

BUILDING ELEMENTS

Corridors

603731 710 .1.00 PERFORMANCE REQUIREMENTS

The requirements set out in this section for corridor clear widths represent the recommended minimum required. These requirements take into account the need to allow for the safe movement of trolleys, beds, wheelchairs and other mobile equipment including the passing of such equipment.

In addition, provision should be made for situations where oversized additional equipment such as bed extensions or bariatric beds is in use. This may be provided for in a number of ways such as by increasing corridor clear width, including passing bays etc.

Refer to:

Section - 710 Doors - for the relationship between door clear width, corridor clear width and door openings in recessed bays.

Section - 730 Human Engineering - Access and Mobility, for accessibility issues.

Section - 790 Safety - Patient Handling and Lifting.

Draft Disability (Access to Premises - Buildings) Standards 2009
Australian Government Department of Health and Ageing.

603732 710 .1.20 INTER-DEPARTMENTAL CORRIDORS

The clear width of major inter-departmental corridors and public corridors generally should be as wide as is deemed necessary for the proposed traffic flow with a recommended minimum clear width of 2200mm. Where physical constraints exist, major inter-departmental corridors and public corridors should not be less than 2100mm.

The provision of wider sections of corridor will allow for the passing of trolleys / beds travelling in opposite directions.

Note: Allow a nominal overall width of up to 1650mm for an attended trolley bed.

603733 710 .1.50 GENERAL

The overriding principle in setting the minimum corridor clear width is the need to allow for a workable width that does not impede egress in the event of an emergency evacuation procedure.

Designers should note that the BCA specifies minimum corridor clear widths for Patient Care Areas. The requirements for certain areas may be higher than the BCA as fire safety and accessibility are not the sole focus of these guidelines.

Most large hospital HPU includes a range of patient and staff-only corridors. If staff-only areas are clearly designated by planning and are not required for patient access, then the guidelines for patient corridors do not apply.

Note 1: All stated corridor clear widths are measured clear of handrails, crashrails and obstructions. For design purposes and considering construction tolerances, allocate 100mm for each handrail.

Note 2: A healthcare facility complex may contain multiple parts with varying BCA classifications - or comprise a United Building. This Part covers Health-care Buildings (BCA classification 9a), containing patient care areas, adopting those definitions and their specific requirements (Australian Building Codes Board 2009).

603734 710 .2.00 FREQUENT PATIENT TRANSPORTATION

In areas where patient beds, trolleys and stretchers will be moved frequently or regularly, such as inpatient units, operating units, birthing units and intensive care units, a 2200mm minimum clear corridor width is recommended. This dimension will accommodate the safe turning of trolleys and beds to ensure staff and patient safety, including situations where additional equipment such as bed extensions are in use or when other equipment is attached.

Even at this dimension, consider increasing the clear width of doorways into adjacent rooms and widening corridors at the entries to the affected rooms to accommodate turning trolleys and beds.

Corridor clear widths in the above areas may be considered at lesser dimensions when utilizing an existing building but special design and planning detail should be incorporated to overcome the problems of congestion and the potential risk to patients and staff in an emergency evacuation.

Note 1: In any event, the corridors may not be narrower than that required by the BCA for patient care areas. BCA Section D Access and Egress covers provision for escape, construction of exits and access for people with disabilities. See 710.6.05 regarding dispensation.

Note 2: For bed or patient trolley access into a bed lift from a corridor or lobby, allowance should be made for turning through 90° e.g. for a 2350mm long bed without extensions, allow a minimum turning circle of 2500mm (attendant at side of bed) or 2950mm with attendant at head of bed - a lift door recess excluded. Attachments and bed-lifters will increase this dimension. For double orthopaedic beams add 300mm.

603735 710 .3.00 INFREQUENT PATIENT TRANSPORTATION

In areas where infrequent trolley or bed movement is expected, corridor clear widths may be reduced to 1800mm in compliance with BCA clause D1.6.

Ensure that door clear widths do not restrict the movement of trolleys or beds from corridor to adjacent rooms including oversize or additional equipment e.g. bariatric, bed extensions, or other attached equipment.

603736 710 .4.00 MINIMAL PATIENT TRANSPORTATION

In outpatient units and areas not routinely used for patient transportation on trolleys or stretchers, the corridor clear widths may be reduced to 1200mm. Note: BCA clause D 1.6 requires 1000mm minimum.

Note 1: The provisions of the BCA Part D and requirements of AS1428.1: Design for access and mobility, Section 7 (Stds Aust 2010) when applied to doorways into or within a path of travel may determine the minimum corridor clear width.

Note 2: Consider the application of AS1428.2 (Stds Aust 2010) as a

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minimum to provide more universal accessibility and better protection against disability discrimination complaint.

603737 710 .5.00 NO PATIENT TRANSPORTATION

In areas where there is no patient transportation requirement, corridors with a minimum clear width of 1200mm are acceptable - providing they satisfy BCA exit travel distances and are in accordance with AS1428.1 covering accessways and circulation space at doorways. Refer to AS1428.2 for minimum guidelines for the passing of wheelchairs in corridors (Stds Aust 2010).

603738 710 .5.05 RECOMMENDED MINIMUM CLEAR WIDTH

In patient care areas corridors should have a minimum clear width of not less than 1200mm except where part of an existing facility or subject to a dispensation from BCA compliance.

603739 710 .6.00 FIRE DOORS

Fire compartment doors can, where necessary, be held open by magnetic hold-open devices connected to the fire alarm system. This ensures that these doors will not impede travel, create manual handling risks or create line of sight risks under normal circumstances.

Ensure minimum height clearances are provided to the underside of the closers and magnetic locks where these are fitted to the underside of door frames.

603740 710 .7.00 INTER-DEPARTMENTAL CORRIDORS

In these guidelines, inter-departmental corridors are referred to as travel. Refer to Section 705 Schedule Of Allowances for Travel and Engineering.

603741 710 .8.00 TABLE OF CORRIDORS

The minimum and recommended requirements for healthcare facility corridors are summarised in the following table:

Note 1: Consider door clear widths into adjacent rooms, wider corridors at entry points for turning trolleys / beds.

Note 2: Door clear widths to ensure movement of trolleys / beds from corridors to adjacent rooms is not restricted.

| LOCATION | BCA CLASS | Trolley Movement | Min Clear Width | Recomm Clear | Hand Rails | Wall Protection | REMARKS |
|---|-----------|----------------------|-----------------|--------------|------------|-----------------|--|
| PATIENT CARE AREAS (EXAMPLES) | | | | | | | |
| OPERATING, EMERGENCY, INPATIENT, BIRTHING, ICU | 9a | Patients - Freq/reg | 2100 | 2200 | Yes | Yes | Refer Note 1 above. |
| MEDICAL IMAGING, AMBULATORY CARE | 9a | Patients - Occas/reg | 1800 | 2100 | Yes | Yes | Refer Note 2 above. |
| AMBULATORY CARE / OUTPATIENTS | 9a | Patients - Rarely/Ne | 1800 | 1800 | Yes | Yes | Part of Acute Care facility. |
| OUTPATIENTS / COMMUNITY HEALTH / CONSULTING ROOMS | 5 | Patients - Never | 1200 | 1200 | Yes | Yes | Separated in accordance with BCA requirements for an acute facility, or stand. |

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|--|----|---------------------|------|--------|-----|-----|--|
| STAFF AREAS | | | 1200 | 1000 | No | No | |
| OFFICES | 5 | None | 1200 | 1200 | No | No | |
| AMENITIES | 5 | None | 1200 | 1200 | No | No | |
| OTHER AREAS | | | | | | | |
| INTER-DEPARTMENTAL CORRIDORS | 9a | Services & Patients | 2100 | 2200 * | Yes | Yes | * Clear width to suit traffic type, volume and passing widths. |
| HOTEL SERVICES E.G. KITCHEN, LAUNDRY, STORES | | Services | 1800 | 2100 * | No | Yes | * Major e.g. connecting to other units, large traffic flow. |
| HOTEL SERVICES E.G. KITCHEN, LAUNDRY, STORE | | None | 1200 | 1500 * | No | Yes | * Minor - within unit. |

603742 710 .9.00 Notes:

1. Minimum clear widths are set by the BCA for fire egress and accessibility purposes. The minimum clear width recommended will generally exceed that set by the BCA for other reasons, including the safe movement of patients on trolleys and safe staff work practices.
2. Install handrails as required by the BCA Clause 2.17 (Australian Building Codes Board 2009) and AS1428.1 (Stds Aust 2010).
3. Wall and corner protection should be provided to suit the type and frequency of traffic.
4. 'Clear width' means a clear, unobstructed width where items such as handrails, drinking fountains, hand basins, telephone booths, vending machines, furniture or portable / mobile equipment of any sort, do not reduce the minimum clear width or impede traffic flow.
5. Comply with the BCA Section D Access and Egress (Australian Building Codes Board 2009) for maximum travel distances for egress and other requirements.
6. Where corridors are to minimum clearances or below, consider providing robust wall protection / material to suit usage.
7. These guidelines are intended to suit functional purposes, not to be used for the minimisation of recurrent costs or maintenance minimisation.

Ramps

603743 710 .10.00 PERFORMANCE REQUIREMENTS

Ramps may be required as part of general facility circulation. Ramps for access by people with a disability are frequently used for general access and for moving beds, ambulance trolleys and other equipment between different levels.

