

# Orientation Program for Infection Control Professionals



Module 10:  
Construction and  
Renovation

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## Module 10: Construction and Renovation

### Objectives

At the completion of this module the ICP will understand the role of the ICP in the planning and operation stages of construction and renovation projects, the risks to all occupants in healthcare facilities including patients, visitors and staff during construction and renovation and the infection prevention and control measures required in order to prevent the spread of infectious diseases.

The ICP will:

1. Identify the organisms which can cause health risks during construction/renovation
2. Describe the infection preventive and control measures required during construction/renovation in a healthcare facility
3. Review a construction project in the facility and identify the role of IPC during the construction/renovation

### Number of hours

- Key Concepts – 3 hours
- Methods – 3 hours

### Required readings

- APIC Text: Chapter 108 (2<sup>nd</sup> Ed.). APIC Text: Chapter 106 (3<sup>rd</sup> Ed.)
- CSA Standard Z317.13-07 Infection control during construction, renovation, and maintenance of health care facilities (2007)
- CSA Z8000-11. (2011). Canadian Healthcare Facilities (sections are recommended by mentor).

### Additional resources

- CHICA-Canada Construction-related Infection Resources  
[http://www.chica.org/links\\_construction.html](http://www.chica.org/links_construction.html)
- PowerPoint presentations on CHICA website from 2007 conference  
[http://www.chica.org/Members/conf\\_presentations07.html](http://www.chica.org/Members/conf_presentations07.html)

### Instructions

Read the material, view the PowerPoint presentations and do the practice exercises. Write out your answers to the questions and discuss them with your mentor.

## Overview

Dispersal of microorganisms during construction and renovation has been reported to cause significant morbidity and mortality for vulnerable patient populations. Input from IPC will ensure that efforts to reduce infectious risks to the patients have been followed.

The main areas for the involvement of infection prevention and control (IPC) during the construction/renovation within healthcare facilities include:

1. Providing IPC consultation during all phases of construction/renovations
2. Monitoring of infection control precautions during and immediately following any construction/renovations
3. Reporting of any breaches of IPC precautions to the Project Leader

## Key Concepts

This is basic information which the ICP will require before becoming involved in the construction/renovation for the facility.

## Definitions

| Key definitions  | Explain what these are and how you can use them |
|--|---|
| Canadian Standard Association Z317.13  |   |
| Infection control risk assessment  |   |
| Preventative measures analysis form  |   |
| Identify your facilities policy and procedure for construction/renovation and know where to locate it. |   |

## Infectious risks

| Describe the role of dust, mould and water as infectious risks. |  |
|---|--|
| Why worry about dust?   |  |
| Where is dust generated from during construction?               |  |

| Describe the role of dust, mould and water as infectious risks.                          |  |
|--|--|
| What are the areas that can be associated with bacteria in the water?                    |  |
| List some other water contaminants that can be found during construction and renovation. |  |

| Describe the construction/renovation health risks associated with the following microorganisms. |   |                              |
|---|---|------------------------------|
| Microorganisms  | Health risk created during construction | How can you reduce the risk? |
| Fungi - Aspergillus   |   |                              |
| Bacteria - Legionella   |   |                              |

**Preventative measures analysis**

| Components of a preventative measures analysis   |                        |  |
|--|------------------------|--|
| Differentiate between population risk group 1, 2, 3, & 4   | Risk Group 1           |  |
|  | Risk Group 2           |  |
|  | Risk Group 3           |  |
|  | Risk Group 4           |  |
| Define construction activities Type A, B, C, D   | Type A                 |  |
|  | Type B                 |  |
|  | Type C                 |  |
|  | Type D                 |  |
| Give examples of differences between preventive measures Class 1, Class 2, Class 3 and Class 4 used <b>before construction</b> | Preventative Measure 1 |  |
|  | Preventative Measure 2 |  |
|  | Preventative Measure 3 |  |
|  | Preventative Measure 4 |  |

| <b>Components of a preventative measures analysis</b>   |                        |  |
|---|------------------------|--|
| Give examples of differences between preventive measures Class 1, Class 2, Class 3 and Class 4 <b>during construction</b> | Preventative Measure 1 |  |
|   | Preventative Measure 2 |  |
|   | Preventative Measure 3 |  |
|   | Preventative Measure 4 |  |

