbes are handled and could cause serious or potentially lethal disease through inhalation. Biological Safety Cabinets must be provided. Access to a BSL-3 should be restricted and controlled with self-closing set of locking doors.

BSL Level 4

Laboratories with maximum containment and protection from exposure to lethal pathogens and life-threatening diseases. Class III biological safety cabinets (glove box) and staff needs to be in a full-bodies suit with positively pressured air supply. BSL Level 4 facilities should be isolated

6 Standard Components of the Unit

Standard Components

Standard Components are typical rooms within a health facility, each represented by a Room Data Sheet (RDS) and a Room Layout Sheet (RLS).

The Room Data Sheets are written descriptions representing the minimum briefing requirements of each room type, described under various categories:

- Room Primary Information; includes Briefed Area, Occupancy, Room Description and relationships, and special room requirements).
- Building Fabric and Finishes; identifies the fabric and finish required for the room 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 typically located in the room along with the services required such as power, data and hydraulics; 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, Heating, Ventilation and Air conditioning (HVAC), 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 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 that 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.

The Laboratory Unit consists of Standard Components to comply with details described in these Guidelines. Refer also to Standard Components Room Data Sheets (RDS) and Room Layout Sheets (RLS) separately provided. Non-Standard Components.

Non-Standard rooms are identified in the Schedules of Accommodation as NS and are described below.

Non-Standard Rooms

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 and are separately covered below.

Sorting/ Processing

The Sorting area within the Laboratory includes labelling of specimens, sorting by specialty and laboratories, initial scanning or copying of requests.

Processing will include temporary holding in refrigeration, holding and packaging specimens for transfer to laboratories.

The Sorting/ Processing area will be located adjacent to the Specimen Reception and with easy access to the laboratories

The area will require:

- Workstations for data entry
- Holding areas for specimens awaiting transit to specialist internal laboratories or remote laboratories
- Scanning equipment
- Refrigerators and freezers in close proximity
- Incubator for microbiology samples
- Hand basin and sink within the initial processing area
- Clinical waste disposal
- Extraction for odours and fumes may be required

Laboratory - High Volume Analyser

The High-Volume Laboratory analyser is an automated analyser, consisting of multiple modules, depending on the required function that may process hundreds of specimens per hour. The analyser may be located in a large open plan area within the Laboratory Unit; the space required will be determined by the equipment selected. The Processor should be located with convenient access to Specimen Reception for efficient sample processing.

The equipment is automated and will require a temperature-controlled environment along with services and data connections according to manufacturer's specifications. Access for installation and servicing should be available.

Laboratory - Physical Containment, High-Risk

The Physical Containment Laboratory will be a fully enclosed, strongly negatively pressured, HEPA filtered laboratory with entry via a dedicated airlock. The Airlock is moderately negative pressured with air flow towards the Laboratory. Doors between the Airlock and Laboratory are interlocking - only one can be open at one time. The Physical Containment laboratory is used for handling infective organisms such as HIV viruses, viral hepatitis and other infective agents and genetically modified organisms. Work inside the Laboratory will be undertaken in a biological safety cabinet. Physical containment Laboratories are classified according to risk of the agents used in them from lowest biosafety level 1 to highest biosafety level 4. These laboratories must be constructed to standards and are certified by an appropriate authority.

At the minimum, airlock is required for:

- Microbiology
- VirologyTB
- Mycology
- High risk cut-up

Requirements include:

- Air pressurisation to be monitored with a display and alarmed
- Walls, floors and ceiling finishes that are smooth, impervious to water, chemical resistant and easily cleaned
- A hand basin and PPE within the laboratory
- Eye wash equipment within the laboratory
- All fittings within the laboratory must be able to be decontaminated and fumigated
- An autoclave
- A fail-safe communication system within the laboratory

Pneumatic Tube Station

The Pneumatic Tube Station should be located at the Specimen Reception under the direct supervision of staff for urgent arrivals. The location should not be accessible by external staff or visitors.

