05 – Roofing, Roof Fabric & Roof Safety

Version	Date	Authors	Summary of Changes
1.1	9 January 2011	Barry Owers	
1.2	8 February 2012	Solomon Elijah	Section and Numbering amended
1.3	27 February 2012	Barry Owers	Compiled roofing and roof safety together
1.4	28 February 2012	Barry Owers	Changes to 22.13 Drainage from roof gutters
1.5	16 March 2012	Barry Owers	Designs, drawings requirements.
1.6	21 March 2012	Barry Owers	Section 22.4 Box gutters
1.7	1 October 2012	Barry Owers & Andrew Smith	Height Safety Specifications
1.8	21 December 2012	Barry Owers	Clause 22.2.4 added
1.9	21 January 2013	Solomon Elijah	Clauses 22.1.1 & 22.1.15 amended
2.0	05 February 2016	Andy Smith	General Revision
2.1	27 February 2020	Andy Smith	General Revision
2.2	10 August 2021	Andy Smith	General Revision
2.3	10 July 2023	Andy Smith	General Revision

Introduction

05.01 The Campus and Buildings Requirements Manual (the CBRM, the Requirements or the Manual) documents the minimum design and construction requirements for new, refurbishment or repurposed building works, landscapes and engineering/infrastructure projects on buildings, facilities and campuses of the Australian National University (the ANU or the University). The Requirements are prepared for the direction of a Consultant, Designer or Project Manager in the preparation of project specific documentation and in the delivery of project works.

05.02 Notwithstanding any Consultant's particular discipline or area of responsibility, each Consultant and/or designer shall consider the document in its entirety. The complete CBRM consists of the following Sections which may be referred to within this Section:

Campus and Building Requirements Manual	
Section 01	General Requirements
Section 02	Architectural Requirements
Section 03	Roads, Car Parking & Civil Works
Section 04	Soft Landscaping
Section 05	Roofing, Roof Fabric & Roof Safety
Section 06	Building Management Systems
Section 07	Electrical Services
Section 08	Fire Protection Systems
Section 09	Hydraulic Systems
Section 10	Mechanical Services
Section 11	Lifts, Cranes & Vertical Transportation Systems
Section 12	Security, CCTV & Access Control

Specific Design Requirements

05.03 Roofs should not be used as plant areas. Where roof mounted equipment is required, install:

- on a structurally sound steel platform to be designed with a limited amount of roof penetrations and all height safety built into this structure; or
- on a structurally sound waterproofed concrete slab formed as the whole or part of the roof structure.

05.04 Consultants are to consider minimising the number of roof penetration which could present a potential roof leakage point.

05.05 Polycarbonate is not to be used as a roof sheet material.

05.06 Fibreglass is not to be used as a roof sheet material.

05.07 The Consultant shall consider Safety in Design principles for roof construction, roof access and roof maintenance.

05.08 Internal box gutters are not acceptable, stringent design standards are applicable to gutters located on the inside edge of external wall parapets.

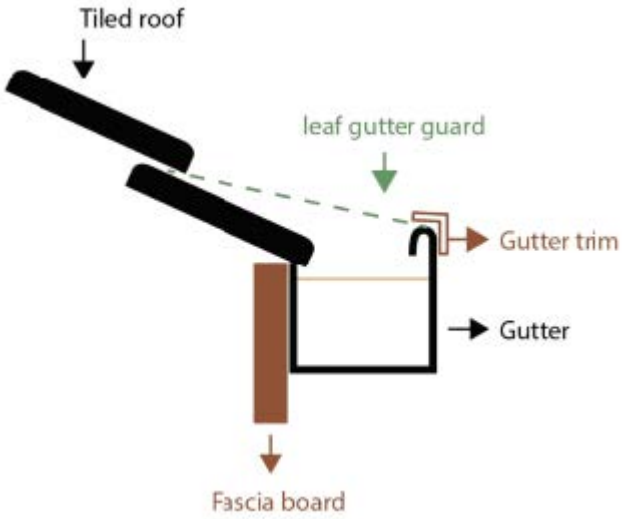
05.09 No downpipes are to be incorporated in structural building elements such as columns.

05.010 Roof, gutter and stormwater water noise must be considered and mitigated where issues are anticipated.

05.011 Overflows are to be provided to all roofs and gutters as a safeguard against flooding. Overflows are to discharge clear of building lines and pedestrian paths or bridges.

05.012 As a minimum roofs and roof drainage systems are to be designed for a 1:100 year return rainfall intensity. Specific projects may be assessed as a higher risk.

05.013 In areas where vegetation overhangs roofs a "leaf gutter guard" shall be installed. Only Colourbond, Aluminium (Power coated), stainless steel (Powder coated) to matched the roof colour is permitted.



05.014 Removable sections or gutter guard windows shall be installed every 6 meters and/or over the downpipe outlet.

05.015 Where a patio, deck, balcony etc. has openings into a building structure floor drains must be installed centrally with spoon/strip drainage installed along walls and doorways. Facade overflows need to be installed 50mm lower than the finished Flour Level.

Roof Penetrations Generally

05.016 When a roof penetration is required only a complete composite proprietary roof flashing system is to be specified for sealing pipes and penetrations. The system is to include all internal and external gaskets and boots.

05.017 Each proprietary roof flashing kit installed is to have a 20 year warranty.

05.018 For single pipes and penetrations only specify products suited for that purpose shall be used.

05.019 For roof penetrations where a set of condensing pipes can be grouped and passed through the roof fabric specify only Deks Top Hat Roof Kit or equal equivalent.

05.020 Metal covers must be installed over all roof penetrations and expansion joints to protect from Hail damage and vermin control.

