Behind the Mask:

Fundamentals of Construction & HVAC related to Infection Prevention

Terry Micheels MSN, RN, CIC, FAPIC
Alisha Sheffield BSN, RN, CIC
Lauren Musil BSN, RN

PROJECT FIRSTLINE

UNMC Nebraska Medicine

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Meet our Subject Matter Experts

Terry Micheels MSN, RN, CIC, FAPIC

Terry is a Masters-prepared registered nurse with 29 years' experience as an Infection Preventionist in acute care settings. Fourteen of her 29 years involved managing IPC programs for community- and academic multi-hospital systems, including outpatient and ambulatory services. She has been certified in Infection Control since 2009 and is a Fellow in APIC. She is currently an IPC Consultant. She has multiple publications and has presented at National Annual APIC Conferences, national IPC webinars and multiple regional conferences.

Alisha Sheffield BSN, RN CIC

Alisha is an Infection Preventionist and Registered Nurse with 21 years of experience in a variety of healthcare settings including ambulatory, acute care, and surgical areas. Over the past 13 years, she has worked as an Infection Preventionist in outpatient surgery as well as at a large academic medical center. Her recent work has focused on utilizing her IPC expertise to develop infection control tools and resources to assist Infection Preventionists in under-resourced settings.

Lauren Musil BSN, RN

Lauren is an Infection Preventionist with a background as Registered Nurse. She has a wide variety of healthcare experience having worked in neurology, neurosurgery, ambulatory surgery, home health and with the Nebraska Biocontainment unit. As an IP, her primary focus was in critical care, oncology, VAE prevention and as the IP to the Nebraska Biocontainment Unit. Her recent work has been spent in a grant funded role to develop innovative tools to aid IPs in rural and remote settings.

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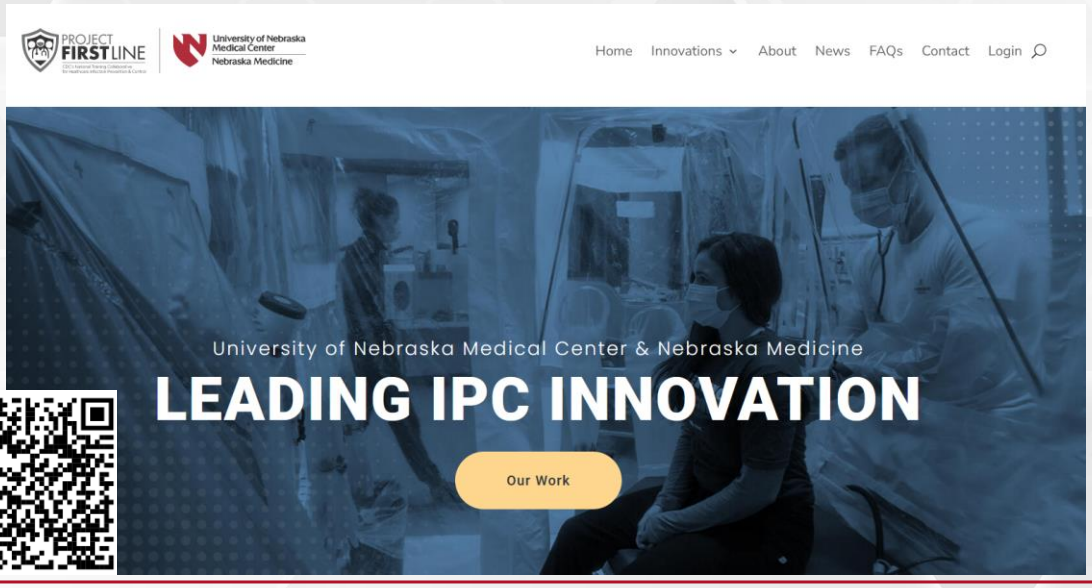

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Disclosure Declaration

- We have no financial disclosures or conflicts related to this presentation.
- This work has been grant funded through the Center for Disease Control and Prevention in support of Project Firstline.
- The views and opinions expressed during this webinar are those of the presenters and do not necessarily reflect those of the University of Nebraska Medical Center, The Nebraska Medical Center or the Centers for Disease Control and Prevention.

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IPC Program Objectives

- Define key components and principles related to infection prevention practice in air-handling and construction.
- Examine performance monitoring principles and their relation to environmental infection prevention programs.
- Explore the systematic ICRA process designed to identify and mitigate potential infection risks and methods to validate the plan's effectiveness.
- Interpret guidelines, regulatory requirements, and best practice literature to enable application of environmental infection prevention practice
- Analyze data to monitor for targeted prevention and improvement strategies.

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Meet your Air Handling Unit! One of your BEST FRIENDS!

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Why Do We Care?

HVAC systems are responsible for providing clean and safe air throughout facilities

Although rare, HVAC systems can be a source of:

- Airborne disease transmission
- Opportunistic pathogen transmission
- Healthcare-associated infections

> Infect Control Hosp Epidemiol. 1996 Jun;17(6):360-4. doi: 10.1086/647317.

Control of construction-associated nosocomial aspergillosis in an antiquated hematology unit

V G Loo [1], C Bertrand, C Dixon, D Vityé, B DeSalis, A P McLean, A Brox, H G Robson

Affiliations + expand

PMID: 8805066 DOI: 10.1086/647317

Nosocomial Fungal Infection During Hospital Renovation

Published online by Cambridge University Press: **02 January 2015**

Keith Krasinski, Robert S. Holzman, Bruce Hanna, M. Alba Greco, Michael Graff and Madhu Bhogal Show author details

Comparative Study > Infect Control Hosp Epidemiol. 1995 Mar;16(3):141-7. doi: 10.1086/647075.

Evaluation of infection control measures in preventing the nosocomial transmission of multidrug-resistant Mycobacterium tuberculosis in a New York City hospital

L A Stroud [1], J I Tokars, M H Grieco, J T Crawford, D H Culver, B R Edlin, E M Sordillo, C L Woodley, M E Gilligan, N Schneider, et al.

