“Lunch & Learn”
2014 Webinar Series

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April, 2014
“**Marge for Mechanics**”
Strategies for Infection Prevention During Construction and Maintenance Projects

Have Questions??

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Objectives

Identify protocols for the risk assessment of infection for construction and maintenance

Identify other mitigation and monitoring strategies

Identify risks for mold remediation

Our Mission

Healthcare facilities continue to undergo transformation as service lines and patient populations change.

Maintenance, construction and renovation of facilities provide legal, regulatory, business and ethical responsibilities to design, construct and maintain a safe environment for patients, their family, staff and practitioners.

Infection Prevention vs. Infection Control

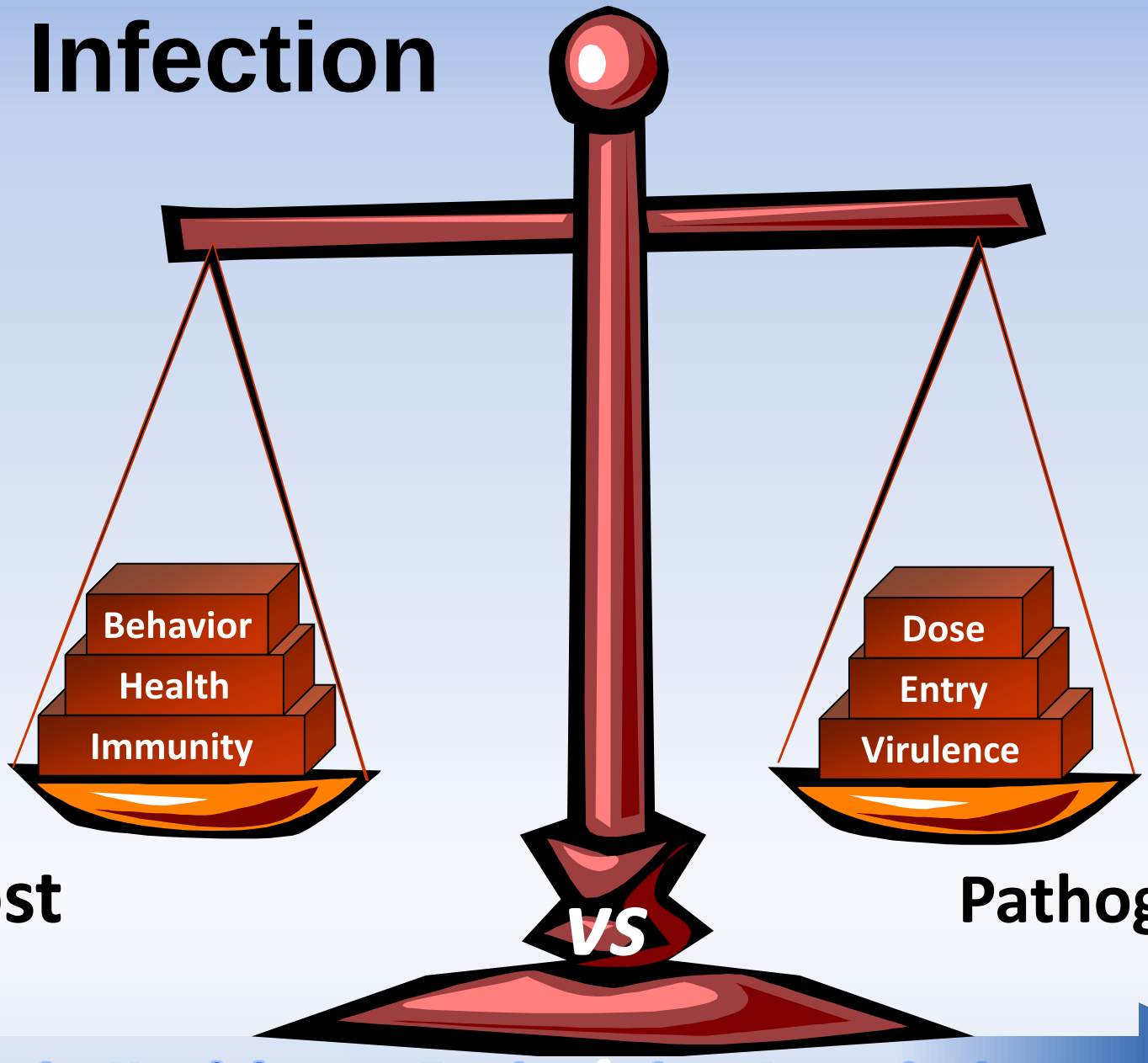
Infection Prevention - proactive planning and design, environmental cleaning, hand hygiene, education, prevention of healthcare-acquired infections

