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Policy Area Infection Prevention
Applicability UNC Medical Center

Plant Engineering and Maintenance

I. Description

Describes the infection prevention guidelines for maintaining the physical environment of the hospital.

II. Rationale

Proper maintenance of the ventilation and physical facilities is essential to help reduce the risk of infections associated with the physical environment.

III. Policy

A. Personnel

1. Personnel should adhere to guidelines found in the Infection Prevention policy: [Infection Control and Screening Program – Occupational Health Service](#).
2. Hand hygiene will be performed in accordance with the Infection Prevention policy: [Hand Hygiene and Use of Antiseptics for Skin Preparation](#).
3. Personnel must be prompt in reporting any exposures to blood or other potentially infectious material (e.g., needlesticks, mucous membrane or non-intact skin) by calling the **Needlestick Hotline** at 984-974-4480. Exposed employees should also complete an employee incident report.
4. Personnel must be familiar with the Infection Prevention policies: [Exposure Control Plan for Bloodborne Pathogens](#) and the [Tuberculosis Control Plan](#).
5. Infection prevention education, which includes OSHA-required Bloodborne Pathogens and Tuberculosis training, is provided initially upon employment and completed annually via the Learning Made Simple System (LMS).

6. When it is necessary to come in contact with patient's body fluids (e.g., repairing sewer lines, toilets), personal protective equipment (e.g., gloves, gowns and/or goggles, masks, face shields) must be worn. If disposable nitrile gloves are inadequate to protect from blood exposure, utility gloves may be used to protect hands from blood and other potentially infectious materials. Hands must be washed after gloves are removed. Reusable utility gloves will be decontaminated using an EPA-registered disinfectant if the integrity of the gloves is not compromised. Utility gloves must be discarded if they are cracked, peeling, torn, punctured, or exhibit other signs of deterioration or when their ability to function as a barrier is compromised.
7. Isolation Precautions
 - a. All personnel will follow the Infection Prevention policy: [Isolation Precautions](#) and any instructions addressed on the isolation precaution sign posted outside the patient's room.
 - b. Equipment (pliers, wrenches, hammers, etc.) must be disinfected with an EPA-registered disinfectant (i.e., Sani-Cloth, Metriguard) after use in an isolation precautions room and when visibly soiled.

B. Maintenance of Buildings

1. All surfaces (floors, walls, and ceilings) require inspection and repair when necessary in order to maintain smooth, dry, and cleanable surfaces. Water leaks or water soaked walls can become reservoirs for fungus.
2. Any openings or breaks in the walls, foundations, window frames, etc. require repair to preserve a clean environment.
3. UNC Medical Center employees and healthcare providers (HCP) will report need for repairs to their supervisors. Supervisor (or designee) will contact Plant Engineering or place a work order/maintenance request using the Plant Engineering (PE) [online maintenance request form](#).

C. Equipment and Repairs

1. Water Treatment
 - a. Domestic Potable Water Primary Treatment
 - i. The domestic potable water supply is treated, disinfected, tested, and approved as safe by public water supplier (Orange Water and Sewer Authority) using a combination of physical and chemical processes in accordance with state and federal regulations.
 - ii. Carbon filters are designed to improve the taste of water, but also filter out chlorine and other chemical disinfectants increasing the risk of bacterial contamination. Carbon filters will not be allowed on potable water supply that are used for patients or patient care.
 - b. Domestic Potable Water Secondary Treatment
 - The domestic potable water supply (cold and hot) to the Bone

Marrow Transplant Unit (BMTU) on 1st Floor Neuroscience Hospital and 5 Children's Protective Environment Unit in Chapel Hill will be served by a secondary treatment system (copper silver ionization). The system will be maintained in accordance with manufacturer's recommendations.

c. Domestic Potable Hot Water

- i. Domestic hot water systems will utilize recirculation pumping and piping technology to maintain continuous flow in hot water distribution loops.
- ii. Water heaters will be of the instantaneous low-volume type or tank type with recirculation.

d. Cooling Towers and Condenser Water

- i. Cooling tower condenser water will be chemically-treated with inhibitors, dispersants and biocides in accordance with industry/vendor best practice standards to protect against fouling, corrosion, scale, and microbiological growth. Water quality parameters and chemical feeds will be controlled, monitored, adjusted, and maintained by automated water treatment controllers and chemical treatment vendor technicians.
- ii. Cooling towers will be cleaned once annually and disinfected twice annually in accordance with industry/vendor best practice standards.
- iii. Cooling tower condenser water makeup will be either by domestic potable water supply or by reclaimed water, both of which are treated by the public water supplier using a combination of physical and chemical processes in accordance with state and federal regulations.

e. Humidifiers in Central Air Handling

- Steam for central air-handler humidification will be provided either by local steam generators fed directly by a domestic potable water supply or by central plant steam that has been treated with amines in accordance with industry/vendor best practice standards.

