

# WHBN 00-09

## Welsh Health Building Note

### Infection control in the built environment



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Cover image courtesy of James Archer, the US Centers for Disease Control and Prevention (CDC), depicts *Pseudomonas aeruginosa* bacteria, which is a prototypical multi drug resistant pathogen associated with nosocomial infections

Cover designed by Keith James

# Overview

## Preamble

This Welsh Health Building Note 00-09 supersedes and replaces all versions of Health Facilities Note 30 (HFN30).

## Introduction

The importance of a clean, safe environment for all aspects of healthcare should not be underestimated. It is important that healthcare buildings are designed with appropriate consultation, and the design facilitates good infection prevention and control (IPC) practices and has the quality and design of finishes and fittings that enable thorough access, cleaning and maintenance to take place. Good standards of basic hygiene, cleaning and regular planned maintenance will assist in preventing healthcare associated infection (HCAI). Such schedules are more likely to be successful when undertaken on a proactive and reactive basis, and are more likely to reduce contamination and risks to patients when the build environment reflects such needs.

Research and investigation have consistently confirmed that the healthcare environment can be a reservoir for organisms with the potential for infecting patients. For HCAs to be reduced, it is imperative that IPC measures are designed-in at the very outset of the planning and design stages of a healthcare facility new build or renovation project and that input continues up to, into and beyond the final building stage.

Designed-in IPC means that designers, architects, engineers, facilities managers and planners work in collaborative partnership with IPC teams, healthcare staff and the users to deliver facilities in which IPC needs have been anticipated, planned for and met.

## Welsh Health Building Note 00-09

This guidance discusses the various stages of a capital build project from initial concept through to post-project evaluation and highlights the major IPC issues and risks that need to be addressed at each particular stage to achieve designed-in IPC.

The principles of this guidance can be applied to all healthcare facilities (guidance on mental health settings is included in this revision – see [Appendix 1](#)). Although the specific recommendations or processes it outlines may not necessarily be relevant to all types of healthcare

facility or organisation, they may become more applicable as certain healthcare services and functions are decentralised.

The most important points raised by the document are the need:

- for an awareness of appropriate Welsh Health Building Notes and Welsh Health Technical Memoranda pertinent to new build or refurbishment projects;
- for timely, comprehensive and collaborative partnership between all parties to achieve IPC goals specific to each construction project;
- for all stakeholders to understand the basic principles of designed-in IPC;
- to understand and assess the risks of infection relating to construction projects and the physical environment;
- for robust project management in relation to IPC considerations for all new-build and refurbishment projects;
- for a system of signing-off plans and meeting notes to include all participating parties including the IPC team;
- for quality control throughout the duration of the construction project;
- to regularly consult with and update all relevant parties throughout the project;
- to continually monitor developments.

## Exclusions

This document does not deal with the operational management of IPC issues (for example, dealing with outbreaks on a ward) or day-to-day standard IPC precautions. These issues will be dealt with locally via the healthcare organisation's own policies and procedures on IPC.

This guidance does not apply to prison hospitals.

### Important

It is essential that the IPC team is consulted throughout every stage of a capital project and their expertise taken into account.

# Glossary of terms

**Airborne transmission:** A mechanism of transmission of an infectious agent by aerosols – that is, microbes in very small particles that can travel long distances but are usually relatively inefficient at transmitting infection. This route is only relevant for a small number of infections, principally tuberculosis.

**Cohorting:** Placing patients infected or colonised with the same infection (but with no other infection) in a discrete clinical area where they are cared for by staff that are restricted to these patients.

**Contact:** Association with an infected person or animal or a contaminated environment such that there is an opportunity to acquire the infection.

**Cross-infection:** An infection either due to a microbe that came from another patient, member of staff or visitor in a healthcare establishment, or due to a microbe that originated in the inanimate environment of the patient.

**Dead-legs:** In a water supply and distribution system, pipes that are capped off (blind ends) or rarely used (dead-legs) or not part of a main circulation system (for example, a branch off the main system).

**Direct contact:** Refers to a mode of transmission of infection between a colonised/infected host and a susceptible host. Direct contact occurs when skin or mucous surfaces touch (for example, via hand contact).

**En suite:** A room attached to a single room or multi-bed room that has a shower, rimless WC and wash- hand basin (with extract ventilation).

**Healthcare associated infections (HCAI):** Encompasses any infection by any infectious agent acquired as a consequence of a person's treatment or which is acquired by a healthcare worker in the course of their duties.

**Immunocompromised patient:** A patient whose immune response is deficient because of an impaired immune system.

**Mode of transmission:** See Transmission

**Non-touch (taps):** Includes foot-operated, knee-operated, elbow-operated and sensor taps.

**Pathogen:** A bacterium, virus or other microorganism that can cause disease.

**Scale:** A ratio representing the relationship between a specified distance on a sketch plan and the actual distance on the ground. For example, at the scale of 1:50, 1 unit of measurement on the plan equals 50 units of the same measurement on the ground.

**Slop-hopper:** A disposal unit used for the disposal of liquid or solid waste.

**Spore:** Some species of bacteria, particularly those of the genera *Bacillus* and *Clostridium*, which are a significant cause of infection in humans, develop highly resistant structures called spores. They may remain viable for many years but when the environment conditions improve the spores germinate and the bacterial cell inside starts to multiply again.

**Thermostatic mixing valves (TMVs):** Valves that mix the hot and cold water in the system to provide water at a predetermined safe temperature.

**Transmission:** Any mechanism by which an infectious agent is spread from a source or reservoir to a person. Modes of transmission of infection include direct transmission involving direct transfer of microorganisms to the skin or mucous membranes by direct contact; indirect transmission involves an intermediate stage between the source of infection and the individual (for example, infected food, water or vector-borne transmission by insects); airborne transmission involves inhaling aerosols containing microorganisms (as is the case with diseases such as legionnaires' disease and tuberculosis).

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# Chapter 1 Context

- 1.1 High standards of environmental hygiene and clinical practice in healthcare facilities have been identified as being important in minimising the risk of the transmission of infection. The design, planning, construction, refurbishment and ongoing maintenance of the healthcare facility also have an important role to play in the prevention and control of infection. The physical environment has to assist, not hinder, good practice.
- 1.2 The Chief Medical Officer's (England) report on infections and the rise of antimicrobial resistance (Davis 2013) stated that the design, construction and maintenance of healthcare facilities have a substantial bearing on the risk of developing a healthcare-associated infection.
- 1.3 It is important that infection prevention and control (IPC) is designed-in at the planning and design stages of a new-build or refurbishment project and that input continues up to the final build stage. Designed-in IPC means that designers, architects, engineers, facilities managers and planners work in collaborative partnership with IPC teams to deliver facilities in which IPC needs have been planned for, anticipated and met.
- 1.4 This guidance highlights IPC issues and risks that need to be addressed at each particular stage to achieve designed-in infection control. The principles of this guidance can be applied to all healthcare facilities.

# Chapter 2 Understanding the planning process

## Important

The infection prevention and control (IPC) team should be consulted throughout every stage of a capital project and their views taken into account.

## Introduction

- 2.1 For IPC teams to effectively participate in the planning process for both new-build and refurbishment projects, it is essential for them to understand the process from its inception to completion and commissioning.
- 2.2 It is important that the IPC team and the chief executive officer or senior responsible owner sign-off each stage of the project. This will ensure that IPC is considered throughout. An example IPC checklist that can be adapted for use during the different stages of a capital project is shown in **Appendix 2**.
- 2.3 IPC is a fundamental imperative in the planning and design stages of a healthcare facility, yet it is often overlooked or compromised throughout the lifecycle of the project. IPC teams should be involved throughout all phases of construction and renovation projects to reduce IPC risks. Failure to assess these risks properly can lead to expensive redesign later and expose the patient and healthcare worker to infection hazards.
- 2.4 To provide and maintain a clean and appropriate environment in premises that facilitate the prevention and control of infections, a healthcare provider should ensure that it has:
  - a. made a suitable and sufficient assessment of the risks to the person receiving care with respect to IPC;
  - b. identified the steps that need to be taken to reduce or control those risks;
  - c. recorded its findings in relation to the first two points;
  - d. implemented the steps identified; and
  - e. put appropriate methods in place to monitor the risks of infection to determine whether further steps are needed to reduce or control infection.

## The planning process

- 2.5 This section explains the planning process, which comprises the following stages (see **Figure 1**):
  - a. Preparation of a business case to support the viability of the project.
  - b. Project funding.
  - c. Concept/feasibility study.
  - d. Design stage.
  - e. Contract.
  - f. Project monitoring/construction.
  - g. Pre-handover inspections ('snagging').
  - h. Commissioning the facility.
  - i. Post-project evaluation.
- 2.6 The aim is to prompt those with overall responsibility for managing capital schemes to include IPC advice at the right time in order to prevent costly mistakes.

## Stages of IPC input

### Preparation of a business case to support the viability of the project

- 2.7 The preparation of a business case is the process that supports a healthcare organisation's submission for funding of new capital projects.
- 2.8 A business case should convincingly demonstrate that the project is economically sound, is financially viable (affordable to the providers and purchasers) and will be well-managed. Above all, a business case for any investment should show that it will benefit patients.
- 2.9 The involvement and support of a wide range of managers and staff may be vital to the success of the business case, both to determine the requirement and scope of the investment and also to participate in subsequent stages of planning.
- 2.10 It is important therefore at this stage to identify and involve key people who have a direct interest in the end product; this will include members of the IPC team along with other leading clinicians, nursing managers and departmental heads.

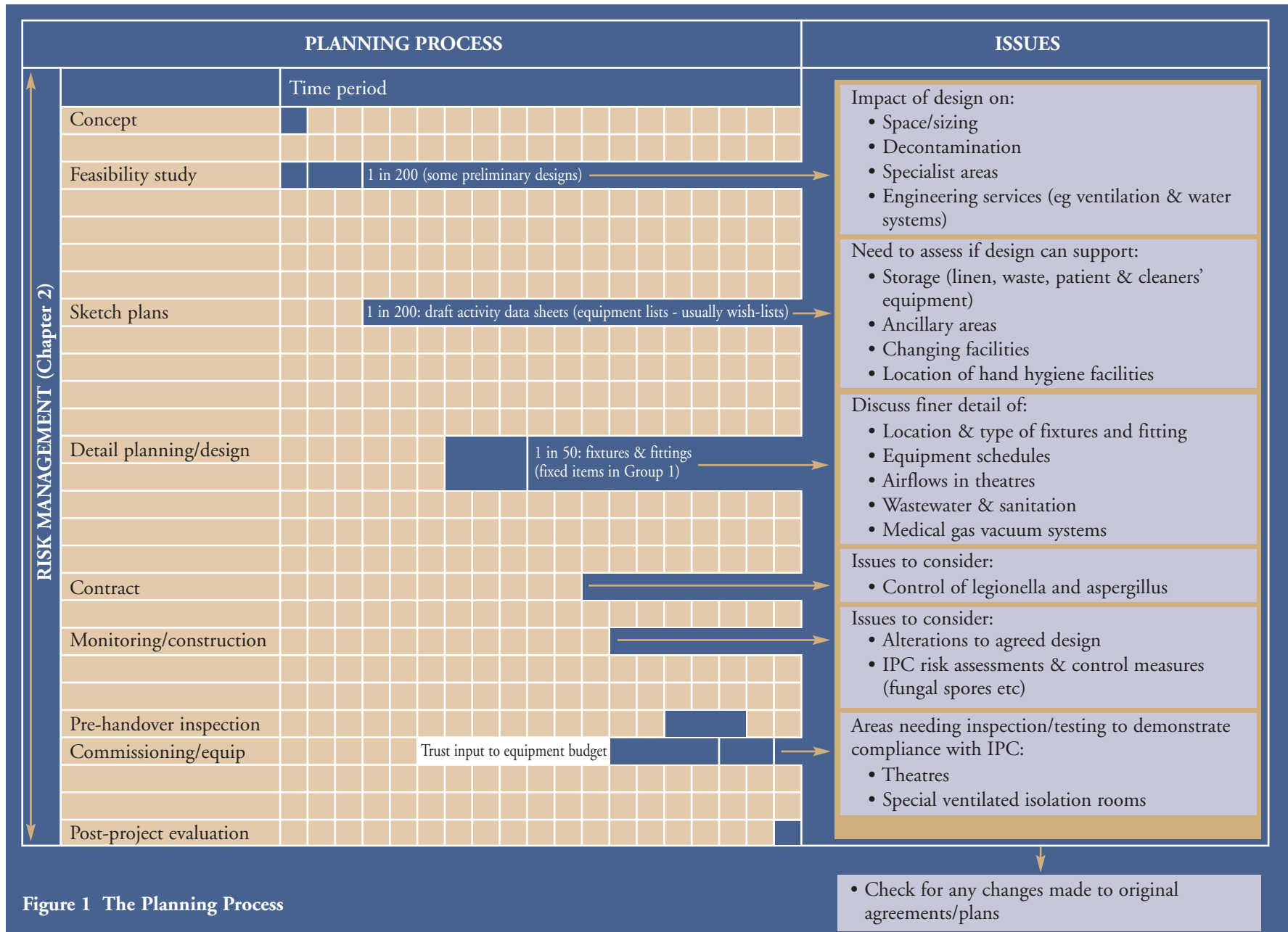


Figure 1 The Planning Process

2.11 Normally the input from the project team should be managed by the project director, but for larger and more complex schemes a project manager, reporting to the project director, may be appointed to conduct the detailed work and manage the business case team.

