Posting Date: 2019-06-13
Posting History Dates: 2004-10, 2005-01, 2008-05, 2015-04-23, 2016-06-23, 2017-07-07, 2018-04-26
Next Review Date: 2020-06-13

Title: IC - Infection Prevention and Control - Guidelines during Construction, Renovation and Maintenance in Healthcare Facilities

Applies to: All staff at Hamilton Health Sciences, St. Joseph's Healthcare, and Hospital Affiliates including outside Contractors and Architects, members of the Medical, Dental and Midwifery Staff, Patients and Visitors.

Section #	Table of Contents

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1.0 Purpose

To outline the measures that must be taken in a healthcare setting, before, during and concluding renovation, construction and maintenance activities. To prevent exposure of patients, staff and visitors to fungal spores and bacteria potentially transmitted by air, soil, water sources and dust.

2.0 Definitions

Adjacent Areas - All of the areas surrounding an area where construction, renovation, or maintenance work is occurring, include, where applicable, all or part of the floors above and below. Note: Determining what constitutes an adjacent area depends on the risks created by the work.

Aspergillus – a genus of fungi found in soil, water and decaying vegetation and damp materials. The fungal spores proliferate on dead organic debris and can remain viable for months in dry locations.

Anteroom - A small room that is immediately adjacent to or within a construction area and is intended to be used by constructors for purposes such as storage or removal of protective clothing, cleaning of debris-removal containers, and/or removal of contaminants from footwear.

Bacterial Spores - Resistant cells produced by bacteria to withstand extreme heat, cold or dehydration.

Biomedical Waste - Waste that is limited to human and animal anatomical waste, non-anatomical waste, cytotoxic waste and other waste that requires special handling as determined by the generator.

Compromised - Lacking resistance to infection due to a deficiency in any of the host defenses.

Construction activity type – a designation applied to a construction project to indicates its potential for creating and dispersing fungus, bacteria and other hazardous materials. See Table 2

Construction Air Handling unit (CAHU) – a machine used to move HEPA-filtered air into or out of a construction site.

Constructor - Person who undertakes a project for an owner and includes an owner who undertakes all or part of a project by himself or by more than one employer.

Construction/Renovation/Maintenance - Major and minor facility activities that disturb or modify facility structures and systems. This also includes repair work.

Exposure - Contact with an infected person or infectious agent.

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Fungi - A diverse group of organisms that includes yeasts, moulds (fungi capable of producing mould) and mushrooms. They are found in soil, water and air and, lacking chlorophyll, derive nourishment from breaking down organic matter. Many type of fungi reproduce by means of spores that are readily dispersed in the air. Spores may remain dormant but viable for months. e.g. Aspergillus.

High-Efficiency Particulate Air (HEPA) Filter - An air filter with an efficiency of 99.97% in the removal of airborne particles 0.03µm or larger in diameter.

HVAC - Heating, ventilation and air conditioning.

Immunocompromised - Immune system that is not capable of a normal, full reaction to pathogens or tissue damage, as the result of a disease.

Infection control risk assessment (ICRA) – a process used to identify design elements that increase the risk of microbial transmission in the environment.

IPAC - Infection Prevention and Control.

Legionella - A genus of gram-negative bacteria found in soil, water and dust. (Legionnaires' disease - a pneumonia that is caused by Legionella and is usually acquired by inhalation of contaminated aerosols).

Negative Pressure – term used to denote airflow which is negative in relation to surrounding air pressure that is, air flows away from the surrounding area. A negative pressure of 7.5 Pa (0.03 inches of water column) shall be maintained within the construction zone. A pressure gauge or manometer should be used to monitor pressure differential.

Occupant - A patient, medical staff, staff member, learner, volunteer or visitor in a health care facility.

Project Designate – the manager, identified by the Facilities Planner and/or director of Engineering Services and/or appropriate Engineering Site Manager prior to the start of construction who acts as the internal contact person for the contractor

Plumbing Dead Leg - A pipe or other plumbing component or system that has contained, contains or likely will contain stagnant water.

Walk-Off Mat (Tack Mat) - A specially designed mat that is placed outside a construction area or in an anteroom and is intended for removal of contaminants from the footwear of constructors.

Sealed Penetrations - Item that juts into an area and which has had a seal placed around the junction.

When using this policy:
Shall - represents something which is required.
Should – represents something which is advised or recommended.

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3.0 Equipment/Supplies

High Efficiency Particulate Air (HEPA) Filter Unit
HEPA Filter Vacuum

4.0 Policy Statement

- The Infection Prevention and Control Guidelines for Construction, Renovation and Maintenance Procedure shall be followed by all campuses of this Health Care Facility.
- All construction and renovation projects shall be lead by Capital and/or Facility Management at HHS and Redevelopment and Building Services at SJHH
- All construction, renovation and maintenance projects will be conducted in compliance with all current standards and guidelines.
- Infection Prevention and Control in collaboration with the Project Designate has the authority to halt work if all appropriate Preventive Measures are not being followed.
- During construction, if unforeseen events occur that could present infection risks, interventions shall be implemented immediately to resolve the issue. Procedures shall be in place to assist staff who may be required to respond to these events.

5.0 Procedure

5.1 Planning Stage

5.1.1 A multidisciplinary team with appropriate expertise shall be established early in the planning stage of every construction project. The team shall be responsible for guiding construction during the planning and execution stages, including determining the location and duration of the work and taking steps to protect occupants who might be affected by the construction.

