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Specification

Small Buildings and Location Cases

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Version 1.3	January 2022	TfNSW template applied
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1. General

1.1. Introduction

This Specification defines the general requirements for:

- Small single storey buildings of brick construction.
- Small buildings of pre-cast concrete construction and pre-fabricated panel construction.
- The manufacture of location, equipment, termination and general purpose cases.

It shall be read in conjunction with other relevant standards and particular project specifications.

1.2. Referenced Documents

1.2.1. Australian Standards

Reference	Description
AS 1289	Methods of Testing Soils for Engineering Purposes
AS 1554.6	Welding, stainless steel
AS 1603	Automatic Fire Detection, Control and Indicating Equipment
AS 1657	Fixed Walkways, Handrails and Ladders
AS 1665	Welding, aluminium
AS 1734	Aluminium and Alloys, Flat Sheet
AS 1744	Standard Alphabets for Road Signs
AS 1851.8	Fire Alarm Systems, Maintenance and Certificates
AS 2676.1	Guide to installation, maintenance, testing and replacement of secondary batteries in buildings – Vented Cells
AS 2676.2	Guide to installation, maintenance, testing and replacement of secondary batteries in buildings – Sealed Cells
AS 3000	Wiring Rules
AS 4680	Hot dip galvanising
AS 3700	Masonry Construction

1.2.2. CRN Standards

CRN SC 021	Cable Route and Associated Civil Works
CRN SC 004	Lightning and Surge Protection

CRN SE 003	Signs, Notice Boards and Instruction Plates
CRN SC 024	Signalling Equipment Temperature Control Guidelines

2. Common Requirements

2.1. General

2.1.1. Selection of Housings

In general, walk-in enclosures (small buildings or bungalows) shall be provided in preference to equipment cupboards, except where the amount of equipment to be housed at a particular location is significantly less than what would fill a double-width cupboard.

In general, walk-in enclosures are the preferred option however equipment cupboards fitted with environmental conditioning (e.g., tropical skins) may be used for housing CBI card files.

2.1.2. Minimum Size

Consideration must be given to rack layout, accessibility and exit, ventilation and heating and communication hatches when determining what size the small building or location case will be.

2.1.3. Environmental Requirements

Design and location of equipment housings shall take into account local environmental conditions including, but not restricted to, potential for flooding, exposure to fires, solar exposure and restricted air circulation.

Where an enclosure houses quantities of environmentally hazardous liquids, the design shall make provision for the containment of spills.

2.2. Earthing, Electrical and Cabling

2.2.1. Earthing

The design and installation of equipment housings shall make full provision for the installation of lightning surge protection systems in compliance with CRN SC 004, in particular as follows:

There shall be provision for a single Main Earth Stake to be installed directly underneath the Main Earth Busbar (which will normally be located on the cable termination rack.

In buildings and bungalows, earthing conduits shall be provided in or below the floor slab as follows:

- Radial conduits for earth conductors from the Main Earth Busbar to the earth stakes at the corners of the signalling earth grid surrounding the building. These shall be run straight from busbar to immediately adjacent to each earth stake, with no bends.

- Conduits for earth bonding conductors direct from each equipment rack to the Main Earth Busbar
- One conduit for the Main Earth Conductor from the 240 volt switchboard to the MEN Main Earth Electrode located clear of the signalling earth grid
- (If there is no MEN earth electrode) One conduit for the ELD Test Earth connection, from below the cable termination rack to the ELD Test Electrode located clear of the signalling earth grid
- The Transient Earth Clamp connection between the MEN Main Earth Bar and the Signalling Main Earth Busbar should be run above floor level and should not require a conduit.

Conduits for earth cables shall be installed as shown on Drawing No. 0708/04.

Earth stakes and earthing shall be installed to the requirements of CRN SC 004.

2.2.2. Arrangements for Power Supply

2.2.2.1 Power Supply Room

At larger locations where signalling power supply originates, a separate power supply room / housing shall be provided to house all incoming power supply and control equipment down to and including the isolating transformers providing the isolated signalling supply.

At smaller locations such as level crossing equipment rooms a separate power supply room / housing may be omitted providing the appropriate levels of electrical safety can be maintained.

At locations fed by 400 volt isolated signalling mains, the step-down / isolating transformer/s and associated equipment shall be housed in a separate enclosure. This shall be either a separate power room or a clearly identified enclosed metal housing within the signalling equipment room or location case.

2.2.3. 240 Volt Electrical Services

A 240 volt switchboard with separate power and light circuits shall be provided. The work shall be as required by *AS 3000* for low voltage application. RCD protection shall be provided covering both power and lighting circuits.

Cabling to light fittings, switches and GPOs shall be carried in conduits encased in the floor, or securely attached to the walls and/or roof.

The light switches for each room shall be surface mounted adjacent to the lock side of the door frame.

Five (5) metres of additional cable shall be left at the cable aperture in the floor.

Fluorescent light fittings shall be double insulated and not earthed. Fluorescent light fittings shall be twin tube 36 watt or the appropriate LED equivalent. There shall be a minimum of two twin light fittings in each room for rooms up to 3.3 m long and four twin light fittings for rooms over 3.3 m long. Diffusers shall be provided for internal light fittings. Light fittings shall be located to provide optimum illumination of both sides of relay and equipment racks. Diffusers and metallic guards shall be provided for external light fittings unless the diffuser is vandal-proof.

In each room, at least one (1) double 240 V GPO shall be provided per 10 m^2 (or part) of floor area, evenly distributed around the room.

When the electrical installation is complete a 'Ready for Test' certificate shall be submitted to the CRN representative.

2.2.4. Communications Compartment

This sub section only applies when CRN communications require a communications compartment 1200 mm high x 500 mm wide x 300 mm deep shall be fitted into the end wall beside the door as shown on Drawing No. 0708/03.

This compartment and door shall be made from 3 mm steel and construction shall be generally as required for the main door and door jamb. The compartment door shall be hinged with two 100 mm stainless steel fixed pin hinges. Locking shall be as required for the main door and painting shall be as for the main door and jamb.

A 150 mm x 300 mm cable entry aperture shall be provided in the floor immediately under the communications compartment.

2.2.5. Cable Ways and Access

2.2.5.1 Cable Entry Pit

At least one cable pit or turning chamber shall be provided at the periphery of the building, for the termination of external buried or surface cable ducts, before the cables enter the building.

Pits adjoining the pathway shall be level and flush with the top of the path. The pits shall be positioned as close as possible to and in line with the cable aperture. Pits shall include chequer plate covers.

Cable pits shall be constructed in accordance with the requirements of CRN SC 021.

2.2.5.2 Cable Ducts

Cable ducts shall be provided in the foundation and floor of masonry buildings and bungalows, from the cable entry pit to beneath the full length of each rack on which external cables will be terminated.

The duct shall be in the form of a channel whose top shall be flush with the finished floor level. The duct depth shall be sufficient to allow all cables to be run and terminated without exceeding their minimum bending radii. In prefabricated bungalows, the floor cut-outs will be considered to be part of the cable duct.

Ground level troughing, where used for cable ducts, shall be positioned in the foundation so that it aligns with the building cable aperture. The top of the GLT cover shall not project above foundation level and all trough and cover joints shall be sealed with sand cement mix (3:1).

Ducts shall include provision for installation of metal covers fitted around the terminated cables and finishing flush with the floor level.

Except where specified for earthing and power supply cable entries, individual pipes or conduits shall not be used as cable ducts within buildings.

At the completion of works, all cable entries shall be sealed against vermin, in accordance with the requirements of CRN SC 021.

2.2.5.3 Conduits for Incoming Mains Supply

One (1) 100 mm diameter heavy duty orange PVC conduit shall be provided from the power supply point in the location building or the power supply room cable aperture to a point as agreed with the local supply authority for connection. Buried ends of the conduits shall be capped and draw wires provided as necessary.

2.3. Temperature Control

All small buildings, bungalows and location cases housing electronic signalling equipment shall be provided with means to limit the temperature rise of internal air above ambient to less than 10 °C at all times. This requirement does not apply to small enclosures such as those housing cable terminations, track circuit matching units, or similar equipment.

Extensive trials have shown that improved ventilation provides the most significant improvement to internal ambient temperatures, compared to double skinning or tropical roofs. However improved ventilation also increases dust in locations. Improved thermal insulation of signalling buildings and location cases can reduce the amount of ventilation required.

