



# 0451 Windows and glazed doors

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# 00 Design principles

## 0.01 Main considerations

It is a requirement to undertake the [00 PLANNING AND DESIGN/0001R - DESIGN REFERENCE](#) and [GLOSSARY OF TERMS](#) information into all aspects of design, detailing and delivery when developing the content here within. Clear demonstration of adherence to these requirements is part of the services and will be called upon at key points in the project and during at the discretion of the Department of Education (DoE).

## 0.02 General

The objective is to have a long-lasting functioning window system offering good security, thermal performance, acoustic performance and controlled ventilation:

- Windows are to be commercial grade integrated system that includes flexible options and configurations, including doors, sliding windows, awning windows, louvres and double-hung components.
- The size and proportions of windows need to be carefully considered in the design to provide maximum efficiency and a balance between the Environmental Sustainable Design (ESD) factors such as; maximising daylight in rooms but avoiding unnecessary solar heat gain and thermal loss etc.
- Window openings should be kept to lengths appropriate for the structural system. The length of windows should consider the structural implications of long window lengths where the structure over the window opening and roof will need to be supported. Continuous runs of windows can be made up of a number of optimum length windows with columns in between to support roof framing or cladding over. Where brickwork above needs to be supported, keep window lengths down to an appropriate length for standard arch bars.
- Building regulations require that the thermal performance of the façade, the window size, glass type and arrangement be assessed to ensure that excessive amounts of energy are not required to maintain a suitable indoor environment.
- Blinds are to be provided to all external windows and glazed doors to facilitate brownout, control glare and provide visual privacy.
- Fly screening must be provided in all schools to the doors, windows and other openings in food preparation, biology, and non-water-closet toilet spaces or where specifically nominated in the EFSG.
- Schools in localities where fly incidence constitutes a health hazard (especially trachoma or other nuisance) will require fly screens to all opening sashes. Consult

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local DoE – Asset Management Unit (AMU) or local NSW Health Data to establish scope.

- Sill Heights: Refer to [00 PLANNING AND DESIGN/0001C DESIGN CHECKLIST - AREAS](#) to recommended sill heights.

## 0.03 Glazing

Generally glazing below 1000mm above the floor level should be avoided. Limited glazing below this height may be acceptable, subject to Department of Education (DoE).

## 0.04 Safety glass

The safety of occupants is paramount where glass is being used, especially in areas subject to human impact. Unless referred to below all glazing types and thickness are to comply with the relevant Australian Standards (AS) as a minimum.

## 0.05 Definition of safety glass

Safety glass is defined in the standard AS 2208 and could include:

Laminated glass

Polycarbonate Plastics glazing sheet

Toughened Glass

## 0.06 Use of laminated safety glass

Laminated safety glass is to be used in DoE schools for all external glazing.

Laminated safety glass is to be used in DoE schools for all internal glazing up to door head height.

Guide Note: Standard thickness laminated safety glass (6.4mm) does not provide category C or above security on external glazing where it is possible to make a hole in the glass and reach through to open a window or door.

Refer to [00 PLANNING AND DESIGN/0001C DESIGN CHECKLIST - SECURITY](#)

## 0.07 Use of squared wired glass

Square wired glass is not to be used in schools.

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## 0.08 Use of polycarbonate plastics

Polycarbonate type glazing sheet that has good safety and security characteristics, but scratches more easily than glass. It is very tough and when it finally breaks, the particles tend to be light, blunt and comparatively harmless.

Polycarbonate type glazing sheet's advantage over glass is in withstanding structural movement because of its greater flexibility. However, it could cost significantly more than glass. Hence it is only to be used where the glazing frame will be subject to excessive distortion, or where major security is necessary (e.g. in areas where repeated illegal entry or vandalism have been experienced in a school).

Guide Note: Because of polycarbonate type glazing sheet's flexibility and very high rate of thermal expansion, glazing rebates need to be deeper than provided on standard window or door sections.

## 0.09 Use of toughened glass

Toughened glass is not recommended to be used in school projects. Whilst much more resistant to breakage than laminated glass it has the disadvantage of crazing and leaving a large opening, when broken.

Toughened glass cannot be cut after being hardened, so each pane must be manufactured to size.

Toughened glass takes longer to manufacture and supply, requiring alternative security arrangements until replacement.

## 0.10 Solid panels

All panels below 1m should be impact resistant, durable & easily maintained.

## Window Framing System

As noted previously, the windows system is to be an integrated system using a commercial grade range of aluminium extrusions suitable for fabricating into fixed, sliding windows, awning windows, double- hung as well as sliding and hinged doors. Other systems require DoE approval.