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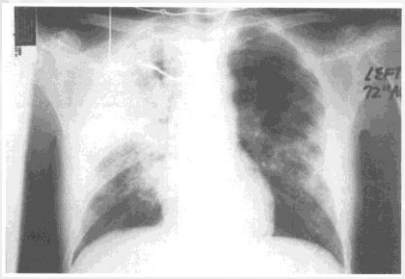

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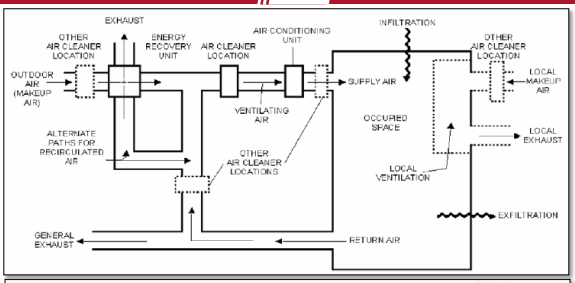
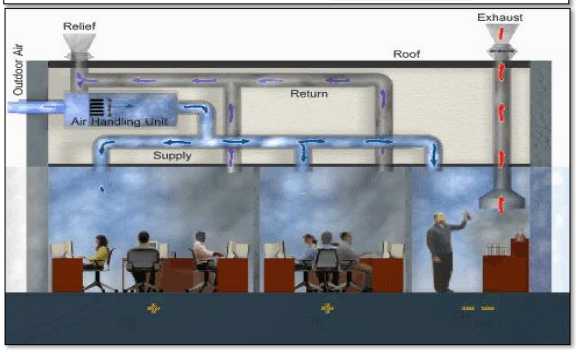
How Your AHU Works

Air Handling Unit – How it Works

- Supply Air
- Air Distribution
- Return Air
- Duct System





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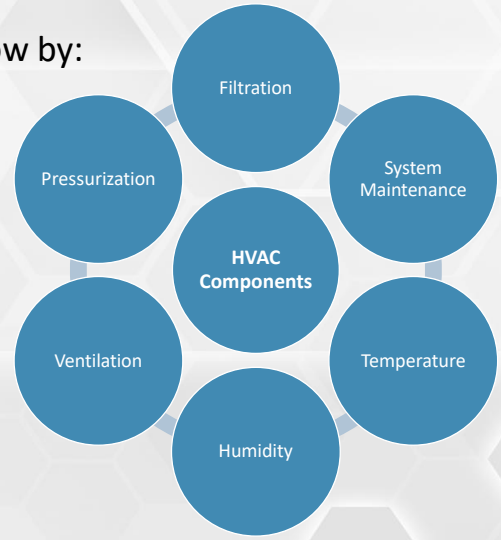
Heating, Ventilation, Air Conditioning

HVAC Systems are designed to regulate airflow by:

- Filtering and diluting recirculated air
- Removing contaminated air
- Establishing pressurization relationships between spaces
- Establishing directional airflow
- Maintaining temperature
- Adjusting relative humidity of air



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Filtration

- Physical removal of particulates from air
- Location of filters
  - First Bank- remove gross particulate matter
  - Second Bank(Final Filters)- higher efficiency filters
- 5 Methods of filtration
- Rated on Minimum Efficiency Reporting Value (MERV)

Basic method	Principle of performance	Filtering efficiency
Straining	Particles in air are larger than openings between filter fibers, resulting in gross removal of large particles.	Low
Impingement	Particles collide with filter fibers & remain attached to the filter. Fibers may be coated with adhesive.	Low
Interception	Particles enter into the filter and become entrapped and attached to the filter fibers.	Medium
Diffusion	Small particles, moving in erratic motion, collide with filter fibers and remain attached.	High
Electrostatic	Particles bearing negative electrostatic charge are attracted to the filter with positively charged fibers.	High

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Filtration

- Physical removal of particulates from air
- Location of filters
  - First Bank (Prefilters)- removes gross particulate matter
  - Second Bank (Final Filters)- higher efficiency filters or HEPA
- 5 Methods of filtration
- Rated on Minimum Efficiency Reporting Value (MERV)
  - Ratings from 1-20

Area designation	Minimum number of filter beds	Filter bed no.1 (%)*	Filter bed No. 2 (%)*
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	30	90
Protective environment room	2	30	99.97
Laboratories	1	80	n/a
Administrative, bulk storage, soiled holding areas, food preparation areas, and laundries	1	30	n/a

Filter efficiencies for central ventilation, listing number of filter beds and efficiency (%) of each for hospitals.

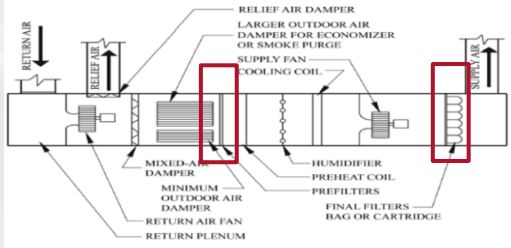

Figure 3-3 *Typical Configuration of Hospital AHU with Economizer*

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Ventilation

- Supply and movement of air to a space
- Ventilation rates expressed as room Air Changes per Hour (ACH)
- Required ACH varies by patient care area
- Laminar Airflow

Unit	Required ACH
Airborne Isolation	≥6 for existing; ≥12 for renovated or new construction
Protective Environment	≥12
Critical Care Rooms	≥6
Isolation Anterooms	≥10
Operating Room	≥15

Table B.1. Air changes/hour (ACH) and time required for airborne-contaminant removal by efficiency *

ACH § ¶	Time (mins.) required for removal 99% efficiency	Time (mins.) required for removal 99.9% efficiency
2	138	207
4	69	104
6⁺	46	69
8	35	52
10⁺	28	41
12⁺	23	35
15⁺	18	28
20	14	21
50	6	8

The number of air changes per hour and time and efficiency.