Where there is a requirement for bed or patient trolley circulation, provide ramps with the required slope, clear width and turning circles based on the size and weight of an occupied bed including a bed mover. These should consider larger turning circles and lower gradients than those needed for wheelchairs. As a guide, more appropriate dimensions would be slope 1:20, with rise of 750mm max between landings and 2500mm landing length.

Meet all OHS requirements for the movement of beds and equipment through risk analysis in consultation with end users. See Section 790 Safety - Patient Handling and Lifting.

The slip-resistance rating for materials used on slopes and ramps may vary

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from those used on horizontal surfaces, and should be selected for the incline and specific conditions of use. Refer to AS4586 Slip resistance classification of new pedestrian surface materials (Stds Aust 2004), and AS Handbook 197 An introductory guide to the slip resistance of pedestrian surface materials (Stds Aust 1999a).

Note 1: The minimum requirements for gradients and spacing of landings for ramps and walkways for egress and accessibility in class 9a and patient care areas are covered by BCA Section D which references AS1428.1 (Stds Aust 2010).

Note 2: Application of AS1428.2 (Stds Aust 2010) as a recommended minimum provides more universal accessibility and better protection against disability discrimination complaint.

Ceiling Heights

603744 710 .11.00 PERFORMANCE REQUIREMENTS

A minimum ceiling height of 2400mm is recommended for corridors, passages, recesses and non-treatment and non-activity areas e.g. offices.

603745 710 .11.50 A minimum ceiling height of 2700mm is recommended for treatment and activity areas e.g. therapy rooms, conference rooms, Intensive Care (open plan), kitchens, etc.

For bariatric patient care the use of high beds, high mattresses, and large slings should be identified. The resulting clearance above the bed may require an increase in standard ceiling heights if some types of bariatric manual handling equipment and lifting devices are used.

Aesthetic and other considerations may also lead to variations such as increasing standard ceiling profiles and heights.

603746 710 .11.60 Generally, a minimum ceiling height of 2700mm is recommended for mental health units with 3000mm for seclusion rooms.

603747 710 .12.00 In portions of remodelled existing facilities, the corridor ceiling height may be reduced to 2250mm but only over limited areas such as where a services duct crosses a corridor.

Note: Within egress routes the BCA Clause D 1.6 (Australian Building Codes Board 2009) provides a minimum unobstructed ceiling height of 2000mm, and door height of 1980mm. For class 9a health-care buildings ceiling heights are to be not less than 2400mm generally with exceptions as noted in clause F 3.1.

603748 710 .13.00 In areas where access is restricted e.g. drinking fountain recess, a minimum ceiling height of 2250mm is acceptable.

603749 710 .14.00 In rooms with ceiling-mounted equipment such as x-ray rooms, ceiling-mounted patient lifting devices may require increased ceiling heights and supporting structure. Ensure that heights reflect the equipment manufacturers' recommendations and are not less than the minimum BCA

requirements.

In areas where bariatric manual handling equipment and lifting devices are to be used (both mobile or ceiling mounted), the minimum ceiling height required should be referred to the Project Control Group or appropriate user body for determination.

Equipment should be selected to avoid increasing existing ceiling heights or affecting overhead services e.g. airconditioning ducts and hydraulics, where possible.

- 603750 710 .15.00 For external areas such as entry canopies, ambulance entries and delivery dock canopies ensure that ceiling (soffit) heights provide adequate clearance for the vehicles expected to use them, and for the vehicle function e.g. overhead skip removal. Give special consideration to the impact of whip aerials fitted to emergency vehicles, or specialist emergency vehicles designed and fitted to transport bariatric patients which may result in increased vehicle height and width.

A risk assessment analysis should be conducted and include provision for such items as tour coaches and fire fighting vehicles at the main entry.

- 603751 710 .16.00 Provide plant rooms with adequate ceiling and door height clearance for equipment and allow safe access for service, maintenance and future replacement of equipment. A minimum ceiling height of 2400mm is recommended, with 2000mm clear below intermittent ductwork. Provide safety markings as required.

- 603752 710 .17.00 Reinforce the ceiling support structure or mount independently of the ceiling support structure where overhead patient hoists are to be installed. This should be noted in the project brief.

Where an increase in bariatric patient intake is predicted, in particular in acute patient care areas, the provision of adequate support for ceiling mounted equipment should be considered in terms of location (flexibility), method and timing (pre or post occupancy).

In addition, review the information provided by equipment manufacturers in terms of the needs of particular items of equipment for passage through full height door openings e.g. to ensuite bathrooms or that may affect the positioning of bed screen tracks or other such fixtures in multi-bed rooms.

Doors

- 603753 710 .18.00 PERFORMANCE REQUIREMENTS

Comply with the requirements of the BCA and AS1428.1 as applicable for the provision of doorways, including all related ancillary requirements such as construction, clearances, glazing, operation, hardware and signage.

Consider the application of AS1428.2 to door opening widths and circulation space as a minimum as this Standard provides more universal accessibility and better protection against disability discrimination complaint (Stds Aust 2010).

For areas occupied by patients with cognitive deficits and scheduled mental health patients, all necessary dispensations to the regulations should be sought and obtained.

603754 710 .18.50 AUTOMATIC DOORS

Automatic sliding doors may be used in high traffic areas and routes, including entry doors to facilities and departments. They may also be used successfully in areas where hands-off access is necessary, such as in access routes for critical care, ambulance and helicopter cases, entries to Operating Unit, etc.

Satisfy the requirements for emergency egress and fit automatic doors with sensors to activate opening that ensures safe use by infants, people with a disability, frail patients and visitors. Consider the use of electronic drop bolt locking where lock down security is required.

Note 1. Requirements for power operated doors are covered in Part D of the BCA.

Note 2. Automatic swing doors are not recommended on the grounds of safety, OHS, high maintenance and problems with wind gusts and air pressure differentials.

603755 710 .19.00 SLIDING DOORS

Sliding doors (single, dual, telescopic etc) may be used subject to compliance with the BCA (Australian Building Codes Board 2009) and AS1428.1 or AS1428.2 if adopted (Stds Aust 2010).

These guidelines recommend careful consideration when using sliding doors in healthcare facilities due to hygiene concerns, poor acoustic performance, maintenance problems and potential for locking in place.

Do not use cavity sliders in the following areas:

- HPU containing Patient Care Areas or Treatment Areas
- HPU containing sterile equipment
- HPU containing patient diagnostic equipment
- catering facilities
- laboratory areas
- mental health facilities.

Surface mounted sliding doors may be used subject to the requirements of accessibility, egress and access in emergency situations.

If used, sliding doors should resist warping or twisting. Top or bottom roller mechanisms, guides and channels should be fit for purpose and ensure safety of operation.

Note: BCA clause D 2.19 covers manually and power operated sliding doors in required exits in class 9a buildings.

603756 710 .20.00 DOOR SWING

Ensure that doors do not open into a zone which impedes the manoeuvring of patients / residents nor swing out into a circulation area in a manner that might obstruct traffic flow or reduce the required corridor recommended minimum clear width.

Some doors may be required to swing out or in both directions for reasons of patient safety e.g. patient bedrooms in mental health units, for reasons of staff safety such as in consultation rooms, or where they form part of an escape route.

In consultation rooms ensure that privacy, door seals and acoustic

performance are not compromised.

Automatic swing doors are not recommended for the reasons as noted in Section 710 Automatic Doors.

603757 710 .21.00 DOORS IN THE PATH OF FIRE EGRESS

All doors on the path of fire egress are subject to the requirements of the BCA, whether single or double swinging leaves except where sliding doors (with conditions) are permitted for exits.

Note: Doors forming part of a fire or smoke compartment enclosure, should when in the closed position, maintain the integrity of the enclosing structure.

Wherever possible use hold-open devices controlled by smoke detectors to assist the safe movement of patients, staff and equipment through doorways. Refer: Section 790 Safety - References and Further Reading.

Note: BCA sections D1 and D2 cover doorways in or forming part of a required exit in class 9a buildings (Australian Building Codes Board 2009).

603758 710 .21.20 LOCKING TO DOORS IN THE PATH OF TRAVEL

Written approval from the local Regulatory Authority (Fire Service / Building Authority) is mandatory before any exit doors in the path of egress travel are locked. Such written building approvals are to be kept for the life of the building.

The fire and evacuation plan for the building should also include appropriate operational procedures / training requirements for the opening of locked fire exit doors in emergency situations.

The operation of a fire alarm and manual override devices, including the fail-safe design of electronically locked exit doors in a path of egress travel, (automatically unlocked upon the operation of a fire alarm), are not to be configured / interfaced through, or be dependent upon the operational status of the fire alarm panel door switch.

Locked exit doors that are electronically locked and automatically unlocked upon the operation of a fire alarm are to have fail-safe manual override devices installed at the exit door including signage instruction for exit door unlocking.

In secure locations e.g. patients with cognitive deficits and scheduled mental health patients where patients / clients could be subject to harm if they operated the manual override device, manual overrides should be provided in secure locations such as at nurse stations or within / near the Fire Indicator Panel.

603759 710 .21.50 MENTAL HEALTH FACILITIES FIRE EGRESS

Latch and locking operation for doors associated with a required exit or path of travel are covered by the BCA clause D 2.21. Provisions are required for immediate unlocking by a fail-safe control switch or by hand. Dispensation should be sought for any variation of this provision.

603760 710 .22.00 DOORS - SECURITY

As a risk management measure all perimeter doors should be provided with

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locks to prevent unauthorized entry or exit. In the case of openings into a secure area or courtyard, security may still be breached in a variety of ways. Any decision to omit locks should be formally recorded.

