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**Ministry of Health**  
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Task Force Group for Designs and  
Constructions of Health Care Facilities

**Guidelines for**  
**General Ward Design**  
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# Chapter 1

## Introduction

Patient care is provided in facilities which range from highly equipped clinics, and technologically advanced teaching hospitals to frontline primary health centers with only basic facilities. Despite progress in public health and hospital care, infections continue to develop in hospitalized patients, and may also affect staff. Many factors promote infection among hospitalized patients; decreased immunity among patients; the increasing variety of medical procedures and invasive techniques and the environmental transmission of drug resistant bacteria among crowded hospital populations, where poor infection control practices may facilitate transmission.

Planning for new construction or major renovation requires early consultation and collaboration to ensure that infection prevention is not only adhered to, but built into the design.

A good hospital design therefore needs to consider the separation of dirty and clean areas, adequate ventilation standards, storage facilities and design of patient accommodation areas including adequate number of wash hand basins and single bed facilities.

The role of infection control in the design of facilities has become increasingly visible as communicable diseases like tuberculosis and multi drug resistant organisms have caught the attention of the media affecting both consumer awareness and regulatory agencies responsible for environmental health and sanitation.

The hospital environment plays an important part in the development of infections. Whereas the hospital may not have such control over the host factors and agents, the hospital certainly is responsible for the environment that surrounds the patient. By controlling and adequate sanitizing the environment of the host, the hospital authorities can markedly reduce the incidence of hospital acquired infections.

Design of ward unit is one of the important areas common to all hospitals that need comprehensive elaboration of its structural requirements.

## 1.1 Key Design Principles

Control of infections in wards not only requires application of the principles of a sepsis and hygiene but also considerations of design, equipment and ventilation of the ward. Hand washing has been recommended as single most important practice to control Hospital Acquired Infection. The number of sinks and their placement should be thoughtfully planned to encourage Health Care worker to practice hand washing before and after every patient care activity.

It is recommended that whenever possible, a patient known or suspected to harbour transmissible microorganisms should be placed in a single room with hand washing and toilet facilities. A single room helps prevent direct or indirect contact transmission or droplet transmission. One to two standard isolation rooms per ward unit should be planned throughout the hospital with wash hand basin in room, shower, toilet and wash hand basin in bathroom.

In all care settings, provision for the following in building design reduces the risk of infection:

- Easy access to hand washing facilities
- Clean air
- Dry environment
- Ample space
- Minimal dust accumulation
- Easy cleaning
- Efficient waste removal

## **CHAPTER 2**

### **2.1 Ward size**

A single ward shall be provided for the small inpatient primary care facility. The number of patient rooms contained in the unit shall be as determined by the functional program but shall not exceed 25 beds per unit.

### **2.2 Patient Rooms**

Each patient room shall meet the following standards:

#### **2.2.1 Capacity**

- In new construction, the maximum number of beds per room shall be one unless the functional program demonstrates the necessity of a two-bed arrangement. Approval of a two-bed arrangement shall be obtained from the licensing authority.
- Where renovation work is undertaken and the present capacity is more than one patient, maximum room capacity shall be no more than the present capacity, with a maximum of four patients.
- Where a facility contemplates, patient/family-centered care rooms should be constructed to meet the needs of the functional program. A patient/family centered care unit where family members can stay with their loved ones in the same room as they progress from intensive care through general care. The idea is to give patients and their family members an active role in the plan of care and recovery.

#### **2.2.2 Space requirements**

Minor encroachments, including columns and hand-washing stations, that do not interfere with functions may be ignored when determining space requirements for patient rooms.

##### **2.2.2.1 Area**

- In new construction, patient rooms shall be constructed to meet the needs of the functional program and have at least 3.66 meters wide by 3.96 meters long or approximately 14.86 square meters exclusive of toilet rooms, closets, lockers, wardrobes, alcoves, or vestibules.
- A minimum of 9.29 square meters of clear floor area per bed in multiple-bed rooms exclusive of toilet rooms, closets, lockers, wardrobes, alcoves, or vestibules.
- These spaces should accommodate comfortable furniture for family members (one or two) without blocking access of staff members to patients.
- Additional areas should be provided at a minimum clear area of 2.79 square meters per family member (permitted by the facility) if possible.
- In case of constructing a patient/family-centered rooms, it should have a minimum of 23.22 square meters of clear floor area exclusive of family alcoves, toilet rooms, closets, lockers, wardrobes, vestibules, staff charting areas, or staff hand-washing stations.

##### **2.2.2.2 Dimensions and clearances**

The dimensions and arrangement of rooms shall be such that there is a minimum of 91.44 centimeters between the sides and foot of the bed and any wall or any other fixed obstruction. In multiple-bed rooms, a clearance of 1.22 meters shall be available at the foot of each bed to permit the passage of equipment and beds.



### **2.2.2.3 Renovation**

- Where renovation work is undertaken, every effort shall be made to meet the above minimum standards. If it is not possible to meet the above minimum standards, the authorities having jurisdiction shall be permitted to grant approval to deviate from this requirement.
- In such cases, patient rooms shall have no less than 7.43 square meters of clear floor area per bed in multiple-bed areas and 9.29 square meters of clear floor area in single- bed rooms exclusive of toilet rooms, closets, lockers, wardrobes, alcoves, or vestibules

### **2.2.3 Windows**

- Each patient room shall have a window.
- Windows are important for the psychological well-being of many patients, as well as for meeting fire safety code requirements. They are also essential for continued use of the area in the event of mechanical ventilation system failure.
- Each patient bed shall have visual access, other than skylights, to the outside environment, with not less than one outside window in each patient bed area.
- Operable windows are not required in patient rooms. If operable windows are provided in patient rooms or suites, operation of such windows shall be restricted to inhibit possible escape or suicide.

