

Hospital Construction and Infection Control Best Practice

Andrew Streifel, University of Minnesota

A Webber Training Teleclass

Construction New & Renovation

Infection Control Best Practice
Training & Experience



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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

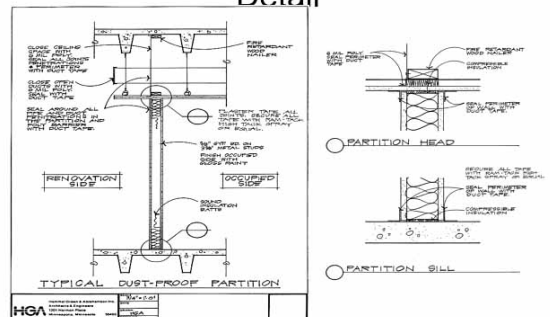
Internal Construction

- 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

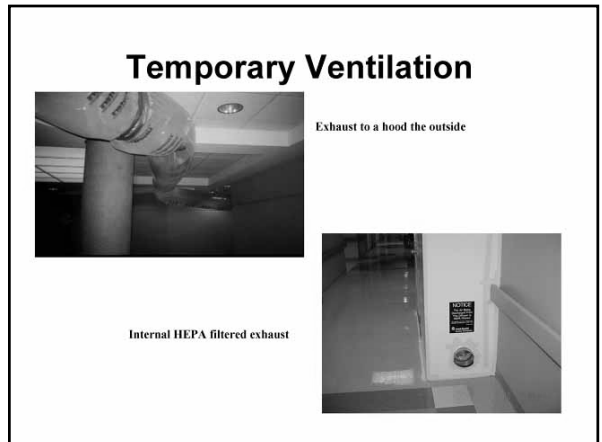
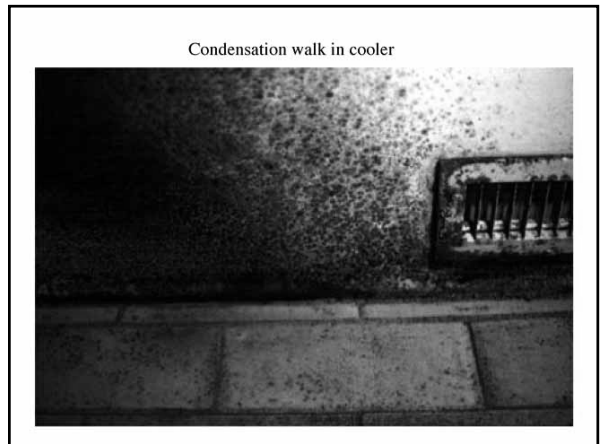
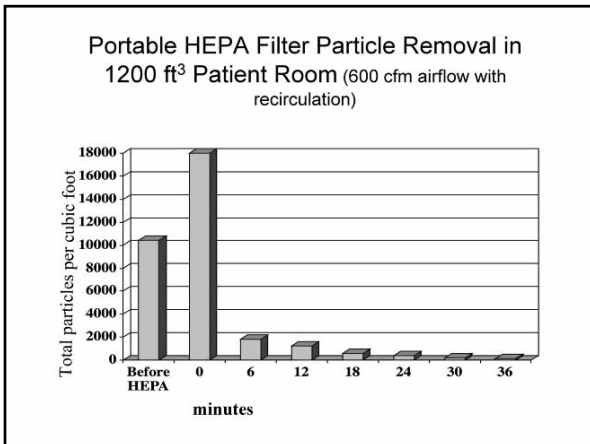
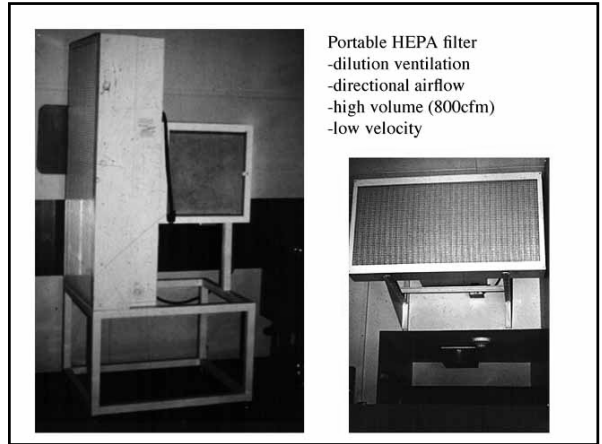
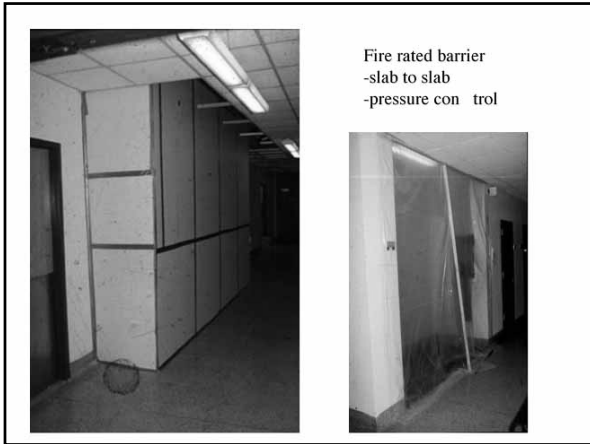
Fire Rated/Dust Partition Detail



