	The Johns Hopkins Hospital	Policy Number	IFC005
	INTERDISCIPLINARY CLINICAL PRACTICE MANUAL	Effective Date	11/30/03
	<i>Subject</i>	Page	1 of 9
	INFECTION CONTROL GUIDELINES RELATED TO CONSTRUCTION/RENOVATION	Supersedes	10/01


KEY WORDS: construction, renovation, building, repairs

POLICY

The intent of this policy is to minimize nosocomial (hospital-acquired) infections in patients that may arise as a result of exposure to organisms released into the environment during construction and renovation activities. Controlling dispersal of air- and/or water-borne infectious agents concealed within building components is critical in all of the Johns Hopkins facilities. To this end, all construction and renovation activities shall be defined and managed in such a way that occupants' exposure to dust, moisture and their accompanying hazards is limited. Controlling construction dust and dirt will further serve to protect staff and visitors, as well as sensitive procedures and equipment, from possible ill effects.

RESPONSIBILITIES

- | | |
|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Facilities Department (FD) | <ul style="list-style-type: none"> ▪ Notify the Hospital Epidemiology and Infection Control Department of planned work to obtain approval prior to start of work (for all new construction or for construction or renovation activities for departments listed in Risk Groups 3 and 4). ▪ |
| Telecommunication Service (TS), Computer Information Services (JHMCIS), Network & Telecommunication Services (NTS) | <ul style="list-style-type: none"> ▪ Notify HEIC of planned work and obtain approval prior to the start of work in Risk Groups 3 or 4. ▪ Follow the approved procedures set up by the FD to minimize the generation of dust. ▪ Notify appropriate Nursing/Clinic/Department manager of any proposed work and precautionary measures, which will be taken. ▪ Oversee projects by inspecting barriers, etc. on a routine basis. ▪ Call Environmental Services to organize any clean up. |
| Legal Department (LD) | <ul style="list-style-type: none"> ▪ Include the following language in all construction maintenance, and or renovation contracts: “HEIC shall approve projects involving manipulation of ceiling tiles, performance of dust generating activities, manipulation of HVAC (Heating, Ventilation, and Air Conditioning) systems, plumbing, and/or other maintenance repairs prior to the initiation of the project.” |
| Environmental Services (EVS) | <ul style="list-style-type: none"> ▪ Work with FD to identify areas that need to be damp mopped and clean these areas as scheduled. ▪ Thoroughly clean new and renovated areas before admitting or readmitting patients. ▪ Coordinate inspection of final cleaning with HEIC prior to opening/re-opening the area. |
| Nursing Departments (and other departments that see patients) | <ul style="list-style-type: none"> ▪ Help identify high-risk patients. ▪ Relocate high-risk patients to unaffected areas before construction/renovation work is initiated. ▪ Optimally, avoid non-emergent admission/testing/treatment of immunocompromised patients during periods of construction/renovation. |
| Hospital Infection Control and Epidemiology (HEIC) | <ul style="list-style-type: none"> ▪ Review procedures that are developed by FD to comply with this policy and submit to HEIC Committee for approval. ▪ Educate Managers, Medical Staff, Environmental Services personnel, and |

	The Johns Hopkins Hospital	Policy Number	IFC005
	INTERDISCIPLINARY CLINICAL PRACTICE MANUAL	Effective Date	11/30/03
	<i>Subject</i>	Page	2 of 9
	INFECTION CONTROL GUIDELINES RELATED TO CONSTRUCTION/RENOVATION	Supersedes	10/01

other staff as needed about risks to immuno-suppressed patients exposed to construction dust.

- Determine whether construction poses sufficient increased risk to require/recommend that patients be moved to an area of the hospital/facility where construction is not occurring.
 - Review indications for performing environmental cultures with the appropriate departments (Health, Safety and Environment; Microbiology Laboratory).
 - Inspect areas where construction has occurred after final cleaning and approve opening or re-opening of the areas.
 - Conduct careful environmental investigation, including culture confirmation (as possible), when a cluster of patients with infections potentially related to construction/renovation (aspergillosis, legionellosis, etc.) is identified.
- Health, Safety and Environment
- Review air-sampling strategy with HEIC.
 - Sample appropriate areas at predetermined time intervals during times of construction/renovation.
 - Send all HEIC requested air-samples for culture to the microbiology laboratory for fungal identification (*Aspergillus*) and speciation.
 - Samples should include selected patient care areas, patient rooms, treatment areas, and predetermined control areas.