### **2.2.4 Patient privacy**

In multiple-bed rooms, visual privacy from casual observation by other patients and visitors shall be provided for each patient. The design for privacy shall not restrict patient access to the entrance, hand-washing station, or toilet.

### **2.2.5 Hand-washing stations**

These shall be provided to serve each patient room.

(1) A hand-washing station shall be located in the toilet room.

(2) A hand-washing station shall be provided in the patient room in addition to that in the toilet room. This shall be located outside the patient's cubicle curtain and convenient to staff entering and leaving the room.

(3) A hand sanitation station in patient rooms utilizing waterless cleaners may be used in renovation of existing facilities where existing conditions prohibit an additional hand-washing station.

Where renovation work is undertaken, every effort should be made to meet this standard. Where space does not permit the installation of an additional hand-washing station in the patient room, or where it is technically infeasible, the authority having jurisdiction may grant approval of alternative forms of hand cleansing

### **2.2.6 Toilet Rooms**

- Each patient shall have access to a toilet room without having to enter a general corridor area.
- One toilet room shall serve no more than two patient rooms and no more than four beds.
- The toilet room shall contain a water closet and a hand-washing station.
- Toilet room doors shall swing outward or be double acting.
- Where local requirements permit, use of folding doors shall be permitted, provided adequate provisions are made for acoustical and visual privacy

### **2.2.7 Patient Storage Locations**

Each patient shall have within his or her room a separate wardrobe, locker, or closet suitable for hanging full-length garments and for storing personal effects.

## **Chapter 3**

### **Special Patient Care Areas**

#### **3.1 Applicability**

Airborne infection isolation is mandatory in every ward, while protective environment rooms may be required as designated by the functional program,

Generally, protective environments are not needed in community hospitals, unless these facilities take care for patients with an extreme susceptibility to infection (e.g., immuno-suppressed patients with prolonged granulocytopenia, most notably bone marrow recipients, or solid-organ transplant recipients and patients with hematological malignancies who are receiving chemotherapy and are severely granulocytopenic).

#### **3.2 Airborne Infection Isolation (AII) Room(s)**

##### **3.2.1 Definition**

A single-occupancy room for patient care in which environmental factors are controlled to minimize transmission of infectious agents spread from person to person by droplet nuclei associated with coughing and inhalation. (Such rooms typically have specific requirements for controlled ventilation, air pressure, and air filtration.)

##### **3.2.2 Number**

At least one airborne infection isolation room shall be provided in each ward. The number of airborne infection isolation rooms for individual patient units shall be increased based upon an infection control risk assessment (ICRA) and based on the needs of specific community and patient populations. This process ensures a more accurate determination of environmentally safe and appropriate room types and spatial needs.

##### **3.2.3 Location**

Airborne infection isolation rooms may be located within individual nursing units and used for normal acute care when not required for patients with airborne infectious diseases, or they may be grouped as a separate isolation unit.

##### **3.2.4 Capacity**

Each room shall contain only one bed.

##### **3.2.5 Facility requirements**

Each airborne infection isolation room shall comply with the following requirements:

- (1) Each room shall have an area for hand-washing, gowning, and storage of clean and soiled materials located directly outside or immediately inside the entry door to the room.
- (2) Construction requirements
  - (a) Airborne infection isolation room perimeter walls, ceiling, and floors, including penetrations, shall be sealed tightly so that air does not infiltrate the environment from the outside or from other spaces
  - (b) Airborne infection isolation room(s) shall have self-closing devices on all room exit doors.
- (3) Separate toilet, bathtub (or shower), and hand washing stations shall be provided for each airborne infection isolation room.

#### **(4) ventilation requirements for Airborne Infection Isolation (AII) rooms**

- Maintain continuous negative air pressure ( $>2.5$  Pa/0.01 inch water gauge) in relation to the air pressure in the corridor
- Ensure that the rooms are well sealed
- Provide ventilation to ensure  $\geq 12$  air changes per hour (ACH) for renovated rooms and new rooms and  $\geq 6$  ACH for existing (AII) rooms.
- Rooms shall have a permanently installed visual mechanism to constantly monitor the pressure status of the room when occupied by patients with an airborne infectious disease. The mechanism shall continuously monitor the direction of the airflow.
- Direct exhaust air to the outside away from air intake and populated areas.
- Air from AII room in new or renovated facilities should not be re-circulated into the general ventilation system. In case that re-circulation of air into the general ventilation system from such room is unavoidable i.e. in existing facilities, in such cases, HEPA filter should be installed in the exhaust duct.
- In general, reliance on a substantial pressure differential ( $> 0.01$ "wg / 2.5Pa) will maintain the appropriate directional airflow with or without an anteroom. The anteroom concept should remain an option (i.e., not required).
  - a. Anterooms, in general, should be designed to meet local fire safety code as well as to prevent air from the patient room from escaping to the corridor or other common areas.
  - b. In addition to the concept of containment of airborne microorganisms, anterooms may appropriately be used for storage of personal protective equipment (PPE) (e.g., respirators, gowns, gloves), clean equipment, and hand hygiene.
  - c. In ganged anterooms (two patient rooms with a common anteroom), it may be difficult to maintain directional airflow and pressure differential intended to avoid contamination from one room to the other through the anteroom. The design, installation, and monitoring of ventilation systems in such configurations is of utmost importance.

### **3.3 Protective Environment Room(s)**

#### **3.3.1 Definition**

A Protective Environment is designed for allogeneic HSCT (hemopoietic stem cell transplant) patients to minimize fungal spore counts in the air and reduce the risk of invasive environmental fungal infections. Air quality for HSCT patients is improved through a combination of environmental controls that include HEPA filtration of incoming air; directed room air flow; positive room air pressure relative to the corridor; well-sealed rooms to prevent flow of air from the outside; ventilation to provide  $>12$  air changes per hour; strategies to minimize dust (e.g., scrubbable surfaces, and routinely cleaning crevices and sprinkler heads); and prohibiting dried and fresh flowers and potted plants in the rooms of HSCT patients. The desired quality of air may be achieved without incurring the inconvenience or expense of laminar airflow. No published reports support the benefit of placing solid organ transplants or other immunocompromised patients in a Protective Environment.