2.12 Specifically at this stage, the project team will:

- set the strategic context,
- define objectives and benefit criteria,
- generate options,
- measure the benefits,
- identify/quantify costs,
- assess sensitivity to risk,
- identify the preferred option,
- present the outline business case.

#### *Issues to be addressed by the IPC team*

2.13 Issues to be addressed by the IPC team at this stage will include:

- storage (including waste collection points and delivery areas) and equipment cleaning areas;
- flooring;
- dirty utilities;
- cleaners' rooms;
- hand-washing facilities;
- furnishings and fittings;
- appropriate finishes which permit efficient cleaning methods, equipment and safe chemicals to be used;
- types and numbers of isolation facilities;
- specific products with IPC implications and applicable regulations (for example, type of pipes, *Legionella* precautions).

2.14 Specifically at this stage, the IPC team will need to:

- agree the requirements for IPC in the design and planning of the project;
- assess the progress of the building/ refurbishment project in relation to compliance with IPC specifications – any unexpected proposed deviations from the infection control specification needs to be agreed with the IPC team at the earliest opportunity;
- ensure that the designers/planners recognise the benefits of not cutting corners on IPC issues.

#### *Project roles and responsibilities*

2.15 A comprehensive approach to planning will include consultation with the appropriate specialists from inception through to post-project evaluation.

2.16 The project organisation (see **Figure 2**) should comprise (relative to the size of the project):

a. Internal organisation of the healthcare provider:

- Healthcare provider's project board (should monitor cost and progress of all capital investment projects at regular meetings. If problems are identified, it needs to be satisfied that appropriate steps are being taken).
  - Chief executive officer (given the project-specific role, title, and responsibility of project owner).
  - Project team (comprising senior staff within the provider organisation who have an interest in the project and whose activities will be affected by the project, for example staff from clinical areas such as IPC).
  - Project director (responsible for project management).
  - Professional adviser (experienced in construction and design, especially of healthcare facilities).
  - User panel (representatives of each of the relevant service departments, in each case authorised to define their department's needs and to review and agree how those needs are to be met) along with patients and carers.
- b. External resources:
- Project manager.
  - Other consultants.

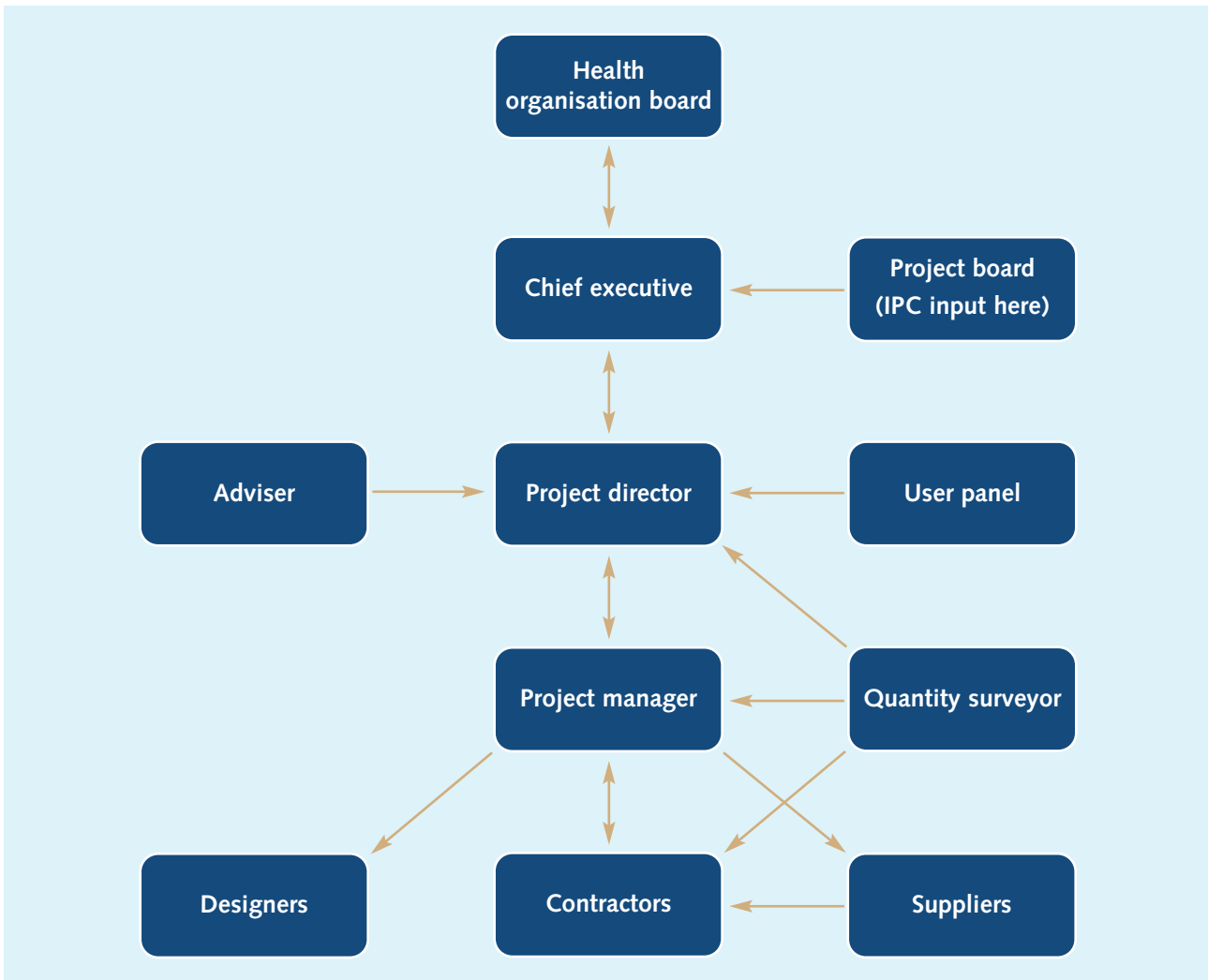
#### **Project funding**

##### *Capital projects*

2.17 The contract between the health board or Trust and the supply chain or contractor is critical and it is important that the service representatives/key stakeholders and particularly in this instance the IPC team are clear about the options available and the evidence to back up any decisions they advise on.

2.18 The IPC team will need to make sure that certain criteria are embedded into the contract in such a way that important decisions on design or build do not go ahead without being signed off by them. The team will need:

- access to all relevant and up-to-date plans and information on operational policies;
- access to any meetings deemed relevant to them or timely minutes from those meetings that they cannot attend;
- access to sites and departments as building work progresses at the appropriate time in the



**Figure 2 Project organisation**

construction programme, for example environmental rounds with checklists based on project objectives;

- regular communication between the internal project manager and the project team;
- involvement in decision-making for any category of equipment the project team will purchase;
- involvement in any contracts for support services (such as catering, cleaning, linen, or sterile services) that the project team may be providing;
- access to certain areas for any microbiological testing deemed necessary at commissioning and prior to handover, for example theatres, pharmacies and clean rooms in sterile services departments.

### Concept/feasibility study

- 2.19 The planning process starts with the identification of a ‘need’ by the users. The development of this need will involve feasibility studies to enable a design brief or output specification to be developed.
- 2.20 Where existing facilities are being modified or extended, the IPC team should review all operational policies and procedures, for example:
- the effect the number of beds or departments will have on current policy and practice such as sterile services, catering, waste disposal and cleaning;
  - contracts for support services such as catering, cleaning, linen, sterile services etc that the project team may be providing;
  - additional specialist areas that may require additional IPC and laboratory services

(consideration should also be given to acquiring specialist advice from external agencies);

- location and relationships between departments;
- the number of surgical instruments and provision of decontamination facilities when planning extra theatres;
- impact of proposed design on ventilation and water systems;
- future maintenance requirements that minimise the potential risks to patients and allow for it to be effectively carried out.

- 2.21 To assist with understanding and mitigating the risks associated with bacterial contamination of water distribution and supply systems, it is recommended that organisations should develop a water safety plan (WSP), which provides a risk-management approach to the microbiological safety of water and establishes good practice in local water distribution and supply. Those organisations with existing robust water management policies for *Legionella* will already have in place much of the integral requirements for developing a WSP.

For further guidance, see:

- Health Technical Memoranda 04-01 Parts A and B:2006 *The control of Legionella, hygiene, "safe" hot water, cold water and drinking water systems*; and
- Welsh Health Technical Memorandum 04-01:2014 *Addendum: Pseudomonas aeruginosa – advice for augmented care units*.

### Design stage

- 2.22 The design brief or output specification should highlight the importance of design solutions for IPC.
- 2.23 At this stage, the IPC team will need to follow up any input they have had in the initial design brief. Sketch plans should be available to the team to explain how the design brief fulfils their requirements at the 1:200 sketch design and 1:50 scale detail design stages of the project. Suggestions for improvement in operability are important at this stage.
- 2.24 At the end of each part of the design stage, the project team and the IPC team will be required to sign-off the information issued and reviewed. This signifies that the design brief requirements and changes agreed during discussions have been incorporated. Any subsequent changes made after sign-off should be made via a 'change protocol', which can have significant cost and programme implications for the project.

### Sketch plans (1:200 scale designs)

- 2.25 At this stage, 1:200 scale outline departmental layout drawings showing rooms outlined within departments will be available and discussions held with the design team. The IPC team needs to assess whether the facility is designed to support the prevention and control of infection. Examples include:

- confirming operational procedures;
- establishing baseline and future staffing profiles;
- establishing baseline and future revenue budgets;
- establishing equipment requirements;
- strategy for equipping;
- procurement and selection of furnishings and equipment;
- missing rooms/facilities;
- appropriate placing and accessibility of hand-hygiene facilities;
- single-bed rooms suitable for patient isolation and special ventilated isolation rooms;
- ventilation and air conditioning systems including the level of filtration where specialised ventilation is required;
- water supply, heating and plumbing;
- storage for:
  - personal protective equipment (PPE)
  - movable equipment
  - clean patient items
  - clean linen
  - healthcare waste, including sharps, and used linen;
- surfaces: ceilings, walls, work surfaces, floor coverings and furnishings;
- utility rooms: dirty, clean, holding, workrooms, cleaners' rooms;
- changing rooms;
- pneumatic delivery systems.

### Detail planning/design (1:50 scale designs) – early period

- 2.26 At this point the 1:50 scale designs indicating equipment and furniture layouts and room data sheets will be available. There may be two or more stages to the consultation process.

### Detail planning/design (1:50 scale designs) – later period

- 2.27 The IPC team will need to discuss finer details such as location and type of fixtures and fittings (for

example, type and size of wash-hand basins and airflows in theatres). Room elevations of selected typical generic rooms should also be made available.

- 2.28 Equipment schedules for groups 1, 2 and 3 (see next page) based on room data sheets/layouts are prepared at this stage. It is important that there is active involvement of the IPC team at this point, as it may have significant design implications. This will ensure that this equipment is compatible with IPC needs and also that proper inspection and testing can be agreed.
- 2.29 A final review of room layouts, equipment, fittings and room data sheets should be carried out at the end of this stage, as this is where the final sign-off by the project team and the IPC team occurs.
- 2.30 Any changes made during construction or after completion could have a significant adverse impact on costs and the building project.
- 2.31 Items available for transfer from an existing facility should also be identified, which will allow schedules for new equipment to be prepared and costs identified.

#### Group 1

Items that are supplied and fixed under the terms of a building/engineering contract and funded within the works cost. These are generally large items of plant/equipment that are permanently wired/installed, for example:

- specialist equipment best suited to central purchasing arrangements;
- taps, sinks and wash-hand basins. Excluded from this group will be items subject to late selection due to considerations of technical change, for example radiodiagnostic equipment. Group 1 items are specified at the design stage.

#### Group 2

Items that have implications in respect of space/construction/engineering services and are installed under the terms of building engineering contracts, but are purchased by the healthcare provider under a separate equipment budget, for example:

- paper towel dispensers;
- soap/scrub dispensers;
- cupboards;
- shelving;
- washer-disinfectors, including bedpan washer-disinfectors or macerators
- washing machines;
- worktops.

#### Group 3

Items that have implications in respect of space and/or construction/engineering services and are purchased and delivered/installed directly by the healthcare provider, for example:

- small refrigerators;
- furniture;
- ventilators;
- monitors;
- trolleys.