PROCEDURES

I. Construction Guidelines


- A. Facilities Department personnel at Johns Hopkins, who are responsible for managing each construction or renovation project, will:
1. Determine the infection control project classification using the matrices* (located below). HEIC and the Health, Safety and Environment department may modify, add, or delete guidelines on individual projects in collaboration with the Facilities Department project leader.
 2. Coordinate the relocation of affected patients and pedestrian traffic routes to areas where there is less potential for exposure to airborne contaminants with the responsible departments.
 3. Coordinate the preparation of the project area, including the removal of medical supplies, waste, and equipment, prior to the commencement of project activities with the responsible departments.

II. Project Classification

▪ **STEP ONE**

Select Construction Activity Type from the table below.

(Construction Activity Type is defined by the amount of dust that is generated, the duration of the activity, and the involvement with HVAC systems). Contact the HEIC Department if any activity is questionable under these guidelines.

	The Johns Hopkins Hospital	Policy Number	IFC005
	INTERDISCIPLINARY CLINICAL PRACTICE MANUAL	Effective Date	11/30/03
	<i>Subject</i>	Page	3 of 9
	INFECTION CONTROL GUIDELINES RELATED TO CONSTRUCTION/RENOVATION	Supersedes	10/01


DEFINITIONS OF CONSTRUCTION ACTIVITY
Type A: Inspections and General Upkeep 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); installation of wall covering; electrical trim work; minor plumbing; and activities, which do not generate dust or require cutting into 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 into walls or ceiling where dust migration can be controlled.
Type C: Any work that generates a moderate to high level of dust. Includes, but is not limited to, demolition or removal of built-in building components or assemblies, sanding of wall for painting or wall covering, removal of floor covering/wallpaper, ceiling tiles and casework, new wall construction, minor ductwork or electrical work above ceilings, major cabling activities.
Type D: Major demolition and construction projects. Includes, but is not limited to, heavy demolition, removal of a complete ceiling system, and new construction.

▪ **STEP TWO**

Select Infection Control Risk Group from the table below.

(Infection Control Risk Groups defined are based on project location and occupancy.) Contact HEIC Department if any location is questionable under these guidelines. When possible, as in outpatient areas, day-treatment only areas, etc., work should be done after hours since these areas have limited times when patients are seen.

DEFINITIONS OF INFECTION CONTROL RISK AREAS/LOCATION				
GROUP 0 LOWEST	GROUP 1 LOW	GROUP 2 MEDIUM	GROUP 3 MEDIUM HIGH	GROUP 4 HIGHEST
<ul style="list-style-type: none"> • Detached buildings 	<ul style="list-style-type: none"> • Office areas • Areas not communicating with patient care activities 	<ul style="list-style-type: none"> • Patient care & other areas not covered under group 3 or 4 • Laundry • Cafeteria • Dietary • Materials Management • PT/OT/Speech • Admission/Discharge • MRI • Nuclear Medicine • Echocardiography • Laboratories not specified as Group 3 • Public Corridors (through which patients, supplies, and linen pass) 	<ul style="list-style-type: none"> • Emergency Rooms • Radiology • Post-anesthesia Care units (except Weinberg) • Labor and Delivery (Nelson 2) • Newborn Nurseries • Newborn Intensive Care unit • Pediatrics (except those listed in group 4) • All Intensive Care Units (except those listed in group 4) • Microbiology lab • Virology lab 	<ul style="list-style-type: none"> • Weinberg building: IPOP HIPOP 4&5 A,B,C,D 3A WICU Radiation therapy (basement) 2, Chemo infusion 1, clinical area • Moore Clinic • Osler 8 • Nelson 6&7 • CMSC 8 E&W • Pharmacy Admixture

	The Johns Hopkins Hospital	Policy Number	IFC005
	INTERDISCIPLINARY CLINICAL PRACTICE MANUAL	Effective Date	11/30/03
	<i>Subject</i>	Page	4 of 9
	INFECTION CONTROL GUIDELINES RELATED TO CONSTRUCTION/RENOVATION	Supersedes	10/01

			<ul style="list-style-type: none"> • Long term/sub-acute units • Pharmacy • Dialysis • Endoscopy • Bronchoscopy areas (including Blalock & Meyerhoff Unit) • Nelson 4 Park 3 	<ul style="list-style-type: none"> • Operating Rooms GOR Weinburg OR PACU Wilmer OR JHOPC OR Greenspring • C Section Rooms • Sterile Processing • CVDL (CMSC 5) • Cardiac Catheterization • Outpatient invasive procedures rooms • Oncology Units Anesthesia and Pump areas
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▪ **STEP THREE**

Using the Construction Activity Type and the Infection Control Risk Group selected from the tables above, use the matrix below to determine Construction Classification (Class).


