

# SESLHD PROCEDURE COVER SHEET



**Health**  
South Eastern Sydney  
Local Health District

<b>NAME OF DOCUMENT</b>	Infection prevention and control during construction, renovation or maintenance
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<b>KEY TERMS</b>	Renovation, redevelopment, building works, infection prevention and control
<b>SUMMARY</b>	<p>To provide additional guidance in conjunction with Part D Infection Prevention and Control - Construction and Renovation Health Facility Guidelines to ensure that all construction, renovation, installation and maintenance activities on healthcare sites are undertaken in a safe and appropriate manner to reduce the risk of infection to patients, visitors and staff.</p> <p>This procedure outlines the risk factors contributing to healthcare associated invasive infections such as <i>Aspergillosis</i>, and other environmental pathogens and identifies at-risk patient groups. Recommendations are made for the measures that can be undertaken to reduce these health risks. This procedure does not cover Asbestos. Please refer to <a href="#">SESLHDPR/314 Asbestos Management Procedure</a></p>

## **COMPLIANCE WITH THIS DOCUMENT IS MANDATORY**

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## 1. POLICY STATEMENT

The documentation and implementation of infection control principles is critical to the planning, design and construction / renovation process in all areas of the facility. Building services should comply with the relevant Australian and New Zealand standards, legislative, and regulatory requirements, in addition to the relevant guidelines issued by the NSW controlling authority. Healthcare acquired infection (HAI) is a significant problem for modern healthcare facilities which can lead to poor outcomes for the patient (including death) and management inefficiencies. This procedure does not cover Asbestos. Please refer to [SESLHDPR/314 Asbestos Management Procedure](#).

## 2. BACKGROUND

Current construction practices can impact on patient wellbeing by disseminating bacteria and filamentous fungi that can cause healthcare-associated infections. Of these healthcare-associated infections, the vast majority are due to filamentous fungi such as *Aspergillus*. Filamentous fungi typically produce many airborne spores that can be inhaled. Outbreaks of invasive Aspergillosis has become a well-recognised complication of construction, demolition or renovation activities generating dust containing fungal spores in or near hospital wards accommodating immunocompromised patients.

Fungal organisms are resistant to desiccation and can remain suspended in the air for long periods, travelling far from their source. Transmission of these contaminated dust particles can be from construction or renovation projects within, or adjacent to, the healthcare facility, improperly functioning or poorly maintained air handling systems, false ceilings, open door construction sites, open windows, carpet, hospital vacuum cleaners and air filters.

## 3. DEFINITIONS

**Airborne transmission:** Occurs by dissemination of either airborne droplet nuclei (small particle residue [5µm or smaller in size] of evaporated droplets that may remain suspended in the air for long periods of time) or dust particles containing the infectious agent

***Aspergillus*:** Is a spore forming fungi that commonly occurs in soil, water, organically enriched debris, decaying vegetation and within the structure of buildings

**Aspergillosis:** Is an infection caused by *aspergillus* which usually affects the respiratory system, but their signs and severity vary greatly

**Colony forming units per millilitre:** Estimate of viable bacteria or fungal units

**Construction:** Is a process that consists of the building or assembling of infrastructure

**Construction Activity Type:** Construction activity type is defined by the amount of dust that is generated, the duration of the activity and any impact on the Heating / Ventilation / Air Conditioning (HVAC) systems

**Demolition:** Tearing down of buildings or other structures

**Dust:** Particles in the atmosphere that come from various sources

**Excavation:** Excavation work generally means work involving the removal of soil or rock from a site to form an open face, hole or cavity using tools, or machinery

**Filamentous Fungi:** Fungi are subdivided on the basis of their life cycles, the presence or structure of their fruiting body and the arrangement of and type of spores (reproductive or distributional cells) they produce. Filamentous Fungi make up two of the three major groups of moulds

**Healthcare-associated infection (HAIs):** Any infection that occurs during or after a healthcare encounter that was not present or incubating at the time of the patient's admission

**Immunosuppressed:** An abnormal condition of the immune system is characterised by markedly inhibited ability to respond to antigenic stimuli

**Infection:** The invasion of the body by pathogenic microorganisms that reproduce and multiply, causing disease by local cellular injury, secretion of a toxin or antigen-antibody reaction in the host

**Micro-organisms:** Tiny form of life which can be bacterial, viral or fungal that may be capable of causing infection or disease

**Mould:** The colloquial term 'mould' is applied to a large and taxonomically diverse number of fungal species where their growth results in a mouldy appearance of objects

**Renovation:** (also called **remodelling**) is the process of improving a structure

**Repair:** To restore to sound condition after damage

**Reservoirs:** Is the principal habitat where a specific infectious agent lives and multiplies and from which it may spread to cause disease

**Spores:** A dormant, reproductive cell formed by certain organisms. It is thick-walled and highly resistant to survive under unfavourable conditions

**Transmission:** A passage or transfer, as of a disease from one individual to another.

#### 4. RESPONSIBILITIES

**Engineering Department Manager will:**

- Ensure all contractors have been provided with this procedure prior to commencement of works.

**General Managers / Service Managers will:**

- Ensure that Infection Prevention and Control services are appropriately consulted during the planning process of work, before commencement of construction activities
- Include an Infection Prevention and Control (IP&C) / Work Health and Safety (WH&S) Co-Ordinator, Microbiologist and/or Infectious Diseases physician in the risk assessment team
- Manage and escalate risks.

**Infection Control or delegate and Work Health and Safety Officer will:**

- Ensure that a risk assessment of the patient population within or adjacent to construction site is conducted prior to the commencement of any construction activities
- Audit compliance with dust mitigation activities during redevelopment.