The use of alarms to indicate the unauthorised use of perimeter doors not used for public access and the use of secure hinges (non-removable pins, etc) to doors identified by risk assessment should be considered.

Entry and exit points into a facility or department should be reduced to a minimum and provided with monitoring / access control as applicable. Provision should be made for use after hours and after dark.

The provision of electronic locks on access and cupboard doors to Pharmacies and to clean utility / medication rooms should be considered to provide both security and a record of access.

Do not implement security measures that adversely affect BCA egress and fire safety requirements.

For design standards refer to Section 790 Security - Building Elements - Doors.

603761 710 .23.00 DOORS USED BY PATIENTS

Use swinging single or double doors to rooms likely to be used by patients without staff assistance. See previous clause Sliding Doors.

Swinging doors will generally open from corridors and distribution spaces into rooms for safety, egress, etc. However, examples of some doors that may need to open out are:

- doors to small patient ensuites
- doors to accessible toilets and showers
- doors to small change cubicles
- doors in areas accessed by mental health patients to prevent patients locking / barricading themselves in the room.

Ensure that doors are easy to open and close (door weight) particularly where patients are using mobility aids such as walkers. A full height or a wide single leaf solid core door can be relatively heavy and can cause injury. Other lighter door leaf constructions that meet the required performance are recommended.

Doors required for emergency access to patients / occupants e.g. toilets, should open out or use special purpose hardware to enable an open out over-ride option for emergencies. Refer to Section 710 Emergency Access.

Locksets and door handles should address risks such as opportunities for self harm in areas where patients are assessed and treated as being at risk of suicide e.g. Emergency Departments, Mental Health Units.

For design standards refer to Section 790 Safety, and to Security - Building Elements - Doors.

Note 1: BCA Part D3 covering access for people with disabilities in 9a buildings applies to all areas normally used by the public, patients or staff, and references AS1428.1 (Stds Aust 2010) for these areas.

Note 2: The interpretation and implementation of the relevant parts of The Disability Discrimination Act (Commonwealth of Australia 1992) may require expert advice.

603762 710 .24.00 DOOR OPENINGS

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Doors within separating corridors are covered by the BCA for doors in the path of fire egress. For the purpose of these guidelines all corridors are on the path of egress.

Note: The BCA clause D 1.6 (Australian Building Codes Board 2009) specifies minimum door clear widths on the path of travel to an exit within a Patient Care Area. Clauses D 2.19 and D 2.20 cover requirements for doors and hardware in required exits.

- 603763 710 .25.00 Provide the recommended minimum dimensions of 1200mm wide and 2030mm high for doors as clear openings to inpatient bedrooms in new areas to ensure clearance for the movement of beds.

In patient care areas and acute care areas in particular, the minimum clear opening dimensions may need to be increased for large sized beds and equipment e.g. bariatric beds exceeding 1200mm width.

For issues with large / heavy door leaves refer to Section 790 Safety. Door closers and hold open devices are dealt with later in this section.

This issue and provision for future trends, including cost benefit analysis, should be referred to the Project Control Group for a directive on policy.

Existing doors of lesser dimensions may be considered acceptable in some instances where function is not adversely affected and replacement is impractical e.g. Adult Mental Health Inpatient Units.

Note: Within a treatment or ward area the BCA. Clause D 1.6 specifies door clear widths relating to corridor clear widths.

- 603764 710 .26.00 To allow access for equipment expected to be used such as IV poles, fracture frames and electric beds, generally a door clear opening height of 2030mm high is adequate. Where necessary this may be increased to 2330mm high e.g. for bariatric equipment and other special circumstances.

Note: Satisfy all provisions for smoke capture at openings where applicable.

Ensure that doors are easy to open and close (door weight), as a full height or wide single leaf solid core door can be relatively heavy or require supplementary hinges and can cause injury. Choose a lighter durable alternative where possible. Special attention should be given to Seclusion Room doors.

A minimum opening clear width of 1200mm is recommended for doors into Seclusion Rooms such as in Emergency and Mental Health Units.

Refer: Section 790 Safety - References and Further Reading.

- 603765 710 .27.00 In general, clear door opening widths to rooms that may be accessed by stretchers, wheeled bed stretchers excluding beds, wheelchairs or persons with disabilities or using assistive devices should be a recommended minimum of 900mm. To allow access for hoists and shower trolleys, increase the clear door opening width to a recommended minimum of 1000mm. For clear door widths for bed access refer to the previous clause.

Manufacturers' recommendations for the equipment selected should be followed, and opening tolerances for new equipment, future use profiles, etc, should be considered.

Note 1: The BCA references AS1428.1 (Stds Aust 2010), where section 7 covers accessibility requirements and correlation between doors and

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circulation space at doorways.

Note 2: New South Wales Health PD 077 recommends doorway clear widths relating to traffic and room type (NSW Health 2005).

- 603766 710 .28.00 While these guidelines are intended to facilitate access by personnel and mobile equipment, consideration should be given to the size of furniture and special equipment that is to be delivered via these access ways.

Allow for egress, safe access for maintenance, service and replacement of equipment in all door openings and circulation routes to Plant Rooms.

603767 710 .29.00 EMERGENCY ACCESS

Provide doors and hardware that permit emergency access from outside the room to rooms identified through risk assessment. These may be defined as rooms that:

- are used independently by patients
- have only one door
- are smaller than 6m²
- have less than 2.5m of clear space behind the single door
- form patient bedrooms, bathrooms and ensuites in mental health facilities
- form secure rooms in mental health facilities.

Note: Similar areas used by visitors and staff should be considered for emergency access as a part of risk assessment.

603768 710 .30.00 MENTAL HEALTH SECLUSION ROOMS

In Mental Health Seclusion Rooms for OHS, patient safety and security, provide the following:

- two single leaf doors opening outwards and wide enough to accommodate a patient with two or more escorts. Ensure a suitable distance between doors and external locks.
- electronic locks connected to a non-interruptible power supply and with at least two locking points should be considered. Do not provide internal handles.

Doors and frames should be solid construction with multiple hinges and multiple locking points. Viewing panels should be constructed from non-breakable material with concealed fixings and designed to prevent removal from within the room.

603769 710 .31.00 DOOR HANDLES

PERFORMANCE REQUIREMENTS

Ensure that all door hardware is fit for purpose and complies with all relevant regulations, standards and policies including those applying within each jurisdiction. This includes all matters of OHS, user and patient safety, DDA (Commonwealth of Australia 1992) and accessibility, security, special requirements, durability, function, etc.

GENERAL

Lever handles are recommended for most hinged doors and pull handles for

sliding doors.

Install handles between 900mm and 1100mm above the floor to BCA, D3 referencing AS1428.1 (Stds Aust 2010), and where applicable at an appropriate height to enable staff to easily open doors whilst supporting or manoeuvring patients or residents.

In areas with frequent staff movement by or through doorways, door handles should be selected with a shape that minimises the risk of snagging clothing or other items. Lever handles with a full return are recommended.

See AS1428.2 (Stds Aust 2010) for additional information on accessible door handles and hardware.

MENTAL HEALTH

In mental health facilities ensure that door hardware will not provide a support point for self-harm, staff-only areas excepted. Use only tested and approved anti ligature products specifically designed to prevent self harm.

Note: Typical hardware consists of recessed, concealed, flush door handles, and tapered doorknobs.

PAEDIATRIC ROOMS

In paediatric rooms where no latching is required consider providing two sets of push plate / pull handles - one at high level and one at low level. Door controls should meet AS1428.3 (Stds Aust 2010) as applicable to paediatric units.

LOCKS

Door handles may incorporate locks, snib latches, push buttons and indicators. Consider the use of flexible hardware systems where the functionality of the door may be changed without changing the hardware.

The type of locking function should be appropriate for the use of the room and prevent a person becoming inadvertently locked in a room.

Keyless entry systems may be required for controlled access areas.

PUSH PLATES / PULL HANDLES

In many instances a door latch is not necessary. Rooms that do not require latching may work well with only a push plate / pull handle and a self closer. Push plates / pull handles should be used in rooms that are used frequently by staff carrying objects e.g. Dirty Utility Rooms.

603770 710 .32.00 DOOR GRILLES AND UNDERCUTS

The heating, ventilation and airconditioning (HVAC) design may require door grilles or undercuts. These are usually required for return air, makeup air or pressure relief.

Door grilles or undercuts may be used in areas that do not compromise the requirements of the BCA and other requirements of these guidelines.

Do not use door grilles or undercuts in the following locations:

- areas with a particular air-pressurisation scheme, e.g. isolation.
- rooms requiring acoustic isolation and privacy
- rooms requiring radiation shielding
- Fire Doors and Smoke Doors.

Do not use door grilles in any patient accessible areas within mental health

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facilities due to the potential for door grilles to suffer impact and damage, be used for self-harm or used as a weapon.

The following requirements and recommendations also apply to grilles and undercuts:

- door grilles should be positioned (above 290mm) to avoid damage by wheelchair footrests in areas used by people in wheelchairs, refer AS1428.1 fig 35 (Stds Aust 2010)
- door grilles are not recommended for bathrooms or ensuites
- large undercuts close to bathroom showers should not be used as they can result in water leaking or splashing into adjoining rooms.

As an alternative to a door undercut consider:

- an inward sloping door slot approximately 200mm above the floor to reduce water egress whilst providing the same functionality as a door undercut for bathroom showers
- ceiling grilles connected via flexible duct within the ceiling space.