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Pressurization

Infection Prevention Requires Overall Positive Building Pressurization

- Prevents unfiltered air (and contaminants) from entering the facility.
- Maintain control of air flow inside the building.
- Maintain pressure relationships

Positive Air Pressure	Negative Air Pressure
• Protective Environment Patient Rooms • Operating Rooms • Sterile Supply Rooms • Clean Storage Rooms • Medication Storage Rooms • Medication Preparation Areas • Special Procedure Rooms	• Airborne Infection Isolation (AII) Patient Rooms • Soiled Utility • Spaces used for Bronchoscopy • Decontamination Rooms • Restrooms and Bathrooms • Laboratories • Hazardous Material Spaces

Airflow Direction →

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Pressurization

Interior Perspectives of Positive and Negative Pressure Rooms

View from inside a positive pressure room
Tissue paper is forced tight to the closed door as air is forced out from gaps around a closed door.

View from inside a negative pressure room
Tissue paper is being blown into the room as air comes in from the gaps around a closed door.

Image source: https://www.ashe.org/project-firstline/ventilation-quick-guide

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Temperature & Humidity

Temperature	Humidity
• Promotes Comfort • Infection prevention implications • 68-75 ° Fahrenheit • Departmental temperature standards	• Percentage of water vapor in the air • 30-60% in healthcare facilities • >60% microbial growth, moisture risk • <30% sparks risk

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Monitoring & Reporting

- HVAC systems require regular preventative cleaning and maintenance
  - Dust cleaning
  - Filter Changes
  - Airflow Checks
- Function Testing to ensure parameters are met
  - ACH
  - Pressurization
  - Humidity
  - Temp, etc.
- Results shared with IPC Team & reported at committee meetings

Image Source

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Construction Background

Why is construction different in a healthcare settings?

- Many patients in the hospital have suppressed immune systems
  - Elderly
  - Oncology
  - Pregnancy
  - Newborns
- At risk patients are located throughout the hospital
- Patients travel throughout the hospital

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How Can Construction Cause Infection

- Large numbers of spores are released into the air when environmental reservoirs are disturbed during construction and renovation
  - Dust contamination
  - Fungal spores can be aerosolized and disseminated
- Small particles stay suspended on air currents
  - Travel down hallways
  - Through the air handling system
- Spores can reach small airways and alveoli, causing invasive disease in at-risk patients

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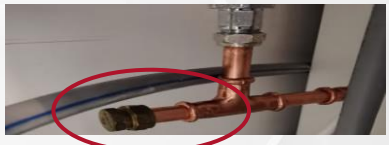
Common Construction Sources

- Unfiltered outside air
- Backflow of contaminated air
- Fireproofing materials
- Air conditioners (condensation)
- Duct Systems
- Air Filters
- Dust above false ceilings
- Pipe leaks
- Dead-end pipes



Dead leg or dead-end pipe

Common Environmental Fungal Pathogens	Implicated Environmental Vehicle
Aspergillus spp.	Construction, improperly functioning ventilation systems, air filters, elevators, damp building materials, opening doors top construction site, etc.
Mucorales/ Rhizopus spp.	Air filters, false ceilings
Scedosporium spp.	Construction
Penicillium spp.	Ventilation duct fiberglass insulation, Air filters, pipe leak, wet/rotting wood
Acremonium spp.	Air filters
Sporthrix	Construction

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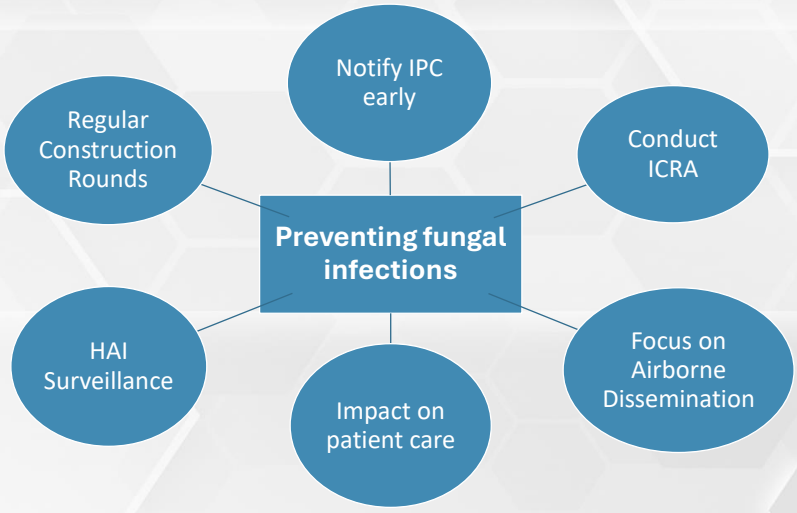
Construction-Related Infections

Key considerations for **preventing infections** due to construction



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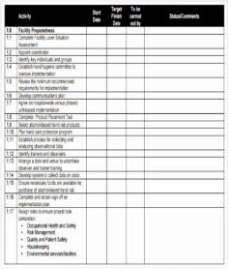
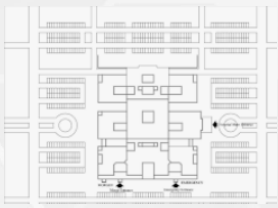
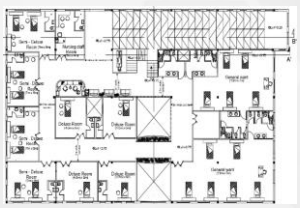
Pre-Construction Planning

Infection Prevention's Influence…







Program Planning → Schematic → Design Development → Furniture, Fixtures & Equipment

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Project Team

Multidisciplinary Team Members

- Infection Preventionist
- Safety
- Facility Manager
- Engineer
- Risk Manager
- EVS
- Project Manager
- Contactor(s)

Team Responsibilities

- Develop Project Management Plan
- Conduct ICRA
- Prevent Unnecessary Exposures
- Oversee all IC Aspects
- Establish Specific IC protocols
- Provide Education
- Plan to Correct Problems Quickly
- Emergency Response Plan

