

CONSTRUCTION, RENOVATION, AND MAINTENANCE TOOLKIT

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A **PRINTED** copy of this toolkit may not be the most recent version.

Purpose

Construction, renovation, and maintenance projects in healthcare facilities pose a potential threat of infection to current and future occupants, particularly those with reduced immunity¹. This toolkit provides guidance and resources to reduce the risk of healthcare-associated infections caused by the dispersal of dust, bacteria, and fungi into the environment during construction, renovation, and maintenance activities by:

- Protecting patients, visitors, contractors, and health care providers.
- Providing tools for clear communication between all stakeholders.
- Ensuring adherence to CSA Z317.13-22 and CSA Z8000-18 (or latest editions).
- Ensuring Infection Prevention and Control (IPAC) is included in **all** steps of construction, renovation, and maintenance.

Introduction

During construction, maintenance, and renovation activities, environmental sources including soil, water, and dust that may be contaminated with fungal spores, bacteria, or other micro-organisms, can be dispersed into the environment. When disturbed these pathogens can lead to increased risk of serious infections, including death¹. This Construction, Maintenance, and Renovation Toolkit has been adapted from the Alberta Health Services Infection Control Risk Assessment (ICRA) and Preventive Measures Toolkit for Construction, Renovation and Maintenance. This toolkit should be used during any construction activities to identify risk factors, implement preventative measures, and minimize the risk of healthcare-associated infections.

What is a Construction Activity?

“Construction activity” is defined as major and minor facility activities that disturb or modify facility structures and systems. This includes all new construction, renovation, maintenance, repurposing, and remediation activities. [CSA 317.13-22: 3.1]¹

At the initial stages of design and planning, the completion of an Infection Control Risk Assessment (ICRA) by the multidisciplinary team (MDT) is an essential component of all construction activities in a healthcare facility.

Modification of a facility or area with the intent to change the original function is considered new construction and shall necessitate the need to meet the current and applicable standards. [CSA 317.13-22: 3.1]¹. Any situation that poses a risk to patients and health care providers shall be reported immediately [CSA Z317.13-22: 6.1.14]³. For more information on construction renovation and maintenance related risks, see CSA Z317.13-22, Section 0.1-0.3³.

Definitions

Adjacent areas

All areas surrounding an area where construction, renovation, or maintenance work is occurring, including, where applicable, all or part of the floors above and below.

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.

Canadian Standards Association

The organization that develops standards related to construction including healthcare facilities.

Commissioning (commissioning process)

A systematic verification, documentation, and training process applied to all activities during the design, construction, static verification, start-up, and functional performance testing of equipment and systems in a facility to ensure that the facility operates in conformity with the owner's project requirements and the basis of design in accordance with the contract documents.

Construction

Major and minor facility activities that disturb or modify facility structures and systems, the term includes not only construction but also renovation, maintenance, and repair work.

New construction

Construction to produce all or part of an HCF that did not exist before the project, including modification of a facility or area with the intent to change the original function. Included as a "construction activity."

Construction air handling unit (CAHU)

A machine used to move HEPA-filtered air into or out of a construction site.

Construction clean

Cleaning performed at the end of a workday by construction workers that removes gross soil and dirt, construction materials, and workplace hazards.

Note: Cleaning to the "construction clean" level may include sweeping and vacuuming but usually does not address horizontal surfaces or areas adjacent to the job site.

Constructor

A person who undertakes a construction or renovation project for an owner. A constructor can be a contractor, subcontractor, construction manager, construction worker, or tradesperson. The term also includes an owner who personally undertakes all or part of a construction or renovation project.

Continuing care

A range of services that support the health and wellbeing of individuals living in their own home, a supportive living or long-term care setting. Continuing care clients are defined by their need for care, not by their age or diagnosis or the length of time they may require service.

Critical care area

A patient care area where the induction and maintenance of general anaesthesia routinely occurs in connection with the examination or treatment of patients, or where contact between patients and medical electrical equipment is frequent or normal.

Dust barrier (hoarding)

Impermeable dust barrier from floor to the underside of the deck (including the areas above false ceilings) consisting of polyethylene and gypsum wallboard.

Environmental containment unit (ECU)

A collapsible and portable containment unit to protect the environment from the dispersal of contaminants.

Environmental services

A department that provides the following services which includes general housekeeping, waste management, pest control, and hazardous material cleanup.

Hand Hygiene

A general term referring to any action of hand cleaning. Hand hygiene relates to the removal of visible soil and removal or killing of transient microorganisms from the hands. Hand hygiene may be accomplished using soap and running water or an alcohol-based hand rub. Hand hygiene includes surgical hand antisepsis. [Hand Hygiene for Construction, Renovation and Maintenance](#).