#### Group 4

Items that may have storage implications but otherwise have no impact on space or engineering services, for example surgical instruments.

#### Contract

- 2.32 Tender documents sent to potential companies should include any statements the healthcare provider/project team may have about IPC that may affect any successful contractor's employees. It should also comprise IPC requirements such as the control of *Legionella* and other microorganisms (for example, aspergillus).

#### Construction

- 2.33 Monitoring will not normally be required by the IPC team until the works are at a stage when site visits can be arranged. At this point, the IPC team should visit the site so that they can make a suitable ongoing assessment of the layout of the departments. This will facilitate the team to identify any differences/problems from the agreed design.

#### Surveillance and monitoring during renovation or construction work adjacent to an existing facility

- 2.34 Where patients with increased susceptibility to infection may be placed at risk, it is important that an appropriate risk assessment is carried out at an early stage in advance of any building works, including disturbance/alterations to the water system/building fabric/ventilation systems (see **Appendix 3**).
- 2.35 Quality assurance of IPC interventions during building work should be based on a suitable and sufficient risk assessment of the precautions needed and frequent audit of the control measures in the risk assessment.
- 2.36 Since airborne fungal spores can travel significant distances, this will apply generally to all works in the immediate vicinity or within the boundary of

the healthcare facility. It is strongly advised that any recommendations informed by the risk assessment should be incorporated into the building (see **Appendix 3**) or engineering project so as to minimise risk both during construction and in future use.

- 2.37 Where water systems are closed down, a *Legionella* risk assessment should be undertaken. This should include the risk posed to adjacent water systems by bacterial overgrowth in dead-legs. Flushing and hyperchlorination should also be considered when the water system is reinstated.

See Health Technical Memoranda 04-01 and Welsh Health Technical Memorandum 04-01 Addendum:2014 *Pseudomonas aeruginosa – advice for augmented care units.*

### Pre-handover inspections

- 2.38 The IPC team should conduct periodic walk-round inspections (commonly referred to as ‘snagging’ visits) during the construction works and also at the completion of the construction works prior to formal handover. They should raise any concerns and outstanding items with the project manager responsible for the capital scheme, with issues that constitute a high risk being appropriately prioritised. The project manager should then address these issues with the contractor and ensure the necessary works are completed prior to formal handover of the construction project.

### Commissioning the facility

- 2.39 Upon completion of construction, the facility should be brought into use; depending on the complexity of the task involved, a commissioning manager and team may be needed. Senior managers, specialist teams and users should be fully involved in the process.
- 2.40 Technical commissioning of the building, services and equipment should include any areas that require inspection and testing to demonstrate compliance with IPC standards (for example, theatres, hydrotherapy pools, special ventilated isolation rooms/suites and clean rooms in pharmacies and sterile services departments). Sufficient time should be built into the commissioning schedule to enable this and any rectification of identified problems.
- 2.41 The commissioning team should establish smaller working groups that:
- identify policy issues for referral to the commissioning team or the construction project team;

- identify staff training and orientation needs;
- establish the occupation programme for that user function, for inclusion into the overall commissioning master plan.

- 2.42 By understanding the commissioning process, the IPC team should ensure that they are fully consulted and engaged in any working groups in which their expertise will have an impact or in which requirements to modify services may have repercussions on other aspects of IPC.

- 2.43 The IPC team should also be involved in processes for:

- analysis of commissioning data;
- transfer of facilities;
- phased or staged occupation;
- storage and subsequent cleaning/disinfection of any furniture or equipment;
- approval of engineering commissioning data for operating theatres;
- commissioning tests (for example, microbiological air-sampling for operating theatres, water testing);
- approval of engineering commissioning data for special ventilated isolation room(s);
- site visits;
- staff orientation and training;
- post-handover period;
- decommissioning of redundant facilities;
- period of handover to operational management;
- confirming communication of procedures with internal and external agencies/users (for example, ambulance service and patient information leaflets).

### Post-project evaluation

- 2.44 The purpose of the post-project evaluation is to improve project appraisal, design, management and implementation. It typically takes place 12 months post-handover and is a learning process that should not be seen as a means of allocating blame. There are three stages:
- a. project appraisal;
  - b. monitoring and evaluation of project;
  - c. review of project operations.
- 2.45 It is at the third stage when it is useful for the IPC team to be included in the evaluation teams that are reviewing project objectives. The outcomes (activity and its consequences) of the project will not be amenable to evaluation until the facility has been in use for some time. However, if the project

is part of a phased refurbishment or new build, valuable lessons can be learned and implemented during ongoing project work.

2.46 It is important that the project is evaluated in terms of its original objectives, not in the light of any new legislation or development. Performance indicators may be used if these can be measured retrospectively. Measurable objectives may include:

- activity data;
- patient satisfaction surveys etc;
- compliance with *Legionella* risk assessments.

# Chapter 3 Designing a healthcare facility: issues to consider

## Examples of design principles

### Design to facilitate cleanliness & cleaning

- Use finishes that are impervious, smooth and seamless, as far as practicable.
- Run hard flooring up the walls for a short distance to provide an easy-to-clean coving.
- Eliminate dead-legs and blind ends in water systems, both in the original design and as the systems are modified.
- Consider hands-free operation of utilities (for example, sensor taps, automatic lights, movement sensors for toilet flushes etc).
- Consider hands-free operation of other facilities (for example, automatic doors, proximity-sensors etc).
- Consider integral blinds as an alternative to curtains at internal windows.

### Encourage desired behaviour (for example, tidiness, hand hygiene)

- Provide sufficient space for activities to take place and to avoid cross-contamination between adjacent bed spaces.
- Provide sufficient storage for patients' possessions and for all supplies to discourage clutter.
- Ensure proper segregation and management of waste, including clinical waste and linen.
- Provide sufficient domestic waste receptacles.
- Provide bedside waste disposal facilities for patient use.
- Design out unnecessary horizontal surfaces (for example, window sills) in order to discourage clutter.
- Provide enough wash-hand basins and antimicrobial hand-rub dispensers.
- Plan for and deliver good separation of clean and dirty activities.
- Provide sufficient space for storage and preparation of cleaning equipment and materials.
- Provide suitable facilities for cleaning of equipment.

### Design for easy cleaning

- It is always best practice to maintain a visibly clean environment that is free from dust and soilage, and acceptable to patients, their visitors and staff.
- Good design can make cleaning immeasurably easier, for example:
  - Use finishes that are easy to clean.
  - In clinical areas, flooring should be seamless and smooth, slip-resistant, easily cleaned and appropriately wear-resistant.
  - Use threshold matting on all external entrances. The type should allow for expected through traffic and easy cleaning.
  - Supply pipework should always be concealed.
- There may be pressure to choose the cheapest products/design. Attention to whole-life costs, including the cost of cleaning and maintenance, is important. Consult with the IPC team before purchase/on planning.

### Important

The IPC team should be consulted throughout a building or renovation project and their advice and recommendations taken account of and documented.

- 3.1 The recommendations in this section should be applied to the planning, design and maintenance of all healthcare buildings – both new build and refurbishments. They offer a planning checklist that can be used throughout the design and planning process. Not all items will need to be included in every project, but using the checklist will ensure areas with IPC implications are not missed. Timing will vary from project to project but refer to **Chapter 2** for the sequence of the project process.
- 3.2 The IPC team should have an integral role in ensuring other members of the project team are appropriately informed of any prevention and control-of-infection issues that may arise when:
  - an initial site is being considered for development;

- the healthcare facility is being designed;
  - the healthcare facility is being constructed or undergoing refurbishment;
  - the healthcare facility is operational.
- 3.3 The participation of the IPC team in all phases of planning and construction and renovation is essential.
- 3.4 For the purposes of this document, the following terminology is used:
- a. Multi-bed room – this is a room that contains more than one bed. It is best practice for multi-bed rooms to have an en suite WC/shower and also doors to the main ward area.
  - b. Single bed room – this is a room with space for one patient and usually contains as a minimum: a bed; locker/wardrobe; and clinical wash-hand basin plus a small cupboard with worktop. (Note: single-bed rooms without en suite sanitary facilities are not recommended).
  - c. En suite single-bed room – as (b) but with en suite shower, WC and wash-hand basin.
  - d. Special ventilated isolation room – this is as (c) but with a ventilation system that prevents uncontrolled escape of infectious aerosols from the room to adjacent areas. It can also provide a degree of dilution of infectious aerosols in the room for the safety of staff and visitors. The room should have extract ventilation that exceeds its supply, such that gaps in its fabric leak inwards not outwards.
  - e. Special ventilated isolation suite – as (d) but with a lobby.
  - f. Isolation facilities – an umbrella term used in this document for room types (b)–(e).
- 3.6 Spacing should take into account the amount of, and ease of access to, equipment around the bed area and access for staff to clinical wash-hand basins. The principle should be to maintain sufficient space for activities to take place and to avoid cross-contamination between adjacent bed spaces. The exact space needed will vary according to numbers and activity of staff and type of patient (see ‘Recommendations’ after paragraph 3.12).
- 3.7 Mode of transmission of infection should also be taken into account. This includes:
- direct transmission;
  - indirect transmission via fomites (for example, articles such as hoists, mobile X-ray units etc); and
  - splash, droplet and airborne transmission.
- 3.8 The route of spread of infection is a basic concept in preventing cross-infection, and spacing has direct implications for the prevention of infection.

### Patient groups

Design guidance on critical care areas will be covered in Welsh Health Building Note 04-02 Critical care units, which is in production at time of publication. Please view the *Publications* page of the NWSSP – Specialist Estates Services website to check if has been published. For guidance on mental health units, see [Appendix 1](#).

### Sizing/space

- 3.9 Floor/bed space is influenced by the type of healthcare facility and the type of patient care. There are four distinct patient groups:
- patients requiring acute care, which includes trauma, multi-organ failure, medical emergencies, planned major surgery and other life-threatening emergencies, plus obstetric and neonatal care;
  - patients with chronic conditions or sub-acute conditions;
  - patients using mental health or learning disability inpatient services (note: this guidance does not apply to domiciliary care services that provide support in people’s own homes);
  - patients requiring ambulatory care, which includes diagnostic services, day surgery, minor injuries and attendance at primary care facilities and walk-in centres.
- 3.10 The first three patient groups will require inpatient care. The volume of care and the degree of intervention, diagnostic equipment and movement of staff around the patient dictates the bed space needed.
- 3.11 The need to deliver the highest standards of privacy and dignity applies equally to all areas of a healthcare facility. Achieving these high standards will usually mean ensuring that men and women do not have to sleep in the same room or share toilet and washing facilities. Patients should not

### Privacy and dignity: same-sex accommodation

have to pass through areas used by the opposite sex to reach their own facilities.

3.12 Same-sex accommodation can be provided in:

- same-sex wards, where the whole ward is occupied by men or women only;
- single rooms;
- mixed wards, where men and women are in separate bays or rooms.

### Recommendations

- The provision of sufficient space in clinical areas, particularly for each bed space, is one of the most important considerations in the planning and design of inpatient accommodation. A risk-based approach should be taken to ensure that the environment is appropriate for carrying out clinical activities and undertaking manual handling operations while maintaining a good standard of infection control. Welsh Health Building Note 04-01:2014 *Adult in-patient facilities* states:
- For IPC reasons, it is imperative that staff members are able to attend to one patient without impinging on the bed space or equipment of a neighbouring patient. In the majority of cases, the dimensions in WHBN 04-01:2014 should be adequate (although bed spaces for critical care areas need to be greater for reasons of circulation space and the equipment used in these areas).
- It is also important that the physical environment complies with disability access requirements and does not compromise the privacy and dignity of patients.
- Spacing should take into account the amount of, and ease of access to, equipment around the bed area and access for staff to clinical wash-hand basins.

## Isolation facilities

See [paragraph 3.4](#) for definitions.

### The role of isolation facilities in preventing cross-infection

3.13 The primary aim of IPC is to prevent the spread of infection between patients, visitors and staff by control or containment of potentially pathogenic organisms. Many of these organisms can be controlled by basic IPC practices such as hand hygiene and environmental cleanliness, and this can be facilitated by single-bed room isolation. A small proportion of patients requiring isolation will require special ventilated isolation facilities.

3.14 The key to effective isolation on general wards is the provision of sufficient en suite single-bed

rooms to prevent patients known to be a risk for spreading infections being cared for in open ward areas. Single rooms reduce the risk of cross-infection for non-airborne diseases. Most patients needing segregation/isolation on general wards can be isolated effectively in en suite single rooms.