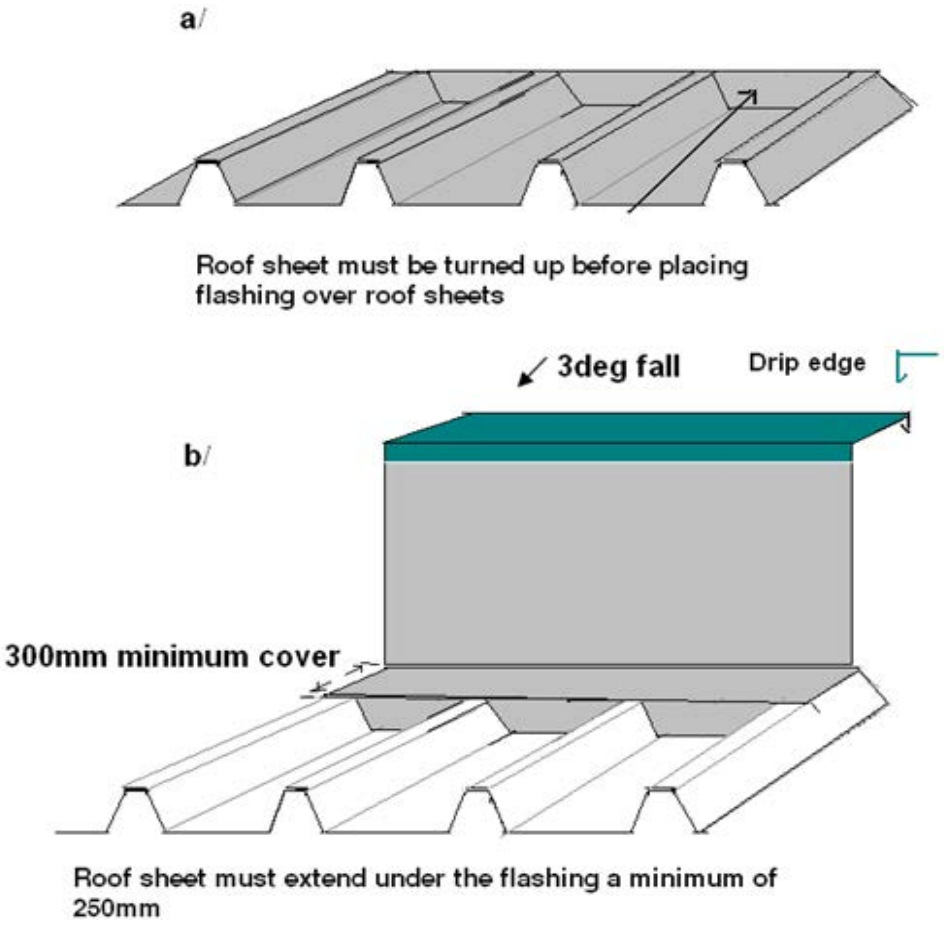
Roof Sheeting and Flashing Specifications

05.021 For all roof sheeting and flashing the following specifications apply:

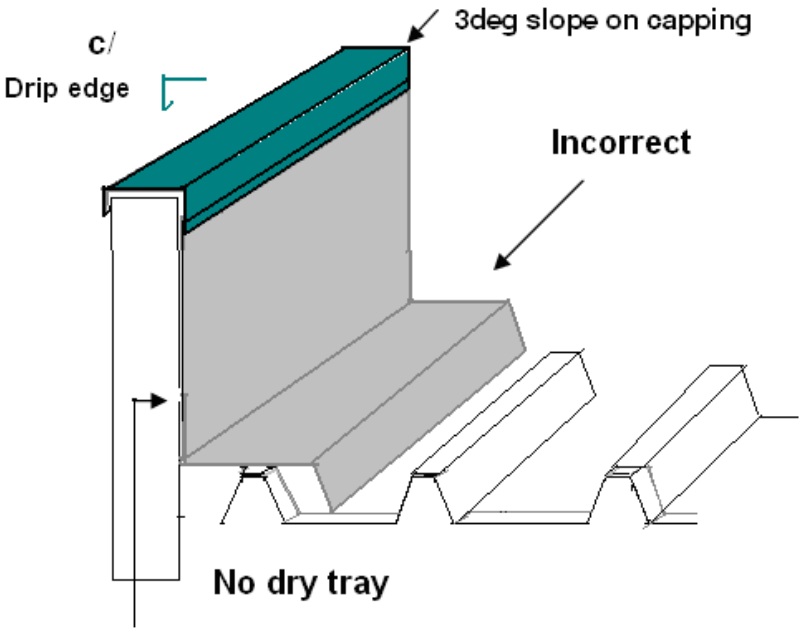
- roof sheets shall be a minimum of .48 BMT (base metal thickness). Specify the heaviest gauge available in the product range;
- roof sheets should be 700 series Stramit or Bluescope with proprietary purpose made accessories including concealed fixing brackets. (Roof sheets with no screws, helps eliminate roof leaks.);
- use only the manufacturers standard colour range;
- flashings and gutters to be .60TCT (Total coated thickness);
- all fixings should be class 3 or 4;
- do not use aluminium rivets, unless it is an existing aluminium roof. Use only blind steel rivets;
- syphonic drainage shall not be used in areas where there is any chance of leaf litter. (This covers most ANU buildings and environments.);
- due to the large amount of traffic on our roofs, battens or C-sections supporting the roof sheeting shall not exceed 800 mm at the top end and bottom of the roof sheets. the intermediate supports shall not exceed 1000 mm;
- ensure that roof sheets are protected when welding or cutting;
- use a cold cut saw blade or tin snips when cutting out sheet metal;
- on completion of roof work, all metal fillings, pop rivets, screws, pieces of metal and any other excess materials to be removed. Ensure roof is left neat and tidy; and
- roof sheets under no circumstances should have a fall of less than 5 degree. A greater degree is better.

05.022 Due to the amount of equipment placed on ANU roofs, it is essential to follow these guidelines. Roofs should not become plant rooms as increases in roof penetrations will increase the potential for roof leaks.