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## 0.11 Window types

The following gives guidance on the suitability of various opening window system types:

### Sliding sashes

Sliding sashes are the most economical and commonly used operable window for Australian conditions. Effectively only single sliding sashes are possible, with either right or left-hand operation.

Large sliding sashes may be difficult to operate and require special carriages (e.g. double bogey).

The use of sliding windows at high levels is to be carefully considered as students could fall through the open window.

### Awning sashes

Awning sashes are mounted on friction arms for manual operation or small frictionless arms for remote control gear.

Awning sashes while giving good rain protection, are generally the least suitable window for summer conditions as the limited sash extension possible with their control gear effectively masks their openings. Further, if located over roofing or paving the sashes can act as a funnel for ducting hot air into the building.

Awning sashes may be the most practical windows for high level ventilation in exposed locations (e.g. clerestory windows), and if used, every alternate sash should be operable.

To reduce the potential danger of injuries where opening onto walkways and circulation spaces, awning sashes should only be used above 2100mm.

### Double hung

They are suitable for most conditions, offering the similar opening area as a slider (45%) but with more control over ventilation.

Depending upon the configuration sashes may be difficult to reach and operate if placed over benches or cupboards.

### Casement sashes

Casement sashes are not appropriate for most school applications due to restricted available sizes, limited ventilation potential, lack of suitable control gear and poor durability of components. Casement windows can only be used with DoE approval.

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## Pivot sashes

Use pivot sashes only in fully air-conditioned buildings, as they are not suitable for use as general operable sashes.

Horizontal pivots are not recommended to be used, as the control mechanism is complex and sashes expensive.

## Adjustable glass louvres

Adjustable louver windows offer good ventilation potential but are easily vandalised, are generally unsuitable for use with laminated glazing and have poor infiltration and water tightness when compared to other window forms. Vertical louvres are not to be used when exposed to weather.

Horizontal adjustable glass louvers can only be used with DoE approval.

If approved, glazed operable louvres should preferably be the security type with metal surrounds. They should be incorporated into the window suite with careful detailing to ensure watertightness.

They should not be used in exposed situations and should be protected by wide eaves or a covered way.

If used at low level, the louver blade width should not project beyond the wall face.

## Lapped sashes

Lapped sash windows are not recommended for permanent ventilation in the Australian climate.

## 0.12 Aluminium doors

Refer to [04 ENCLOSURE/0453 DOORS AND ACCESS PANELS](#)

The selection of the type, size, finish and hardware of doors is to be undertaken on the basis of a Whole of Life consideration in order to provide doors that will be cost effective and the most appropriate door for the individual location.

When selecting doors, the following characteristics should be considered:

- **Functionality:** Choose frame, leaf and hardware as appropriate to the function of the door and the use of the space to which the door is providing access.



- **Durability:** Doors in pupil accessible areas are subject to extensive wear and tear. In order to be fit for purpose, the frame, door leaf and hardware need to be robust.
- **Maintainability:** door hardware needs to be readily available, easy and economical to maintain.
- Minimum clear door openings must be in accordance with building regulations, to enable easy access for wheelchair and trolley to all areas and functional spaces used by students and staff. (Minimum 850mm clear). The clear door opening width is to be measured between the door and the frames and /or door hardware when the door is open.
- Consider safety when planning for doors opening onto circulation spaces.
- Threshold Steps are to be avoided in order to allow wheelchair and trolley access. Weather bars at thresholds are to have a maximum height of 3mm.
- Operable Walls (between general learning areas): require a Weighted Sound Reduction Index (Rw) rating of 45 for all Schools and should have an acoustically absorbent surface lining, to improve room acoustics. Refer to Acoustics section of the design guide for further details.
- Accordion Doors are not recommended due to their poor acoustic performance.

Fire Rated Doors to be used where required by regulation for fire separation, such as store rooms to Communal Halls. Refer also to [00 PLANNING AND DESIGN/0001C DESIGN CHECKLIST - FINISH](#) for general materials and finishes requirements.

## Sliding doors

Right- or left-hand operation with 2100 mm door height limitation.

Doors to slide within frame on integral track.

Operable side lights or windows to be incorporated for ventilation control.

Sliding doors alone should not be relied upon for ventilation.

## Hinged doors

Hinged doors are to be to commercial grade standard installed in frames to match the window frame sections.