### Employees will:

- Comply with Infection Prevention and Control policies in relation to building works
- Report any risks and incidents related to building works to line manager
- Must be aware of potential risks to their patient groups when construction projects are being undertaken, and take all measures to identify symptoms, diagnose, treat, and consult an Infectious Diseases physician as necessary.

## 5. PROCEDURE

### 5.1 Preliminary Considerations

Prior to the commencement of any construction or renovation project the facility / service Executive and the project team / engineering and maintenance in conjunction with WHS Co-ordinator and IP&C Department must consider the following:

- Design and function of the new structure or area
- Assessment of the infection risk from environmental organisms
- Strategies to minimise the risk of construction associated infection e.g. dust control
- Monitoring requirements indicated during the project including costs of monitoring
- If risk changes during project, and unforeseen risks occurs i.e. additional dust monitors needed, contracts can be updated to include that additional expenses will be incurred by contractor.

### 5.2 Risk Assessment and Infection Prevention Measures

The risk identification strategy must address as a minimum:

- The extent of construction work
- The identification of the patient population at risk
- The location of the patient population in relation to the site and construction
- Ventilation system types and potential impact
- Traffic and supply routes
- Determination of air monitoring requirements, methodology and frequency, including baseline measurements if required (air quality and dust monitoring)
- The identification of possible contaminants and their locations, as contaminants may be present in ceiling dust; service shafts (especially damp conditions); sprayed fire retardants, and bird droppings
- Prophylactic treatment options for at risk patients if required.

### 5.3 Patient Risk Assessment, Management of at risk patients, and controls

#### *Clinical Risk Assessment and Management*

- A risk assessment of the patient population within or adjacent to construction site must be undertaken by the clinical service manager / Director or delegate prior to the commencement of any construction / renovation activities. This is particularly important when demolition or major construction works are planned external to or within the healthcare facility
- This type of activity is recognised as the most significant risk for the severely immunosuppressed patient population group (refer table 1)
- All clinicians must be aware of potential risks to their patient group when construction projects are undertaken and take all measures to identify symptoms, diagnose, treat, and consult infectious diseases as necessary.

**Table 1: Risk for Invasive Aspergillosis**

<b>No evidence of increased risk</b>	<ul style="list-style-type: none"> <li>All patients / staff / service providers and contractors not listed in Groups 2-below.</li> </ul>
<b>At risk</b>	<ul style="list-style-type: none"> <li>Patients / individuals on prolonged courses of high dose steroids particularly those hospitalised for prolonged periods</li> <li>Severely immunosuppressed HIV / AIDS patients</li> <li>Patients undergoing mechanical ventilation</li> <li>Patients / individuals having chemotherapy who are not neutropenic*</li> <li>Dialysis patients.</li> </ul>
<b>High risk</b>	<ul style="list-style-type: none"> <li>Neutropenia* for less than 14 days following chemotherapy</li> <li>Solid organ transplantation</li> <li>Neonates in Intensive Care Units (ICU).</li> </ul>
<b>Very high risk</b>	<ul style="list-style-type: none"> <li>Allogeneic bone marrow transplantation: within 12 months of transplant, if &gt;12 months, consult with haematologist</li> <li>Autologous peripheral blood stem cell transplantation, i.e. during the neutropenic period</li> <li>Prolonged neutropenia for greater than 14 days following chemotherapy or immunosuppressive therapy: e.g. acute myeloid leukaemia (AML), acute lymphoblastic leukaemia (ALL), primary CNS lymphoma</li> <li>Aplastic anaemia patients</li> <li>Children with: Severe Combined Immunodeficiency Syndrome (SCIDS); or Chronic Granulomatous Disease of Childhood (CGDC).</li> </ul>

\*Neutropenia defined as absolute neutrophil count (ANC),  $<1 \times 10^9/L$

**5.4 Minimising Patient Exposure to Construction-associated Contaminants**

- If possible relocate at-risk patients who are adjacent or near to the construction zone
- Where indicated, inform high risk patients of risks of exposure when going near construction zone
- Ensure surgical mask are available to high-risk patients to wear in transit when near construction zones, if it is unavoidable
- Where HEPA-filtered positive pressure rooms are available, high-risk inpatients must have priority access.

**5.5 Environmental Controls**

- [The Australian Health Facilities Guidelines](#) Part D identifies minimum control measures to be implemented when undertaking construction activities on occupied healthcare sites. Based on these recommendations and international best practice, control measures for a specific activity can be identified that will reduce the risk of infection to designated patient groups or zones
- There are four key components to this assessment and management of associated risks:
  - Identifying the type of construction activity (refer table 2)
  - Determine the population or geographical risk group (refer table 3)
  - Identify the 'Class' of control measures prescribed using the construction activity and Risk Group Matrix (refer table 4)
  - Implementation and quality control of prescribed control measures (refer table 5)

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- The control measures outlined in table 5 have been further developed to provide detail and role responsibility for each component

**Table 2: Types of Construction, Renovation, Installation, and Maintenance (Construction) Activities**

<b>Type A</b> <b>Inspections and general upkeep activities</b>	<b>Type B</b> <b>Small scale, short duration activities, which create minimal dust</b>	<b>Type C</b> <b>Any work that generates a moderate to high level of dust</b>	<b>Type D</b> <b>Major demolition and construction projects</b>
Includes but not limited to: removal of ceiling tiles for visual inspection (limited to 1 tile per 5 m <sup>2</sup> ); painting (but not sanding); installation of wall covering; electrical trim work; minor plumbing; any activities that do not generate dust or require cutting into walls or access to ceiling other than for visual inspection.	Includes, but is not limited to: installation of telephone and computer cabling, access to chase spaces, cutting into walls or ceiling where dust migration can be controlled.	Includes, but is not limited to: demolition or removal of built-in building components or assemblies, sanding of wall for painting or wall covering, removal of floor covering / wallpaper, ceiling tiles and casework, new wall construction, minor ductwork or electrical work above ceiling, major cabling activities.	Includes, but is not limited to: heavy demolition, removal of a complete ceiling system, and new construction.