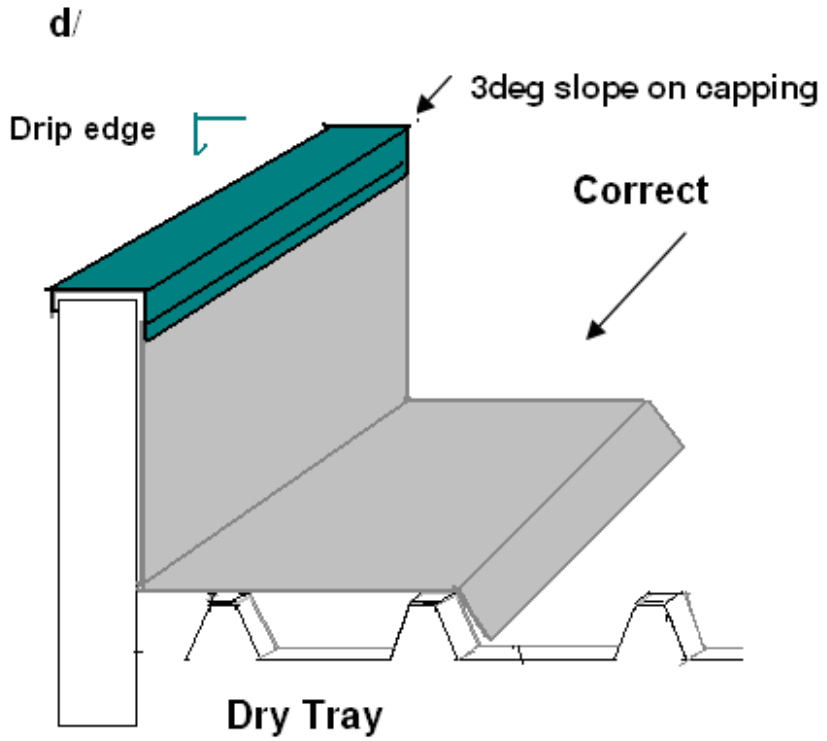
Apron Flashings

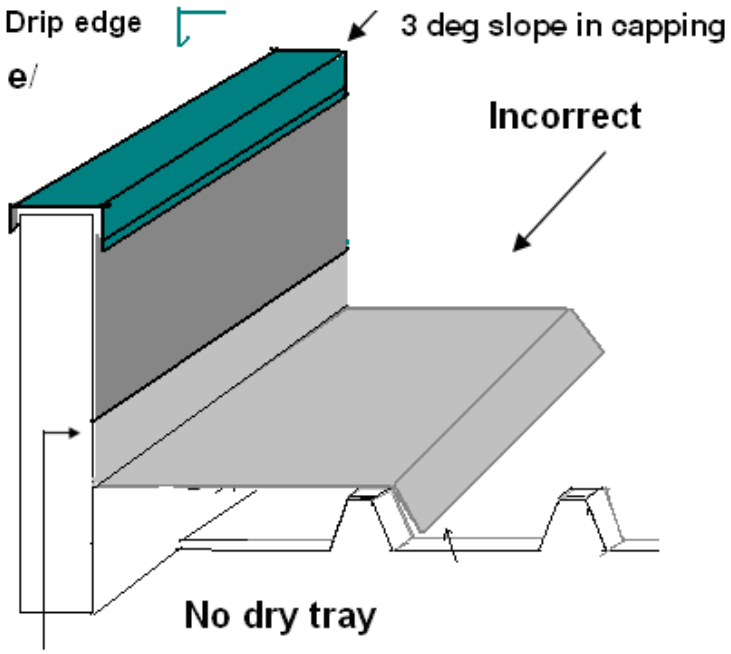


Apron Flashings to be installed with a dry tray

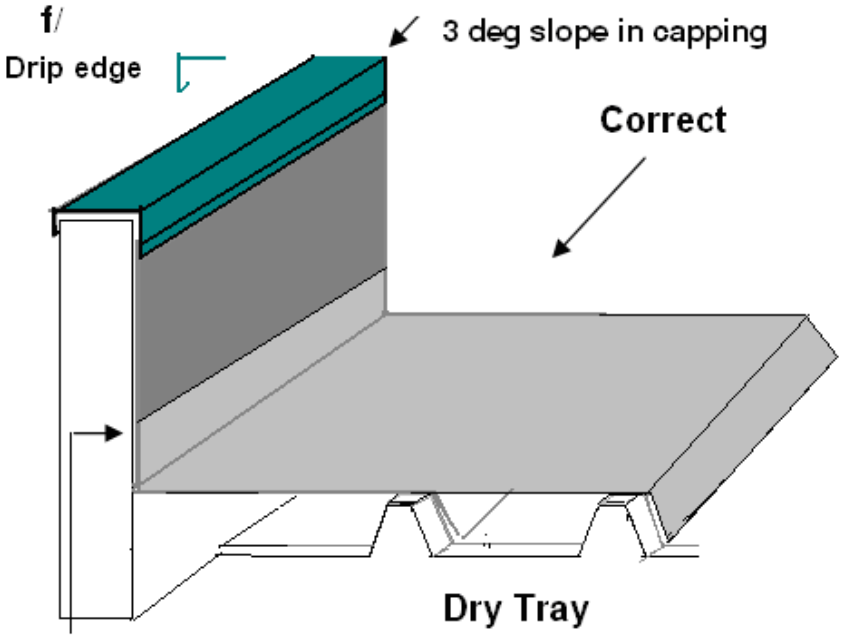


Note- This can be a full section or over lapped as shown



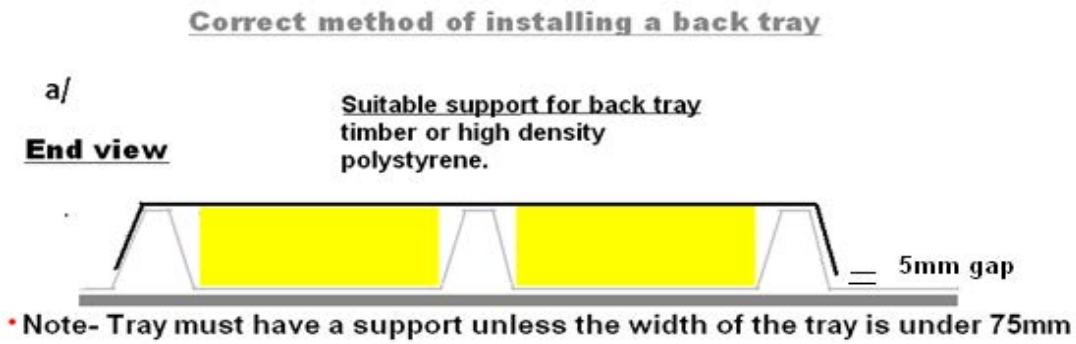


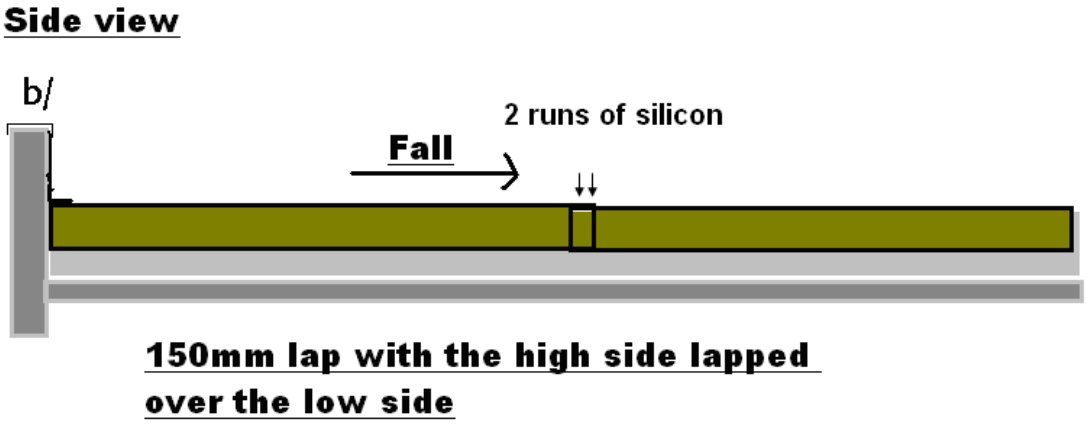
Note- This can be a full section or over lapped as shown

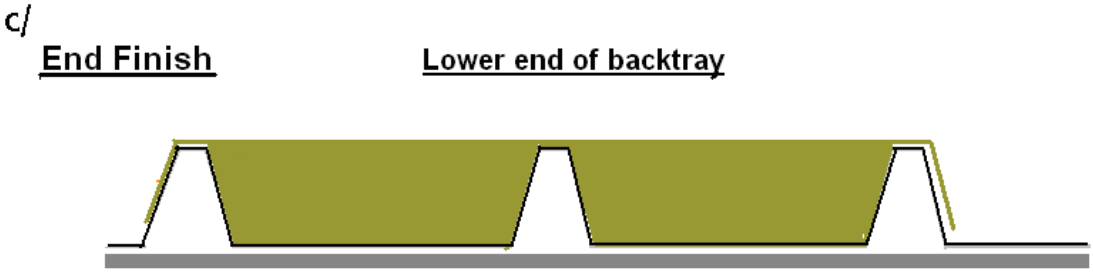


Note- This can be a full section or over lapped as shown

Back Trays





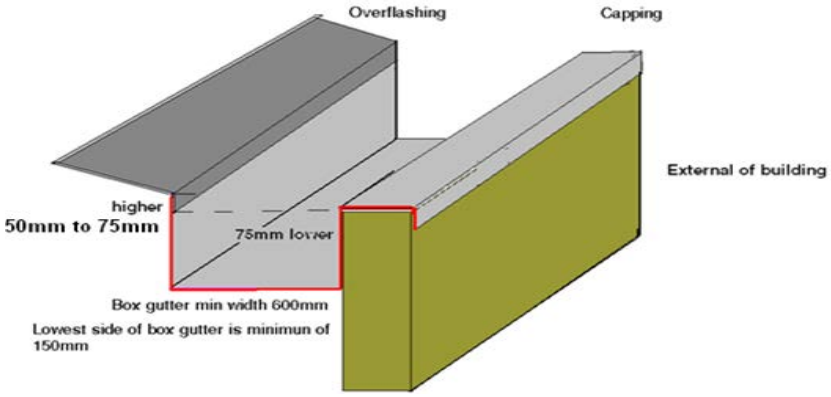


Requirements for Box Gutters

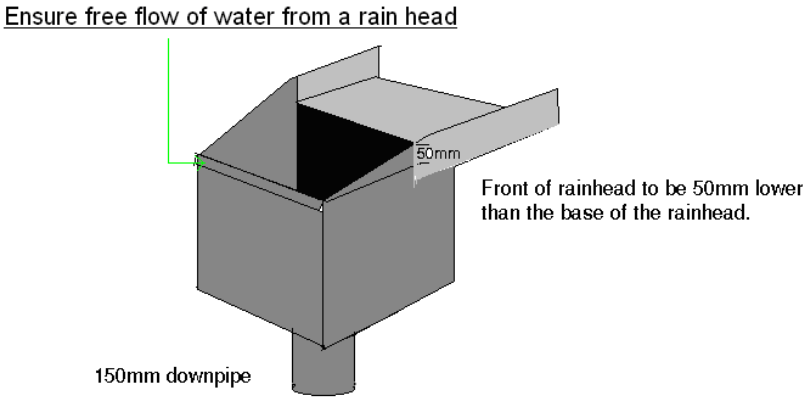
05.023 The sizes indicated below are minimum sizes. Larger sizes may be required and are to be calculated to accommodate a 1:100 year return rainfall intensity.

On buildings that require box gutters the internal section of the gutter is to be 75 mm above the external side of the box gutter.

The box gutter is to be made in one piece extending over the external wall or fascia.



Rain head preferred concept from a box gutter.



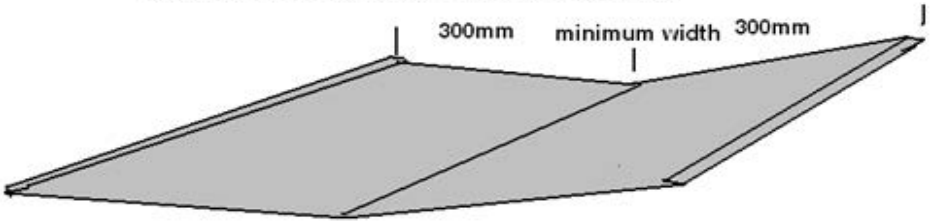
Note:

- Box gutters with rain head outlets can be used on buildings that have roof and gutter upgrades.
- The removal of water from the box gutter is of prime importance. Do not reduce the flow from the gutter to the rain head.
- Standard propriety gutter hail guards systems only are to be used on the ANU building stock.
- Walkways can be used as hail protection devices if the systems are install 2.5 Metres away from the Box gutter.

