Appendix D

Sample Template of a Hospital Policy Document on Infection Prevention and Control Recommendations for the Prevention of Nosocomial Invasive Pulmonary Aspergillosis during Hospital Construction or Renovation

This template should be used in conjunction with the Consultation Draft of the National Guidelines for the Prevention of Nosocomial Aspergillosis 2016, available at http://www.hpsc.ie/A-Z/Respiratory/Aspergillosis/ConsultationDraftGuidance/

<table>
<thead>
<tr>
<th>Owner:</th>
<th>Infection Prevention and Control Team (IPCT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewed by:</td>
<td>Infection Prevention and Control Steering Committee (IPCSC)</td>
</tr>
<tr>
<td>Approved by:</td>
<td>Chairperson IPCSC</td>
</tr>
<tr>
<td>Effective from:</td>
<td></td>
</tr>
<tr>
<td>Revision Due:</td>
<td></td>
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<tr>
<td>Document History:</td>
<td>Version</td>
</tr>
</tbody>
</table>

Distributed to: Stakeholders (eg Chief Executive Officer/Manager, Nurse Managers, Department heads)

1.0 Introduction

1.1 Aspergillus species are ubiquitous fungi that commonly occur in soil, water, organically enriched debris and decaying vegetation. Many species of Aspergillus have been recognised in nature but only a few have been associated with human disease. A. fumigatus is the principal pathogenic Aspergillus species. A. flavus, A. terreus, A. niger and A. nidulans are relatively less common. Aspergillus spp. are responsible for a wide spectrum of human illnesses ranging from colonisation of the bronchial tree to rapidly invasive and disseminated diseases. Invasive aspergillosis (IA) is primarily an infection of severely immunocompromised patients i.e. patients with haematological malignancies undergoing intensive remission-induction chemotherapy, or haematopoietic stem cell transplantation, and solid organ transplant recipients and is difficult to diagnose and treat. However, over the last decade it has been increasingly recognised that immunocompetent patients who are critically ill or with severe chronic obstructive pulmonary disease (COPD) are at increased risk of IA. Mortality is still high despite new therapies, thus making prevention a high priority in the management of all at-risk patients.

Hospital acquired outbreaks of IA have become a well-recognised complication of construction, demolition or renovation work in or near hospital wards in which immunosuppressed patients are
Aspergillus spores are superbly adapted to airborne dissemination. These spores are passively liberated during construction/renovation activities and can be transported great distances as airborne particles by normal atmospheric conditions such as convection currents and wind. Airborne transmission is the principal route of transmission of Aspergillus within the hospital environment. The respiratory tract is the most common portal of entry and the small diameter of the spores (2.5-3.5 μm) permits them to reach the pulmonary alveolar spaces, where they may germinate to form hyphae.

1.2 The majority of the outbreaks reported were related to contamination of the hospital air as a result of the dust and dirt raised during construction, demolition or renovation projects within or adjacent to the health care facility. Specific construction/maintenance activities included: (i) general construction and renovation work, (ii) disturbance of soil resulting from earth works associated with building construction and site development, (iii) removal of suspended ceiling tiles, (iv) removal of fibrous insulation material, and (v) opening up of service distribution shafts. Aspergillosis outbreaks have also been associated with improper operation and poor maintenance of sophisticated air ventilation systems.

1.3 Host immunity plays a major role in determining who may be at risk of developing IA.

2.0 Responsibility and Accountability

2.1 Compliance to this policy is monitored as part of the Infection Prevention and Control Team (IPCT) review of compliance to infection prevention and control Aspergillosis risk reduction guidance circulated to relevant stakeholders prior to the commencement of project following review of scope of works method statement.

2.2 The Hospital Chief Executive Officer/Manager has overall responsibility for the health and safety of patients, staff and visitors.

2.3 The Infection Prevention and Control Team (IPCT) will:

- communicate and provide advice regarding implementation of measures prior to and during construction/renovation phase to reduce the risk of IA.
- be consulted and involved at the design phase and throughout the project until completion and commissioning for all construction/renovation projects
- monitor compliance to this policy with the Technical service staff
2.4 The Technical services staff:

- should be aware of the risks posed by construction activity to at-risk patients
- should consult with the IPCT in advance of all minor or major construction or renovation activities
- should monitor implementation of preventive practices and maintain records relating to fixed plant precautions and maintenance of *Aspergillus* protection systems. The use of an *Aspergillus* preventive measures compliance checklist is recommended to control such activities (Appendix I)
- should ensure details of all works and maintenance activities are communicated to the infection prevention and control team and method statement provided to IPCT

2.5 The Planning Department must consult with the IPCT at the design phase and planning meetings for any construction/renovation projects.

2.6 Department Heads/Ward Managers are responsible for informing the IPCT if there is any breach in implementation of the guidance.

2.7 Hospital Managers should ensure that they are aware of construction/renovation activities external to but proximal to the hospital and institute precautionary measures to protect at-risk patients where appropriate, based on the findings of the risk-assessment.