#### **3.3.2 Applicability**

When determined by an ICRA, special design considerations and ventilation to ensure the protection of patients who are highly susceptible to infection shall be required.

#### **3.3.3 Functional program**

The appropriate clinical staff shall be consulted regarding room type, and spatial needs to meet facility infection control requirements shall be incorporated into the functional program.

### **3.3.4 Number and location**

The appropriate numbers and location of protective environment rooms shall be as required by the ICRA.

### **3.3.5 Capacity**

Protective environment rooms shall contain only one bed.

### **3.3.6 Facility requirements**

- (1) Each protective environment room shall have an area for hand-washing, gowning, and storage of clean and soiled materials located directly outside or immediately inside the entry door to the room.
- (2) Patient bathing and toilet facilities. Separate toilet, bathtub (or shower), and hand-washing stations shall be directly accessible from each protective environment room.
- (3) Rooms shall have a permanently installed visual mechanism to constantly monitor the pressure status of the room when occupied by patients requiring a protective environment. The mechanism shall continuously monitor the direction of the airflow.
- (4) Central or point-of-use HEPA (99.97% efficiency) filters capable of removing particles 0.3  $\mu\text{m}$  in diameter for supply (incoming) air.
- (5) Ventilation to maintain  $>12$  ACH
- (6) Directed air flow: air supply and exhaust grills located so that clean, filtered air enters from one side of the room, flows across the patient's bed, exits on opposite side of the room
- (7) Positive room air pressure in relation to the corridor. Pressure differential of ( $>2.5$  Pa / 0.01" water gauge)
- (8) Monitor and document results of air flow patterns daily using visual methods (e.g., flutter strips, smoke tubes) or a hand held pressure gauge
- (9) Protective environment room perimeter walls, ceiling, and floors, including penetrations, shall be sealed tightly so that air does not infiltrate the environment from the outside or from other spaces.
  - Proper construction of windows, doors, and intake and exhaust ports
  - Ceilings: smooth, free of fissures, open joints, crevices
  - Walls sealed above and below the ceiling
  - If leakage detected, locate source and make necessary repairs
- (10) Protective environment room(s) shall have self-closing devices on all room exit doors.
- (11) Maintain back-up ventilation equipment (e.g., portable units for fans or filters) for emergency provision of ventilation requirements for PE areas and take immediate steps to restore the fixed ventilation
- (12) Protective environment rooms have special requirements and considerations during renovation and construction.

### **3.4 Immuno-suppressed host air-borne infection isolation (protective environment /air-borne infection isolation)**

Combined Immuno-suppressed host airborne infection isolation should have the following:

a. Having a protective environment is not a minimum requirement.

Facilities with protective environment rooms should include at least one immuno-suppressed host airborne infection isolation room.

b. An anteroom is required for the special case in which an immuno-suppressed patient requires airborne infection isolation.

c. There is no prescribed method for anteroom ventilation—the room can be ventilated with either of the following airflow patterns:

(1) airflows from the anteroom, to the patient room and the corridor,

Or

(2) airflows from the patient room and the corridor, into the anteroom. The advantage of pattern (1) is the provision for a clean anteroom in which health care workers need not mask before entering the anteroom.

### **3.5 Seclusion Rooms**

#### **3.5.1 Applicability**

If indicated by the functional program, the hospital shall provide one or more single- bed rooms for patients needing close supervision for medical and/or psychiatric care.

#### **3.5.2 Location**

These rooms may be part of the psychiatric unit

#### **3.5.3 Capacity**

Maximum room capacity shall be two patients.

#### **3.5.4 Facility requirements**

Typical Psychiatric Patient Rooms Each patient room shall meet the following standards:

- Each patient room shall have a window.
- There shall be a desk or writing surface in each room for patient use.
- Each patient shall have direct access to a toilet room without having to enter the general corridor area. (This access requirement may be disregarded if it conflicts with the supervision of patients as required by the functional program).The toilet room shall contain a water closet and a hand-washing station.
- Each patient shall have within his or her room a separate wardrobe, locker, or closet.
- Adequate storage shall be available for a daily change of clothes for seven days.

Seclusion room in acute care setting should have the following extra requirements:

(1) shall be for single occupancy.

(2) shall be located to permit staff observation of the entrance, preferably adjacent to the nurse station.

(3) shall be designed to minimize the potential for escape, concealment, injury, or suicide.

(4) If vision panels are used for observation of patients, the arrangement shall ensure patient privacy and prevent casual observation by visitors and other patients.

## Chapter 4

### SUPPORT AREAS:

Provision for the services listed below shall be in or readily available to each unit. The size and location of each service area will depend upon the numbers and types of beds served. Identifiable spaces are required for each of the indicated functions. Services may be shared with adjacent units. Where the words "room" or "office" are used, a separate, enclosed space for the one named function is intended; otherwise, the described area may be a specific space in another room or common area.

#### 4.1 Support Areas - General

The size and location of each support area shall depend on the numbers and types of beds served.

##### 4.1.1 Administrative center(s) or nurse station(s)

- This area shall have space for counters and storage and shall have convenient access to hand washing stations.
- This area may be combined with or include centers for reception and communication.
- Station should permit visual observation of all traffic into the unit.

##### 4.1.2 Examination room:

Such room may be omitted if all patient rooms are single -bed rooms.

Examination/treatment areas should be 9.29 square meters of clear floor space, with hand-washing stations, vacuum, oxygen, and air outlets, and examination lights.

###### 4.1.2.1 Location

Centrally located examination and treatment room(s) shall be permitted to serve more than one nursing unit on the same floor.