Equipment housings shall be provided with temperature control measures appropriate to the amount of heat generated by the equipment that it will house. The heat removal capacity to be provided shall be based on the calculated equipment generated heat load.

Calculation of designed heat loads and ventilation measures shall be in accordance with document CRN SC 024.

2.3.1. Ventilation

For a typical bungalow room with a heat load of 1000 watts, the minimum requirements are.

- A 400 mm industrial rotary roof ventilator
- Rotary roof vents shall be sealed to prevent water entry, and the bungalow layout design shall be such that condensation or leakage from the ventilator cannot drip on equipment below.
- 0.5 m^2 of unrestricted low level inlet air vents. This shall be achieved by a combination of wall and door vents.
- Vandal resistant cages for the roof ventilators. The cages must not significantly restrict the air flow.
- Roof (only) shall be painted with Solacoat™ or Skycool™ heat reflective coating to reduce solar heat gain.
- External walls should not be painted with this treatment, as it would make the bungalows too prominent and may be cause for complaint by nearby residents.
- Ventilators and air inlet vents shall be designed to minimise the entry of air borne dust and be fitted with effective insect barriers which provide minimal restriction to the air flow.

A typical room ventilation arrangement would be

- For single room buildings
    - One 400 mm diameter rotary roof vent at the peak of the roof
    - One vent 600 mm x 450 mm in the lower half of the door
    - One vent 300 mm x 300 mm or two vents 150 mm x 300 mm in the wall opposite the door
- For buildings with two rooms
    - One 400 mm diameter rotary roof vent at (or near) the peak of the roof in each room
    - One 600 mm x 450 mm vent in the lower half of each door
    - Two 150 mm x 300 mm vents distributed along each side wall of each room.

2.3.2. Shade Structures

In some locations or installations, where local conditions mean that ventilation alone would not provide the necessary temperature control, a shade structure comprising roof and (possibly) wall screening shall be provided to limit solar energy gain within the building.

Provision of shade structures is secondary to the provision of proper ventilation.

The shade roof and wall screening may be attached directly to the bungalow or may be a standalone structure spanning over the bungalow, generally as shown on Drawing Nos. 0708/5 and 6.

- Wall screening shall only be required
- On northern and western walls where the building will be fully exposed to afternoon sun.
- Where roof shading does not extend beyond the bungalow eaves.

Shade roofs shall be designed to reduce the entrapment of heated air underneath the structure. Open metal louvre mesh should be used in preference to solid metal roofing. Mesh should be oriented to present the maximum opaque surface to mid-day and afternoon sun.

The roof slope can be reduced if the roof material is not solid and permits heated air to rise through the roof.

With solid metal roofing, the slope should be between 10 to 18 degrees to allow the heated air to escape. The low side should be on the North or West side depending on the available natural shade. The low side should be toward the North if no other shade is available. These guidelines are based on studies published by the CSIRO on shade structures.

Lysaght ‘Louvamesh’ has been approved for use in shade screens. Vertically mounted mesh is installed with its long way opening horizontal and strands sloping outward and down. This is the manufacturer's recommendation for maximum shading effect.

2.3.3. Air Conditioning

The use of air conditioners is the least preferred method of controlling temperatures in equipment housings, after ventilation and shading.

Air conditioning should be provided only in extreme cases where the other means are not effective or not possible. The air conditioning unit shall be a wall mounted split system, capable of maintaining the room temperature at less than 30 °C and the relative humidity at less than 70%. The air conditioner should have at least a 4-star energy rating for cooling. Heating cycle is not required.

With the main power switch “on”, automatic restart after power outage must be provided.

Air conditioners should be rated for significantly more than the normal equipment heat load. Twice the equipment heat load is considered appropriate.

The building should have an insulation rating of at least R2.5 for an air conditioner to be economically installed over its life cycle. Typical bungalows have an R value of about 0.25. This means that air conditioners installed in bungalows will have to have a much higher capacity to control the temperature on very hot days (as well as be more in-efficient because of the inadequate building insulation).

2.4. Construction Aspects

Detailed construction requirements for buildings, bungalows, equipment cupboards and small housings are given in the later individual sections. The clauses below cover elements common to all or several types of equipment housing.

Unless specifically excluded, the construction of the equipment housing shall include the installation of pit and/or duct covers, grates and any bollards required to protect the housing from vehicular traffic.

2.4.1. Pit Covers

Cable pits and floor ducts shall be fitted with galvanised steel chequer plate or proprietary covers. Aluminium may be used for covers if appropriately reinforced.

Pit covers and duct covers shall be rated in accordance with location and the load that they will, or may reasonably be expected, to carry. Generally, this shall be pedestrian traffic, with a minimum load of two adults, or 250 kg.

To prevent unauthorised access, external pit covers shall incorporate mechanisms to fit a padlock with a minimum bow diameter of 10 mm. To eliminate trip hazards, the arrangements shall not protrude.

2.4.2. Nameplates

Location and Room nameplates shall be provided on all doors and comply with the requirements of Clause 5.11 of CRN SE 003 Signs and drawing M05-022.

Text shall be 100 mm high retro reflective white Class 1 material, on a black non-reflective background.

2.4.3. Flooring

Unless stated otherwise on the Drawings all rooms (excepting Battery Rooms) shall have 2 mm thick x 300 mm x 300 mm anti-static vinyl tile flooring which shall be laid with a waterproof adhesive and finished with two coats of sealer.

2.4.4. Fall Restraints

Small buildings and bungalows shall be provided with approved roof anchor points for attachment of fall restraint devices.

2.4.5. Walkway

A 100 mm thick concrete path or pad with a 1 degree slope away from the building shall be provided all round each building or location case. The joint between the pathway and the building or case foundation shall be treated as an expansion joint.

The minimum width of pathways shall be 1000 mm on sides with doorways, and 750 mm elsewhere.

The pathway shall be reinforced with one layer of F61 mesh and expansion joints shall be provided at 1800 mm intervals. The concrete to be used shall have a 28-day strength of 20 MPa. Finish shall be wood float and edges shall be rounded.

2.4.6. Handrails

Handrails shall be provided to any path where:

- Any part of the path is within three metres of the nearest rail of any railway line.
- The edge of the path is within 2 metres of the top of an embankment

If handrails are to be installed, then a minimum distance of 400 mm clearance is required between the edge of any open door and the closest handrail.

2.4.7. Bollards

Bollards to protect the structure and surrounding walkway from vehicular traffic shall be located where directed by the CRN representative.

Both handrails and bollards shall be in accordance with the provisions of CRN SC 021.

2.4.8. Retaining Walls

Retaining walls shall be provided where the pathway around the building is above or below the adjacent ground level.

Where a retaining wall is required, it shall be constructed in accordance with CRN SC 021.

2.4.9. Security Fencing

If security fencing is required by the project specification then following completion of the concrete slab, an 1800 mm high galvanised chain wire security fence, constructed in accordance with CRN SC 021, shall be erected around the site. Unless otherwise nominated in the Particular Specification or precluded by site restrictions, the fence shall be constructed at a distance 3 metres from the walls of the building.

The security fence shall have three rows of galvanised barbed wire attached to the posts above the 1800 mm chain-wire.

Buildings with two or more rooms shall have access gateways at each end of the building whilst one room buildings shall have one access gateway opposite the main entry door.

The access gateway openings shall be a minimum of 3.6 metres wide and shall consist of two equal widths of galvanised chain wire gates.

2.4.10. Boundary Gate

Where a railway boundary fence giving access to a public road or street is adjacent to the building, a 900 mm wide x 1800 mm high galvanised chain wire mesh gate shall be cut into the fence. The gate shall be fitted with a catch which includes provision for the CRN's standard access padlock.

2.5. Site and Site Works

2.5.1. Location

Buildings shall be positioned where shown on detailed site survey plans.

Care shall be taken to ensure that the buildings are positioned clear of:

- Structure Gauge (June 1998 version) as shown in CRN SC 021 Cable. Wherever possible the building shall be at least 2.5 metres clear of structure gauge. Where the building is less than 2.5 m clear of structure gauge a sign shall be fixed to the walls of the building facing the access road from both directions warning of the reduced distance to structure gauge.
- Access roads and pathways
- Where possible, no part of the building shall be closer than 1.5 metres to an access road.
- The area into which catchpoints or a derail will deflect a derailed vehicle.
- The ends of sidings where error may lead to overrun.
- Non-interlocked (hand thrown) points in yard areas.