Refer to [04 ENCLOSURE/0455 DOOR HARDWARE](#)

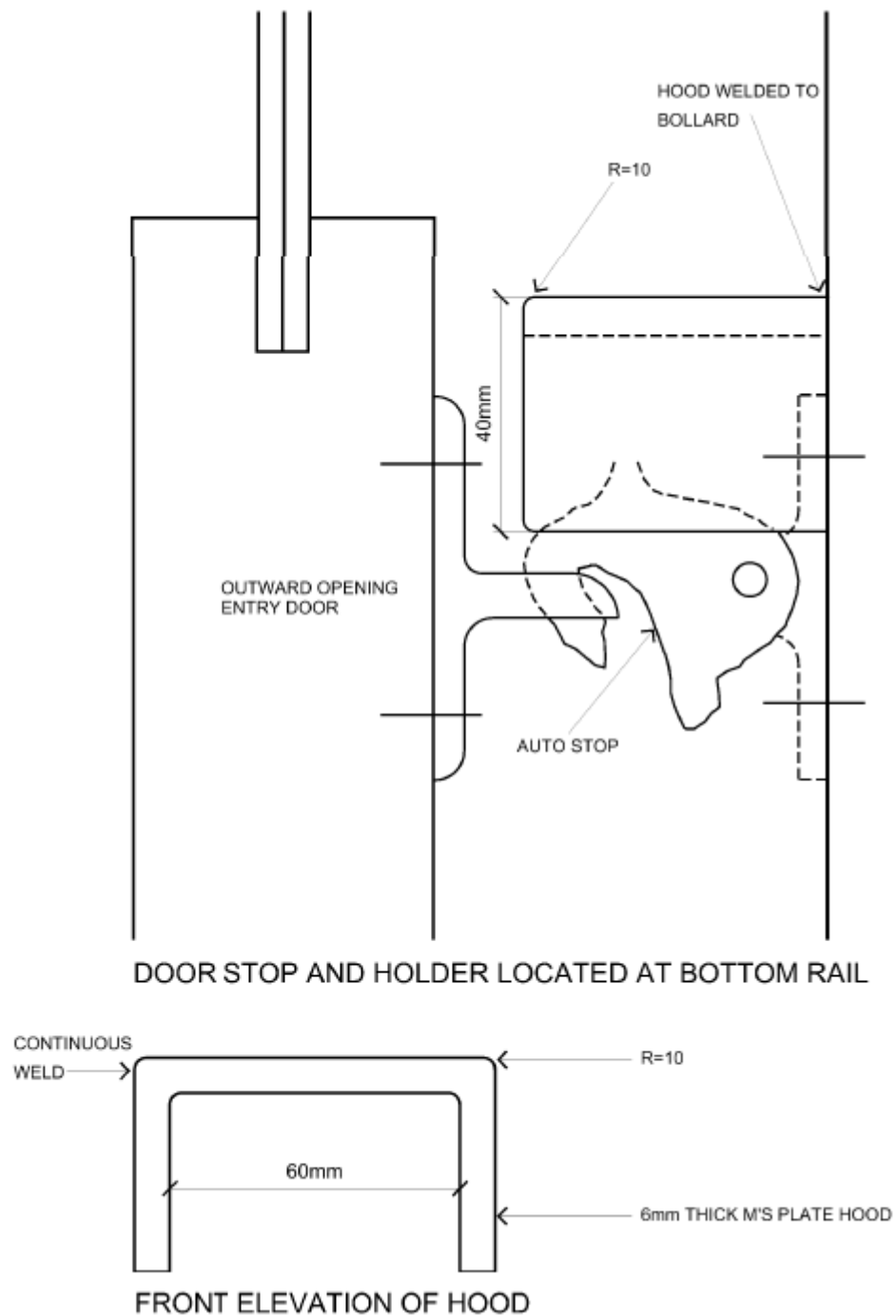
Include door stops and/ or hold open devices where doors may be kept open for extended periods. Generally automatic door stops and holders (auto stops), should be used to prevent damage to the doors, hinges and door closers.

Where doors open externally against a wall surface, the automatic door stop and holders should be fixed to the wall surface at approximately 2m above finished floor level. Where this is not practicable, provide a steel bollard or railing for fixing the stop with protective hood.

**Figure 01: Hood for Bollard with Auto-Stop**

**NOTES**

- 1 Applicable to all external opening out doors, except for
  - 2 Plant Room doors.
- Complete unit to be hot dipped galvanised after fabrication



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Entry/egress doors in Primary Communal Hall, Secondary Gymnasium and Movement Studio should be fitted with a full-length overlapping cover strip at the meeting edges of the door leaves.

Guide Note: “Interfold quick-fix” hinges or wide throw hinges to clear reveals are not recommended due to associated maintenance problems.

## 0.13 Remote control

Sashes and louvres require mechanical and/or electrical remote controls where the sill or transom line is 2000mm or more above the floor.

Sashes are to have frictionless stays and louvres must have H13 (ring type) handles.

### Types of remote control

Swan Neck System (SSN), is suitable for sashes and louvres 2 to 3m from floor or where fly screens, blinds, security grilles, etc. are to be fitted.