603771 710 .33.00 HOLD-OPEN DEVICE

Door hold-open devices should be considered for doors that may need to remain open, such as doors on main traffic routes and delivery doors. Devices should meet the following recommendations:

- hold-open devices should be capable of activation and de-activation without any need for the staff to bend down, reach upwards or reach behind the door
- hold-open devices should not be fitted to doors where this compromises doors that are required to achieve a specific air pressurisation or isolation scheme by these guidelines
- hold-open devices should not be fitted to the side of a door that may permit a disturbed patient to lock the door from inside or where they may provide a potential hanging point for patients who are at high risk of self harm
- in areas frequently used by staff holding objects or pushing trolleys, the use of delayed action combined self closer / hold-open device is recommended
- hold-open devices used for fire doors should comply with the BCA and be controlled either by smoke detectors or by activated fire alarms.

603772 710 .34.00 SELF CLOSERS

Self closers required for fire and smoke doors are covered under the BCA. This section deals with other door types.

Self closers should be provided for the following doors and rooms:

- doors required to achieve a certain airflow or air pressurisation scheme required by these guidelines
- entrance doors to any area nominated as a restricted area by these guidelines including:
 - operating unit
 - CSSU
 - kitchen
 - sterile stock room
 - isolation rooms
 - birthing rooms.

603773 710 .35.00 Apart from the previous recommendation, the over-provision of self closers can lead to unnecessary capital expenditure and maintenance costs. Door closers should not be fitted where they exacerbate or create manual

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handling risks, where they impede the movement of patients or where they reduce the independence of patients.

- 603774 710 .36.00 The use of door closers to utility and other high use rooms should be referred to the Project Control Group. The use of delayed action closers is an option where there is a high incidence of staff carrying objects or wheeling trolleys.

Note 1. Refer to AS1428.1 clause 11.1.1 (Stds Aust 2010) for permissible maximum opening forces.

- 603775 710 .37.00 HARDWARE

Door hardware is a specialist subject covering a wide range of products and product options. The selection of hardware for healthcare is particularly complex. The services and advice of experienced industry support staff is recommended.

Interior Glazing

- 603776 710 .38.00 PERFORMANCE REQUIREMENTS

Interior glazing in the form of glazed panels within partitions or doors is often required for the safe and efficient operation of the door or space. When provided in this context it should be fit for purpose and comply with the relevant regulations, guidelines and standards, in particular:

- AS1288 Glass in Buildings - Selection and Installation (Stds Aust 2006)
- AS1905.1: Components for the Protection of Openings in Fire Resistant Walls - Part 1 - Fire Resistant Door Sets (e.g. glazing in fire doors) (Stds Aust 2005a).

- 603777 710 .38.05 GENERAL

Apart from aesthetic considerations interior glazing is used for a number of purposes, some of which include:

- OHS (employee safety)
- safety of patients, public and others
- clinical observation of patients
- security e.g. checking room occupation in emergency departments
- work practices
- visual communication.

Glazed panels for both doors and partitions should be sized, positioned vertically and located to enable use by the majority of occupants i.e. 90% of the population when seated (eye height 685 - 845mm*), and standing (eye height 1405 - 1745mm*) and for persons in wheelchairs assume a seated eye height.

*From Table 1 in AS Handbook 59 - Ergonomics - The human factor - A practical approach to work systems design (Stds Aust 1994a).

Note: A variety of terms are used for interior glazing that include 'viewing panels', 'observation panels', 'glazed doors', etc.

- 603778 710 .39.00 The use of glazing in doors is similar to partition glazing in that it provides for all of the functional categories above, however the use and operation of

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doors present a separate OHS risk to staff and safety risk to occupants. Glazing is typically used in the following areas and situations:

- entry / exit to operating rooms or procedure rooms
- scrub room to operating room
- airlocks
- clean and dirty utility
- work rooms frequently used by staff
- kitchens and pantries
- entry doors and doors across corridors.

603779 710 .39.05 Where glazing is required to areas for the functional purposes listed previously, it is usually provided in the form of glazed panels in partitions. The instances where these occur are too numerous to list however the following should be noted:

- rooms used to interview mental health or disturbed patients (mandatory in WA) including Mental Health Secure Rooms
- waiting rooms and other public areas - not in a direct line of sight.

Where adjustable venetian blinds are provided these should be incorporated between glazing - integral assembly - for protection against damage and dust collection. Controls should be located to avoid misuse.

In cases where partition glazing is required as above but cannot be included due to room layout, furniture or fittings, glazed door panels can be used provided that any required obscuration can be achieved.

603780 710 .40.00 Interior glazing is not recommended in the following areas:

- rooms requiring acoustic isolation unless the panel can be designed to achieve the required rating
- where patient or staff privacy is required although safety requirements may need to be balanced against this in some situations.

Glazed panels should have a mechanism, device or material to obscure the glazing in the following areas:

- patient bedrooms to facilitate privacy
- staff areas when privacy is required.

Glazed panels should have the means (mechanism, device, material) to maintain the integrity of the level of protection or security required in the following and other similar areas:

- Operating Rooms and Procedure Rooms where a laser may be in use
- rooms requiring x-ray or other radiation shielding
- rooms requiring electromagnetic shielding e.g. a Faraday Cage.

603781 710 .41.00 Door observation panels may be obscured glazing (varying grades) in areas where a clear vision of the room is not required. This type of glass or applied film may suit rooms where the primary concern is OHS, patient, staff or functional privacy. Obscured glass is usually adequate and is recommended in doors to the following rooms:

- Clean Utility
- Dirty Utility
- Operating and Procedure Rooms
- Examination / Treatment Rooms.

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- 603782 710 .41.05 The type and grade of safety glazing should be fit for purpose e.g. avoiding potential risks for security, violence or self-harm in addition to complying with any the BCA requirements. Refer Section 790 Safety - Glazing and 790 Security - Building Elements, References and Further Reading.

Windows

- 603783 710 .42.00 PERFORMANCE REQUIREMENTS

Comply with the requirements of the BCA Part F4 Natural light and ventilation as applicable to class 9a buildings (Australian Building Codes Board 2009).

In addition to the BCA requirements it is recommended that all rooms occupied by patients or staff on a regular basis have glazed windows or doors to achieve external views and/or make use of direct or borrowed natural light where practical.

The external windows of all patient bedrooms should overlook external areas defined as the perimeter space around a building as well as naturally ventilated and lit atriums and courtyards.

- 603784 710 .43.00 The requirement for windows to provide natural light to patient areas is summarised in the following schedule:

| ROOM/SPACE | External Window | Alternatives | Alternatives | Required | | REMARKS |
|-------------------------|-----------------|--------------|--------------|----------|--|-------------------------------------|
| BEDROOM | Yes | | | Yes | | BCA F4.1 (c) Natural light |
| BIRTHING ROOM | Yes | | | Yes | | BCA F4.1 (c) Natural light |
| PATIENT BAY - CRITICAL | Yes | Skylight | Internal | | | CCU/ICU Bed Cubicle, Pre-op Cubicle |
| PATIENT BAY - NON ACUTE | Yes | Skylight | | No | | |
| PATIENT BAY - ACUTE | Yes | Skylight | | No | | |
| NURSERY | Yes | | | Yes | | BCA F4.1 (c) Natural light |
| PATIENT LOUNGE | Yes | Skylight | | Yes | | |
| PATIENT ACTIVITY ROOM | Yes | Skylight | Internal | Yes | | |
| PATIENT DINING | | | | Yes | | |

- 603785 710 .44.00 To allow a view of the outside environment, the height of window sills should be level or lower than the sight line of patients in their beds or in a chair. See IEQ below.

Note 1: BCA clause F4.1 requires the provision of natural light to all rooms used for sleeping purposes in a class 9a building. This does not apply to the Operating Unit, Emergency Unit and similar areas.

Note 2: Where possible, the provision of external windows to ICU and CCU bed areas is required by these guidelines.

Note 3: For the purpose of this clause an internal atrium with artificial ventilation will be accepted if it complies with BCA requirements.

External Views

603786 710 .45.00 Windows and skylights can provide natural light, natural ventilation and views. These functions are often undifferentiated but each is separate and should be accessed separately.

Requirements covering natural and artificial light, and natural and mechanical ventilation - including airconditioning, are dealt with separately under the BCA under Part F4.

The provision of an external view as required by this guideline is not directly covered by the BCA which covers only the location and size of windows providing natural light under clause F4.2.

603787 710 .46.00 INDOOR ENVIRONMENT QUALITY (IEQ)

Access to external views and natural light is a part of optimising Indoor Environment Quality (IEQ) designed to assist in the healing process for patients, and to improve the working conditions for staff. See Further Reading below.

In addition to improving IEQ in general use areas, access to external views can be particularly beneficial for areas such as:

- trauma, critical, acute or long term care
- general and intensive medical procedures
- repetitive technical and clerical work processes
- deep plan clerical and work areas.

In all the above examples, and in similar areas, every opportunity should be sought to provide an external view. The need for external views is in direct proportion to restriction experienced by patients, the repetitive nature or intensity of a task, and some desk-bound clerical or technical tasks.

IEQ requirements are usually covered by jurisdictions under Ecologically Sustainable Development (ESD) Guidelines.

The importance of external views is reflected by the growth in research and evidenced-based literature on the subject.

Note: Some ESD Rating Tools and systems award credit points to External Views or Daylight and Views under IEQ.