## Methods

Learning objective: The ICP will apply the key concepts to a current construction/renovation project within the healthcare facility. Your mentor will arrange for a tour of a construction/renovation site.

| <b>Discuss with your mentor:</b>                                     |  |
|--|--|
| Does your facility have a construction/renovation committee or team? |  |
| What members are included on the team?                               |  |
| What are the roles and responsibilities of the ICP on the team?      |  |
| Identify key contacts for construction/renovation in your facility.  |  |
| At what class of construction does the ICP become involved?          |  |

| <b>Education for construction/renovation staff</b>   |  |
|--|--|
| Review your organization's education session for construction/renovation staff for this project. If one is not in place, discuss with your mentor where you might get one. |  |
| What would you include in your education to the construction renovation staff?   |  |

|   |  |
|---|--|
| <b>Education for construction/renovation staff</b>  |  |
| Is there anyone else you would need to include in your education session besides the construction team? |  |
| For this project, has there been an evaluation of the education sessions been done?                     |  |

|   |  |
|---|--|
| <b>Design phase What to look for?</b>   |  |
| Identify any issues that were identified by IPC during the design phase of this project.  |  |
| Identify IPC issues relating to the following design projects: <ul style="list-style-type: none"> <li>• Hand hygiene stations</li> <li>• Patient rooms</li> <li>• Flooring – factors to consider</li> <li>• Location of clean/dirty utility rooms</li> <li>• Locations of washrooms for patients, staff and public</li> </ul> |  |

|   |  |
|---|--|
| <b>Monitoring of the project – what to look for</b> |  |
| PMA phase   |  |
| Education Phase                                     |  |
| Design Phase  |  |
| Construction Phase                                  |  |

## Documentation and Reporting

The ICP should visit the construction site with the facility project manager to ensure that preventive measures are being adhered to and appropriate modifications are made if there are any on-site design changes.

|   |  |
|---|--|
| <b>For the construction project that you have identified :</b>                      |  |
| Is there a documentation process in place for visits made to the construction site? |  |
| Review documentation related to visits to the project.                              |  |

| <b>For the construction project that you have identified :</b>  |  |
|---|--|
| How often were visits made? Who made the visits?  |  |
| Where there any recommendations for the project manager or IPC as a result of the visits?   |  |
| If occurrences are not corrected, is there a reporting responsibility?  |  |
| What are the key components of the report?  |  |
| Was there an awareness of the Infection Control recommendations by the project staff and by the staff on the Unit affected by the construction (if applicable)? |  |

## **Other Issues**

### **Commissioning of the site**

| <b>Following completion of the project, identify the responsibilities of IPC.</b> |
|---|
|   |
|   |
|   |
|   |

## Appendix A

### Completion of the Preventative Measures Analysis

#### Step 1: Using the following table, identify type of Construction Project Type (A-D)

|               |   |
|---------------|---|
| <b>Type A</b> | <p><b>Inspection and Non-Invasive Activities</b></p> <p>Includes but not limited to:</p> <ul style="list-style-type: none"> <li>a) Activities that require removal of no more than one ceiling tile or require wall or ceiling tiles to be opened.</li> <li>b) Painting (but not sanding), and wall covering</li> <li>c) Electrical trim work</li> <li>d) Minor plumbing work that disrupts water supply to a localized patient care area (i.e. 1 room) for less than 15 minutes; and</li> <li>e) Other maintenance activities that do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.</li> </ul>   |
| <b>Type B</b> | <p><b>Small scale short duration activities which create minimal dust</b></p> <p>Includes but not limited to:</p> <ul style="list-style-type: none"> <li>a) Activities that require access to chase spaces (i.e. where wire could be run or may include duct work)</li> <li>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</li> <li>c) Sanding or repair of a small area of a wall; and</li> <li>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 minutes</li> </ul>   |
| <b>Type C</b> | <p><b>Activities that generate a moderate to high level of dust; requires demolition; require removal of any fixed building components (e.g., sink) or assembly (e.g., countertops, cupboards); or cannot be completed in a single work shift.</b></p> <p>Includes but not limited to:</p> <ul style="list-style-type: none"> <li>a) Activities that require sanding of a wall in preparation for painting or wall covering</li> <li>b) Removal of floor coverings, ceiling tiles, and casework</li> <li>c) New wall construction</li> <li>d) Minor ductwork</li> <li>e) Electrical work above ceilings</li> <li>f) Major cabling activities, and</li> <li>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 minutes but less than 1 hour.</li> </ul> |