Requirements include:

- The bay should not impede access within reception areas
- Racks should be provided for pneumatic tube canisters
- Wall protection should be installed to prevent wall damage from canisters

7 Schedule of Equipment & Furniture

The Schedule of Equipment and Furniture below lists the major equipment for the key rooms in this FPU.

Room/ Space	Standard Room Code	Item Description	Qty	Remarks
Biochemistry	biochem-i	Analyser: clinical chemistry, automated, freestanding	1	1x to be used for backup, analyser throughput as per operational requirements
	biochem-i	Centrifuge: general purpose	1	
	biochem-i	Centrifuge: general purpose, refrigerated	1	
	biochem-i	Mixer: tube, 9 rollers	1	
	biochem-i	Mixer: vortex	1	
	biochem-i	Osmometer, digital	1	
	biochem-i	PH meter	1	
	biochem-i	Pipette set & stand: electronic, multi channel	3	10 -100 microliter and 100 - 1000 microliter
	biochem-i	Refrigerator: laboratory	4	2x for reagent storage and 2x for sample storage. At least 300L each, capacity as per operational requirements
	biochem-i	Freezer: laboratory	1	for storage of reconstituted aliquots of controls, capacity as per operational requirements
	biochem-i	Shaker: orbital, digital	1	
Blood Store	blst-i	Freezer: plasma	1	capacity as per operational requirements
	blst-i	Refrigerator: blood products	2	1x used for cross-matched blood, capacity as per operational requirements

	blst-i	Refrigerator: laboratory	1	for storage of reagents, antisera, control cells… etc. Capacity as per operational requirements
	blst-i	Platelet incubator and agitator	1	for storage of platelets
	blst-i	Plasma thawer	1	for thawing of plasma
	blst-i	Water bath: digital	1	
	blst-i	Centrifuge: general purpose	1	
	blst-i	Pipette set & stand: electronic, multi channel	3	10 -100 microliter and 100 - 1000 microliter
	blst-i	Analyser: immunohaematology, fully automated	1	for performing tests such as blood grouping, cross-matching, antibody screening, and antibody identification, analyser throughput as per operational requirements
Haematology	hemat-i	Microscope: upright	1	
	hemat-i	Analyser: coagulation, automated, benchtop	1	Analyser throughput as per operational requirements
	hemat-i	Analyser: Erythrocyte Sedimentation Rate (ESR)	1	Analyser throughput as per operational requirements
	hemat-i	Analyser: haematology, benchtop, mid volume	2	1x to be used for backup. Analyser throughput as per operational requirements
	hemat-i	Balance: analytical	1	
	hemat-i	UV viewer	1	for G6PD test
	hemat-i	Centrifuge: general purpose	1	
	hemat-i	Centrifuge: microhaematocrit	1	
	hemat-i	Dry bath/ block heater, digital	1	
	hemat-i	Fume hood: general purpose	1	
	hemat-i	Hot plate stirrer: magnetic	1	
	hemat-i	Microscope: upright	1	
	hemat-i	Mixer: tube, 9 rollers	1	