###### 4.1.2.2 Space requirements

Such rooms shall have a minimum floor area of 11.15 square meters.

###### 4.1.2.3 Patient privacy

Provision shall be made to preserve patient privacy from observation from outside the exam room through an open door.

###### 4.1.2.4 Facility requirements

The room shall contain a hand-washing station; storage facilities; and a desk, counter, or shelf space for writing

##### 4.1.3 Procedure room

A separate examination / treatment / procedure room of 11.15 square meters of clear floor space should be provided with hand-washing stations, vacuum, oxygen, and air outlets, and examination lights.

The procedures should be performed in a room that meets the ventilation requirements for the procedures done.

**4.1.3.1 Cough-inducing procedure rooms and Aerosol-Generating Procedures.** Rooms used for sputum induction, aerosolized pentamidine treatments, or other cough-inducing procedures shall meet the requirements of Table 1 for airborne infection isolation rooms.

- All cough-inducing procedures performed on patients who may have infectious Mycobacterium

tuberculosis shall be performed in rooms using local exhaust ventilation devices (e.g., booths or special enclosures that have discharge HEPA filters and exhaust directly to the outside).

- If a ventilated booth is used, the air exchange rate within the booth shall be at least 12 air changes per hour, with a minimum exhaust flow rate of 50 cfm and differential pressure of ( $>0.01$ " w.g. / 2.5 Pa ).

#### **4.1.4 Documentation area**

Charting facilities shall have linear surface space adequate to ensure that staff and physicians can chart and have simultaneous access to information and communication systems.

#### **4.1.5 Nurse or supervisor office**

#### **4.1.6 Multipurpose room(s)**

- Room(s) shall be provided for patient conferences, reports, education, training sessions, and consultation.
- These rooms shall be accessible to each nursing unit.
- These rooms may be on other floors if convenient for regular use.
- One such room shall be permitted to serve several nursing units and/or departments.

#### **4.1.7 Hand-washing stations**

- In nursing locations, hand-washing stations shall be conveniently accessible to the nurse station, medication station, and nourishment area.
- If it is convenient to each, one hand-washing station shall be permitted to serve several areas.

#### **4.1.8 Medication station**

Medication shall be distributed from a medicine preparation room or unit, from a self-contained medicine dispensing unit, or by another approved system.

##### **A. Medicine preparation room**

- This room shall be under visual control of the nursing staff.
- This room shall contain a work counter, a hand washing station, a lockable refrigerator, and locked storage for controlled drugs.
- When a medicine preparation room is to be used to store one or more self-contained medicine dispensing units, the room shall be designed with adequate space to prepare medicines with the self contained medicine-dispensing unit(s) present.
- This room shall have a minimum of clear floor area of 4.65 square meters.

##### **B. Self-contained medicine dispensing unit**

- Location of a self-contained medicine dispensing unit shall be permitted at the nurse station, in the clean workroom, or in an alcove, provided the unit has adequate security for controlled drugs and adequate lighting to easily identify drugs.
- Convenient access to hand-washing stations shall be provided. (Standard cup-sinks provided in many self-contained units are not adequate for hand-washing.)

#### **4.1.9 Nourishment area**

- A nourishment area shall have a sink, work counter, refrigerator, storage cabinets, and equipment for hot and cold nourishment between scheduled meals. This area shall include space for trays and dishes used for nonscheduled meal service.

- Provisions and space shall be included for separate temporary storage of unused and soiled dietary trays not picked up at mealtime.
- Hand-washing stations shall be provided in the nourishment area.

This room shall have a minimum clear floor area of 4.65 square meters.

#### **4.1.10 Ice machine**

- The main sources of microorganisms in ice and ice machines are contaminated potable water used to make the ice, and transfer of microorganisms from hand contact.
- Ice should not be handled directly. An ice scoop or tongs should be used.
- Ice intended for human consumption shall be from self-dispensing ice makers.
- Each nursing unit shall have equipment to provide ice for treatments and nourishment.
- Access to ice machines should be restricted, and they should be located in a clean area away from general traffic routes. It may be in the clean workroom/holding room or at the nourishment station.
- Ice-making facilities shall be easily cleanable and convenient to the dietary function and should be regularly maintained

#### **4.1.11 Patient bathing facilities**

- (1) Showers and bathtubs
  - Where individual bathing facilities are not provided in patient rooms, there shall be at least one shower and/or bathtub for each 12 beds without such facilities.
  - Each bathtub or shower shall be in an individual room or enclosure that provides privacy for bathing, drying, and dressing.
- (2) Toilets. A toilet shall be provided within or directly accessible to each central bathing facility.
- (3) Special bathing facilities, including space for attendant, shall be provided for patients on stretchers, carts, and wheelchairs at the ratio of one per 100 beds or a fraction thereof. These facilities may be on a separate floor if convenient for use.

#### **4.1.12 Storage area**

##### **4.1.12.1 Storage Issues**

- Storage systems should be selected on the basis of minimizing dust accumulation, potential for damage to stock, and to facilitate cleaning
- It is preferable for stock to be enclosed, protected from dust accumulation
- Porous materials should be avoided in storing units.
- To facilitate cleaning, cupboards and drawers etc should not be excessively deep and should permit easy access
- Outer cardboard cartons and excess wrapping to be removed in suitable area at delivery point
- Storage space should be allocated for personal protective equipment (PPE). PPE should be readily available to all staff in close proximity to procedural areas
- In bulk storage areas, minimize the number of doors to reduce dust entry, and ensure the entire floor area is accessible for cleaning.

##### **4.1.12.2 Storage of Sterilized Consumables**

- Consumables storage should be kept to a minimum to avoid dust and damage
- Storage areas on wards are to be located away from contaminated areas, in a low activity, dry environment with limited access
- Non-sterile and sterile stock can be stored in the same area



- Shelving may be solid or open wire construction, burr free, with a height of at least 250mm from the floor and 440mm from the ceiling to reduce contamination, promote accessibility and enable cleaning of the floor below
- Sterile stock is to be stored away from extremes of temperature, away from direct sunlight in a well-ventilated, dry, clean area
- Storage bins should be able to be routinely cleaned and dried
- Stock in patient bed/holding area to be minimal unless items have a high turnover, storage should be within cupboards or drawers.