Where used for level crossing locations, the building shall be positioned as close as practicable to the CRN boundary and at least 8 metres from the edge of the roadway to reduce exposure in the event of an accident and to reduce obstruction to the line of sight of an approaching train, a distance of less than 8 metres may be approved by the Principal Signal & Communications & Network Control Engineer, a risk assessment will be required when seeking an approval for a level crossing location to be less than 8 metres from the edge of the roadway.

2.5.2. Site Preparation

Earthworks shall be carried out as required to:

- Clear the site and allow correct finished levels and falls for floor slabs and external paved or graded areas

- Allow for underground services such as stormwater, drainage, power cables, earthing cables, signalling cable route entry and any pits, ducts etc. included on any drawings or in the specifications.

The site shall be cleared and levelled to provide for the building and a 1 metre wide pathway all round. Where it is necessary to excavate into a cutting wall or bank to locate the building a suitable retaining wall shall be provided, and provision made for drainage around the building.

A level bed 100 mm below ground level shall be provided to accept the road base for the building foundation.

The area up to 5 metres away from the building on all sides, except where site restrictions preclude, shall be graded to achieve a minimum fall away from the building, of 1:100.

2.5.3. Filling and Back-Filling

Filling or back-filling shall not be carried out before all organic material and rubbish has been removed from the area to be filled and:

- The site has been inspected and approved
- Fill material to be used in the filling or back filling has been approved.

All filling or back-filling material shall be placed in layers of not greater than 150 mm thickness and compacted by an approved means to 95% Standard Density in accordance with AS 1289.

Any unsuitable fill material shall be removed from site.

2.5.4. Site Clean Up

Upon completion of the building works, the ground shall be graded between the concrete walkway around the building and up to 4 metres away from the building, and all rubbish, surplus materials and surplus excavated materials removed from the site.

On completion of installation of the building and any cable route to, or in the vicinity of, the building, the site shall be restored to as close as possible to its original topography and (where previously improved e.g., by landscaping) its original appearance.

Where special drainage provision has been made to protect the building, care shall be taken to ensure that run-off from these drains will not cause erosion or direct water onto access roads or pathways or into private property unless this is a natural drainage route.

Following completion of the clean-up, the Contractor shall supply and compact a 50mm layer of stabilised road base including a minimum 5% cement content, over the graded area. The road base shall be compacted and levelled to RTA Class A standard.

3. Small Brick Buildings

This part of the specification outlines the specific requirements for small buildings of double brick construction. It is limited to buildings which: -

- Have “slab on ground” foundations,
- Have the roof load entirely supported on the perimeter walls,
- Do not contain toilets, showers or kitchen facilities

3.1. Foundations

3.1.1. Certification of Foundations

Following the excavation of the foundations and before any foundation concrete is poured, a Structural Engineer’s certificate, verifying the suitability of the foundations for the proposed building on that specific site, shall be submitted.

3.1.2. Concrete Foundation

3.1.2.1 Formwork and Underlay

Formwork used shall produce concrete elements that conform within the specified tolerances to shape, line, level, dimension and quality of surface finish. An underlay of 50 mm of clean sand covered with Fortecon 200 shall be provided. Joints in the Fortecon shall be lapped at least 200 mm and sealed with self-adhesive waterproof tape.

3.1.2.2 Reinforcement

Reinforcing steel shall have minimum yield strength of 250 MPa and shall be clean and free of loose rust.

Unless specified otherwise, the minimum concrete cover to the reinforcement shall be 40 mm on all surfaces except the top of the slab, where the cover may be reduced to a minimum of 25 mm.

Any conduits encased in the concrete shall be located at least 30 mm clear of any reinforcement and shall have a minimum concrete cover of one half the conduit diameter or 20 mm, whichever is the lesser.

3.1.2.3 Concrete

Concrete shall not be poured until the reinforcement has been approved by a structural engineer.

Concrete used shall have a minimum compressive strength 20 MPa and shall be mechanically vibrated.

The appropriate precautions shall be taken if concrete is poured when the ambient temperature exceeds 32 °C or is less than 10 °C. Freshly placed concrete shall be protected from premature drying and excessively high or low temperatures.

Curing of concrete shall be carried out for a minimum of seven days by either keeping the concrete constantly wet or by the application of an approved curing oil membrane.

3.2. Structural

3.2.1. Brickwork

The colour and texture of external brickwork shall match, as closely as possible, the colour and texture of any adjacent buildings, particularly if such buildings are heritage listed.

Where this is not a consideration, the bricks shall be of a hard-faced smooth surfaced type that is more readily cleaned.

Internal brickwork shall be smooth surfaced face brick of an off-white or cream colour.

Brick samples shall be submitted for approval. All brickwork shall be constructed in accordance with AS 3700.

Finished brickwork shall be acid cleaned then washed.

Lintels where required shall be of the following minimum sizes: All lintels shall be hot dip galvanised.

For spans of less than two (2) metres, the lintels shall have a minimum bearing at each end of 150 mm. For spans of greater than two metres, the minimum bearing area at each end shall be 230 mm.

Table 1 – Lintel Design Requirements

Maximum Span (mm)	Lintel Dimension (mm)	Type
1050	75 x 10	Flat bar
1200	75 x 75 x 8	Angle
1350	90 x 90 x 8	Angle
1500	90 x 90 x 8	Angle
1650	100 x 75 x 8	Angle
1800	100 x 75 x 10	Angle
2100	125 x 75 x 10	Angle
3000	150 x 90 x 12	Angle

Damp course and flashing shall be provided where necessary or shown on the Drawings and shall be bitumen coated aluminium 0.7 mm thick.

Joints in internal face brickwork or brickwork to be rendered or plastered shall be cut flush.

External face brickwork shall have joints to match adjacent buildings or, if none, shall be cut flush.

Where control joints are required, unless shown otherwise on the Drawings, they shall be 15 mm wide, and be filled with an elastomeric sealing compound.

3.2.2. Steelwork

Where steel sections are used for roof framing, the size and number of elements used shall be in accordance the manufacturer's recommendations for a trafficable roof. All elements and fasteners shall be galvanised.

Roof construction shall be such that only the perimeter walls carry any loading (including uplift) from the roof. Interior walls if any are to be treated as purely partition walls.

3.2.3. Timber

If timber is used for structural framework either in the roof or interior walls it shall be at least stress grade F5 and shall be clean and straight. Timber is not permitted in areas subject to bushfire risk.

3.3. Roof Cladding and Accessories

3.3.1. Roofing

Unless otherwise specified, roofing shall be Colorbond sheet steel unless local conditions dictate otherwise (and subject to prior approval by CRN.).

The roofing shall be installed at not less than the minimum angle specified by the roofing material manufacturer for the profile used and shall be supported and fastened in accordance with the manufacturer's recommendations for that locality.

Ridge capping, fascias and barge flashings shall be Colorbond finished steel to suit the roof sheeting profile and colour.

3.3.2. Gutters and Down Pipes

Gutters and downpipes, when fitted, shall be Colorbond finished steel, or aluminium. Guttering shall include overflow slots to preclude flooding back into eaves or ceiling.

Downpipes shall not be less than 90 x 50 cross section. Except where the run-off from downpipes is likely to cause ponding adjacent to the track or interfere with access to the building, downpipes may empty directly onto the concrete path surrounding the building.

In areas subject to leaf fall from overhanging trees, gutters shall be fitted with leaf guards of a type which sheds leaves freely, minimising accumulation of leaves on top of the leaf guard and gutter. Leaf guards shall be of metal or flame-retardant plastics.

3.3.3. Insulation

Sarking and insulation shall be provided in the roof. Insulation shall have a thermal resistance value of at least 2.5((m^2.K)/W. Sarking shall be fitted between beam and purling (or rafter and batten) and insulation shall be supported from the roof structure rather than by the ceiling.

3.3.4. Eaves Lining

Eaves lining may be Colorbond steel sheet or Versilux sheet or equivalent.

3.4. Internals

3.4.1. Ceilings

Ceilings shall be (minimum) one-hour fire resistant gyprock or cement sheeting with taped and plastered joints. Cornice mouldings shall be fitted at all walls.