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Infection Control Risk Assessment

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5 Step ICRA Process

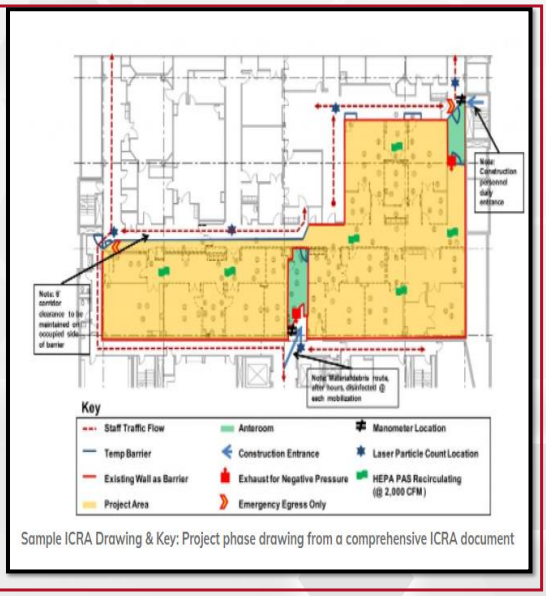
STEP 1: Determine the activity type
(A,B,C,D)

STEP 2: Determine the patient risk group
(Low, Medium, High, Highest)

STEP 3: Complete the Infection Control matrix to determine the class of precautions
(I, II, III, IV, V)

STEP 4: Determine the required precautions based upon the Infection Control risks

STEP 5: Complete the Construction and Renovation Risk Assessment Form



Sample ICRA Drawing & Key: Project phase drawing from a comprehensive ICRA document

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Infection Control Risk Assessment (ICRA)

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Step 1
Project Activity determines the Project type

Type A	**Inspection and non-invasive activities.** Includes but is not limited to: • Removal of ceiling tile for visual inspection-limited to 1 tile per 50 square feet with limited exposure time. • Limited building system maintenance (e.g., pneumatic tube station, HVAC system, fire suppression system, electrical and carpentry work to include painting without sanding) that does not create dust or debris. • Clean plumbing activity limited in nature.
Type B	**Small-scale, short duration activities that create minimal dust and debris.** Includes but is not limited to: • Work conducted above the ceiling (e.g., prolonged inspection or repair of firewalls and barriers, installation of conduit and/or cabling, and access to mechanical and/or electrical chase spaces). • Fan shutdown/startup. • Installation of electrical devices or new flooring that produces minimal dust and debris. • The removal of drywall where minimal dust and debris is created. • Controlled sanding activities (e.g., wet or dry sanding) that produce minimal dust and debris.
Type C	**Large-scale, longer duration activities that create a moderate amount of dust and debris.** Includes but is not limited to: • Removal of preexisting floor covering, walls, casework or other building components. • New drywall placement. • Renovation work in a single room. • Non-existing cable pathway or invasive electrical work above ceilings. • The removal of drywall where a moderate amount of dust and debris is created. • Dry sanding where a moderate amount of dust and debris is created. • Work creating significant vibration and/or noise. • Any activity that cannot be completed in a single work shift.
Type D	**Major demolition and construction activities.** Includes but is not limited to: • Removal or replacement of building system component(s). • Removal/installation of drywall partitions. • Invasive large-scale new building construction. • Renovation work in two or more rooms.

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Infection Control Risk Assessment (ICRA)

Step 2 Patient Risk Group determined by the highest population risk (Low Risk, Medium Risk, High Risk, Highest Risk).

Low Risk Non-patient care areas such as:	Medium Risk Patient care support areas such as:	High Risk Patient care areas such as:	Highest Risk Procedural, invasive, sterile support and highly compromised patient care areas such as:
• Public hallways and gathering areas not on clinical units. • Office areas not on clinical units. • Breakrooms not on clinical units. • Bathrooms or locker rooms not on clinical units. • Mechanical rooms not on clinical units. • EVS closets not on clinical units.	• Waiting areas. • Clinical engineering. • Materials management. • Sterile processing department - dirty side. • Kitchen, cafeteria, gift shop, coffee shop, and food kiosks.	• Patient care rooms and areas • All acute care units • Emergency department • Employee health • Pharmacy - general work zone • Medication rooms and clean utility rooms • Imaging suites: diagnostic imaging • Laboratory.	• All transplant and intensive care units. • All oncology units. • OR theaters and restricted areas. • Procedural suites. • Pharmacy compounding. • Sterile processing department - clean side. • Transfusion services. • Dedicated isolation wards/units. • Imaging suites: invasive imaging.

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Infection Control Risk Assessment (ICRA)

Step 3 Precautions: Use the matrix to find the project class, ICRA precautions and strategies.
(Class 1, Class II, Class III, Class IV, Class V).

Patient Risk Group	Construction Project Type			
	TYPE A	TYPE B	TYPE C	TYPE D
LOW Risk Group	I	II	II	III*
MEDIUM Risk Group	I	II	III*	IV
HIGH Risk Group	I	III	IV	V
HIGHEST Risk Group	III	IV	V	V

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Infection Control Risk Assessment (ICRA)

Step 4
ICRA work methods to prevent airborne dust from dispersing during construction