2.8 Medical and nursing staff should be aware of patient populations at risk, potential hazards that construction/renovation projects pose to patients, and the preventive measures required. The IPCT should collaborate with medical and nursing staff to identify patients at risk, and to monitor the effectiveness of preventive measures taken throughout the project.

3.0 **Key Statements**

3.1 The key measures to minimise the risk of *Aspergillus* infection are:

1) minimise the dust generated during construction activity
2) prevent dust infiltration into adjacent patient care areas.

3.2 Non-adherence to invasive aspergillosis risk reduction guidance will result in cessation of project, convening of meeting by the Chief Executive Officer with the Project team, Risk Manager, IPCT and other relevant stakeholders.
4.0 Infection Prevention & Control Measures

4.1 There is now an acceptance that IA can be linked to demolition, excavation, construction and refurbishment activities within or adjacent to the hospital site. Over the last decade the adoption of control measures by health care facilities has been successful and has facilitated extensive hospital building works without a significant increase in aspergillosis. However, the variety of patients susceptible to IA has expanded and with advanced medical technology will become more extensive. It is imperative to plan and ensure that optimum protection is afforded to all patient groups, based on their perceived risk. The preventive measures implemented will depend on the type of construction/renovation being undertaken in the hospital and the proximity of the at-risk patients to this site. This will be based on the results of a risk assessment.

4.2 A formal invasive aspergillosis Risk Assessment (IARA) should be performed by a multi-disciplinary team whereby the following are identified:

(1) the scope and hazards inherent in the building project,
(2) the patient groups ‘at risk’ and
(3) the necessary safeguards.

Implementation of the recommended preventive measures is assigned to the appropriate groups that extend from ward level to the project manager.

There are four steps to the process.

Step One: Consider patient risk factors and assign to correct group: 1- 4. If more than one risk groups are identified within a specific cohort, select the higher risk group (Table 1).

Step Two: Detail construction activity and assign type: A1, A2, B, C or D (Table 2).

Step Three: Determine the construction site preventive measures and assign class: 0-III (Table 3).

Step Four: Verify risk assessment by checking with matrix (Table 4).
Table 1  Classification of At-Risk Patients

At-risk patients may be categorised as outlined below. However, all patients should be individually risk assessed to determine if they are at risk of developing IA.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Details</th>
</tr>
</thead>
</table>
| Group 1 - No evidence of risk<sup>1</sup> | 1. Staff members, Service Providers and Contractors  
2. All patients not listed in Groups 2 – 4 below |
| Group 2 - Increased risk   | 1. Patients on prolonged courses of high dose steroids particularly those hospitalised for prolonged periods  
2. Severely immunosuppressed AIDS patients  
3. Patients undergoing mechanical ventilation  
4. Non-neutropenic patients on chemotherapy<sup>2</sup>  
5. Dialysis patients |
| Group 3 - High risk        | 1. Patients with neutropenia for less than 14 days following chemotherapy  
2. Adult acute lymphoblastic leukaemia patients on high dose steroid therapy  
3. Solid organ transplantation  
4. Patients with Chronic Granulomatous Disorder  
5. Neonates in intensive care units  
6. COPD patients meeting GOLD stage III and IV criteria and in intensive care<sup>3</sup>  
7. Patients with extensive burns |
| Group 4 - Very high risk   | 1. Allogeneic haematopoietic stem cell transplantation<sup>4</sup>  
a. during the neutropenic period  
b. with graft-versus-host disease requiring steroid +/- other immunosuppressive therapy  
2. Autologous haematopoietic stem cell transplantation<sup>5</sup>, i.e. during the neutropenic period  
3. Non-myeloablative transplantation  
4. Children with severe combined immuno-deficiency syndrome  
5. Prolonged neutropenia for greater than 14 days following chemotherapy or immunosuppressive therapy (including acute myeloid leukemia)  
6. Aplastic anaemia patients |

<sup>1</sup> Assuming no known immunocompromise  
<sup>2</sup> ANC count >1 x 10<sup>9</sup>/l  
<sup>3</sup> Wards with a high occupancy of COPD patients meeting GOLD stage III and IV criteria should be risk assessed on the basis of the patients’ levels of immunosuppression, and the threat posed to the patients by the construction activity.  
<sup>4</sup> Includes bone marrow transplantation patients  

**Note:** Cystic fibrosis patients should also be considered. Each cystic fibrosis patient is assigned to one of the above four categories depending on the stage of his/her illness.
Table 2. Details of the type of construction project activity