#### **4.1.12.3 Clean linen storage**

- Location of the designated area within the clean workroom, a separate closet, or an approved distribution system on each floor shall be permitted.
- If a closed cart system is used, storage of clean linen carts in an alcove shall be permitted. This cart storage must be out of the path of normal traffic and under staff control.
- Storage area for clean linen is to be clean, dry, dust free.
- Adequate storage facilities for pillows, blankets to be incorporated

#### **4.1.12.4 Equipment storage room or alcove**

- Appropriate room(s) or alcove(s) shall be provided for storage of equipment necessary for patient care and as required by the functional program.
- Each unit shall provide sufficient storage area(s) located on the patient floor to keep its required corridor width free of all equipment and supplies, but not less than 0.93 square meters per patient bed shall be provided.

#### **4.1.12.5 Storage space for stretchers and wheelchairs**

- Space shall be provided in a strategic location, without restricting normal traffic.

#### **4.1.12.6 Emergency equipment storage**

- Space provided for emergency equipment that is under direct control of the nursing staff, such as a cardiopulmonary resuscitation (CPR) cart.
- This space shall be located in an area appropriate to the functional program but out of normal traffic.

#### **4.1.13 House keeping room.**

Housekeeping rooms shall be provided throughout the facility as required to maintain a clean and sanitary environment.

- They shall be directly accessible from the unit or floor they serve and may serve more than one nursing unit on a floor.
- One housekeeping room shall be provided for each nursing unit or nursing floor.
- It shall contain a service sink or floor receptor and provisions for storage of supplies and housekeeping equipment.
- Janitor's closet of 3.5 square meters for keeping mops and detergents should be provisioned in each ward.
- Separate lockable areas situated conveniently to minimize travel time
- Adequate space to store buckets, cleaning equipment, cleaning agents

**Note:** This housekeeping room may not be used for other departments and nursing units that require separate housekeeping rooms.

#### **4.1.14 Clean Workroom or Clean Supply Room:**

Such rooms shall be separate from and have no direct connection with soiled workrooms or soiled holding rooms.

##### **4.1.14.1 Clean workroom:**

If the room is used for preparing patient care items, it shall contain a work counter, a hand free hand-washing station, and storage facilities for clean and sterile supplies.

##### **4.1.14.2 Clean supply room:**

If the room is used only for storage and holding as part of a system for distribution of clean and sterile materials, omission of the work counter and hand-washing station shall be permitted.

#### **4.1.15 Soiled Workroom and Soiled Holding Room:**

Such rooms shall be separate from and have no direct connection with clean workrooms or clean supply rooms.

##### **4.1.15.1 Soiled workrooms:**

Room of size 10.5 square meters per ward is required in each ward with facilities for:

- A clinical sink (or equivalent flushing-rim fixture) and a hand-washing station. Both fixtures shall have a hot and cold mixing faucet.
- A work counter and space for separate covered containers for soiled linen and a variety of waste types should be provided.
- Facilities for water disposal and rinsing of buckets and equipment.
- Water supply of hot and cold water should be catered.

##### **4.1.15.2 Soiled holding rooms:**

- This room is only used for temporary holding of soiled material so clinical sink and work counter are not needed.
- This room shall contain soiled linen receptacles, and waste receptacles in number and type as required by the functional program.
- Separate arrangements for garbage and infectious waste removal from wards and departments in the form of separate staircases and lifts shall be provided.
- As per standard guidelines a space should be provided to keep urine and stool samples of patients and their disposal.

## **4.2 Support Areas for Staff**

### **4.2.1 Lounge facilities**

It shall be sized per the functional program but shall not be less than 9.29 square meters.

### **4.2.2 Dining area**

Separate area for dining shall be provided for staff

### **4.2.3. Staff Toilet Room(s)**

These shall be conveniently located for staff use.

#### **4.2.4 Staff Storage Facilities**

Securable closets or cabinet compartments for the personal articles of nursing personnel shall be located in or near the nurse station. At a minimum, they shall be large enough for purses and billfolds.

### **4.3 Support Areas for Visitors**

#### **4.3.1 Visitor lounge.**

Each ward shall have access to a lounge for visitors and family.

- This lounge shall be sized appropriately for the number of beds served per the functional program.
- This lounge shall be conveniently located to the ward(s) served.
- This lounge shall provide comfortable seating.

This lounge shall be designed to minimize the impact of noise and activity on patient rooms and staff functions.

#### **4.3.2. Toilet room(s)**

A toilet room(s) with hand washing station shall be located convenient to public use.

## CHAPTER 5

### Heating, Ventilation and Air-Conditioning (HVAC) Systems

System design features should provide protection of outside air intakes, location of return air grilles, and types of filtration.

#### 5.1 Air-handling systems

- (a) These shall be designed with an economizer cycle where appropriate to use outside air. (Use of mechanically circulated outside air does not reduce need for filtration.)
- (b) The energy-saving potential of variable-air-volume systems (VAV systems) is recognized, and the standards are intended to maximize appropriate use of those systems. Any system used for occupied areas shall include provisions to avoid air stagnation in interior spaces where thermostat demands are met by temperatures of surrounding areas.

It is recommended that when practical, ventilation requirements should be met by a central air-handling system with filtration and humidification provisions.