**Table 3: Population and Geographical Risk Areas**

<b>Construction Activity Risk Level</b>	<b>Type A</b>	<b>Type B</b>	<b>Type C</b>	<b>Type D</b>
Group 1	Class I	Class II	Class II	Class III/IV
Group 2	Class I	Class II	Class III	Class IV
Group 3	Class I	Class III	Class III/IV	Class IV
Group 4	Class III	Class III/IV	Class III/IV	Class IV



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**Table 4: Construction Activity and Risk Group Matrix**

Group 1 - Low	Group 2 - Medium	Group 3 – Medium/High	Group 4 - Highest
Office areas	Patient care and other areas not listed under Groups 3 or 4	Emergency Department	Oncology units
Group 1 - Low	Group 2 - Medium	Group 3 - Medium/High	Group 4 - Highest
Office areas	Patient care and other areas not listed under Groups 3 or 4	Emergency department	Oncology units
Non-patient/low risk areas not listed	Laundry	Medical Imaging – general	Radiation therapy
	Cafeteria	Recovery rooms	Oncology clinical areas
	Dietary	Delivery rooms	Chemotherapy
	Materials management	High Dependency Unit	Transplant
	Allied Health	Newborn nurseries	Pharmacy admixture/clean rooms
	Admissions/discharge	Paediatrics (except Paediatric ICU)	Operating rooms
	MRI	Microbiology labs	Sterile supply units
	Nuclear medicine	Virology labs	Cardiac catheterisation
	Echocardiography	Long stay sub-acute units	Angiography rooms
	Laboratories not specified under Group 3	Pharmacy	Outpatient invasive procedure rooms
	Public corridors used by patients and to transport linen and supplies	Endoscopy	Anaesthetic and pump rooms
		Bronchoscopy	All Intensive Care Units
		Dialysis	– adult, paediatric, neonatal

**Table 5: Specifications for Infection Prevention and Control Measures**

<b>Class I: Infection Prevention and Control Measures</b>
<p><b>Engineering / Maintenance Staff and Contractors Construction Activities</b></p> <p><i>Dust Control</i></p> <ul style="list-style-type: none"> <li>• Execute work using methods to minimise dust during construction activities</li> <li>• Immediately replace any ceiling tile displaced for visual inspection</li> <li>• Wipe down / mop work area with a clean damp cloth / mop or use vacuum with a HEPA filter.</li> </ul> <p><i>Cleaning</i></p> <ul style="list-style-type: none"> <li>• Damp mop and vacuum (with HEPA filter) area as needed and when work is completed</li> <li>• Wipe horizontal and vertical work surfaces with clean damp cloths using neutral detergent and water.</li> </ul> <p><b>Engineering / Maintenance Staff and Contractors Plumbing Activities</b></p> <ul style="list-style-type: none"> <li>• Schedule water interruptions during periods of low activity (e.g. evenings / overnight, if possible)</li> <li>• Flush water lines prior to reuse</li> <li>• Observe for discoloured water</li> <li>• Ensure temperature meets the applicable standard</li> <li>• Ensure gaskets and items made of materials that support the growth of Legionella are not being used</li> <li>• Ensure tap 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>Hotel Services Plumbing Activities</b></p> <ul style="list-style-type: none"> <li>• Report discoloured water and water leaks to Maintenance Department.</li> </ul> <p><b>Medical / Nursing Staff Construction Activities</b></p> <p><i>Patient Risk Reduction</i></p> <ul style="list-style-type: none"> <li>• Minimise patients' exposure in construction area</li> <li>• Move at risk patients (refer table 1) away from construction zone.</li> </ul> <p><b>Medical / Nursing Plumbing Activities</b></p> <ul style="list-style-type: none"> <li>• Report discoloured water and water leaks to Maintenance Department.</li> </ul>



### Class II: Infection Prevention and Control Measures – in addition to Class I

#### Engineering / Maintenance Staff and Contractors Construction Activities

##### *Dust Control*

- Execute work using methods to minimise dust during construction activities damp mop and/or vacuum (with HEPA filter) as necessary
- Provide active means to minimise dust generation and migration in to the atmosphere:
  - Use drop sheets to control dust
  - Seal windows and unused doors with duct tape
  - Seal air-vents and oxygen outlets in construction zone
  - Place dust-mat at entrance and exit of work area and replace or clean when no longer effective.

##### *Ventilation*

- Isolate HVAC system in areas where work is being performed
- Wipe down / mop work area with a clean damp cloth / mop or use vacuum with a HEPA filter
- Monitor need to change and/or clean filters construction zone.

##### *Debris Removal and Clean-up*

- Contain construction waste before transport in tightly covered containers
- Wipe horizontal and vertical work surfaces with clean damp cloths using neutral detergent and water
- Damp mop and vacuum (with HEPA filter) when work is completed.

#### Engineering / Maintenance Staff and Contractors Plumbing Activities

##### *Containment and Prevention*

- Avoid collection tanks and long pipes that water to stagnate
- Consider hyperchlorinating or superheating stagnant potable water (especially if Legionella is already present in potable water supply).

#### Medical / Nursing Staff Construction Activities

##### *Patient Risk Reduction*

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

### Class III: Infection Prevention and Control Measures – in addition to Class I & II

#### Engineering / Maintenance Staff and Contractors Construction Activities

##### *Risk Reduction*

- Ensure the infection control measures for the construction activity have been approved.