Infection Control - management of an outbreak or mitigation for the potential of construction or maintenance risk

Preventative Maintenance is Infection Control/Prevention

- Protecting infrastructure from water damage
- Protecting supplies and materials from dirt and water
- Ensuring correct and consistent building pressurization
- Maintaining traffic flow

Infection

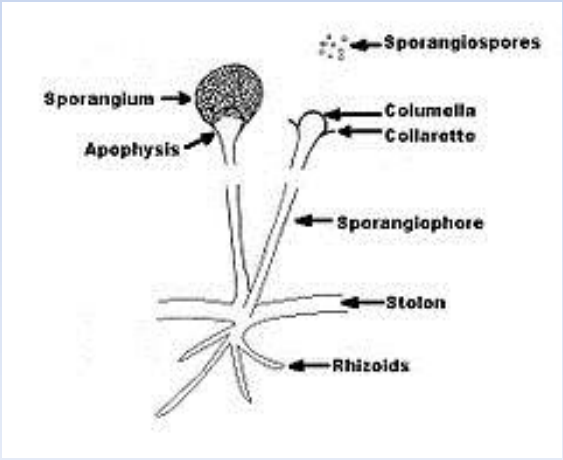

Behavior
Health
Immunity
Dose
Entry
Virulence
Host
VS
Pathogen

Healthcare Populations

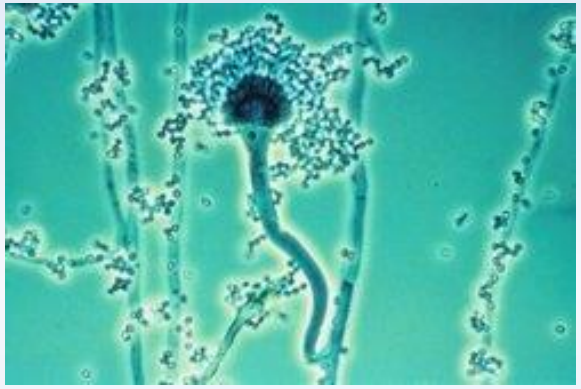
- Surgical procedures by penetrating the skin can affect a persons natural defenses with cutting and inserting foreign items into the body.
- Persons are more at risk due to compromised immune system.
- Elderly and young simply do not have the ability to fight off common sources of infection.

Molds are Fungi with Spores

100's of thousands types of molds – don't make their own food



Indoor environments*: **Aspergillus**, Penicillium, Fusarium, Rhizopus, Alternaria*



Outdoor environments: *Histoplasmosis, Coccidioides, **Aspergillus**, Blastomycosis*

Mold

- Spores can be found anywhere
- Thrive on wood, paper, ceiling tiles, and in building ventilation systems.
- Easy to disturb because they are lightweight, resistant to drying
- Spread on the air currents in a building, even by routine building maintenance functions

Aspergillus

- Can affect the lungs, brain, liver or skin
- 50% fatal in normal populations
- Almost 100% fatal in immune compromised individuals
- Hard to treat under ideal situations
- Major concern with construction and maintenance activities - DUST..

Aspergillus and Construction

- 1993 - 4 deaths due to an elevator project
- 1999 - 4 deaths due to construction dust in a Rheumatology Unit project
- 2000 – 6 deaths from 20 cases SICU/CCU

  -2006 – identified that the duct cleaning did not happen as promised in the Plan of Correction
- 2009 – 3 pediatric oncology deaths

How Construction/Maintenance Contributes

- Lack of knowledge to implement process to reduce risks to patients.
- Lack of adequate barriers/safeguards.
- Lack of control of dust/debris.
- Lack of communication/coordination with occupants.
- Improper shutdowns of systems.
- Improper start up of systems.

Why Do We Need an ICRA?

To address issues and protocols throughout **each** of the phases of planning, design, construction, renovation and facility maintenance.

To ensure that impacted service lines have an opportunity to manage patient safety and facility impacts in an effective, proactive and efficient manner.

Large Projects vs Small Projects

- Result from months of planning
- Multiple participants representing various interests/Formal team
- Completed Risk Assessment **VS**
- “just do it” – quick purchase order
- Single department affected
- Different set of vendors
- Self performed

Problem Areas for Small Projects or Maintenance

1. Not conducting an ICRA
2. Inadequate negative pressure system
3. Conducting renovations on “off-hours”
4. Improper barrier and anteroom design
5. Failure to follow industry protocol for mold

What Needs to be Included in a Risk Assessment?