	hemat-i	Mixer: vortex	1	
	hemat-i	Pipette set & stand: electronic, single channel	3	10 -100 microliter and 100 - 1000 microliter
	hemat-i	Refrigerator: laboratory	1	for reagent storage, at least 250L, capacity as per operational requirements
	hemat-i	Auto stainer	1	
	hemat-i	Shaker: orbital, digital	1	
	hemat-i	Timer: multi, laboratory	1	
Histology/ Cytology	hist-cyt-i	Bath: tissue floatation	1	
	hist-cyt-i	Cabinet: biological safety, Class II, Type B2	1	
	hist-cyt-i	Cabinet: storage, slides & paraffin tissue blocks, freestanding	1	
	hist-cyt-i	Centrifuge: cytology	1	
	hist-cyt-i	Dryer: slide, forced air	1	
	hist-cyt-i	Microscope: upright	5	2x for histopathologists and 3x for cyto screeners
	hist-cyt-i	Microtome: cryostat, freestanding	1	
	hist-cyt-i	Microtome: rotary, automated	1	
	hist-cyt-i	Oven: laboratory, drying	1	capacity as per operational requirements
	hist-cyt-i	Paraffin trimmer	1	
	hist-cyt-i	Pipette set & stand: electronic, multi channel	3	10 -100 microliter and 100 - 1000 microliter
	hist-cyt-i	Printer: cassette	1	
	hist-cyt-i	Printer: slide	1	
	hist-cyt-i	Processor: cytology, automated, liquid-based	1	
	hist-cyt-i	Refrigerator: laboratory	1	for storage of consumables and antibodies, at least 250L, capacity as per operational requirements
	hist-cyt-i	Slide stainer: cytology/ histology, automated, with coverslipper	1	
	hist-cyt-i	IHC Autostainer	1	
	hist-cyt-i	Tissue embedding station	1	
	hist-cyt-i	Tissue processor: freestanding	1	
	hist-cyt-i	Water bath: digital	1	
Histology/ Cytology (Grossing)	gross-i	Grossing station: ventilated, freestanding	1	
	gross-i	Imaging system: grossing station	1	
Immunology/ Serology	imm-sero-i	Analyser: immunoassay, benchtop, mid volume	1	Analyser

				throughput as per operational requirements
	imm-sero-i	Balance: analytical	1	
	imm-sero-i	Centrifuge: general purpose	1	
	imm-sero-i	Dry bath/ block heater, digital	1	
	imm-sero-i	Elisa processor: automated, 2-microplate	1	
	imm-sero-i	Hot plate stirrer: magnetic	1	
	imm-sero-i	Microscope: upright	1	
	imm-sero-i	Mixer: tube, 9 rollers	1	
	imm-sero-i	Mixer: vortex	1	
	imm-sero-i	Pipette set & stand: electronic, multi channel	3	10 -100 microliter and 100 - 1000 microliter
	imm-sero-i	Refrigerator: laboratory	1	for reagent storage, at least 250L, capacity as per operational requirements
	imm-sero-i	Shaker: orbital, digital	1	
Microbiology	micro-i	Analyser: blood culture, automated	1	Analyser throughput as per operational requirements
	micro-i	Analyser: microbiology, identification & susceptibility (ID/ AST)	1	Analyser throughput as per operational requirements
	micro-i	Analyser: urinalysis, fully automated	1	Analyser throughput as per operational requirements
	micro-i	Balance: analytical	1	
	micro-i	Bunsen burner: electric	1	
	micro-i	Cabinet: biological safety, Class II, Type B2	1	
	micro-i	Centrifuge: general purpose	1	
	micro-i	Dry bath/ block heater, digital	1	
	micro-i	Incubator: CO2, air jacketed, 150L	1	capacity as per operational requirements
	micro-i	Incubator: microbiology, 100L	1	capacity as per operational requirements
	micro-i	Microscope: upright	1	
	micro-i	Microscope: upright, phase contrast & fluorescence	1	
	micro-i	Mixer: tube, 9 rollers	1	
	micro-i	Mixer: vortex	1	
	micro-i	Pipette set & stand: electronic, multi channel	3	10 -100 microliter and 100 - 1000

				microliter
	micro-i	Refrigerator: laboratory	1	capacity as per operational requirements
	micro-i	Shaker: orbital, digital	1	
Microscopy	microsc-i	Microscope: 3-head	1	more heads may be added depending on operational requirements
Specimen Reception/ Sort/ Preparation	sprec-i	Centrifuge: general purpose	1	
	sprec-i	Pipette set & stand: electronic, multi channel	3	10 -100 microliter and 100 - 1000 microliter
	sprec-i	Refrigerator: laboratory	1	capacity as per operational requirements
Store - Chemical/ Reagents	stcm-i	Cabinet: storage, ventilated, chemicals	1	
	stcm-i	Cabinet: storage, ventilated, flammable	1	

8 Schedule of Accommodation

The Schedule of Accommodation (SOA) identifies the rooms required in the Unit along with the quantity and the recommended room area. The sum of these room areas is the Sub Total and Total Departmental areas with a recommended circulation percentage. The circulation percentage represents the area required for internal corridors and is a target for efficient planning. SOAs and room sizes are developed for typical units and are organised into the functional zones applicable to the Unit. Quantities of rooms may need to be proportionally adjusted to suit the desired unit size and service needs.