- 3.15 A risk assessment should be used to inform decisions regarding which patients to nurse in single-bed rooms. Healthcare providers should audit the use of en suite single-bed rooms to determine where further local requirements and adaptations are greatest.
- 3.16 Multi-bed rooms can also be used to cohort infectious patients if they have an en suite WC and shower, and a door to the main ward area. The possible need for this should be considered at the design stage.
- 3.17 Clinical wash-hand basins should be provided in addition to the general wash-hand basin provided for patients.
- 3.18 Storage of, and ready access to, clean PPE is important to encourage its use, as well as appropriate waste receptacles for its disposal once worn.
- 3.19 Gloves and aprons should be sited outside single-bed rooms, ideally in lobbies.
- 3.20 Additional storage facilities will be required for the care and treatment of patients in isolation facilities, especially if the isolation is likely to last for some time:
- the storage of supplies, such as PPE, retained in the room;
  - personal clothing and possessions (see also [Appendix 1](#) on mental health settings).
- 3.21 In accident & emergency departments, a dedicated room should be provided for patients with a known or suspected infectious disease. If airborne isolation is required, this room should be at negative pressure to the corridor; a lobby is not required. This room should also be suitable for general use when not required for isolation.

### Note

It may be necessary to cohort-nurse a group of infectious patients in a multi-bed room if insufficient single-bed rooms are available. This can be more easily achieved where wards are divided into two- or four-bedded rooms with en suite sanitary facilities, which can be isolated further by closure of doors to the areas. When IPC guidelines are adhered to, research has demonstrated that cohort-nursing can successfully control and contain infection in hospital facilities.

## Design

- 3.22 WHBN 04-01:2014 *Adult in-patient facilities* provides guidance on en suite single rooms.
- 3.23 WHBN 04-01 Supplement 1:2014 *Isolation facilities for infectious patients in acute settings* provides guidance on the facilities required for isolating infectious patients on acute general wards (source isolation). It also provides guidance on the ventilation parameters for a special ventilated isolation room/suite.

## Ceilings

- 3.24 Removable ceiling tiles are not advised for special ventilated isolation rooms/suites.

## Doors

- 3.25 Doors are critical to the design of a special ventilated isolation room/suite. For specific guidance on source isolation, refer to WHBN 04-01 Supplement 1:2014 *Isolation facilities for infectious patients in acute settings*.

## Lobbies

- 3.26 Lobbies facilitate staff compliance with hand washing and use of PPE. They may also be essential with some types of special ventilated isolation rooms.

## Engineering requirements for special ventilated isolation rooms/suites

- 3.27 Planned maintenance and revalidation – maintenance and revalidation programmes should be established for special ventilated isolation rooms to ensure the design criteria are maintained and met at all times. Although it is impossible to give specific maintenance frequencies, each unit should be included in a planned preventative maintenance that includes pressure/air flow monitoring equipment at least annually.

### Recommendations

- Single-bed rooms with en suite sanitary facilities are optimum for infection prevention.
- There should be sufficient en suite single-bed rooms to prevent patients known to be a risk for spreading infections being cared for in open ward areas. Healthcare providers should audit the use of en suite single-bed rooms to determine where further local requirements and adaptations are greatest.
- The provision of additional isolation facilities should be considered when designing new healthcare buildings and renovating existing buildings.

## Hand-hygiene facilities

This section should be read in conjunction with paragraphs **3.178–3.190** on safe hot and cold water systems.

- 3.28 Compliance with hand-hygiene guidelines can be improved by conveniently placed and well-designed hand-hygiene facilities. The importance of facilities to encourage and facilitate good hand-hygiene practices should be high on the list of priorities when designing and planning new healthcare premises or refurbishment of existing premises is being undertaken.

### Wash-hand basin design

See also Welsh Health Building Note 00-10 Part C:2014 *Sanitary assemblies* and WHBN 00-02: 2013 *Sanitary spaces*.

#### Clinical wash-hand basins

- 3.29 The dimensions of a clinical wash-hand basin should be large enough to contain most splashes and therefore enable the correct hand wash technique to be performed without excessive splashing of the user. This can also occur if the water outlet is placed too high above the basin.
- 3.30 Clinical wash-hand basins should be wall-mounted using concealed brackets and fixings. They should also be sealed to a waterproof splash-back to allow effective cleaning of all surfaces.
- 3.31 They should not have a plug or a recess capable of taking a plug. A plug allows the basin to be used to soak and reprocess equipment that should not be reprocessed in such an uncontrolled way.
- 3.32 Clinical wash-hand basins should not have overflows, as these are difficult to clean and become contaminated.
- 3.33 Taps should not be aligned to run directly into the drain aperture, as contamination from the waste outlet could be mobilised (see WHBN 00-10 Part C:2014).
- 3.34 Healthcare providers should have policies in place ensuring that clinical wash-hand basins are not used for other purposes such as emptying of patient bathing water, as this may transfer strains to the water supply system where they can colonise existing biofilms.

See also **Appendix 1** on mental health settings.

#### General wash-hand basins

- 3.35 All en suite facilities should have a wash-hand basin for use by patients and their visitors.

- 3.36 All toilet facilities should have a wash-hand basin.
- 3.37 Overflows should not be provided as these are difficult to clean and become contaminated.
- 3.38 Taps should not be aligned to run directly into the drain aperture.
- 3.39 All general wash-hand basins should be sealed to a waterproof splash-back.

See also **Appendix 1** on mental health settings.

### Clinical wash-hand basin provision

- 3.40 All clinical wash-hand basins should be accessible and should not be situated behind curtain rails. Inconveniently located or insufficient clinical wash-hand basins are two of the main reasons that healthcare staff do not comply with hand-hygiene protocols. There is a need to review the numbers and placement of clinical wash-hand basins as well as their dimensions (see WHBN 00-10 Part C:2014; WHBN 00-02:2013; and WHTM 04-01 Addendum:2014).
- 3.41 Hand-hygiene facilities should be readily available in all clinical areas. There should be sufficient numbers and appropriate sizes of clinical wash-hand basins to encourage and assist staff to readily conform to hand-hygiene protocols.
- 3.42 The location and provision of clinical wash-hand basins should ensure that they are all readily available and convenient for use. Having a clinical wash-hand basin easily available at all times is more important than compliance to a precise bed-to-basin ratio. For example, in a multi-bed room, if two clinical wash-hand basins are placed side-by-side, both on the same side of the entrance, only the one closest to the entrance will get significant use – the other will form a dead-leg in the water distribution system. While it may be marginally more complex in terms of plumbing, there should be one clinical wash-hand basin on each side of the entrance or at opposite sides of the room.
- 3.43 Guidelines for the appropriate numbers of clinical wash-hand basins in clinical areas are given in WHBN 04-01:2014 *Adult in-patient*. To encourage good practice and to give reasonable access, it is recommended that:
  - A minimum of one clinical wash-hand basin in each single-bed room is required. En suite single-bed rooms should have a general wash-hand basin for personal hygiene in the en suite facility in addition to the clinical wash-hand basin in the patient's bedroom.
  - In intensive care and high dependency units (critical care areas), a clinical wash-hand basin

should be available by each bed space. It should be noted, however, that under-usage of basins encourages colonisation with *Legionella* and other microorganisms. Designers should be aware of this and, accordingly, should balance ease of staff hand washing with the avoidance of under-used wash-hand basins (see also WHTM 04-01 Addendum:2014 *Pseudomonas aeruginosa – advice for augmented care units*).

- Two clinical wash-hand basins in multi-bed rooms (note that there should be no more than four beds in a multi-bed room in line with WHBN 04-01:2014 ).

For guidance on mental health settings, see **Appendix 1**.

- 3.44 In primary care and outpatient settings, where clinical procedures or examination of patients/clients is undertaken, a clinical wash-hand basin should be close to where the procedure is carried out (see WHBN 00-03:2013 *Clinical and clinical support spaces*).
- 3.45 WHBN 00-10 Part C:2014 also gives details of sanitary assemblies for other areas such as kitchens and patient wash areas.

### Water/taps

- 3.46 Health and safety regulations (*Workplace (Health, Safety and Welfare) Regulations 1992*) require that both hot and cold running water should be available in areas where employees are expected to wash their hands.
- 3.47 Hands should always be washed under running water; mixer taps allow this to be practised in safety in healthcare settings where hot water temperatures may be high to control *Legionella* (see Health Technical Memoranda 04-01).
- 3.48 Taps can be lever- or sensor-operated and should be easy to turn on and off without contaminating the hands.
- 3.49 Taps discharging directly into a drain hole can cause splashing, which could disperse contaminated droplets. The tap outlet flow should not discharge directly into the waste aperture.
- 3.50 Non-TMV taps (commonly used in kitchens and on sinks in cleaners' rooms/dirty utilities) allow the user free rein to determine the temperature of the water delivered at the point of use; however, a risk assessment should be undertaken first.
- 3.51 Swan-neck tap outlets are not recommended, as they do not empty after use. Similarly, strainers, aerators and flow restrictors should not be used as they become colonised with bacteria.

### Taps in augmented care settings

3.52 For the augmented care setting, the choice and type of water outlets is important and should be based on a risk assessment of infection control and scalding issues. There is some evidence that the more complex the design of the outlet assembly (for example, some sensor operated taps), the more prone to *P. aeruginosa* colonisation the outlet may be (Berthelot et al 2006).

3.53 In intensive care and other critical care areas, where patients are unlikely to be able to use the wash-hand basins, the installation of non-TMV mixing taps may be the preferred control option following a risk assessment (see WHTM 04-01 Addendum:2014 *Pseudomonas aeruginosa – advice for augmented care units*).

### Soap dispensers

3.54 Liquid soap dispensers should be wall-mounted at all wash-hand basins and be designed to be operated without contamination from the user's hands coming into direct contact with the dispensing mechanism.

3.55 Dispensers should not be refillable but be of a disposable single-cartridge design (see also **Appendix 1** for guidance on mental health units).

3.56 Antimicrobial hand-rub dispensers should be available at the point of patient care, subject to local risk assessment. Users and IPC teams should liaise and advise on the position of these units in clinical areas.

### Hand drying

3.57 Paper hand-towel dispensers should be conveniently placed by all wash-hand basins (clinical and non-clinical).

3.58 The use of paper towels in rolls should be discouraged; they are difficult to tear off without contaminating the remaining roll.

3.59 Fabric towels are a source of cross-contamination and are not recommended in clinical areas.

3.60 Hot-air hand dryers reduce paper waste and may be considered for use in public areas of healthcare facilities, but should not be installed in clinical areas as they are noisy and could disturb patients.

3.61 Hands-free waste bins, with appropriate colour-coded waste bags, should be provided by each wash-hand basin.

### Sinks and disposal facilities

3.62 Using sinks for both hand washing and the cleaning of equipment should be discouraged as this will significantly increase the risk of hand and

environmental contamination. Dirty utility rooms should contain a:

- sluice for disposing of body fluids and patients' wash-water;
- separate sink for cleaning equipment;
- clinical wash-hand basin.

3.63 Contaminated fluids such as patients' wash-water should not be emptied down clinical wash-hand basins in adjacent ward areas.

3.64 Disposal facilities should be provided in areas where dirty wastewater is disposed (for example, dirty utility rooms and cleaners' rooms/areas for cleaning equipment). See WHBN 00-10 Part C:2014 *Sanitary assemblies* for further guidance.

### Recommendations

- In each single-bed room, a minimum of one clinical wash-hand basin should be available. En suite single-bed rooms should have a separate general wash-hand basin for patients and visitors in the en suite facility.
- In critical care areas, one clinical wash-hand basin should be available by each bed space.
- In multi-bed rooms, two clinical wash-hand basins should be provided.
- In primary care and outpatient settings, where clinical procedures or examination of patients/clients is undertaken, a clinical wash-hand basin should be close to where the procedure is carried out.
- All clinical wash-hand basins should be accessible and should not be situated behind curtain rails.
- All en suite facilities should have a wash-hand basin for use by patients and their visitors.
- Clinical wash-hand basins should not have an overflow or be capable of taking a plug.
- All wash-hand basins should be sealed to a waterproof splash-back.
- Wall mounted liquid soap and paper-towel dispensers should be available at each wash-hand basin.
- Antimicrobial hand-rub dispensers should be available at the point of patient care.
- Space should be allowed at the design stage for the placement of hands-free waste bins next to each wash-hand basin.
- Hands-free operated taps are recommended for clinical wash-hand basins.
- Taps should not be aligned to discharge directly into the waste aperture.
- The alignment of tap and basin should be such that staff can wash their hands without excessive splashing to their bodies.

- For decontamination, two sinks will be needed – one for decontamination/washing and one for rinsing, plus a clinical wash-hand basin for staff use.

For guidance on mental health units, see **Appendix 1**.

## Footwear washing facilities

3.65 Where specialist footwear, such as clogs within theatres, is required specific guidance on cleaning is covered in HBN 26:2004 *Facilities for surgical procedures*, paragraphs 5.21-5.23.

## Ancillary areas

3.66 It is important that ancillary areas are of an acceptable standard to support effective infection prevention. Clean and dirty areas should be kept separate and the workflow patterns of each area should be clearly defined.