<table>
<thead>
<tr>
<th>Type</th>
<th>Description of the activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE A1</td>
<td><strong>Minor internal containable activities with no/minimal dust generation</strong></td>
</tr>
<tr>
<td></td>
<td>This includes but is not limited to inspection and non-invasive activities and small-scale</td>
</tr>
<tr>
<td></td>
<td>activities that create minimal dust. These include, but are not limited to, activities that</td>
</tr>
<tr>
<td></td>
<td>require removal of ceiling tiles for preliminary visual inspection (limited to 1 tile per</td>
</tr>
<tr>
<td></td>
<td>$5m^2$), painting (no sanding), wall covering, electrical trim work, minor plumbing and</td>
</tr>
<tr>
<td></td>
<td>other maintenance activities that <strong>do not generate dust</strong> or require cutting of walls or</td>
</tr>
<tr>
<td></td>
<td>access to ceilings other than for visual inspection.</td>
</tr>
<tr>
<td>Type A2</td>
<td><strong>Minor internal small-scale works with some dust generation that can be contained</strong></td>
</tr>
<tr>
<td></td>
<td>This includes, but is not limited to, minor works on a small scale where dust containment</td>
</tr>
<tr>
<td></td>
<td>is achieved by using dust barriers and a HEPA-filtered vacuum.</td>
</tr>
<tr>
<td></td>
<td>Activities that require access to conduit spaces, cutting of walls, woodwork or ceilings</td>
</tr>
<tr>
<td></td>
<td>where dust migration can be controlled for installation or repair of minor electrical work,</td>
</tr>
<tr>
<td></td>
<td>ventilation components, telephone wires or computer cables. It also includes minor plumbing</td>
</tr>
<tr>
<td></td>
<td>as well as minor drilling to allow for the erection of brackets and shelving.</td>
</tr>
<tr>
<td>TYPE B</td>
<td><strong>Major internal containable activities</strong></td>
</tr>
<tr>
<td></td>
<td>Any work that generates a moderate level of dust or requires demolition or removal of any</td>
</tr>
<tr>
<td></td>
<td>fixed building components or assemblies (e.g. counter tops, cupboards, sinks). These include,</td>
</tr>
<tr>
<td></td>
<td>but are not limited to, activities that require sanding of walls for painting or wall</td>
</tr>
<tr>
<td></td>
<td>covering, removal of floor-covering, ceiling tiles and stud work, new wall construction,</td>
</tr>
<tr>
<td></td>
<td>minor duct work or electrical work above ceilings, major cabling activities, and any activity</td>
</tr>
<tr>
<td></td>
<td>that cannot be completed within a single work shift. This type of activity includes</td>
</tr>
<tr>
<td></td>
<td>extensive plumbing work. It also includes demolition or removal of a complete cabling system</td>
</tr>
<tr>
<td></td>
<td>or plumbing and new construction that requires consecutive work shifts to complete.</td>
</tr>
<tr>
<td>TYPE C</td>
<td><strong>Minor external non--containable activities</strong></td>
</tr>
<tr>
<td></td>
<td>External construction activities that generate moderate levels of dust or minor excavations.</td>
</tr>
<tr>
<td></td>
<td>Such activities include, but are not limited to, digging trial pits and minor foundations,</td>
</tr>
<tr>
<td></td>
<td>trenching, landscaping, minor construction and demolition work.</td>
</tr>
<tr>
<td>TYPE D</td>
<td><strong>Major external non--containable activities</strong></td>
</tr>
<tr>
<td></td>
<td>External construction activities that generate large levels of dust. Such activities would</td>
</tr>
<tr>
<td></td>
<td>include, but are not limited to, major soil excavation, demolition of buildings and any</td>
</tr>
<tr>
<td></td>
<td>other construction activity not covered under Type C.</td>
</tr>
</tbody>
</table>
Table 3. Description of the required infection prevention and control precautions by class

<table>
<thead>
<tr>
<th>Class 0 Preventive Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dust Control</strong></td>
</tr>
<tr>
<td>• Immediately replace ceiling tiles displaced for preliminary visual inspection</td>
</tr>
<tr>
<td><strong>Cleaning</strong></td>
</tr>
<tr>
<td>• Wet mop and vacuum area as needed and when work is completed</td>
</tr>
<tr>
<td>• Wipe horizontal and vertical work surfaces with hot soapy water</td>
</tr>
<tr>
<td><strong>Infection Prevention and Control Personnel</strong></td>
</tr>
<tr>
<td>• Approval to be sought from IPCT for the construction activity</td>
</tr>
<tr>
<td><strong>Patient Risk Reduction</strong></td>
</tr>
<tr>
<td>• Minimise increased risk patients’ (Group 2) exposure to the construction/renovation area</td>
</tr>
<tr>
<td>• Minimise dust and increase cleaning in patient area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class I Preventive Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dust Control</strong></td>
</tr>
<tr>
<td>• Immediately replace ceiling tiles displaced for visual inspection</td>
</tr>
<tr>
<td>• Execute work by methods to minimise dust generation from construction or renovation activities</td>
</tr>
<tr>
<td>• Provide active means to minimise dust generation and migration into the atmosphere</td>
</tr>
<tr>
<td><strong>Cleaning</strong></td>
</tr>
<tr>
<td>• Wet mop and vacuum area as needed and when work is completed</td>
</tr>
<tr>
<td>• Wipe horizontal and vertical work surfaces with hot soapy water</td>
</tr>
<tr>
<td><strong>Infection Prevention and Control Personnel</strong></td>
</tr>
<tr>
<td>• Approval to be sought from IPCT for the construction activity and the permit to be issued</td>
</tr>
<tr>
<td>• In collaboration with cleaners and technical services, ensure that the construction zone remains sealed and that the cleaning is adequate at all times</td>
</tr>
<tr>
<td><strong>Patient Risk Reduction</strong></td>
</tr>
<tr>
<td>• Move at-risk patients (Groups 2-4) away from construction area. If it is not possible to move e.g. ICU patients, an impermeable dust barrier should be erected around the construction area</td>
</tr>
<tr>
<td>• Minimise patients’ exposure to the construction/renovation area</td>
</tr>
<tr>
<td>• Minimise dust and increase cleaning in patient area</td>
</tr>
</tbody>
</table>
Class II Preventive Measures