Torque Rod System (T/R), is suitable for sashes 3 to 5m from the floor in Gymnasiums. The heavier duty torque rod system enables more sashes to be controlled from the one regulator. Under certain circumstances an increased opening beyond the standard can be achieved.

Electro-mechanical system, is the most effective for sashes over 5m from the floor. Either the swan neck or torque rod system is used in conjunction with the electric system. The use of electric controls enables multiple sashes and louvres to be operated from a central operating point.

A remote-control manufacturer should be consulted at documentation stage to provide the most efficient and economical method of control.

## Regulations

For single sashes a single operator or small gearbox is required.

Multiple sashes or louvres require a small gearbox, heavy duty gearbox or electric regulator.

Where possible, all windows in a room should have a single control.

Not more than 8 sashes may be served by any one regulator.

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## 0.14 Point of contact

Sashes with any dimension exceeding 1200mm should have two (2) points of contact to each sash.

## 0.15 Opening width

Standard: 220mm

Sashes over 1200mm high: 300mm

## 0.16 Handle height

Generally: 1350mm from floor

Gymnasium: 1800mm from floor Detachable handles may be specified.

## 0.17 Finish

Standard Natural Polished Aluminium.

## 0.18 Louvres

### Fixed louvres

Fixed louvres should only be used in areas such as toilet areas and plant rooms, where permanent ventilation is appropriate.

Building Code of Australia (BCA) thermal performance requirements for spaces that are provided with heating or cooling will generally preclude the use of louvres due to their permanent open nature.

The use of fixed louvers in non-habitable spaces (e.g. toilets) should not compromise the insulation requirements of adjacent habitable spaces.

In external walls, vulnerable to vandalism, solid louvres should be prefinished steel or aluminium. Louvre blades should be of robust design with short lengths and/ or reinforced so as to prevent blades being forced apart.

Louvres are to have vermin mesh

Security Stores: fixed louvres are a security/safety risk and should not be used.

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School for specific purposes (SSP) Toilets

Some SSP children have difficulty regulating their body temperature.

These are areas where children may spend some time semi-naked.

Treat the shower/toilet room as a habitable space for thermal comfort.

## Operable louvres

Louvres should seal once closed to avoid infiltrations and air leakage.

Minimise use on elevations exposed to strong prevailing winds and rain.

In external walls, vulnerable to vandalism, solid louvres should be prefinished steel or aluminium.

## 0.19 Grilles

Where permanent ventilation is required in stores, it is generally provided by air grilles located in doors & /or ceilings.

# Specification

## 01 General

As per current NATSPEC except as follows:

### Responsibilities

Windows are to be a commercial grade integrated system that includes flexible options and configurations, including doors, sliding windows, awning windows, louvres and double hung components.

### Submissions

GUIDE NOTE: Include the following additional requirement

Number of copies: 4

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## Window Assemblies

### Window Hardware

Keyed Locks: Where windows require key operated locks, submit sample window lock for approval. Master key and key alike locks as directed.

### Related sections

Refer to the following specification work section for hardware requirements: [04 ENCLOSURE/0455 DOOR HARDWARE](#)

## 02 Products

As per current NATSPEC except as follows:

### 2.2 General

Aluminium extrusions

Materials: Aluminium alloy B6063-T5 unless otherwise specified.

Radius edges/corners: All edges and external corners including all cut sections must have radius (rounded) corners. Finish: Clear Anodised.

### 2.6 Ventilating louvres assemblies

#### Fixed metal louvres:

Sill, Head/jamb, Glazing pocket infill: Roll formed aluminium channels

Material: Aluminium    Finish: Anodised

Mesh: Galvanised birdwire 12 x 12mm grid.

Fixed to the internal face of the louvre with proprietary clips.

Spans greater than 1000mm require stiffening channels fixed to the inside back of every louvre blade (1000mm maximum centres).

#### Adjustable louvres:

Stiles and mullions: Roll formed aluminium channels.

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Material: Aluminium Finish: Anodised

Blade holding clips: Aluminium with double return legs at each end.

### **Blade material:**

GUIDE NOTE: Select appropriate type from the following blade types.

Framed glass blades: 6 mm thick and 152 mm deep safety glass as scheduled. Blades shall be fully framed by aluminium extrusions mitred at each corner and fitted with concealed corner stakes, frames pop riveted to aluminium clips at each end. Maximum width 1000 mm.

Aluminium blades: 152 mm deep extrusions ribbed to a thickness of 6 mm and pop riveted to each louvre clip. Maximum width 1000 mm. Finish: Anodised, all components to match windows unless otherwise specified.