Valley Box Gutters

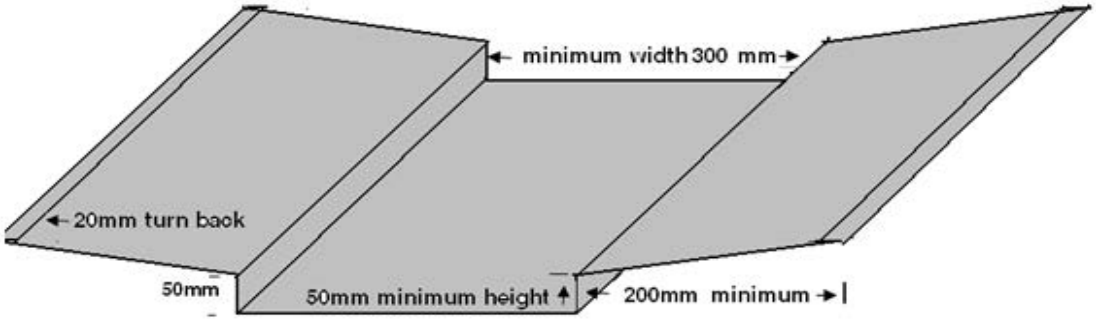
a/ **Conventional vee shape valley gutters**

Only to be used on roofs over 22deg pitch



b/ **Valley box gutters to be used on all roofs under 22deg pitch**

Size of the valley box gutter depends on roof area, rain fall and the amount of leaf litter.



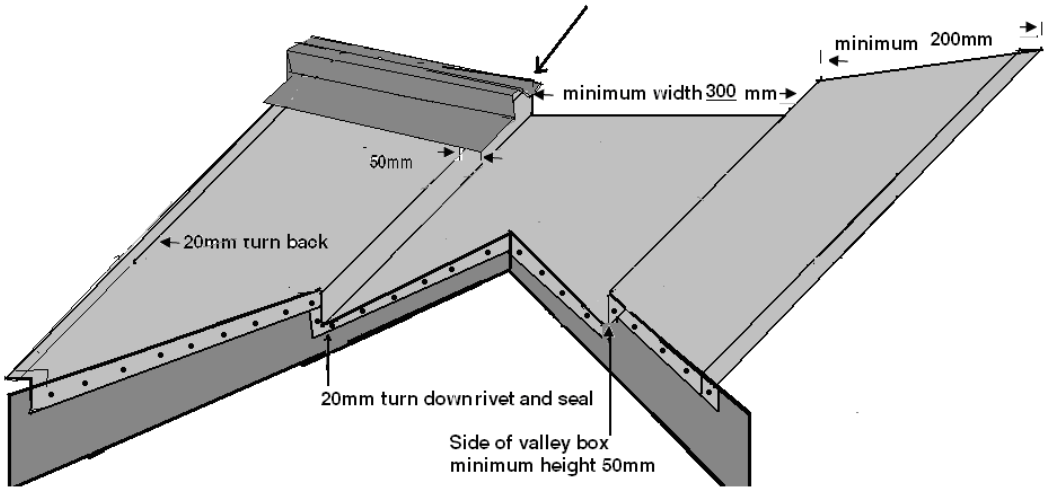
Box valley gutter to be cut into the back of the box gutter or external gutter

c/

Size of the valley box gutter depends on roof area, rain fall and the amount of leaf litter.