Window Types

603788 710 .47.00 PERFORMANCE REQUIREMENTS

In multi-level hospitals with ducted airconditioning systems and in buildings in cyclone prone areas, it is not always possible or desirable to utilise operable (opening) windows. In these circumstances, fixed windows are acceptable with access for external window cleaning where required that complies with OHS regulations.

For Mechanical Services refer to Part E of these guidelines and the policies within each jurisdiction e.g. for the use of mixed mode airconditioning to utilise natural ventilation to minimise energy usage.

Note: Other factors affecting Indoor Environment Quality (IEQ) include external pollutant sources such as vehicle and building emissions, bushfires, and naturally occurring allergens or pollutants.

Provide operable windows as necessary to allow for ventilation in case of breakdown of mechanical ventilation systems e.g. airconditioning. The use of operable windows for this purpose should be regulated by the

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use of key operated sashes managed by staff.

- 603789 710 .48.00 Provide operable windows with hardware to control / restrict the degree of opening. Windows, fittings and hardware should be fit for purpose and comply with all relevant regulations and standards.

Refer to Window Security below and Section 790 Security - Windows.

- 603790 710 .49.00 Top hung awning windows may act as smoke / heat scoops from fires in storeys below and should not be used in multi-storey buildings.

- 603791 710 .50.00 If it is considered undesirable to allow patients to open windows for reasons such as avoiding potential problems with the central airconditioning then the opening section of the windows should be operated with a lock or 'Allen key' held by the staff. See previous clause.

Note 1: Fly screens should be fitted to the opening sections of a window or door as described above.

Note 2: The provision of opening windows also facilitates energy efficiency as artificial lighting and airconditioning systems may not be necessary at certain times of the day and year. However, Infection Control requirements may override this. Refer to Part D.

Note 3: To prevent unauthorised access through windows a restriction device should be used. This applies particularly to areas that may accommodate children or persons with dementia or confusion or mental illness.

Refer: AS2047 Windows in Buildings - Selection and installation (Stds Aust 1999b).

Window Size

- 603792 710 .51.00 PERFORMANCE REQUIREMENTS

Comply with the requirements of the BCA Part F4 (Australian Building Codes Board 2009) covering natural light and natural ventilation.

- 603793 710 .51.50 Window design and solar shading devices should incorporate ESD principles and comply with applicable ESD guidelines and regulations.

Privacy or shading where required should be provided without affecting the requirements of the BCA.

Window Cleaning

- 603794 710 .52.00 PERFORMANCE REQUIREMENTS

Make appropriate provision for window cleaning in accordance with the local regulations and guidelines.

- 603795 710 .52.50 GENERAL

The selection of methods used to clean the exterior window pane and facades is dependent on a number of factors such as roof types, balconies, shading devices, ledges, etc.

Windows and their opening function for cleaning may be influenced by the room use and interior fittings or furniture e.g. workstations.

Facade cleaning and maintenance methods should be designed to prevent people or other objects falling from heights and can be classified as:

- passive
- active
- personal protective equipment.

The following are methods of cleaning used. However comply in each case with the relevant safety regulations.

- inward opening or pivoting sashes allow for the cleaning of the exterior surface in a safe manner from inside the building. Room use, fixtures and layout may prevent this option.
- with alternate fixed and opening sashes it is possible to open one sash to clean the next fixed sash - for this, provide anchorage points
- a window cleaning ledge or balcony may be provided specifically for window cleaning (no patient access). For this provide anchorage points
- cleaning by using an extension (tucker) pole may be used for windows that are one level above the ground or accessible from a terrace or roof. For this water supply points should be provided.

Note: Refer to the relevant OHS legislation in each jurisdiction including:

State Government of New South Wales 2001, Occupational Health and Safety Regulation 2001, updated 2010.

State Government of Queensland 2009, Workplace Health and Safety Act 2008, Office of the Queensland Parliamentary Counsel.

Workplace Health and Safety Queensland 2007, Guide to the workplace health and safety obligations of designers of structures, Queensland Department of Employment and Industrial Relations.

WorkCover NSW 2000, Guidelines for Building Facade Access Systems, WorkCover NSW.

Workplace Health and Safety Queensland 2007, Guide to the workplace health and safety obligations of designers of structures, Queensland Department of Employment and Industrial Relations.

Workplace Health and Safety, Queensland, 2009, Work at Heights, Department of Employment and Industrial Relations.

See also: Section 790 Safety - References and Further Reading.

Windows - Security

603796 710 .53.00 PERFORMANCE REQUIREMENTS

Conduct a security risk assessment and provide security risk mitigation treatments such as bars, security screens, security glazing, electronic security, locks, restrictors, etc, to external perimeter windows as appropriate to minimise unauthorised entry.

Where physical barriers are provided to windows in the form of non-removable bars, security screens, etc, ensure that fire safety including emergency evacuation is not compromised.

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For building design standards refer Section 790 Security - Building Elements - Windows.

603797 710 .54.00 SUMMARY

Fixtures and Fittings refer to items that are generally factory made or otherwise manufactured off-site then installed in the building - see Glossary. Some fixtures and fittings may be present at the time of the completion of the construction or renovation. Others may be installed at a later date.

For the purpose of these guidelines all fixtures and fittings that are installed, that is fixed to the building, are part of the building and subject to the requirements of these guidelines. As such the relevant requirements of all parts of the AusHFG apply, in particular:

- ergonomics
- human engineering
- safety precautions
- fire safety
- security
- infection control.

Selection of Fixtures and Fittings is covered in detail in Part F of these guidelines.

Note: Consult with employees and identify, assess and control risks when selecting, purchasing and installing FF&E. Refer to OHS legislation and regulations in each jurisdiction.

Refer to:

Section 705 Planning Models for OHS consultation.

Section 790 Safety and Security for Precautions.

AS4145.3 Mechanical locksets for windows in buildings (Stds Aust 2001).

AS5039 Security screen doors and security window grilles (Stds Aust 2008).

AS5040 Installation of security screen doors and window grilles (Stds Aust 2003c).

Ceilings and Ceiling Finishes

603798 710 .55.00 PERFORMANCE REQUIREMENTS

Ensure ceiling types and finishes meet all relevant regulatory requirements, in particular the BCA criteria (Australian Building Codes Board 2009) for acceptable Fire Hazard Properties. Meet specific indices for flammability, spread-of-flame and smoke-developed, ensure fitness for purpose, and satisfy aesthetic, sustainability and life cycle requirements.

Ensure that suspended ceiling systems meet the structural requirements of the BCA including air pressure and earthquake resistance, and that any accessories e.g. acoustic pillows and acoustic flexible sheet materials used over perforated materials meet the required Fire Hazard Properties indices.

603799 710 .55.50 GENERAL

Ceiling type and finish have an impact on the aesthetics, acoustics and general atmosphere of a room. Ensure that the effect of the ceiling finish and

colour do not adversely affect the level of lighting in a room.

603800 710 .56.00 SELECTING CEILING SYSTEMS AND FINISHES

Consider the following issues when selecting a ceiling finish.

Surface durability and soil resistance are key considerations where ceilings may be damaged or need to be kept clean. Other factors may include the need for effective noise reduction, light reflection, moisture resistance or the need to accommodate the support of heavy equipment such as medical imaging or other screening machines, patient lifters and other devices.

Ceilings should be easy to maintain and repair. Locally available standard systems are recommended to ensure continuity for replacement of damaged parts.

Ceilings will generally be subjected to the cleaning protocols documented in the Operational Policies for the facility or for the specific unit.

Access panels should be fit for purpose, minimise the ingress of dust and be secure i.e. accessed only with a special key tool to prevent unauthorised access.

Ceilings should comply with applicable ESD regulations and guidelines.

603801 710 .57.00 RESISTANCE TO SURFACE DAMAGE

Ceilings in corridors, emergency receiving areas and mental health units may need to withstand surface impact or other forms of abuse.

In any areas where inlaid ceiling panels frequently need to be removed for access, resistance to surface scratching and breakage is recommended.

The specification for the proposed finish should be adequate for the particular requirements for each location including resistance to impact and fracture, surface scratching, mould and air diffuser soiling.

603802 710 .58.00 INFECTION CONTROL

Each area within a facility will require a different degree of infection control management or standard of hygiene. Collaboration with the facility infection control representative and compliance with the current infection control policy in each jurisdiction is a required part of the risk management process.

Select and design ceilings to support the level of infection control management required in each space.

Ceilings are covered by AS Handbook 260 Hospital acquired infections - Engineering down the risk (Stds Aust 2003a) as follows. In Section 5 - Rooms suitable for Infection Control purposes - recommendations for ceilings for Type 4 and 5 rooms (standard isolation and respiratory isolation) include:

- ease of cleaning and suitability for cleaning methods to be used
- continuous, impervious and durable finishes
- elimination of joints, gaps and features supporting microbial growth
- ability to withstand disinfecting and cleaning agents without deterioration
- sealed penetrations for fittings in walls and ceilings e.g. pipes, light fittings, for Type 5 rooms for respiratory isolation.

In areas requiring a pressure differential for infection control, ceilings and

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support systems should meet the individual performance criteria including structural soundness and stability e.g. air pressure change and earthquake forces.

Although ceilings rarely become soiled with any hazardous matter, use a smooth washable finish in areas where splash or spillage might occur e.g. Resuscitation Rooms in Emergency Departments, Operating Rooms or where routine washdown or isolation is required.

For further information regarding Infection Control refer to Part D.

603803 710 .59.00 USE OF ACOUSTIC FINISHES

Ceilings can be used independently or together with floor and wall finishes and furnishings to control the acoustic environment in occupied spaces.