**Dust Control**
- Execute work by methods to minimise dust generation from construction or renovation activities
- Erect an impermeable dust barrier
- Ensure windows and doors are sealed
- A separate entrance away from patient traffic should be created for use by construction workers
- Protective clothing should be worn by construction workers and removed when leaving the construction site
- Dust barrier should not be removed until the project is complete

**Ventilation of Construction Area**
- Seal windows
- Maintain negative pressure within construction zone by using a portable extract fan
- Ensure air is exhausted directly to the outside and away from intake vents or filtered through a minimum of an F9 filter
- Ensure ventilation system is functioning properly and is cleaned if contaminated by soil or dust after construction or renovation project is complete

**Debris Removal and Cleaning**
- Contain debris in covered containers or cover with either an impermeable or moistened sheet before transporting for disposal
- Remove debris at end of the work day
- An external chute will need to be erected if the construction is not taking place at ground level
- Vacuum work area with HEPA filtered vacuums daily or more frequently if required

**Infection Prevention and Control Personnel**
- Approval to be sought from IPCT for the construction activity and the permit to be issued
- In collaboration with cleaners and technical services, ensure that the construction zone remains sealed and that the cleaning is adequate at all times

**Patient Risk Reduction**
- Move all patients from within the construction area
- If possible move at-risk patients (Groups 2-4) who are adjacent or near to the construction area
- Ensure that patients do not go near construction area
- All windows, doors, air intake and exhaust vents should be sealed in areas of the hospital containing patients who are classified as at increased risk (Groups 2-4), if the construction or demolition work is considered likely to result in Aspergillus-contaminated air entering these areas
- High and very high-risk patients (Groups 3-4) should preferably be treated in HEPA-filtered, positive pressure isolation rooms or facilities. Where such facilities are not available, the local IPCT should do a risk assessment to identify alternative options. This may include neutral pressure isolation rooms (also referred to as positive pressure ventilated lobby (PPVL) room). Although these facilities have been validated from an engineering perspective they have not yet been clinically validated for the prevention of nosocomial aspergillosis among at-risk patients.

**Traffic Control**
- In collaboration with the technical services manager designate a traffic pattern for construction workers that avoids patient care areas and a traffic pattern for clean or sterile supplies, equipment, patients, staff and visitors that avoids the construction area
- A traffic path should be designated for the removal of rubble from the construction site which preferably is separate to and away from all hospital related traffic.
### Class III Preventive Measures

**Dust Control**
- Execute work by methods to minimise dust generation from construction or renovation activities
- Provide active means to minimise dust generation and migration into the atmosphere. During dry weather, soil must be regularly dampened for periods involving any ground works.

**Debris Removal and Cleaning**
- Contain debris in covered containers or cover with an impermeable or moistened sheet before transporting for disposal.
- Ensure no increased dust within the hospital; increased cleaning may be necessary.

**Infection Prevention and Control Personnel**
- Approval to be sought IPCT for the construction activity and the permit to be issued.
- In collaboration with technical services ensure that dust is minimised from the construction site and that the construction site measures are being adhered to.
- Ensure that cleaning is adequate to minimise dust within the hospital.

**Patient Risk Reduction**
- No specific requirement for Risk Group 1.
- If possible, move at-risk patients (Groups 2-4) who are adjacent or near to the construction area.
- Ensure that patients do not go near construction areas.
- All windows, doors, air intake and exhaust vents should be sealed in areas of the hospital containing at-risk patients (Groups 2-4), if the construction or demolition work is considered likely to result in *Aspergillus*-contaminated air entering these areas.
- High and very high-risk patients (Groups 3-4) should be preferably treated in HEPA-filtered, positive pressure isolation rooms or facilities. Where such facilities are not available, the local IPCT should do a risk assessment to identify alternative options. This may include neutral pressure isolation rooms (also referred to as positive pressure ventilated lobby (PPVL) room), although these facilities have been validated from an engineering perspective, they have not yet been clinically validated for the prevention of nosocomial aspergillosis among at-risk patients.