The Schedules of Accommodation are developed for particular levels of service known as Role Delineation Level (RDL) and numbered from 1 to 6 (including in-between numbers such as 4-5). Level 1 represents uncomplicated health facilities, ascending to level 6 representing complex specialist services and hospitals. Refer to the full Role Delineation Framework in these guidelines for a full description of the RDL's identified.

The Schedule of Accommodation for a Laboratory Unit in a typical hospital-based facility at RDL 4 to 6 follows. The Schedule of Accommodation lists generic spaces that form a Laboratory Unit. Quantities and sizes of some spaces need to be determined in response to the service needs of each unit on a case-by-case basis.

All laboratory areas are to be based on the functionality of the labs, equipment requirements, level of automation, etc.

Laboratory Unit located within a health facility

ROOM/ SPACE	Standard Component Room Codes	RDL 4 Qty x m2			RDL 5/6 Qty x m2			Remarks
Entry/ Reception								
Specimen Reception/ Registration	sprec-i similar	1	x	12	1	x	20	Receiving, data entry for tracking
Pneumatic Tube Station	NS	1	x	1	1	x	1	
Sorting/ Initial Processing	NS	1	x	15	1	x	20	Initial processing includes dispatch area
Laboratory - General								
Laboratory - General	pthlb-mod-i similar	1	x	50				Clinical Chemistry, Haematology, Blood bank processing combined; RDL 5/6 separate labs
Haematology								
Laboratory - High Volume analyser	NS	1	x	30	1	x	80	
Laboratory - Manual Testing	pthlb-mod-i	1	x	12	1	x	25	
Lab Workstations - Microscopy	pthlb-mod-i similar	1	x	12	1	x	30	
Store - General	stgn-8-i similar	1	x	8	1	x	8	
Clinical Chemistry								
Laboratory - High Volume analyser	NS				1	x	50	
Lab Workstations - Chemistry	pthlb-mod-i				1	x	25	May include manual processing stations
Bay - Storage	bs-2-i				1	x	2	Equipment that needs to be located in the zone
Microbiology/ Serology								
Laboratory - Blood Culture	pthlb-mod-i similar	1	x	15	1	x	15	Enclosed, Negative Pressure; to comply to Part E - Engineering Services
Ante-room	anrm-i	1	x	6	1	x	6	
Laboratory - Physical Containment	NS				1	x	25	Negative Pressure includes biological safety cabinet/s; to comply to Part E - Engineering Services
Anteroom - Physical Containment Laboratory	anrm-i				1	x	6	For pressurisation; with PPE provisions; to comply to Part E - Engineering Services

ROOM/ SPACE	Standard Component Room Codes	RDL 4 Qty x m2			RDL 5/6 Qty x m2			Remarks
Cool Room/ Refrigerator	corm-i similar				2	x	6	Separate clean and dirty cool storage; walk-in cool room or bay with refrigerator or freezer, alarmed
Laboratory - Incubators	pthlb-mod-i similar				1	x	15	
Lab Workstations - Microscopy, Specimen reading	pthlb-mod-i similar				1	x	40	Enclosed, Negative Pressure; to comply to Part E - Engineering Services
Laboratory - Mycology, Microscopy	pthlb-mod-i similar	1	x	15	1	x	25	Enclosed, Negative Pressure; to comply to Part E - Engineering Services
Anatomical Pathology								
Laboratory - Cytology	pthlb-mod-i similar				1	x	20	
Laboratory - Immunochemistry (IHC)	pthlb-mod-i similar				1	x	15	
Lab Workstations - Blocking & Embedding	pthlb-mod-i similar				1	x	15	
Lab Workstations – Chemical Prep & Staining	pthlb-mod-i similar				2	x	20	
Lab Workstations - Microscopy	pthlb-mod-i similar				1	x	40	
Laboratory - Cutting room	pthlb-mod-i similar				1	x	40	
Laboratory - Tissue processing	pthlb-mod-i similar				1	x	15	
Laboratory - Cryostat	pthlb-mod-i similar	1	x	10	1	x	15	Frozen sections; temperature controlled and alarmed
Store – Samples, Slides & Specimens	stgn-20-i				1	x	20	
Bay - Storage	bs-2-i				1	x	2	Equipment that needs to be located in the zone
Clinical Immunology								
Laboratory - Antibody	pthlb-mod-i				1	x	25	
Laboratory - Proteins, Allergy	pthlb-mod-i	1	x	25	1	x	25	
Bay - Refrigerators/ Freezers	bmeq-4-i similar				1	x	4	Temperature monitored, alarmed
Blood Bank								**Optional: Recommended if hospital has 100+ beds**
Blood Checking/ Labelling/ Work Area	bldwk-i similar	1	x	8	1	x	12	