HEPA (high-efficiency particulate air) filter

An air filter with an efficiency of 99.97% in the removal of airborne particles 0.3 µm or larger in diameter.

Infection control risk assessment (ICRA)

A process used to identify design elements that increase the risk of microbial transmission in the environment.

Note: An ICRA considers the facility's patient population and clinical programs, and the potential effects of disruptions to essential services (e.g., water, ventilation, electricity) that could affect patient placement or necessitate relocation of patients.

Infection Preventionist

Trained individual responsible for a health care setting's infection prevention and control activities.

Infection Control Construction Consultant

A professional with demonstrated education and training, knowledge, and experience who advises on and monitors required infection prevention and control strategies, approaches, methods, and measures relative to construction methodologies for Capital Planning Projects. Note: This term refers to a person who provides specific consulting services during a project, and is distinct from the IP, i.e., an individual who has received training in infection prevention and control and whose primary responsibility is infection control and prevention in a healthcare setting. An ICP can act as an infection control construction consultant during a project, but not all such consultants are ICPs.

Patient care area

An area within a health care facility (including a contracted facility), hallway or lobby, which is accessible to patients, residents or clients who are there to access care or services. This includes any other location where care is provided, such as home and community care locations (including a client's home). It does not include locations such as administrative areas or private offices which are not generally accessed by patients, residents, or clients.

Maintenance

A type of construction activity conducted to preserve the condition and functionality of a physical element of a health care facility. See Construction

Note:

- Maintenance can be performed by an equipment supplier, contractor, or facility-based operation and maintenance workers.
- The term “maintenance” also covers repairs.

Multidisciplinary team (MDT)

A group comprising representatives from various disciplines in the health care facility that works with the project management team and others to ensure that the appropriate infection prevention and control measures are followed during construction activities.

New construction

A project intended to produce a complete health care facility, or a new section of an existing facility, which did not exist prior to the project.

Patient

A person who is waiting for or undergoing medical investigation, care, or treatment.

Note: This guideline uses “patient” as a global term applying to all Health Care Facilities (HCFs). Some HCFs prefer to use alternative terms such as client, resident, or occupant.

Patient care area

An area within a health care facility (including a contracted facility), hallway or lobby, which is accessible to patients, residents or clients who are there to access care or services. This includes any other location where care is provided, such as home and community care locations (including a client's home). It does not include locations such as administrative areas or private offices which are not generally accessed by patients, residents, or clients.

Personal protective equipment

Items that when worn correctly form a barrier or shield against hazardous materials.

Plumbing dead leg

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

Plenum box (Remote HEPA Module)

An air distribution box designed with the intent to baffle the air discharged from a CAHU, reducing channelled air from turbulent to laminar flow, while providing additional HEPA filtration (Plenum Box).

Preventive measure

A system involving precautionary actions, equipment, and barriers at each phase of a project to decrease the spread of contaminants during construction, renovation, or maintenance of a health care facility.

Preventive measures analysis

The process of evaluating construction-related risks to patients and health care providers and determining the preventive measures that will be necessary to mitigate those risks.

Renovation

Construction to modify or upgrade an existing HCF to be used for similar purposes. Also included as a “construction activity.”

Return to Service Cleaning

The thorough cleaning of a clinical space following construction and before the space is used for patient care, medical equipment, or the storage of clean or sterile supplies, to remove contaminating micro-organisms that could be acquired by subsequent occupants or health care providers.

Unoccupied space

An area where there are no patients or patient-related activities and that is absent of any medical supplies or equipment. Unoccupied spaces may include vacant wards, basements, shelled spaces for future development, or spaces only accessed for equipment servicing. Patient care areas that are intermittently unoccupied due to designated working hours are not considered unoccupied spaces.

User

Person occupying or performing an activity in a building, area, or room intended for that purpose (e.g., diagnosis, treatment, waiting, dining, etc.).

Walk-off 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 workers.

Note: Walk-off mats include, for example:

- Mats for removal of sand and winter road salt.
- Mats with a sticky surface.
- Sections of carpet made with synthetic fibers; or
- Antibacterial mats that include a frame allowing for placement of antibacterial solutions.

Roles and Responsibilities

Multidisciplinary Team

What is a Multidisciplinary Team (MDT)?

A group of professionals from various disciplines in the healthcare facility that work with the project management team and others to ensure that the appropriate infection prevention and control measures are followed during construction activities.