3.67 The design and finish of ancillary areas should facilitate good cleaning. These areas should have facilities for hand hygiene and sufficient storage for supplies and equipment.

3.68 IPC issues are determined on:

- the use of the ancillary area;
- who will have access; and
- what type of activity will be carried out there.

3.69 Ancillary areas include:

- dirty utility;
- clean utility;
- clean linen store;
- decontamination room;
- disposal room;
- day room/patient waiting areas;
- play areas;
- nappy-changing area;
- visitors' toilets;
- personal laundries in mental health and learning disability settings (but not domiciliary care settings);
- treatment room.

### Dirty utility room

3.70 A dirty utility room should include facilities for:

- cleaning items of equipment;
- testing urine;
- the disposal of body fluids including water contaminated with body fluids, exudate etc;
- the decontamination of commodes;

- temporarily holding items requiring reprocessing;
- clinical washing of hands after activity in the dirty utility room.

3.71 Space and facilities for the holding, reprocessing or disposing of bedpans, urinals and vomit bowls are required. Unused bedpans and linen-bag carriers can also be stored in this area. Apron and glove dispensers should be provided for ease of access to PPE.

3.72 Where commodes are to be used, there should be sufficient space allowed for their decontamination and storage.

3.73 A clinical wash-hand basin is necessary plus a slop-hopper for disposal of body fluids and a separate sink for decontaminating equipment.

3.74 There needs to be a clear demarcation between clean/unused equipment and soiled/dirty equipment. Clean and dirty areas should be kept separate and the workflow patterns of each area should be clearly defined.

### Clean utility room

3.75 A clean utility room is required where drugs and lotions may be stored and prepared, a supply of clean and sterile supplies may be held and dressing trolleys prepared. Clinical hand-hygiene facilities are required.

3.76 The room should be located adjacent to the treatment area.

3.77 It is important that planners/design teams think about the type of storage facilities provided. There should be enough storage area for sterile supplies equipment and other clean supplies to keep supplies off the floor with sufficient space under the lowest shelf to permit cleaning the floor underneath.

3.78 It is important that sufficient worktop area is provided to enable aseptic preparation to be carried out (for example, preparation of intravenous infusion).

3.79 Storage facilities should be able to be cleaned easily and quickly while protecting clean stores and equipment from dust and contamination.

### Clean linen store

3.80 Clinical areas should have designated areas for the storage of clean linen to maintain the cleanliness of the linen and allow easy access. Storage should be on slatted shelving or racking and be off the floor, with sufficient space under the lowest shelf to permit cleaning the floor underneath.

### Treatment room

- 3.81 A treatment room may be required for inpatient examination or investigations. In primary care settings, it will require different design features according to its planned use, for example immunisation or wound dressing.
- 3.82 A clinical wash-hand basin should be provided (see WHBN 00-03:2013 *Clinical and clinical support spaces*).
- 3.83 Carpets should not be used as this area has a high probability of body fluid contamination.
- 3.84 Space should be available to allow for the storage of equipment and sterile supplies.

### Equipment decontamination room

- 3.85 Local decontamination (that is, the decontamination of reusable medical devices undertaken at the point of use) is associated with large items of equipment that are not amenable to steam sterilization such as infant incubators in neonatal intensive care units. This room should facilitate a defined dirty-to-clean flow throughout the decontamination process and have sufficient work surfaces and sinks to allow effective reprocessing.

### Disposal room

- 3.86 The disposal room is for temporary storage of supplies and equipment that have to be removed for cleaning, reprocessing or disposal (for example, used linen, items to be returned to the sterile services department (SSD), waste bags and sharps bins).
- 3.87 The sizing of disposal rooms should be considered at the design stage, taking into account the predicted levels and types of waste to be generated and the planned operational policies relating to frequency of waste and linen collection.
- 3.88 This area should be secure and not accessible to the public.

### Cleaners' room

- 3.89 This room is used to deliver day-to-day cleaning services for a defined area. Cleaning materials and equipment in daily use should be stored in this room.
- 3.90 The room should be provided with a sink and slop-hopper or janitorial unit as well as a wash-hand basin. There should be unrestricted access to the sink and slop-hopper/janitorial unit (see WHBN 00-10 Part C:2014 for more information on these sanitary assemblies).
- 3.91 Space should be provided for mops, buckets, a vacuum cleaner, scrubbing/polishing machine (for

hard floors) and other appropriate cleaning equipment.

### Day room/patient waiting areas

- 3.92 There is often conflict between the aesthetics of these areas and the prevention of contamination of the environment or furnishings and ease of cleaning/disinfection. This is especially the case in waiting areas such as in accident and emergency departments, primary care and minor injury units.
- 3.93 It is important that where blood and body-fluid spillages may occur, the environment should be able to be cleaned effectively. Carpets should not be used in areas where body fluid spillage is anticipated.

### Play area

- 3.94 All equipment, finishes and furnishings should be fluid-resistant and be able to withstand cleaning and disinfection. This is particularly important for play mats and soft floor coverings.

### Nappy-changing area

- 3.95 Facilities for the disposal of soiled nappies and for hand washing in the immediate environment are required along with a regular cleaning programme of equipment used.
- 3.96 The area used for nappy changing should have a surface that can be easily cleaned and disinfected.

### Visitors' toilets

- 3.97 Visitors' toilets are heavily used and should provide enough space and have a high grade of finish to maintain a high standard of cleanliness.
- 3.98 There should be provision of disposal facilities for sanitary waste in women's, accessible and unisex toilets.
- 3.99 The number of toilets, wash-hand basins and hand drying facilities provided should be sufficient for the size of the facility (see WHBN 00-02:2013).
- 3.100 Hand drying should be by single-use paper hand towels or hot-air hand dryers. If a facility is in, or closely adjacent to, areas where patients may be sleeping, hot-air hand dryers should be avoided due to the noise they create.

### Recommendations

- Clean and dirty areas should be kept separate and the workflow patterns of each area should be clearly defined.
- The design and finish of ancillary areas should facilitate good cleaning. They should have facilities for hand hygiene and sufficient storage for supplies and equipment.

## Storage

- 3.101 Storage areas need to be appropriate for the operational requirements of each clinical area.
- 3.102 The need for sufficient secure storage should not be underestimated. Many plans start with sufficient storage, but this space is often lost to other areas during the design process. This can have implications for both clinical practice and infection control.
- 3.103 Storage away from areas of clinical activity is required for both small and bulky items of equipment to minimise clutter, enabling efficient environmental cleaning.
- 3.104 All healthcare premises need a storage area for large pieces of equipment such as beds, mattresses, hoists, wheelchairs and trolleys that are not currently in use. The use of equipment libraries can be an effective way of storing, maintaining and decontaminating large or electrical equipment.
- 3.105 Cleaning equipment, laundry and clinical waste need to be stored in separate purpose-built areas to prevent cross-contamination.
- 3.106 Sufficient and appropriate storage will protect equipment from damage, contamination and dust (which may potentially carry microorganisms), but should also allow free access to floors and shelves for cleaning.

### Storage for patients' possessions

- 3.107 Adequate space should be allocated for the storage of patients' possessions. Wardrobes and lockers used for storage of patients' possessions should be selected to be easily and efficiently cleaned. Louvre doors should not be fitted, as they are difficult to keep clean.
- 3.108 In mental health settings, risk assessment should inform the choice of furniture (see **Appendix 1**).

#### Recommendations

- Wardrobes and lockers used for storage of patients' possessions should be selected to be easily and efficiently cleaned.
- Cleaning equipment, laundry and clinical waste need to be stored in separate purpose-built areas to prevent cross-contamination.
- All healthcare premises need a storage area for large pieces of equipment such as beds, mattresses, hoists, wheelchairs and trolleys that are not currently in use.
- Sufficient and appropriate storage will protect equipment from damage, contamination and dust (which may potentially carry microorganisms), but should also allow free access to floors and shelves for cleaning.

## Interior finishes/fixtures and fittings

### Note

Although a range of antimicrobial-impregnated products (such as surface coatings, paints and curtains) is available, there are, at present, no definitive data to support their efficacy in reducing HCAs.

- 3.109 The quality of finishes in all clinical areas should be readily cleaned and resilient. It is important that the healthcare environment is aesthetically pleasing but takes into account the clinical nature of the intended purpose suited to its function.

### Flooring

For guidance on flooring in healthcare facilities, see WHBN 00-10 Part A:2014 *Flooring*.

For guidance on flooring in mental health settings, see **Appendix 1**.

#### Flooring in clinical areas

- 3.110 Flooring should be seamless and smooth, slip-resistant, easily cleaned and appropriately wear-resistant.
- 3.111 There should be coving between the floor and the wall to prevent accumulation of dust and dirt in corners and crevices.
- 3.112 Any joints should be welded or sealed to prevent accumulation of dirt and damage due to water ingress.
- 3.113 Wood and flooring with unsealed joints are difficult to keep clean and should be avoided.
- 3.114 In areas where frequent wet cleaning methods are employed (for example, clinical areas and theatres), floors should be of a material that is unaffected by the agents likely to be used.
- 3.115 Floors that are particularly subject to traffic when wet (bathrooms, kitchens) should have a slip-resistant surface, but be easy to clean.

#### Carpets

- 3.116 **Carpets should not be used in clinical areas.** This includes all areas where frequent spillage is anticipated. Spillage can occur in all clinical areas, corridors and entrances. Aesthetic considerations and noise reduction are most often cited as the reason for using carpets; yet in areas of frequent spillage or heavy traffic, they can quickly become unsightly. Smell and staining have been the reasons behind the removal of carpets in many clinical areas (see **Appendix 1** for flooring in mental health settings).
- 3.117 If carpets are to be considered for non-clinical areas (for example, interview rooms, counselling

suites, consulting rooms), it is essential that a documented local risk assessment is carried out with IPC involvement and a clearly defined pre-planned preventative maintenance and cleaning programme is put in place.

- 3.118 Where the care environment is also a person's home, such as a residential setting for people with a learning disability, carpets may be acceptable. The use of carpets may be appropriate in such facilities but the need for frequent cleaning should be considered in the design stage, both in the choice of carpet and its continued maintenance.
- 3.119 Facilities should also be available for the prompt and effective removal of any spillage.

### Walls

- 3.120 Smooth cleanable impervious surfaces are recommended in clinical areas. Design should ensure that surfaces are easily accessed, will not be physically affected by detergents and disinfectants, and will dry quickly. Additional protection to the walls should be considered to guard against gouging/impacts with bedheads and trolleys. Wall surfaces should be maintained so that they are free from fissures and crevices (see also WHBN 00-10 Part B:2014 *Walls and ceilings*).

### Ceilings

- 3.121 Smooth jointless impervious ceilings should be used in operating theatres and special ventilated isolation rooms.
- 3.122 Suspended ceilings may be installed in general clinical areas and other areas in the healthcare facility (see WHBN 00-10 Part B:2014). Dust and fungal spores may accumulate on the upper surface of ceiling tiles over time, and their dispersal on tile removal or manipulation may pose an inhalation risk to highly immunocompromised patients. A risk assessment should always be done before such work is carried out (see **Appendix 3**).

### Lighting

- 3.123 Efficient lighting in all areas of wards or departments enables cleaning staff to undertake cleaning more effectively. CIBSE's *Lighting Guide 2: Hospitals and healthcare buildings* (SLL LG2) gives guidance on lighting levels in healthcare facilities.
- 3.124 Light fittings that are easy to clean and unlikely to accumulate dust should be chosen for clinical areas. For example, flush ceiling fittings are acceptable, but not open up-lights.
- 3.125 The location and design of luminaires should permit easy changing of lamps and frequent cleaning. They should be designed so that there

are no ledges or ridges and they allow ease of access for cleaning. If skylights or light tubes are to be installed, ease of cleaning and maintenance should be the key considerations.

### Doors

- 3.126 Doors should be cleanable, that is, smooth, non-porous and fluid-resistant, especially where contamination with blood or body fluid is a possibility.
- 3.127 Doors should have smooth handles that can be easily cleaned and dried. Additional protection to the doors should be considered to guard against gouging/impacts with bedheads and trolleys.
- 3.128 In mental health settings, risk assessment should inform the choice of door furniture (see also **Appendix 1**).

### Windows

- 3.129 Windows should be sealed and unopenable in operating theatres and special ventilated isolation rooms.
- 3.130 Internal ledges in all windows should be avoided as this will allow dust and clutter to accumulate. Sloping ledges should be considered.

### Finishes

- 3.131 Floors or walls penetrated by pipes, ducts and conduits should be sealed to stop entry of pests.

### Fixtures and fittings

- 3.132 Design should ensure that surfaces are easily accessed, will not be physically affected by detergents and disinfectants, and will dry quickly.

### Work surfaces

- 3.133 All work surfaces should be impervious, designed for easy cleaning and be free of fissures and unsealed joints. They should be able to withstand the effects of regular cleaning with both detergents and disinfectants.