ROOM/ SPACE	Standard Component Room Codes	RDL 4 Qty x m2			RDL 5/6 Qty x m2			Remarks
Laboratory - Processing Area	pthlb-mod-i				1	X	25	RDL 4 processing done in Lab-General
Blood Products Cool Room/ Refrigerator/s	corm-i similar	1	x	2	1	X	6	Walk-in cool room or bay with refrigerator/s to suit; temperature monitored and alarmed
Sample Holding Area	bpath-1-i similar	1	x	2	1	X	2	
Blood Products Freezer	corm-i similar	1	x	1	1	x	6	Walk-in freezer room or bay with freezer to suit; temperature monitored and alarmed
After-hours Blood Store	blst-i similar	1	x	3	1	x	3	
Bay - Storage	bs-2-i	2	x	2	2	x	2	Storage before and after collection areas
Store – Equipment	steq-10-i similar	1	x	10	1	x	14	
Dispatch	pha-co-i similar	1	x	9	1	x	9	
Specimen Collection	**(attached or remote)**							
Reception	recl-12-i recl-15-i	1	x	10	1	x	15	
Waiting (Male/ Female)	wait-10-i wait-20-i similar	2	x	10	2	x	20	Separate Male/ Female waiting
Specimen Collection Bays	specc-i	2	x	9	4	x	9	
Blood Collection Work Area	bldcw-i similar	1	x	8	1	x	12	
Toilet - Patient	wcpt-i	2	x	4	2	x	4	Separate Male/ Female
Toilet - Accessible	wcac-i	1	x	6	1	x	6	Optional
Bay - Pneumatic Tube Station	NS	1	x	1	1	x	1	Optional; locate at Reception
Bay - Mobile Equipment	bmeq-i	1	x	4	2	x	4	Phlebotomy trolleys
Dirty Utility	dtur-s-i dtur-12-i	1	x	8	1	x	12	
Store - General	stgn-8-i stgn-14-i similar	1	x	8	1	x	14	Consumables, sterile stock
Support Areas								Shared between Laboratories
Bay - Emergency Shower and Eyewash	bese-1-i	1	x	1	5	x	1	Locate in each separate laboratory
Cleaner's Room	clrm-6-i	1	x	6	2	x	6	
Wash-up Room	wash-i similar	1	x	10	1	x	15	

