

Z317.13-03

***Infection Control during
Construction or Renovation
of Health Care Facilities***

Update No. 1

Z317.13-03

January 2004

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A National Standard of Canada
(approved January 2004)

Infection Control during Construction or Renovation of Health Care Facilities



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Preface

This is the first edition of CSA Z317.13, *Infection Control during Construction or Renovation of Health Care Facilities*. It is part of a series of Standards related to health care facility engineering and sets forth preventive measures intended to protect patients, staff, and visitors from disease transmission and other health problems, such as allergic reactions, that can be produced by the construction or renovation of health care facilities.

This Standard was developed after evidence from many health care facilities indicated that serious health risks for patients, staff, and visitors are created during construction and renovation by the dispersal of dust particles contaminated with bacteria and fungi. The evidence led to the conclusion that early planning in construction and renovation projects must integrate infection prevention and control, engineering services, and building design to prevent infections and minimize allergen load and other workplace hazards.

This Standard is based on *Construction-related Nosocomial Infections in Patients in Health Care Facilities: Decreasing the Risk of Aspergillus, Legionella and Other Infections* from the Nosocomial and Occupational Infections Section, Health Care Acquired Infections Division, Centre for Infectious Disease Prevention and Control, Population and Public Health Branch, Health Canada, Ottawa, Ontario, Canada.

This Standard was prepared by the Subcommittee on Infection Control during Construction or Renovation of Health Care Facilities under the jurisdiction of the Technical Committee on Health Care Facility Engineering and Physical Plant and the Strategic Steering Committee on Health Care Technology. It has been formally approved by the Technical Committee.

April 2003

Notes:

- (1) Use of the singular does not exclude the plural (and vice versa) when the sense allows.
- (2) Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.
- (3) This publication was developed by consensus, which is defined by CSA Policy governing standardization — Code of good practice for standardization as “substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity”. It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this publication.
- (4) CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee.
- (5) All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.
Requests for interpretation should
 - (a) define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;
 - (b) provide an explanation of circumstances surrounding the actual field condition; and
 - (c) be phrased where possible to permit a specific “yes” or “no” answer.

Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are published in CSA’s periodical Info Update, which is available on the CSA Web site at www.csa.ca.

Z317.13-03

Infection Control during Construction or Renovation of Health Care Facilities

0 Introduction

0.1

More than 30 reports published between 1975 and 1995 have documented incidents in health care facilities of construction-related infections caused by *Aspergillus*, *Legionella*, and other agents. See Health Canada's *Construction-related Nosocomial Infections in Patients in Health Care Facilities: Decreasing the Risk of Aspergillus, Legionella and Other Infections*. The mortality rate for aspergillosis (i.e., an *Aspergillus* infection) and legionnaires' disease (one of the diseases caused by *Legionella*) acquired in health care facilities is high (65 to 100% for the former, 24 to 80% for the latter), even when these infections are recognized and treated. Thus, precautionary measures are a priority.

The occupants of the health care facility, their proximity to the construction or renovation areas, and the type of construction activity in and around the facility are examples of issues that need to be addressed when a construction or renovation project is undertaken by a health care facility. Immunosuppressed patients are at greatest risk of acquiring a fungal or bacterial infection. This group includes patients who have undergone bone marrow or solid organ transplants, patients receiving dialysis, patients taking immunosuppressive medications (including steroids), and oncology patients receiving chemotherapy. Assessment of the risks to occupants of the health care facility is necessary before construction or renovation begins.

0.2

Aspergillosis acquired in health care facilities can cause severe illness in, or the death of, immunocompromised patients. Aspergillosis is acquired primarily by inhalation of fungal spores, which can lead to pneumonia following local lung tissue invasion. The fungus can also disseminate through the bloodstream to involve deep organs. Aspergillosis is difficult to diagnose and treat; consequently, there should be an emphasis on prevention and improved detection.

0.3

Legionnaires' disease is a preventable pneumonia for which both vigilant surveillance of possible health care facility sources of legionellosis (i.e., a *Legionella* infection) and confirmation by laboratory tests are required.

0.4

Assessing the risks to health care facility occupants and preventing and detecting fungal and bacterial infections require a multidisciplinary team approach to

- a) improve understanding of the issues;
- b) identify responsibilities; and
- c) implement suitable avenues of communication between responsible parties.

1 Scope

1.1

This Standard describes precautionary and remedial measures for preventing exposure to agents released or augmented because of actions undertaken during health care facility construction, renovation, maintenance, and repair work.

Notes:

- 1) In this Standard, the term "construction" includes not only construction but also renovation, maintenance, and repair work, unless the context indicates otherwise.
- 2) This Standard does not cover all maintenance activities.

1.2

This Standard is intended to apply to the activities of

- a) architects;
 - b) engineers;
 - c) commissioning teams;
 - d) constructors (as defined in Clause 3);
 - e) infection prevention and control personnel;
 - f) planning and project managers;
 - g) facility managers and maintenance managers;
 - h) environmental services staff;
 - i) medical and nursing staff; and
 - j) occupational health hygiene professionals
- involved in any aspect of construction or renovation in occupied health care facilities.

1.3

This Standard has been developed for use during the project specification phase of construction projects and as a guideline for preventing and controlling construction-related fungal and bacterial infections during the construction phase of projects.

1.4

In CSA Standards, "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; "should" is used to express a recommendation or that which is advised but not required; and "may" is used to express an option or that which is permissible within the limits of the standard. Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material. Notes to tables and figures are considered part of the table or figure and may be written as requirements.

2 Reference Publications

This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below.

CSA (Canadian Standards Association)

CAN/CSA-Z317.1-99

Special Requirements for Plumbing Installations in Health Care Facilities

CAN/CSA-Z317.2-01

Special Requirements for Heating, Ventilation, and Air Conditioning (HVAC) Systems in Health Care Facilities

Z318.1-95 (R1999)

Commissioning of HVAC Systems in Health Care Facilities

Z318.3-95 (R1999)
Commissioning of Plumbing Systems in Health Care Facilities

Health Canada

Construction-related Nosocomial Infections in Patients in Health Care Facilities: Decreasing the Risk of Aspergillus, Legionella and Other Infections. Canada Communicable Disease Report Supplement Volume 27S2, July 2001

IICRC (Institute of Inspection, Cleaning and Restoration Certification)

S500
Standard and Reference Guide for Professional Water Damage Restoration

Manitoba Department of Labour, Workplace Safety and Health Division

Guidelines for the Investigation, Assessment, and Remediation of Mould in Workplaces, March 2001

New York City Department of Health, Bureau of Environmental and Occupational Disease Epidemiology

Guidelines on Assessment and Remediation of Fungi in Indoor Environments, April 2000

3 Definitions

The following definitions apply in this Standard:

Aspergillosis — an *Aspergillus* infection.