### Soft furnishings

- 3.134 Soft furnishings (for example, seating) used within all patient areas should be chosen for ease of cleaning and compatibility with detergents and disinfectants. They should be covered in a material that is impermeable, preferably seam-free or heat-sealed.
- 3.135 Fabric that becomes soiled and stained cannot be adequately cleaned and will require replacement.

### Curtains and blinds

- 3.136 Privacy curtains become contaminated with microorganisms, which can then be transmitted to staff hands. Where patients may be particularly

susceptible to infection, curtains should have fittings that make them quick and convenient to replace; such fittings are common in disposable curtains.

- 3.137 In new-build or refurbished augmented care units, consideration should be given to having separate curtains for each bed space, sufficiently separated such that staff can easily and correctly identify which curtain belongs to which bed space.
- 3.138 Reusable curtains should be able to withstand decontamination in healthcare laundering processes.
- 3.139 There should be a local policy on the changing of privacy curtains, both for routine changing when the curtains become soiled and after the discharge of a patient with a known/suspected infection.
- 3.140 Window blinds that are not readily amenable to cleaning are not recommended. Double-glazed room vision panels with integral blinds are easy to clean.
- 3.141 Impervious dividers, screens that can be manoeuvred on wheels or retractable fixed screens between bed spaces can be of benefit in certain clinical areas. The use of these dividers requires consideration at the planning stages as extra space is required either for their use between beds or for storage. It is important that they are easily cleaned, are non-fabric and can withstand the effects of disinfectants.

### Radiators

- 3.142 Radiators must be accessible and cleanable. In clinical areas, supply pipework should always be concealed. In all cases, the objectives of design and specification should be an installation that is neat, easy to clean and maintain, and durable.
- 3.143 Underfloor heating should be considered in mental health and inpatient learning disability settings.

#### Recommendations

- The quality of finishes in all clinical areas should be readily cleaned and resilient.
- **Carpets should not be used in clinical areas.**
- Flooring should be seamless and smooth, slip-resistant, easily cleaned and appropriately wear-resistant.
- Design should ensure that surfaces are easily accessed, will not be physically affected by detergents and disinfectants, and will dry quickly.
- Avoid internal ledges in all windows as this will allow dust and clutter to accumulate. Consider the use of sloping ledges.

- All work surfaces should be impervious, designed for easy cleaning and be free of fissures and unsealed joints.
- In all cases, the objectives of design and specification should be an installation that is neat, easy to clean and maintain, and durable.

## Changing facilities

### Outpatient and day surgery changing facilities

- 3.144 In areas such as outpatients, day surgery, imaging and minor injuries units, it will be necessary to provide sufficient changing/storage facilities if clothing has to be removed and kept safe. These facilities should be included at the planning stage and should be able to be cleaned easily.

### Clinical staff changing facilities

- 3.145 By providing staff changing facilities, sanitary facilities, showers and sufficient locker space for outdoor clothing, staff will be able to change out of their uniform on site. Wash-hand basins and shower facilities for staff should be available and easily accessible in case of substantial blood or body fluid contamination. There needs to be sufficient storage for clean scrub suits and footwear.

### Maintenance staff

- 3.146 Changing facilities should be provided for maintenance staff members who undertake activities that could expose them to contamination. There should also be access to showers in case of significant contamination.

#### Recommendations

- Appropriately sized changing facilities should be provided for staff to encourage them to change out of their uniform on site.
- Wash-hand basins and sanitary facilities should be included, and showers should be provided in the event of contamination by blood or body fluid.

## Laundry and linen services

- 3.147 A Welsh Health Technical Memorandum covering laundry and linen services (WHTM 01-04) is currently in production. Please contact NWSSP-Specialist Estate Services at [whe.info@wales.nhs.uk](mailto:whe.info@wales.nhs.uk) for advice on this topic.

## Catering/food hygiene

- 3.148 Hand-hygiene facilities should be provided for staff members who prepare and serve food. Ward kitchens should have a separate staff wash-hand

basin with non-touch taps, liquid soap and paper towels.

- 3.149 Hand-washing facilities should ideally be located between raw and cooked-food preparation areas.

## Healthcare waste

- 3.150 Guidance on healthcare waste management is outlined in WHTM 07-01:2013 *Safe management of healthcare waste*.

### Responsibilities under 'duty of care'

- 3.151 The 'duty of care' is a law (as set out in section 34 of the *Environmental Protection Act 1990* and associated regulations) decreeing that anyone who manages waste and/or has responsibility for the management of waste must take all reasonable steps to keep that waste safe.
- 3.152 One of the main responsibilities under duty of care, which has major implications for IPC and the built environment, is to ensure that waste is stored safely on site. Essentially:
- storage areas at ward and unit level should be secure and located away from public areas;
  - storage areas should be sufficient in size to allow packaged waste to be segregated and so as to avoid waste of different classifications being stored together in the same area.

### Waste segregation and storage

- 3.153 Any new capital developments should have enough space for waste receptacles to be located close to the point of waste production to avoid unnecessary handling of waste.
- 3.154 Waste segregation entails providing sufficient space for recycling, reuse and recovery to minimise waste and reduce costs.
- 3.155 Space at the ward/unit level is needed for suitable waste receptacles to segregate the waste in line with the approach described in WHTM 07-01:2013. The storage should be sufficient for different waste streams to be segregated pending collection; that is, domestic waste should be separate from clinical waste, and clinical waste with different disposal routes should not be mixed (for example, sharps waste not mixed with orange-bagged waste). There should be no public access to this area.
- 3.156 Adequate secure storage areas for waste are best located at entrances to wards or departments, preferably with access from both ward and hospital corridor to facilitate collection by authorised personnel only. Waste can then be stored in these areas – instead of taking up valuable space in dirty utility rooms.

- 3.157 Storage for used linen should be in a clearly designated area separate from waste. This should minimise any risks of used linen being accidentally taken for disposal, or of waste being taken to the laundry.

- 3.158 The waste and used linen storage areas should be easy to clean efficiently. The holding area should be large enough to hold a wheeled-bin, which in turn will reduce handling and the associated risks to porters.

- 3.159 A designated secure area is also necessary to hold receptacles from the whole site for collection for disposal and should be provided with good access routes away from public areas. This area should also be washable and animal-proof.

### Waste receptacles

- 3.160 The size of waste receptacles required needs to be in line with the quantity of waste generated in a particular area by waste stream (that is, clinical or domestic waste).
- 3.161 Waste receptacles should be foot-operated only (that is, it should not be possible to open them by hand in normal use) and should be easy to clean. The foot pedal should be sturdy and durable. Staff training and awareness-raising on the risks of cross-infection will be key to understanding the importance of the receptacle's hands-free operation and design.
- 3.162 The lids of clinical waste receptacles need to be of a design to allow them to be cleaned and disinfected. Temporary labels should not be attached to receptacles as they inhibit effective cleaning.

### Clinical waste generated in primary care and community settings

- 3.163 In healthcare facilities such as care homes and primary care settings, all waste should be contained appropriately and kept secure at all times.
- 3.164 The system and frequency of waste collection needs to be taken into account when planning facilities needed for temporary holding bays etc. If located externally, the holding bay or receptacle should be washable, secure and animal-proof. Only rigid lockable receptacles should be stored in external areas.
- 3.165 There should be a strict routine for removing waste to ensure it does not remain uncollected for extended periods.

### Storage capacity

- 3.166 Storage areas need to be of a sufficient size to meet the needs of the number of different waste streams likely to be generated.

- 3.167 Storage capacity needs to match the proposed frequency of collection by a waste disposal contractor. The design of the facility should also take account of accessibility and space needed for vehicles collecting the waste.

#### Recommendations

- Refer to WHTM 07-01:2013 *Safe management of healthcare waste*.
- Waste receptacles should be foot-operated only (that is, it should not be possible to open them by hand in normal use) and should be easy to clean.
- The lids of clinical waste receptacles should be of a design to allow cleaning and disinfecting.
- Storage areas need to be of a sufficient size to meet the needs of the number of different waste streams likely to be generated in the healthcare facility.

### Engineering services

- 3.168 This section discusses various aspects of engineering services and the IPC implications of each.

#### Planned preventative maintenance

- 3.169 Local policies should be in place for planned preventative maintenance to ensure safety and efficiency of the engineering services provided.

### Heating/temperature control

#### General

- 3.170 Covered heat emitters allow dust to build up beneath and inside the heat emitter grille. Where heat-emitter covers are used, regular planned cleaning should be undertaken to prevent dust accumulation. When installing heat emitters, it is recommended that there be sufficient space underneath the heat emitter to allow cleaning machinery to be used.

#### Pipework siting and access

- 3.171 Pipework should be contained in a smooth-surfaced box that is easy to clean; pipework sited along a wall can become a dust trap and be impossible to clean.
- 3.172 Pipes and cables running through walls above suspended ceilings should be sealed as far as is practicable.

#### Heating and general ventilation grilles

- 3.173 Ventilation grilles need to be accessed easily for inclusion in cleaning programmes by cleaning and maintenance staff.

### Ventilation ductwork

- 3.174 Ventilation ductwork should be installed in such a way that it can be accessed for cleaning. Extract ductwork accumulates large amounts of dust, particularly where heat reclamation systems are used.

See HTMs 03-01 Parts A and B *Specialised ventilation for healthcare premises* (Please check the **Publications** page of NWSSP-SES website for the most recent edition of these guides as, at the time of publication, these are being re-written) for comprehensive guidance on the design, installation and operational management of ventilation systems in healthcare premises.

### Specialised ventilation

- 3.175 In healthcare premises, certain activities will necessitate the provision of ventilation equipment with additional special features in order to achieve and maintain specific conditions. For infection prevention in specialist areas such as operating theatres, to prevent contaminated air from entering designated clean areas, it should be ensured that air flows from the cleanest to sequentially less clean areas. This direction of airflow prevents contaminated air passing in the opposite direction.
- 3.176 The following areas usually have specialised ventilation requirements for infection prevention:
- a. operating departments;
  - b. airborne infectious diseases isolation;
  - c. bronchoscopy and sputum induction rooms where a risk assessment has indicated a tuberculosis risk;
  - d. accommodation for highly immunocompromised patients;
  - e. cardiac catheterisation/interventional radiology units;
  - f. microbiology containment laboratories;
  - g. mortuaries.

### Split and cassette air-cooling units and active chilled beam units

- 3.177 These types of units must not be used in clinical areas.

### Hot and cold water systems

- 3.178 See HTM 04-01 Parts A and B for comprehensive guidance on the design, installation and operational management of water systems in healthcare premises.
- 3.179 The *Water, England and Wales. Water Supply (Water Quality) Regulations 2010* contain provisions to

ensure that the drinking water supply within buildings to which the public has access remains wholesome and is not adversely affected by the local distribution system.

- 3.180 Immunocompromised patients are at particular risk from cryptosporidium. Very low numbers of cryptosporidium cysts can occasionally occur in mains potable water. A local risk assessment could be used to establish the need for filtration of drinking water to remove these cysts. For guidance on separate cold water services for drinking water, see HTM 04-01 Part A:2006.

#### Storage and distribution of water

- 3.181 Many organisms capable of causing disease, particularly in highly susceptible patients (such as *Pseudomonas aeruginosa* and *Legionella* spp.), have been isolated from healthcare water systems. Preventative measures include:
- routine inspections of water storage tanks with cleaning as required;
  - identifying and removing dead-legs and blind ends;
  - keeping cold water systems cold and hot water systems hot; and
  - ensuring rapid turnover in water storage.
- 3.182 Temperature control is the traditional strategy for reducing the risk from *Legionella* spp. in water systems. This will require temperature monitoring on a regular basis. The recommended test frequencies are given in HTM 04-01 Part B:2006. It is good practice to ensure that hot- and cold-water pipework is separated, insulated and preferably not in the same ducting to avoid heat transfer to the cold water supply.
- 3.183 Chemical and other water treatments that have been shown to be capable of controlling *Legionella* spp. to some extent may also be considered. They will only work in systems that are amenable to their use (for example, those that do not have dead-legs and blind ends).

For guidance on control of *Legionella* in water systems, see the Health & Safety Executive's (2013) *Legionnaires' disease. The control of Legionella bacteria in water systems: Approved Code of Practice and guidance*.

Health Technical Memorandum 04-01 Part B:2006 provides guidance on the monitoring and maintenance of water systems (including water storage).

See also Welsh Health Technical Memorandum 04-01: Addendum 2014 *Pseudomonas aeruginosa. Advice for augmented care units*.