##### *Dust Control*

- Erect an impermeable dust barrier from true ceiling (includes area above false ceilings) to the floor made of 6mm polyethylene (if in place for  $\leq 5$  days), or plaster board, compressed cardboard or plywood (if in place  $>5$ days). Barriers to be in place before works commence. Do not remove barriers from work area until complete project is thoroughly cleaned
- Ensure that windows, doors, plumbing penetrations, electrical outlets and intake and exhaust vents are properly sealed with plastic and duct taped 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

### Class III: Infection Prevention and Control Measures – in addition to Class I & II

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 minimise spreading dust and other debris particles associated with the construction project
- Temporarily seal holes in barriers immediately or within 60 minutes of notification and repair within four hours.

#### *Ventilation*

- Maintain negative pressure within construction zone by using portable HEPA equipped air filtration units
- Ensure air is 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
- Isolate HVAC system in area where work is being done to prevent contamination of the duct.

#### *Debris Removal and Clean-up*

- Remove debris at the end of the work day in tightly covered containers
- Wet mop or vacuum twice per eight hour day of construction activity to minimise tracking of dust
- Erect an external chute if the construction is not taking place on ground level if possible.

#### **Engineering / Maintenance Staff and Contractors Plumbing Activities**

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

#### **Infection Prevention and Control Service Construction Activities**

##### *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.

#### **Hotel Services Construction Activities**

- Increase frequency of cleaning in areas adjacent to the construction zone while the project is under way
- Ensure area is thoroughly cleaned when work is complete.

#### **Medical / Nursing staff Construction Activities**

##### *Patient Risk Reduction*

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

***Very high-risk patients (Group 4) should be accommodated in HEPA-filtered, positive pressure rooms***

**Class IV: Infection Prevention and Control Measures – in addition to Class I, II & III**

**Engineering / Maintenance Staff & Contractors Construction Activities**

*Dust Control*

- Before starting the construction project erect an impermeable dust barrier that also has an anteroom from true ceiling (includes area above false ceilings) to the floor made of plaster board, compressed cardboard or plywood. Barriers to be in place before works commence. Do not remove barriers from work area until complete project is thoroughly cleaned. Barrier material should be wet wiped before removal
- Construct anteroom and require all personnel to pass through the room
- Place a walk-off mat outside the anteroom in patient care areas and inside the anteroom to trap dust from the 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
- Temporarily seal holes in barriers immediately or within 60 minutes of notification and repair within four hours
- Seal holes, pipes, conduits and punctures to prevent dust migration.

*Ventilation*

- Isolate HVAC system in and where work is being done to prevent contamination of the duct system
- Ensure negative pressure is maintained within the anteroom and construction zone using HEPA filtered ventilation units or other methods of maintaining negative pressure
- 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.

*Debris Removal and Clean-up*

- Remove debris at the end of the work day in tightly covered containers
- Wet mop or vacuum twice per eight hour day of construction activity to minimise tracking of dust
- Erect an external chute if the construction is not taking place on ground level if possible
- Wet mop or HEPA vacuum anteroom daily.

*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.

**Engineering / Maintenance Staff & Contractors Plumbing Activities**

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

**Infection Prevention and Control Service Construction Activities**

*Risk Reduction*

- 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

**Class IV: Infection Prevention and Control Measures – in addition to Class I, II & III**

evaluate their effectiveness and identify problems at the end of the construction project.

**Hotel Services Construction 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.

**Medical / Nursing staff Construction Activities**

*Patient Risk Reduction*

- To reduce the possibility of transferring fungal spores, staff are not permitted to visit the construction site.

*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

**Medical/Nursing staff Plumbing Activities**

- 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

**6. AIR QUALITY CONTROLS**

**6.1 Assessment of Existing Air Quality Controls and Implementation of ‘Enhanced Controls’**

Healthcare facilities undertaking major construction or renovation, including demolition and excavation must:

- Identify the location of all air-conditioning intake vents in relation to proposed works
- Identify the areas within the facility served by these vents
- Confirm type of primary air filter installed is compliant with AS 1324.1 2001
- Retrofit those air vents that do not comply with this standard, especially if servicing high-risk areas. If the air handling units cannot tolerate the retro-fit of these filters, then the highest rating tolerable should be installed
- Increase routine inspection, maintenance and replacement of filters as necessary during the construction works
- Identify location of cooling towers in relation to the proposed works
- Cleaning, disinfection and maintenance processes and schedule must be consistent with AS/NZS 3666.2: 2011. Air-handling and water systems of buildings - Microbial control may need to be increased during periods of heavy excavation.

**6.2 Identification of Potential Dust and Spore Intrusion Zones**

Healthcare facilities undertaking major construction or renovation, including demolition and excavation must:

- Identify all opening doors and windows within the facility
- Areas with shared air routines
- Gaps or ingress locations in external and internal walls, ceilings, roof, or eaves etc. where dust and spores may gain access to internal patient zones or ceiling spaces
- Identify missing, broken, or ajar ceiling tiles and replace, repair or adjust.

### 6.3 Water Quality Controls

See [SESLHDPR/344 Water Systems: Microbial Control](#)

### 6.4 Microbial Sampling

#### 6.4.1 Fungal Spore Sampling

- Baseline microbial sampling for fungal spores can be considered prior to the commencement of major construction and renovation activities. This should include external and internal air samples
- The location for sampling is determined in consultation with the facility planners and in consultation with key stakeholders i.e. Microbiology, WHS, Infectious Diseases, Infection Control using the location of the proposed works, population and geographical risk groups to inform this advice. Details of the locations for frequency of sampling and reporting is determined in consultation with the stakeholders, Facility Executive and Project Team. Ideally this should be detailed in contractual arrangements with the Construction Contractor (see Appendix 1).