3.4.2. Doors

Unless shown otherwise in the Drawings, doors shall have a minimum fire rating of 1 hour.

External doors shall be steel clad or of all steel construction**.** The exterior skin shall consist of 2.4 mm (minimum) thick steel sheet. The skin shall either be folded around the frame and intermittently welded or if not folded shall be continuously welded to the frame all round.

Door frames shall consist of galvanised steel sections with suitable provision for fixing specified hardware such as hinges, closers and the like and include necessary accessories such as mortar guards, strike plates, buffers, cavity flashing, fixing lugs, base plates, spreaders and the like, pre-finished with a protective primer coat and built in. The door frames shall be designed and installed to accommodate outward opening fire rated doors and steel clad doors.

Doors shall be hinged using four, 100 mm stainless steel fixed pin hinges per door welded to the door and bolted or screwed to the door jamb.

Door handles shall be chrome finish and shall be 1000 mm above finished floor level.

Locks shall be chrome finish Falcon S Series, S100DG latch set with D4470 dead lock fitted with interchangeable core cylinders. It shall be possible to exit the building even if the deadlock has been locked from the outside.

Door closers shall be chrome finish Briton 532 or similar and shall be provided on all doors.

Door latches shall be bronze finish and shall be attached to the building to hold the doors in the fully open position.

Bottom edge door seals of a type approved by the CRN representative shall be provided on all external doors and shall fit neatly in the recessed step to prevent water and rain entry.

3.4.3. Service Skirting

Ducted skirting shall be installed on all walls and shall consist of an extruded aluminium anodised dual cavity section to accommodate the electrical and telephone wiring.

3.4.4. Windows

Windows shall be installed where shown on the Drawings and shall be constructed with anodised aluminium frames. Security grill flyscreens shall be installed on all opening windows.

3.5. Finishes

3.5.1. Walls

Provided that the bricks used are of a smooth light coloured finish, cement rendering of interior walls is not required

3.5.2. Painting

All exposed surfaces (excluding external brickwork and steel chequer plate) which have not been paint finished at manufacture shall be painted.

External brick walls are to be treated with a clear anti-graffiti finish.

Prior to the application of any coating, the surface shall be properly prepared.

- Woodwork shall have primer coat, undercoat and two finishing coats applied.
- Steelwork and metalwork shall have primer coat and two finishing coats applied.
- Galvanised steel shall have an etch primer, undercoat and two finishing coats applied.
- Internal brickwork shall have a clear silicone based sealer coat applied.
- Versilux, cement fibre sheeting and Gyprock shall have a sealer/undercoat coat and two finishing coats applied.

3.6. Battery Rooms

Where a separate battery room is required, it shall comply with the requirements of AS 2676.1 or AS 2676.2 Guide to installation, maintenance, testing and replacement of secondary batteries in buildings, depending on the type of battery to be installed.

Unless stated otherwise on the drawings Battery Room floors and skirting shall be non-slip ceramic tiles. The skirting shall be one tile width or 100 mm in height whichever is the greater. The tiles shall be grouted with epoxy grouting

The plumbing and associated fittings shown on the Drawings plus items nominated hereunder shall be supplied and installed.

Battery Rooms shall have an eyewash facility equivalent to Bradley Eye Wash Fountain Model S1922 plus a chrome plated hose cock adjacent to the eyewash. The water supply to the eyewash and hose cock shall also be provided.

A water waste outlet shall be installed in the floor of the Battery Room and toilet.

Water waste from the battery room shall be discharged into an appropriate sealed concrete pit approved by the CRN Representative.

3.7. Fire Protection

Fire detection and or protection equipment, if required, shall be detailed in the Particular Specification and /or shown on the Drawings for the specific building.

4. Pre-Fabricated Concrete Bungalows

4.1. General

This part of the specification sets out the requirements for the manufacture and installation of pre-cast concrete small buildings (“bungalows”) to a maximum size of two rooms. The type of building specified herein is one that is cast off-site then transported to site in one piece, or in major units designed for simple assembly on site.

The particular Specification or order will define the size of building and number of rooms required.

Maximum size is 3.3 m x 7 m (external dimension). Any building greater than this must be constructed in accordance with the Small Brick Building section.

4.2. Inspection

Pre delivery inspection of the buildings may be carried out at CRN's discretion. A certificate is required from a structural engineer that the building has been built in accordance with this specification and any other associated drawings.

4.3. Warranty

The building shall be warranted free of defect in manufacture for a period of two (2) years from the date of delivery to site.

Where installation is carried out by Contract or forms part of a contract, the installation work shall also be warranted for 2 years.

4.4. Construction

Three types of prefabricated bungalow may be accepted. In order of preference these are monolithic precast, precast panel, and reinforced cement mortar; these are defined below.

Subject to site and access limitations, lower preference items shall only be used where site limitations do not permit the use of the preferred item.

Only type approved designs shall be permitted.

4.4.1. Monolithic Precast Type

All walls and floor shall be poured as one (1) Monolithic Structure creating a seamless connection between adjacent walls and between the walls and floor. The roof shall be a separate unit, installed on top of the walls after manufacture.

The floor thickness shall be a minimum of 150 mm with two (2) layers of SL 92 reinforcing mesh.

Walls shall be manufactured from 40 MPa concrete poured over one (1) layer of SL 92 reinforcing mesh and shall have a minimum thickness of 100 mm with extra bars around lifting points. The walls shall be vertical and of regular line of finish.

Door jambs shall be cast in-situ creating a permanent bond with the walls and floor.

Roofs shall be manufactured from 40 MPa concrete poured over one (1) layer of SL 92 reinforcement mesh and shall have a minimum thickness of 115 mm. The roof must be waterproofed by adding the manufacturer's specified quantity of BASF RHEOMIX 300 without requiring additional treatment. Roof slope shall be three (3) degrees or more with the high point at the centre (or on one centre line) of the building.

Prior to placement of the roof on the structure the top of the walls shall be lined with a Closed Cell Rubber Foam (minimum thickness of 6 mm) creating an air and watertight seal. The joint between the walls and roof shall be lined with a Silicone Sealant providing a smooth blended finish.

Lifting point sizes and positions shall be determined by the manufacturer and the adequacy of the devices to withstand all lifting and handling loads shall be the responsibility of the manufacturer.

Cable entry aperture(s) shall be provided in the floor as shown on Drawing No. 122000/04 or where shown in documentation provided with the order or contract.

Starter Bars to tie the floor to the walls shall be Y12 600 mm x 600 mm L Bars at 200 mm centres.

For Monolithic Pre-cast Concrete Buildings over 6 m in length extra vertical and L Bars shall be provided up to 1500 mm from corners at 150 mm centres.

Additional reinforcement around apertures shall be positioned diagonally to corners and shall be not less than 25mm from the aperture perimeter. The reinforcement shall be Y12 bars.

Concrete strength shall not be less than 32 MPa at 28 days. Floors shall be manufactured from 40 MPa poured concrete.

Buildings shall be cured for at least fourteen (14) days following manufacture and shall not be transported, lifted or otherwise moved from their places of manufacture for twenty one (21) days following manufacture.

4.4.2. Precast Panel Type

This type of building shall be constructed of individual reinforced concrete floor, wall and roof panels, manufactured off-site and assembled on site. The floor may be poured in-situ.

Material types and strengths shall be equivalent to those specified monolithic precast buildings.

Proposed details of design, materials, reinforcing, assembly and sealing shall be subject to approval before the building is manufactured.

Curing, lifting, transport and installation details shall be the responsibility of the manufacturer.

4.4.3. Reinforced Cement Mortar Type

The floor thickness shall be a minimum of 125 mm with two (2) layers of F82 reinforcing mesh. Starter mesh to tie the floor to the walls shall be two (2) layers of WG11G3 with a minimum overlap of 300 mm. Cable entry aperture(s) shall be provided in the floor as shown on Drawing No. 122000/04 or where shown in documentation provided with the order or contract.

Lifting point sizes and positions shall be determined by the manufacturer and the adequacy of the devices to withstand all lifting and handling loads shall be the responsibility of the manufacturer.

Walls shall be manufactured from cement mortar placed over two (2) layers of WG11G3 galvanised reinforcing mesh and shall have a minimum rendered thickness of 60 mm. The walls shall be vertical and of regular line and finish.