Installation: Screw fix the stiles and mullions to the building structure and/or frame with stainless steel screws. Provide weather strips to heads and sills.

Method of operation: Pantograph operating bars fully housed inside channels and incorporating locking device.

GUIDE NOTE: Delete sub-clause "INSECT SCREENS" nominated in NATSPEC Building Template/ work section and include the following.

## **2.8 Insect screens**

Aluminium framed screens - general

Frame: 25 x 11 x 1.6mm anodised aluminium extruded section with mesh fixing channel, mitred and staked at corners. Provide an extended frame section where necessary to adapt to window operating gear (eg. remote control push rods).

Frame finish: Match windows.

Mesh: Anodised aluminium or fibre glass mesh (as required) beaded into the frame channel with a continuous resilient gasket, so that the mesh is taut and without distortion.

Hardware:

Hinged screens: Hinge at the top to open inwards.

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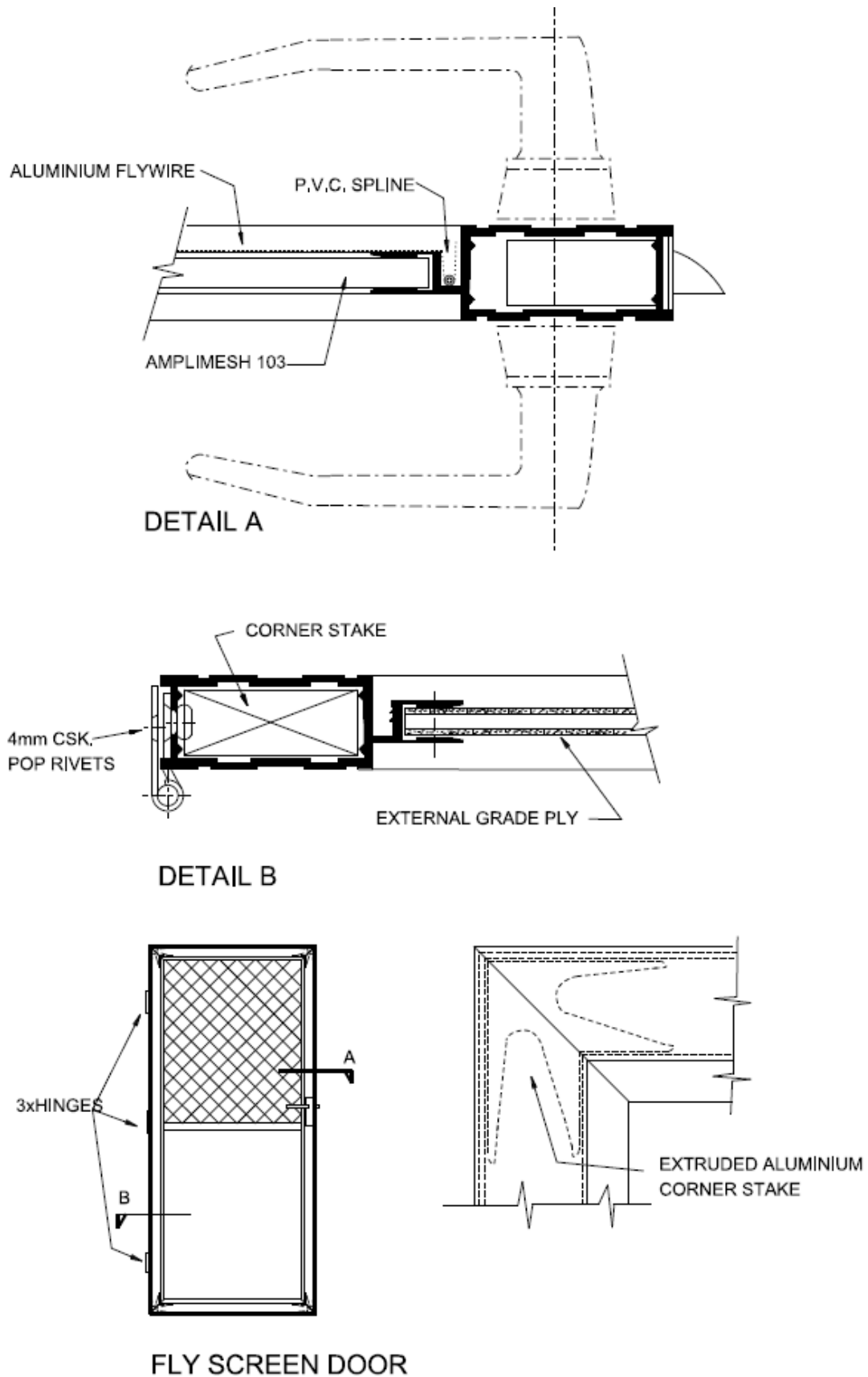
Aluminium framed screens – Canteen

Materials and construction: As for aluminium framed screens – general.