#### 6.4.2 Dust Monitoring

- Constructing buildings, roads and other infrastructure can have a substantial, temporary impact on local air quality. The most common impacts are increased particulate matter (PM) concentrations and dust soiling. Depending on the risk of dust effects occurring, monitoring may need to be carried out during both demolition and construction activities to ensure that the applied mitigation measures are effective
- To ensure that the construction activities do not give rise to any exceedances of the air quality objectives / limit values for PM10 and/or PM2.5, or any exceedances of recognised threshold criteria for dust deposition / soiling
- To provide an 'alert' system with regard to increased emissions of dust, and a trigger for cessation of site works or application of additional abatement controls
- To help to attribute any high levels of dust to specific activities on site in order that appropriate action may be taken
- A period of baseline monitoring prior to the start of construction activities (including any demolition or site clearance works) can often be beneficial
- In the selection of monitoring locations, a number of issues need to be taken into account, including a decision on the number of sites that are to be established, whether they are to remain in a permanent position throughout the entire construction works, and whether monitoring is required for direct comparison with the objectives / limit values. There are a number of practical issues that also must be considered, such as the availability of electrical power, access to the monitoring sites, and security
- As reports are often retrospective. It is important for builders to document findings of daily visual assessments, including obvious reasons for increased release of dust i.e. weather (dry periods with higher wind speeds) and site operations (activities with increased potential for dust release). This assists to provide evidence to healthcare facilities about strategies that were used at the time of the spike to mitigate risk i.e. increasing use sprinkler systems
- When it is clear that these conditions are occurring, the nominated representative (building supervisor) should increase the frequency of visual assessments of dust release and monitoring of any visible surface soiling. This is particularly the case if the prevailing wind is in a direction towards sensitive receptors.



### 6.4.3 Operating theatre Commissioning Microbiological Testing

- There is no national or international consensus on the methods, frequency, types of sampling or acceptable levels of microbial contamination. However, there is evidence to support microbiological air sampling of ORs as part of the commissioning process of a new facility or following major refurbishment, as an adjunct to other heating, ventilation and air conditioning (HVAC) quality assurance controls. The purpose of microbiological air sampling is to gauge the efficacy of the HVAC systems, including high-efficiency particulate air (HEPA) filters following installation or after major structural refurbishment. Refer to advice from [Department of Health Western Australia - Microbiological Air Sampling of Operating Rooms in Western Australia Healthcare Facilities Policy](#).

## 7. DIAGNOSIS AND SURVEILLANCE

- It is imperative to maintain a high index of suspicion for any diagnosis of health care associated Aspergillosis in at-risk patient groups. This surveillance should be achieved through review of relevant clinical cases at ward level and review of relevant microbiological / histological specimens at laboratory level
- Potential outbreaks / cases of invasive disease related to construction activities require immediate action and notification to Facility Executive, Director of Clinical Services, Microbiologists, Infectious Diseases Clinicians, Infection Prevention and Control, WHS and treating teams.

## 8. COMMUNICATION AND EDUCATION

- Communication and education are two vital elements to the successful implementation of proactive infection control measures to reduce the risk of construction-associated nosocomial infections from environmental organisms. [See Appendix 4 and 5](#)
- It is imperative that all relevant parties including but not limited to: architects, project managers, contractors, sub-contractors, hotel services, building services, medical and nursing staff are provided with appropriate education and communications regarding the implementation of effective infection control measures and personal safety at all stages of construction work
- Factsheets are available for clinical staff and patients. [See Appendix 6](#)
- Site induction of building workers should be carried out as per [SESLHDPR/333 Contractor Management](#).

## 9. DOCUMENTATION

- Infection Risk Assessment and Prevention and Control Measures for Construction Activities Checklist and Permit [Refer to Appendix 2](#)
- Infection Prevention and Control Compliance Check List [Refer Appendix 3](#)  
Also refer to [Pre-Occupancy Checklist](#).

## 10. AUDIT

- See Appendix 3: Infection Risk Assessment for Construction Activities
- See Appendix 4 Site Inspections

## 11. REFERENCES

- Australian Health Facility Guidelines. Part D- Infection Prevention and Control. Revision 6.0, 11 June 2015
- NSW Health Policy Directive PD 2017\_013 Infection Control Policy

# SESLHD PROCEDURE

## Infection Prevention and Control during Construction, Renovation and Maintenance

**SESLHDPR/374**

- Australian Commission on Safety & Quality in Healthcare; Australian Guidelines for the Prevention and Control Of Infection in Healthcare 2010
- National Standard 3 Prevention of Healthcare Associated Infections
- Health Facility Guidelines - Australasian Health Facility Guidelines in NSW
- Vonberg, R-P, Gastmeier, & P. (2006) Nosocomial Aspergillosis in outbreak settings. Journal of Hospital Infection, 63, 246-254
- AS 1324.1-2001 Air filters for use in general ventilation and airconditioning - Application, performance and construction
- AS 4260-1997 High efficiency particulate air (HEPA) filters - Classification, construction and performance
- NSW Health TS-11 Engineering Services & Sustainable Development Guidelines, Sydney (NSW Health 2007);
- Australian Health Facility Guideline: Part D – Infection Prevention and Control 900 – Construction and Renovation, Rev 5.0, 1 June 2015
- AS 1324.1 2001: Air filters for use in general ventilation and air-conditioning, Application, performance and construction.
- National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction/Renovation Activities, Ireland 2018
- AS/NZS 3666.2:2011. Air-handling and water systems of buildings - Microbial control
- SESLHDPR/344 Water systems: Microbial control
- IAQM. 2012. Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites
- Department of Health Western Australia. 2015. Microbiological Air Sampling of Operating Rooms in Western Australian Healthcare Facilities
- [SESLHDPR/314 Asbestos Management Procedure](#)
- [SESLHDPR/344 Water Systems: Microbial Control](#)
- [SESLHDPR/333 Contractor Management](#)
- [The Australian Health Facilities Guidelines](#)
- [Department of Health Western Australia - Microbiological Air Sampling of Operating Rooms in Western Australia Healthcare Facilities Policy](#)
- [Pre-Occupancy Checklist](#)