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

Construction — major and minor building activities that disturb or modify building structures and systems. In this Standard, the term includes not only construction but also renovation, maintenance, and repair work, unless the context indicates otherwise.

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

Cytotoxic — destructive to cells.

Environmental services — health care facility services such as general housekeeping, waste management, pest control, and hazardous material cleanup.

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, they derive nourishment from breaking down organic matter. Many types of fungi reproduce by means of spores that are readily dispersed in air.

Granulocytopenia — an abnormal reduction of granulocytes in the blood. A granulocyte is a type of white blood cell.

Health care facility — a set of physical infrastructure elements supporting the delivery of health-related services.

HEPA (High-Efficiency Particulate Air) filter — an air filter with an efficiency of 99.97% in the removal of airborne particles 0.3 µ or larger in diameter.

Immunodeficiency — a decreased or compromised ability to respond to antigenic stimuli (stimuli capable of causing antibody production) with an appropriate cellular immunity reaction.

Immunosuppressive — acting to suppress the body's natural immune response to an antigen (a substance on the surface of a cell that stimulates the production of antibodies).

Ketoacidosis — acidosis (an increase in the acidity of the blood) resulting from an excess of ketone bodies (a group of substances in the blood that increase as a result of impaired carbohydrate metabolism).

Legionella — a genus of gram-negative bacteria found in soil, water, and dust.

Legionellosis — a *Legionella* infection.

Legionnaires' disease — an infection acquired by inhalation of aerosols contaminated with *Legionella pneumophila*.

Micro-organism — a minute organism not perceptible to normal or corrected-to-normal vision.

Mould — the fuzzy coating of fungus that grows on food surfaces and on many building materials that contain sufficient moisture. Mould spores are readily dispersed during excavation, demolition, and construction, and inhalation of some types can cause infections or allergic reactions in humans.

Neoplastic disease — any disease characterized by new and abnormal tissue formation.

Neutropenia — an abnormal reduction of neutrophils in the blood. A neutrophil is a type of white blood cell.

Occupant — a patient, resident, staff member, or visitor in a health care facility.

Pseudo-infection — a false-positive result produced by contaminated equipment during a test for infection.

Renovation — see **Construction**.

4 Risk Factors and Sources of Construction-Related Infections in Health Care Facilities

4.1 General

4.1.1

Construction projects in health care facilities pose a potential threat to occupants whose health status is affected by any of the conditions listed in Items c) through l) of Clause 4.2.

4.1.2

Contamination of laboratory specimens exposed to construction activities can result in pseudo-infections.

4.2 Risk Factors for Infections with Fungi or Bacteria

Risk factors for infections with fungi or bacteria include, but are not limited to,

- a) exposure to construction activities, including renovation and excavation;
- b) plumbing system malfunctions;
- c) immunosuppressive factors such as
 - i) bone marrow or solid organ transplantation;
 - ii) graft-versus-host disease requiring treatment;
 - iii) prolonged neutropenia or granulocytopenia resulting from cytotoxic chemotherapy;
 - iv) prolonged use of antibiotics to treat fevers or previous infections; and
 - v) steroid therapy or other immunosuppressive therapy;
- d) acquired immunodeficiency syndrome (AIDS);
- e) congenital immunodeficiencies;
- f) dialysis or renal failure;
- g) diabetic ketoacidosis;
- h) pulmonary ventilation or chronic pulmonary disease;
- i) cardiac failure;
- j) neoplastic disease;
- k) surgery or other invasive medical procedures; and
- l) extreme youth (neonates) or extreme old age.

4.3 Sources

4.3.1

Some of the environmental sources of infection in health care facilities include soil, water, and dust contaminated with fungal spores or bacteria.

The biological agents that can cause construction-related infections or allergic reactions include, but are not limited to,

- a) fungi (e.g., forms of the *Aspergillus* species such as *A. fumigatus*, *A. flavus*, *A. niger*, and *A. terreus*; *Candida tropicalis*; *Candida parapsilosis*; *Fusarium*; *Zygomycetes*; *Rhizopus indicus*; *Mucoraceae rhizopus*; and *Scedosporium prolificans*); and
- b) bacteria (e.g., *Nocardia asteroides* and forms of the *Legionella* species such as *L. pneumophila* and *L. bozemanii*).

4.3.2

Contamination can be caused by many factors during construction, including

- a) inadequate preparation and quality control;
- b) inadequate or uncontrolled ventilation;
- c) improper or inadequate containment of construction activities;
- d) improper or inadequate storage of construction materials;
- e) disturbance of existing contaminated materials (e.g., disturbance of soil during excavation, removal of ceiling tiles, demolition of partitions);
- f) penetration of construction materials by water, and resultant stagnation;
- g) contaminated materials brought to the construction site;
- h) entry of vermin (e.g., rodents, insects, birds); and
- i) inadequate cleanup and sanitation procedures.

4.3.3

Examples of health care facility construction activities and occurrences that have been known to cause contamination producing infections and pseudo-infections include the following:

- a) soil excavation:
 - i) soil excavation near health care facilities; and
 - ii) soil from construction contaminating the water supply;
- b) heating, ventilation, and air conditioning systems (HVAC):
 - i) air intakes or exhaust grilles in patient care rooms that are not covered during construction or demolition work;

- ii) changing of air filters in patient care areas;
- iii) demolition of ducts; and
- iv) failure to maintain air filters;
- c) windows:
 - i) construction or demolition near windows that are open or improperly sealed;
 - ii) presence of a window air conditioner facing road construction activity; and
 - iii) disturbance of dust during work on window blinds; and
- d) other activities and occurrences:
 - i) carpeting that becomes contaminated during construction;
 - ii) construction dust that contaminates supplies;
 - iii) construction dust that enters an elevator shaft;
 - iv) construction near high-risk patients;
 - v) disturbance or removal of ceiling tiles when contaminated material is located above the tiles;
 - vi) disturbance of contaminated wall coverings;
 - vii) dust barriers not erected before construction;
 - viii) dust from ceiling tiles contaminates microbiological plates and produces a false diagnosis;
 - ix) nearby construction work contaminates isolation rooms;
 - x) removal of fibrous thermal insulating material (glass fibre); and
 - xi) water supply repressurizes when a valve is opened, causing descalement inside a pipe.

5 Selection of Appropriate Construction Materials

5.1 General

Consideration should be given to the selection, design, application, specification, and assembly of construction materials that are used in the health care facility. This should reduce the possibility of an occupant acquiring an infection in the short term (during construction) or in the long term (during the life of the building).