Insect screen door:



**Figure 02: Fly Screen Door**



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## 2.10 Security window grilles

GUIDE NOTE: Delete “General” nominated in NATSPEC Building Template/ Work section and include the following.

### General

Metal security grille/screen and frame fixed to the building structure with tamper resistant fasteners.

Stainless steel security window grilles (Administration/Staff)

GUIDE NOTE: Stainless Steel security window grilles are to be installed where security grilles are required for all administration and staff locations only. Mesh and galvanised mild STEEL grilles are to be installed on all other locations as required.

Refer to [00 PLANNING AND DESIGN/0001C DESIGN CHECKLIST - SAFETY](#) and [00 PLANNING AND DESIGN/0001C DESIGN CHECKLIST - SECURITY](#)

Security category: C or D

Location/s: Administration and staff locations only

Fabrication: Vertical or horizontal stainless-steel rods with even spacings not exceeding 100mm set in an aluminium RHS frame. Assemble grilles after windows are constructed from site measurements only.

Frame:

- Side channels: 32 x 25 x 3mm anodised RHS aluminium with radius corners
- Head, sill and anti-spreaders: 25 x 25 x 3mm square section anodised RHS aluminium with radius corners.
- Centres: 500 mm (maximum)

Maximum size: 3000mm (length). For longer lengths use a 35 x 35 x 3mm RHS MS joining mullion and bolt assembly together as described in “Fixing”.

Finishes: Stainless steel: polished, 12.7mm diameter solid bars.

Grade: 304

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Aluminium: Anodised (clear) to AS 1231

Film thickness: 0.025mm.

Grille: Use horizontal bars for sliding windows and vertical bars for double hung or awning windows.

Installation: To AS 5040. Where two grilles are to be joined bolt together through frame and mullion with stainless bolts at 400 mm centres and bond nuts to bolt post.

**GUIDE NOTE:** The Manufacturer/Installer must hold one of the following master security licences issued by the security licensing & enforcement directorate (sled) of the NSW police force – subclass ma, mb, mc, or md, PLUS also one of the following security licences 2a, 2b or 2e.

Manufacturer/installer: The installation must be carried out by a company and installer holding a subclass MA, MB, MC or MD and a 2A or 2B Master Security Licence issued by Security Licensing & Enforcing Directorate (SLED) of the NSW Police Force.

Certification: Hand to the Principal's Authorised Person / Principal's Representative certification that the security grilles have been manufactured and installed by holders of current appropriate licenses.

Steel security window grilles (except Administration/Staff)

**GUIDE NOTE:** Mesh and galvanised mild STEEL grilles are required for all locations except for administration and staff locations where stainless security grilles are required.

## Selection

**GUIDE NOTE:** Select one type of security grille listed below, Type A, Type B or Type C and include the selection (Type) in the Security grilles schedule.

Security category: C or D.

Type A - Mild steel frame with horizontal or vertical rails

Location/s: All locations excluding Administration and staff locations.

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Fabrication: Mild steel frame with horizontal or vertical rails with even spacings not exceeding 100mm, welded together, frame drilled for fixing, hot dipped galvanised after fabrication. Assemble grilles after windows are constructed from site measurements only.

Welding: Prepare for welding at every join and intersection. The weld must be carried out in accordance with proper techniques necessary obtain sufficient depth of weld that will withstand substantial attack force

Frame: Perimeter frame: 30 x 10mm solid MS flats. Infill panelling: 16 x 16mm solid MS bars

Mid rails: 500mm centres (maximum). 16 x 16mm solid MS bars

Maximum size: 3000mm (length). For longer lengths use a 35 x 35 x 3mm RHS MS joining mullion and bolt assembly together as described in "Fixing".

Grille Types: Use horizontal bars for sliding windows and vertical bars for double hung or awning windows.

Installation: Internally fitted.

To AS 5040

Where two grilles are to be joined bolt together through frame and mullion with galvanised M12 bolts at 400mm centres and weld nuts to bolt post.

Where galvanising has been damaged by welding, coat damaged area with zinc rich paint.

**GUIDE NOTE:** The Manufacturer/Installer must hold one of the following master security licences issued by the security licensing & enforcement directorate (sled) of the NSW police force – subclass ma, mb, mc, or md, PLUS also one of the following security licences 2a, 2b or 2e

Manufacturer/Installer: The installation must be carried out by a company and installer holding a subclass MA, MB, MC or MD and a 2A or 2B Master Security Licence issued by Security Licensing & Enforcing Directorate (SLED) of the NSW Police Force.