**Traffic Control**
- In collaboration with the technical services manager, designate a traffic pattern for construction workers that avoids patient care areas and a traffic pattern for clean or sterile supplies, equipment, patients, staff, and visitors that avoids the construction area.
- A traffic path should be designated for the removal of rubble from the construction site which preferably is separate to and away from all hospital-related traffic.
Table 4. Matrix of construction project activity type, patient risk group and class of required infection prevention and control precautions

This matrix was adapted from Infection Control Risk Assessment Matrix of Precautions for Construction & Renovation from the Association of Professionals in Infection Control and Epidemiology

<table>
<thead>
<tr>
<th>Patient Risk Group</th>
<th>TYPE A1</th>
<th>TYPE A2</th>
<th>TYPE B</th>
<th>TYPE C</th>
<th>TYPE D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 – No evidence of risk</td>
<td>0</td>
<td>I</td>
<td>I</td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td>Group 2 – Increased risk</td>
<td>0</td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td>Group 3 – High risk</td>
<td>I</td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td>Group 4 – Very high risk</td>
<td>I</td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>III</td>
</tr>
</tbody>
</table>

Note 1: Discussion with Infection Prevention and Control Team will be required when the construction activity and risk level indicate that Class II or Class III control procedures are necessary.

Note 2: This is a guide and if specific risk issues are identified an individual risk assessment of that issue may be required.

5.0 Construction and Ventilation Measures

5.1 A number of measures may be implemented by hospital construction designers and maintenance personnel to protect at-risk patients during building activities on hospital sites. The measures identified in the available literature on the subject vary from basic minimal precautions and good housekeeping to major mechanical services intervention involving dedicated high-efficiency particulate air (HEPA) filtered installation systems to protect the areas in which the at-risk patients are housed.

5.2 These measures may be divided into:

5.2.1 Measures to reduce dust emission from construction area

5.2.2 Measures to physically protect at-risk patients

5.2.1 Measures to reduce dust emission from construction area

5.2.1.1 The construction area should be sealed fully during the construction period. A dust barrier should be created from the floor to the slab (true ceiling) and edges sealed.

5.2.1.2 For short-term minor projects, this may be plastic sheeting, however for more long term projects this should be a solid sealed barrier. It may be necessary to create a lobby (anteroom) if the barrier is the entrance/egress for construction workers.
5.2.1.3 Dust-proof barriers should be inspected at least daily by the contractors to ensure that the seals are intact.

5.2.1.4 All windows, doors, vents, plumbing penetrations, electrical outlets and any other sources of potential air leak should be sealed in the construction zone.

5.2.1.5 Air pressure in the construction zone should be negative compared with adjacent areas. An extract fan may be used for this purpose. Air from the construction zone should be exhausted directly to the outside and this is the most appropriate option. If this is not possible then the air should be filtered through HEPA filters (that have been properly fitted and strictly monitored) before being re-circulated to the hospital.

5.2.1.6 Dust reduction techniques should be used for cutting and hole boring.

5.2.1.7 Debris should be removed from the construction area at the end of each working day. Debris should be removed in covered containers preferably through window openings. A chute may be necessary if the construction is above ground floor level. In addition, normal good housekeeping procedures should prevail during the operation in particular, holding skips and other containers should be kept moistened and/or covered. The construction area should be vacuumed on a daily basis or more frequently if required, to maintain an environment as free from dust as possible.

5.2.1.8 A mat with a sticky surface or moist carpet should be placed inside the exit from the construction zone to trap dust. This should be vacuumed/changed daily or more frequently when visibly soiled.

5.2.1.9 Construction workers should wear protective clothing, which should be removed before leaving the construction zone.

5.2.1.10 The measures implemented to reduce dust emission from the construction area will vary depending on the construction/renovation activity (See Table 2). The measures required for the various types of construction activity are outlined in the Sample Construction Permit (Appendix II)

5.2.2 Measures to physically protect at-risk patients

5.2.2.1 Patients who are at risk should be moved to an area away from the construction zone if the air quality cannot be guaranteed during construction.

5.2.2.2 At-risk patients (Groups 2-4) should wear protective masks if it is necessary to transport them through a construction area. These masks should be capable of filtering Aspergillus spores such as particulate-filter respirators which give a >95% filtration efficacy of 0.3 μm particle size and are used in association with the National Institute for Occupational Safety and Health (NIOSH) regulations.
5.2.2.3 All windows, doors (apart from essential access points) and vents should be sealed in areas of the hospital containing patients who are most susceptible (Groups 2-4), if the construction or demolition work is considered likely to result in *Aspergillus*-contaminated air entering these areas. If the area is not served by a ventilation system, these precautionary measures may result in unacceptable environmental conditions within the area involved. Any fresh air introduced into this area must be HEPA filtered. If the area is connected to a central ventilation system, it is important that prior to construction works, the ventilation should be thoroughly checked and if it is to remain functional, it should be fitted with HEPA filters if air from the construction zone may be drawn into the system.

5.2.2.4 For high and very high-risk patients (Groups 3-4), it is recommended that an environment that is fully HEPA filtered and at positive pressure is provided. This involves the installation of dedicated remote air handling systems, which are ducted through supply systems to the at-risk area. The intake air handling unit is fitted with a combination of coarse bag and panel filters and finally a HEPA filtered section which is the only filter capable of trapping the 2.5 to 3.5 μm size of the *Aspergillus* spore. Typically, these dedicated ventilation/filter units should provide an air exchange rate of 10 air changes per hour within the at-risk areas and a pressure differential for positive pressure areas of +10 Pascals relative to the corridor.