#### 5.2 Air outlets and inlets

##### 5.2.1 Fresh air intakes

- (a) Fresh air intakes shall be located at least 7.62 meters from exhaust outlets of ventilating systems, combustion vents (including those serving rooftop air handling equipment), medical-surgical vacuum systems, plumbing vents, or areas that may collect vehicular exhaust or other noxious fumes. (Prevailing winds and/or proximity to other structures may require greater clearances.)
- (b) Plumbing vents that terminate at a level above the top of the air intake may be located as close as 3.05 meters.
- (c) The bottom of outdoor air intakes serving central systems shall be as high as practical, but at least 1.83 meters) above ground level, or, if installed above the roof, 91.44 centimeters above roof level.

**5.2.2 Relief air.** Relief air is exempt from the 7.62-meter separation requirement. Relief air is defined as air that otherwise could be returned (re-circulated) to an air handling unit from the occupied space, but is being discharged to the outdoors to maintain building pressure, such as during outside air economizer operation.

**5.2.3 Construction requirements.** The bottoms of air distribution devices (supply/return/exhaust) shall be at least 7.62 centimeters above the floor.

#### 5.3 Ventilation and space conditioning requirements.

All rooms and areas used for patient care shall have provisions for ventilation.

- (1) Ventilation rates. The ventilation systems shall be designed and balanced, as a minimum, according to the requirements shown in Table 1 and the applicable notes. The ventilation rates shown in Table 2 do not preclude the use of higher, more appropriate rates.
- (2) Temperature. Space temperature shall be as indicated in Table 1.
- (4) Air movement direction. To maintain asepsis control, airflow supply and exhaust shall generally be controlled to ensure movement of air from “clean” to “less clean” areas.
- (3) Although natural ventilation for non sensitive areas and patient rooms (via operable windows) shall be permitted, mechanical ventilation shall be considered for all rooms and areas in the facility.

**Table 1: Ventilation Requirements for Areas Affecting Patient Care**

Area designation	Air movement relationship to adjacent area	Minimum air changes of outdoor air per hour <sup>3</sup>	Minimum total air changes per hour	All air exhausted directly to outdoors	Re-circulated by means of room units <sup>7</sup>	Design temperature (degrees C)
Patient room	—	2	6-10	-	-	21–24°C
Toilet room	in	-	10	yes	-	-
Patient corridor	-	-	2	-	-	-
Medication room	out	-	4	-	-	-
Clean workroom or clean holding	out	-	4	-	-	-
Soiled workroom or soiled holding	in	-	10	yes	no	-
Examination room	-	-	6	-	-	24°C
Treatment room	-	-	6	-	-	24°C
Soiled linen (sorting and storage)	in	-	10	yes	no	-
Clean linen storage	out	-	2	-	-	-
Soiled linen and trash chute room	in	-	10	yes	no	-
Bedpan room	in	-	10	yes	no	-
Bathroom	in	-	10	yes	no	24°C
Housekeeping room	in	-	10	yes	no	-
Protective environment room	out	2	12	-	No	24°C
Airborne infection isolation room	In	2	12	Yes	No	24°C
Isolation alcove or anteroom	In/Out	-	10	Yes	No	-

## **5.4 Humidity Control**

- a. According to ASHRAE Standards, the recommendation is 30 to 60 percent relative humidity for comfort.
- b. If duct humidifiers are located upstream of the final filters, they should be at least 4.56 meters upstream of the final filters. Ductwork with duct-mounted humidifiers located downstream of the final filters should have a means of water removal. An adjustable high-limit humidistat should be located downstream of the humidifier to reduce the potential for condensation inside the duct. All duct takeoffs should be sufficiently downstream of the humidifier to ensure complete moisture absorption. Steam humidifiers should be used. Reservoir-type water spray or evaporative pan humidifiers should not be used.

## **5.5 Exhaust systems**

- (a) To enhance the efficiency of recovery devices required for energy conservation, combined exhaust systems shall be permitted.
- (b) Local exhaust systems shall be used whenever possible in place of dilution ventilation to reduce exposure to hazardous gases, vapors, fumes, or mists.
- (c) Fans serving exhaust systems shall be located at the discharge end and shall be readily serviceable.
- (d) Airborne infection isolation rooms shall not be served by exhaust systems incorporating a heat wheel.

## **5.6 HVAC Duct Work**

### **5.6.1 General**

- (a) Air-handling duct systems shall be designed with accessibility for duct cleaning and shall meet the requirements of National Fire Fighting Authority (NFFA).
- (b) When smoke partitions are required, heating, ventilating, and air conditioning zones shall be coordinated with compartmentation in so far as practical to minimize the need to penetrate fire and smoke partitions.
- (c) All ductwork of air conditioning systems and ventilation systems which supply or re-circulate air, is to comply with the following:
  - reasonable access for low frequency cleaning without need for major works
  - fit screen type lint filters to return air and exhaust air grilles of ward and treatment areas
  - Attenuators to have impervious lining between facing and acoustic lining.
  - Attenuators shall be readily removable and located within plant rooms and other accessible areas that facilitate easy removal

### **5.6.2 Duct linings**

- (1) Interior lining is not preferred but if duct lining is used, it shall be coated and sealed according to standards of the American Society for Testing and Materials (ASTM).
- (2) These linings (including coatings, adhesives, and exterior surface insulation on pipes and ducts in spaces used as air supply plenums) shall have a flame-spread rating and a smoke developed rating in accordance with NFFA.
- (3) Interior duct linings shall not be used in ducts serving operating rooms, delivery rooms, nurseries, protective environment rooms, and critical care units. This requirement shall not apply to mixing boxes and sound attenuators that have special coverings over such lining.
- (4) Duct lining shall not be installed within 4.57 meters downstream of humidifiers.
- (5) Renovation. If existing lined ductwork is reworked in a renovation project, the liner seams and punctures shall be resealed.