Certification: Hand to the Principal's Authorised Person / Principal's Representative a certification that the security grilles have been manufactured and installed by holders of current appropriate licenses.

OR

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### Type B - Mild steel angle frame with mesh

Fabrication: Mild steel angle frame with mesh welded to the inside of the frame at 100mm intervals. Hot dip galvanized after fabrication. Assemble grilles after windows are constructed from site measurements only.

Frame: 50 x 50 x 6mm MS angle.

Mesh:

Nominal Mesh Size: LWM 120mm

SWM 34mm

Nominal Strand Size: Width 8.4mm

Thick 5mm

Weight: 14.0 kg / sq m

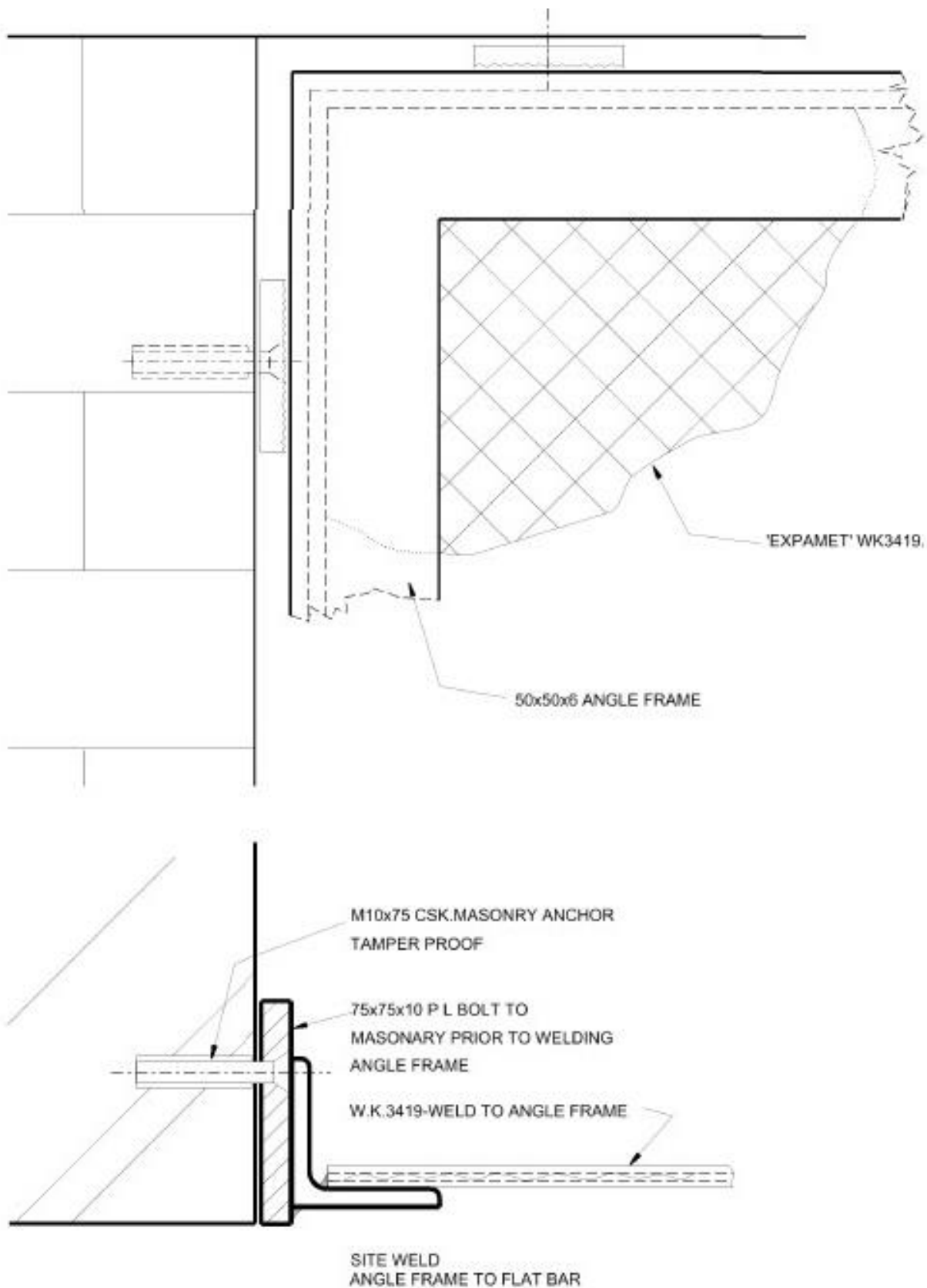
GUIDE NOTE: Substitute security grade expanded mesh approved by SSU for CAT. C Security if mesh also serves as a sunscreen.