5.2.2.5 A mat with a sticky surface should be placed at the entrance to the patient care area. This should be changed or vacuumed daily or when visibly soiled.

6.0 Dust containment

6.1 The objectives of dust containment measures are:

- To minimise the dust generated during the work activity
- To prevent dust infiltration into adjacent patient care areas.
- The categorisation of the construction activity in conjunction with its geographical location will determine the controls required to achieve these objectives. The use of a construction permit will assist in achieving compliance with the requirements (Appendix II)

7.0 Cleaning

7.1 In addition to minimising dust through measures outlined in the construction permit increasing the existing cleaning regimes to prevent dust accumulation on surfaces, ceilings and air duct grills will be necessary. As the quantity of dust generated will vary depending on
the type of building activity, the increased cleaning regimes need to be adjusted accordingly to minimise dust accumulation. Damp dusting not dry cleaning is recommended. Air filtration systems must be regularly checked. Where vacuum cleaners are used, in areas where high-risk and very high-risk patients are cared for and in adjacent areas, these should be equipped with HEPA filters and appropriately maintained to minimise dust dispersal. Filters in the air filtration systems and the vacuum cleaners need to be changed regularly and a record/log should be kept of these changes.

7.2 Responsibility for cleaning the construction zone lies with the contractors.

8.0 Traffic

8.1 Pedestrian: Pedestrian traffic from the construction area should be directed away from patient areas, with workmen having a separate entrance to the construction site as outlined in the construction permit. When possible, patients and visitors should avoid entering the hospital adjacent to major construction/demolition sites, where debris or dust is being removed from the works area.

8.2 Supplies: Alternative routes, which avoid the construction site, through which inanimate items are transported throughout the hospital, may need to be identified during construction. Clean or sterile supplies or equipment should be transported to storage areas by a route that minimises contamination risks from the construction site.

8.3 In some critical areas and in some instances where it may not be possible to alter traffic patterns, consideration will have to be given to scheduling construction to off-hour periods and weekends. Some areas may need to be relocated or closed temporarily.

9.0 Protective Measures for At-Risk Patients

9.1 Patients deemed to be at risk of systemic mould infection should be stratified on the basis of their underlying disease, its treatment and the area in the hospital in which they are being treated in relation to the proposed building programme. An information leaflet on Aspergillosis is available for patients (Appendix III).

9.2 Environmental measures

9.2.1 Very high-risk patients (Group 4)

Patients at very high risk (Group 4) should receive maximum protection irrespective of the type/size of the building programme. All very high-risk patients should be nursed in HEPA filtered positive pressure rooms during the neutropenic period. If they are subsequently
transferred to a ward, the windows should be sealed and suitable air quality provided (See Point 5.2.2).

9.2.2 High-risk patients (Group 3)
Patients at high risk (Group 3) should receive protection if the area of treatment is juxtaposed or near the hospital construction area or if it is otherwise likely that Aspergillus-contaminated air may enter the area. High-risk patients should be nursed in a ward with sealed windows and suitable air quality (See Point 5.2.2).

9.2.3 Increased-risk patients (Group 2)
Patients at increased risk (Group 2) are usually dispersed throughout the hospital and therefore physical protection may be impractical. Consideration should be given to moving patients away from the construction area.

9.3 Chemoprophylaxis
Antifungal chemoprophylaxis should be considered in at-risk patients in line with current guidelines and hospital policy and in consultation with the Consultant Microbiologist.

10.0 Cessation of Works
10.1 Non-conformance to IPC Aspergillosis risk reduction guidance will result in cessation of works until all measures are implemented. The CEO should convene a multi-disciplinary team meeting with the Project team, IPCT, Risk Manager/s and other relevant stakeholders.
10.2 Risk assessment of patient population risk group will be carried out in consultation with patients’ primary team.
10.3 An adverse incident form should be completed.
Appendix I. Nosocomial invasive aspergillosis preventive measures compliance checklist

Works:
Date:
Reference: Infection Prevention and Control Guidelines to minimise exposure risk to patients during above works.

<table>
<thead>
<tr>
<th>Standard</th>
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<tbody>
<tr>
<td><strong>Patient risk reduction</strong></td>
<td></td>
</tr>
<tr>
<td>1. Windows /vents sealed</td>
<td></td>
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<tr>
<td>2. Restricted access to site</td>
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<tr>
<td>3. No “at risk” patients exposed</td>
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<td>4. PRF masks used if required</td>
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<tr>
<td>5. Other</td>
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<tr>
<td><strong>Traffic Control</strong></td>
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<tr>
<td><strong>Dust Control</strong></td>
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<tr>
<td><strong>Ventilation</strong></td>
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<tr>
<td><strong>Debris removal</strong></td>
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<tr>
<td><strong>Cleaning</strong></td>
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Comments:
Appendix II. Sample Construction Permit

**Construction Permit**

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<th>Permit No:</th>
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<th>Infection Control Personnel Approval</th>
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**Construction/Renovation Activity**

**Type A2 - Minor Internal Containable Activities**
This includes minor works on a small scale where dust containment is achieved by using dust barriers and a HEPA-filtered vacuum. Activities that require access to conduit spaces, cutting of walls or ceilings where dust migration can be controlled for installation or repair of minor electrical work, ventilation components, telephone wires or computer cables. It also includes minor plumbing. This may include minor drilling to allow for the erection of brackets and shelving.