Roofs shall be manufactured from cement mortar placed over two (2) layers of WG11G3 galvanised reinforcement and shall have a minimum rendered thickness of 60 mm. The roof must be waterproof without requiring additional treatment. Roof slope shall be 3° or more with the high point at the centre (or on one centre line) of the building.

Cement mortar strength shall be not less than 32 MPa at 28 days.

Additional reinforcement around apertures shall be positioned diagonally to corners and shall be not less than 25 mm from the aperture perimeter. The reinforcement shall be galvanised WG11G3.

Buildings shall be cured for at least fourteen (14) days following manufacture and shall not be transported, lifted or otherwise moved from their place of manufacture for twenty one (21) days following manufacture.

No equipment or boxes shall be mounted on the walls of reinforced mortar bungalows. All equipment or boxes must be post mounted in close proximity of the precast building (location of equipment should be shown on the detailed site surveys)

4.5. Doors and Hardware

4.5.1. Doors

Doors shall be of all steel construction. The door shall have dimensions 2040 mm high x 820 mm wide and shall consist of a 25 x 25 RHS perimeter frame with four cross members, two at mid height to support the locking mechanism.

The exterior skin shall consist of 2.4 mm (minimum) thick steel sheet. The skin shall either be folded around the frame and intermittently welded or if not folded shall be continuously welded to the frame all round.

The bottom edge of the door shall extend a minimum of 15 mm below finished floor level to prevent ingress of water.

4.5.2. Door Jambs

Door jambs shall be formed from 3 mm steel sheet as shown on Drawing No. 0708/01 and shall be fitted with a 50 mm wide awning over the doorway.

4.5.3. Hardware

The doors shall be hinged with four 120 mm stainless steel fixed pin hinges per door welded to the door and bolted or screwed to the door jamb. The inner (hinge side) edge of the door shall be fitted with two security pins, approximate dimensions 10 mm diameter and 12 mm long, which engage securely with matching holes in the door jamb when the door is closed. These should be located near the upper and lower hinges.

Unless otherwise directed by the CRN representative or noted in the Particular Specification, doors shall be hinged on the left hand side as observed from outside of the building.

The doors shall include a Lockwood model 355 deadlock or equivalent with the strike plate set on the inside frame stop. Doors shall also be fitted with an exterior handle and lock guard.

A retainer catch shall be provided, to fit over the handle to restrain the door in the fully-open position. The retainer shall be arranged to slide on a vertical rod fixed to the location wall either with ‘Chemset’ anchors or bolts through the wall.

Door, lock, guard and handle arrangements are shown on Drawing No. 0708/01.

4.6. Finishes

The exterior surface shall be smoothly rendered without voids. The surface shall be coated with one coat of sealer and finished with a graffiti resistant topcoat. Colour will be nominated for the particular locality.

The roof (only) shall be painted with Solacoat™ or Skycool™ heat reflective coating.

The interior roof and wall surfaces shall be smoothly rendered and free of voids. These surfaces shall be painted with one coat acrylic sealer/undercoat and two finish coats of white gloss acrylic.

Doors and jambs shall be coated with one coat inorganic zinc silicate primer to a dry film thickness of 75 um and one coat white Vinyl Copolymer paint to a minimum dry film thickness of 100 um.

4.7. Installation

4.7.1. Foundation

The foundation shall consist of a stabilised road base pad compacted and levelled to RTA class A to a minimum depth of 200 mm. Road base cement content shall be at least 3% and aggregate size shall not exceed 20 mm.

The foundation shall span the total area of building and surrounding path plus 150 mm and shall be battered to ground level at not more than 20°. The top of the finished foundation pad shall be not less than 75 mm above the highest surrounding ground.

All cable entry ducts and conduits shall be installed as required.

A layer of sand not more than 25 mm deep shall be laid between the foundation and the building floor. A waterproof membrane (‘Fortecon’ or similar) shall be laid between the sand and building floor and shall extend at least 300 mm outside the building all around.

Where retaining walls and/or drainage systems and/or stairways are required, designs shall be submitted to the CRN Representative for approval before any construction is commenced. Stairways shall conform to the requirements of AS 1657.

4.7.2. Handling of Building

The building should be lifted onto the foundation. Spreader bars must be used to avoid damage to the exterior of the building.

Where lifting is not possible it may be slid off a tilt tray directly onto the foundation. If slid off the tilt tray, care shall be taken to ensure that the prepared sand surface of the foundation is not disturbed to the extent that voids will be left under the floor.

5. Location Cases, Termination Cases and General Purpose Cases

5.1. General

This part of the specification sets out the requirements for location/equipment cases, termination cases and general-purpose cases, to a maximum size of 2200 mm high x 3500 mm wide x 900 mm deep. Larger cases are free standing while smaller cases may be free standing or post/wall mounted.

5.2. Definitions

For the purpose of the specification:

Location or Equipment Cases

Defined as any cases that contain items of signalling equipment which are known to be, or may reasonably be expected to be, temperature sensitive in terms of their safe operation, reliability and service life.

Termination / Distribution Cases

Defined as cases that do not contain any equipment other than cable/wiring and terminals.

General Purpose Cases

Contain components, which are not temperature sensitive. For example, ESML and EOL cases, points control valve cases, track circuit matching/tuning unit cases.

For all types of cases, where there are no drawings referenced in this specification, drawings of the case(s) to be supplied shall be submitted for prior approval.

5.3. Welding

Welding shall be carried out generally in accordance with AS 1665 for aluminium and with AS 1554.6 for stainless steel.

5.4. Installation

Location cases and equipment cases shall be installed on foundations with surrounding concrete pads constructed in accordance with CRN SC 021. Cable entry shall always be up through the base of the case.

When located on embankments or in flood-prone areas, location cases shall be installed on elevated galvanised steel structures complete with compliant walkway, handrails and steps as required, in accordance with Clause 14.3 of CRN SC 021 and AS 1657 Fixed Walkways, Handrails and Ladders.

The designs shall provide secure, enclosed means of cable entry between the ground surface and the location case. Detailed designs for all such elevated structures shall be submitted to the CRN Representative for approval before any construction is commenced.

Termination/distribution cases may also be installed on similar foundations or, if less than 750 mm wide, may be bolted or clamped to a galvanised steel pipe or channel post. Cable entry shall always be through the bottom of the case.

General purpose cases shall be able to be bolted or clamped to a galvanised steel post or bolted directly onto a wall.

5.4.1. Electrolytic Corrosion Precautions

Where stainless steel cases are mounted on dissimilar metals, including galvanised steel, precautions shall be taken to provide an effective isolating barrier between the two metals, to prevent the corrosion of one or the other by electrolytic action.

5.5. Anti-Graffiti Finish

Where nominated in the Particular Specification, the exterior surfaces shall be finished with an approved anti-graffiti finish which both resists the adhesion of applied paints and sprays and responds readily to removal of graffiti with non-aggressive cleaning materials, with no deterioration of the anti-graffiti finish itself.

5.6. Location and Equipment Cases

5.6.1. Sizes

Generally, locations shall be single, double or triple, with or without communication compartments, as detailed in the standard drawings.

5.6.2. Construction

All location or equipment cases shall be manufactured from grade 316 stainless steel of 1.2 mm minimum thickness and No 4 finish.

Location cases and footings shall be constructed in accordance with drawings M05-143 to M05-150 inclusive.

Location cases shall be constructed such that the loaded weight of the equipment rack within is supported directly by the base of the case and there is only minimal reliance on the sides or top of the case for stability.

Equipment racks shall be uniform and interchangeable between single, double and triple width cabinets (refer to drawing M05-149 for Equipment rack details).

Equipment shall be mounted on equipment racks only and not to the case of the location.

5.6.3. Roof

The roof shall be designed to allow for the exhausting of the hot air from within the case. The roof shall have a slope to ensure condensation runs to the side and does not drip onto equipment. A slope of 4º (45 mm in 620 mm) is preferred, with the minimum acceptable slope being 2.5º (30 mm drop in 620 mm).

Internal ceilings of locations shall not have any protrusions or points from which condensation can collect and drip, that are directly above equipment mounting positions. Rafters or support members running across the line of slope especially promote the forming of drips.