Infection Prevention

Interim Life Safety Measures

- Remodel
- Remediation
- Maintenance
- Infrastructure upgrades

Scope of the Project

- Minor repair and system replacements
- Major system upgrades
- Area renovations
- Major additions
- Adjacent construction

Common “Construction” Activities

- Updating plumbing, piping, security, communications, data, electrical systems
- Involve opening ceiling cavities and, in some cases, walls—in short, demolition
- Exposure to contaminants may be brief or could last for days
- All of these activities have the potential to spread contamination into occupied spaces if not properly controlled

Stand Alone Projects

- “git r done”
- Environments may be harder to isolate
- May seem to take more time to set up containment than the project itself
- Most often performed in house
- Often a risk assessment not completed
- Perceived as an irritation to staff
- A disruption to normal traffic flow

Time for a Risk Assessment (ICRA)

- Design- long range planning
- Pre-Construction – impact, disruptions
- Mitigation- barriers, training, phasing
- Intra-construction – demo and build back
- Monitoring- continuing monitoring of effectiveness
- Post construction and cleanup

Clarify Expectations

- Work methods
  - Negative pressure verification
  - Dust/debris control and removal process
  - Define cleaning methods/frequencies
  - How to turn off/on systems
- Time Schedules
  - Noise/vibrations
  - Closures/system shut downs

Expectations Prior to Beginning

Define barriers

- Types and locations
- Who is responsible to construct
- Who is responsible to maintain
- Define when erected
- Define when can be removed

Design Phase

Long-range planning

Patient Centered Care

Process efficiency

Single bed rooms

Acuity adaptable

Noise reduction finishes

Potential conflicts Green vs. Clean

Long Range Planning

Location of handwashing sinks

Handwashing sinks on emergency power

Integral back splashes

Alcoves for linen carts

Washable non-cloth draperies for Airborne Isolation rooms

Location of hand sanitizer

Scope of Work

The scope of the maintenance or project will determine the level of protection needed.

Does every project need an assessment?

Does every project need to include all the elements of protection?

Do Small Projects Need an Assessment?

All maintenance and small construction projects need to be assessed and performed with the same level of attention to the Infection Control/Prevention Risk Assessment.

Small projects may also require an assessment for interim life safety, noise and vibration, asbestos and essential services disruption.

Assessments Include

- Number, location, and type of areas affected.
- Location of special ventilation and filtration such as emergency department waiting and intake areas.
- Interruption of water systems to limit *Legionella* and other waterborne opportunistic pathogens.

Identify Vulnerable Areas of Work

- Central Sterile
- Oncology
- Nursery
- ???

- Survey activities as well as work need special precautions…HEPA, PPE

How Do We Communicate Risk?

- Staff/Clinicians
- Patients/Families
- Contractors
- Vendors
- Departments providing support
  - Biomed now pulling data cables
  - Not familiar with the Risk Analysis process
  - At risk areas and procedures were not defined

Determining Risk

Infection Control Risk Assessment
Matrix of Precautions for Construction & Renovation

Step One:
Using the following table, identify the Type of Construction Project Activity (Type A-D)

Type A	**Inspection and Non-Invasive Activities** Includes, but is not limited to: • Removal of ceiling tiles for visual inspection limited to 1 tile per 50 square feet • Painting (but not sanding) • Wall covering, electrical trim work, minor plumbing, and activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection
Type B	**Small scale, short duration activities which create minimal dust** Includes, but is not limited to: • Installation of telephone and computer cabling • Access to chase spaces • Cutting of walls or ceiling where dust migration can be controlled
Type C	**Work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies** Includes, but is not limited to: • Sanding of walls for painting or wall covering • Removal of floor coverings, ceiling tiles and casework • New wall construction • Minor duct work or electrical work above ceilings • Major cabling activities • Any activity which cannot be completed within a single workshift
Type D	**Major demolition and construction projects** Includes, but is not limited to: • Activities which require consecutive work shifts • Requires heavy demolition or removal of a complete cabling system • New construction

Step 1 _____

Step Two:
Using the following table, identify the Patient Risk Groups that will be affected. If more than one risk group will be affected, select the higher risk group.