5.2 Susceptibility to Moisture Damage

Construction materials that could be inherently susceptible to moisture damage and resultant growth of biological organisms include

- a) carpets;
- b) cellulose insulation products;
- c) fibre-based insulation products;
- d) natural fibre products such as jute-backed floor coverings, ceiling tiles, and cork;
- e) organic adhesives;
- f) paper and paper-faced materials such as gypsum wallboards, panels, and wall coverings;
- g) wood and wood products such as veneers;
- h) wood-based composite core surfaces that use plastic laminate, metal, or other impervious surface materials; and
- i) woven fabrics and fabric-covered products.

5.3 Performance of Construction Materials

The unique operating characteristics of health care facilities create substantial physical stresses that can adversely affect the performance of construction materials. These characteristics include

- a) frequent cleaning of exposed surfaces;
- b) year-round control of humidity levels;
- c) the need for accessibility to technical systems; and
- d) continuous operation of all facilities.

5.4 Selection and Usage

5.4.1

Materials that have inherent characteristics resistant to the growth of micro-organisms should be selected, especially in high-risk areas.

5.4.2

Plumbing materials shall be durable and resistant to corrosion. See also CAN/CSA-Z317.1.

5.4.3

The health care facility's exterior structure, spatial separations (e.g., walls, partitions, floors, and floor slabs), ventilation system, and water supply shall be assessed for any infection control problems. With the ventilation system, for example, it is important to ensure that the air pressure, air flow, air exchange rates, and filtration systems have been assessed by heating, ventilation, and air conditioning personnel and are working as designed.

5.4.4

Any infection control problems shall be corrected, as appropriate, before construction begins.

5.4.5

A regular program of preventive inspection and maintenance shall be in place for the health care facility's water and ventilation systems. See CAN/CSA-Z317.1 and CAN/CSA-Z317.2. Maintenance and inspection shall be more frequent and rigorous in high-risk areas.

5.4.6

Cooling towers and water supply equipment shall be disinfected before being put into service. Water supply equipment in unoccupied areas of the health care facility shall be disinfected before being put back into service.

6 Procedures

6.1 Infection Prevention and Control Measures

6.1.1

Appropriate infection prevention and control measures, as specified in Clause 8, shall be documented and employed, with a particular focus on control of fungi and bacteria, throughout the life of a construction project.

6.1.2

Infection prevention measures shall be clearly outlined in the relevant construction documents (e.g., drawings, specifications, tender or bid documents) before any construction project is started, and they shall be maintained for the duration of the project.

6.1.3

Before construction begins, occupied areas adjacent to the construction area, and the systems serving those areas, shall, if there is a possibility that they will be affected by the construction, be assessed with regard to the risks posed to the occupants, and appropriate measures shall be taken.

In this Standard, the term "adjacent areas" encompasses all surrounding areas, including areas on floors above and below the construction area.

6.1.4

Infection prevention measures shall include

- a) continual monitoring of critical parameters (such as air velocity and pressure differential) across air barriers between the construction area and adjacent areas; and
- b) periodic testing of air quality and hygienic criteria in areas adjacent to the construction area.

6.1.5

Before the area where construction was undertaken is occupied, it and all adjacent areas shall be tested for air quality (including temperature), relative humidity, and volatile organic compounds.

6.2 Multidisciplinary Team

The extent and complexity of the risks, and the expertise required to deal with them, necessitate a well-managed multidisciplinary team when a construction project is being planned. The multidisciplinary team shall include, but not be limited to,

- a) design consultants (e.g., architects, engineers);
- b) infection prevention and control personnel;
- c) project management and construction management professionals;
- d) representatives from facility management (e.g., building maintenance and operations) and facility environmental services; and
- e) caregivers and support staff (e.g., medical and nursing staff).

6.3 Communication and Commitment

For infection prevention and control measures to be effective, a high level of commitment, understanding, and co-operation is required from all personnel involved in a construction project.

Clear lines of communication within the multidisciplinary team shall be established early in the planning stage of the project. The roles and responsibilities of each member of the multidisciplinary team shall be clearly outlined and documented and be consistent with the member's role in the design and implementation of the project.

All personnel involved in the construction project shall be informed of the potential risks, and preventive measures shall be in place before visiting, inspecting, or working on the project. This information can be provided in the form of written guidelines or oral instructions issued by designated personnel.

6.4 Proactive Approach

Special attention should be paid to the facility's plumbing and ventilation systems. A proactive approach shall be taken to minimize the likelihood of construction-related infections. This approach shall include

- a) control of dust generated during demolition and construction activity;
- b) prevention of dust infiltration into patient care areas, laboratories, food preparation areas, and diagnostic areas; and
- c) prevention of generation of aerosols from contaminated water sources.

6.5 Preventive Measures Analysis

6.5.1

To reduce the incidence of construction-related infections, Table 1 shall be used by the multidisciplinary team during the project design process to identify the preventive measures to be initiated.

6.5.2

The preventive measures analysis in Table 1 requires three steps:

- a) identifying the population risk group (1, 2, 3, or 4) in accordance with the locational criteria presented in Table 2;
- b) identifying the construction activity type (A, B, C, or D) in accordance with the activity-related criteria presented in Table 3; and

- c) identifying the preventive measure type (I, II, III, or IV) by referring to the cell in Table 1 where the row for the applicable population risk group and the column for the applicable construction activity type intersect.

6.5.3

Anyone undertaking a preventive measures analysis described in Clause 6.5.2 shall record the results of the analysis on a copy of the form provided in Figure 1.

6.5.4

Because Preventive Measures III and IV involve major work of long duration in high-risk areas, a copy of the completed Figure 1 form, or an equivalent analysis, shall be sent to the health care facility's infection prevention and control department when the analysis indicates that Preventive Measure III or IV is required. Changes to the preventive measures may be made only after approval from the health care facility's infection prevention and control department.

6.6 Air and Water Quality

6.6.1 General

Preventive measures are essential for decreasing the incidence of construction-related infections and are cost-effective because patient safety is maintained.

6.6.2 Dust Control

Appropriate methods shall be used to control the migration of dust particles from the construction area to the occupied areas of the health care facility. Dust control methods vary depending on factors such as proximity to the construction project. The personnel responsible for dust control shall do the following:

- a) Personnel shall 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 (walls, partitions, floors, and floor slabs) and to seal gaps.
- b) 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. Areas housing patients who are most susceptible to infections (see Clause 4.2) shall be sealed off from the construction area to prevent air leaks into the patient care areas.
- c) The top and bottom of plastic barriers that reach from the floor to the ceiling shall be sealed off to isolate the construction area from the adjacent areas of the health care facility.
- d) High-efficiency exhaust fans with High-Efficiency Particulate Air (HEPA) filters shall be used.
- e) Air movement from all adjacent occupied areas of the health care facility into the construction area shall be monitored to ensure that it exceeds 10 m/min (30 ft/min) and that the negative pressure differential with respect to all adjacent building areas is no less than 7.5 Pa (0.03 in wc).