## 12. REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
November 2014	0	Draft procedure developed
April 2015	1	Draft for Comment Period
September 2015	1	Endorsed by Executive Sponsor. Forwarded to CE and CQC for approval to be published.
September 2015	1	Approved for publishing by CE and CQC
July 2018	2	Minor review – tables and references updated and endorsed by Executive Sponsor.
July 2018	2	Executive Services processed prior to publishing – Minor review.



**Appendix 1 - Fungal Spore Monitoring**

**Interpretation of Fungal Spore Monitoring**

**Factors that influence fungal spore counts**

**Levels of fungal spores vary by several orders of magnitude during the course of a day due to:**

- Activity levels in any one particular area
- Fluctuations in temperature
- Fluctuations in humidity
- Fluctuations in air flow
- Changes in light level

A single air sample will often underestimate the fungal contamination in the air and multiple air sampling has to be performed.

**Threshold guidance**

No strict numerical guidelines are available for *Aspergillus* counts, which are appropriate for assessing whether the contamination in a particular location is acceptable or not but the following threshold levels have been recorded:

- Outdoor air (Note: seasonal variation recognised): *Aspergillus*: 5-10 CFU/m<sup>3</sup>
- HEPA-filtered air (>99.95% efficiency and >10 ACH): <1 CFU/m<sup>3</sup>
- In ward area with no air filtration: <5.0 CFU/m<sup>3</sup>

Other authorities (121) recommend for:

- Protected environments (including rooms or areas with HEPA filtration): no *Aspergillus* CFUs
- Other clinical areas: *Aspergillus* ≤2 CFU/m<sup>3</sup>

**The following principles guide interpretation of results and indications further action:**

- Total indoor counts are greater than outdoor counts
- Fungal counts should not vary significantly from baseline values
- Comparison of indoor and outdoor levels of fungal organisms show one of the following:
  - Organisms are present in the indoor sample and not in the outdoor sample
  - The predominant organisms found in the indoor sample is different from the predominant organism in the outdoor sample
  - A monoculture of an organism is found in the indoor sample. It may be absent from samples taken in other areas of the building
  - A low reading is not conclusive evidence that there has not been any fungal spore contamination
  - A single high reading is always significant and should be investigated.

*\*National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction / Renovation Activities, Ireland 2018*

**Recommended Actions**

When results exceed the threshold limit an investigation of possible sources of contamination should be undertaken and corrective actions implemented as soon as possible.

An intensive evaluation and review of procedural practice in high-risk patient care environments is indicated in the following circumstances:

- Threshold counts are exceeded
- Total indoor counts are greater than outdoor counts
- Comparison of indoor and outdoor levels of fungal organisms show one of the following:

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- Organisms are present in the indoor sample and not in the outdoor sample
- The predominant organisms found in the indoor sample is different from the predominant organism in the outdoor sample
- A monoculture of an organism is found in the indoor sample. It may be absent from samples taken in other areas of the building
- Persistently high counts.

If persistently high counts are recorded, or nosocomial invasive Aspergillosis suspected or confirmed, identify source of contamination by sampling:

- dust
- fabrics
- ventilation ducts / screens / fans
- ceiling voids
- kitchen areas
- excreta of roosting birds in close proximity of windows.

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### Appendix 2: Infection Risk Assessment for Construction Activities

Infection Risk Assessment and Control Measures for Construction Activities Checklist and Permit					
Hospital/Facility:		Location of activity:			
Date of assessment:		Project start date:		Estimated duration:	
Type of activity:	<input type="checkbox"/> Construction	<input type="checkbox"/> Renovation	<input type="checkbox"/> Installation	<input type="checkbox"/> Maintenance	
Name of person completing risk assessment:			Role/Title:		

### Construction Activity

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

Please indicate yes or no for each section

Yes	No	Construction Activity (refer Part A – page 3)	Yes	No	Population & Functional Risk Group (refer Part B – page 3)
		<b>Type A:</b> Inspections and general upkeep activities			<b>Group 1:</b> Low Risk
		<b>Type B:</b> Small scale, short duration activities, which create minimal dust			<b>Group 2:</b> Medium Risk
		<b>Type C:</b> Any work that generates a moderate to high level of dust			<b>Group 3:</b> Medium to High Risk
		<b>Type D:</b> Major demolition and construction projects			<b>Group 4:</b> Highest Risk

Using the matrix below identify the **class of preventive measures** required for this work. Enter the identified class of preventive measures in the Assessment and Sign-off Table. Refer to Part D for specifications for infection prevention and control measures.