Membership on an MDT shall include Infection Prevention and Control (IP), Facilities Maintenance and Engineering (FMO), Operational and/or Clinical Representative, Project Management, Infection Control Consultant for Capital Planning Projects, Environmental Services, Design (Architects and Engineers), Administration, Clinical Care, Risk Management and Constructors (Z317.13-22, 6.2.1.5)³.

- Determines Class of Preventative Measures as per CSA Z317.13-22, Table 1 Preventive Measures Analysis, (pg. 163) and Table 2 Population Risk Groups and Geographical Areas (pg. 164).
- Ensures a [Scope of Work Plan](#) is **completed and approved prior** to commencement of work. Constructor may use own template.
- Organizes regular project meetings to review infection control progress/issues as required.
- Ensures the infection control tools at the end of this document are utilized.
- Determines which projects require one or more members to visit/review the work area on an ongoing basis to ensure adherence of preventative measures.
 - Reviews contractor Infection Prevention and Control Site Monitoring Tool (Form 5).
- Has the authority to stop work activities if there is a significant safety risk due to failure of adherence to the required infection control preventative measures. If work stoppage is required, inform the project manager ASAP.
 - Review the steps in the [Stop Work Order Procedure](#).
 - Ensures the Emergency Contact List is posted outside the hoarding.
- Ensures that the construction area has been terminally cleaned by environmental services before occupancy.
- Ensures that infection control requirements have been met upon project completion and/or commissioning.

Infection Preventionist (IP)

- Participates as a member of the MDT for preventative measures III and IV projects from planning through completion/commissioning.
 - [Infection Prevention and Control Preventative Measures Tool](#).
- Provides input on facility infrastructure as per the CSA Z8000-18 (or latest edition).
- Reviews [Scope of Work Plan](#) with MDT and may approve and sign the [Infection Control Measures Permit](#) **prior** to project commencement (may be exception for Capital Projects).

- Provide education for Facilities Maintenance and Operations Workers (FMO) and external contractors.
 Note: Learning Hub online education module [Infection Control During Construction, Renovation and Maintenance](#).
- When there is high-risk work being done (i.e., ventilation, water supply) ensures there is a plan in place to monitor construction related infections.
- Establishes guidelines for all health care providers pertaining to traffic control and pattern that avoids patient care areas and for moving clean or sterile supplies that avoids the construction area (CSA Z317.13-22, Annex B)
- Makes recommendations for cleaning procedures in collaboration with Environmental Services for areas adjacent to the construction area (CSA Z317.13:22, Annex B)³, as well as the construction area once project is complete.
 - [Infection Prevention and Control Post Construction Tool](#)
- Participates in risk assessment when identifying design elements such as fixtures, finishes, etc., as per CSA Z8000-18, as well as ensuring high risk patients are kept safe with the appropriate preventive measures.
 - *Legionella* surveillance shall be conducted before, during and after construction.
 - Surveillance shall include any changes in infection rates and patterns during the construction, renovation, and maintenance projects (CSAZ317.13.22, Annex B).

Project Manager

- Participates as a member of the MDT as well as deciding who is represented at planning, design, construction, and commissioning meetings.
- Oversees and coordinates the activities of healthcare facility personnel and consultants involved in the construction project.
- Manages the information flow amongst members of the MDT with regular meetings and updates.
- Ensures consultants and constructors selected for the project understand the requirements of the CSA 317.13-22 Standard, and their responsibilities for these requirements (CSA 317.13-22, 6.3.4).
- Ensures IP is notified of **ALL** work involving Population Risk Groups 3 and 4.

Project Manager of Design & Standards for ALL Capital Planning Construction/Renovation Projects

- Liaise with IPAC leadership to identify the IP(s) who may support the construction aspect of the project and the designated MDT for the project. This individual will be responsible to review the [Scope of Work Plan](#) and complete the [Infection Control Measures Permits](#) and respond to subsequent Impact Notices.
- Works collaboratively with IPAC during all phases of each project as part of the MDT, to ensure compliance to IH and CSA design standards.

Design and Management Professionals

- Shall be responsible for providing design and construction documentation that meet requirements of the CSA Z317.13.-22 (6.3.7.1) and CSA Z8000.18, the infection prevention and control objective of the healthcare facility, the ICRA, and the requirements for dust barriers and control of recirculated air.
- Design professionals shall be responsible for issuing instruction to the constructor during construction on behalf of the facility and project MDT.