6.6.3 Environmental-Biological Air Sampling

6.6.3.1

Environmental-biological air sampling should not be routinely undertaken during construction. It is limited as a preventive measure because it measures airborne levels of contaminants at only one point in time. Moreover, lack of biological growth on samples does not necessarily indicate that the environment is free of biological contaminants. Environmental-biological air sampling should therefore be considered only after all other preventive measures have been instituted (see Clause 8) and air quality monitoring has been undertaken.

Air samples should be taken before construction commences. This will provide baseline levels that can be compared against levels from sampling during and after construction.

6.6.3.2

Environmental-biological air sampling may also be considered when

- a) investigating a case of infection where disease agents are associated with environmental contamination;

- b) assessing the effectiveness of the environmental barriers installed to control the transmission of dust during major construction activities (e.g., the Type D construction activities described in Table 3);
- c) assessing changes in housekeeping activities; or
- d) commissioning new or renovated space intended for high-risk patients, to ascertain that the space is safe for occupation.

The frequency of sampling shall be determined by the susceptibility of the patient population and the amount of dust generated. The greater the risk for patients, or the greater the generation of dust, the more frequently sampling shall be undertaken.

6.6.3.3

The total particulate and fungal spore concentrations measured in the construction area after construction and in the patient care areas during or after construction shall not exceed preconstruction concentrations.

6.6.4 Water Quality

Moist environments and aqueous solutions can serve as growth media for micro-organisms. The modes of transmission to humans include direct contact, ingestion, indirect contact, inhalation of aerosols, and aspiration of contaminated water.

Appropriate methods shall be used to ensure the potability of the water in the health care facility during construction. Procedures shall be in place to ensure that

- a) the water lines are flushed before reuse after new plumbing has been installed;
 - Note:** *Flushing times could vary depending on a number of factors, including line size, flow rate, pressure, length of pipe, number of dead ends, age of the system, and history of contamination.*
- b) after excavations on health care facility grounds or when the plumbing system has been shut down and is then repressurized,
 - i) stagnant domestic water is superheated to a temperature of 66 °C (150°F) or the water system is hyperchlorinated, or both, before the water system is repressurized, to prevent pneumonia caused by *Legionella bozemanii*;
 - ii) persistent discoloured water is reported to maintenance and infection prevention and control personnel; and
 - iii) the water supply is cultured for *Legionella* in areas where there are immunocompromised patients;
- c) *Legionella* monitoring is undertaken before, during, and after construction;
- d) plumbing materials do not promote the growth of bacteria and are resistant to corrosion;
- e) features conducive to stagnation, such as long pipe runs and dead ends, are minimized in the design of health care facility plumbing systems, and that faucet aerators have been removed;
- f) the temperature of the water provided by hot water outlets meets the standards set by the health care facility; and
- g) a regular program of preventive plumbing system maintenance is followed.

See also CAN/CSA-Z317.1.

6.7 Personnel and Their Responsibilities

6.7.1 General

6.7.1.1

The multidisciplinary team shall be aware of the planned construction activity, its location and duration, and the patient population that could be affected by it. If there is a possibility that the construction will affect high-risk patients, the infection prevention and control department should be notified, even when the work is minor.

6.7.1.2

Clauses 6.7.2 to 6.7.9 outline the responsibilities of some of the key professionals involved in construction projects in health care facilities and show how collaboration with the infection prevention and control professional (ICP) (see Clause 6.7.2 and Annex B) can decrease the risk of infections.

6.7.2 Infection Prevention and Control Professional

6.7.2.1

The ICP should identify the key members of the multidisciplinary team (e.g., facility owner and his or her agents and employees, project manager, design professionals, and constructor) and educate them about the need for preventive measures to decrease construction-related infections.

6.7.2.2

The ICP shall

- a) be an active member of the multidisciplinary team throughout the life of the construction project, from the planning stage to the final evaluation after completion of the work;
- b) ensure that the appropriate preventive measures are initiated and adhered to; and
- c) have the authority to stop construction if there is a significant failure to adhere to the required preventive measures.

Note: For more information on the role of the ICP, see Annex B.

6.7.3 Administrators

Administrative support is essential for the successful implementation of infection control measures during construction. The health care facility's administrators shall ensure that there are policies and procedures that clearly outline the necessary infection control measures and the related responsibilities of participants in the construction project.

6.7.4 Facility Project Manager

The facility project manager shall be responsible for

- a) overseeing and coordinating the activities of health care facility personnel and consultants involved in the construction project;
- b) managing information flow among members of the multidisciplinary team; and
- c) deciding who shall be represented at planning, design, construction, and commissioning meetings.

6.7.5 Environmental Services Personnel

Environmental services personnel shall be responsible for keeping areas adjacent to the construction area clean and areas between the construction area and the occupied areas of the health care facility clean and clear of obstructions.

Before the construction project is started, the responsibility for cleaning the adjacent areas shall be determined.

Note: In some cases, the constructor will designate the person responsible for cleaning the adjacent areas.

6.7.6 Medical and Nursing Staff

6.7.6.1

Medical and nursing staff shall be responsible for maintaining patients' health and safety. They shall be aware of

- a) patient populations at risk;
- b) potential hazards that construction activities pose to patients; and
- c) the relevant preventive measures.

6.7.6.2

Infection prevention and control personnel shall collaborate with the medical and nursing staff to identify patients at risk of acquiring construction-related infections, such as those who are immunosuppressed because of a medical condition or medical treatment.

6.7.6.3

Increased awareness on the part of medical and nursing staff, as described in Clause 6.7.6.1, could promote identification of deficiencies in dust containment and the timely investigation of situations where patients are suspected of having acquired pneumonia in the health care facility.

6.7.7 Design Professionals

Design professionals, including architects and engineers, shall be responsible for providing design and construction documentation that meets the health care objectives of the health care facility (e.g., the design of dust barriers or the control of recirculated air). The documentation shall form part of the construction agreement with the constructor. Design professionals shall be responsible for issuing instructions to the constructor during construction on behalf of the health care facility.

6.7.8 Maintenance Staff

6.7.8.1

When the maintenance staff of the health care facility act as constructors or project managers for a construction project, they shall be cognizant of the patient population that could be at risk and the impact that the project could have on construction-related infections.