#### Sanitary facilities

- 3.184 WCs, bathrooms and showers should be designed to be easily cleaned and maintained. Wash-hand basins should be provided in or adjacent to WCs.
- 3.185 Showers are generally more practical than baths in connection with clinical procedures and are easier to keep clean. Any fixture with a shower such as a seat should be readily amenable to cleaning.
- 3.186 To minimise the possibility of bacterial colonisation of showerheads, they should be regularly cleaned and descaled.
- 3.187 Bidets may present infection risks, depending on design and patient group (although they are most commonly installed in maternity units). The appliance should be rimless with an over-rim water supply and conform to the specifications given in WHBN 00-10 Part C:2014.
- 3.188 Baths should be easy to clean. Recirculating spa pools are not recommended (see WHBN 00-10 Part C:2014).
- 3.189 In wet rooms, high quality water-resistant cladding should be used on the walls to prevent mould.

WHBN 00-10 Part C:2014 contains guidance to assist the design team in the selection, specification and application of sanitary assemblies in healthcare buildings. It also gives guidance on the appropriate cleaning and maintenance regimes.

WHBN 00-02:2013 gives detailed guidance on the design of sanitary facilities.

#### Water fittings

- 3.190 Water fittings (washers etc) should not support microbiological growth. All fittings should satisfy the requirements of the *Water Supply (Water Fittings) Regulations 1999*, SI 1999/1148. Even if WRAS-approved, the unnecessary use of flexible hoses should be avoided.
- 3.191 Where flexible hoses must be used (for example, on essential equipment such as hi-lo baths), they must be lined with a suitable alternative to EPDM (ethylene propylene diene monomer) as well as being WRAS-approved. Care should be taken to avoid kinking or distorting them during installation – see the Department of Health Estates & Facilities Alert DH (2010) 03 *Flexible water supply hoses* which, although not officially circulated in Wales, is still pertinent.

#### Ice for patient consumption

- 3.192 Ice machines should be of a type that dispenses ice by a non-touch nozzle.

- 3.193 Ice should be made directly from water that is of drinking quality. Ice for the immunocompromised should be made by putting drinking water into single-use ice-making bags, then into a conventional freezer.

### Bedhead services

- 3.194 Bedhead services should be smooth, accessible and easy to wipe clean.
- 3.195 Sufficient dedicated 13-amp socket outlets should be provided in corridors and in individual rooms to enable cleaning appliances with 9m long leads to operate over the whole department.
- 3.196 Where possible, socket outlets should be provided flush-mounted or in trunking systems to enable easy cleaning and prevent the buildup of dust.

### Patient entertainment systems

- 3.197 Radio and television headsets should be of a design that may be cleaned or disinfected between patient use or should be single use, whichever is the most economical method to adopt.

See HTM 08-03: 2011 *Bedhead services* for further guidance.

### Wastewater and sanitation

- 3.198 Wastewater is generated from a huge number of tasks carried out in healthcare buildings, which range from cleaning, hand washing, specialist laundries, surgical operations and areas such as renal dialysis units. Most of this wastewater contains pathogenic microorganisms and must be disposed of via a safely contained internal drainage system into the external wastewater sewerage system.

### Internal drainage system

- 3.199 An internal drainage system should use the minimum amount of pipework, retain water and be airtight at joints and connectors. It should be sufficiently ventilated to retain the integrity of water seals.
- 3.200 The design should comply with the relevant British Standards and Codes of Practice, including BS EN 12056:2000 and *Drainage and waste disposal. Approved document H* of the Building Regulations (2010). Recommendations for spatial and access requirements for public health engineering services are contained in CIBSE Guide G (2014) *Public health and plumbing engineering*.
- 3.201 Provision for inspection, rodding and maintenance should be located to minimise disruption or possible contamination, and access points should not be sited in clinical areas.

### Bedpan washer-disinfectors/macerators

- 3.202 Where reusable bedpans are used, ward areas require adequate and suitable bedpan washer-disinfectors that comply with WHTMs 01-01 Parts A-E. *Decontamination of medical devices within acute services*.
- 3.203 Where fitted, bedpan washer-disinfectors should be installed according to the *Water Supply (Water Fittings) Regulations 1999*, SI 1999/1148 to prevent backflow and contamination. Easy access is essential.
- 3.204 When considering installation of bedpan macerators, it should be established that internal drains and the external sewerage system can cope with the resultant slurry.
- 3.205 Where reusable supports are used with maceratable bedpans, there should be adequate facilities for their cleaning and disinfection between uses.

See also **Appendix 1** on mental health settings.

### Medical gas vacuum systems

- 3.206 Health Technical Memoranda 02-01 Parts A and B. *Medical gas pipeline systems* give guidance regarding piped medical gases and vacuum systems and includes recommendations on emergency procedures, power failure, access for cleaning contaminated vacuum systems, training and communication, maintenance and infection risk.

### Pneumatic air tube transport systems

- 3.207 Guidance for the design and management of pneumatic transport systems can be found in HTM 2009:1995 *Pneumatic air tube transport systems*.
- 3.208 The carrier for specimens should be transparent, able to be autoclaved and incorporate a leak-proof seal.
- 3.209 If leaking samples are allowed to enter the tube system or station, the station should be isolated and dealt with following advice from the IPC team. The disinfection procedure or cleaning will depend on the nature and level of risk imposed by the contaminant. Each incident will need to be assessed separately.
- 3.210 If clinical samples leak on entering or during transportation, the station and/or system should be isolated and dealt with following advice from the IPC team. Each incident will need to be assessed separately.
- 3.211 Major policy decisions with reference to the system should be made through the director responsible for infection prevention and control (DIPC) and/or the IPC team.

### **Recommendations**

- Refer to HTMs 04-01 Parts A and B for comprehensive guidance on the design, installation and operational management of water systems in healthcare premises.
- Heat emitters should be designed and installed in a manner that prevents buildup of dust and contaminants.
- Heat emitters, heating and general ventilation grilles should be easily accessible for cleaning.
- WCs, bathrooms and showers should be designed to be easily cleaned and maintained. Wash-hand basins should be provided in or adjacent to WCs.
- To minimise the possibility of bacterial colonisation of showerheads, they should be regularly cleaned and descaled.
- Lighting should be planned so that units can be easily cleaned, with no ledges or ridges where dust can gather.
- Contamination of the water supply can occur due to poor design of pipework, inappropriate storage or during renovation and refurbishment work (see HTMs 04- 01).
- Ice-making machines should not be installed in immunocompromised patient facilities. Ice for the immunocompromised should be made by putting drinking water into single-use ice-makers, then into a conventional freezer.
- With regard to pneumatic air tube transport systems, the carrier for specimens should be transparent, able to be autoclaved and incorporate a leak-proof seal.

# Appendix 1: Mental health and learning disability settings

## Note

1. This appendix should be read in conjunction with the rest of the document.
  2. With regard to learning disability settings, this guidance applies to inpatient units only and not to domiciliary care services that provide support in people's own homes.
1. The need to minimise the risk of cross-infection is important in mental health settings, but other factors such as ligature risk and the creation of a positive therapeutic environment will need to be taken into consideration when providing advice to these areas.
  2. The IPC requirements for those using all types of mental health and learning disability environments must be made in conjunction with health and safety teams, risk management teams and clinicians when advising on the built environment.

## Recommendations

- Creating/maintaining a non-clinical feel can be achieved by using furnishings/fittings that are manufactured especially for this setting and are easy to clean and maintain. For example, wood-effect vinyl can be used to create a less clinical environment, but cleanliness can be maintained. Vinyl is easy to maintain and requires less frequent replacement.
- In some specialties within mental health bedroom areas, porcelain basins and toilets would present a risk; alternatives such as resin or stainless steel should be considered. Cleaning of these materials should, however, be considered carefully.
- There is no requirement for a clinical wash-hand basin in an en suite bedroom. Alternative arrangements to provide healthcare staff with access to hand hygiene should be made.
- There should be sufficient access to hand-hygiene facilities for staff. Clinical wash-hand basins should be sited only in supervised areas such as the clean utility room, treatment rooms and dirty utility room. Antimicrobial hand-rub should be provided. Where necessary, the use of patient wash-hand basins in en suite rooms can be used with care to avoid recontamination of hands.
- In secure mental health units, hand dryers or vandal-proof integral hand-wash dryers in communal toilets may provide a safer option for hand hygiene while encouraging those in the service to clean their hands.
- Single rooms can be used for source isolation.
- Risk assessment should inform the storage of protective clothing, soap and paper towels, clinical waste receptacles etc. All fixtures and fittings should be anti-ligature.
- Assessment of the need for a macerator or bedpan washer-disinfector should be undertaken. If a specific dirty utility room is not required, alternative procedures should be in place for the disposal of body fluids and urine testing.

## Appendix 2: Example of a typical IPC checklist

Business case		
For non-clinical issues related to the design, construction and fitting out of multi-bed rooms and associated areas		Date:
To be completed by the healthcare provider		
Healthcare provider		
Site		
Project/scheme		
Building/ward		
Project manager for the healthcare provider		
Business case or design stage to which this checklist/ review applies		
Completed by (for healthcare provider)		Date:
Reviewed by		Date:
General notes		

## Part 1. Sign-off

The infection prevention and control checklist/review should be signed off by the relevant parties before the scheme proceeds. Some of the roles below (not chief executive officer) may be covered by a relevant director in the healthcare provider organisation. If appropriate, a single sign-off, clearly stating which areas of responsibility are covered, may suffice.

Check	Reason	Involvement	Design signed-off by:
Chief executive officer	With regard to control and prevention of infection and privacy and dignity issues of the facilities to be provided by his/her organisation to patients, staff and visitors.	To ensure that all departments/commissioners are satisfied with the IPC issues for the facilities proposed. The person ultimately responsible.	
Director responsible for infection prevention and control (DIPC)	With regard to IPC of the facilities and resources to be provided by his/her organisation to patients, staff and visitors.	The provision of coordination, advice and management across clinical boundaries and to inform the health board/management team.	
Director of Estates & Facilities	With regard to design, operation and maintenance of the buildings and resources to be provided by his/her organisation in order to ensure a safe estate is provided for patients, staff and visitors.	The provision of coordination, advice and management across the estates and facilities team and to inform the health board/management team.	
IPC team manager	To ensure involvement in the design and signing-off process and that the design is to their satisfaction for IPC purposes.	To provide specialist input into the design and management process to facilitate effective IPC performance.	
Facilities manager	To ensure that the design and detailing is approved with respect to the potential for effective and efficient cleaning and that sufficient resources are/will be available.	Working with the maintenance manager, current and anticipated problems should be designed out of the new/refurbished facility.	
Maintenance manager	To ensure that the design and detailing is approved with respect to the potential for effective and efficient maintenance to promote and maintain effective and efficient cleaning.	As above.	
Ward/nurse manager/matron	To ensure that the physical design and the operation of the facility or ward can be run and managed in an efficient and hygienic manner.	Nursing/local input is essential as the nursing staff are ultimately those using the facility. Their buy-in as a stakeholder in direct patient care is very important.	
Equipping manager	To ensure that storage facilities and space provided for equipment is adequate and is suitable.	One of the prime causes of poor cleaning is clutter and poor storage facilities.	

## Part 2. Design

	Check	Reason	Possible issues to consider	Y/N	Comments on scheme
1	Has an infection prevention and control risk assessment been completed in relation to the completed facility as proposed?	To assist in designing-out all IPC-related risks.	See issues below.		
2	Isolation facilities	The primary aim of IPC is to prevent the spread of infection between patients, visitors and staff by control or containment of...	A risk assessment should be used to inform decisions regarding which patients to nurse in single-bed rooms. Healthcare providers should audit the use of en-suite single-bed rooms to determine where further local requirements and...		
3					

### Recommendation

- Healthcare organisations will each have their own specific design and build issues to consider. They should use the guidance in this document to develop bespoke IPC checklists for sign-off by the relevant parties.

## Part 3. Management of the construction of the new facility (including demolition and enabling works)

	Check	Reason	Possible issues to consider	Y/N	Comments on scheme
1	Has an infection prevention and control risk assessment been completed in relation to the construction refurbishment of the healthcare facility?	To minimise and manage risks.	See issues below.		
2	Will the new facilities...	Has the design and project planning taken into account the implications on existing patients and staff? IPC...	Protecting immunocompromised patients from airborne fungal infection. Prevent interference with specialist ventilation systems, eg if work is adjacent to an operating theatre or isolation room...		