5.6.4. Temperature Control

Control of temperature rise within location and equipment cases shall be in accordance with CRN SC 024.

To this end, cases shall be of double skin construction with an air gap between inner and outer wall and door skins as per drawings. Ventilation openings shall be provided at the bottom of the inner end wall and doors, positioned so that dust and dirty entry into the case is minimized. The skins on the end walls and doors shall be vented all around the outside edges.

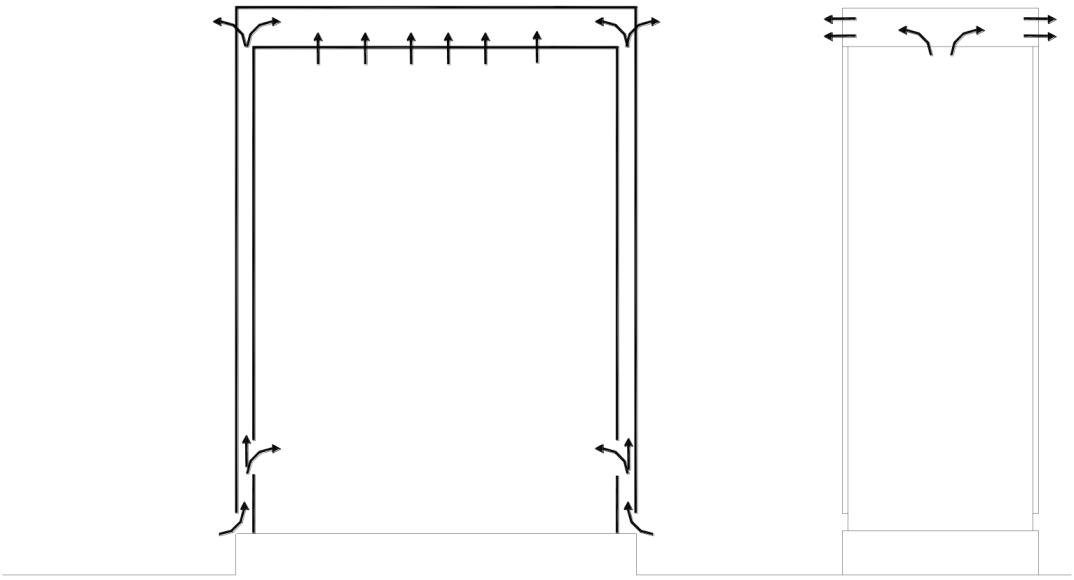

Figure 1 – Location Case Ventilation Concept

New locations should be double skin with ventilation for 200 watts equipment generated heat load per width. This is equivalent to one inlet air vent at the base of each door, approximately 150 mm high by 800 mm wide. The width should match the door width. Outlet air vents should be of equivalent or larger size to the inlet air vents and located above the highest equipment mounting point. Additional inlet vents may be provided low down on the sides of the location case with the size of door vents being reduced by an equivalent amount.

5.6.5. Doors and Door Hardware

Doors shall be provided with three-point locking, engaging at the top, bottom and side of the door. The door handle shall be recessed when in the locked position and shall be secured with a CRN standard padlock with a maximum bow diameter of 10 mm.

Doors shall be provided with automatic latching top and bottom stays to support the door in the open position (which shall generally be approximately 135 degrees) in wind speeds up to 45 m/sec. The stays shall be secured to door and case such that the method of securing is stronger than the stay. A single stay only is required on doors less than 1500 mm high.

Door sealing shall be with synthetic rubber material securely and permanently attached to either case or door.

5.6.6. Lighting

A single 18 watt fluorescent or equivalent LED fitting shall be provided in each location case behind each door. These fittings shall be double insulated and not earthed. The voltage rating of the fitting shall be determined by the power supply arrangement at the particular location.

Cut-out switches shall be provided on each door so that opening of any door will operate all lights in the location. An additional isolating switch complete with neon indicator light is to be provided for the purpose of isolating lights during daylight.

5.6.7. Communications Compartment

If specified, a separate compartment with its own access door shall be provided in one end of each location case. This will provide for a separately accessible communications cable head. This cable head of itself does not require temperature control but its provision shall not compromise temperature control of the rest of the location case.

5.6.8. Storage for Maintenance Record Documents

Pockets shall be provided for storage of A4-sized track circuit history cards either on the inside of the doors or in the case.

5.7. Termination/Distribution Cases

5.7.1. General

For all types of cases, where there are no drawings referenced in this specification, drawings of the case(s) to be supplied shall be submitted for prior approval.

5.7.2. Materials

Termination cases shall be of marine grade aluminium or 316 grade stainless steel. The thickness of material used shall be determined by the size of the case and the requirement for structural integrity and panel rigidity.

5.7.3. Construction

Termination/distribution cases shall be constructed such that the back or base of the case forms the support for the termination rack within. The back of the case shall be of sufficient strength or sufficiently stiffened to support the case and rack without distortion when bolted or clamped to a single steel post 150 mm or less wide.

Termination cases shall not exceed 900 mm in width, 300 mm in depth and 900 mm in height. Where a larger housing is required, a standard location case may be installed.

5.7.4. Door and Door Hardware

Doors shall be provided with a locking system that includes a handle that is lockable with a CRN standard padlock.

5.7.5. Ventilation and Lighting

Ventilation and lighting are is not required for termination/distribution cases.

5.8. General Purpose Cases

Where there are no drawings referenced in this specification, drawings of the case to be supplied shall be submitted for prior approval.

5.8.1. Materials

General purpose cases shall be of marine grade aluminium or 316 grade stainless steel. The thickness of material used shall be determined by the size of the case and the requirement for structural integrity and panel rigidity.

The design of the case should provide protection to IP43 standard – protection against entry by solid objects greater than 1 mm diameter, and sprayed water.

5.8.2. Size

General purpose cases shall not exceed 750 mm high x 600 mm wide X 200mm deep.

5.8.3. Door and Door Hardware

The door may either be hinged or sliding depending on application.

Where it is necessary to interlock the door with equipment within the case (e.g., ESML cases), it shall be hinged on 2 stainless steel fixed pin hinges. For other applications, such as pneumatic control valve cases, the door may be vertically sliding and may be removable.

In both cases the door shall be locked by padlock. For general applications and pneumatic valve applications the padlock will have a 10 mm diameter bow while for ESML and EOL applications the padlock will have a rectangular bow 15 mm x 5 mm.

5.8.4. Ventilation and Lighting

Ventilation and lighting are not required for general purpose cases that do not contain electronic or heat-generating equipment.

5.8.5. ESML or EOL Application

For an ESML case or an EOL case, the door shall be constructed in such a manner that it cannot be closed and locked until the switch machine emergency crank handle or EOL key has been restored to the normal position in the ESML lock or EOL switch.

This may require door stiffening to prevent the door being forced closed against a crank or key which is not in the normal position.

6. Drawings

6.1. Standard Drawings for Location Cases

M05-143 /1	Signal Location Case Single Width Case Arrangement
M05-143 /2	Signal Location Case Single Width Case Arrangement & Details
M05-143 /3	Signal Location Case Single Width Case Footing Details
M05-143 /4	Signal Location Case Single Width Case Mounting Frame Details
M05-144 /1	Signal Location Case Single Width Case With Communications Cabinet Arrg't
M05-144 /2	Signal Location Case Single Width Case Communications Cabinet Arrangement & Details
M05-144 /3	Signal Location Case Single Width Case Communications Cabinet Footing Details
M05-144 /4	Signal Location Case Single Width Case Communications Cabinet Mounting Frame Details
M05-145 /1	Signal Location Case Double Width Case Arrangement
M05-145 /2	Signal Location Case Double Width Case Arrangement & Details
M05-145 /3	Signal Location Case Double Width Case Footing Details