For recommended sound levels refer to AS/NZS 2107: Recommended design sound levels and reverberation times for building interiors (Stds Aust 2000), in particular Table 1: Recommended design sound levels for different areas of occupancy in buildings. For OHS issues refer to Section 790 - Noise Reduction.

Materials should be selected to achieve the recommendations of AS/NZS 2107 while not compromising the medical or functional performance required in each area e.g. infection control, hygiene, OHS, cleaning, maintenance, etc.

Sound control includes reducing the transmission of air-borne sound from space to space, using the mass of the material layer e.g. solid plasterboard, fibre cement and/or reducing the reverberation time or reflected sound within a space by absorption e.g. using mineral fibre, perforated surfaces, etc. The industry label 'acoustic' is generally used to indicate low-mass, sound absorbent products.

Most acoustic ceiling tile products consist of absorbent materials with a porous surface and are generally used with a suspended grid system either exposed or concealed. Both of these factors usually exclude their use in areas where infection control or hygienic conditions are required.

Acoustic products specifically produced for use in clean areas should be assessed on their tested performance. Do not use acoustic and/or tiled ceilings where particulate matter may interfere with hygienic environmental control. The use of acoustic tiles should be avoided in areas where splash spillage can occur.

603804 710 .60.00 ACCESS TO SERVICES

Provide access to services and ceiling voids through ceilings as required except in areas such as Operating and Procedure Rooms, isolation and controlled environments. If access panels are used in procedural areas, they should be provided with an effective air pressure seal.

Suspended modular ceiling systems may be used where access to services is required and a smooth seamless finish is not required.

Access panels should be opened only with a special key tool to prevent unauthorised access.

Ceilings to patient areas in mental health units should be designed to prevent patients from accessing ceiling spaces.

In areas requiring security or restricted access e.g. cash holding, pharmacy, stores, medication / clean utility rooms and stores, suspended ceilings or partitions should incorporate measures to prevent unauthorised entry e.g.

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steel mesh, or locked access panels. In mental health units compressed fibre cement sheet may be required to reduce damage and prevent access.

603805 710 .61.00 AVOIDANCE OF DEFORMATION AND SAGGING

Sagging ceilings are often the result of moisture exposure in high humidity areas such as laboratories, kitchens, laundries, locker rooms, shower areas and indoor pools.

Ensure that exhaust and fan systems are appropriate e.g. dedicated, single use systems and adequate for processes and occupancy. Provide remote alarm indication of fan failure where required.

By avoiding where possible the following situations, the incidence of ceilings sagging may be reduced or removed:

- intermittent, seasonal use of facilities or long refurbishment where heating, ventilation, and airconditioning (HVAC) systems might be shut down for extended periods
- installation of ceiling systems prior to the activation of the HVAC system in new construction or renovation projects
- attempted refreshment of indoor air quality by increasing the percentage of outside air that is circulating through a ventilation system.

603806 710 .61.50 For airconditioning equipment installed within the ceiling space provide condensate pans and drains as necessary. Refrigerant and chilled water piping should have appropriate lagging and be supported along its length to prevent moisture from pooling and damaging the ceiling. Penetrations above the ceiling should be appropriately sealed to prevent the ingress of moisture and to maintain the integrity of fire / smoke compartments.

603807 710 .62.00 SUSPENDED AND EXPOSED GRID SYSTEMS

The design of suspended exposed grid ceiling systems should have adequate resistance to corrosion, fire and sagging, and be dimensionally stable.

Exterior soffit linings and support systems in adverse environments such as coastal locations and indoor hydrotherapy pools require special consideration.

Floor Finishes

603808 710 .63.00 PERFORMANCE REQUIREMENTS

Ensure that floor finishes meet all relevant regulatory requirements, standards and policy guidelines within each jurisdiction. They should adequately address the following issues:

- staff safety - OHS and manual handling
- patient and visitor safety - slips, trips and falls
- area function, sustainability and life cycle cost efficiency
- infection and odour control
- the needs of special user groups
- acoustic and aesthetic considerations.

Ensure that interior floor finishes meet the criteria for acceptable Fire Hazard Properties required by the BCA for class 9a buildings (Australian Building Codes Board 2009) specifically flammability, spread-of-flame and smoke-developed indices.

603809 710 .64.00 GENERAL

Floor finishes have an impact on various requirements within the AusHFG. Part D covers matters that affect management of infection prevention and control. This section of Part C covers aspects that affect access, mobility, OHS, manual handling and known floor safety issues e.g. slips, trips and falls (STF), maintenance, sustainability, etc. Ensure that floor finishes support the aims and requirements of the other parts of the AusHFG.

603810 710 .65.00 The selection of floor coverings can impact on staff work practices in the following ways:

- cleaning / maintenance procedures e.g. too rough a surface may lead to arm and shoulder injuries when using a mop
- manoeuvrability of wheeled equipment relating to the degree of resistance to push / pull and turning forces
- risk of slipping or tripping, and injury from falls
- fatigue on feet and legs from standing and walking - in this instance, the types of shoes worn by staff should also be considered.

Refer: Section 790 Safety - References and Further Reading for OHS regulations and guidelines in each jurisdiction.

Fire safety compliance is also a special consideration. A duty of care exists where professionals such as architects and interior designers are involved in the selection of products and purchasing officers and retailers / agents purchase replacement products.

Floor finishes also have a direct impact on the whole of life costs of any building where cleaning and maintenance is concerned. This is especially true in a healthcare facility. Lower initial capital cost may result in higher whole of life costs.

603811 710 .66.00 SELECTING FLOOR FINISHES

SUMMARY

Selection of floor finishes requires consideration of multiple factors, often calling for balance or compromise. Investigate alternative materials, arrange for realistic on-site testing, and check other existing installations with clinical, housekeeping and maintenance staff before selection. The following clauses set out the issues to be considered.

Also refer to TS-7 (NSW Health & CHAA, UNSW 2009).

603812 710 .67.00 MOVEMENT OF OBJECTS

Floor finishes should be selected to provide minimum rolling friction to wheeled equipment including beds, all trolleys, wheelchairs, etc to minimise the OHS risks to employees and others from manual handling and to allow independent mobilisation for persons using manual wheelchairs. This is particularly relevant to acute, rehabilitation, and other areas or situations where there is frequent use of wheeled equipment, hoists, etc. The movement of bariatric patients should be considered in all areas.

Consider the following when selecting floor finishes:

- wheels on equipment should be appropriate for the floor finish

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- rubber tread wheels (softer) suit smooth hard or resilient finishes, polyurethane (harder) suit softer textile finishes.

- if both carpet and vinyl is to be used in clinical areas, the wheeled equipment should be selected for the highest friction surface i.e. carpet.

- equipment is generally supplied with a standard wheel diameter and tread material. While tread materials may be varied, the diameter cannot usually be varied.

Standard vinyl and similar resilient sheet products are the easiest materials for the movement of beds, hoists, trolleys and wheelchairs.

Carpet should be level short pile thickness, tufted loop pile construction, direct stick, dense (high 'Pile Weight Density Factor'), heavy duty commercial grade or above. See limitations to use.

Bonded (flocked and needle punched) budget carpet has poor whole of life performance and now has limited use e.g. external, back of house, etc. The one-way pile characteristic can cause tracking problems with wheeled equipment.

For areas subject to heavy wheeled traffic foam-backed acoustic vinyl may be unsuitable as the resilience can provide resistance to movement and may deform or delaminate. A resilient backed vinyl with a heavy gauge wear layer should be used if this product type is sought.

Note: Fibres from carpet can collect in the wheel mechanism and increase maintenance and manual handling risks.

603813 710 .68.00 NOISE GENERATION AND SOUND ABSORPTION

Textile floor finishes reduce both impact sound (footfalls) and airborne sound. Although carpet is effective in corridor areas outside patient bedrooms where a great deal of noise can be generated, its use is circumscribed by resistance to wheeled equipment, OHS concerns and reduced infection control and cleaning efficiency. Improved sound reduction should not be implemented in a manner that adversely affects employee OHS (manual handling) or patient safety e.g. slips, trips and falls.

Cushion backed acoustic vinyl, rubber and linoleum are also effective in minimising sound generation but are less effective than carpet. Ceramic tiles, terrazzo and similar hard surfaces generate sound from impact and reflect airborne sound. They also generate additional risk to safety from falls.

Sound level reduction data tests should be compared to determine if claimed advantages are beneficial.

603814 710 .69.00 EASY ON THE FOOT

Surfaces such as vinyl - standard and cushioned, rubber and linoleum and thin dense carpet are considered easy to stand on for long periods of time. Most OHS research indicates that surfaces such as ceramic tiles and terrazzo are too hard to stand on for more than a few hours. However this may be alleviated by suitable shock absorbent footwear. Hard surfaces are therefore not generally recommended in healthcare facility work areas and should be used with caution due to potential injury from falls with appropriate slip resistance coefficients where contamination is expected, especially in food preparation / servery, wet areas, etc.

603815 710 .70.00 INFECTION CONTROL

Each area within a facility will require a different degree of infection control management or standard of hygiene. Collaboration with the facility infection control representative and compliance with the current infection control policy in each jurisdiction is a required part of the risk management process.

Floor finish selection should support the level of infection control management required for each space. Selection should also satisfy any other specific functional or environmental criteria e.g. acoustic.