5.1.2 Capital and/or Facility Management representative shall serve as the lead of the multidisciplinary team at HHS
Redevelopment and/or Building Services representative shall serve as the lead of the multidisciplinary team at SJHH

5.1.3 The team shall include expertise from the following areas:

- Infection Prevention and Control (IPAC)
- Administrators
- Project Management
- Environmental Services
- Health Care (Medical and Nursing Staff)
- Occupational Health and Safety
- Design (Architects, Engineers)
- Operations and Maintenance
- Construction

5.1.4 The Multidisciplinary Team:

- Shall communicate its policies and procedures to the constructor before construction begins
- Should include a copy of the infection control plan in contract document
- Should designate a representative to communicate with the constructor and attend

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construction meetings as necessary. Membership may vary depending on the size and scope of the project (e.g. Minor renovations). Members of the team shall be consulted as necessary with respect to construction planning.

5.2 Infection Prevention and Control (IPAC)

Shall be an active member of the multidisciplinary team throughout the life of the construction project.

- Ensure that the appropriate preventative measures are initiated and adhered to. See **(Appendix A and Tables 1-4)**.
- Shall ensure that all affected staff are aware of the risks that the construction/renovation project poses to patients staff and visitors, and the precautionary measures required to prevent exposure to these risks.
- Perform regular construction site audits to ensure that all appropriate preventive measures are being adhered to.
- Comply with all PPE requirements when auditing a construction /renovation zone.

5.3 Project Designate

5.3.1 Shall inform IPAC of any renovation, construction or maintenance.

5.3.2 Shall include IPAC in the planning team beginning with functional plans, to ensure that the appropriate materials and design concepts related to IPAC are incorporated in the plans. Construction materials should be selected that are not susceptible to moisture damage.

5.3.3 Shall review with IPAC all tender documents and prints, to ensure that all IPAC issues are addressed and make all necessary changes to meet hospital requirements.

5.3.4 Shall ensure that the contract agreement outlines the mandatory IPAC measures as well as contractor accountability in the event that breeches in IPAC practices and related written agreements occur.

5.3.5 Shall present the proposed IPAC plan to the multidisciplinary team for discussion and comment.

5.3.6 Shall propose and institute IPAC measures for the duration of the construction project and for ongoing maintenance and operations.

5.3.7 Shall in collaboration with IPAC and Capital and/or Facility Management at HHS and Redevelopment and/or Building Services at SJHH ensure that the construction workers are aware of the risks that construction poses to patients, staff and visitors and the preventative measures that the workers must take.

5.3.8 Should designate an individual responsible for IPAC to liaise with the multidisciplinary team and monitor and coordinate the constructors IPAC procedures.

5.3.9 Should coordinate with IPAC education sessions as required for the construction project.

5.3.10 Should notify Environmental Services of need for enhanced cleaning in areas adjacent to construction zones during the project and arrange for a hospital level clean of the area at the completion of construction.

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5.4 Constructor

5.4.1 Constructor shall comply with Infection Prevention and Control policy during construction, maintenance and renovation. Constructor shall ensure Plumbing and HVAC systems are supplied, installed and commissioned in accordance with CAN/CSA-Z317.1, CAN/CSA-Z317.2 and CAN/CSA-Z318.0.5

5.4.2 Shall ensure duct work be handled and installed in accordance with SMACNA'S Duct cleanliness for New Construction Guidelines (Advanced Level) (or most current version of guidelines).

5.4.3 Shall ensure construction materials susceptible to contaminants and moisture damage shall be protected during delivery and construction as per CAN/CSA-Z317.1Wall, ceiling and floor coverings to be used are defined and approved in accordance with CAN/CSA-Z8000-11.

5.4.5 Shall ensure that all workers are aware that no tools or ladders may be left unattended at any time unless in a secure location accessible only by workers.

5.5 Construction Phase

5.5.1 **Pre Construction**
See **Appendix B** to ensure that all appropriate Preventive Measures are in place.

5.6 Medical Supplies and Equipment
The area Manager is to ensure that:

5.6.1 Supplies and equipment are removed from the area prior to the start of the project. The extent to which this occurs depends on the scope of the project and the assessment performed by the Multidisciplinary Team in the planning stage.

5.6.2 Supplies and equipment needed for use in the area but not required to be sterile are covered with polyethylene sheeting to prevent contamination by dust and debris.

5.6.3 All sterilized packaged equipment and supplies are removed from the area, prior to the start of construction/renovation.

5.6.4 All waste (including sharps containers) is removed from the project site before the start of construction/renovation or sufficient precautions are in place to minimize risks to the workers.

5.7 Traffic Control
Project Designate is to ensure:

5.7.1 Designated alternate traffic routes for the transportation of facility equipment and/or supplies and/or patients must be established to prevent exposure to dust and debris from the project site**.**

5.7.2 Designated traffic routes for transportation of construction equipment and material must be established and maintained free of dust and debris and use only designated elevators.

5.7.3 If it is determined that the elevator cab has significant risk of contamination (heavily soiled demolition debris) and the cab travels in a shared elevator shaft, the exhaust output from the elevator cab shall be minimized in the construction area to ensure that it is not re- circulated

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into the health care facility. This may be achieved by introducing additional filtration within the elevator cab or toggling the airflow inside the cab.

5.7.4 Designate an elevator that shall be used by construction workers.

5.7.5 Post signs to direct any unauthorized traffic away from the project site.

5.8 Barriers

The contractors are responsible to:

5.8.1 Review the risk assessment matrix **(Table 4)** which will have been completed during the planning stages of the project, tender documents, and site visits to determine appropriate barriers.

5.8.2 Supply, erect, and maintain the integrity of appropriate barriers between the construction area and adjacent areas of the health care facility.

