1. Purpose

- To provide comfortable environmental condition for patients, their attendants and the staff and to, help, in reducing preventable part of hospital associated infection (HAI).
- To protect patients form infection and to avoid the spread of infection.
- To contain dust that creates from work because it can effect on patients allergies and breathing
- To prevent the dust from clogging of instruments and smoke detectors

2. Scope

Hospital wide

3. Introduction

Construction / renovation can disrupt microorganisms in the Environment so that they pose a risk to patients. Fungal spores (i.e. Aspergillus) are frequent contaminants of ceiling tiles and wallboards. During construction they are disrupted and dispersed into the air. These spores can pose a threat to immune compromised patients.

4. Policy

4.1 Planning:

4.1.1 Infection control risks, interventions, and control must be considered in planning new construction and/or renovation in the hospital setting.

4.1.2 Infection Control should be able to provide guidance before that start of

construction, maintenance, and operational input once renovation or construction has begun.

4.1.3 Specific concerns need to be customized in each project and include infection control practices, education, and monitoring.

4.1.4 Training and support to "users/ the area under construction should be available.

4.1.5 Environmental rounds should be scheduled as often as necessary and include a variety of observable "indicators" such as (doors, signage), air handling (windows closed), project area (debris, cleanliness, traffic control).

4.1.6 If construction is scheduled after normal hours or on weekends it may be necessary to reschedule the environmental rounds at those times.

4.1.7 ICN performs active surveillance on Aspergillus isolates. This is reported to the infection control committee quarterly.

4.2 Risk assessment

- Before starting a construction project, perform a risk assessment with key hospital staff, including the safety officer, infection control professional, and nurse managers on the patient units on or near where you will be working.
- Any patient or staff member within 75 ft of the construction site may be at risk for exposure to contaminants unless you take certain precautions.
- The important step is to establish a perimeter of the area affected and identify protective measures for the environment within the area.

4.3 Containment of the job site.

4.3.1 The area must be identified as the project requires.

4.3.2 Small, short duration projects generating minimal dust might use fire-rated plastic sheeting, but must be sealed at full veiling height with at least 2-feet

overlapping flaps for access to entry.

4.3.3 Any project that produces moderate to high level of dust requires rigid, dust-proof, and fire-rated barrier walls (e.g., drywall) with waterproof filler and sealant for a tight seal.

4.3.4 Large dust projects need an entry vestibule for tight seals which must be maintained at the full perimeter of walls and wall penetrations.

4.3.5 An interim plastic barrier would be required to protect the area while the rigid impervious barrier is being constructed.

4.3.6 Cleaning is required at completion of the barrier construction. Plans must also describe a terminal barrier removal process that minimizes dust dispersal.

4.4 Traffic control.

4.4.1 Designated entry and exit procedures must be defined.

4.4.2 Exits should be free of debris; designated elevators should be used during scheduled times; and only authorized personnel should be allowed to enter the construction zone.

4.4.3 Signage should direct pedestrian traffic away from the construction area and materials.

4.5 Demolition.

4.5.1 Debris should be removed in carts with tightly fitted covers, using designated traffic routes.

4.5.2 Efforts should be made to minimize use of elevators with transport during the lowest period of activity.

4.5.3 Debris should be removed daily and at times specified by agreements.

4.6 Exterior windows.

Windows should be sealed to minimize infiltration from excavation debris.

4.7 Visual monitoring.

Compliance with barrier maintenance includes training of staff for simple clues (e.g., accumulation of visible dust evidenced by footprints, opened doors/ windows evidenced by presence of insects and flies, wet ceiling tiles, etc.)

4.7 Ventilation and environment control.

4.8.1 Air must flow from clean to dirty areas.

4.8.2 Filters may be added or return vents covered as needed with filter material or plastic.

4.8.3 Air within the construction area must be negative pressure with respect to surrounding areas and with no disruption of air systems of adjacent areas.

4.8.4 The status of sealed penetrations and intact ceilings should be verified.

4.8.5 Air exchange rates and pressure relationships should be maintained with proper rates in critical areas near construction activity to ensure that air is not re-circulated without filtration from the construction activity.