**Type B - Major Internal Containable Activities**
work that generates a moderate level of dust or requires demolition or removal of any fixed building components or assemblies (eg counter tops, cupboards sinks). These include, but are not limited to, activities that require sanding of walls for painting or wall covering, removal of floor-covering, ceiling tiles and stud work, new wall construction, minor duct work or electrical work above ceilings, major cabling activities, and any activity that cannot be completed within a single work shift. This type of activity includes extensive plumbing work. It also includes demolition or removal of a complete cabling system or plumbing and new construction that requires consecutive work shifts to complete.

**Type C - Minor External Non-Containable Activities**
External construction activities that generates moderate levels of dust or minor excavations. Such activities include digging trial pits and minor foundations, trenching, landscaping and minor construction and demolition work.

**Type D - Major External Non-Containable Activities**
External construction activities that generate large levels of dust. Such activities would include major soil excavation, demolition of buildings and any other construction activity not covered under Type C.

---

**Population Risk Groups**

**Group 1 - No Evidence of Risk**
- Staff Members/Service Providers/Contractors
- All patients not listed in Groups 2-4 below

**Group 2 - Increased Risk**
- Patients on prolonged courses of high dose steroids
- Severely immunosuppressed AIDS patients
- Patients undergoing mechanical ventilation
- Non-neutropenic patients on chemotherapy
- Dialysis patients

**Group 3 - High Risk**
- Neutropenia for less than 14 days following chemotherapy
- Adult acute lymphoblastic leukaemia on high dose steroid therapy
- Solid organ transplantation
- Chronic Granulomatous Disorder
- Neonates in intensive care units
- COPD patients meeting GOLD stage III and IV criteria
- Patients with extensive burns

**Group 4 - Very High Risk**
- Allogeneic haematopoietic stem cell transplantation
  - during the neutropenic period
  - with graft-versus-host disease requiring steroid +/- other immunosuppressive therapy
- Autologous haematopoietic stem cell transplantation, ie during the neutropenic period
- Non-myeloablative transplantation
- Children with severe combined immunodeficiency syndrome (SCID)
- Prolonged neutropenia for greater than 14 days following chemotherapy or immunosuppressive therapy (including acute myeloid leukaemia)
- Aplastic anaemia patients
### Class I

**Class I Preventive Measures are recommended for Minor Internal Containable Construction Activities (Type A2)**

#### Dust Control
- Immediately replace ceiling tiles displaced for visual inspection
- Execute work by methods to minimise dust generation from construction or renovation activities
- Provide active means to minimise dust generation and migration into the atmosphere

#### Cleaning
- Wet mop and vacuum area as needed and when work is completed
- Wipe horizontal and vertical work surfaces with hot soapy water

#### Infection Prevention and Control Personnel
- Approval to be sought from IPCT for the construction activity and the permit to be issued
- In collaboration with cleaners and technical services, ensure that the construction zone remains sealed and that the cleaning is adequate at all times

#### Patient Risk Reduction
- Move at-risk patients (Groups 2-4) away from construction zone. If it is not possible to move eg ICU patients, an impermeable dust barrier should be erected around the construction zone
- Minimise patients’ exposure to the construction /renovation area
- Minimise dust and increase cleaning in patient area

### Class II

**Class II Preventive Measures are recommended for Major Internal Containable Construction Activities (Type B)**

In addition to the Class I measures outlined above the following measures should be also implemented for Type B activities

#### Dust Control
- Execute work by methods to minimise dust generation from construction or renovation activities
- Erect an impermeable dust barrier
- Ensure windows and doors are sealed
- A separate entrance away from patient traffic should be created for use by construction workers
- Protective clothing should be worn by construction workers and removed when leaving the construction site
- Dust barrier should not be removed until the project is complete

#### Ventilation of Construction Zone
- Seal windows
- Maintain negative pressure within construction zone by using a portable extract fan
- Ensure air is exhausted directly to the outside and away from intake vents or filtered through a minimum of an F9 filter
- Ensure ventilation system is functioning properly and is cleaned if contaminated by soil or dust after construction or renovation project is complete

#### Debris Removal and Cleaning
- Contain debris in covered containers or cover with either an impermeable or moistened sheet before transporting for disposal
- Remove debris at end of the work day
- An external chute will need to be erected if the construction is not taking place at ground level
- Vacuum work area with HEPA filtered vacuums daily or more frequently if required

#### Infection Prevention and Control Personnel
- Approval to be sought from IPCT for the construction activity and the permit to be issued
- In collaboration with cleaners and technical services, ensure that the construction zone remains sealed and that the cleaning is adequate at all times