Class of Precautions	Mitigation Activities (Performed Before and During Work Activity)
Class I	1. Perform noninvasive work activity as to not block or interrupt patient care. 2. Perform noninvasive work activities in areas that are not directly occupied with patients. 3. Perform noninvasive work activity in a manner that does not create dust. 4. Immediately replace any displaced ceiling tile before leaving the area and/or at end of noninvasive work activity.
Class II	1. Perform only limited dust work and/or activities designed for basic facilities and engineering work. 2. Perform limited dust and invasive work following standing precautions procedures approved by the organization. 3. This Class of Precautions must never be used for construction or renovation activities.
Class III	1. Provide active means to prevent airborne dust dispersion into the occupied areas. 2. Means for controlling minimal dust dispersion may include hand-held HEPA vacuum devices, polyethylene plastic containment, or isolation of work area by closing room door. 3. Remove or isolate return air diffusers to avoid dust from entering the HVAC system. 4. Remove or isolate the supply air diffusers to avoid positive pressurization of the space, 5. If work area is contained, then it must be neutrally to negatively pressurized at all times. 6. Seal all doors with tape that will not leave residue. 7. Contain all trash and debris in the work area. 8. Nonporous/smooth and cleanable containers (with a hard lid) must be used to transport trash and debris from the construction areas. These containers must be damp-wiped cleaned and free of visible dust/debris before leaving the contained work area. 9. Install an adhesive (dust collection) mat at entrance of contained work area based on facility policy. Adhesive mats must be changed routinely and when visibly soiled. 10. Maintain clean surroundings when area is not contained by damp mopping or HEPA vacuuming surfaces.
Class IV	1. Construct and complete critical barriers meeting NFPA 241 requirements including: Barriers must extend to the ceiling or, if ceiling tile is removed, to the deck above, and all penetrations through the barrier shall meet the appropriate fire rating requirements. 2. All (plastic or hard) barrier construction activities must be completed in a manner that prevents dust release. Plastic barriers must be effectively affixed to ground and ceiling and secure from movement or damage. Apply tape that will not leave a residue to seal gaps between barriers, ceiling or floor. 3. Seal all penetrations in containment barriers, including floors and ceiling, using approved materials (UL schedule firestop if applicable for barrier type). 4. Containment units or environmental containment units (ECUs) approved for Class IV precautions in small areas totally contained by the unit and that has HEPA-filtered exhaust air. 5. Remove or isolate return air diffusers to avoid dust entering the HVAC system. 6. Remove or isolate the supply air diffusers to avoid positive pressurization of the space. 7. Negative airflow pattern must be maintained from the entry point to the anteroom and into the construction area. The airflow must cascade from outside to inside the construction area. The entire construction area must remain negatively pressurized. 8. Maintain negative pressurization of the entire workspace by use of HEPA exhaust air systems directed outdoors. Exhaust discharged directly to the outdoors that is 25 feet or greater from entrances, air intakes and windows does not require HEPA-filtered air. 9. If exhaust is directed indoors, then the system must be HEPA filtered. Prior to start of work, HEPA filtration must be verified by particulate measurement as no less than 99.97% efficiency and must not alter or change airflow/pressure relationships in other areas. 10. Exhaust into shared or recirculating HVAC systems, or other shared exhaust systems (e.g., bathroom exhaust) is not acceptable. 11. Install device on exterior of work containment to continually monitor negative pressurization. To assure proper pressure is continuously maintained, it is recommended that the device(s) have a visual pressure indicator. 12. Contain all trash and debris in the work area.

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Infection Control Risk Assessment (ICRA)

Step 5
Documenting the ICRA

Guideline for infection prevention and control during healthcare facility construction, renovation and maintenance: RISK ASSESSMENT	
Project	
Date	/ /
Reviewer	
Planned date of commencement	/ /
Site	
Construction activity type	
Patient risk group	
Class of infection control precautions required	
Safety and quality notification	

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ICRA: Traffic & Contractors

- Traffic Control
- Barriers and Containment
- Air Control
- Negative Pressure
- Protecting the HVAC
- Debris Containment

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ICRA: Traffic & Contractors

Route traffic with least patient/visitor exposure

Restrict traffic to contractors & authorized personnel

Special attire/ PPE required for sensitive areas

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ICRA: Barriers & Containment

- Self- Contained
- Dust Box with HEPA Filtration
- Fire-rated Poly Vinyl
- Hard Wall

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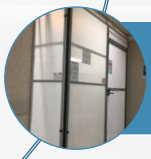
ICRA: Air Control

Directional air movement

Pressure differential



Ante room to maintain airflow from clean space to ante room to construction area

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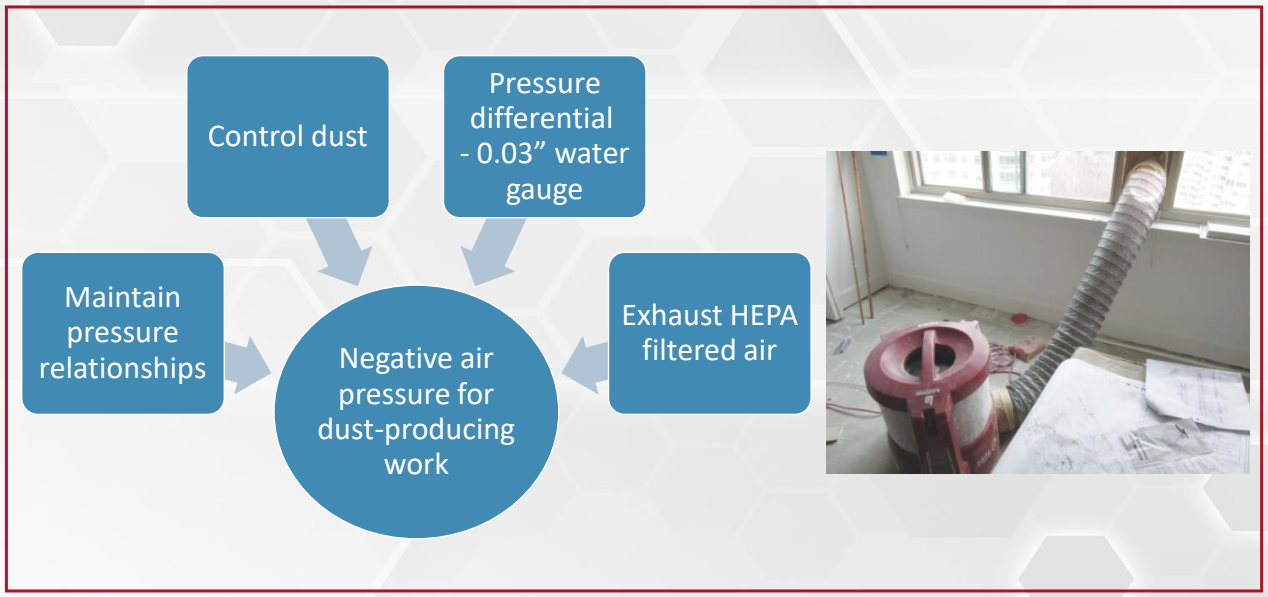
ICRA: Negative Pressure