- Keep entry doors closed and have door frames with gaskets.
- Ensure that tight seals are maintained at the perimeter of walls and wall penetrations.
- Use a plastic dust barrier to protect the area during the construction of the rigid impervious barrier.
- Clean the area after the barrier is constructed.
- Ensure all vacuuming equipment has a HEPA exhaust.
- Use an anteroom or entry vestibule when required for the workers to remove dusty clothing and to store tools.

5.8.3 Make every attempt to obtain drawings that show the layout of the ventilation systems that supply air to, or exhaust air from, the work area. It shall be determined whether it is necessary to close outlets, modify performance, shut down systems, or make other changes to the HVAC systems.

5.9 Dust Control and Plumbing

5.9.1 Windows and doors in areas of the health care facility adjacent to construction areas shall be sealed, especially around buildings that are going to be demolished.

The constructor shall do the following:

5.9.2 Windows must remain closed at all times.

5.9.3 Personnel shall check for leakage paths between construction areas and adjacent areas of the health care facility.

5.9.4 Windows, doors and air intake and exhaust vents in areas of the health care facility adjacent to construction areas shall be sealed, especially around buildings that are going to be demolished.

5.9.5 Negative pressure differential from all adjacent occupied areas into the construction area shall be maintained at 7.5 Pa. (-0.03 in wc)

5.9.6 Quality, distribution and use pattern associated with the health care facility's source water

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should be identified and high-risk areas highlighted.

5.9.7 Features conducive to stagnation (e.g., long pipe runs and dead ends) shall be minimized in the design of health care facility plumbing systems.

5.10 Air Quality Testing

5.10.1 If necessary, Air Quality Testing is performed in this stage by qualified personnel.

5.10.2 Engineering/Operations/Maintenance Staff/Constructors shall: With the multidisciplinary planning team, ensure that the appropriate environmental monitoring is performed before, during and at the completion of the construction/renovation project as deemed necessary by IPAC and Occupational Health and Safety.

6.0 During Construction

6.1 Dust and Debris Control and Removal

6.1.1 Staff should inform their manager and report when there is evidence of dust and debris outside construction zone to project manager and/or IPAC.

The constructor shall do the following:

6.1.2 Remove debris using carts with tight fitting lids or cover the contents with a wet sheet to avoid dispersing dust and dirt.

6.1.3 Remove debris according to the schedule and specified routes including designated elevators outlined in the construction plan.

6.1.4 Use enclosed chutes, directed into enclosed dumpsters, to direct debris outside, whenever possible for removing debris from above the ground floors.

6.1.5 Ensure that the chute opening is not placed near air intakes.

6.1.6 HEPA (as defined) - filtered negative air machines are recommended to be used. Filters must be sealed in a plastic bag before removal from the construction area.

6.1.7 Check for leakage paths between the construction area and adjacent areas of the health care facility. Wind and stack effects shall be considered, and steps shall be taken to plug holes in spatial separations (e.g., walls, partitions, floors, and floor slabs).

6.1.8 Clean the project site daily or more frequently as necessary to control dust and debris with wet mop or HEPA equipped vacuum.

6.1.9 Use walk-off mats outside the construction area exit(s) to remove dust and debris and to prevent tracking to other areas. They shall be large enough that constructors have to place both feet on the mat at least once on exiting the construction area. Material used for walk-off mats shall be appropriate to the site, the expected traffic level, and the type of soil that is likely to be tracked.

6.1.10 Remove loose soil and debris from their clothing before leaving the project site. Protective clothing when worn must also be removed before leaving the site.

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6.1.11 Provide workers with disposable overalls, and head and shoe coverings for entry into invasive procedure areas.

6.1.12 Wipe all tools and equipment with a damp cloth before entering invasive procedure areas.

6.1.13 Wipe all tools and equipment with a damp cloth or place in sealed plastic bag prior to removal from the construction zone.

6.2 Ventilation and Air Handling Controls

Constructor in conjunction with the Project Designate:

6.2.1 Shall take special precautions related to ventilation systems in the construction area.

6.2.2 IPAC shall be consulted for any construction requiring Preventive Measures III or IV.

6.2.3 For high risk population groups the ventilation system should be disabled until the project has been completed. Alternatively, an engineering analysis shall be performed to ensure that the fan systems continue to perform their intended function and that the operation of the HVAC system is not compromised.

6.3 Portable Construction Air Handling Units

Shall be: Thoroughly inspected before leaving storage and upon arrival at the work area to ensure they are operating as per manufacturers specifications, are in good working order, are thoroughly clean and free from dust, dirt, soil, debris, residue, moisture and biological contamination, all filters are in place and the unit has been performance leak test certified.

Before removing from the construction site the CAHU shall have all surfaces thoroughly cleaned using a HEPA-filtered vacuum or damp wiping and pre-filters shall be removed, bagged and sealed. The CAHU intake and exhaust openings shall be covered with polyethylene and tape sealed to prevent dust from being dislodged during transport through the health care facility or from site to site.

6.3.1 Certified with documentation (DOP testing); recommended testing conducted on site.

6.3.2 Recertified every 12 months and the recertification shall be documented.

6.3.3 Visually inspected by the constructor at least daily and their conditions shall be documented.

6.3.4 Filters shall be replaced when loaded and as per manufactures recommendations Constructors shall adhere to operation, preventive maintenance, movement and storage of CAHU's as defined by CSA Z317.13-17

6.3.5 Construction, maintenance, and repair area exhaust air shall not be discharged to areas occupied by Population Risk Group 3 or 4.