### Class II cont’d

**Patient Risk Reduction**
- Move all patients from within the construction zone
- If possible move at-risk patients (Groups 2-4) who are adjacent or near to the construction zone
- Ensure that patients do not go near construction zone
- All windows, doors, air intake and exhaust vents should be sealed in areas of the hospital containing patients who are classified as at increased risk (Groups 2-4), if the construction or demolition work is considered likely to result in Aspergillus-contaminated air entering these areas
- High and very high-risk patients (Groups 3-4) should preferably be treated in HEPA-filtered, positive pressure isolation rooms or facilities or if not available, do a risk assessment to identify alternative options (see Section 3.4 on Class II preventive measures)

#### Traffic Control
- In collaboration with the technical services manager, designate a traffic pattern for construction workers that avoids patient care areas and a traffic pattern for clean or sterile supplies, equipment, patients, staff and visitors that avoids the construction zone
- A traffic path should be designated for the removal of rubble from the construction site which preferably is separate to and away from all hospital related traffic.

### Class III

**Class III Preventive Measures are recommended for All External Non-Containable Construction Activities (Type C & D)**

#### Dust Control
- Execute work by methods to minimise dust generation from construction or renovation activities
- Provide active means to minimise dust generation and migration into the atmosphere. During dry weather soil must be regularly dampened for period involving any ground works

#### Debris Removal and Cleaning
- Contain debris in covered containers or cover with an impermeable or moistened sheet before transporting for disposal
- Ensure no increased dust within hospital, increased cleaning may be necessary

#### Infection Prevention and Control Personnel
- Approval to be sought from IPCT for the construction activity and the permit to be issued
- In collaboration with technical services ensure that dust is minimised from the construction site and that the construction site measures are being adhered to
- Ensure that cleaning is adequate to minimise dust within the hospital

#### Patient Risk Reduction
- No specific requirement for Risk Group 1
- If possible move at-risk patients (Groups 2-4) who are adjacent or near to the construction zone
- Ensure that patients do not go near construction zone
- All windows, doors, air intake and exhaust vents should be sealed in areas of the hospital containing at-risk patients (Groups 2-4), if the construction or demolition work is considered likely to result in Aspergillus-contaminated air entering these areas
- High and very high-risk patients (Groups 3-4) should preferably be treated in HEPA-filtered, positive pressure isolation rooms or facilities or if not available, do a risk assessment to identify alternative options (see Section 3.4 on Class II preventive measures)

#### Traffic Control
- In collaboration with the technical services manager, designate a traffic pattern for construction workers, that avoids patient care areas and a traffic pattern for clean or sterile supplies, equipment, patients, staff and visitors that avoids the construction zone.
- A traffic path should be designated for the removal of rubble from the construction site which preferably is separate to and away from all hospital related traffic.

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February 2016
Appendix III. Information Leaflet on Aspergillosis during Construction Activities

General Information
The purpose of this leaflet is to inform patients, relatives, health care workers and those involved in the activities of construction of the risk of aspergillosis during construction work. This leaflet should be considered as introductory information only.

*Aspergilli* are tiny fungi that cannot be seen by the eye but commonly occur in soil, water and decaying vegetation. They can also live in old buildings or in areas such as ventilation shafts. Many types of *Aspergillus* are found in nature but only a few species cause human diseases.

*Aspergillus* may be released into the air during construction/renovation activities ranging from demolition and renovation, to construction. *Aspergillus* can be transported great distances by normal conditions such as air currents and wind. Small pieces of dirt or dust in the air are the main ways that *Aspergillus* travels and causes infection in hospitals. Hospital activities that generate dust such as maintaining the ventilation system, cleaning, vacuuming and dry dusting can also allow *Aspergillus* to travel through the air.

Patients who are undergoing high dose chemotherapy for leukaemia and related illnesses or who are having bone marrow, stem cell or other transplants, or who are having other forms of therapy which may suppress their immune system may be at risk of developing infection with this fungus in the lungs or other parts of the body. Healthy adults and children are not at increased risk of infection during construction work.

For the Patient
Should you be undergoing treatment in hospital which suppresses your immunity to infection you may become susceptible to developing infection with a fungus found in the environment called *Aspergillus*. Everyone breaths it into their airways and it normally doesn’t do any harm. But this fungus can be a major cause of illness where a patient becomes exposed to high numbers of Aspergillus in the air while their immunity is suppressed by an underlying blood cancer like leukaemia, by chemotherapy, or other immunosuppression with eg, drugs like corticosteroids, by stem cell or solid organ transplantation, or because of an underlying chronic lung condition. During building work every effort will be made to prevent the spread of *Aspergillus*. The medical team who is treating you will be in close communication with builders and the Microbiology/Infection Prevention and Control Team to make sure that the risk of spreading *Aspergillus* is kept to a minimum and will tell you if you need to take any special precautions.
References

# Document Log

**Title:** Infection Prevention and Control Recommendations for Prevention of Nosocomial Invasive Aspergillosis during Construction/Renovation Policy.

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