6.7.8.2

During renovation projects and construction of additions to an existing site, maintenance staff shall coordinate with the constructor regarding the relationship between building systems at the construction site and building systems in the occupied part of the health care facility. The maintenance manager shall ensure that the building systems at the construction site are isolated from the building systems in the occupied part of the health care facility to prevent contamination of air, water, medical gas, and other systems.

6.7.8.3

The maintenance manager shall work with the constructor to maintain constant air flow from the health care facility toward the construction area. Air systems in the construction area and adjacent areas within the health care facility shall be monitored by the maintenance department to ensure continued operation and constant relative pressurization. If air systems are controlled by a central automated system, the operators of the automated system shall monitor the status of the air systems and set appropriate alarm limits.

6.7.8.4

Heavy construction can potentially introduce larger than normal amounts of dust into the fresh air intakes of nearby buildings. During heavy construction, air system filters could require more frequent changing to maintain the design parameters of the air handling systems.

6.7.8.5

Proper maintenance of building systems is essential for providing a healthy environment for patient care. Maintenance staff shall be involved in the commissioning of systems in newly constructed and renovated areas in order to become familiar with their operation. Maintenance managers shall ensure that the maintenance staff are appropriately trained on these systems so that future maintenance can be properly performed. See CSA Z318.1 and CSA Z318.3.

6.7.9 Constructor

During construction, the constructor shall

- a) supply, erect, and maintain the integrity of all barriers between the construction area and adjacent areas of the health care facility;
- b) maintain the construction site ventilation system;

- c) keep dust generation at the construction site within acceptable limits;
- d) be responsible for housekeeping at the construction site; and
- e) be responsible for the actions of his or her employees and subtrades.

The constructor and facility manager shall ensure that all gaps, holes leading to adjacent areas, and floors above or below the construction area are securely sealed.

7 Remedial Measures

7.1 General

During construction or routine maintenance, events occur in which immediate intervention is necessary to limit damage and reduce the risk of environmental contamination by micro-organisms. Procedures shall be in place to assist staff who may be required to respond to these events.

7.2 Water Leaks and Flooding

Water leaks and flooding shall be reported immediately to the managers of the affected patient care areas and to a member of the multidisciplinary team, who shall be responsible for

- a) protecting patients or removing them from the affected areas;
- b) defining, locating, and controlling the source of the leaks or flooding;
- c) recording the extent of water damage to structures, materials, and furniture; and
- d) implementing and monitoring remedial measures.

7.3 Investigation

7.3.1

If water damage is detected, there shall be a thorough investigation of all damaged areas by trained maintenance staff or accredited consultants. This is particularly important if it is possible that long-term damage has occurred.

7.3.2

All concealed spaces (e.g., above ceilings, behind walls, and below floors) in the affected areas shall be inspected to determine the extent of damage and moisture penetration. A moisture meter shall be used to test porous materials for the extent of water invasion.

7.3.3

If moisture penetration is detected within 48 h, staff shall proceed with the measures outlined in Clause 7.5. If moisture penetration has been undetected or ignored for over 48 h, the mould abatement measures in Clause 7.6 shall be instituted.

7.3.4

Affected areas can be classified as follows:

- a) Level 1 — small area, less than 1 m²;
- b) Level 2 — medium-size area, 1 to 3 m²;
- c) Level 3 — large area, greater than 3 m² to 10 m²;
- d) Level 4 — extensive contamination of an area greater than 10 m² or numerous areas; and
- e) Level 5 — HVAC or domestic water systems contamination in any affected area.

Note: See also Clause 7.7.2.

7.4 Containment of Contaminants

7.4.1

All investigations and removal and abatement procedures shall be conducted in a manner that does not promote dispersal of dust and spores.

7.4.2

A dust suppression method, such as misting, shall be used prior to disturbing or removing contaminated materials.

7.4.3

Ductwork, diffusers, and all openings in the construction area shall be sealed or capped dust tight. All work areas within an enclosure shall have negative air pressure provided by HEPA-filtered negative air units. Ventilation systems shall be configured to create negative pressure in the contaminated area. Additional equipment, e.g., portable exhaust fans or HEPA filter-equipped air cleaners, could be required during peak contamination periods.

7.4.4

The contaminated areas shall be physically separated from uncontaminated areas by closing and sealing all openings (e.g., openings for doors and windows). If an opening is not already connected to an object that can seal it (e.g., a door), an impermeable dust barrier shall be constructed.

7.4.5

All personnel involved with or exposed to contaminated materials shall be equipped with protective clothing and safety apparatus consistent with occupational health and safety requirements.

7.4.6

All personnel involved with or participating in the implementation of remedial measures shall take appropriate measures to avoid the spread of contaminants when leaving affected areas, such as removal of protective clothing and washing or wiping of boots, equipment, and tools.

7.5 Corrective Measures

7.5.1

In cases where contamination or mould growth has not been detected and only moisture damage has occurred, immediate action is required to prevent further problems.

7.5.2

Cellulose and fibre-based materials such as acoustic ceiling tiles and fabrics shall be removed, dried, inspected and, if necessary, replaced.

Because mould can rapidly appear on fabrics and ceiling tiles, these materials should be replaced if they have been wet for more than 48 h.

7.5.3

Non-removable materials shall be dried using absorbent materials or mechanical dryers.

Note: For more information on water damage restoration, see *Institute of Inspection, Cleaning and Restoration Certification Standard S500*.

7.6 Abatement Measures

7.6.1

In a manner consistent with currently accepted protocols, such as the New York City *Guidelines on Assessment and Remediation of Fungi in Indoor Environments* and the Manitoba Department of Labour *Guidelines for the Investigation, Assessment, and Remediation of Mould in Workplaces*, a plan of abatement measures for the contaminated areas shall be prepared.

7.6.2

The work shall be performed by a qualified abatement contractor or by maintenance staff trained in abatement protocols.

7.6.3

Contaminated materials shall be removed in a manner that limits dust generation and spore release.

7.6.4

Removed building materials shall be wrapped with a minimum 0.15 mm (6 mil) layer of polyethylene and sealed with tape.

7.6.5

Non-removable building materials shall be thoroughly cleaned by vacuuming with a HEPA filter-equipped vacuum cleaner followed by scrubbing with a detergent solution.

7.6.6

All surfaces and materials adjacent to the affected area shall be thoroughly vacuumed with a HEPA filter-equipped vacuum cleaner and wet wiped with a mild detergent.

7.6.7

If investigation determines that there is a risk of contamination, the air ductwork to and from the affected area shall also be vacuumed with a HEPA filter-equipped vacuum cleaner and wet wiped. All downline filters shall be replaced.