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Healthcare Construction: Case Studies in Medical Facilities

MRI remodeling with portable filters



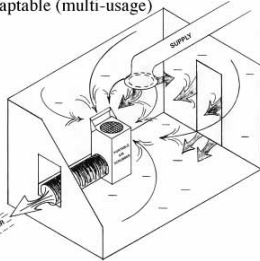
Negative pressure machine

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



Portable filter criteria

- air delivery
- volume output
- noise
- HEPA
- negative pressure (>.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



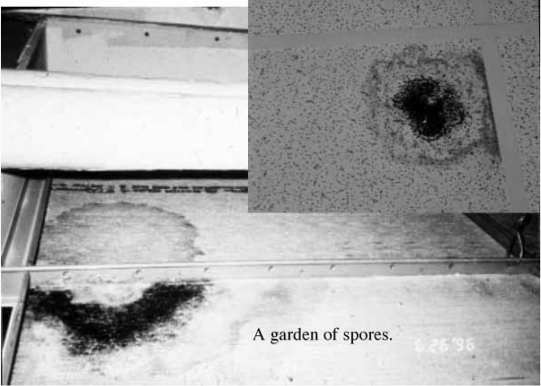
CEILING CLIPS

PORTABLE FILTERS

GLOVE BOXES & FILTERED VACUUM

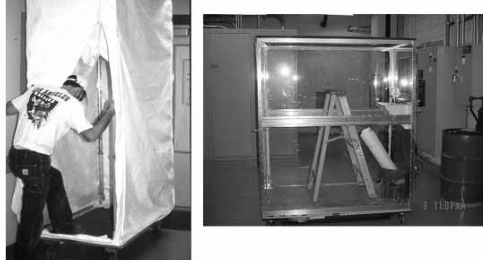
HELPFUL TOOLS

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

PORTABLE FILTERS CAN BE FUN?!?!

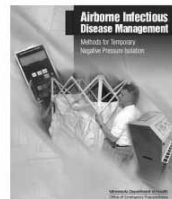


HOW NOT TO USE THE PORTABLE HEPA MACHINE

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



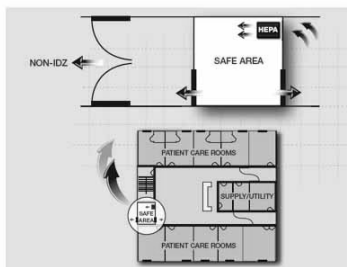
Contaminated air must be removed from the building



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

ISOLATION OF A SUITE OF ROOMS FOR AIRBORNE ISOLATION

Parts of hospitals are set aside for construction or infectious patients when needed.



Criteria for Portable Filter Certification

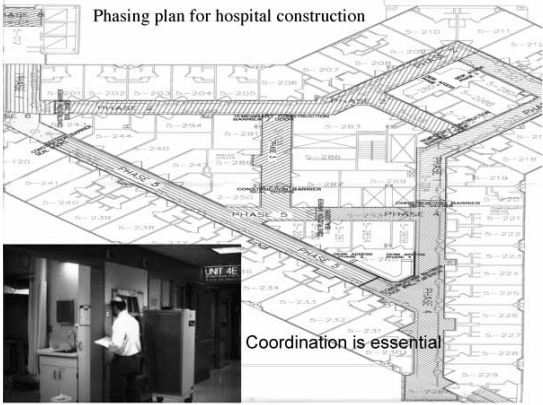
- Policies and Procedures for usage
 - discharge of air modes
 - outside, inside adjacent & recirculate in room
- portable filters should be routinely evaluated
 - volume output should be determined
 - $Q=VA$
 - leak check for filter
 - 16 locations over output area
 - criteria for filter change
 - pressure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

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Phasing plan for hospital construction




Coordination is essential




Managing aerosol presents challenges for construction in hospitals.