### **5.6.3 Duct humidifiers**

- (a) If duct humidifiers are located upstream of the final filters, they shall be at least 4.57 meters upstream of the final filters.
- (b) Ductwork with duct-mounted humidifiers shall have a means of water removal.
- (c) An adjustable high-limit humidistat shall be located downstream of the humidifier to reduce the potential for condensation inside the duct.
- (d) Humidifiers shall be connected to airflow proving switches that prevent humidification unless the required volume of airflow is present or high-limit humidistats are provided.
- (e) All duct takeoffs shall be sufficiently downstream of the humidifier to ensure complete moisture absorption.
- (f) Steam humidifiers shall be used. Reservoir type water spray or evaporative pan humidifiers shall not be used.

### **5.6.4 Fire and smoke dampers**

Fire and smoke dampers shall be constructed, located, and installed in accordance with the requirements of NFPA, and the specific damper's listing requirements.

**5.6.5 Construction requirements.** Ducts that penetrate construction intended to protect against x-ray, magnetic, or other radiation shall not impair the effectiveness of the protection.

## **5.7 HVAC Filters**

### **5.7.1 Filter efficiencies**

- (1) All central ventilation or air conditioning systems shall be equipped with filters with efficiencies equal to, or greater than, those specified in Table 2.
- (2) Non central air-handling systems shall be equipped with permanent (cleanable) or replaceable filters with a minimum efficiency rating value (MERV) 3 (68 percent weight arrestance).

### **5.7.2 Filter bed location**

Where two filter beds are required, filter bed no. 1 shall be located upstream of the air conditioning equipment and filter bed no. 2 shall be downstream of any fan or blowers.

### **5.7.3 Filter frames**

Filter frames shall be durable and proportioned to provide an airtight fit with the enclosing ductwork. All joints between filter segments and enclosing ductwork shall have gaskets or seals to provide a positive seal against air leakage.

### **5.7.4 Filter housing blank-off panels**

It shall be permanently attached to the frame, constructed of rigid materials, and have sealing surfaces equal to or greater than the filter media installed in the filter frame.

### **5.7.5 Filter manometers**

It shall be installed across each filter bed having a required efficiency of 75 percent or more, including hoods requiring HEPA filters. Provisions shall be made to allow access to the manometer for field testing.

**Table 2: Filter Efficiencies for Central Ventilation and Air Conditioning Systems**

Area designation	No. filter beds	Filter bed no. 1 (MERV, %)	Filter bed no. 2 (MERV, %)
All areas for inpatient care, treatment, and diagnosis, and those areas providing direct service or clean supplies such as sterile and clean processing, etc.	2	8 (30%)	14 (90%)
Protective environment room	1	8 (30%)	17 (99.97%)
Administrative, bulk storage, soiled holding areas, food preparation areas, and laundries	1	8 (30%)	-

Notes

1. Additional roughing or pre-filters should be considered to reduce maintenance required for filters with efficiency higher than 75 percent.
2. MERV = minimum efficiency rating value. MERVs are based on ASHRAE .
3. The filtration efficiency ratings are based on average dust spot efficiency per ASHRAE .



## **CHAPTER 6 FINISHING**

### **6.1 Floors**

Floor materials should be:

- easily cleanable and appropriately wear-resistant for the location, stain resistant material that does not retain odour.
- water-resistant.
- withstand detergents and disinfectants.
- non slippery.
- homogenous, but may have tightly sealed joints.
- complying with fire fighting authority in areas and rooms in which flammable anesthetic agents are stored or administered.
- coved and sealed to ensure minimal damage by cleaning equipment and reduce moisture accumulation
- reducing noise.
- preferably Seamless or welded impervious finish and coved up the wall to a minimum of 15cm to form a continuous skirting

### **6.2 Walls**

- Wall finishes shall be washable. In the vicinity of plumbing fixtures, wall finishes shall be smooth and water-resistant.
- Wall construction, finish, and trim, including the joints between the walls and the floors, shall be free of insect- and rodent-harboring spaces
- Isolation rooms, and sterile processing rooms, wall finishes shall be free of fissures, open joints, or crevices (cracks) that may retain or permit passage of dirt particles.

### **6.3 Penetrations.**

Floors and walls penetrated by pipes, ducts, and conduits shall be tightly sealed to minimize entry of rodents and insects. Joints of structural elements shall be similarly sealed.

### **6.4 Ceilings**

**6.4.1** Ceilings, including exposed structure in areas normally occupied by patients or staff shall be:

- smooth, impervious.
- constructed of non-porous materials.
- cleanable with routine housekeeping equipment.
- with a minimum ceiling height of 2.39 meters.

**6.4.2** In semi-restricted areas:

- Ceiling finishes in semi-restricted areas such as airborne infection isolation rooms, protective environment rooms, clean corridors, central sterile supply spaces, specialized radiographic rooms, and minor surgical procedure rooms shall be smooth, scrub able, non absorptive, non perforated
- Capable of withstanding cleaning with chemicals, and without crevices that can harbor mold and bacterial growth.
- If lay-in ceiling is provided, it shall be gasketed or clipped down to prevent the passage of particles from the cavity above the ceiling plane into the semi restricted environment.

- Perforated, tegular, serrated cut, or highly textured tiles are not acceptable.

#### **6.4.3** Avoid locating access to ceiling space in clinical areas.

#### **6.4.4** Ceiling tiles should be avoided in clinical areas for the following reasons:

- ceiling tiles or similar porous materials (acoustic and or fireproofing and filter materials) may become moist through environmental contamination or condensation
- dust permeates through ceiling tiles and falls into clinical areas and onto patients
- they are a potential reservoir for fungal spores and pests
- they are difficult to clean.

In ensuite, all surfaces should be seamless and appropriately welded to flooring material.

### **6.5 Corridor width**

(1) In outpatient suites and in areas not commonly used for patient bed or stretcher transportation, reduction of corridor width to 1.52 meters shall be permitted.

(2) Location of items such as drinking fountains, telephone booths, vending machines, and portable equipment shall not restrict corridor traffic or reduce the corridor width below the minimum standard.