7.7 Inspection of Remediated Areas

7.7.1

All areas (including those concealed behind walls and ceilings) shall be thoroughly inspected before they are made available again for use by patients and staff.

7.7.2

Clearance air samples shall be taken in Levels 4 and 5 affected areas (see Clause 7.3.4).

7.7.3

Surfaces shall be retested with a moisture meter to determine that drying is complete.

8 Infection Prevention and Control Measures (See Table 1)

8.1 Preventive Measure I

8.1.1 Before Construction

8.1.1.1

Preventive Measure II specifications shall be followed if dust is created during Type A construction activity.

8.1.1.2

Before Type A activity starts, the infection prevention and control department shall be consulted to provide information on infection prevention measures that could be necessary.

8.1.1.3

The project manager shall identify essential services (e.g., water supply, electricity, and ventilation systems) that could be disrupted and measures to compensate for the disruption; he or she shall then communicate the information to the people responsible for the patients who could be affected by the disruption. It may be necessary to provide alternative water sources for patient use if the domestic water supply will be disrupted.

8.1.1.4

The medical or nursing staff, in conjunction with infection prevention and control personnel, shall minimize patient exposure by identifying high-risk patients who could need to be temporarily moved away from the construction area. Patients who are immunosuppressed shall be moved to an area away from the construction area if air quality cannot be ensured during construction.

8.1.2 During Construction

8.1.2.1

During Type A activity, engineering or maintenance staff or contractors shall be responsible for dust control and

- a) immediately after the Type A activity (e.g., visual inspection) has been completed, close access panels and replace displaced tiles; and
- b) clean the work area with a HEPA filter–equipped vacuum cleaner, if necessary.

8.1.2.2

During Type A activity, engineering or maintenance staff or contractors performing plumbing work shall

- a) ensure that gaskets and items made of materials that support the growth of *Legionella* are not being used;
- b) ensure that faucet aerators are not installed or used;
- c) maintain a dry work environment; and
- d) schedule water interruptions during periods of low user activity (e.g., evenings).

8.1.2.3

During Type A activity, environmental services and medical or nursing staff shall

- a) report discoloured water and water leaks to the maintenance and infection prevention and control departments; and
- b) ensure that patient care equipment and supplies are protected from dust exposure.

8.1.3 After Construction

The multidisciplinary team, or a person or persons designated by the team, shall review the preventive measures that were undertaken and assess their effectiveness and any problems that were encountered.

8.2 Preventive Measure II

8.2.1 Before Construction

8.2.1.1

Preventive Measure I shall be followed. Preventive Measure II shall be followed if dust is created during Type A construction activity.

8.2.1.2

The infection prevention and control department, in conjunction with the project manager, shall follow Preventive Measure I and

- a) determine a safe route for the transportation of clean or sterile supplies and equipment away from the construction area;
- b) establish traffic patterns for construction workers that avoid patient care areas;
- c) if possible, ensure that the ventilation of any elevator cab and shaft is not recirculated in the facility and designate an elevator to be used solely by construction workers;
- d) establish water temperature standards for the health care facility; and
- e) determine an appropriate method for cleaning any water system affected by the construction (e.g., hyperchlorination, superheating, flushing, or a combination of these methods).

8.2.1.3

Infection prevention and control personnel shall follow Preventive Measure I and ensure that an effective surveillance system is in place to monitor patients for *Legionella* during soil excavation on health care facility grounds or when the water supply has been disrupted and then repressurized.

8.2.2 During Construction

8.2.2.1

Engineering or maintenance staff or contractors shall follow Preventive Measure I and execute their work using methods that minimize dust generation and migration into the atmosphere, e.g., by

- a) using drop sheets to control dust;
- b) controlling dust by water-misting work surfaces while cutting;
- c) sealing windows and unused doors;
- d) sealing plumbing penetrations, electrical outlets, and any other sources of potential air leaks in the construction area;
- e) sealing air vents in the construction area; and
- f) placing a walk-off mat outside the entrance to the construction area to trap dust from the equipment and shoes of personnel leaving the area, and vacuuming the mat daily with a HEPA filter–equipped vacuum cleaner or when visibly soiled.

8.2.2.2

Engineering or maintenance staff or contractors shall follow Preventive Measure I and take special precautions related to the ventilation system in the construction area. If possible, the ventilation system shall be disabled until the project has been completed. Alternatively, the air vents in the construction area shall be sealed.

8.2.2.3

Engineering or maintenance staff or contractors performing plumbing work shall follow Preventive Measure I and

- a) avoid using collection tanks and long pipes (which allow water to stagnate);
- b) maintain a dry work environment and report any water leaks through walls or substructures; and
- c) hyperchlorinate or superheat stagnant domestic water (especially if *Legionella* is already present in the domestic water supply). The water lines in the construction area and adjacent patient care areas shall be flushed before reuse.

8.2.2.4

Engineering or maintenance staff or contractors in the construction area shall follow Preventive Measure I and

- a) place debris in covered containers or cover it with a moistened sheet before transporting it for disposal;
- b) clean the construction area with a HEPA filter–equipped vacuum cleaner, a wet mop, or both, as necessary;
- c) place supplies and equipment in covered containers during transportation through the health care facility to prevent contamination in other areas; and
- d) remove the debris in the evening when patients are in their rooms and visitors have left. If this is not possible, debris should be removed at the end of the workday. Exposure of the occupants of the health care facility to debris shall be minimized.

8.2.2.5

Environmental services and medical or nursing staff shall follow Preventive Measure I.

8.2.3 After Construction

8.2.3.1

The multidisciplinary team, or a person or persons designated by the team, shall follow Preventive Measure I and

- a) review the preventive measures that were undertaken and assess their effectiveness and any problems that were encountered; and
- b) conduct a final inspection to ensure that the ventilation system is functioning properly in the construction area and adjacent areas.

8.2.3.2

Infection prevention and control personnel shall follow Preventive Measure I and ensure that the construction area has been thoroughly cleaned before patients are readmitted to the finished area.

8.2.3.3

Environmental services and medical or nursing staff shall follow Preventive Measure I and

- a) ensure that the construction area has been cleaned with a HEPA filter–equipped vacuum cleaner, a wet mop, or both, as necessary, and that horizontal work surfaces have been wiped with a disinfectant; and
- b) report discoloured water and water leaks to the maintenance and infection prevention and control departments.

8.3 Preventive Measure III

8.3.1 Before Construction

Preventive Measures I and II shall be followed.