ROOM/ SPACE	Standard Component Room Codes	RDL 4 Qty x m2			RDL 5/6 Qty x m2			Remarks
Cool Room/s	corm-i similar	1	x	6	2	x	10	Can be replaced with refrigerator bay
Freezer Room/s	frrm-i similar				1	x	10	optional
Disposal Room	disp-8-i similar	1	x	5	1	x	10	
Bay - Freezer	blst-i similar	1	x	3	1	x	10	
Sterilising Room	NS	1	x	7	1	x	12	Adjacent to Clean-up
Store - Bulk	stbk-20-i similar	1	x	20	3	x	20	
Store - Chemical	stcm-i similar	1	x	4	1	x	8	
Store - General	stgn-8-i stgn-14-i similar	1	x	8	1	x	14	General supplies & consumables
Store - Photocopy/ Stationery	stps-8-i similar	1	x	8	1	x	8	optional
Store - Files	stfs-10-i similar	1	x	10	1	x	10	optional
Offices & Staff Areas								
Meeting Room - Medium/ Large	meet-l-15-i meet-l-30-i similar	1	x	15	2	x	25	
Office - Single Person	off-s12-i	1	x	12	1	x	12	Head of Unit
Office - Single Person	off-s9-i				4	x	9	Pathologists include microscope station
Office - 2 Person Shared	off-2p-i	1	x	12	2	x	12	Clerical support
Office - 2 Person Shared	off-2p-i				6	x	12	Lab Managers & Supervisors, Senior Technician
Office - Workstation/s	off-ws-i	3	x	5.5	10	x	5.5	Technical staff for each specialty
Staff Room (Male/ Female)	srm-25-i	Shared			2	x	25	
Property Bay - Staff	prop-3-i	2	x	3				Lockers, separate M/F areas
Change Room - Staff (M/F)	chst-20-i				2	x	20	Includes Toilet, Shower and Lockers
Shower - Staff	shst-3-i	2	x	3				Separate M/F
Toilet - Staff	wcst-i	2	x	3	2	x	3	Separate M/F
Sub Total		**373.5**			**1430**			
Circulation %		**25**			**25**			

ROOM/ SPACE	Standard Component Room Codes	RDL 4 Qty x m2	RDL 5/6 Qty x m2	Remarks
Total Areas		**467**	**1788**	

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 the Role Delineation Level nominated.
- All the areas shown in the SOA follow the No-Gap system described elsewhere in these Guidelines.
- 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.
- Room sizes indicated should be viewed as a minimum requirement; variations are acceptable to reflect the needs of individual Unit.
- Office areas are to be provided according to the number of approved full-time positions within the Unit.

9 Future Trends

Laboratory practise is rapidly changing with advances in technology affecting the service delivery. Future trends include the following:

- As software capabilities continue to develop, clinical chemistry analysers will be able to offer increased testing speed and degree of automation
- Automation is progressing towards Total Laboratory Automation
- Software is becoming more sophisticated in linking analysers to laboratory information systems, ordering and reporting are becoming more automated
- Continued improvements to sample turnaround and throughput speed
- Analysers with specimen storage and retrieval capabilities
- Increase used of genetic testing and biopsy testing
- Increased use and accuracy of point of care devices.

All of the above may have a direct influence on the type of service to be offered and the amount of space required in future laboratories.

10 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:

- Australasian Health Facility Guidelines, Part B Health Facility Briefing and Planning, 0550 - Pathology Unit, Revision 6, 2016 refer to https://healthfacilityguidelines.com.au/health-planning-units
- Building Type Basics for Research Laboratories, Daniel Watch. New York, NY: John Wiley & Sons, Inc., 2001.
- CDC (Center for Disease Control) US. Guidelines for Environmental Infection Control in Health-Care Facilities, US, refer to website http://www.cdc.gov/hicpac/pubs.html
- CRC Handbook of Laboratory Safety, 5th Edition, A. K. Furr. Boca Raton, FL: CRC Press, 2000 refer to https://www.crcpress.com/CRC-Handbook-of-Laboratory-Safety-5th-Edition/Furr/p/book/9780849325236
- ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories, 2005, refer to https://www.iso.org/standard/39883.html
- Laboratory Design Guide, 3rd Edition; Brian Griffin, Architectural Press, Elsevier UK, 2005
- The Clinical Biochemist Reviews, Clinical Chemistry Laboratory Automation in the 21st Century, David A Armbruster, David R Overcash and Jaime Reyes, 2014 Aug; 35(3): 143–153, refer to https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4204236/
- The Facility Guidelines Institute (US), Guidelines for Design and Construction of Hospitals and Outpatient Facilities, 2014. Refer to website www.fgiguidelines.org