Constructor

- Completes section 3 of the [Infection Control Measures Permit](#) for levels III and IV projects (The MDT determines Preventative Measures Level).
Note: Preventative Measure I and II do not require an IC permit, however appropriate preventative measures shall still be utilized per CSA Z317.13-22.
- Submits the completed [Scope of Work Plan](#) to the MDT for approval **prior** to commencement of work (including initiation of hoarding process).
 - Provides MDT a minimum of five business days' notice to complete the [Infection Control Measures Permit](#).
- For ceiling lift and cable pulls installations only, complete the specific standardized permit: [Ceiling Lift Permit](#) and [General Ceiling Access Permit](#)
- During construction, constructors shall:
 - Implement preventive measures as agreed upon by MDT.
 - Supply, erect, and maintain the integrity of all barriers (e.g., hoarding) between the construction area and adjacent areas.
 - Maintains the construction site ventilation system by monitoring, maintaining, and logging temperature, humidity, and airflow via logs/checklists; ([Daily Preventative Measures Log](#) (optional, [IPAC Construction Site Monitoring Tool](#)))
 - Keeps contaminants within an acceptable limit.
 - Responsible for construction cleaning protocols at the construction site.
 - Be responsible for the actions of their employees and sub-trades.
 - Be responsible for the physical security of the construction site.
 - Ensure that material is kept clean and dry during delivery, storage, and installation.
 - Ensure that all gaps and holes leading to adjacent areas and floors above or below are securely sealed (CSA Z317.13.22, 6.3.9)³.
- Construction activities can commence once the [Infection Control Measures Permit](#) has been **signed** by the MDT and **posted** at the construction site. The permit must remain posted for the duration of the project.
- Complete the [Daily Preventative Measures Log](#) and post outside the construction zone. Frequency of checks to be determined by the MDT.
- [Hand hygiene practices](#) shall be followed.
- Dress code to be dictated as per clinical work setting. Clothes must be clean and not a risk to contaminate areas outside the construction area.

Environmental Services

- Participates as a member of the MDT for preventative measures III and IV projects from planning through completion/commissioning.
- Responsible for keeping areas adjacent to the construction site, as well as access and egress routes clean and clear of obstructions – this is to be determined by the MDT before construction begins and is documented in the work plan (CSA Z317.13-22, 6.3.5).
- Terminally cleans construction area as directed by MDT before any occupancy of health care providers and/or patients (more than one terminal clean may be required).

Operations and Maintenance Workers

- Operations and maintenance workers (FMO) shall be made aware of the building occupants that may be at risk and any impacts a project could have on construction related infections.
- Prior to any modifications, maintenance, or renovations, the condition of the existing systems shall be reviewed, assessed, and documented to create a baseline of information.
- During renovation projects, FMO shall coordinate with constructors to ensure that contamination of air, water, medical gas, and other systems are prevented.
- HVAC systems and air systems are checked at least daily, and status and alarms are monitored.
- During heavy construction, air system filters shall be monitored at least daily and replaced if necessary to maintain the design parameters of the air handling system.
- FMO workers shall be involved in the commissioning of systems in newly constructed and renovated areas to become familiar with their operation, and all workers are appropriately trained on these systems so that future maintenance can be performed properly (CSA 317.13-22 6.3.8).

Procedure

- Construction activities shall include IPAC personnel in the project planning stages prior to blueprint creation, contracting and commencement of activities. (CSA Z317.13-22: 6.2.1.5, 6.2.2, 6.3.2)¹, (CSA Z8000-18: 4.3)
- There shall be an assessment of occupied areas adjacent to the construction area, and the systems serving those areas, to identify potential risks to the occupants. [CSA Z317.13-22: 6.1.3]¹
- An infection control risk assessment (ICRA) shall be conducted before construction, renovation, and maintenance begins on **any** project involving preventive measures III or IV (PM III or IV) and Population Risk Group 3 or 4. For other projects (PM I or II), an ICRA should be conducted. [CSA Z317.13-22: 6.1.3]¹
 - *Note:* Sufficient advance notice allows the MDT to make the appropriate preparations and organize alternative arrangements if needed. Notice should be provided **at least five business days in advance**.
 - *Note:* IP is to be made aware of any work impacting a Group 3 or 4 population risk area

What is an Infection Control Risk Assessment (ICRA)?

A process used to identify design and construction elements that increase the risk of microbial transmission in the environment (CSA Z317.13-22¹).

What is a Preventative Measures Analysis (PMA)?

The process of evaluating construction related risks to patients and health care workers and determine the preventative measures that will be necessary to mitigate those risks (CSA Z317.13-22¹).

