Hospital Construction and Infection Control Best Practice
Andrew Streifel, University of Minnesota
A Webber Training Teleclass

What construction infection control best practice works?
• Internal construction
  – Barriers
  – Ventilation
  – Demolition
• External construction
  – Barriers
  – Ventilation
  – Demolition

Objectives for Infection Control during Construction in Healthcare Facilities
• Respectful of patients
• Control aerosols
• Maintain a clean environment
• Prevent water damage
• Respond to emergencies
• Provide documentation
• Be trained & communicate

Internal Construction
• Dust containment, removal and moisture control
  – Educate construction workers and staff
  – Prepare the site
  – Notify staff, visitors, patients re: precautions
  – Relocating patients and moving staff as needed
  – Monitoring for adherence to infection control
  – HVAC system maintenance; water system
  – Daily clean-up and removal of debris

Barrier management
• Solid versus plastic barriers
• Short and long term (3 days)
• Framed or taped barriers
• Ceilings and door barriers
• Smoke control barriers
• Pressure differential management
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Fire rated barrier
-slab to slab
-pressure control

Portable HEPA filter
-dilution ventilation
-directional airflow
-high volume (800cfm)
-low velocity

Portable HEPA Filter Particle Removal in 1200 ft³ Patient Room (600 cfm airflow with recirculation)

Condensation walk in cooler

Temporary Ventilation

Exhaust is a hood the outside

Internal HEPA filtered exhaust

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MRI remodeling with portable filters

A good idea may not work if the window is not sealed.

Portable filter criteria
- air delivery
- volume output
- noise
- HEPA
- negative pressure (>0.01 inch wg)
- adaptable (multi-usage)

Filter in barrier
- dilution vent
- depressurization

Simple airflow monitor device

Demonstrates correct & incorrect airflow.

Chart recorder

Pharmacy construction next to IV preparation

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Pharmacy water damage
- barrier with zipper door
- gaps in exhaust filter connection
- look for other gaps
- blue tape excellent for sealing
- maintain negative pressure
- remove water damage material
- decontaminate
- build back to specification

Barriers CM1-101
CEILING CLIPS
GLOVE BOXES & FILTERED VACUUM
HELPFUL TOOLS
CONTAINMENT METHODS

A garden of spores.

Portable Containment

Portable containment on BMT unit
Portable side wall & Ante room unit

Some small maintenance jobs can be a risk?

How do you do repairs on a drinking fountain?
Can you see accumulated dust?
Easy to set up barriers work.

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Particle counter
- filter check
- air velocity
- determine particle reduction
- determine volume for air change rate

Criteria for Portable Filter Certification

- Policies and Procedures for usage
  - discharge of air modes
    - outside, inside adjacent & recirculate in room
- portable filters should be routinely evaluated
  - volume output should be determined
    - \[ Q = VA \]
- leak check for filter
  - 16 locations over output area
- criteria for filter change
  - pressure differential or volume of filter output
- maintenance
  - storage, pre filter change & cleaning

Contaminated air must be removed from the building

Specified areas within the healthcare facility can create an isolation zone if the contaminated air is relieved to the outside. This requires sophistication in the controls that will allow for other priorities to be maintained: fire mgmt, fresh air makeup, etc. But this process can be improvised to expedite the need for ventilation control.

Employee training & understanding important to avoid exposure to environmental opportunistic microbes.

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Have you seen this before?
• air handler door propped open
• what does this do to the air supply?
• what might this indicate as a problem?

EXTERNAL CONSTRUCTION MANAGEMENT

• Verification of existing protective ventilation
• Control of building entrances
• Window infiltration
• Utility tunnel access to construction
• Building tie-ins
• Employee training
• Street cleaning
• Emergency response

External Construction

• Keep the facility air pressure positive to the outside?
• Ensure that roughing filters are changed frequently and primary filters properly installed
• Seal and caulk windows, especially in PE
• Keep doors closed as much as possible
• Wet dust surfaces avoid track dirt
• Protect immunocompromised patients from dust during transfers

At this stage of construction it is not a good time to start seeing fungal infections in patients!

Preconstruction risk assessment:
• Identify high risk areas
• Determine existing conditions
• Window seal
• Filtration efficacy
• Air exchange rate
• Pressure relationships
• Entrance to hospital
• Building pressure
• Pedestrian pathways
• Architectural structure leaks
• Road cleaning protocol
• Emergency response

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Building tie-ins can be problematic
- noise & vibration
- relocate patients
- air infiltration
- barrier management

Solutions for issues
- fan outage during penetration
- worker access control
- airflow control
- communication

Sensitive areas
- above BMT unit
- beside OR
- noise and vibration
- communication

Failure to protect the gird connection can bring a deluge below.

Proper flashing helps to minimize water damage even for temporary repairs.

WATER DAMAGE ALLOWS MOLD TO GROW IF NOT QUICKLY DRIED.

Vulnerable air intakes
- should be extended
- provide added filtration?
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Standing water can promote mold growth. Debris should be removed.

How do you keep the weep holes from plugging??

What about roof drains do they leak?

Flashing on the roof protects from water buildup.

The AHS for a TX ward needs to be replaced.
- how do you do it?
- new fan but old ducts
- what to do with patients?
- what do you need to avoid?
- exhaust close by?

Roof drain
Preventative Maintenance is Infection Control

Package unit in front of above
->25 ft from exhaust
- MERV 15 filters (>95%)
- cut over at specific time
- after fan checked for % effic
- connect duct turn on fan slow
- clean ceiling tile in
- move patients?

How to commission a air handling system?
- is it clean
- when do you test
- what about the filters

What filters are needed during Construction?
- equivalent to specification?
- when are filters changed?
- how to verify if they fit

Shrink wrapping protects the air handling system components during transport to the job site.

When the wrapping is broken the material should be replaced to avoid dust buildup.

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Specify Duct Cleanliness
  - A. Basic Level
  - B. Intermediate Level
  - C. Advanced Level
- Specify in contract

Some organizations require cleaning floor rails in certain areas during new construction. Will such an effort help keep mold under control?

Why should the specification for gypsum board installation include keeping it off the slab?
Because it keeps the gypsum board dry???
Keep the porous material less than 20% water content and relative Humidity < 95%.

VENTILATION OUTAGE PLANNING

- Planned maintenance outages
  - critical areas - time limits
  - combining tasks for efficiency
  - patient protection
- Emergency Outages
  - backup motors, fan belts, bearings, etc.
  - redundant systems in critical areas
  - portable filtration contingencies

Healthcare Construction: Case Studies in Medical Facilities

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Emergency Planning for Physical Plant Disruption

- Develop contingencies for:
  - critical ventilation
  - water supply
  - loss of steam
- Water damage control
  - notification process
  - drying time < 72 hours
  - remediation precautions if moldy
  - certification after cleanup in critical areas

Best practice includes
- cleaning site
- protecting critical equipment
- well-trained supervisors
- exhaust reliability

The Next Few Teleclasses

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<td>Evonne Curran, Public Health Agency, UK</td>
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<td>Voices of CHICA (a FREE teleclass)</td>
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<td>March 22</td>
<td>A Year of Cleaner, Safer Care – A Worldwide Experience</td>
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