6.3.6 For any projects requiring Preventive Measures III or IV, Negative pressure differential from all adjacent occupied areas into the construction area shall be:

1. Continuously monitored using a pressure differential monitoring device with the ability to data log;

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2. Connected to a local alarm that is active at all times and that can be heard or seen from within the construction area;
   NOTE: consider the use of an automatic dialer system, a centrally monitored alarm panel or other automated communication system for projects that require continuous monitoring.
3. Maintained at 7.5 Pa (-0.03 in wc). Intermittent disruptions may occur under controlled conditions, provided that they are planned for and documented by the multidisciplinary team before construction begins, otherwise the HEPA will run continuously (24/7).

6.3.7 Air flow rates, distribution, and pressurization of a facility's HVAC system can be affected. Accordingly, the main facility system shall be verified for operation in accordance with design during construction work. The health care facility and constructor shall verify the pressure relationships for critical areas near the construction area (ie. Population Risk Group 4 areas).

6.3.8 Permanent air handling systems should not be used for exhausting air from construction or renovation work areas. Temporary ductwork may be installed for such purposes. However, it shall not connect to the facility's HVAC system.

6.3.9 In cases where air cannot be exhausted directly outside an engineering analysis shall be performed by qualified personnel if attempting to tie into the building's exhaust system to ensure that exhaust air will not be re-entrained into the occupied building and the multidisciplinary team must approve piping to the exhaust system.

6.3.10 In cases where air cannot be exhausted directly outside or piped through the building exhaust system, consult IPAC.

6.4 Plumbing

Appropriate methods shall be used to ensure water potability during health care facility construction.

6.4.1 Water lines shall be flushed before reuse after new plumbing has been installed, following excavations on health care facility grounds, or when the plumbing system has been shut down and then re-pressurized. Flush time will be determined by Engineering at HHS and Building Services at SJHH based on line-size, flow-rate, water pressure & temperature, length of pipes, number of dead ends, age of system and history of contamination.

Follow Code Grey: Facility Loss of Essential Service Protocol.

6.4.2 Dead legs that are removed shall be removed as close to the main line as possible.

6.4.3 Where dead legs cannot be removed, they shall be isolated from the live plumbing system, drained of water, and permanently capped. A tag identifying that the line has been isolated and the date of isolation shall be affixed to each end where the line has been isolated.

6.4.5 The contractor shall determine what worker protection is required for removal of the dead leg pipe.

6.4.6 Constructors performing plumbing works shall:

- Avoid using collection tanks and long pipes (which allow water to stagnate).
- Maintain a dry work environment.
- Report any water leaks that may have contacted building supplies and materials.

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- Report any water leaks through walls or substructures.

6.4.7 Staff should report discolored water and water leaks to maintenance and IPAC.

6.5 Water Leaks and Flooding

Leaks and flooding shall be reported immediately to the managers of the affected area and to a member of the member of the multidisciplinary team. Refer to Code Aqua Protocol.

- All areas shall be thoroughly inspected for water damage including those concealed behind wall and ceilings
- Surfaces shall be retested with a moisture meter to determine that drying is complete (drying must be completed within 48 hrs or abatement measures must be followed)

6.6 Essential Services:

6.6.1 **Planned or Emergency Water shutdown:**
Capital and/or Facility Management at HHS and Redevelopment and/or Building Services at SJHH are responsible to:

- Convene a working group with the site administrator and IPAC if it is a complete shutdown of water in the facility.
- Engineering/Building Services shall determine if a Code Grey should be in effect. Refer to Code Grey Protocol.

The working group is responsible to:

- Ensure adequate water is available for drinking, flushing toilets and for basic care requirements.
- Ensure disposable moistened wipes are available if the shutdown is extended.
- IPAC notifies Public Health in the event of any extended water shutdown for information regarding other suitable water sources.

Area managers are responsible to:
Working with Engineering/Building Services, once the water is turned on in an area, ensure that their staff run the water until the water runs free of air with clear colour;

- Ensure that the traps are not clogged.
- Drains are running freely.

6.6.2 **Sewer Interruption:**
Capital and/or Engineering at HHS and Redevelopment and/or Building Services at SJHH are responsible to:

- Ensure that chemical toilets are available if required.
- Contact waste disposal companies if required.

6.6.3 **Infection Control Monitoring:**
IPAC is responsible to:

- Perform active surveillance to detect infections caused by organisms thought to be associated with construction activities.
- Assess infections, determine if they are healthcare associated and identify any risk factors and the interventions required to preventing a re-occurrence.
- Perform appropriate environmental monitoring for evidence of non-compliance (e.g.

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footprints in the dust or the presence of flies and insects).
- Perform regular audits of construction sites and/or renovation projects to ensure that preventive measures are being followed appropriately.
- Stop work if preventive measures are not being followed and notify Project Lead immediately. Complete and issue a Stop Work order (**Appendix G**) to the Project Lead for follow-up.

7.0 Mould Abatement

7.1 Staff should notify their Manager, Maintenance, OH&S and IPAC when they suspect or identify mould in their work area. Mould-affected areas can be classified as follows:
a) Level 1: small area, less than 1m^2
a) Level 2: medium-size area, 1 to 3 m^2
b) Level 3: large area, greater than 3 m^2 to 10 m^2
c) Level 4: extensive contamination of an area greater than 10 m^2 or numerous areas; and
d) Level 5: HVAC or domestic water systems contamination in any affected area.

7.2 Because mould can rapidly appear on cellulose and fibre-based materials, such materials shall be replaced if they have been wet for more than 48 h and have had multiple exposures to moisture. Mould Abatement procedures shall be performed by qualified abatement contractor or by operations and maintenance staff trained in abatement procedures.