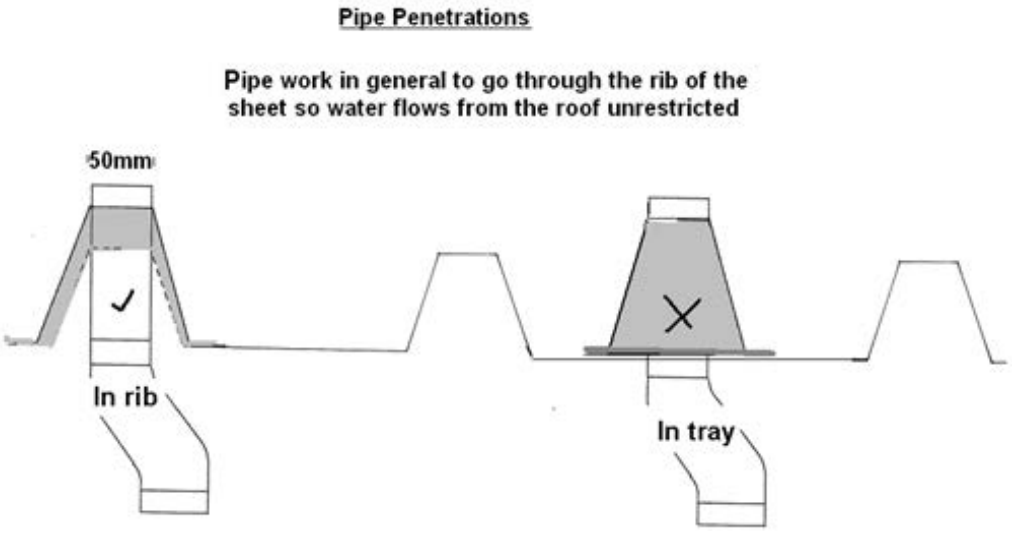
Refer to A.S.3500

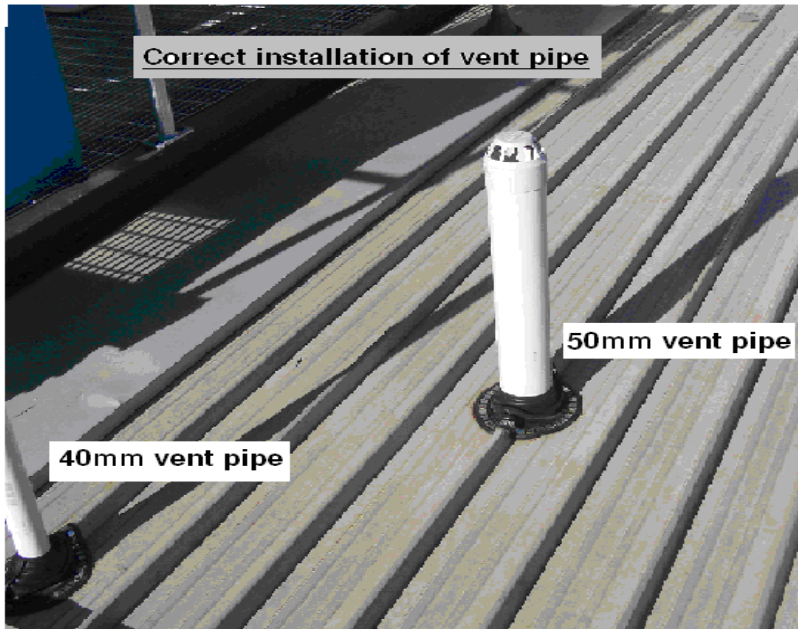
Roof sheet not to extend into the box section any more than 50mm to allow for easy cleaning



Vent Pipes

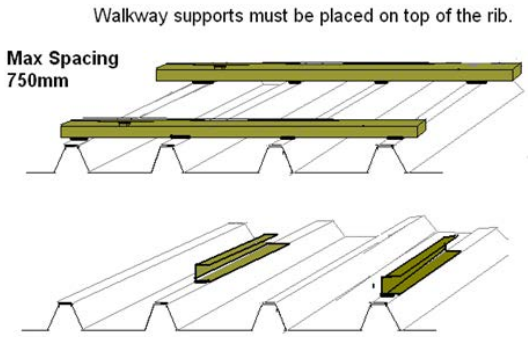
05.024 Only one proprietary roof flashing kit shall be used for each single pipe/ conduit that penetrates the roof. Fluted flexible electrical conduit will not be accepted. Only smooth surfaces shall be flashed in this way.



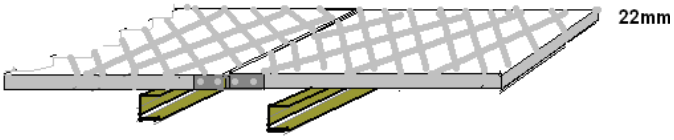


Walkway Supports

a) If walkways are specified in aluminium, they are to be 22 mm in thickness or greater.



b) Where ever a walkway joins, a support must be placed as close as possible either side of the join. Supports are to be placed no more than 250 mm apart.

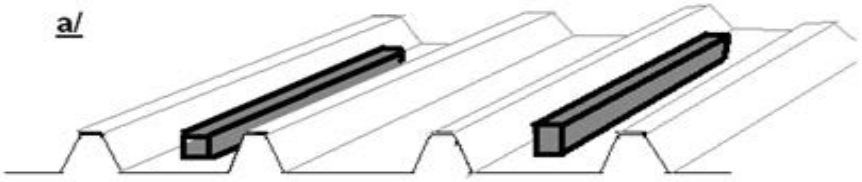


Support of Equipment on Roofs

Note-When there are multiples of equipment a platform should be used

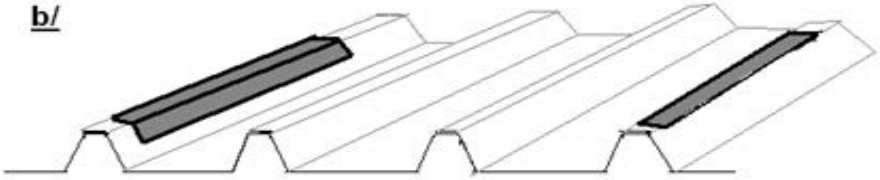
Never place the supports in the tray of the roof sheet, this restricts the flow of water and traps leaf matter

a/



Place a rubber seal between the two metal surfaces

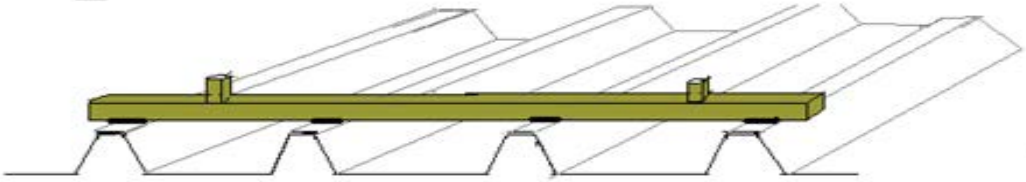
b/



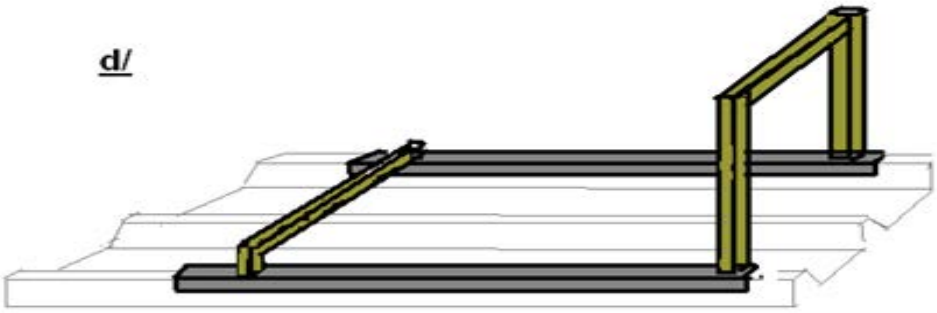
Some examples of the correct support on roof sheets