2. Ventilation system

- a. Air filters will be monitored as indicated in [Summary of Air Quality Systems Management](#) which details the requirements and monitoring for filters, pressures, and air changes. From an infection prevention and control perspective, temperature and relative humidity monitoring is not necessary so long as temperature and relative humidity are not excessive (temperature >90°F, relative humidity >80% for longer than 48 hours).
- b. Disposable filters are never cleaned or reused.
- c. All roughing filter beds will be visually inspected every 3 months to ensure

that unfiltered air does not bypass the filters because of leaks around the filter frames or holes in the filters. N-95 respirators (fit-testing required) are available to staff for use when filters are changed.

- d. Air exchange rates and the air pressure differential between patient rooms and the adjacent corridor will be checked as requested by the Infection Prevention Department. Rooms used for isolation of patients on Airborne Precautions will be monitored annually (see [Summary of Air Quality Systems Management](#)). The results will be kept on file by Plant Engineering for a period of 3 years and a copy of annual monitoring results will be sent to Infection Prevention. Rooms of patients on Airborne Precautions are to be monitored by the nursing staff at least daily when in use for Airborne Precautions using the "tissue test" per the Infection Prevention policies: [Isolation Precautions](#) and [Highly Communicable Diseases - Preparedness and Response Plan](#).
- e. To preclude bypass of unfiltered air, all hospital windows will remain closed and outside doors will remain closed when not in active use.
- f. When cleaning dust from behind vent covers in patient rooms, use a damp cloth or HEPA-filtered vacuum cleaner. This cleaning should only be done when the patient is not in the room, and the door closed. The room should remain unoccupied for 30 minutes, if possible.

3. Ice Machines

- a. Only ice machines that dispense ice directly into portable containers at the touch of a control will be purchased.
- b. Ice machines will be inspected, cleaned and repaired if necessary, on a regular maintenance schedule. Refer to [Sanitary Care and Maintenance of Ice Chests and Ice Machines](#).

4. Automatic sensor sinks

- Automatic sensors will not be installed in Bone Marrow Transplant Unit (BMTU), 5 Children's Protective Environment (5CH), and the Burn Intensive Care Unit (BICU) patient rooms.

5. Other Equipment and Repairs

- a. Perform routine inspection and servicing of all plumbing, heating, refrigeration, steam supplies, electrical and air-conditioning systems. Maintenance records will be prepared on all routine inspections and servicing and will be kept on file for 3 years. Inspection and monitoring of these systems are summarized in [Summary of Air Quality Systems Management](#).
- b. The computerized tube system is maintained and cleaned as per hospital policy. The McLendon Labs and Plant Engineering have separate functions in ensuring the maintenance of this system. Please refer to specific departmental procedures for Plant Engineering and UNCHC Operational Policies and Procedures for further details. Staff should comply with the

guidelines found in the Plant Engineering policy: [Usage of the \(CTS\) Computerized Tube System](#) for decontaminating specimen spills in the tube system.

6. Ceilings and Leaks

- a. Plant Engineering/Maintenance Department occasionally must enter ceilings to perform repairs or maintenance. This process involves removal of ceiling tiles, opening ceiling access hatches or cutting of dry wall to gain access to above ceiling spaces. Ceiling openings have been documented as a risk factor for the acquisition of infection with fungal spores (i.e., *Aspergillus* sp., *Mucor* sp.) by immunocompromised and critically ill patients. Dust and mold containment is required in areas housing and treating these highest risk patients. Infection Prevention guidance for reducing risk of above ceiling access and a list of highest risk areas are found in [Precautions for Patients in Clinical Areas Where Ceiling Work is Planned](#), and in the Environmental Health and Safety policy: [Safety and Infection Control Management Plan for Construction, Renovation, and Modernization Projects](#).
- b. When Plant Engineering/Maintenance staff find stains suggestive of leaks (e.g., ceiling tiles, walls), they should investigate the reason for the stain, correct the leak as needed, and ensure there are no wet structural materials or mold (hidden or visible) resulting from the leak. If mold is found, contact Environmental Health and Safety, Infection Prevention, and develop a clean-up plan. Stains on ceiling tiles or other areas should only be painted or tiles replaced after this investigation has been done and the leak corrected. Carpeting that remains wet after 72 hours will be replaced. Carpet that is soiled by sewage spills should be replaced regardless of the time it remains wet.
- c. Infection Prevention and Environmental Health and Safety should be notified by Plant Engineering about any leak that is recurrent and/or associated with mold in adjacent areas.
- d. Water intrusion/leaks will be managed in accordance with CDC Environmental Infection Control Guidelines available on the CDC website.