7.3 Mould Abatement procedures shall be conducted in accordance with currently accepted protocols (e.g. the Canadian Construction Association Standard Construction document 82-2004, Mould Guidelines for the Canadian Construction Industry; the New York City Department of Health's Guidelines on Assessment and Remediation of Fungi in Indoor Environments; or IICRC S520 Mould Remediation Guidelines

7.4 Project Designate shall inform OH&S and IPAC of abatement operations.

8.0 Post Construction Phase

8.1 Exhaust fans shall run after the completion of construction to remove 99% of airborne contaminants in Preventive Measures I and II areas and 99.9% of airborne contaminants in Preventive Measures III and IV (see **Table 5** ***Time required for airborne contamination removal at efficiencies of 99% and 99.9%***).

8.2 Constructor to perform post construction clean.

8.3 IPAC together with the constructor shall do a final walk-through inspection of the area and complete **Appendix C**: Infection Control Completion of Construction/Renovation Checklist.

8.4 IPAC shall ensure that the construction area has been thoroughly cleaned (hospital clean) before building occupants are readmitted to the completed construction area

8.5 Multidisciplinary team shall review the preventative measures that were undertaken for the construction project and asses their effectiveness.

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9.0 Documentation

9.1 Documentation is to be kept by Capital and/or Engineering at HHS and Redevelopment and/or Building Services at SJHH and/or IPAC if required using the designated forms.

9.2 The Project Designate is responsible for completing **Appendix A** and submitting to IPAC for approval. IPAC is responsible for completing **Appendix B, C and D** and submitting to Project Designate.

- Preventative Measures Analysis **Appendix A**
- Infection Control Site Preparation Checklist **Appendix B**
- Infection Control Site Inspection during Construction Checklist **Appendix C**
- Infection Control Completion of Construction Checklist **Appendix D**

10.0 References

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SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) Duct Cleanliness for New Construction Guidelines, 2000

US Department of Health and Human Service's Guidelines for Environmental Infection Control in Health-care Facilities**.** Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). US CDC. 2003.

11.0 Developed By and In Consultation With

Infection Prevention and Control – HHS and SJHH
Capital and/or Facility Management at HHS and Redevelopment and/or Building Services at SJHH
Environmental Services
Occupational Health and Safety

12.0 Approved By

Regional Infection Prevention and Control

13.0 Appendix

Appendix A: Preventive Measures Analysis – to be completed during planning stages of construction/redevelopment

Table 1. Matrix: Class Precautions for Construction Projects by Patient Risk (Class I, II, III, IV)

Table 2. Type of Construction Activity

Table 3. Population Risk Groups and Geographical Areas

Table 4. Infection Control Precautions by Class

Table 5. Time required to remove airborne contaminate at efficiencies of 99% and 99.9%.

Appendix B: Infection Control Site Preparation Checklist
Appendix C: Infection Control Site Inspection during Construction Checklist

Appendix D: Infection Control Completion of Construction Checklist
Appendix E: HEPA filtered air sign
Appendix F: Infection Control sign for posting
Appendix G: Stop Work Order

Keyword Assignment	**Construction** **Renovation**

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Appendix A: Preventive Measures Analysis – to be completed during planning stages of construction/redevelopment/renovation

Project and Location
Proposed Start Date and Length of Project:
Description of Work and Preventive Measures :
Preventive Measures Analysis:
Type of construction activity as per CSA Stds A, B, C, or D:
Patient Population Risk Group 1, 2, 3, 4:
Preventive Measure (I, II, III, IV):
Other areas impacted (e.g., , above, below or adjacent to construction or connected by ducts, conduit space):
Additional requirements: (include additional information or drawings as necessary)
Contractor: **Contact Person:** **Phone #:** **Pager#:**

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Project Designate:	
Phone #:	**Pager#:**
IPAC Practitioner:	
Ext:	**Pager#:**
Analysis completed by :	
Signature:	**Date:**

Infection Control Risk Assessment Process (Adapted from CSA Z317.13-12)

General Instructions: Use the tables in the following order to determine the required Infection Prevention and Control Precaution

1. Use Table 2 to identify the **Type of Construction Activity.**
2. Use Table 3 to identify the **Patient Risk Groups** affected by the construction activity.
3. Use Table 1 to find the **Class of Precautions** by matching the **Patient Risk Group** with the **Type of Construction Activity**.
4. After following the previous 3 steps, refer to table 4 for a brief description of the required infection control precautions. Refer to the main body of the policy for additional Preventive Measures that must be followed during construction and renovation procedures.

TABLE 1. Matrix:
Class Precautions for Construction Projects by Patient Risk (Class I, II, III, IV)

Patient Risk Group	Type A	Type B	Type C	Type D
Group 1	**I**	**II**	**II**	**III/IV**
Group 2	**I**	**II**	**III**	**IV**
Group 3	**I**	**III**	**III/IV**	**IV**
Group 4	**I-III**	**III/IV**	**III/IV**	**IV**

Note: Infection Control **must** be consulted when the Matrix indicates that **Class III or IV** control procedures are necessary.