M05-145 /4	Signal Location Case Double Width Case Mounting Frame Details
M05-146 /1	Signal Location Case Double Width Case With Communications Cabinet Arrangement
M05-146 /2	Signal Location Case Double Width Case Communications Cabinet Arrangement & Details
M05-146 /3	Signal Location Case Double Width Case Communications Cabinet Footing Details
M05-146 /4	Signal Location Case Double Width Case Communications Cabinet Mounting Frame Details
M05-147 /1	Signal Location Case Triple Width Case Arrangement
M05-147 /2	Signal Location Case Triple Width Case Arrangement & Details
M05-147 /3	Signal Location Case Triple Width Case Footing Details
M05-147 /4	Signal Location Case Triple Width Case Mounting Frame Details
M05-148 /1	Signal Location Case Triple Width Case With Communications Cabinet Arrangement
M05-148 /2	Signal Location Case Triple Width Case Communications Cabinet Arrangement & Details
M05-148 /3	Signal Location Case Triple Width Case Communications Cabinet Footing Details
M05-148 /4	Signal Location Case Triple Width Case Communications Cabinet Mounting Frame Details
M05-149 /1	Signal Location Case Equipment Rack Arrangement
M05-149 /2	Signal Location Case Equipment Rack Details
M05-150	Signal Location Case Removable Lifting Bracket Details

6.2. Other Drawings

0708/01	Door with Lock, Guard, Handle and Retainer
0708/02	Deleted
0708/03	Communications Hatch
0708/04	Cable Apertures and Earth Conduits – Typical Arrangement
0708/05	Free Standing Shade Structure – conceptual arrangements
0708/06	Free standing Shade Structures - Wall screening position relative to building orientation