(Construction Classification Class determines the procedures to be followed during construction and renovation projects). Contact HEIC Department for “special case” questions.

Construction Activity Matrix				
CONSTRUCTION ACTIVITY→	TYPE “A”	TYPE “B”	TYPE “C”	TYPE “D”
RISK LEVEL ↓				
Group 0	Class 0	Class 0	Class 0	Class 0
Group 1	Class I	Class II	Class II	Class III/IV
Group 2	Class I	Class II	Class III	Class IV
Group 3	Class I	Class III	Class III/IV	Class IV
Group 4	Class III	Class III/IV	Class III/IV	Class IV


▪ **STEP FOUR**

Implement the appropriate Infection Control Construction Guideline based on the project classification selected from the Construction Activity matrix (listed above) in STEP THREE.

(Infection Control Construction Guidelines are procedures to control release(s) of airborne contaminants resulting from construction, demolition, or renovation activities).

	The Johns Hopkins Hospital	Policy Number	IFC005
	INTERDISCIPLINARY CLINICAL PRACTICE MANUAL	Effective Date	11/30/03
	<i>Subject</i>	Page	5 of 9
	INFECTION CONTROL GUIDELINES RELATED TO CONSTRUCTION/RENOVATION	Supersedes	10/01

INFECTION CONTROL CONSTRUCTION GUIDELINES	
CLASS 0	<ul style="list-style-type: none"> No infection control measures required.
CLASS I	<ul style="list-style-type: none"> Execute work by methods to minimize raising dust from construction operations. Replace any ceiling tile displaced for visual inspection as soon as possible.
CLASS II	<ul style="list-style-type: none"> Provide active means to prevent air-borne dust from dispersing into atmosphere Seal unused doors with duct tape. Contain construction waste before transport in tightly covered containers. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area daily. Place dust-mat at entrance and exit of work area and replace or clean when no longer effective. Isolate HVAC system in areas where work is being performed. Wipe casework and horizontal surfaces at completion of project.
CLASS III	<ul style="list-style-type: none"> Isolate HVAC system in area where work is being done to prevent contamination of the duct system. Complete all construction barriers before construction begins. Maintain negative air pressure within work site utilizing HEPA filtered ventilation units or other methods to maintain negative pressure. Public Safety will monitor air pressure. Do not remove barriers from work area until complete project is thoroughly cleaned. Wet mop or vacuum twice per 8-hour period of construction activity or as required in order to minimize tracking. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. Barrier material should be wet wiped, HEPA vacuumed or water misted prior to removal. Contain construction waste before transport in tightly covered containers. Place dust-mat at entrance and exit of work area and replace or clean when no longer effective. Wipe casework and horizontal surfaces at completion of project.
CLASS IV	<ul style="list-style-type: none"> Isolate HVAC system in area where work is being done to prevent contamination of duct system. Complete all construction barriers before construction begins. Maintain negative air pressure within work site utilizing HEPA filtered ventilation units or other methods to maintain negative pressure. Public Safety will monitor air pressure. Seal holes, pipes, conduits, and punctures to prevent dust migration. Construct anteroom and require all personnel to pass through this room. Wet mop or HEPA vacuum the anteroom daily. During demolition, dust producing work or work in the ceiling, disposable shoes and coveralls are to be worn and removed in the anteroom when leaving work area. Do not remove barriers from work area until completed project is thoroughly cleaned. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. Barrier material should be wet wiped, HEPA vacuumed or water misted prior to removal. Contain construction waste before transport in tightly covered containers. Place dust-mat at entrance and exit of work area and replace or clean when no longer effective. Keep work area broom clean and remove debris daily. Wet mop hard surface areas with disinfectant at completion of project. HEPA vacuum carpeted surfaces at completion of project Wipe casework and horizontal surfaces at completion of project.

	The Johns Hopkins Hospital	Policy Number	IFC005
	INTERDISCIPLINARY CLINICAL PRACTICE MANUAL	Effective Date	11/30/03
	<u>Subject</u>	Page	6 of 9
	INFECTION CONTROL GUIDELINES RELATED TO CONSTRUCTION/RENOVATION	Supersedes	10/01

III. Submittals


- A. Unless previously specified in the construction documents:
1. Contractors, or the responsible Johns Hopkins department, will submit report of Infection Control procedures, including locations and details of barriers, means of creating negative pressure, etc., prior to the start of project for review by Health, Safety and Environment, HEIC and Facilities departments responsible for managing the project.
 2. Contractor will submit product data for review as requested.