8.3.2 During Construction

8.3.2.1

Engineering or maintenance staff or contractors shall follow Preventive Measures I and II and

- a) erect an impermeable dust barrier, from the true ceiling (includes the areas above false ceilings) to the floor, consisting of two layers of 0.15 mm (6 mil) fire-retardant polyethylene or gypsum board. The dust barrier shall remain in place until the project is complete and the area has been cleaned thoroughly and inspected. After the construction has been completed, the dust barrier shall be removed to prevent the spread of dust and other debris particles adhering to the barrier;
- b) vacuum mechanical and electrical systems and spaces above drop or false ceilings, if necessary; and
- c) remove protective clothing each time they leave the construction area and before entering patient care areas.

8.3.2.2

Engineering or maintenance staff or contractors shall follow Preventive Measures I and II and

- a) disable the ventilation system and seal duct openings in the construction area until the project is completed;
- b) 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;
- c) ensure that the air is exhausted directly outside and away from intake vents, or filtered through a HEPA filter before being recirculated; and
- d) ensure that the ventilation system is functioning properly and is cleaned if contaminated by soil or dust after the construction project is complete.

8.3.2.3

Engineering or maintenance staff or contractors performing plumbing work shall follow Preventive Measures I and II.

8.3.2.4

Engineering or maintenance staff in the construction area shall follow Preventive Measures I and II and clean outside the work area with a HEPA filter–equipped vacuum cleaner every day or more frequently if necessary.

8.3.2.5

Medical or nursing staff shall follow Preventive Measures I and II.

8.3.2.6

Environmental services staff shall follow Preventive Measures I and II and

- a) increase the frequency of cleaning in areas adjacent to the construction area while the project is underway;
- b) wet mop and vacuum the area with a HEPA filter–equipped vacuum cleaner as necessary and when work is complete; and
- c) wipe horizontal work surfaces with a disinfectant.

8.3.2.7

Infection prevention and control personnel shall follow Preventive Measures I and II and

- a) in collaboration with environmental services staff, ensure that the construction area is thoroughly cleaned when work is complete;
- b) inspect the integrity of the dust barriers; and
- c) in collaboration with the facility project manager, designate a traffic pattern for construction workers that avoids patient care areas and a traffic pattern for clean or sterile supplies and equipment that avoids the construction area.

8.3.2.8

Medical or nursing staff shall follow Preventive Measures I and II and

- a) ensure that patient care equipment and supplies are protected from dust exposure;
- b) ensure that patients do not go near the construction area;
- c) ensure that staff do not visit the construction area; and
- d) report discoloured water and water leaks to maintenance and infection prevention and control personnel.

8.3.3 After Construction

Preventive Measures I and II shall be followed.

8.4 Preventive Measure IV

8.4.1 Before Construction

Preventive Measures I, II, and III shall be followed.

8.4.2 During Construction

8.4.2.1

Preventive Measures I, II, and III shall be followed.

8.4.2.2

Engineering or maintenance staff or contractors shall follow Preventive Measures I, II, and III and

- a) construct an anteroom at access points to the construction area if access is from within the health care facility;
- b) place a walk-off mat outside the anteroom in patient care areas and inside the anteroom to trap dust from the workers' shoes and from equipment and debris that leaves the construction area;

- c) ensure that the construction workers
 - i) leave the construction area through the anteroom so that they can be vacuumed with a HEPA filter–equipped vacuum cleaner before leaving; or
 - ii) wear protective clothing that is to be removed each time they leave the construction area and before going into patient care areas;
- d) repair holes in walls within 8 h or seal them temporarily; and
- e) ensure that ventilation systems are working properly in adjacent areas.

8.4.2.3

Environmental services staff shall follow Preventive Measures I, II, and III and ensure that the construction area is thoroughly cleaned when work is complete.

8.4.2.4

Infection prevention and control personnel shall follow Preventive Measures I, II, and III and regularly visit the construction area to ensure that the preventive measures are being followed.

8.4.3 After Construction

Preventive Measures I, II, and III shall be followed.

Table 1
Preventive Measures Analysis
(See Clauses 6.5.1, 6.5.2, and 8 and Figure 1.)

Population risk group*	Construction activity type†			
	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

*See Table 2 to determine the population risk group.

†See Table 3 to determine the construction activity type.

‡When the risk group is Group 4 and the construction activity is Type A, the infection prevention and control department shall be consulted to determine the appropriate preventive measure (I, II, or III).

Table 2
Population Risk Groups and Geographical Areas
 (See Clause 6.5.2, Table 1, and Figure 1.)

Population risk group	Typical areas
Group 1 Lowest risk	Office areas Unoccupied wards Public areas Laundry and soiled linen cleaning areas Physical plant workshops and housekeeping areas
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 (non-operating) Nurseries for healthy newborns Nuclear medicine Hydrotherapy Echocardiography Laboratories General medical and surgical wards Pediatrics Geriatrics Long-term care 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-anaesthetic 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 areas Cardiovascular and cardiology patient areas Endoscopy Pharmacy admixture rooms Sterile processing rooms Sterile supply areas Burn care units Animal rooms Trauma rooms Protective environment isolation rooms Tissue culture laboratories Bronchoscopy Cystoscopy Pacemaker insertion rooms Dental procedure rooms Central processing department

Table 3
Construction Activity Type
(See Clauses 6.5.2 and 6.6.3.2, Table 1, and Figure 1.)

Construction activity type	Description
Type A	<p>Inspection and non-invasive activities. These include, but are not limited to,</p> <ul style="list-style-type: none"> a) activities that require removal of no more than one ceiling tile or require wall or ceiling panels to be opened; b) painting (but not sanding) and wall covering; c) electrical trim work; d) minor plumbing work that disrupts the water supply to a localized patient care area (i.e., one room) for less than 15 min; and e) other maintenance activities that do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.
Type B	<p>Small-scale, short-duration activities that create minimal dust. These include, but are not limited to,</p> <ul style="list-style-type: none"> a) activities that require access to chase spaces; b) where dust migration can be controlled, cutting of walls or ceilings for installing or repairing minor electrical work, ventilation components, telephone wires, or computer cables; c) sanding or repair of a small area of a wall; and d) plumbing work that disrupts the water supply of more than one patient care area (i.e., two or more rooms) for less than 30 min.
Type C	<p>Activities that generate a moderate to high level of dust; require demolition; require removal of a fixed building component (e.g., sink) or assembly (e.g., countertop, cupboard); or cannot be completed in a single work shift. These include, but are not limited to,</p> <ul style="list-style-type: none"> a) activities that require sanding of a wall in preparation for painting or wall covering; b) removal of floor coverings, ceiling tiles, and casework; c) new wall construction; d) minor ductwork; e) electrical work above ceilings; f) major cabling activities; and g) plumbing work that disrupts the water supply of more than one patient care area (i.e., two or more rooms) for more than 30 min but less than 1 h.
Type D	<p>Activities that generate high levels of dust, and major demolition and construction activities requiring consecutive work shifts to complete. These include, but are not limited to,</p> <ul style="list-style-type: none"> a) activities that involve heavy demolition or removal of a complete cabling system; b) new construction that requires consecutive work shifts to complete; and c) plumbing work that disrupts the water supply of more than one patient care area (i.e., two or more rooms) for more than 1 h.