- For new construction and contracted renovations, the ICRA and preventive measures, analysis shall be completed collaboratively by MDT before construction begins. [CSA Z317.13-22: 6.1.3, 6.1.4]¹
 - *Note:* The project manager confirms that ICRA and preventive measures analysis is completed by the MDT and is documented in the project records.
- ICRA and Preventive Measures Analysis (PMA) shall be included in tendering documents. [APIC: 117]⁴, [CSA Z8000-18: 4.5.1.3, 4.5.5, 5.3.1.1]², [CSA Z317.13-22: 6.1.6]¹
- The constructor leadership shall have demonstrated experience and knowledge of the principles and practices of infection control during construction.
 - *Note:* Experience and knowledge of infection control during construction may be demonstrated, for example, by presenting proof of training classes completed, documentation showing work on HCFs in the past, or work performed with experienced supervisors. [CSA Z317.13-22: 6.1.7]¹
- Development of a written infection control plan, describing the procedures, process, and safeguards for the specific construction project shall be completed by the constructor or their qualified representative. [CSA Z317.13-22: 6.1.5, Annex D]¹

What is an infection control plan?

A sequence of events that includes:

- Healthcare Facility identification of potential risks, done through an ICRA.
- Communication of risks and preventive measures in tendering documents.
- Contractor development of infection control plan that is appropriate to the project
- MDT approval of the infection control plan.
- Implementation of the infection control plan, including the necessary training of personnel.
- Updating the infection control plan as needed throughout the project
- Adapted from: CSA Z317.13-22, 6.1.6

- A documented plan for meeting the required PMA shall be completed and reviewed by the project MDT including the contractors. [CSA Z317.13-22: 6.1.5]¹.
- PMA identified shall be implemented, monitored, and updated as required. If the scope of the construction activity changes, a new ICRA shall be required [CSA Z317.13-22:6.1.10]³, [APIC: 117]⁷.
- For construction activity that involves ceiling access for minor work or inspection, refer to CSA Z317.13-22 Annex K for specific recommendations and preventive measures.
 - Note: Use [General Ceiling Access Permit](#) or [Ceiling Lift Permit](#) for all ceiling lift installations.
- Monitoring of construction activity is a shared responsibility between the project MDT members (IP, Project Management, and FMO, etc.). A documented monitoring plan shall be developed, reviewed, and implemented. [CSA Z317.13-22: 6.1.11]³.
- Written protocol for a stop work order shall be identified prior to beginning work. A stop work plan will include lines of authority, communication, investigation, and remediation prior to restarting activity. [CSA Z317.13-22]³ [APIC: 117]⁷. See [Stop Work Order Procedure](#).
- The facility shall have an IP education plan for health care providers and external contractors regarding construction related potential risks and preventive measures. [CSA Z317.13-22: 6.3.2.1]³, [APIC: 117]⁷.
- Food and drink (other than water) shall be prohibited on all construction sites, except in designated eating areas (e.g., a lunchroom or trailer). [CSA Z317.13-22: 6.1.16]³.
- Infection prevention and control personnel should ensure an effective surveillance system is in place to monitor patients for Legionella if soil excavation takes place on, or in proximity to, HCF grounds; or the water supply has been disrupted and then repressurized [CSA Z317.13-22 6.3.2.2]³.
 - Note: Any lab-confirmed clinical cases of Legionella will be investigated.

Hand Hygiene Sinks

Hand Hygiene is considered the most important and effective infection prevention and control measure to prevent the spread of healthcare-associated infections [BC Ministry of Health]⁷. Having access to free-standing hand washing sinks dedicated to hand hygiene, and used for no other purpose, should be part of any facilities Hand Hygiene Program [BC Ministry of Health]⁷. Construction activities that include installation or replacement of sinks should consult the CSA Z8000-18 to ensure that hand hygiene sinks meet all requirements. Interior Health has created a resource document: [Recommended Hand Hygiene Sinks](#).

Tools and Permits

[Infection Control Measures Permit \(ICRA\)](#)

[General Ceiling Access Permit](#)

[Ceiling Lift Permit](#)

[Scope of Work Plan](#)

[Daily Preventative Measures Log](#)

[Infection Prevention and Control Construction Site Monitoring Tool](#)

[Infection Prevention and Control Preventative Measures Tool](#)

[Infection Prevention and Control Preventative Post Construction Tool](#)

[IH Recommended Hand Hygiene Sinks](#)

[Stop Work Order Procedure](#)

[Hand Hygiene for Construction, Renovation and Maintenance Activities](#)

[IPAC Use of Remote HEPA Unit \(Plenum Box\)](#)

References

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	Entirely new format for document		Updated resources and current CSA standard.
			New format in toolkit.
			Inclusive of new tools and permits.