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ICRA: Negative Pressure

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ICRA: Negative Pressure

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ICRA: Protect the HVAC

Protect the Heating Ventilation and Air Conditioning system

- Isolate the HVAC system
- Shut off return air vents, seal grilles
- Seal/protect new duct work

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ICRA: Debris Containment

Routes must have no patient/visitor access

- Materials to the site and waste removal follow the same route
- Transport construction waste in tightly covered container
- Damp dust equipment/cart before leaving construction area
- Roll wheels over sticky mat/wet mat to remove dust

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Infection Control Risk Assessment (ICRA)

Project: Renovation of a restroom in the waiting room of med-surg floor
Location: 2nd Floor, Medical Surgical Unit (East Wing)
Timeline: Three Weeks (Start Date: March 1, End Date: March 21)
Type of Project: Small-scale renovation of an existing restroom, updating fixtures, improving accessibility, and enhancing design features and updating ductwork to meet airflow standards.

Type A	**Inspection and non-invasive activities.** Includes but is not limited to: • Removal of ceiling tile for visual inspection-limited to 1 tile per 50 square feet with limited exposure time. • Limited building system maintenance (e.g., pneumatic tube station, HVAC system, fire suppression system, electrical and carpentry work to include painting without sanding) that does not create dust or debris. • Clean plumbing activity limited in nature.
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• Public hallways and gathering areas not on clinical units. • Office areas not on clinical units. • Breakrooms not on clinical units. • Bathrooms or locker rooms not on clinical units. • Mechanical rooms not on clinical units. • EVS closets not on clinical units.	• Waiting areas. • Clinical engineering. • Materials management. • Sterile processing department - dirty side. • Kitchen, cafeteria, gift shop, coffee shop, and food kiosks.	• Patient care rooms and areas • All acute care units • Emergency department • Employee health • Pharmacy - general work zone • Medication rooms and clean utility rooms • Imaging suites: diagnostic imaging • Laboratory.	• All transplant and intensive care units. • All oncology units. • OR theaters and restricted areas. • Procedural suites. • Pharmacy compounding. • Sterile processing department - clean side. • Transfusion services. • Dedicated isolation wards/units. • Imaging suites: invasive imaging.

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Infection Control Risk Assessment (ICRA)

Project: Renovation of a Restroom in the waiting room of the medical surgical floor
Location: 2nd Floor, Medical Surgical Unit (East Wing)
Timeline: Three Weeks (Start Date: March 1, End Date: March 21)
Type of Project: Small-scale renovation of an existing restroom, updating fixtures, improving accessibility, and enhancing infection control features.

Patient Risk Group	Construction Project Type			
	TYPE A	TYPE B	TYPE C	TYPE D
LOW Risk Group	I	II	II	III*
MEDIUM Risk Group	I	II	III*	IV
HIGH Risk Group	I	III	IV	V
HIGHEST Risk Group	III	IV	V	V

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Infection Control Risk Assessment (ICRA)

Project: Renovation of a Restroom in the waiting room of the medical surgical floor

- Barriers must prevent dust release- secured to ground and ceiling
- HEPA-filtered exhaust air directed outdoors or >25 feet from entrances/intakes etc.
- Protect HVAC- isolate ore remove return and supply air diffusers
- Negative airflow
- Maintain negative pressurization of the entire workspace by use of HEPA exhaust air systems directed outdoors. 99.97% efficiency
- Monitor negative pressurization
- Contain all trash and debris in the work area
- Damp wipe containers holding debris
- Worker clothing free of visible dust- consider HEPA vacuuming
- Shoe covers
- Sticky mat
- Consider particle monitoring

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Infection Control Risk Assessment (ICRA)

Barriers	Air	Dust	Debris	Monitoring
Poly	HEPA	Vacuum sander or wet sanding	Contain waste	Particles
Ground to ceiling	Isolate HVAC	Mist flooring	Wipe containers	Negative Air
	Negative air	HEPA vacuum		

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Infection Control Risk Assessment (ICRA)

Alternative Scenario

Project: Renovation of a Patient Restroom in the Oncology Unit
Location: 2nd Floor, Oncology Unit (East Wing)
Timeline: Three Weeks (Start Date: March 1, End Date: March 21)
Type of Project: Small-scale renovation of an existing restroom, updating fixtures, improving accessibility, and enhancing infection control features.

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Infection Control Risk Assessment (ICRA)

Low Risk Non-patient care areas such as:	Medium Risk Patient care support areas such as:	High Risk Patient care areas such as:	Highest Risk Procedural, invasive, sterile support and highly compromised patient care areas such as:
• Public hallways and gathering areas not on clinical units. • Office areas not on clinical units. • Breakrooms not on clinical units. • Bathrooms or locker rooms not on clinical units. • Mechanical rooms not on clinical units. • EVS closets not on clinical units.	• Waiting areas. • Clinical engineering. • Materials management. • Sterile processing department - dirty side. • Kitchen, cafeteria, gift shop, coffee shop, and food kiosks.	• Patient care rooms and areas • All acute care units • Emergency department • Employee health • Pharmacy - general work zone • Medication rooms and clean utility rooms • Imaging suites: diagnostic imaging • Laboratory.	• All transplant and intensive care units. • All oncology units. • OR theaters and restricted areas. • Procedural suites. • Pharmacy compounding. • Sterile processing department - clean side. • Transfusion services. • Dedicated isolation wards/units. • Imaging suites: invasive imaging.