### **6.6 Doors**

#### **6.6.1 Door type**

- Doors and door handles should be constructed of materials that are easily cleaned.
- Laminate or stainless steel is suitable for protection panels.
- All doors between corridors, rooms, or spaces subject to occupancy shall be of the swing type and it should open automatically (i.e. sensor doors) to avoid the need for hand contact with the surface.
- Manual or automatic sliding doors may be exempt from this standard where fire and other emergency exiting requirements are not compromised and where cleanliness of surfaces can be maintained.

#### **6.6.2 Door size**

- General:  
Door width and height shall be the nominal dimension of the door leaf, ignoring projections of frame and stops. Although these standards are intended to accommodate access by patients and patient equipment, size of office furniture, etc., shall also be considered.
- Inpatient bedrooms
  - (i) New construction. The minimum door size for inpatient bedrooms in new work shall be 1.12 meters wide and 2.13 meters high to provide clearance for movement of beds and other equipment.
  - (ii) Renovation. Existing doors of not less than 86.36 centimeters wide may be considered for acceptance where function is not adversely affected and replacement is impractical.
- Rooms for stretchers/wheelchairs. Doors to other rooms used for stretchers (including hospital wheeled-bed stretchers) and/or wheelchairs shall have a minimum width of 86.36 centimeters.

#### **6.6.3 Door swing.**

Doors, except those to spaces such as small closets not subject to occupancy, shall not swing into corridors in a manner that might obstruct traffic flow or reduce the required corridor width. (Large walk-in-type closets are considered inhabitable spaces.)

#### **6.6.4 Door hardware**

- Patient bathing/toilet facilities
  - (i) Rooms that contain bathtubs, showers, and/or water closets for inpatient use shall be equipped with doors and hardware permitting emergency access from the outside.
  - (ii) When such rooms have only one opening or are small, the doors shall open outward or in a manner that will avoid pressing a patient who may have collapsed within the room.
  - (iii) Similar considerations may be desirable for certain outpatient services.

#### **6.7 Windows**

- The following should be pursued in choosing nature and location of windows
  - patient and staff comfort and privacy
  - reduced sun penetration and glare
  - energy conservation
  - ease of cleaning.
  - complying with the flame spread ratings of fire fighting authority.
  - Operable windows are not required in patient rooms. If operable windows are provided in patient rooms or suites, operation of such windows shall be restricted to inhibit possible escape or suicide.
  - Ease of access for cleaning external windows needs to be addressed in the planning stage. The use of double glazed windows with internal Venetian blinds is recommended.
  - break-resistant material that creates no dangerous cutting edges when broken
  - Avoid paned windows due to the time required for cleaning.
  - Insect screens. Windows and outer doors that frequently may be left open shall be equipped with insect screens.

#### **6.8 Hand-washing stations**

- (1) Location and arrangement of fittings for hand-washing stations shall permit their proper use and operation. Particular care shall be given to the clearances required for blade-type operating handles.
- (2) Mirrors shall not be installed at hand washing stations in food preparation areas, nurseries, clean and sterile supply areas, scrub sinks, or other areas where asepsis control would be lessened by hair combing.
- (3) Provisions for hand drying
  - (a) Provisions for hand drying shall be included at all hand-washing stations except scrub sinks.
  - (b) These provisions shall be paper or cloth units enclosed to protect against dust or soil and to ensure single-unit dispensing. Hot air dryers shall be permitted provided that installation precludes possible contamination by recirculation of air.
- (4) Anchoring. Lavatories and hand-washing stations shall be securely anchored to withstand an applied vertical load of not less than 113.4 kilograms on the fixture front.

#### **5.9 Curtains and blinds**

- The decision to use blinds or curtains should be made on the basis of potential for dust accumulation, ease of cleaning, and maintenance requirements.
- Vertical and horizontal blinds are difficult to clean. These window coverings are only suitable in offices, however they require increased effort to clean.
- Cubicle curtains and draperies shall be noncombustible or flame-retardant and shall comply with the national fire fighting authority.
- Materials and certain plastics known to produce noxious gases when burned shall not be used for mattresses, upholstery, and other items insofar as practical.

### **5.10 Bed Screens**

Bed screens should be washable, easy to remove and to hang and recessed into the ceiling and when pulled around the bed, there is room for staff to carry out procedures without brushing against the screen. They should be secured when not in use.

### **5.11 Light**

(1) Patient rooms. Patient rooms shall have general lighting and night lighting.

(a) A reading light shall be provided for each patient.

ii) Incandescent and halogen light sources that produce heat shall be avoided to prevent burns to the patient and/or bed linen.

(2) Nursing unit corridors. Corridors in nursing units shall have general illumination with provisions for reducing light levels at night.

(3) Exam/treatment/trauma rooms. A portable or fixed examination light shall be provided for examination, treatment, and trauma rooms.

### **5.12 Elevators**

- Hospital-type elevator cars shall have inside dimensions that accommodate a patient bed with attendants. Cars shall be at least 1.73 meters wide by 2.74 meters deep.
- Additional elevators installed for:
  - visitors and material handling shall be permitted to be smaller than noted above, within restrictions set by standards for disabled access.
  - clean supplies (medication ,food ,linen.. etc)
  - contaminated supply and waste

### **5.13 waste management**

- The location of sharps, and recycling container at the ward waste removal areas shall be determined by the functional program.
- Red bag waste shall be staged in enclosed and secured areas. Bio-hazardous and environmentally hazardous materials and other regulated waste types, shall be segregated and secured.
- The functional program shall stipulate the categories and volumes of waste for disposal and the methods of handling and disposal of waste. Also it shall outline the space requirements, including centralized waste collection and storage spaces. Size of spaces shall be based upon the volume of projected waste and length of anticipated storage.
- Safe transfer routes, distances from waste sources, temporary storage requirements in wards to the waste processing area (incineration) which should be outside the hospital shall be carefully planned.

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