Ensure there is structural support with in the building frame work to carry the load intended

c/



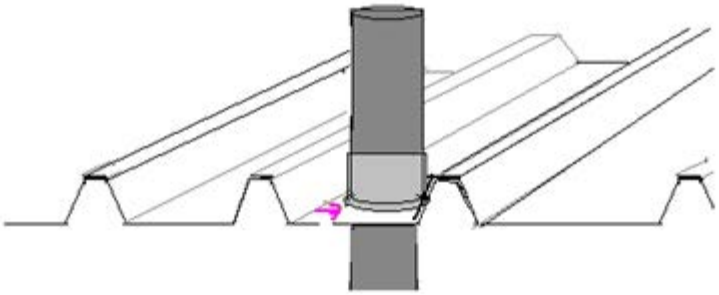
d/



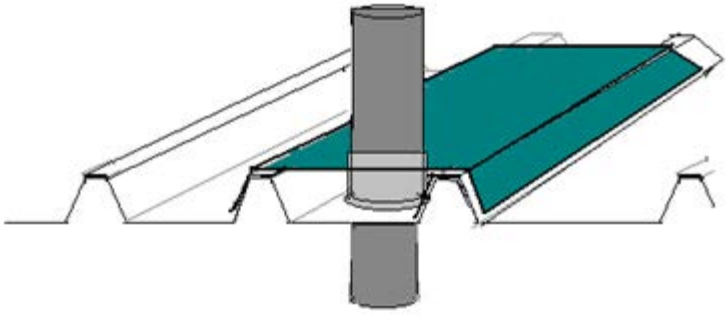
Roof Penetrations

Exception to dry tray rule

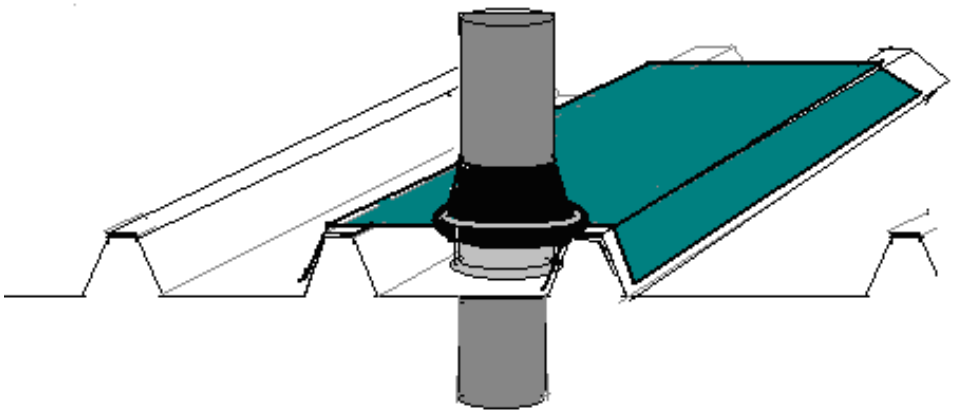
a/ Seal flange to tray so that it is water tight



b/ Install back tray



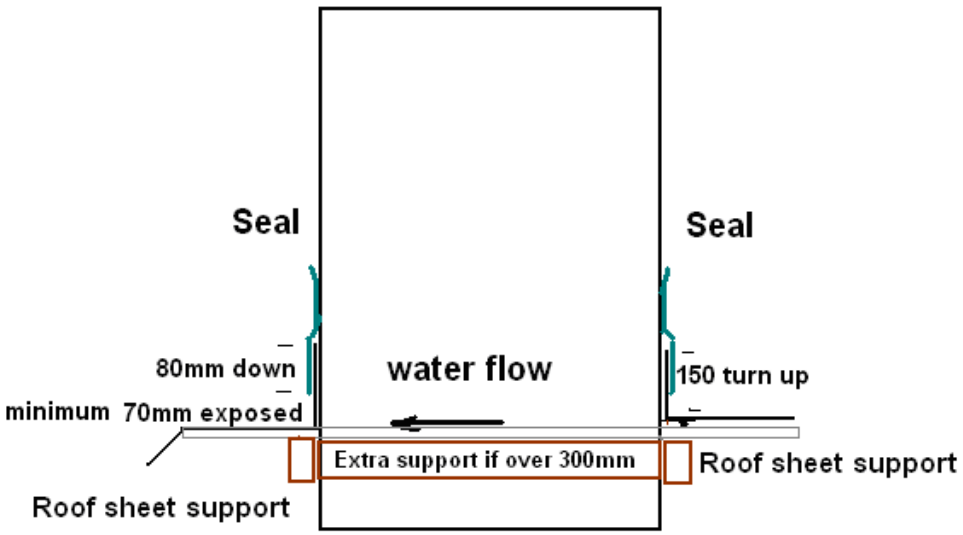
c/ Install Dektite



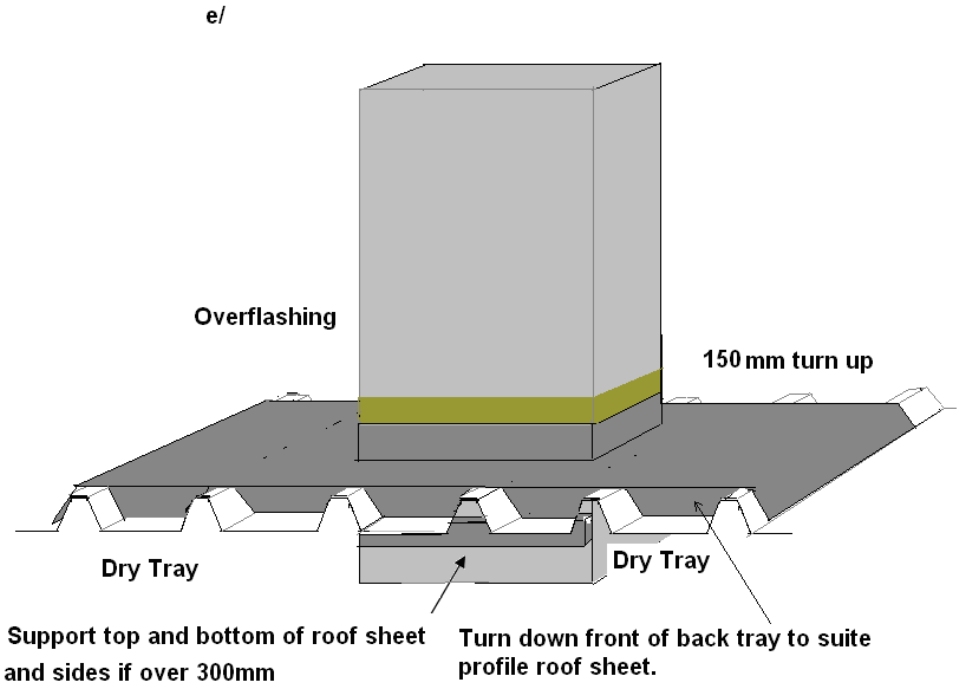
This would only be suitable for pipes or tubing up to 100mm.