Preventive Measures Analysis

A Preventive Measures analysis of the construction or renovation project described below has been undertaken in accordance with Tables 1, 2, and 3 of CSA Z317.13-03. The results of the analysis are provided below.

Brief Description of Construction or Renovation Project

Preventive Measures Analysis

Population risk group (1, 2, 3, or 4): _____

Construction activity type (A, B, C, or D): _____

Preventive measure (I, II, III, or IV): _____

Analysis completed by (insert name): _____

Signature: _____ Date: _____

Figure 1
Preventive Measures Analysis Form
(See Clauses 6.5.3 and 6.5.4.)

Annex A (informative)

An Example of Instructions to Contractors

Note: *This Annex is not a mandatory part of this Standard.*

A.1 General

The following list is an example of instructions given to contractors and construction personnel:

Please ensure that you and your subtrades follow these instructions. Failure to do so will result in your removal from the site. Any costs associated with following these instructions should be included in your tendered price. Planning and coordinating elevator use, access routes, and waste disposal will be done at the preconstruction site tour and included in the tender documents.

1. For movement to and from the site, dedicate one hallway, one elevator, and one stairwell as points of exit. The construction crew should not use other elevators or stairwells.
2. Seal off all other exits with plastic drapes and tape.
3. Post signs on the doors indicating that there is absolutely no entrance or exit through the sealed-off areas except for fire or security reasons. Ensure that these restrictions are complied with by the construction crew and others.
4. At all door exits, install mats moistened with a detergent solution.
5. Ensure that the dedicated elevator is vacuumed with a HEPA filter–equipped vacuum cleaner and damp mopped daily (or more often if necessary) to remove dust.
6. All debris is to be removed from the construction site in closed containers.
7. Where possible, install industrial fans inside the construction area to create a negative pressure differential with respect to the patient care areas.
8. Vacuum the construction area daily with a HEPA filter–equipped vacuum cleaner.
9. Dirty or dusty footprints outside the construction area that have been left behind by people who were in the construction area are to be promptly cleaned.
10. Establish an orderly system for retrieving construction equipment and supplies to reduce the number of trips into and out of the construction area.

Annex B (informative)

The Infection Prevention and Control Professional

Note: *This Annex is not a mandatory part of this Standard.*

B.1 General

As a member of the multidisciplinary team, the infection prevention and control professional (ICP) has a number of responsibilities, as outlined in this Annex. There may be more than one ICP on a team.

B.2 Communication

B.2.1

In the planning phase of the construction or renovation project, the ICP can help establish clear lines of communication between all personnel involved in the project by ensuring that an effective communication plan is followed throughout the project.

B.2.2

The ICP should prepare for effective involvement in the construction project by becoming familiar with the capital planning process for health care facilities and knowing the key individuals and their roles.

B.3 Establishing Guidelines

The ICP can be instrumental in establishing guidelines for all facility staff pertaining to the following construction-related concerns:

- a) Traffic control:
 - i) In collaboration with the facility project manager, the ICP can designate a traffic pattern for construction workers that avoids patient care areas and a traffic pattern for moving clean or sterile supplies and equipment that avoids the construction area.
 - ii) The ICP can help medical or nursing staff ensure that patients do not go near the construction area.
- b) Environmental cleaning procedures:

In collaboration with the environmental services staff, the ICP can make recommendations on the cleaning procedures that should be used in areas adjacent to the construction area.

B.4 Education

B.4.1

The ICP plays a major educative role by

- a) providing scientific evidence that life-threatening infections in patients could be the result of improperly contained construction activities;
- b) sharing evidence that properly contained construction activities should not increase the risk of infection; and
- c) acting as a role model by wearing the appropriate safety equipment when visiting the construction area.

B.4.2

The ICP can educate administrators on infection control concerns and the importance of preventive measures.

B.4.3

The ICP should develop a close working relationship with the facility project manager and educate him or her on infection control concerns and the importance of preventive measures.

B.4.4

Through education, the ICP can ensure that committee members understand the risks and respond with appropriate measures. Changes to the preventive measures should be made only after approval by the ICP.

B.5 Risk Assessment

B.5.1

The ICP should be involved in the risk assessment and reduction process. These activities may include

- a) collaborating with the medical or nursing staff to identify high-risk patients and the appropriate preventive measures to ensure their safety;
- b) conducting routine *Legionella* surveillance before, during, and after construction; and
- c) moving high-risk patients who are in or adjacent to the construction area.

B.5.2

The ICP should ensure that the infection prevention and control department is notified, even in the case of minor construction activity (e.g., drilling holes in walls), when high-risk populations could be affected.

B.6 Surveillance and Evaluation

The ICP should regularly visit the construction area with the facility project manager to ensure that preventive measures are being adhered to and that appropriate modifications are made if there are any on-site design changes. The ICP should ensure that the construction area is thoroughly cleaned when work is complete and check the area before patients are readmitted. Any concerns should be shared with the environmental services department and the facility project manager.

B.7 Documentation

The ICP should document surveillance data collected before, during, and after the project and share that data with the appropriate members of the multidisciplinary team.

Proposition de modification

N'hésitez pas à nous faire part de vos suggestions et de vos commentaires. Au moment de soumettre des propositions de modification aux normes CSA et autres publications CSA prière de fournir les renseignements demandés ci-dessous et de formuler les propositions sur une feuille volante. Il est recommandé d'inclure

- le numéro de la norme/publication
- le numéro de l'article, du tableau ou de la figure visé
- la formulation proposée
- la raison de cette modification.

Nom/Name: _____

Affiliation: _____

Adresse/Address: _____

Ville/City: _____

État/Province/State: _____

Pays/Country: _____ **Code postal/Postal/Zip code:** _____

Téléphone/Telephone: _____ **Télécopieur/Fax:** _____

Date: _____

Proposal for change

CSA welcomes your suggestions and comments. To submit your proposals for changes to CSA Standards and other CSA publications, please supply the information requested below and attach your proposal for change on a separate page(s). Be sure to include the

- Standard/publication number
- relevant Clause, Table, and/or Figure number(s)
- wording of the proposed change
- rationale for the change.