TABLE 2. Construction Activity Type

Type A	**Inspection and Non-Invasive Activities,** *includes, but not limited to:* • Activities that require single controlled opening in a wall or ceiling for minor work or visual inspection by removing no more than one ceiling tile or access panel • Painting (not sanding) or wall covering • Electrical trim work, • Minor plumbing that disrupts water supply for less than 15 min. in localized patient care area (ie. one room) • Other maintenance activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection

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Type B	**Small scale, short duration, minimal dust activities,** *includes but not limited to:* • Activities that require access to and use of chase spaces • Cutting a small opening in a contained space where dust migration can be controlled e.g. cutting of walls or ceilings to provide an access point for installing or repairing minor electrical work, ventilation components, telephone wires, or computer cables • Sanding, or repair of small area of walls • Plumbing work that disrupts water supply for less than 30 min in more than one patient care area
Type C	**Activities that generates a moderate to high level of dust, cause a moderate service disruption, requires demolition or removal of any fixed facility component (e.g., a sink) or assembly (e.g., a countertop or cupboard) or cannot be completed in a single work shift,** *includes but is not limited to:* • Sanding of walls in preparation for painting or wall covering • Removal of floor coverings, ceiling tiles and casework • New wall construction • Minor duct work • Electrical work above ceilings • Major cabling activities • Plumbing work that disrupts water supply for more than 30 minutes but less than 1 hour in more than one patient care area
Type D	**Activities that generate high level of dust, activities that necessitate significant service disruptions and major demolition and construction activities requiring consecutive work shifts to complete,** *includes but is not limited to:* • Activities requiring heavy demolition or removal of a complete cabling system • New construction that requires consecutive work shifts • Plumbing work that disrupts water supply for greater 1 hour or more in more than one patient care area • Soil excavation

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TABLE 3. Population Risk Groups and Geographical Areas

Population Risk Group	Typical Areas
Group 1 **Lowest risk**	• Office areas (non-clinical) • Unoccupied wards • Public areas not intersecting a patient care area • Laundry and soiled linen sorting or storage areas • Physical plant workshops • Housekeeping rooms and closets
Group 2 **Medium risk**	• Patient care areas, unless listed in Group 3 or Group 4 • Outpatient clinics (except oncology and surgery) • Admission and discharge units • Waiting rooms • Autopsy and morgue • Occupational therapy areas remote from patient care areas • Physical therapy areas remote from patient care areas
Group 3 **Medium to high risk**	• Emergency (except trauma rooms) • Diagnostic imaging • Labour and birthing rooms without OR capacity • Nurseries for healthy newborns • Nuclear medicine • Hydrotherapy • Echocardiography • Laboratories • General medical and surgical wards (includes all areas including soiled and clean utility rooms) • Pediatrics • Geriatrics • Long-term care • Mental health • Food preparation, serving, and dining areas • Respiratory therapy • Clean linen handling and storage areas
Group 4 **Highest risk**	• Intensive care units (ICUs) • Operating rooms (including prep, induction, post-anesthetic care unit (PACU), and scrub areas) • Anaesthesia storage areas and workrooms • Oncology units and outpatient clinics for cancer patients • Transplant units and outpatient clinics for transplant patients • Wards and outpatient clinics for patients with AIDS or other immunodeficiency diseases • Dialysis units • Critical care nurseries (NICU) • Labour and delivery operating rooms • Cardiac catheterization and angiography • Interventional radiology • Interventional or high-risk diagnostic imaging • Cardiovascular and cardiology patient areas

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	• Endoscopy • Pharmacy admixture rooms • Medical device reprocessing • Clean and sterile storage • Burn care units • Animal rooms • Trauma rooms • Protective environment isolation rooms • Tissue culture laboratories • Bronchoscopy • Cystoscopy • Pacemaker insertion rooms • Dental procedure rooms

TABLE 4. Infection Control Precautions by Class

This is a description of the Infection Prevention and Control Requirements for Preventive Measures I, II,II and IV.

I	Project designate should Identify essential services that could be disruptive and appropriate measures to address disruption Constructors shall be responsible for: <u>Dust and control and cleaning of area following activity</u> • Use methods to minimize raising dust from construction activities • Cover patient care equipment and supplies to protect from dust exposure • Ceiling Tiles: Immediately replace when removed for visual inspection • The transportation route for clean supplies is not near contaminated materials • Avoid moving patients through work areas • Ensure the work area is cleaned with a HEPA vacuum after the work is completed. <u>Plumbing</u> • Schedule water interruptions during low user activity • Ensure faucet aerators are not used or installed • Maintain a dry work environment • Ensure gaskets and items made of materials that support the growth of Legionella are not used
II	**In addition to Preventative Measures I** Constructors shall be responsible for: <u>Dust Control</u> • Decrease airborne dust by cleaning with wet mop. Place walk off mat at entrance/exit • Sealing windows and unused doors, covering holes in the wall if exposed for >4 hrs • Water mist work surfaces to control dust while cutting • Remove and replace wet porous ceiling tiles; nonporous tiles can be removed, cleaned with an acceptable hospital disinfectant and replaced when dry • Debris should be covered during transport with a hard cover or dampened tarp and removed during low activity times.