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Infection Control Risk Assessment (ICRA)

Patient Risk Group	Construction Project Type			
	TYPE A	TYPE B	TYPE C	TYPE D
LOW Risk Group	I	II	II	III*
MEDIUM Risk Group	I	II	III*	IV
HIGH Risk Group	I	III	IV	V
HIGHEST Risk Group	III	IV	V	V

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Infection Control Risk Assessment (ICRA)

Alternative Scenarios

Project: Update of phone wires on the oncology unit
Location: 2nd Floor, Oncology Unit (East Wing)
Timeline: 1 day
Type of Project: Pull cables from existing phone line and install a new jack at a third workstation. Involves access to ceiling tiles to pull the lines across office spaces and cutting a small amount of dry wall to pull cables through and place jack and hardware.

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Pre-Construction Preparation

Forgotten supplies found on construction rounds

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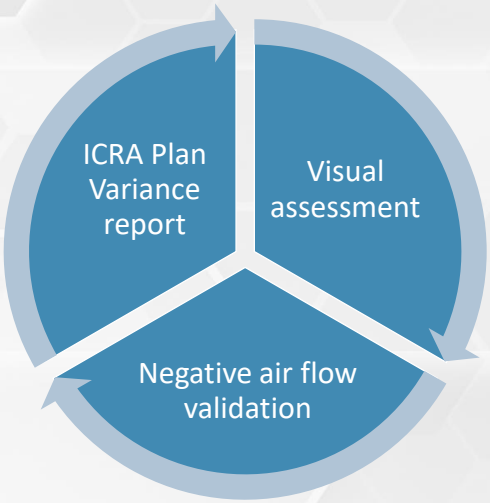
Validate the ICRA Plan



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Construction & Renovation Rounds[5]

Project _____ Date ___/___/___

Location of work _____ Time _____

Surveyor _____ Department _____

During the construction/renovation phase dust barriers and other protective measures should be regularly monitored depending on a risk assessment of the area involved, i.e. if high risk areas and patient groups are involved then daily monitoring should occur.

1. Construction barricade	Answer (circle one)		
> dust tight barricades sealed, no penetration	Yes	No	N/A
> dust mats at entrance/exit	Yes	No	N/A
> all access doors close and seal properly	Yes	No	N/A
> all access doors are closed to public	Yes	No	N/A
> ventilation ducts to building site covered	Yes	No	N/A
2. Adjacent areas with staff / patients access	**Answer (circle one)**		
> ceiling areas intact and dry	Yes	No	N/A
> floor areas clean with no dust tracked	Yes	No	N/A
> walls intact and dry	Yes	No	N/A
> horizontal surfaces dust free	Yes	No	N/A
> vents dust free	Yes	No	N/A
> all ventilation ducts from building site sealed	Yes	No	N/A
> no signs of pest infestation	Yes	No	N/A
3. Traffic flow	**Answer (circle one)**		
> building contractors accessing site through approved non-patient care areas	Yes	No	N/A
> waste covered and contained prior to removal	Yes	No	N/A
> routine and timing of waste removal as per agreement	Yes	No	N/A

- Frequency of Rounds
- High Risk Patients & Locations
- Round on project perimeter & interior

Non-compliance issues

Issue	Report to	Date

Resurvey date ___/___/___ Surveyor _____ Compliance achieved (circle) Yes No

Further action taken:

_____

_____

_____

_____

Surveyor's signature _____

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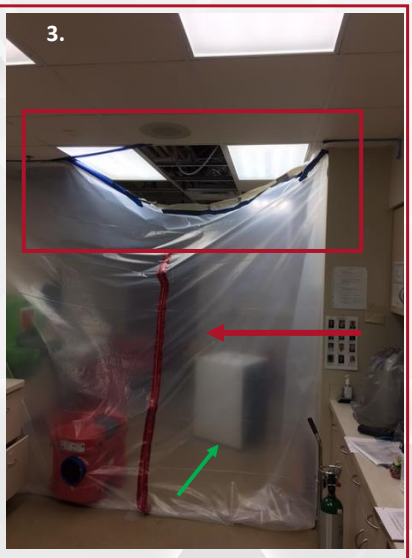
Perimeter Construction Rounds



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Perimeter Construction Rounds

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Interior Construction Rounds

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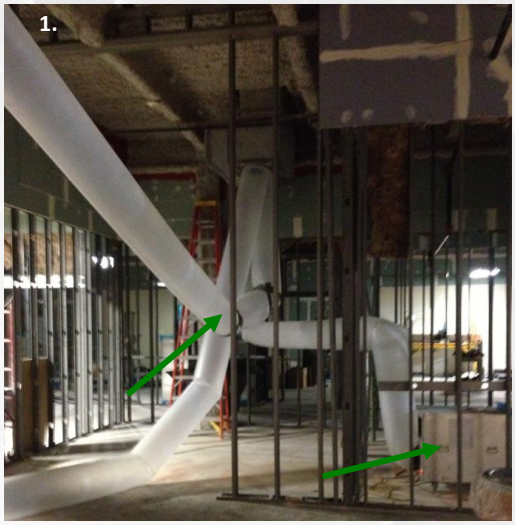
Interior Construction Rounds



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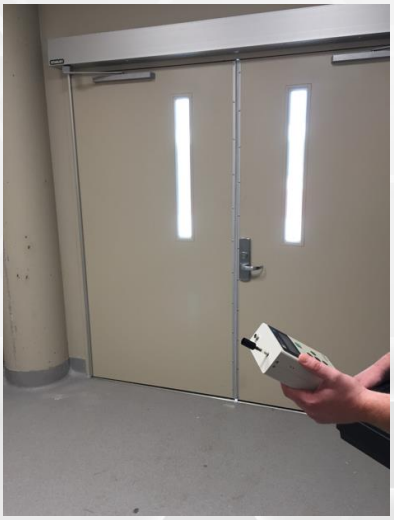
Validate the ICRA Plan

Particulate Air Sampling

- Construction dust associated with 5 to 10 microns
- Commonly used to compare indoor air to outdoor air
- Evaluate particle count comparison between adjacent spaces
- Absence of air quality and action level standards