## Appendix 3: IPC risk assessment during construction/refurbishment of a healthcare facility

1. Quality assurance in IPC associated with building work, fungal spore generation and susceptible patients should be centred on the three principles of:
  - a. identifying susceptible patient groups;
  - b. where necessary, using methods of work that reduce the dissemination of airborne fungal spores; and
  - c. protecting susceptible patients from those airborne fungal spores that will be generated.
2. The first principle is one of clinical risk assessment. The second and third are deciding on actions and ensuring those actions are constantly applied for the duration of the risk. This could be achieved by:
  - instruction of those working on the project, those in the estates team and clinical staff in affected areas;
  - routine monitoring of actions and precautions; and
  - an efficient reporting and reaction system (should deficiencies be identified).
3. Patients who are highly immunocompromised are thought to be at particular risk from infection by inhalation of fungal spores whose airborne concentrations are thought to increase in association with demolition, construction, maintenance and refurbishment (that is, building) works. The occurrence of clusters of fungal infection associated with building works has been observed on a number of occasions, which suggests the need to minimise the risk of spore dispersal during this time. Many of the recommendations in this appendix are based on consensus rather than scientific observation. The following measures are thought to reduce the dissemination of spores, including *aspergillus*.
5. Early and sustained involvement of the IPC team in the planning process is essential and will lead to minimising of potential infection risks. Building dust control measures may not be sufficient for the control of fungal spore release; therefore, the following should be considered:
  - Use floor-to-ceiling barriers that completely enclose the work area.
  - Seal windows in areas accommodating patients assessed as susceptible to minimise ingress of fungal spores generated by nearby building work.
  - If vacuum cleaners are used, ensure they have high efficiency filters on exhausted air.
  - Use a vacuum cleaner with a HEPA filter to clean areas daily or more often if necessary.
  - Transport debris in sealed bags or containers with tightly fitting lids, or cover debris with a wet sheet.
  - The removal of debris by chutes is liable to produce airborne fungal spores. The use and positioning of chutes should be carefully considered.
  - Do not haul debris through patient-care areas, but through an exit restricted to the construction crew.
  - Commission additional hotel services with regard to cleaning during construction projects.
  - Temporary storage for clinical equipment and clean linen should be clean and free of pests.

### Help to reduce specific infection problems during construction

4. A planned contamination control programme is essential when building work of any nature is planned.

### Monitoring

6. Demonstration that measures have reduced ingress of fungal spores into protected areas can be demonstrated by exposing settle plates in protected areas and comparing fungal deposition on these with equivalent settle plates exposed outside protected areas at the same time and for the same duration.
7. There is limited evidence that occasional active sampling for fungal spores demonstrates that protective measures are effective.

1. First, identify **construction activity type** from the table below

<b>Type A</b>	<p>Inspection and non-invasive activities, includes, but not limited to:</p> <ul style="list-style-type: none"> <li>• removal of ceiling tiles for visual inspection on corridors and non-clinical areas;</li> <li>• painting and minimum preparation in corridors and non-clinical areas;</li> <li>• electrical trim work (all plugs, switches, light fixtures, smoke detectors, ventilation fans);</li> <li>• minor plumbing and activities that do not generate dust or require cutting of walls or access to ceilings other than for visual inspection</li> </ul>
<b>Type B</b>	<p>Small scale, short duration activities that create minimal dust. Includes:</p> <ul style="list-style-type: none"> <li>• removal of a limited number of ceiling tiles in low risk clinical areas for inspection only;</li> <li>• installation of telephone and computer cabling;</li> <li>• access to chase spaces;</li> <li>• cutting of walls or ceiling where dust migration can be controlled in non-clinical areas.</li> </ul>
<b>Type C</b>	<p>Any work of long/short duration which generates a moderate-to-high level of dust or requires minor building works, demolition or removal of any fixed building components or assemblies. Includes, but is not limited to:</p> <ul style="list-style-type: none"> <li>• sanding of walls for painting or wall covering;</li> <li>• removal of floor coverings, ceiling tiles, panelling, and wall-mounted shelving and cabinets;</li> <li>• new wall construction;</li> <li>• minor duct work or electrical work above ceilings;</li> <li>• major cabling activities.</li> </ul>
<b>Type D</b>	<p>Major demolition and construction projects. Includes, but is not limited to new construction/machinery and equipment installations, rectifications and modifications</p>

2. Then identify the infection control risk **group by area**

<b>Group 1 (low risk)</b>	<b>Group 2 (medium risk)</b>	<b>Group 3 (high risk)</b>
Office areas/corridors Plant rooms/service ducts Primary care/community treatment rooms	A&E clinical rooms Radiology/magnetic resonance imaging General surgery recovery units Wards Nuclear medicine Admissions/discharge units Echocardiography Other departmental clinical areas Outpatient department Pharmacy (general) Laboratories Endoscopy clinics Examination rooms	Day surgery rooms All intensive care units All operating suites All high dependency units Dialysis & transplant units Oncology Cardiology Cardiac catheterization suite Pharmacy clean rooms Sterile services departments Bone marrow transplant units

3. Now identify the '**risk class**' by correlating '**construction type**' with '**risk group**' (from 1 and 2 above) in the matrix below

<b>Construction activity type</b>				
<b>Risk group</b>	<b>Type A</b>	<b>Type B</b>	<b>Type C</b>	<b>Type D</b>
<b>Group 1</b>	Class 1	Class 2	Class 2	Class 3
<b>Group 2</b>	Class 1	Class 2	Class 3	Class 3
<b>Group 3</b>	Class 2	Class 3	Class 3	Class 4

4. After identifying the risk class from 3, follow the risk measures advised for each **class**

<b>Class 1</b>	<ul style="list-style-type: none"> <li>• Execute work by methods to minimise dust from construction</li> <li>• Immediately replace any ceiling tile displaced for visual inspection</li> </ul>
<b>Class 2</b>	<ul style="list-style-type: none"> <li>• Where appropriate, isolate HVAC (heating, ventilating, and air conditioning) system in areas where work is being performed</li> <li>• Provide active means to prevent airborne dust from dispersing into atmosphere if practicable, ie dust bag to machine</li> <li>• Water-mist work surfaces to control dust while cutting</li> <li>• Avoid pooling of water which may be prolonged</li> <li>• Seal unused doors with duct tape</li> <li>• Block off and seal air vents</li> <li>• Wipe work surfaces with detergent</li> <li>• Contain construction waste before transport in tightly covered containers</li> <li>• Wet-mop and vacuum with filtered vacuum cleaner before leaving work area</li> <li>• Place dust-attracting mat at entrance and exit of work area (tacky mat)</li> <li>• Remove isolation of HVAC system</li> </ul>
<b>Class 3</b>	<ul style="list-style-type: none"> <li>• Where appropriate, isolate HVAC system in area where work is being done to prevent contamination of duct system</li> <li>• Complete all critical barriers and implement dust control methods before construction begins</li> <li>• Maintain negative air pressure within work site. Use HEPA (high efficiency particulate air) -equipped air filtration unit if there is a risk that air will enter building</li> <li>• Do not remove barriers from work area until complete project is clinically clean</li> <li>• Vacuum with filtered vacuum cleaner during works</li> <li>• Wet-mop area during works</li> <li>• Remove barrier materials carefully to minimise spreading of dust and debris associated with construction</li> <li>• Contain construction waste before transport in tightly covered containers</li> <li>• Remove isolation of HVAC system in areas where work has been done and appropriate checks performed</li> </ul>
<b>Class 4</b>	<ul style="list-style-type: none"> <li>• Isolate HVAC system in area where work is being done to prevent contamination of duct system</li> <li>• Complete all critical barriers and implement dust control methods before construction begins</li> <li>• Maintain negative air pressure within work site using HEPA-equipped air filtration unit</li> <li>• Seal holes, pipes, conduits and punctures appropriately</li> <li>• Construct airlock and require all personnel to remove dirty apparel and clean down before leaving the work site. The use of cloth/paper disposable overalls/shoes, etc., may be required</li> <li>• Do not remove barriers from work area until completed project is thoroughly cleaned (as before) and repeat clinical clean after barrier removed</li> <li>• Vacuum work area with filtered vacuum cleaner</li> <li>• Wet-mop area with detergent during works</li> <li>• Remove barrier materials carefully to minimise spreading of dust and debris associated with construction</li> <li>• Contain construction waste before transport in tightly covered and sealed containers</li> <li>• Remove isolation of HVAC system in areas where work has been done and appropriate checks performed</li> </ul>

## Appendix 4: Microorganisms and infections: a guide for designers

1. Microorganisms are classified into bacteria, viruses, fungi and parasites. A human body has probably more bacteria in or on it than it has cells. The vast majority of microorganisms that people encounter will, for most of their lives, do no harm. However, some of them can take advantage of susceptible individuals and cause infections. Many patients in hospitals are unusually susceptible to infection and it is this, rather than the pathogenicity (disease-causing ability) of the microorganisms, that is responsible for most infection in hospitals.
5. A patient can also be infected by microorganisms that have been harmlessly living on or in them for years. This change in interrelationship can be as a result of increased patient susceptibility to infection. Infection with one's own resident microorganisms is termed endogenous, as opposed to infection with microorganisms from elsewhere, which is termed exogenous.

### What is an infection?

2. An infection occurs when microorganisms on or in a person's body cause them harm. In order to do this, the microorganisms will have to combat the person's defences against infection (immunity); they can invade the tissues and produce harmful substances (toxins) that cause damage either locally or systemically.
3. To produce an infection, a sufficient number of a suitably virulent microorganism has to be introduced into a suitably susceptible site on a suitably susceptible individual. The point most amenable to control is that of reducing the numbers of microorganisms that are transferred between patients – this is the most valuable control point in IPC.
4. Microorganisms that can cause infection sometimes exist in an individual without causing disease. This is termed colonisation or carriage. However, they can cause infection if transferred to another, more susceptible, person. As there is no obvious disease when an individual is colonised, it may not be recognised that they are a source of potentially dangerous microorganisms. These microorganisms can also cause disease in the person originally colonised if they become more susceptible, either due to another disease process or as a complication of their treatment.
6. Patients can acquire infections as a consequence of their treatment in a healthcare facility (HCAI). They can acquire an infection outside hospital and bring that infection into hospital (community-acquired infections). Sometimes the community-acquired infection will be the reason a patient is admitted into hospital, and so the infection should be obvious, but other times it may not be (for example, a patient with hepatitis B who has been admitted hospital for an unrelated surgical procedure). At any one time in a hospital, about half of the infections are HCAs and half are community-acquired, but both can be a risk of transmission to other patients.

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*Water, England and Wales. The Water Supply (Water Quality) Regulations 2010*, Welsh Statutory Instruments 2010/994 (W.99)  
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*Workplace (Health, Safety and Welfare) Regulations 1992*, SI 1992/3004  
<http://www.legislation.gov.uk/uksi/1992/3004/introduction/made>

## British Standards Institution

The latest version of any standard should be used provided that it continues to address the relevant requirements of these recommendations.

<http://shop.bsigroup.com/en/>

**BS EN 12056:2000.** *Gravity drainage systems inside buildings.*

## NHS Wales Shared Services Partnership – Specialist Estates Services

Health Technical Memoranda (HTMs) and Health Building Notes (HBNs) issued by the Department of Health in England are being superseded by specific Welsh editions which will be titled Welsh Health Technical Memoranda (WHTMs) and Welsh Health Building Notes (WHBNs) and which will use the same numerical coding. The guidelines referenced below were the most recent at time of publication; however, ***the latest version should always be used, provided that it continues to address the relevant requirements of these recommendations.*** All are available from the NHS Wales Shared Services Partnership – Specialist Estates Services websites:

Intranet:  
<http://howis.wales.nhs.uk/sites3/page.cfm?orgid=254&pid=39106>

Internet:  
<http://www.wales.nhs.uk/sites3/page.cfm?orgid=254&pid=6142>

### Welsh Health Building Notes (WHBN)

WHBN 00-02:2013 *Sanitary spaces*

WHBN 00-03:2013 *Clinical and clinical support spaces*

WHBN 00-10 Part A:2014 *Flooring*

WHBN 00-10 Part B:2014 *Walls and ceilings*

WHBN 00-10 Part C:2014 *Sanitary assemblies*

WHBN 04-01:2014 *Adult in-patient facilities*

WHBN 04-01 Supplement 1:2014 *Isolation facilities for infectious patients in acute settings*

WHBN 04-02 *Critical care units.* In production at time of publication. Please view the *Publication* page of the NWSSP – Specialist Estates Services website to check if it has been published

<http://www.wales.nhs.uk/sites3/page.cfm?orgid=254&pid=64096> or contact us at 029 2090 4118

## Welsh Health Technical Memoranda (WHTM)

WHTM 01-01 Parts A-E *Decontamination of medical devices within acute services*

HTM 02-01:2006 *Medical gas pipeline systems. Part A: design, installation, validation and verification*

HTM 02-01:2006 *Medical gas pipeline systems. Part B: operational management*

HTM 03-01:2007 *Specialised ventilation for healthcare premises. Part A: design and validation*

HTM 03-01:2007 *Specialised ventilation for healthcare premises. Part B: operational management*

Please view the *Publication* page of the NWSSP – Specialist Estates Services website to check whether recent Welsh versions of the above two HTMs have been published

<http://www.wales.nhs.uk/sites3/page.cfm?orgid=254&pid=64096>

HTM 04-01:2006 *The control of Legionella, hygiene, “safe” hot water, cold water and drinking water systems. Part A: Design, installation and testing*

HTM 04-01:2006 *The control of Legionella, hygiene, “safe” hot water, cold water and drinking water systems. Part B: Operational management*

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