IV. Execution

- A. Products and Materials
1. **Barrier products** which are approved:
 - Sheet Plastic: Fire retardant polyethylene, 6-mil thickness. Dry wall with metal studs.
 - Solid core, wooden doors in metal frames - painted.
 - Portable dust containment system, such as “ZipWall” as manufactured by Zip Wall LLC, Cambridge, Mass., or equivalent
 2. **HEPA-filtered ventilation units** such as those manufactured by “HPA Aire” Model PAS 2000 HC or Model PAS 2000 HC or Model PAS 1000HC equipped air filtration units or equivalent. Provide HEPA filter, primary and secondary filters.
 3. **Exhaust Hoses:** Heavy duty flexible steel reinforced; Ventilator Blower Hose, WPC such as that manufactured by Federal Hose Mtg. Co. Painsville, OH 44077 or equivalent.
 4. **Adhesive Walk-Off Mats:** Provide minimum size mats of 24 inches X 36 inches such as those manufactured by 3 M, St. Paul, MN 55144 or equal.
 5. **Disinfectants:** Johns Hopkins Hospital approved disinfectant.
 6. **Filters:** Return and exhaust air ducts shall be covered with 2” thick pleated air filters. Filters to be model #FME-40 as manufactured by Purolator or approved equivalent. Minimum efficiency 25/35% with minimum of 10 pleats per foot.

VI. Procedures

- A. **Isolation**
1. Construction activities causing disturbances of existing dust, or creating new dust, will be conducted in tight enclosures that cut off flow of particles into adjacent areas.
 2. Where containment is possible, utilizing building walls and doors (all doors *except construction access doors*) should be closed and sealed with duct tape to prevent dust and debris from escaping.
 3. Construction, demolition, or reconstruction not capable of containment utilizing, existing building walls and doors, will use one of the following methods of isolation:
 - Airtight plastic barriers extending from floor to ceiling decking, or ceiling tiles if not removed. Plastic barrier seams will be sealed with duct tape to prevent dust and debris from escaping.
 - Portable dust containment units with polyethylene pulled tight against floor and ceiling.
 - Drywall barriers. Seams or joints will be covered or sealed to prevent dust and debris from escaping.
- B. **Additional isolation requirements**
1. Seal all penetrations at existing perimeter walls.

	The Johns Hopkins Hospital	Policy Number	IFC005
	INTERDISCIPLINARY CLINICAL PRACTICE MANUAL	Effective Date	11/30/03
	<i>Subject</i>	Page	7 of 9
	INFECTION CONTROL GUIDELINES RELATED TO CONSTRUCTION/RENOVATION	Supersedes	10/01

2. Place isolation barriers at penetration of ceiling envelopes, chases and ceiling spaces to stop movement of air and debris.
3. Erect dust barriers at elevator shafts or stairways with the field of construction, allowing for emergency egress.
4. Provide anteroom or double entrance openings that allow workers to remove protective clothing or vacuum off existing clothing. Construct anteroom to maintain airflow from clean area through anteroom and into work area.
5. Create overlapping flap (minimum of 2 feet wide) at plastic enclosures for personnel access.
6. When openings are made into existing ceilings, a portable dust containment or plastic enclosure will be used, sealing off openings, and fitted tightly from ceiling to floor. Any ceiling access panels opened for investigation beyond the sealed areas will be replaced immediately when unattended.
7. Direct pedestrian traffic from construction areas away from patient-care areas to limit opening and closing of doors (or other barriers) that may cause dust dispersion, entry of contaminated air, or tracking of dust to patient areas.
8. Prevent birds and insects from gaining access to the hospital and hospital air-intact ducts. Exterior openings will remain closed when not in use.

C. ***Ventilation***


1. Negative air pressure will be maintained within the construction area.
2. The central HVAC system will be used where possible to help maintain negative air pressure. Contractors will be responsible for blocking off supply ducts and covering return air ducts with 2" pleated air filters.
3. Where central HVAC systems are not capable of maintaining negative air pressure in the work area, the contractor will provide exhaust fans or HEPA filtered ventilation units to maintain the negative air- pressure within the construction area. Exhaust fans or HEPA filtered ventilation units will run continuously. Contractors are responsible for maintaining equipment and replacement of HEPA and other filters in accordance with the manufacturer's recommendations.
4. Construct an anteroom to maintain airflow from clean area through the anteroom and into the work area.