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*Infection Prevention and Control / WHS / Microbiology / Infectious Diseases must be consulted when construction activities are planned*

Assessment and sign-off			
Class of preventive measures:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<b>Class I</b>	<b>Class II</b>	<b>Class III</b>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<b>Class III/IV</b>	<b>Class IV</b>	
<b>Facility Project Manager</b>			
Name:	<input type="text"/>	Signed:	<input type="text"/>
		Phone Number:	<input type="text"/>
<b>Facility Work Health and Safety</b>			
Name:	<input type="text"/>	Signed:	<input type="text"/>
		Phone Number:	<input type="text"/>
<b>Facility IP&amp;C Department</b>			
Name:	<input type="text"/>	Signed:	<input type="text"/>
		Phone Number:	<input type="text"/>
<b>Project Manager</b>			
Name:	<input type="text"/>	Signed:	<input type="text"/>
		Phone Number:	<input type="text"/>
<b>Construction Supervisor/Manager</b>			
Name:	<input type="text"/>	Signed:	<input type="text"/>
		Phone Number:	<input type="text"/>

*Detail controls relevant to planned building works – refer Part D for minimum standards*

Contractor Management	Hospital Site Management	Status

## Appendix 3: Infection Control Compliance Checklist

	YES	NO	N/A	CORRECTED
<b>1. Construction Hoarding</b>				
Barriers sealed, no penetrations				
Walk off mats in place and clean				
Barrier doors have closers and they are working				
Door frames have gaskets, doors are closed and properly sealed				
Signs posted informing about spread of dust				
Adjacent ceiling areas intact				
Adjacent floor is clean and no dust tracked				
Contractor site audit posted and current				
Date and time of last contractor site audit	Date:		Time:	

Comments:

<b>2. Negative Air</b>				
Negative pressure at barrier entrance				
All windows and doors closed behind barrier				
Negative air units or exhaust fans running				
Negative air filters clean				
Negative air units discharge ducts intact				

Comments:

<b>3. Jobsite</b>				
Project area is clean and debris removed daily				
Debris removed in containers				
Debris removed in time specified				

Comments:

<b>4. Occupied Areas</b>				
Work authorised and scheduled				
Barrier in place and properly sealed				
Ceiling access sign posted				
Surrounding areas are clean				

Comments:

## Appendix 4: Letters to immunocompromised patients

### Families of Immunocompromised patients

To be emailed to Senior Medical Staff and Clinical Nurse Consultants with the following:

*“If you have patients who are severely immunocompromised and at risk of fungal infections as a result of congenital or acquired T cell or neutrophil disorders, that may be visiting the hospital in between [insert date], could you please arrange for the attached letter and information sheet to be given to them”*

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TO Facility Patients and Families

---

CC Facility Director of Clinical Operations

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DATE

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SUBJECT Safety during building works

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Commencing [insert date], building works will start in [briefly describe project location and extent of planned works]. These works will be in close proximity to [identify entrances and other specific units] and may impact on patients and families visiting the hospital.

Hospital management is committed to providing all patients and visitors with a safe environment at all times. While all steps will be taken to minimise risk, there may still be dust generated during this work that could invade other spaces.

During construction and demolition activities a tiny fungus called *Aspergillus* may be released into the air. *Aspergillus* can travel on air currents to areas surrounding these works, and may cause infection in severely immunocompromised patients.

Patients who are undergoing high dose chemotherapy for leukemia and related illnesses, are having bone marrow, stem cell or other transplants, or are having other forms of therapy which may suppress their immune system may be at risk of developing *Aspergillus* infection. Healthy adults, women and children are not at risk of infection during construction work.

If you have been identified by your doctor as being at risk, you will be provided with a special mask to wear when coming to the hospital. Once you have arrived at your ward or treatment area you are free to remove the mask.

Yours sincerely

<Name>

<Title>

## Appendix 5: Internal Memorandum to staff

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TO Facility Patients and Families

---

CC Facility Director of Clinical Operations

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DATE

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SUBJECT Safety during building works

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As you are aware, there are significant building and construction works underway at [insert hospital].

Hospital management is committed to providing all staff with a safe work environment at all times. While all steps will be taken to eliminate and minimise risk there may still be dust generated during the refurbishment that could invade other work spaces. We are advised that microbes in the dust may be harmful to anyone with immune-compromised conditions that require ongoing care of a specialised Immunologist.

If you believe that you are at any level of risk, please notify your manager immediately. Please note that you need only provide advice regarding your degree of risk and full confidentiality of any information provided will be maintained. Hospital management will work with any affected staff, and their relevant clinician, to make alternative arrangements during this period.

I understand the disruption that building works such as this can have to the general work environment and ask for your understanding and patience during this short period.

Yours sincerely

<Name>  
<Title>



**Appendix 6: Factsheets**

# Invasive Aspergillosis Factsheet

## Information for Staff

### **Construction Associated Nosocomial Invasive Aspergillosis**

Certain types of demolition and construction activities can result in an increased risk of invasive Aspergillosis among immunosuppressed patients.

#### **Introduction**

- *Aspergillus* species are spore forming fungi that commonly occur in soil, water, organically enriched debris, decaying vegetation and within the fabric of buildings.
- Many species of *Aspergillus* have been recognised in nature, but only a few have been associated with human disease, particularly *A. fumigatus*, *A. flavus*, *A. niger*, *A. terreus* and *A. nidulans*.
- Most people are immune to infection and *Aspergillus* rarely poses a threat to healthy people. It is however, recognised as a potential cause of severe illness and mortality in highly immunocompromised patients.
- *Aspergillus* spp. are responsible for a wide spectrum of human illnesses ranging from colonization of the bronchial tree to more widespread disease in people receiving immunosuppressive or cytotoxic therapy, transplant recipients, patients with HIV infection and people with granulomatous disease who are those at increased risk of developing *Aspergillus* infection.

#### **Incubation Period**

- From a few days to a few months

#### **Common Clinical Presentations**

- Pneumonia
- Acute Aspergillus sinusitis
- In less than half of immunocompromised people with Aspergillus infection, other parts of the body may be affected such as the kidney, brain, liver, eyes or skin.