Routine cleaning helps impress cleanliness necessary for safe patient care during construction.



•Cover debris during transport




•Use portable HEPA filters




•Provide visual indicators

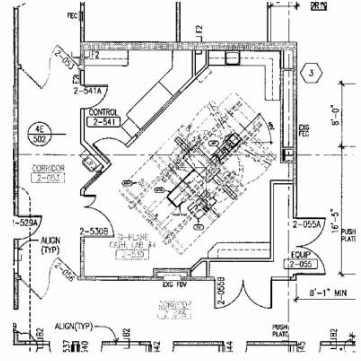
- pressure
- signage
- flexible door



•Use walk off mats




What happens when the area for remodeling needs to be used during the project?




Time separation from patients allows for cleanup and verification.

Radiology remodeling is ongoing due to tech advances.

NRC SAYS WE CANNOT MOVE TREATMENT



AIR QUALITY VERIFICATION


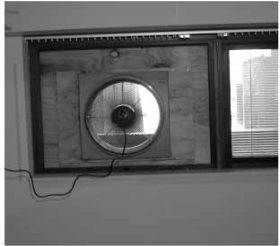


PORTABLE FILTERS WORK

Construction & Patient care

- when the situation is difficult you need to find a solution
- the risk assessment must determine the risk based on the situation
- such problems can be solved

What method is best for exhausting air from a construction zone.

The ducted exhaust advantages

- *control
- The direct exhaust advantages
- *no duct losses


Disadvantages

- No one is paying attention!

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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?

Ongoing construction at health care facilities




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
- ID architectural structure leaks
- road cleaning protocol
- emergency response

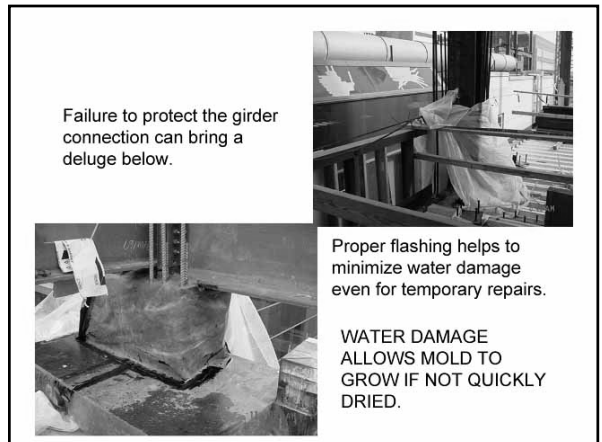
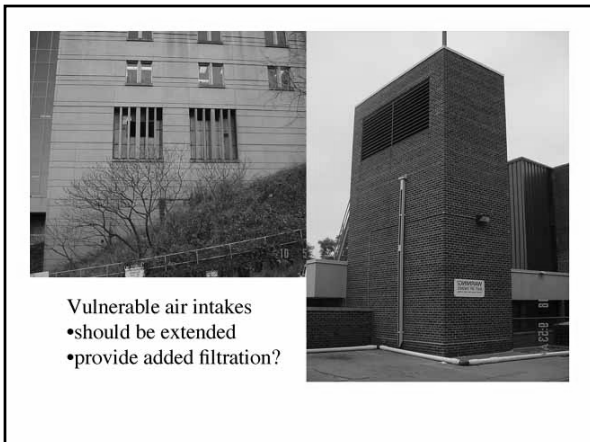
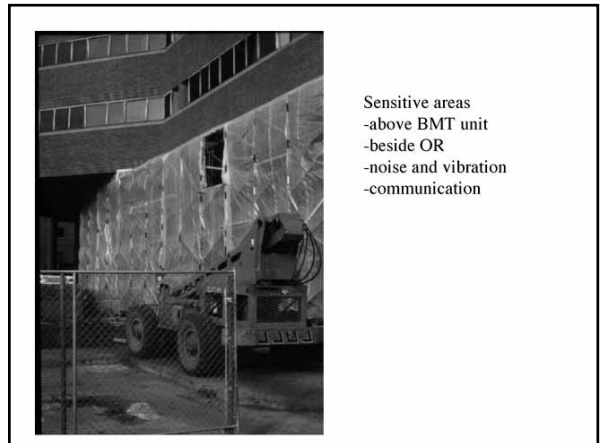
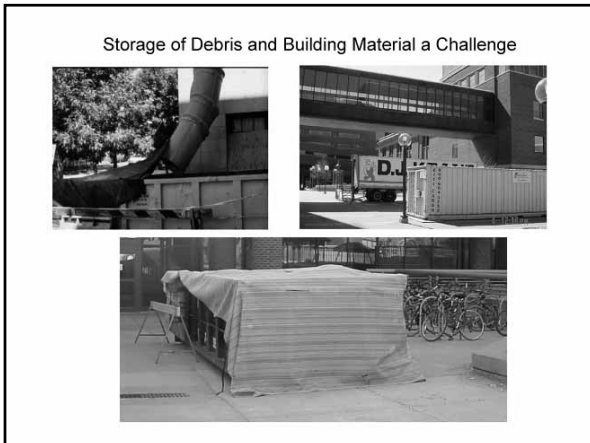
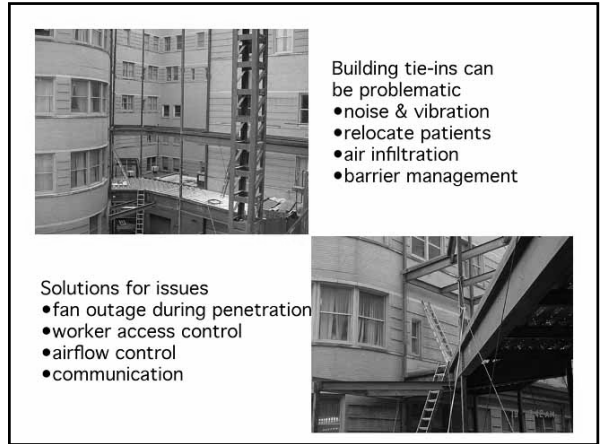
Plugged air intake - what does this cause?