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	HVAC • Block and seal air vents/duct openings before starting • Monitor the change or clean filters during construction as required • Remove or isolate HVAC system in areas where work is being performed to prevent contamination of the duct system • Disable supply and return to the area under construction. • Install a certified DOP tested portable negative air unit, which must be operated for 24/7 hours during the construction period • Housekeeping must increase area cleaning around the construction site along with adjacent rooms more frequently • When the permanent air handling system shall be used for exhausting air from the construction zone via a portable negative air unit, the following conditions shall be maintained: **a)** The air handling system is an exhaust system that leads directly to the outdoors; **b)** An engineering analysis is performed to ensure that the exhaust system continues to perform its intended function and that the operation of the HVAC system is not compromised. **c)** The operation of the exhaust fan shall be monitored and alarmed to building operations staff **d)** Alarmed in the construction zone **e)** If the conditions outlined in terms (a) to (c) cannot be satisfied, then the steps outlined in Preventive Measure III shall be followed. Plumbing Determine whether domestic cold, hot, and recirculation water lines will be affected by the construction. The assessment shall include: • Identifying plumbing lines that will need to be shut off or interrupted using existing valves; or isolated by additional valves; • Determining the method to be used to sanitize the water lines before occupancy; • Drafting the procedure to be used to sanitize the water system, including identifying the required equipment
III	**In addition to Preventative Measures I and II** Constructors shall be responsible for: • Notify Infection Prevention and Control to review and complete Site Prep and During Construction Check Lists Dust Control • Install impermeable dust barriers sealed from floor to ceiling including the areas above false ceiling. • The barriers must be two layers of 0.15mm (6mil) fire retardant polyethylene or and equivalent barrier and gypsum wall board protection approved by the multidiscipline team • Debris chutes for removal of construction materials, must be enclosed down to the waste container must also be enclosed. The chute room must have a negative pressure compared to non-construction area • Seal openings from removed tiles in the ceilings until replaced • Vacuum mechanical and electrical systems and spaces above drop or false ceilings if required • Remove protective clothing before entering patient care area

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	HVAC • Maintain negative pressure (-0.03 in wc) in construction area • Increase air filter exchange frequency • Ventilation system should be cleaned and balanced after completion of construction • Disable the ventilation system and seal duct openings in the construction area until the project is completed; • Maintain negative pressure within the construction area by using portable HEPA filter – equipped air filtration units that include pressure gauges and an alarm. Filters shall be monitored and replaced if clogged or functioning below the manufacturer's specifications; Ensure that the air is exhausted directly outside and away from intake vents and filtered through a HEPA filter. In conditions that prohibit exhausting exhaust outside, consult IPAC. Plumbing • Flush water lines at the site and in adjacent areas before patient occupation • Check temperatures before patient occupation
IV	**In addition to Preventative Measures I, II and III** Constructor shall be responsible for: • Notify Infection Prevention and Control to review /complete Construction Check Lists Dust and Control • Ensure that all access shall be from outside the occupied areas of the health care facility or construct anterooms at access points to the construction area if access is from within the health care facility • Place a walk-off mat outside and inside the anteroom to trap dust from equipment, debris and the shoes of personnel leaving the construction area. Walk off mats shall be sufficient size to ensure that the constructors have to place both feet on the mat at least once on exiting the construction area • Ensure constructors leave the construction area through the anteroom so that they can be vacuumed with a HEPA filter-equipped vacuum cleaner before leaving o Wear protective clothing that is to be removed each time they leave the construction area • Repair holes in hoarding walls within 8 hr or seal them temporarily • Carefully remove barrier walls and use short term protection to minimize environmental contamination

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TABLE 5. Time required for airborne contaminate removal at efficiencies of 99% and 99.9%.

	Time required for removal (min.)	
Air changes per hour (ACH)	**99% efficiency***	**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**

* Exhaust fans shall run after the completion of construction to remove 99% of airborne contaminants in Preventive Measures I and II areas.
**Exhaust fans shall run after the completion of construction to remove 99.9% of airborne contaminants in Preventative Measures III and IV areas.

Values apply to an empty room with no aerosol-generating source. Removal times will be longer in rooms or areas with imperfect mixing or air stagnation.
Note: This table has been adapted from Table B.1 of the US Department of Health and Human Service's Guidelines for Environmental Infection Control in Health-care Facilities**.**

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Appendix B: Infection Control Site Preparation Construction Checklist

Project: _____

Project Lead:_____

Construction Company:_____

Date: _____ **Signature:** _____

Date:_____**Signature:**_____

Completed by Infection Prevention and Control.

Page 1 of 3

Infection Control Measures	**Yes**	**No**	**N/A**
1. All equipment and supplies have been removed by hospital personnel or covered with poly			
2. Proper directional signage is posted for pedestrians.			
3. Entry/exit procedures are defined for workers.			
4. Entry/exit paths are free of obstruction/debris.			
5. Designated elevators and times for use are defined for workers. Elevator cab number:_____ Specify times for debris/material removal:_____			
6. Carts with lids/wet sheets available for debris removal.			
7. Proper debris removal procedures are defined for workers.			
8. Daily cleaning procedures are defined for workers (clean, HEPA equipped vacuum, wet mop).			
9. Tack mats are in place at exits *both inside and outside of anterooms*			
10. Disposable overalls/head and shoe coverings are available for construction workers entering invasive procedure areas. (e.g. OR)			
11. Workers are aware of special precautions required for invasive procedure areas (i.e. wiping off tools and equipment, disposable overalls, etc.)			
12. Barriers			
a) Minor Projects (<24 hours, generating minimal dust)			
• Fire rated 12 mm or double layer 6 mm poly sheeting is in place			
b) Major Projects (producing high levels of dust)			
• Barriers are rigid, dust proof and fire rated e.g.: dry wall			
• Dry wall barrier seams are caulked or taped			
• Entry doors have gasketed frames			
• Wall perimeters/penetrations are sealed			
• Anteroom present (for removal of clothing and tool storage)			