Carpet - tile and broadloom - with a good maintenance regime is acceptable for general use in patient care areas. Carpet is less easily cleaned than resilient or hard finishes and should not be used where there is a high rate of spillage or soiling or where smooth, impervious, seamless surfaces are required for infection control.

For further information refer to:

Part D Infection Prevention and Control 880 - Surfaces and Finishes.

Infection control policies within each jurisdiction.

AS Handbook 260: Hospital acquired infections - Engineering down the risk, when endorsed (Stds Aust 2003a).

TS-7 Floor Coverings in Healthcare Buildings (NSW Health & CHAA, UNSW 2009).

603816 710 .71.00 EASE OF CLEANING

Floor materials should be easy to clean and have wear resistance appropriate for the location involved. See Infection Control above.

603817 710 .72.00 WET AREAS

In areas subject to running water and regular wetting e.g. ensuites / showers, floor finishes should satisfy all relevant regulations and standards for safety. Installations should be durable and waterproof.

603818 710 .73.00 CONDUCTIVE FLOORING

Static conductive or anti static 'Astatic' flooring may be required in some areas e.g. areas with electro-medical equipment use or testing / repair facilities. Static control floors are categorised as 'Static Dissipative' and 'Static Conductive'.

The degree of electrical resistance or conductivity required should be accurately briefed to ensure that the correct grade of anti static flooring and associated construction are selected.

Special grades of flooring are available for specific conditions. However for some applications standard flooring may be adequate.

603819 710 .73.50 Flammable anaesthetic agents such as ether, cyclopropane or ethyl chloride are no longer used for the treatment of humans. Previous anti static flooring requirements for these agents in theatres and gas storage areas are therefore no longer applicable except to veterinary procedures.

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603820 710 .74.00 SELECTION AND INSTALLATION

| ROOM | FACILITY | | | | | | FLOOR FINISH |
|---------------------|---------------------------|--|--|--|--|--|----------------------------------|
| BEDROOMS | Acute | | | | | | Cushioned Vinyl |
| | Aged Care | | | | | | Cushioned Vinyl or Carpet* |
| | Rehabilitation | | | | | | Cushioned Vinyl or Carpet* |
| BATHROOM / ENSUITES | All | | | | | | Non slip vinyl, tile*, or resin* |
| CORRIDORS | Acute | | | | | | Vinyl or Cushioned Vinyl |
| | AgedCare / Rehabilitation | | | | | | Cushioned Vinyl or Carpet* |
| DINING ROOMS | All | | | | | | Vinyl or Carpet* |
| LOUNGE ROOMS | All | | | | | | Cushioned Vinyl or Carpet* |

603821 710 .75.00 Note: 'vinyl' and 'cushioned vinyl' includes 'resilient sheet materials' e.g. Rubber (incl. natural and synthetic) and linoleum (except for wet areas). 'Carpet' includes 'Textile floor finishes' in both sheet and tile form.

* indicates 'subject to careful consideration'.

Note 1: The junction of different floor finishes e.g. vinyl / carpet can create a safety hazard. Consider low profile junction / diminishing strips, to reduce risk of slips, trips and falls (STFs) and OHS manual handling with wheeled equipment.

Note 2: The use of different types of floor finishes in the one room e.g. carpet and vinyl should be avoided as it often results in varying floor levels due to need to use diminishing strips and can create a feeling of unsure footing. Non slip finishes are required at basin locations and may affect general floor finish selection.

Note 3: Unexpected changes in floor friction may create a greater risk of slips, trips and falls (STFs). To prevent tripping any changes in floor surface and slip resistance should be indicated by a visual cue such as a change of colour.

Note 4: Carpet; thin, dense and level pile, direct stick carpet is recommended as this provides less rolling resistance for the movement of equipment, less fatigue in walking and standing for staff and less potential for tripping.

Note 5: The use of cushioned vinyl or underlay should be assessed for OHS manual handling risks and for suitability for independent manual wheelchair mobility.

Note 6: In aged care and rehabilitation environments the selection of floor finishes should address the continence of patients. Carpet tiles, specifically designed for this environment, may be considered if used in conjunction with a sealed sub floor surface and where maintenance regimes permit its use. However carpet is less easily cleaned than resilient finishes and should not be used where there is a high rate of spills or soiling.

Note 7: Construct floor movement / construction joints to resist the passage of fire / smoke, as required by the BCA.

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- 603822 710 .76.00 Provide the slip resistance required and appropriate for different conditions. The following may be used as a guide:
- Standard vinyl is suitable for dry areas where patients, public and staff are expected to wear shoes.
 - Safety vinyl is similar to standard vinyl and provides greater slip resistance for dry use and spills but may cause tripping for some users e.g. aged care, gait / mobility problems, etc.
 - Enhanced safety flooring with raised profile vinyl flooring balances slip resistance with ease of cleaning and is suitable for barefoot use in wet areas such as patient showers where water, soap and body fat are present.
 - Enhanced safety vinyl flooring suits non barefoot wet areas where trolley movement is also expected, such as Dirty Utility and CSSU Decontamination Areas.
 - Stone and terrazzo are sometimes used in entrance foyer areas. However, when wet, worn or poorly maintained these finishes may present a danger to staff and visitors from STF. To increase slip resistance only proven proprietary non-slip chemical or other treatments should be used.

- 603823 710 .77.00 Select floor finishes capable of maintaining slip resistant for areas such as showers and bathrooms, kitchens and similar work areas that are subject to traffic whilst wet.

Note: Floor finishes should be slip resistant where the presence of fine powder such as talcum powder on a smooth dry floor will constitute a slip hazard.

Refer to:

AS/NZS 3003: Electrical installations - Patient treatment areas of hospitals and medical and dental practices (Stds Aust 2003b).

AS/NZS 3661: Slip Resistance of Pedestrian Surfaces (Stds Aust 1994b).

AS/NZS 4586: Slip resistance classification of new pedestrian surface materials (Stds Aust 2004).

BRANZ Bulletin 370: Slip Resistant Floors (BRANZ 1998).

BRANZ 018-2000: Selecting Flooring (BRANZ 2000).

Centre for Health Assets Australasia 2007, Wall and Floor Finishes for Wet Areas, University of New South Wales, Sydney (CHAA 2007).

CIRIA 2006: C652: Safer surfaces to walk on, reducing the risk of slipping (CIRIA 2006).

NSW Health & CHAA UNSW 2009, TS-7: Floor Coverings in Healthcare Buildings V1.1, NSW Health.

The Center for Health Design: Sound Control for Improved Outcomes in Healthcare Settings (Joseph & Ulrich 2007).

Stds Aust 1999, AS Handbook 197: An introductory guide to the slip resistance of pedestrian surface materials (Stds Aust 1999a).

WorkSafe Victoria 2007, A Guide to Designing Workplaces for Safer Handling of People (For Health, Aged Care, Rehabilitation and Disability Facilities), 3rd, edn, WorkSafe Victoria.

Wall Finishes

603824 710 .78.00 PERFORMANCE REQUIREMENTS

Ensure that wall finishes meet all relevant regulatory requirements, standards and policy guidelines within each jurisdiction. Also ensure that they are fit for purpose and adequately address requirements for safety, OHS, sustainability, life cycle cost efficiency, indoor environment quality (IEQ) e.g. acoustic and aesthetic value, and indoor air quality (IAQ).

Ensure that interior wall finishes meet the criteria for acceptable Fire Hazard Properties required by the BCA for class 9a buildings specifically indices for flammability, spread-of-flame and smoke-developed.

603825 710 .78.50 GENERAL

Wall finishes are often the largest visual element in an area and thus can have an impact on the aesthetic appeal of the space. Selection of appropriate wall finishes may help create a non-institutional atmosphere and assist in the healing process. Other aspects such as the ease of cleaning, infection control, fire safety and patient care requirements may need to be considered in the finish selection.

See Part D for infection control issues.

603826 710 .79.00 SELECTING WALL FINISHES

In addition to the performance requirements above select wall finishes to adequately address the following issues:

- durability and resistance to impact from furniture, trolleys, aggressive patients, etc
- ease of cleaning and retention of appearance over time
- fire hazard properties
- requirements for infection control.

Ceramic tiles are not generally recommended as a wall finish due to their potential to compromise infection control. They are also susceptible to damage, and if cracked or broken, individual tiles may be difficult to replace.

603827 710 .80.00 WALL PROTECTION

Wall protection is recommended to improve the longevity and retain appearance of most wall finishes particularly in patient care areas, service corridors and other areas where beds, trolleys and other mobile equipment are used.

603828 710 .81.00 SKIRTINGS

Skirting can perform a number of different functions by providing:

- vital protection from scuffing and marking by wheeled equipment, cleaning appliances and feet
- a barrier against bacterial penetration and the build up of contaminants
- effective and easy cleaning
- accessible ducting for cable services
- skirting heating.

Skirting may be:

- a manufactured item in various materials profiles and sizes either separate or welded to the flooring, or
- coved and integral with the floor, formed on-site by dressing the flooring material up the wall.

Pre-formed vinyl skirting is available as flat, feather edge or as ducted skirting for services. Flat and ducted skirting is also available in metal. Flat is commonly used with textile flooring with a feather edge for resilient floors. Other factors influence skirting type e.g. sequence of trades, new or retro-fit work, protection of wall or integrity of skirting during carpet laying operations.

Integral coved, on-site formed, skirting involves dressing the floor material up the wall over a preformed coving fillet usually 20-38mm radius.

Coved skirting should be a minimum of 150mm high. The skirting can either be tapered at the top to provide a minimal horizontal dust catching edge or finished with a capping seal profile.