Low Risk	Medium Risk	High Risk	Highest Risk
• Office areas	• Cardiology • Echocardiography • Endoscopy • Nuclear Medicine • Physical Therapy • Radiology / MRI • Respiratory Therapy	• CCU • Emergency Room • Labor & Delivery • Laboratories (specimen) • Newborn Nursery • Outpatient Surgery • Pediatrics • Pharmacy • Post Anesthesia Care Unit • Surgical Units	• Any area caring for immunocompromised patients • Burn Unit • Cardiac Cath Lab • Central Sterile Supply • Intensive Care Units • Medical Unit • Negative pressure isolation rooms • Oncology • Operating rooms including C-section rooms

Step 2 _____

Step Three: Match the ...
Patient Risk Group (Low, Medium, High, Highest) with the planned...
Construction Project Type (A, B, C, D) on the following matrix, to find the ...
Class of Precautions (I, II, III, IV) or level of infection control activities required.

Class I-IV or Color-Coded Precautions are delineated on the following page.

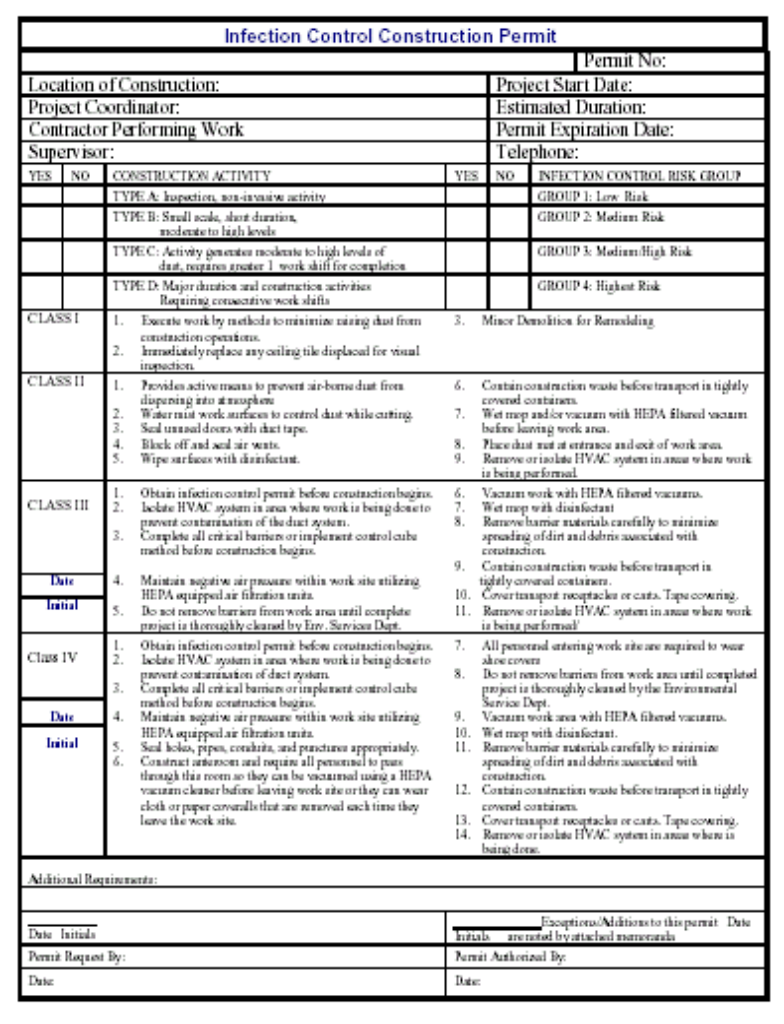
IC Matrix – Class of Precautions: Construction Project by Patient Risk

	CONSTRUCTION PROJECT TYPE			
PATIENT RISK GROUP	Type A	Type B	Type C	Type D
LOW Risk Group	I	II	II	III/IV
MEDIUM Risk Group	I	II	III	IV
HIGH Risk Group	I	II	III/IV	IV
HIGHEST Risk Group	II	III/IV	III/IV	IV

Note: Infection Control approval will be required when the Construction Activity and Risk Level indicate that Class III or Class IV control procedures are necessary.

Step 3 _____

Infection Control Permit



Infection Control Construction Permit

Permit No:

Location of Construction:	Project Start Date:
Project Coordinator:	Estimated Duration:
Contractor Performing Work	Permit Expiration Date:
Supervisor:	Telephone:

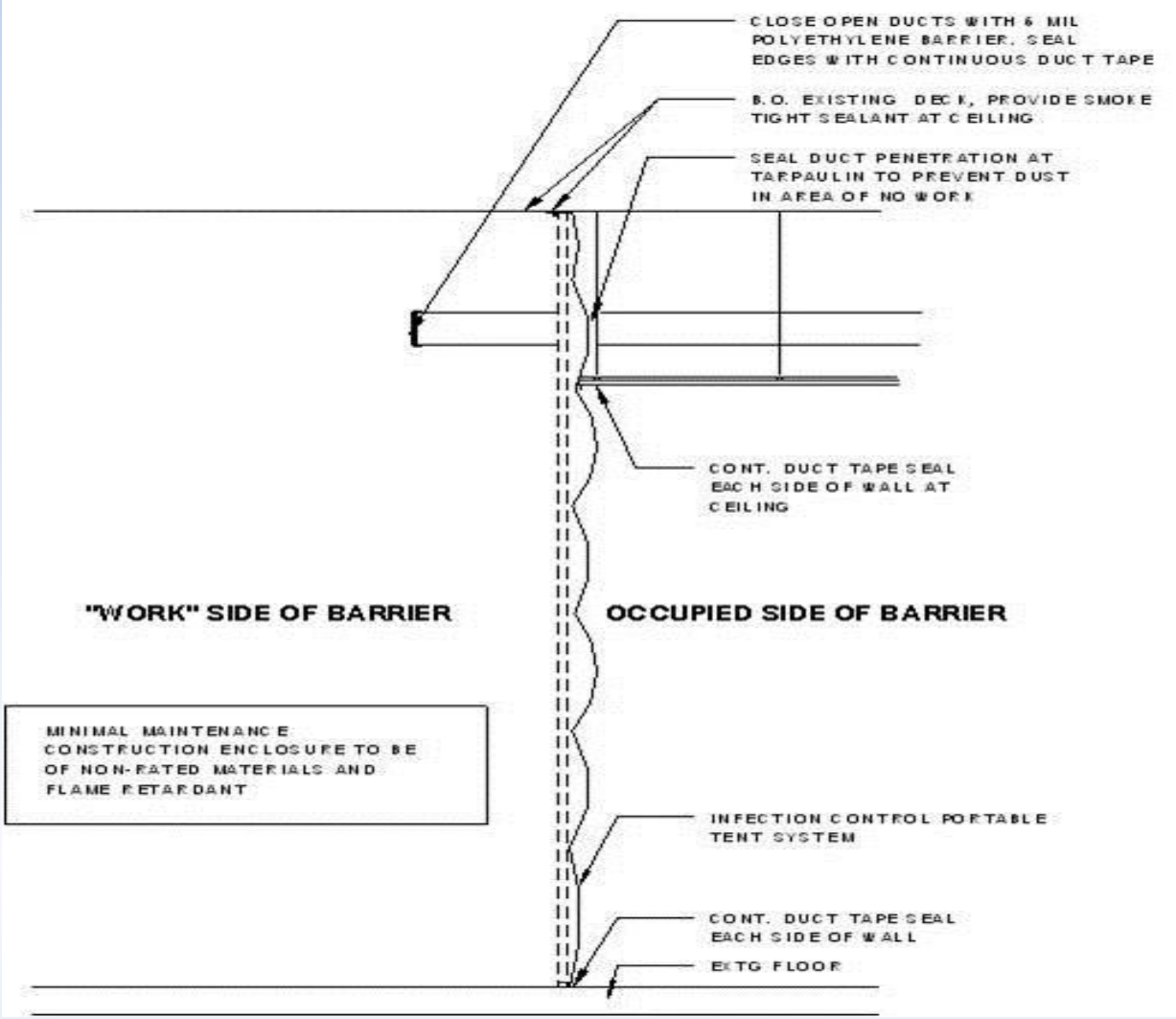
YES	NO	CONSTRUCTION ACTIVITY	YES	NO	INFECTION CONTROL RISK GROUP
		TYPE A: Inspection, non-invasive activity			GROUP 1: Low Risk
		TYPE B: Small scale, short duration, moderate to high levels			GROUP 2: Medium Risk
		TYPE C: Activity generates moderate to high levels of dust, requires greater 1 work shift for completion			GROUP 3: Medium/High Risk
		TYPE D: Major duration and construction activities Requiring consecutive work shifts			GROUP 4: Highest Risk