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• Entry area is cleared after barrier construction			
• Exterior windows are sealed			
13. HEPA filter vacuum is available for cleaning and has been DOP certified within the past 12 months **Date tested**:_____			
14. Contractor has consulted with Facility Engineering Department to determine if HVAC is to be disabled or airflow altered.			
15. Ductwork is sealed/capped within the construction area.			
16. All air from construction area is either vented to the outside. In cases where air cannot be exhausted directly, air may be HEPA filtered for re-circulation into building areas occupied by only Risk Group 1 or 2.			
17. Monitoring system for negative air pressure is in place. Negative air pressure measures a minimum of -0.03 in wc **Air pressure reading**:_____			
18. HEPA filter units are DOP certified with documentation and will operate continuously. **Date tested**:_____			
19. Verify that sealed penetrations and ceilings are intact in areas adjacent to construction area.			
20. Workers are aware that IPAC and area managers must be notified if water or sewer interruptions are to take place so that any necessary provisions can be made. Details: _____ _____			
21. Wall, ceiling and floor coverings to be used are defined and approved. (In accordance with CSA Z8000-11 Canadian Healthcare Facilities)			
22. Sinks and plumbing to be used are defined and approved. (In accordance with CSA 317.1-09 Special requirements for plumbing installations in health care facilities)			
23. If required, baseline environmental monitoring has been defined and performed by qualified personnel.			
24. Pre-construction IPAC education in-service has been completed for construction workers.			
25. Pre-construction IPAC in-service has been completed for affected health care workers.			
26. Exterior windows are closed and sealed.			
27. The Constructor has been provided with a copy of the Healthcare facilities IPAC Guidelines for Construction and Renovation Precautions Policy.			
28. Infection Control signoff sticker is posted at the entrance to the project after pre-construction checklist approved.			

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29 Housekeeping/EVS are aware that increased cleaning in areas adjacent to the construction area (e.g. corridors) may be required			
Non-compliance(s) found:			
Action Taken:			

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Appendix C: Infection Control During Construction Routine Checklist

Project: _____

Project Lead: _____

Construction Company: _____

Date: _____ **Signature:** _____

Date: _____ **Signature:** _____

Completed by Infection Prevention and Control.

Page 1 of 2

Infection Control Measures	**Yes**	**No**	**N/A**
1. Daily cleaning procedures are being followed.			
2. Tack mats are in use and replaced as needed.			
3. Barriers			
a) Minor Projects (<24 hours, generating minimal dust)			
• Fire rated double layer 6mm poly sheeting is intact, seams are sealed			
b) Major Projects (producing high levels of dust)			
• Rigid barriers are intact, seams are sealed			
• Wall perimeters/penetrations are sealed			
• Construction Air Handling Units (CAHU) are in use			
4. CAHUs are running continuously; and filters are changed promptly when indicator light comes on.			
5. Monitoring system for negative air pressure is in use and reading correct pressure differential. (-0.03 in wc) Pressure reading: _____			
6. Workers are using only the designated traffic routes at the specified times.			
7. Doors to entry/exit areas are closed.			
8. Exterior windows are closed and sealed.			
9. General cleanliness of entry/exit areas is being maintained and daily cleaning procedures are being followed.			
10. Visual evidence of non-compliance is present. (e.g. dusty foot prints outside construction area, flies and insects inside sealed areas)			
11. Construction workers are wearing appropriate coverings when entering construction zones in invasive procedure areas.			
12. Water is available for misting to control dust if required.			
13. Contractor tools and ladders are secured when workers off site			

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Noncompliance(s) found: _____ _____ _____ _____ _____ Actions taken: _____ _____ _____ _____ _____ _____			

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Appendix D: Infection Control Project Completion Checklist

Project: _____

Project Lead:_____

Construction Company:_____

Date: _____ **Signature:** _____

Date: _____ **Signature:** _____

Completed by Infection Prevention and Control.

Page 1 of 1

Infection Control Measures	**Yes**	**No**	**N/A**
1. HEPA filter unit has run after the completion of construction to remove airborne contaminants.			
2. Constructor has performed initial construction grade clean of the area.			
3. Hospital Environmental services have performed a secondary hospital grade clean of the area.			
4. Final air monitoring testing is performed (if required).			
5. Barrier materials are removed after environmental cleaning.			
6. Constructor has confirmed that water lines have been flushed appropriately. Water taps have run until water colour is clear and drains are running freely.(if required)			
7. Constructor confirmed that HVAC is clean and functioning. Air balancing has been completed for critical areas.			
8. All ceiling tiles replaced/no open ceiling spaces			
9. Other:			

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Appendix E: HEPA Filter Air Sign- To be used if filtered air cannot be vented externally

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Appendix F: IPAC Sign-Off Sign

Hamilton Health Sciences St. Joseph's Healthcare Hamilton

This construction project has been inspected and approved by the *Infection Prevention and Control* department.

Location/Project: _____

Date: _____ Signature: _____

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Appendix G: Stop Work Order

Stop Work Order

A stop work order can be issued by the facility Infection Prevention and Control (IPAC) Practitioner upon identifying breaches in preventive measures that are not adhered to. Breaches can put patients and staff at risk for hazardous or infectious processes.

- Stop work can be issued when repeated breaches in IPAC preventive measures are identified and/ or not corrected in a timely manner.
- An IPAC During Construction Checklist will be completed by the IPAC department and provided to the MRP. This checklist will explicitly list the reason for the stop work order and the affected area where the deficiency/breach was identified.
- Remedial work will be permitted to correct the deficiencies.
- To lift a stop work order, a re-inspection will be performed to ensure corrective measures have been taken and deficiencies corrected.

Date Issued: _____Time of Issue:_____

Issued to:_____

Stop Work Order Issued by:_____

Requested Action to Comply and Lift Stop Order:

_____

_____

_____

Re-inspection Completed by:_____

Date Work can Resume:_____

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