|               |   |
|---------------|---|
| <b>Type D</b> | <p><b>Activities that generate high levels of dust, and major demolition and construction activities requiring consecutive work shifts to complete.</b></p> <p>Includes but not limited to:</p> <ul style="list-style-type: none"> <li>a) Activities that involve heavy demolition or removal of a complete cabling system</li> <li>b) New construction that requires consecutive work shifts to complete; and</li> <li>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 hour.</li> </ul> |
|---------------|---|

**Step 2: Using the following table, identify the Patient Risk Group that will be affected. If more than one risk group will be affected, select the higher risk group.**

|  |   |
|--|---|
| <b>Group 1<br/>Lowest Risk</b>         | <ul style="list-style-type: none"> <li>• Office areas</li> <li>• Public areas</li> <li>• Unoccupied wards</li> <li>• Laundry and soiled linen cleaning areas</li> <li>• Physical plant workshops and Housekeeping</li> </ul>  |
| <b>Group 2<br/>Medium Risk</b>         | <ul style="list-style-type: none"> <li>• All other patient care areas unless stated in Group 3 or 4</li> <li>• Outpatient clinics (except for oncology &amp; surgery)</li> <li>• Admission and discharge units</li> <li>• Waiting rooms</li> <li>• Autopsy and morgue</li> <li>• Occupational and Physical therapy areas remote from patient care areas</li> </ul>  |
| <b>Group 3<br/>Medium to High Risk</b> | <ul style="list-style-type: none"> <li>• Emergency room (except trauma rooms)</li> <li>• Diagnostic Imaging</li> <li>• Birth Unit (non-operating room)</li> <li>• Nurseries for healthy newborns (i.e. Family Newborn Unit)</li> <li>• Nuclear Medicine</li> <li>• Hydrotherapy tank areas (in Physiotherapy)</li> <li>• Echocardiography</li> <li>• Laboratories</li> <li>• General medicine and surgical units (other than those listed in Group 4)</li> <li>• Paediatrics</li> <li>• Geriatrics</li> <li>• Food preparation, serving, dining areas</li> <li>• Respiratory therapy</li> <li>• Clean linen handling and storage areas</li> </ul> |

|                                 |  |
|---------------------------------|--|
| <b>Group 4<br/>Highest Risk</b> | <ul style="list-style-type: none"> <li>• All Intensive Care Areas (NICU &amp; PICU)</li> <li>• All Operating Rooms (Birth Unit, Gynecology, &amp; Pediatrics), including prep, induction, post-anesthesia care unit (Recovery Room) and scrub areas.</li> <li>• Anaesthesia storage areas and workrooms</li> <li>• Oncology units and outpatient clinics for cancer patients (i.e. 6 North Inpatient and Ambulatory)</li> <li>• Transplant units and outpatient units for transplant patients (i.e. 6 North Inpatient and Ambulatory)</li> <li>• Units and outpatient clinics for patients with AIDS or other immunodeficiency diseases (i.e. PMU and MDTAU)</li> <li>• Dialysis units</li> <li>• Cardiac catheterization and angiography areas</li> <li>• Endoscopy or Bronchoscopy areas</li> <li>• Cystoscopy</li> <li>• Pharmacy admixture rooms</li> <li>• Central Sterile Processing Department or any sterile supply rooms</li> <li>• Burn care units</li> <li>• Animal rooms</li> <li>• Trauma rooms</li> <li>• Protective environment isolation rooms</li> <li>• Tissue culture laboratories</li> <li>• Dental procedure rooms</li> </ul> |
|---------------------------------|--|

**Step 3: Match the Patient Risk Group (low, medium, medium-high, highest) with the planned Construction Project Type (A, B, C, D) to find the Class Precautions (I, II, III, IV) or level of infection control activities required.**

| Construction Activity |        |        |        |        |
|-----------------------|--------|--------|--------|--------|
| Risk Group            | Type A | Type B | Type C | Type D |
| Low                   | I      | II     | II     | III/IV |
| Medium                | I      | II     | III    | IV     |
| Medium-High           | I      | III    | III/IV | IV     |
| Highest               | I-III  | III/IV | III/IV | IV     |

For highest risk group and all other shaded areas (Class III, III/IV, & IV) IPCS consult shall be completed. If unsure of the level of risk or if work to take place in a patient care area IPCS shall be contacted.