CLASS I	1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace any ceiling tile displaced for visual inspection.	3. Minor Demolition for Remodeling
CLASS II	1. Provides active means to prevent air-borne dust from dispersing into atmosphere 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Wipe surfaces with disinfectant.	6. Contain construction waste before transport in tightly covered containers. 7. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 8. Place dust mat at entrance and exit of work area. 9. Remove or isolate HVAC system in areas where work is being performed.
CLASS III Date Initial	1. Obtain infection control permit before construction begins. 2. Isolate HVAC system in area where work is being done to prevent contamination of the duct system. 3. Complete all critical barriers or implement control cube method before construction begins. 4. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 5. Do not remove barriers from work area until complete project is thoroughly cleaned by Env. Services Dept.	6. Vacuum work with HEPA filtered vacuums. 7. Wet mop with disinfectant 8. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 9. Contain construction waste before transport in tightly covered containers. 10. Cover transport receptacles or carts. Tape covering. 11. Remove or isolate HVAC system in areas where work is being performed.
Class IV Date Initial	1. Obtain infection control permit before construction begins. 2. Isolate HVAC system in area where work is being done to prevent contamination of duct system. 3. Complete all critical barriers or implement control cube method before construction begins. 4. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 5. Seal holes, pipes, conduits, and punctures appropriately. 6. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site.	7. All personnel entering work site are required to wear shoe covers 8. Do not remove barriers from work area until completed project is thoroughly cleaned by the Environmental Service Dept. 9. Vacuum work area with HEPA filtered vacuums. 10. Wet mop with disinfectant. 11. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 12. Contain construction waste before transport in tightly covered containers. 13. Cover transport receptacles or carts. Tape covering. 14. Remove or isolate HVAC system in areas where is being done.

Additional Requirements:

Date Initials	Exceptions/Additions to this permit Date Initials are noted by attached memoranda
Permit Request By:	Permit Authorized By:
Date:	Date:

Temporary Barriers



Facility Modification Risk Assessment (FMRA)

Needed for internally completed projects

May be viewed as “maintenance” rather than construction

Includes a quick assessment of impact on multiple life safety features of the facility

FMRA

- ***Infection Prevention/Control***
- ***Determine Risk Group/ Activity Type from ICRA***
- Risk Group: ___ Activity Type: _____
- Environmental Containment or Barriers required? ☐ Yes ☐ No
- ***(If YES proceed to Infection Prevention/Control Policy)***

FMRA: Utility Disruptions

Electrical Systems:

Emergency Power Systems:

HVAC Systems:

Medical Gas / Vacuum:

Waste / Vent:

Water:

Pneumatic Tube system:

Communications / Telephone:

FMRA: Life Safety

Fire Alarm System:

Sprinkler System:

Does it involve more than a one-room project?

Does it infringe on a patient care corridor?

Emergency egress closed during this project?

Fire or Smoke Separation Compromised?

FMRA (continued)

Ceiling / Wall / Floor Penetrations

Any penetrations of walls, ceiling, or floor

If YES, list what Fire Stop System will be utilized.

Vibration & Noise

Is there a potential for areas to be impacted by Noise or Vibration?

FMRA (continued)

Asbestos

Is the project in an area identified as having asbestos containing materials (ACM)?

Mold

Is the project in an area identified as having any previous water damage or mold issues?

Construction/Maintenance

Impact of disrupting essential services

Determination of the specific hazards & protection needed

Location of patients by susceptibility to infection

Construction/Maintenance

Impact of potential outages & protection during planned or unplanned outages, movement of debris, traffic flow, cleanup, and testing and certification.

Assessment of external as well as internal construction activities.

Mitigation

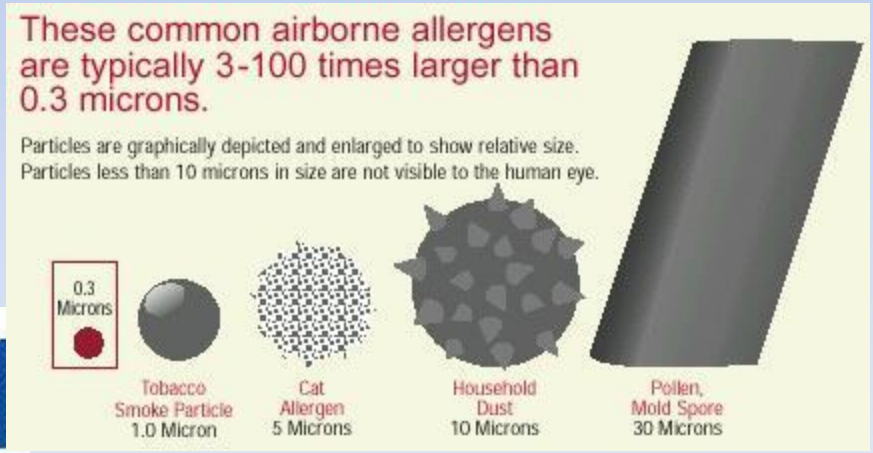
- Patient placement and relocation
- Barriers required to protect adjacent areas and susceptible patients
- Phasing for construction or modification of HVAC systems
- Protection from demolition
- Measures taken to train hospital staff, visitors and construction personnel