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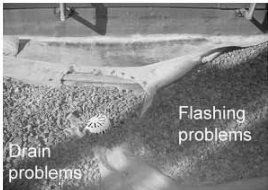
Standing water can promote mold growth. Debris should be removed.

Roof should drain. Equipment should not be stored on the roof membrane. Protect the roof!

How do you keep the weep holes from plugging??


What about roof drains do they leak?


Flashing on the roof protects from water buildup.

Drain problems

Flashing problems




Will this work?



Roof drain

Preventative Maintenance is Infection Control





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?

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

- Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) – *Duct Cleanliness for New Construction Guidelines* (2000)
 - A. Basic Level www.smacna.org
 - B. Intermediate Level
 - C. Advanced Level
- Specify in contract



Protection of openings & storage of material.



Med gas piping

These details should be part of the construction specification to assure not installing water damaged material & prevention of water damage to susceptible material.



Some organizations require cleaning floor rails in certain areas during new construction.

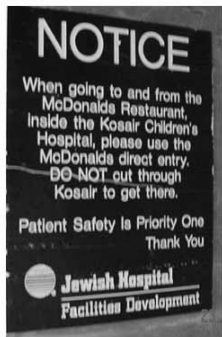


Will such an effort help keep mold under control?



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%.



- SIGNAGE IS ESSENTIAL**
- inform construction workers
 - inform building occupants
 - utility outages
 - noise
 - other
 - location
 - public spaces
 - email blast
 - elevators
 - sign boards for info sharing



Healthcare Construction: Case Studies in Medical Facilities

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

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Healthcare Construction: Case Studies in Medical Facilities

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 clean up in critical areas



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



Infectious Disease Management in Healthcare

- complex balance of mechanical and operational issues
- ventilation design essential to protect patients & personnel
- source management of infectious agents essential
- recognition of sources important for control training
- protective measures needed for prevention of infection
- infection control risk mitigation is a tool for proper means and methods for infection prevention



The Next Few Teleclasses

- | | |
|----------|---|
| March 6 | <i>Tuberculosis in the Modern Age</i>
... Evonne Curran, Public Health Agency, UK |
| March 8 | <i>Voices of CHICA (a FREE teleclass)</i>
... with CHICA-Canada Board Members & Guests |
| March 22 | <i>A Year of Cleaner, Safer Care – A Worldwide Experience</i>
... with Dr. Didier Pittet, World Health Organization, Geneva |
| March 29 | <i>Environmental Control Strategies for C. diff</i>
... with Dr. Lynne Sehulster, CDC |
| April 12 | <i>Who's Afraid of the CIC Exam? (a FREE teleclass)</i>
... with Sharon MacDonald and Sharon Krystofiak, CBIC |

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