**Step 4: Using the following tables, identify the outlined precaution (Class I-IV) and Infection Control Requirements**

| <b>Class I</b>  |
|---|
| <p><b>Engineer/Maintenance Staff &amp; Contractors</b></p> <p><b>Construction/Renovation Activities</b></p> <ul style="list-style-type: none"><li>• Dust Control</li><li>• Immediately replace tiles displaced for visual inspection</li><li>• Vacuum work area</li></ul> <p><b>Plumbing Activities</b></p> <ul style="list-style-type: none"><li>• Schedule water interruptions during low activity</li><li>• Flush water lines prior to reuse</li><li>• Observe for discoloured water</li><li>• Ensure water temperature meets the standards set by the healthcare facility</li><li>• Ensure gaskets and items made of materials that support the growth of Legionella are not being used</li><li>• Ensure faucet aerators are not installed or used</li><li>• Maintain as dry an environment as possible and report any water leaks that occur to walls and substructures</li></ul> <p><b>Environmental Services</b></p> <p><b>Plumbing Activities</b></p> <ul style="list-style-type: none"><li>• Report discoloured water and water leaks to maintenance and IPCS</li></ul> <p><b>Medical/Nursing Staff</b></p> <p><b>Construction/Renovation Activities</b></p> <ul style="list-style-type: none"><li>• Risk Reduction</li><li>• Minimize patients' exposure to construction/renovation area</li></ul> <p><b>Plumbing Activities</b></p> <ul style="list-style-type: none"><li>• Report discoloured water and water leaks to maintenance and IPCS</li></ul> |

## Class II

### Engineer/Maintenance Staff & Contractors

#### Construction/Renovation Activities

- Dust Control
  - Execute work by methods that minimize dust generation from construction or renovation activities
  - Wet mop and/or vacuum as necessary
  - Provide active means to minimize dust generation and migration into the atmosphere
    - Use drop sheets to control dust
    - Control dust by water misting work surfaces while cutting
    - Seal windows and unused doors with duct tape
    - Seal air vents in construction/renovation area
    - Place dust mat at entrance to and exit from work area
- Ventilation
  - Disable the ventilation system in the construction/renovation area until the project is complete
  - Monitor need to change and/or clean filters in construction/ renovation area
- Debris Removal and Cleanup
  - Contain debris in covered containers or cover with a moistened sheet before transporting for disposal

#### Plumbing Activities

- Avoid collection tanks and long pipes that allow water to stagnate
- Consider hyperchlorinating or superheating stagnate water

### Environmental Services

#### Construction/Renovation Activities

- Dust Control
  - Wet mop and vacuum area with a HEPA filtered vacuum as needed and when work is complete
  - Wipe horizontal surfaces with a disinfectant

### Medical/Nursing Staff

#### Construction/Renovation Activities

- Risk Reduction
  - Identify high risk patients who may need to be temporarily moved away from the construction zone
  - Ensure that patient care equipment and supplies are protected from dust exposure

**Note: The above specifications are to be considered in addition to those listed in Class I.**

## Class III

### Engineer/Maintenance Staff & Contractors

#### Construction/Renovation Activities

- Risk Reduction
  - Ensure that IPCS consultation has been completed and Infection Prevention and control measures have been approved.
- Dust Control
  - Erect an impermeable dust barrier from true ceiling (includes area above false ceiling) to the floor consisting of 2 layers of 6 ml polyethylene or sheetrock.
  - Ensure that windows, doors, plumbing penetrations, electrical outlets and intake and exhaust vents are properly sealed with plastic and duct tape within the construction/renovation area.
  - Vacuum air ducts and spaces above ceilings if necessary.
  - Ensure that construction workers wear protective clothing that is removed each time they leave the construction site before going into patient care areas.
  - Do not remove dust barrier until the project is complete and the area has been cleaned thoroughly and inspected.
  - Remove dust barrier carefully to minimize spreading dust and other debris particles associated with the construction project.
- Ventilation
  - Maintain negative pressure within the construction zone by using portable HEPA equipped air filtration units.
  - Ensure air exhausted directly outside and away from intake vents or filtered through a HEPA filter before being recirculated.
  - Ensure ventilation system is functioning properly and is cleaned if contaminated by soil or dust after construction or renovation project is complete.
- Debris Removal & Cleanup
  - Remove debris at the end of the workday.
  - Erect an external chute if the construction is not taking place on the ground level.
  - Vacuum work area with HEPA filtered vacuums daily or more frequently if needed.