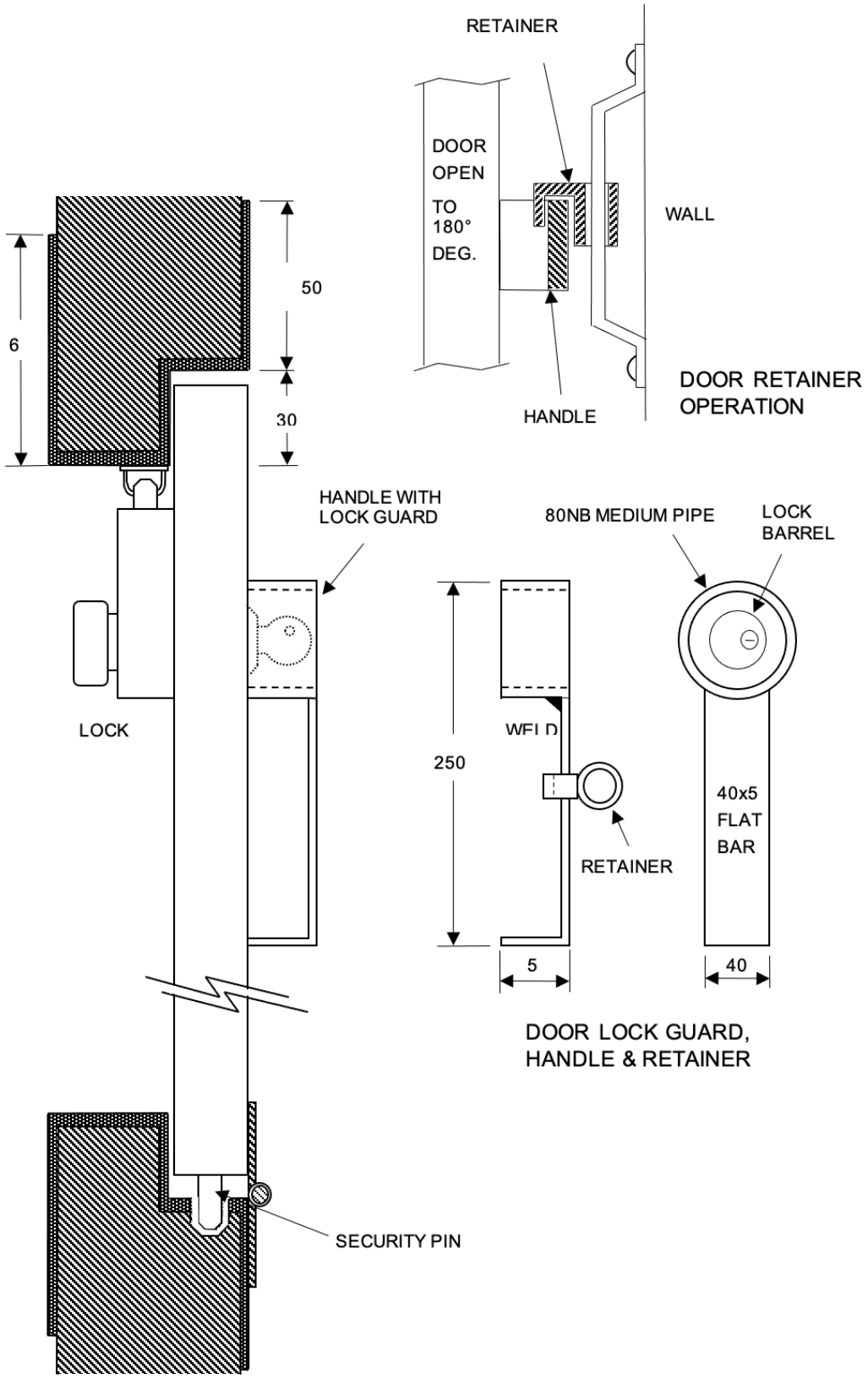

Figure 2 - DRAWING No 0708/01 DOOR WITH LOCK, GUARD, HANDLE & RETAINER

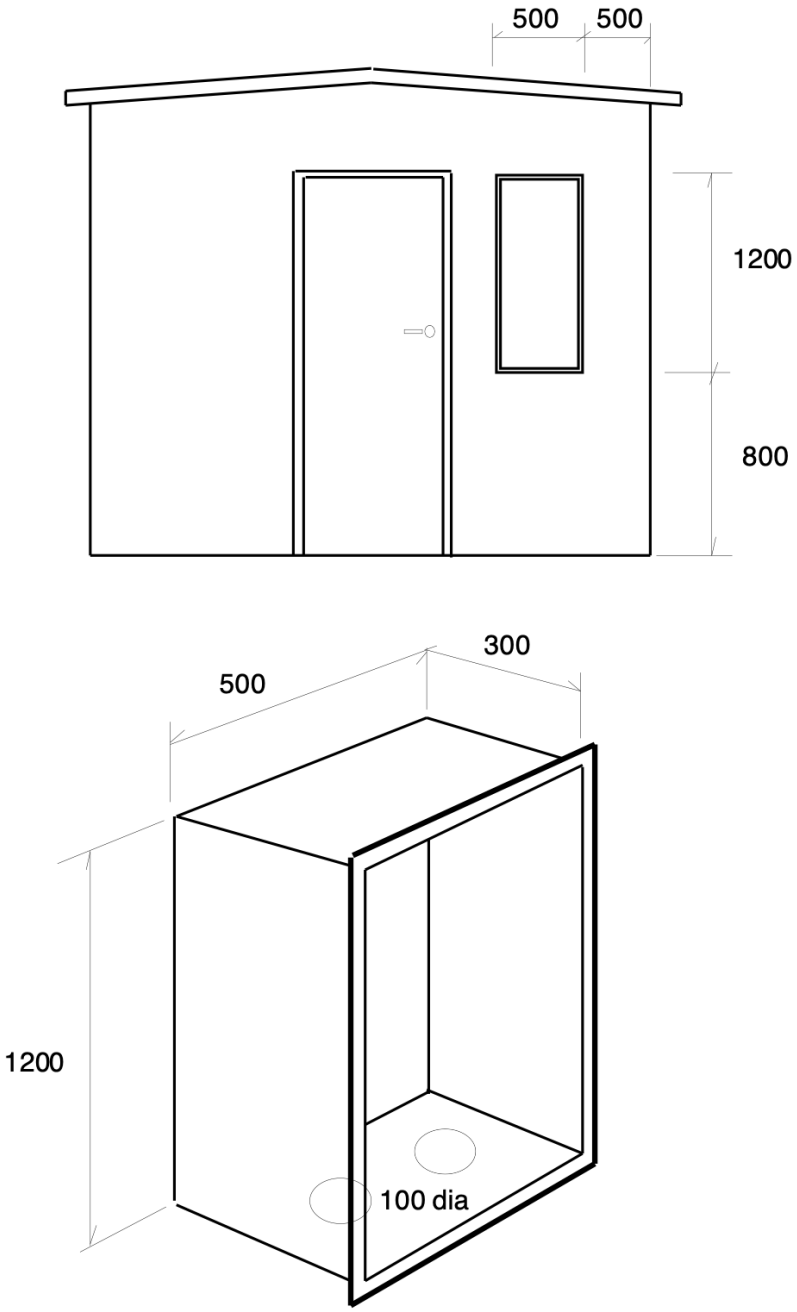

Figure 3 - Dwg No 0708/03 : Communications Hatch

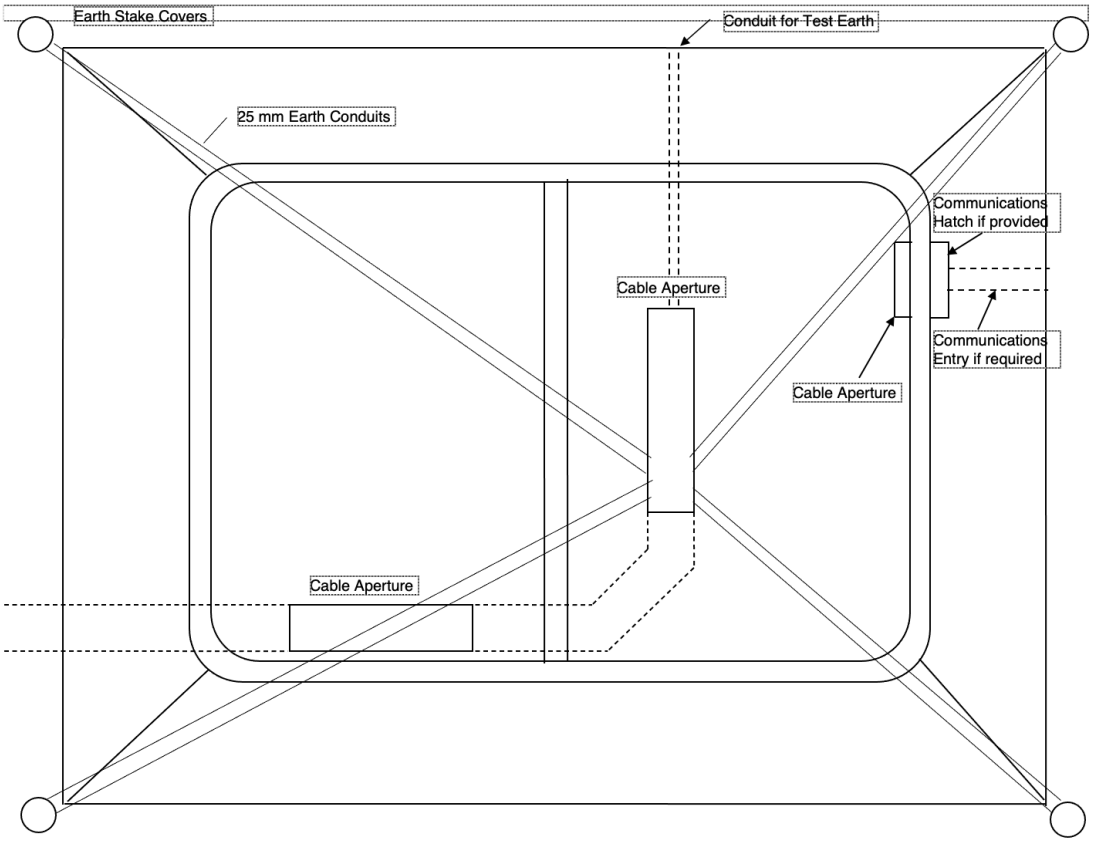

Figure 4 - Dwg No. 0708/04: Cable Apertures and Earth Conduits – Typical Arrangement

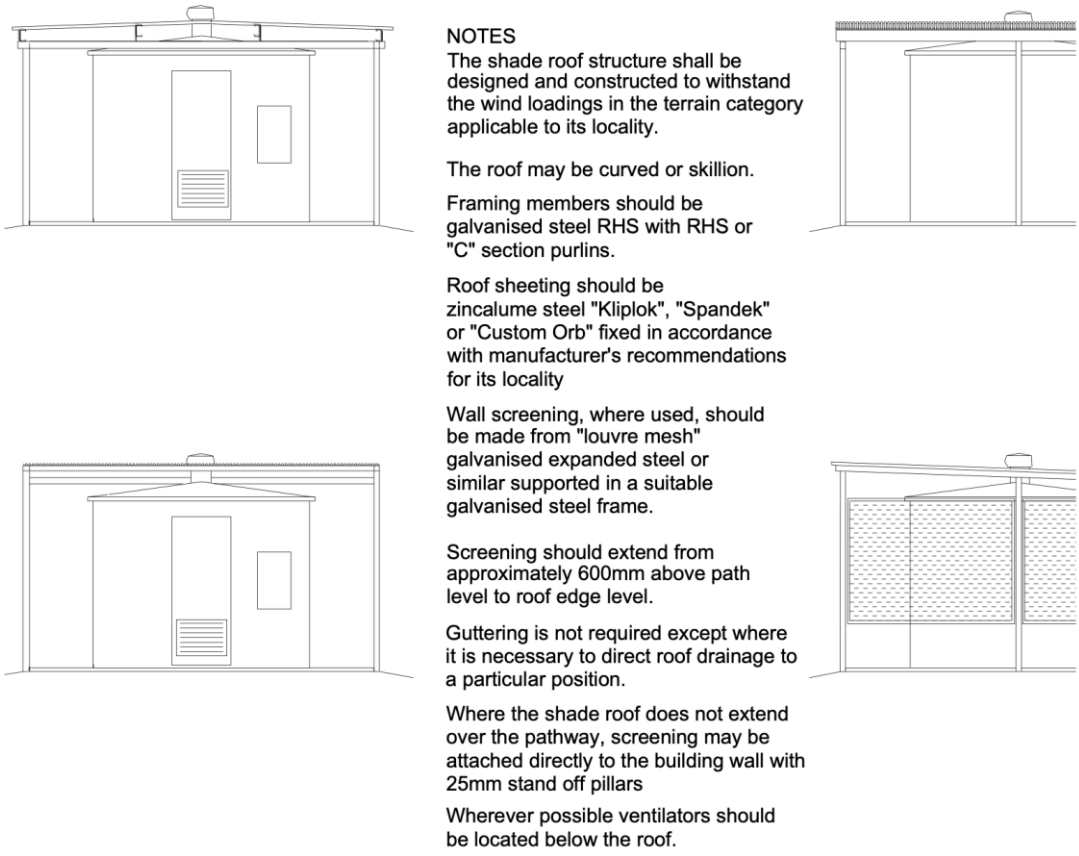

Figure 5 - Dwg No. 0708/5: Free Standing Shade Structure – Conceptual Arrangements

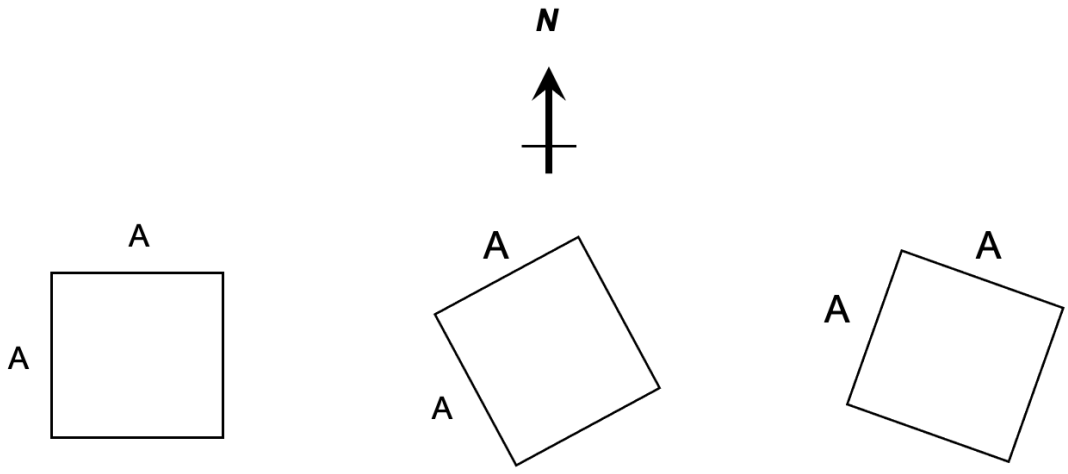

Figure 6 - Dwg No. 0708/6: Free standing Shade Structures- Wall screening position relative to building orientation Sides marked 'A' should be screened