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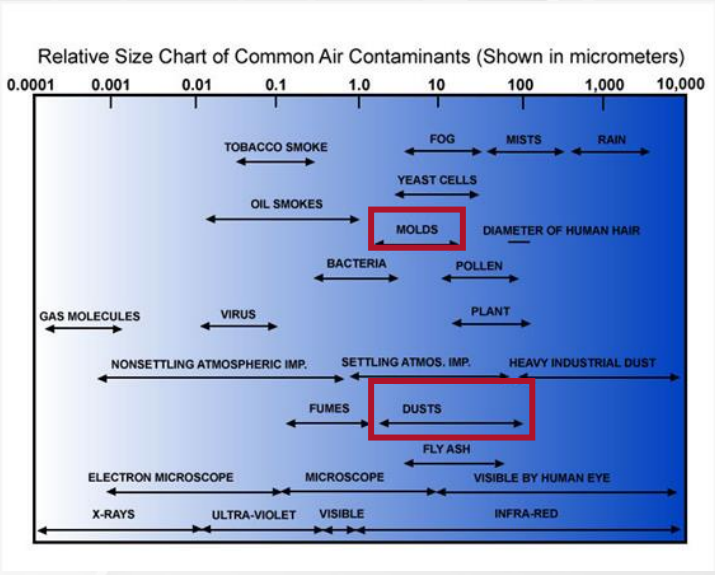
Particulate Sizes



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Contingency Plan: Mold Discovery

IPC should be notified whenever mold is discovered

- Moisture Assessment
  - Visual inspection, Moisture meter, Borescope, Sampling
- Clean up strategies
  - Stop water intrusion
  - Determine extent of water damage & mold contamination
  - Test for moisture; dry in <72 hours
  - 1:10 bleach solution for hard surfaces
  - Remove/discard materials that cannot be cleaned

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Validate the ICRA Plan

Air Sampling

- Controversial due to unresolved technical limitations and the need for substantial lab support
- Lack of standards linking fungal spore levels with infection rates
- No recommendation is offered on routine microbiologic air sampling
- Investigators have suggested the following limits for Aspergillosis outbreaks:
  - 15 CFU/m^3 for gross colony count of fungal organisms
  - <0.1 CFU/m^3 for *Aspergillus fumigatus* and other opportunistic fungi for HEPA filtered areas

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Project Completion

Prior to handover and before occupying the space, it is the responsibility of the multi-disciplinary planning committee to ensure the area is fit for patient occupancy.

Project _____

Review date ____/____/____

Infection control measures	Answer (tick one) Yes	No	Not applicable
> The area has been thoroughly cleaned. This includes all horizontal and vertical surfaces to ensure all dust and debris has been removed.			
> The area has been vacuumed with a HEPA filter vacuum			
> The area has been wet mopped with detergent / disinfectant			
> When commissioning a new or refurbished operating theatre or pharmacy clean room check air sampling and particle counts have been performed and results are within acceptable limits. > Air conditioning is working correctly and within recommended parameters as per engineering and building services and / or the Contractor > HEPA filters and laminar/clean flow systems (where installed) have been recertified			
> If the water supply has been disrupted: maintenance/contractor has flushed water through all taps and water sampling has occurred (as per the *Guidelines for the Control of Legionella* (2013), as necessary, with results within acceptable levels (<10 cfu/ml)			
> Sinks and plumbing fixtures are suitable for the task and properly located (as per relevant Standards)			
> Air intake and exhaust outlets are located and working properly			

Comments

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Common IP Challenges

Common challenges with Healthcare Facilities, Maintenance and Contractors…

- IPs are excluded from program planning, design development, selecting surfaces, fixtures & furniture
- Delays in involving IPC
- ICRA Compliance
- Focus on eliminating dust

When to contact an industrial hygienist?

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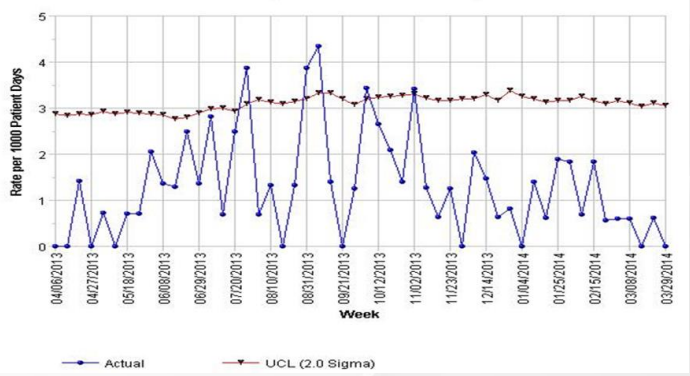
Infection Control Surveillance

- Set real time alerts on your surveillance program for construction-related pathogens, patient location & specimen source
- Control chart
- Case reports, clusters, line list



Aspergillus niger Line List

2024 Year/Month	Adm. Date	Specimen collection date	Specimen Source	Location of specimen collection	Onset
August	8/26/2024	8/28/2024	Sputum	6 South - Oncology	CO
September	9/9/2024	9/10/2024	Pleural fluid	IR	CO
	9/24/2024	9/30/2024	Pleural fluid	6 North - Pulmonary	CO
October	9/29/2024	10/1/2024	Sputum	6 South - Oncology	CO
	10/12/2024	10/13/2024	Lt. knee aspiration	7 South - Ortho	CO
	10/12/2024	10/14/2024	Rt. Ankle aspiration	OR	CO
	9/12/2024	10/9/2024	Pleural fluid	6 North - Pulmonary	CO

CO=Community onset
HO=Hospital onset

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Role of IPs in HVAC & Construction

- Build relationships
- Offer expertise
- Surveillance
- Data Monitoring
- Outbreak Investigations
- Environmental Sampling
- Environmental Rounding

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Join us in 2025 for Fundamentals of Water & Waste Management

January 16th, 2025

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Questions

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