4.8.6 Vibration and disturbances have the potential to dislodge dust collected above suspended or false ceilings; vibrations loosen corrosion within water pipes as well.

4.8.7 Plans should require vacuuming of affected areas and flushing debris from water systems before re-occupancy.

4.8.8 Determination of appropriate temperature humidity ranges should be done for the area.

4.8.9 Monitoring must consider risks of malfunction or complete loss of utilities.

4.8.10 Both visual cues and particulate air monitoring, evaluation of results, and follow-up action be designated parties should be part of the planning process.

4.9 Contamination of patient rooms, supplies, equipment, and related areas.

4.9.1 Barriers around construction should be monitored to maintain protection for in-use patient care areas as described.

4.9.2 Patient doors adjacent to construction areas should be kept closed, with appropriate traffic control.

4.9.3 Storage should be designated for construction materials.

4.9.4 The construction zone should be maintained in a clean manner by contractors and swept daily or as needed to minimize dust.

4.9.5 Adjacent areas should be damp mopped daily or as needed.

4.9.6 Walk-off mats may minimize tracking of heavy dirt and dust from construction areas.

4.9.7 Contracts should clearly specify responsibilities and expectations for routine and terminal cleaning before opening the newly renovated or construction zone.

5.0 Patient care activities to minimize exposure to construction sites should be considered.

5.1 Provide treatment in the patient's room.

5.2 Transport by an alternate route.

5.3 Scheduling of transport or procedures during periods within minimal construction activity.

5.4 Minimize waiting procedure times near construction zones.

5.5 Masking patients or provide other barriers based on patient's

6.0 Patients who are at risk include:

6.1 Those who are neutropenic due to : leukemia, lymphoma, aplastic anemia, or Myeloplastic disease

6.2 Those with a neutrophil count of less than 500

6.3 Those with congenital or acquired immunodeficiency syndrome

6.4 Those who receive steroids
6.5 Those who have open wounds, including burn patients
6.6 Premature neonates

HVAC: Heating, Ventilation, and Air conditioning is a system to maintain the hygienic comfortable environment by controlling the temperature, humidity and freshness of air.

Types of Air Conditioning System:

1. Window/ Split Air Conditioner.
2. Package Air Conditioning
3. Central Air Conditioning System

The first two systems are based on direct cooling system and fitted with prefilter only. These systems are installed in some diagnostic area and the Auditorium where central air conditioning system is not feasible.

Central air conditioning system is an indirect cooling system and consists of Air handling Unit (AHU), fan coil unit (FCU) and treated fresh air (TFA) according to requirement of area to be air-conditioned.

Air conditioning of different application (HVAC) areas:

Patients' Rooms:

Individual Fan Coil units are installed in all the patient rooms with thermostat, which maintains the desired temperature. Common TFA is installed on each floor to deliver treated fresh air for ventilation of rooms. Healing coil is fixed with TFA unit, which supply the hot air to all the rooms in winter.

ICUs:

The rooms are having negative pressure inside, with positive pressure outside the ICU room, thus preventing airborne infection to other patients.

OTs:

All Operation Theaters are designed ON12-15 air changes per hour with respect to fresh air and 40-45 air changes per hour in totality. The following equipments are installed in Operation Theaters.

a) AHU' Air Handling Units are installed to maintain the temperature.
b) TFA: I rested Fresh Air units are installed for ventilation and to maintain the positive pressure.
c) EU: Exhaust Units are installed for maintaining air changes.

Three level filtration is provided to all the Operation Theatres i.e.

a) **Level I** - Pre-filter which filters the air with 90% efficiency down to 10 microns.

b) **Level II**- Micro Filter which filters the air with 99.5% efficiency down to 5 microns.

c) **Level III**- HEPA filter: which filters the air with 99.97efficiency down to 0.3 microns.

Performance:

a) Quality assurance
b) Maintenance
c) Surveillance & Monitoring
   i) Physical parameters
   ii) Microbiological

Quality Assurance: Indoor air quality is being monitored on regular intervals. For different applications, different classes i.e. class 1000, class 10,000 & class 1, 00,000 for O.Ts, ICUs & patient's rooms respectively, are being maintained.