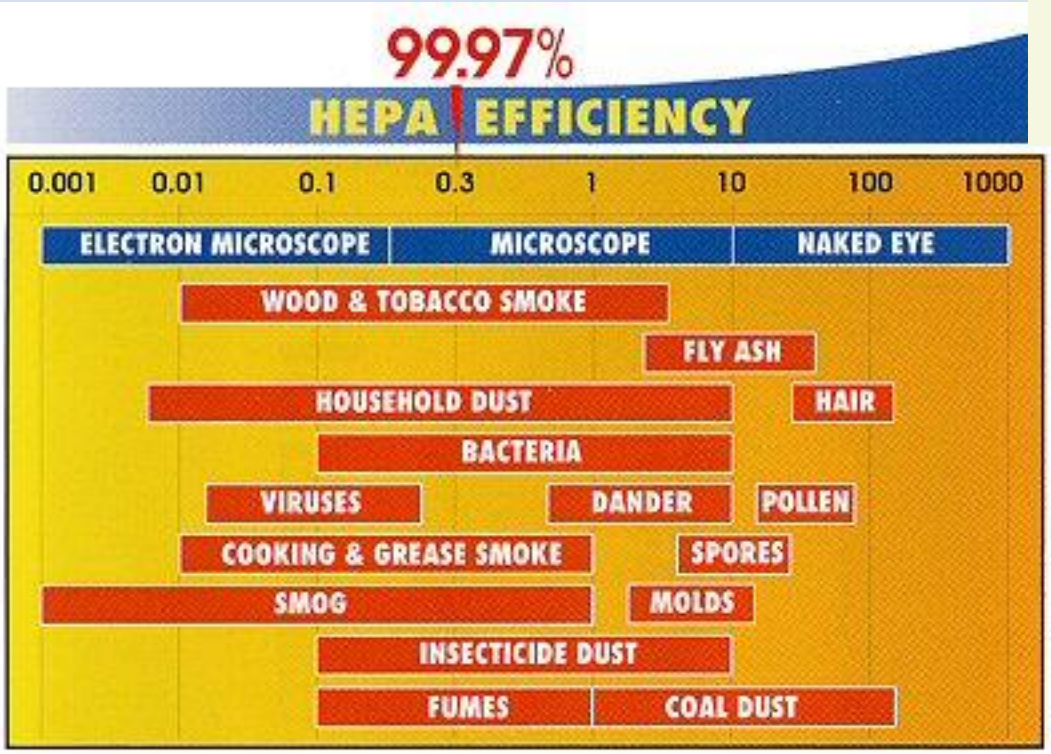
Continuous Monitoring

The monitoring of the effectiveness conducted by in-house infection prevention and safety staff or by independent consultants.

Include written procedures for emergency suspension of work, indicating responsibilities of each party—owner, designer, constructor and monitors.

Relative Size of Particles





HEPA Filter Machines

Portable filter criteria

air delivery

volume output

noise

HEPA (defined as 99.97 %)

negative pressure (>.01 inch water)

adaptable (multi-usage)

HEPA Filters

Air Monitoring

No construction standard

- Consider former “clean room standards”
- USP 797 references
  - Class V for sterile preparations
    - < 100 particles at 0.5 microns/cu ft.
  - Class VII for ante preparation area
    - < 10,000 particles at 0.5 microns/cu ft

Hand Held Particle Counter

Requires annual calibration
Counts 2-3 channels
Software available

Strategies for Monitoring

Gather baseline samples (on different dates)

3 samples of 1 minute duration counting at 0.5 microns or larger

Include outside air samples

Compare counts during construction and after terminal cleaning process

Suggest investigating any counts more than 2x the baseline

Post Activity Cleaning

- Identify protocols for terminal cleaning by contractor/facility
- Remove barriers
- Air monitoring (particulate counts after cleaning)
- Flushing water pipes
- Cleaning HVAC system
- Commissioning

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Mold Remediation for Smaller Projects

Includes both finding and fixing conditions allowing mold growth.

Reports of odors of mold should be investigated thoroughly by visual inspection (e.g., under sinks, enclosed areas) and by checking for previous reports or work requests of water damage.

- Special attention should be given to identify carpet under cabinets, furnishings, etc.