7. Sinks

- a. Aerators on scrub sink faucets are to be replaced annually as part of a scheduled preventative maintenance program.
- b. Aerators on sink faucets in ICUs are to be replaced annually as part of a scheduled preventative maintenance program

8. Decorative Water Fountains/Water Walls

- Decorative water fountains/water walls are prohibited in the indoor environment.

D. Hospital Renovations/Construction

- All renovations/construction plans at UNC Medical Center will be reviewed by Infection Prevention to maintain the air quality in the hospital and to ensure appropriate considerations have been made to infection prevention and control issues. The procedure details are provided in the Environmental Health and Safety policy: [Safety and Infection Control Management Plan for Construction, Renovation, and Modernization Projects.](#)
 - a. To preclude exposure to organisms (e.g., *Aspergillus*) which are associated with dust, all renovations and repair procedures must be carefully reviewed and patient care areas must be protected from construction areas by an effective barrier system. When new construction or renovation is planned at UNC Medical Center, the Plant Engineering office will invite Infection Prevention to the pre-construction conference for all in-house and contract construction. Plant Engineering will be responsible for initiating the risk assessment form that will be forwarded to Infection Prevention for approval prior to construction.
 - b. Contract and UNC Medical Center employees cannot conduct renovation or new construction until the plan and risk assessment is approved by Infection Prevention.
 - c. Inspections of the construction/renovation sites are conducted by Infection Prevention staff regularly (e.g. every 2 weeks) and as needed during new construction or renovation to ensure the precautions needed to preclude patient exposure have been implemented and maintained.
 - d. Walk-off mats will be placed at construction/renovation site entrances and will be replaced as needed to prevent tracking dust. Bleach (10%) spray on wet carpet will be allowed *inside* the site when needed for heavy demolition/high dust producing activities (provided OSHA regulations are met). In addition, the wet carpet should be replaced or professionally cleaned weekly because of the decreased effectiveness of the bleach in the presence of heavy dirt and debris.
 - e. Portable HEPA units generating negative pressure as measured by a digital manometer will be used for renovation/construction areas classified as Class III and IV projects on the Infection Control Risk Assessment form as outlined in the Environmental Health and Safety policy to minimize the likelihood of air contamination. If negative pressure cannot be achieved then Infection Prevention shall be consulted to determine an acceptable solution that minimizes patient risk. Portable HEPA unit air filters will be replaced per manufacturer's instructions for use.
 - f. Any construction or renovation can be terminated immediately if the Infection Prevention staff believes there is an unacceptable infection risk associated with such activities.

E. Implementation

The implementation and enforcement of this policy is the responsibility of the Director of Plant Engineering.

IV. References

Centers for Disease Control and Prevention. Guidelines for Environmental Infection Control in Health-Care Facilities. 2003. Updated July 2019

Facility Guidelines Institute. Guidelines for design and construction of hospitals and outpatient facilities. Chicago, IL: American Society for Healthcare Engineering of the American Hospital Association, 2018.

Review of fungal outbreaks and infection prevention in healthcare settings during construction and renovation. Kanamori H, Rutala WA, Sickbert-Bennett EE, Weber DJ. Clin Infect Dis. 2015 Aug 1;61(3):433-44. doi: 10.1093/cid/civ297.

V. Related Policies

[Environmental Health and Safety Policy: Safety and Infection Control Management Plan for Construction, Renovation, and Modernization Projects](#)

[Infection Prevention Policy: Exposure control Plan for Bloodborne Pathogens](#)

[Infection Prevention Policy: Hand Hygiene and Use of Antiseptics for Skin Preparation](#)

[Infection Prevention Policy: Highly Communicable Diseases: Preparedness and Response Plan](#)

[Infection Prevention Policy: Infection Control and Screening Program: Occupational Health Service](#)

[Infection Prevention Policy: Isolation Precautions](#)

[Plant Engineering Policy: Usage of the \(CTS\) Computerized Tube System](#)

Attachments

[1: Sanitary Care and Maintenance of Ice Chests and Ice Machines](#)

[2: Summary of Air Quality Systems Management](#)

[3: Precautions for Patients in Clinical Areas Where Ceiling Work is Planned](#)

Approval Signatures

Step Description

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