Installation: Externally fitted

To AS 5040

If fixing to reveals can be achieved secure a 75 x 75 x 10mm MS fixing plate to reveals.

**Figure 03: Security Grille**



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If fixing to reveals cannot be achieved secure security grille to window frame to AS/NZS 4605.

Maximum size: 3000mm (length). For longer lengths use a 35 x 35 x 3mm RHS joining mullion and bolt assembly together.

Where two grilles are to be joined bolt together through frame and mullion with galvanised M12 bolts at 400mm centres and weld nuts to bolt post.

Where galvanising has been damaged by welding, coat damaged area with zinc rich paint.

**GUIDE NOTE:** The Manufacturer/Installer must hold one of the following master security licences issued by the security licensing & enforcement directorate (sled) of the NSW police force – subclass ma, mb, mc, or md, PLUS also one of the following security licences 2a, 2b or 2e

**Manufacturer/Installer:** The installation must be carried out by a company and installer holding a subclass MA, MB, MC or MD and a 2A or 2B Master Security Licence issued by Security Licensing & Enforcing Directorate (SLED) of the NSW Police Force.

**Certification:** Hand to the Principal's Authorised Person / Principal's Representative a certification that the security grilles have been manufactured and installed by holders of current appropriate licenses.

OR

Type C – Security Mesh

**Type:** High tensile 304 or 316 marine grade stainless steel mesh, 0.8 mm thick wire to ATSM A555, ISO 9044, ATSME437-92 tensioned in aluminium frame

**Finish:** High durability powder coating to mesh and frame, black colour.

**Mesh colour:** Black

**Frame colour:** To match windows and louvers.

**Fix** from outside, within window reveal except to operable louvre assemblies where fixed from inside. 2.11 Aluminium frame finishes

**Anodised:**

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GUIDE NOTE: Aluminium windows are to be clear anodised. Do not use colour anodising or powder coating as finishes for aluminium windows.

Finish: Anodised (clear) to AS 1231

Film thickness: 0.025mm

## 2.15 Fixed wall panels

Type: As detailed

Fixed panels:

Type: Non-combustible aluminium panels Face and base material

Metal type and thickness: Aluminium 0.5mm Finish: Stucco embossed mill finish aluminium.

Core material:

Type: Must be deemed non-combustible when tested to AS1530.1

Panel thickness: 4mm (nominal)

Finish: Factory prefinished

Refer to [06 FINISH/0671 PAINTING](#)

## 2.16 Door hardware

Requirement: Provide door hardware including locks, handles, closers, bolts, hinges and the like supplied and fixed by the aluminium fabricator.

Refer to [04 ENCLOSURE/0455 DOOR HARDWARE](#)

## 2.17 Aluminium doorsets

Proprietary heavy commercial design with 2mm minimum wall thickness, pocket glazing system and lock stile width to suit 45mm wide narrow stile lock case. Top rail width equal to bottom rail width and intermediate rails. Provide integral cover meeting stile to two door leaf doorsets with self-latch locks or panic bolts sets. Fit concealed weather drop seals to bottom rails of external exposed doors.



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## 2.18 Double glazed (internal glazing)

GUIDE NOTE: Insert Project specific location/s refer to the Educational Facilities Standards and Guidelines.

Location:

Sealed type:

GUIDE NOTE: Typical internal double-glazing application (e.g. Technical and Applied Sciences (TAS) MAT 1 - Wood & Metal).

## 03 Execution

As per current NATSPEC except as follows:

### 3.1 Installation

Machining:

Cut edges, drilled holes, riveted joints and flat sheets be clean, neat, free from burrs, and indentations. Remove sharp edges without excessive radiusing, fit mitred joints accurately to a fine hairline.

Hardware:

Where door closers, panic exit devices and all other surface mounted door hardware are screw fixed into aluminium sections, fix with rivet nuts.

Self-tapping screws or pop rivets are not acceptable.

Fixing:

Use standard fixing brackets as required and fabricate sill brackets from 40 mm x 6 mm mild steel bent to shape and hot dip galvanised. Bitumen coat steel in contact with aluminium. Fix brackets to sill at maximum 600 mm centres.

For metal structures screw fix brackets through metal structure members into fixing blocks.

Replacement Glazing:

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GUIDE NOTE: Laminated safety glass is to be used for all external glazing. Refer to [04 ENCLOSURE/0461 GLAZING](#)

Safety Glass: Where laminated safety glass is used to replace ordinary annealed glass, upgrade the sash/window assembly as required to enable the sash to operate correctly. (e.g. Increased sash counter balances/weights for double hung or vertical sliding windows to compensate for heavier safety glass).

## 04 Selection

As per current NATSPEC.