D. ***Housekeeping***

1. Walk-off mats will be used at exits and entrances to the work area. Adhesive walk-off mats should be placed at all doors *exiting* the construction area and carpeted walk-off mats should be placed at all doors *entering* into a construction area.
2. Carpeted walk-off dust mats will be vacuumed at least twice per 8-hour shift and at the end of the workday. Any dust tracked outside of the construction area shall be vacuumed or damp-mopped immediately. Vacuum cleaners shall be outfitted with HEPA filters.
3. Adhesive walk-off mats should be changed daily, or more frequently as needed, to maintain adhesive surfaces.
4. When construction is in an occupied area, the construction area will be vacuumed or damp-mopped at least at the end of each shift. Vacuum cleaners will be outfitted with HEPA filters.

E. ***Protective Clothing***

1. Disposable shoe covers and coveralls are to be worn during demolition.
2. Protective clothing will be removed any time the worker leaves the immediate work area.
3. Used coveralls and shoe covers will be placed in a sealed plastic bag, prior to removal from the work area, for disposal by the contractor.

	The Johns Hopkins Hospital	Policy Number	IFC005
	INTERDISCIPLINARY CLINICAL PRACTICE MANUAL	Effective Date	11/30/03
	<i>Subject</i>	Page	8 of 9
	INFECTION CONTROL GUIDELINES RELATED TO CONSTRUCTION/RENOVATION	Supersedes	10/01

F. ***Storage of Building Supplies***

1. Construction materials such as drywall will be stored in clean, dry areas to prevent the growth of bacteria and fungi.
2. Ductwork materials will be stored in a clean, dry area to prevent the accumulation of dust in the ductwork prior to installation.

G. ***Post Construction***

1. The contractor will vacuum and clean all surfaces in the completed construction area, rendering them free of dust prior to the removal of isolation barriers.
2. Barrier materials should be removed carefully to minimize spreading of dirt and debris associated with construction. (Barriers should be discarded as construction debris.) Barrier materials should be wet wiped, HEPA vacuumed or water misted prior to removal.
3. The contractor will remove all blockages from the air systems.
4. The contractor will balance the ventilation system to design specifications (as described in the project manual/agreement).
5. Johns Hopkins' Facilities department will examine the HVAC equipment and filters for blockage and/or leakage.
6. Johns Hopkins' Environmental Services will perform the final cleaning of newly constructed/renovated areas before allowing patients to enter the areas.

H. ***Special Precautions for Water Handling (Plumbing alterations)***

1. Exercise caution when handling fluids (i.e. removing plumbing pipes and fixtures) to prevent wetting of building materials and/or contamination of work areas.
2. Cap unused domestic water pipe branches at no more than 12 inches from the main line.
3. Before an area is turned over for patient occupancy/use, Johns Hopkins' Facilities will test the domestic water for temperature and potability.
4. **Aerators will not be used on water faucets in patient care/testing/treatment areas.**

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SPONSOR

- Medical Care Evaluation Committee

DEVELOPERS

- Department of Hospital Epidemiology and Infection Control
- Facilities Design and Construction Department

	The Johns Hopkins Hospital	Policy Number	IFC005
	INTERDISCIPLINARY CLINICAL PRACTICE MANUAL	Effective Date	11/30/03
	<i>Subject</i>	Page	9 of 9
	INFECTION CONTROL GUIDELINES RELATED TO CONSTRUCTION/RENOVATION	Supersedes	10/01

COMMUNICATION & EDUCATION

1. Facilities project managers will educate construction managers (including those of contractors) who will be overseeing construction/renovations. HEIC is available to assist with this education or for consultation as needed.
2. An article regarding the new policy will be submitted by HEIC for publication in “Hopkins Hot Line”.
3. HEIC will maintain the ongoing consultative relationship with Facilities, Environmental Services, and Health, Safety and Environment as needed to provide guidance and education.
4. Placement of policy on-line at www.Hopkins-HEIC.org.
5. This policy will be placed in the Interdisciplinary Clinical Practice Manual on the JHH Intranet site <http://www.insidehopkinsmedicine.org/icpm>. Paper distributions will be made to the Functional Unit Nursing offices in the event of web access difficulty.

REVIEW CYCLE	• Three (3) years	MEDICAL BOARD	Approval Date: 8/12/03 Effective Date: 11/30/03
VICE PRESIDENT FOR MEDICAL AFFAIRS			

Date:			