#### **Acquisition**

- Healthy people commonly inhale Aspergillus spores from environmental sources without becoming sick.
- The concentration of Aspergillus in the air commonly increases during construction works.
- Immunocompromised people are at risk of illness but Aspergillus is not spread person to person.

#### **Prevention and control**

##### **Contractor:**

Environmental control measures to minimise the risk of Aspergillus spores being dispersed into the air will be put in place by the contractor during demolition / construction / refurbishment activities.

##### **Patients:**

- Patients accommodated in the nearby areas require a risk assessment to identify whether they fall into any of the risk groups overleaf, prior to the demolition / construction / refurbishment work commencing
- Whilst the construction work is in progress, this risk assessment must be carried out for all patients on admission to hospital or their attendance at outpatient appointments
- Those considered by their clinician as being at increased risk, and who are adjacent or near the refurbishment / demolition area may need to be moved to another ward well away from the construction site

- Those identified by their clinician as being in the highest risk group should be nursed in a HEPA filtered positive pressure room during the neutropenic period (treating physician to advise on accommodation in facilities that do not have HEPA filtered positive pressure rooms)
- All new admissions to areas near to the demolition / construction / refurbishment sites should be risk assessed against the risk groups below by their clinical team.

### Staff:

- Unauthorised staff, patients and visitors **must not** enter construction areas
- All staff must be vigilant and report the spread of construction dust into adjacent patient areas to their line manager
- SESLHD staff members who identify themselves as being at risk should discuss their circumstances with their manager and seek advice from their treating clinician

***A high index of suspicion for the diagnosis of Aspergillosis should be maintained for those persons identified as being at risk and surveillance through clinical and microbiological / histological specimen reviews.***

### Highest risk groups

#### Anyone who is/has:

- neutropaenic;
- undergoing or who has recently completed any organ or tissue transplant
- had a solid organ transplant (i.e. liver, kidney, heart etc) in the past
- had at least three (3) months of immunosuppressant treatment, with multiple medications, for renal disease
- diagnosed graft vs host disease following a transplant
- Acute Lymphoblastic Leukaemia (ALL)
- aplastic anaemia.

#### Children with:

- Severe Combined Immunodeficiency Syndrome (SCIDS)
- Chronic Granulomatous Disease of Childhood (CGDC).

### Further information

**Contact the Infection Prevention and Control Service**

*\*Adapted from Illawarra Shoalhaven Local Health District Infection Management and Control Service-April 2012*

# Aspergillus Infection Factsheet

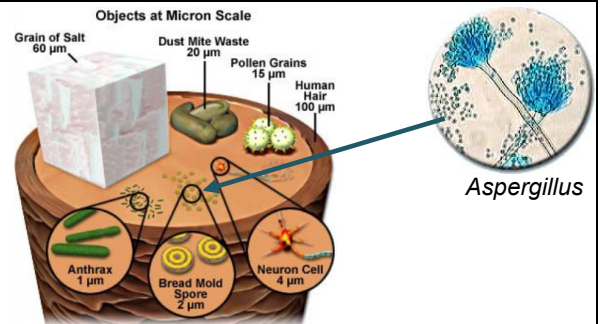
## Information for Construction Site Workers

### Construction Works in Healthcare Facilities

- As construction workers you would be familiar with the disease Asbestosis, and that there are specific control measures required to prevent the release of asbestos fibres into the air to protect workers and the general public.
- Hospitals provide healthcare to a large number of people, some of whom may be extremely at risk of getting infections caused by germs that would normally not be a problem if the person was healthy.
- One example of such a germ is a fungus called Aspergillus. This is unlikely to make a healthy person ill, but if a person has an illness, or is having treatment, that damages their immune system, Aspergillus can make them extremely sick.
- For this reason we ask that you are committed to reducing the chances of dust and fungal spores entering the buildings.

### What is Aspergillus?

- Aspergillus lives all around us, in soil, decaying vegetation, and within the structure of buildings.
- Construction, demolition and excavation activities disturb the fungus and may release millions of tiny spores.
- Because of their size and shape they can stay in the air and travel for long distances on air currents.
- Hospital air conditioning includes filters to clean outside air as it moves inside the building, but construction works often change the way that air moves into and inside the building and filters may not be relied on.



• Relative sizes of fungal spores

### • Who is at risk? (Please remember that Aspergillus rarely causes illness in healthy people)

- People who do not have a healthy immune system e.g. cancer or kidney patients, or those who are very young.
- How much of a problem Aspergillus will be to a person will depend on their immune system and the amount of contact they have with the fungus.
- We know that some demolition and construction activities are more risky than others which is why a risk assessment is done for each project and the advice may differ from one project to another.

## How is it spread?

- Aspergillus cannot be spread from person to person.
- If Aspergillus spores are breathed in by a person who has a problem with their immune system the person may develop a lung infection, or the fungus can spread in the blood to other parts of the body.

## How does it affect patients?

- Patients who get sick with Aspergillus need special drugs to treat the infection.
- They may need to stay in hospital for longer than expected.
- They may get very sick and might die from the infection.

## What can you do to protect patients?

**Whenever dust is created, it is important to stop it from contaminating the environment and the air. These can be done in a number of ways:**

- Water misting during demolition or excavation activities
- Floor to ceiling hoarding when working inside the healthcare facility
- Timely repair of any breaches in hoarding barriers
- Covering waste with plastic sheeting before removing it from the construction zone
- Sticky mats at the exit and entrance to an internal construction zone
- Not wearing dusty cloths and shoes outside the internal construction zone
- Regular cleaning with a damp mop or vacuum with a HEPA filter.

## Further information

Infection Prevention and Control Service

*\*Adapted from Illawarra Shoalhaven Local Health District Infection Management and Control Service-April 2012*