- 603829 710 .81.50 The combination of sheet resilient flooring with welded seams and integral coved skirtings, as described above, is generally recommended for all patient care, clinical, wet and other areas where hygiene, infection control, ease of cleaning and decontamination are desirable or required.

For semi industrial and food process / waste handling areas, seamless coatings, ceramic tiling, etc may be used as appropriate to function.

Where used for wet, clean or similar applications, vinyl wall finishes may be welded to the vinyl floor finish provided that both finishes are homogeneous with a matching or 2mm minimum thickness.

Note: The use of vinyl wall sheet products of 1mm thickness carried down over the skirting and glued with an overlap is not recommended for healthcare use.

603830 710 .82.00 CORNER GUARDS AND CRASHRAILS

Provide corner guards and crashrails to protect wall linings and finishes against damage from impact in:

- inpatient, outpatient and public circulation corridors
- support services corridors, storage bays, equipment rooms
- any areas with trolley, mobile equipment or bed traffic.

Crashrail design should be appropriate for differing functional requirements e.g. inpatient units, back of house, loading docks.

Crashrail function is frequently incorporated in a dual purpose handrail / crashrail design. Ensure that the handrail and crashrail functions comply with AS1428 (Stds Aust 2010) and meet specific user requirements e.g. aged care.

Note: Additional lower crashrail or wall protection may be required for a particular damage pattern.

603831 710 .82.50 HANDRAILS

Provide handrails as required to provide assistance and support for patients and visitors, as required by the BCA and as a result of risk assessment. Each department should also be assessed individually for the requirements of staff and visitors with disabilities.

Free ends should be returned as these constitute a potentially serious head injury risk to children. Design should ensure no pinch points or grip obstructions from fixing brackets.

Refer to Section 730 - Grab Rails for additional detail, and to Section 790 - Safety for self harm issues.

603832 710 .83.00 SPLASH PROTECTION

Apply splash protection to walls in areas such as laboratories, Formula Rooms, Beverage Bays, Kitchens, Bathrooms, Showers, and Dirty Utility Rooms in addition to handbasins, scrub troughs, cleaners' and laundry sinks.

603833 710 .84.00 RADIATION PROTECTION

Radiation protection will depend on individual room requirements. Material used and the extent of radiation shielding should be determined by a Radiation Services consultancy in accordance with the governing regulations and guidelines.

For example: In Western Australia, The Radiation Safety Act - 1975 (State Government of Western Australia 1975); and The Radiation Safety Regulations - 1983 (State Government of Western Australia 1983) - as administered by The Radiological Council of Western Australia.

603834 710 .85.00 BENCH TOPS

Bench tops should have a smooth, impervious and durable finish and be resistant to stains. Joins should be avoided where possible for ease of cleaning. The design and the materials used should adequately meet all functional, sustainable and life cycle requirements. A range of products are suitable e.g. laminates, synthetics and stainless steel.

The junction between wall and bench top work surface may be sealed, provided with an upstand and/or wall protection, or designed with an upstand and/or cleanable gap, as required by function e.g. cleaning, infection control.

Handwash Facilities

603835 710 .86.00 PERFORMANCE REQUIREMENTS

Comply with the recommendations of Part D Infection Prevention and Control and the Standard Components for standard clinical and non-clinical basin types, fittings and locations.

In addition to the recommendations of Part D, and for any other special basin types, handbasins should be:

- large enough and taps and spouts positioned in such a manner to prevent splashing from the waste trap or from the bowl onto the floor creating a safety hazard
- fixed at a height, including fittings, to suit the particular function, such as paediatric, accessible, and standard
- securely supported with basins fixed to withstand an applied vertical load of not less than 115 kg on the front of the fixture
- located, including fittings, to permit their proper use and operation. Liquid soap dispensers should be located over the basin wherever possible.

Note: For accessible mirrors the BCA requires that these be located within

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900mm of the floor. Since the preferred location of mirrors is over the basin some compromise is required.

603836 710 .87.00 TAPWARE

Particular care should be given to the clearances required for elbow lever action handles.

Standard handles with effective finger grips and non-thermal transmitting are preferred.

603837 710 .88.00 NO TOUCH TAPWARE

Decisions regarding the provision of 'no touch' basin tapware should be referred to the project control group for resolution. Issues to be considered include installed and maintenance costs, jurisdiction and area / district health service infection control policies, tapware type and function. The types of 'no-touch' tapware include:

- sensor operated with wave on / wave off
- sensor operated - on demand
- timed flow - touch operated
- foot or knee operated, etc.

Tapware should comply with AS/NZS 3718: Water supply - Tap ware (Stds Aust 2005b).

References and Further Reading

603838 710 .90.00 GENERAL

Further references are provided below. Ensure that current versions of the following documents or web references are consulted. The list is not exhaustive and additional references are provided above within the text.

AUSTRALASIAN

For Accessibility and Disability issues. Refer Section 730 and Further Reading.

Australian Human Rights Commission 2009, Australian Human Rights Commission homepage, Human Rights and Equal Opportunities Commission, www.humanrights.gov.au

INDIVIDUAL JURISDICTIONS

AusHFG Part B - Access for each jurisdiction.

AusHFG Part D Infection Prevention and Control.

603839 710 .90.10 FURTHER READING AND REFERENCES

Centre for Health Assets Australasia 2007, Wall and Floor Finishes for Wet Areas, University of New South Wales, Sydney.

Commonwealth of Australia 1992, Disability Discrimination Act 1992, Office of Legislative Drafting and Publishing, Canberra.

Department of the Environment and Heritage 2006, ESD Design Guide for Australian Government Buildings, 2nd edn, Australian Government.

Green Building Council Australia 2006, Healthcare V1, Green Star.

Green Guide for Health Care 2005, Green Guide for Health Care V 2.1, GGHC.

Joseph, A 2006, The Impact of Light on Outcomes in Healthcare Settings Issue Paper 2, Centre for Health Design, Concord, CA.

Joseph, A. and Ulrich, R. 2007, Sound Control for Improved Outcomes in Healthcare Settings, The Center for Health Design.

NSW Health 2005, PD 2005-077: Improved Access to Health Care Facilities, NSW Health.

603840 710 .90.20 STANDARDS AND REGULATIONS

Australian Building Codes Board 2009, The Building Code of Australia, Australian Government, State and Territory Governments of Australia.

BRANZ 1998, Bulletin 370: Slip Resistant Floors: Building Research Association of New Zealand.

BRANZ 2000, BRANZ 018-2000: Selecting Flooring, Building Research Association of New Zealand.

CIRIA 2006, C652: Safer surfaces to walk on - reducing the risk of slipping, CIRIA, UK.

NSW Health & CHAA, UNSW, 2009, TS-7: Floor Coverings in Healthcare Buildings V1.1, NSW Health.

State Government of New South Wales 2010, Occupational Health and Safety Regulation 2001 (updated 2010), NSW Government.

State Government of Queensland 2009, Workplace Health and Safety Act 2008, Office of the Queensland Parliamentary Counsel.

State Government of Western Australia 1975, Radiation Safety Act 1975.

State Government of Western Australia 1983, Radiation Safety (Attorney-General's Department) Regulations 1983.

Stds Aust 1994a, AS Handbook 59: Ergonomics - The human factor - A practical approach to work systems design, SAI Global.

Stds Aust 1994b, AS/NZS 3661: Slip Resistance of Pedestrian Surfaces, SAI Global.

Stds Aust 1999a, AS Handbook 197: An introductory guide to the slip resistance of pedestrian surface materials, SAI Global.

Stds Aust 1999b, AS 2047/Amdt. 1-2001: Windows in buildings - Selection and installation, SAI Global.

Stds Aust 2000, AS/NZS 2107: Acoustics - Recommended design sound levels and reverberation times for building interiors, SAI Global.

Stds Aust 2001, AS 4145.3: Mechanical locksets for windows in Buildings, SAI Global.

Stds Aust 2003a, AS Handbook 260: Hospital acquired infections - Engineering down the risk., Sydney, Australia, SAI Global.

Stds Aust 2003b, AS/NZS 3003: Electrical installations - Patient treatment

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areas of hospitals and medical, dental practices and dialyzing locations, SAI Global.

Stds Aust 2003c, AS 5040: Installation of security screen doors and window grilles, SAI Global.

Stds Aust 2004, AS/NZS 4586: Slip resistance classification of new pedestrian surface materials, SAI Global.

Stds Aust 2005a, AS 1905.1: Components for the protection of openings in fire-resistant walls - Fire-resistant doorsets, SAI Global.

Stds Aust 2005b, AS 3718: Water Supply - Tap ware, SAI Global.

Stds Aust 2006, AS 1288: Glass in buildings - Selection and installation, SAI Global.

Stds Aust 2008, AS 5039: Security screen doors and security window grilles, SAI Global.

Stds Aust 2010, AS 1428.(Set): Design for Access and Mobility, SAI Global.

WorkCover NSW 2000, Guidelines for Building Facade Access Systems, WorkCover NSW.

Workplace Health and Safety Queensland 2007, Guide to the workplace health and safety obligations of designers of structures, Queensland Department of Employment and Industrial Relations.

Workplace Health and Safety, Queensland, 2009, Work at Heights, Department of Employment and Industrial Relations.

WorkSafe Victoria 2007, A Guide to Designing Workplaces for Safer Handling of People (For Health, Aged Care, Rehabilitation and Disability Facilities) 3rd edn, WorkSafe Victoria,