Maintenance:-

Preventive maintenance schedule shall be made for each equipment & shall be strictly being adhered to.

History cards shall be placed with plants, which contain the record for both preventive maintenance & breakdown repair. All the preventive maintenance schedules shall be fed software, which gives advance information for planning of preventive maintenance & also keeps all the records

Surveillance & Monitoring

i) Physical Parameters

Physical parameters shall be monitored periodically in various areas as mentioned below

S.No.	Area	Parameters	Monitoring frequency	Agency
1.	O.Ts	Temperature	Daily	Internal
		Relative Humidity	Daily	Internal
		Air flow (sterile-clean-dirtier)	Half-yearly	External
		Air changes	Half-yearly	External
		Pressure	Daily	Internal

Monitoring of physical parameters shall be carried out by means of random checks, by Engineering Department.

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Microbiological monitoring: Microbiological monitoring of various critical care areas i.e. O.T.s , ICUs, HDUs, delivery room, IV, Cath Labs is undertaken periodically by the Department of Microbiology. This shall be carried out by 'Settle Plate Method', according to the Hospital Infection Control Manual. Appropriate and necessary action as detailed in the manual .depending upon the interpretation of results of such monitoring shall be taken by the designated staff. Results shall be tabled before the Infection Control Committee in its subsequent meeting.

ENVIRONMENTAL MONITORING

MODE OF ENVIRONMENTAL SURVEILLANCE

BACTERIOLOGICAL MONITORING

OT / ICU's and other Critical Care Areas

METHOD:

- Settle Plate method.
- Two culture plates shall be exposed for one hour periodically in the above mentioned areas, at least once a month

1. OPERATION THEATRES (O.T.)

- OT Complex- O.T 1,2 & 3

2. OTHER AREAS: Any other areas deemed fit to be put under surveillance, by the Infection Control Committee / Infection Control Team.

Other Critical Care Areas shall be monitored periodically but at least once in three months:

- CATH LAB
- ENDOSCOPY
- DIALYSIS
- MORTUARY

AIR SAMPLING RESULTS OF ENVIROMENTAL STUDY BY SETTLE PLATE METHOD

	O.T - I,II & III		**Other areas**
	At Rest	At Activity	
	C.F.U./ dm^2/hr	C.F.U./ dm^2/hr	C.F.U./ dm^2/hr

Satisfactory	0 - 4	0 - 60	<100 (+20)
Acceptable Limits	5 - 8	61- 90	100-200(+20)
Not Satisfactory	> 9	>91	>200 (+20)

ACTION REQUIRED ON THE RESULTS

1. **Satisfactory**
   Congratulation! Continue the practices.

2. **Acceptable Limit**
   Hand written information shall be provided to OT – In charge on the next day of exposure of culture plate(s). The date and time of information shall be recorded in the lab and by OT – In charge.

   Action Required: After receipt of the report, the following is advised to be carried out:

   - Clean and carbolize with 1% Sodium Hypochlorite solution, Bacillocid as per manufacturer's direction before and after each operation till results become satisfactory.
   - Monitor patients operated in OT a day earlier and on toe day of exposure of the plate, the results of which is non satisfactory.

- Check the Physical activity and population density (Number of persons in the area, total number of persons who have entered the area during exposure of the plates, frequency of the opening and closing of door etc).
- Check the atmospheric pressure difference between outside and inside.
- Check if the patient(s) in the area was / (were) known infected cases.
- Any other cause.

3. **Not satisfactory**

Hand written information shall be provided to OT – In charge on the next day of exposure of culture plate(s). The date and time of admission shall be recorded in the lab and by OT – In charge.

Action Required: After receipt of the report, the following is advised to be carried out:

- Clean and carbolize with 1-4% Sodium Hypochlorite solution, Ecoshield Fogging as per manufacturer's direction. Repeat the procedure twice before restarting
- Monitor patients operated in OT a day earlier and on the day of exposure of the plate, the results of which is non satisfactory.
- Check the Physical activity and population density (Number of persons in the area, total number of persons who have entered the area during exposure of the plates, frequency of the opening and closing of door etc).
- Check the atmospheric pressure difference between outside and inside.
- Check if the patient(s) in the area was / (were) known infected cases.