Definitions for Mold Remediation

CLEAN WATER - *Potable water*

CONTAMINATED WATER*: water that may have or is known to have unprocessed sewage*

UNSANITARY WATER - *water whose source is from rain that has not been treated or tested for humans, or flood waters not contaminated by sewage or ground water infiltration.*

Water Intrusion

- any water-based liquid that has absorbed into any building components
- may include carpet, wood, drywall wall, ceiling tiles, or any porous materials that absorb and hold moisture
- include but is not limited to potable water, domestic hot water, reheat water, steam, steam condensation, sewage and rainwater
- liquid classified as biological hazard should be treated as a hazardous waste spill

New York Protocols

New York City Dept of Health and Mental Hygiene 2008 defines protocols:

- <10 total square feet
- 10-100 square feet
- >100 square feet

Includes specific training and competency assessment of all involved in the construction or maintenance process

Location, Location, Location

Step 1. Determine risk group by location: RISK GROUP			
Low	Medium	High	
Offices Administration Non-patient areas Parking Decks Library Maintenance Shops	On call sleep rooms and other sleeping areas Dining and vending areas Non-hazardous lab Clinical Storage Computer rooms Morgue Corridors between patient areas Depts. Not Identified Above	**Patient care areas** Dialysis Diagnostic areas (e.g., gastrointestinal and bronchoscopy suites) Emergency Department Treatment areas Radiology Kitchen (Food preparation area) OR Labor and Delivery Pharmacy Clinical Lab Sterile Supply	

MOLD REMEDIATION MATRIX: Risk Group by Area of Contamination

Step 2. Determine level of remediation measures based on area contaminated and risk group.			
Parameter of Area Contaminated	Risk Group		
	Low	Medium	High
Small Isolated Areas < 30 ft2 ceiling tiles, small areas on walls, or single wallboards	**I**	**I**	**II**
Large Isolated Areas 30-100 ft2 (several wallboard panels)	**II**	**II**	**III**
Extensive Involvement > 100 ft2 contiguous in an area	**III**	**III**	**IV**

New York City Guidelines for levels of mold management and PPE requirements

Level	Area type	Example	PPE requirements
1	Small isolated areas, 10 sq.ft. or less	Ceiling tiles, small areas on walls	N95 respirator, gloves, eye protection
2	Midsize isolated areas, 10-30 sq.ft.	Individual wallboard panels	N95 respirator, gloves, eye protection
3	Large isolated areas, 30-100 sq.ft.	Several wallboard panels	N95 respirator, gloves, eye protection
4	Extensive contamination, greater than 100 contiguous sq.ft. in an area	Faulty building designs, improper building material installation, condensation from high humidity environments, buildings affected by natural disaster	Full-face respirator with HEPA cartridges for mold, disposable protective clothing covering head, hands, and shoes

Where Is the Water?

- Dry wall/sheet rock
- Ceiling tiles
- Furniture
- Carpeting
- Documents/files
- Electrical: outlets, fixtures, wiring
- Non-porous hard surfaces

Step 3. Circle the measures applicable for the work

LEVEL I (ITEMS 1-10)

1. Work area shall be unoccupied during abatement. Appropriate signage is posted.

2. Vacating spaces adjacent to work area shall be evaluated.

3. PPE (N95 respirator is recommended according to OSHA respiratory protection standard, utility gloves, eye protection) should be worn by remediation staff.

Level I Activities (Cont.)

4. Containment of work area is not necessary. (level I only)

5. Dust suppression methods (high efficiency particulate air filters [HEPA] vacuum, misting and damp mop of surfaces) shall be used.

6. Contaminated materials shall be removed in a sealed plastic bag.

7. HEPA vacuum/mop work area at end of work period.

Level I Activities (Cont.)

8. Keep doors to work area closed.
9. Remove trash daily in clean covered containers.
10. HEPA vacuum/mop outside work areas as needed (daily). Provide walk-off mats and change as needed.

Wake Forrest Healthcare, NC

- Avoid breathing in mold or mold spores
- Wear gloves
- Wear goggles that do not have ventilation holes
- Use plastic coverings and HEPA filtered equipment
- Moisten surface with soap and water

»Work in unoccupied areas

Resources

Facility Modification Risk Assessment – adapted with permission from Healthcare Safety Consulting, 2012

Moisture Management And Mold Remediation Protocols for Healthcare Facilities - sample mold remediation plan

References

ISO Classification of Particulate Matter in Room Air (limits are in particles of 0.5 mm and larger per cubic meter

ISO 14644-1 : 1999 Clean rooms and associated controlled environments

Former Federal Standard No. 209E measures particles in cubic feet.

Bibliography

Facilities Guidelines Institute (FGI) ”*Guidelines for the Design and Construction of Healthcare Facilities”* , 2010 and 2014

“Guidelines on Assessment and Remediation of Fungi in Indoor Environments”, New York City Dept of Health and Mental Hygiene, Nov 2008

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