#### Plumbing Activities

- Flush water lines at construction or renovation site and adjacent patient care areas before patients are readmitted.

### Environmental Services

#### Construction/Renovation Activities

- Increase frequency of cleaning in areas adjacent to the construction zone while the project is under way.
- In collaboration with the ICP ensure that construction zone is thoroughly cleaned when work is complete.

## Class III

### Infection Prevention and Control Personnel

#### Construction/Renovation Activities

- Risk Reduction
  - Move high-risk patients who are in or adjacent to the construction area.
  - In collaboration with environmental services ensure that construction zone is thoroughly cleaned when work is complete.
  - Inspect dust barriers.
- Traffic Control
  - 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.

#### 2) Plumbing Activities

- Consider hyperchlorinating or superheating stagnant, potable water

### Medical/Nursing Staff

#### 1) Construction/Renovation Activities

- Risk Reduction
  - Move high risk patients who are in or adjacent to the construction zone
  - Ensure that patients do not go near the construction area
  - In collaboration with environmental services and the ICP ensure that construction zone is thoroughly cleaned when work is complete.

**Note: The above specifications are to be considered in addition to those listed in Class I and II.**

## Class IV

### Engineer/Maintenance Staff & Contractors

#### Construction/Renovation Activities

- Dust Control
  - Before starting the construction project erect an impermeable dust barrier that also has an anteroom
  - Place walk-off mat outside the anteroom in patient care areas and inside the anteroom to trap dust from workers' shoes, equipment and debris that leaves the construction zone.
  - Ensure that construction workers leave the construction zone through the anteroom so they can be vacuumed with a HEPA filtered vacuum cleaner before leaving the work site; or that they wear cloth or paper coveralls that are removed each time they leave the work site.
  - Direct all personnel entering the construction zone to wear shoe covers
  - Ensure that construction workers change the shoe covers each time they leave the work site
  - Repair holes in walls within 8 hours or seal them temporarily.
- Ventilation
  - Ensure negative pressure is maintained within the anteroom and construction zone
  - Ensure ventilation systems are working properly in adjacent areas
  - Review ventilation system requirements in the construction area with ICP to ensure system is appropriate and is functioning properly
- Evaluation
  - Review infection control measures with other members of the planning team or delegate to evaluate their effectiveness and identify problems at the end of the construction project.

#### Plumbing Activities

- If there are concerns about *Legionella*, consider hyperchlorinating stagnant potable water or superheating and flushing all distal sites before restoring or re-pressurizing the water system.

### Environmental Services

#### Construction/Renovation Activities

- Evaluation
  - Review Infection Prevention and control measures with other members of the planning team or delegate to evaluate their effectiveness and identify problems at the end of the construction project

### Infection Prevention and Control Personnel

#### Construction/Renovation Activities

- Risk Reduction

#### Class IV

- Regularly visit the construction site to ensure that preventive measures are being followed. Wear coveralls and shoe covers when visiting the site.
- Evaluation
  - Review infection control measures with other members of the planning team or delegate to evaluate their effectiveness and identify problems at the end of the construction project.

#### **Plumbing Activities**

If there are concerns about *Legionella*, consider hyperchlorinating stagnant potable water or superheating and flushing distal sites before restoring or repressurizing the water system.

#### **Medical/Nursing Staff**

***Staff are not permitted to visit the construction site.***

#### **Construction/Renovation Activities**

- Evaluation
  - Review infection control measures with other members of the planning team or delegate to evaluate their effectiveness and identify problems at the end of the construction project.

#### **Plumbing Activities**

- Potable water
  - Consider using another source of potable water for patients who are at greatest risk until potable water has been cleared for signs of *Legionella* after major plumbing installation/repairs.

**Note: The above specifications are to be considered in addition to those listed in Class I, II, and III.**

PICNet welcomes your comments and feedback on these modules.  
For comments or inquiries, please contact:

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June 2012