Cross section of a roof penetration

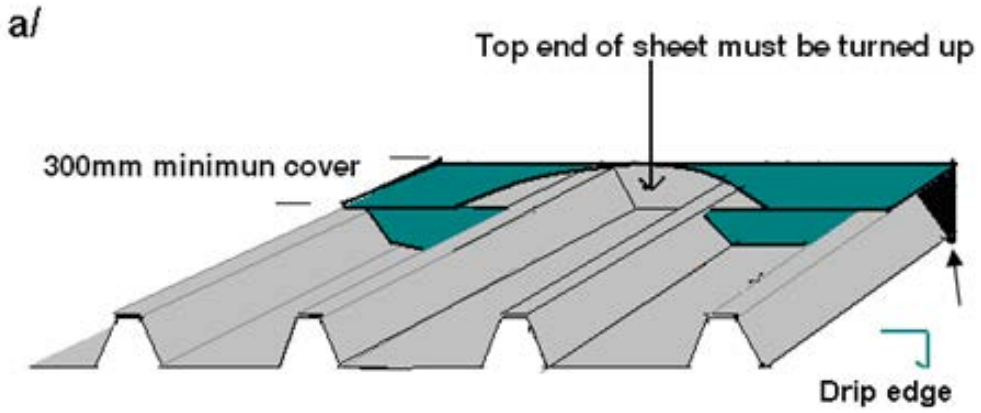
d/

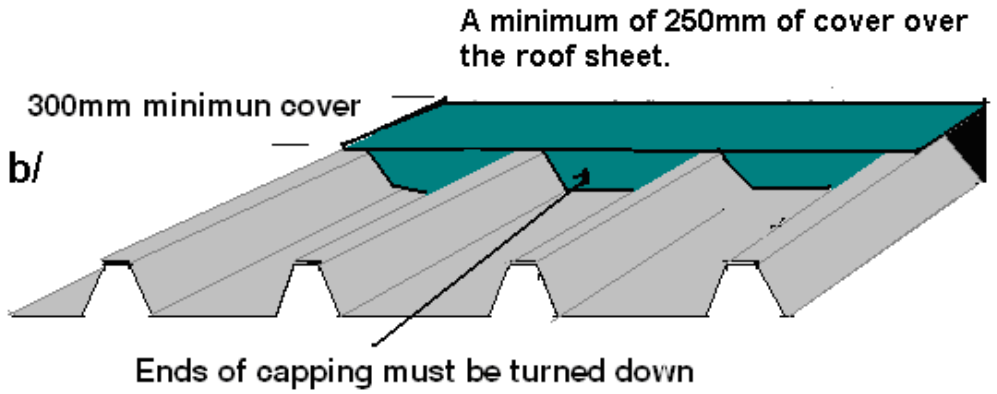


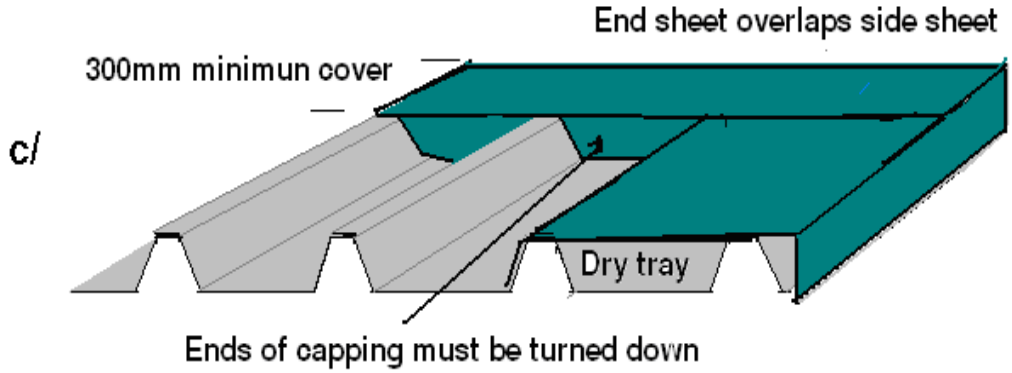
For Larger roof penitrations



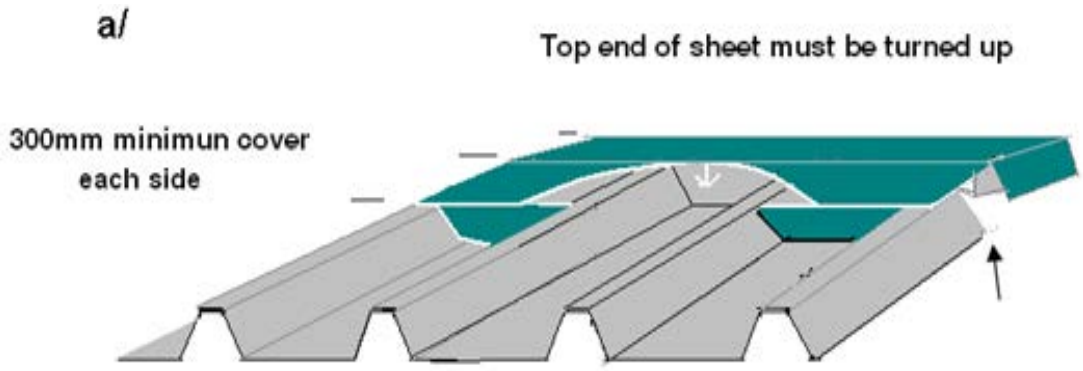
End Capping/Barge Capping







Ridge Capping

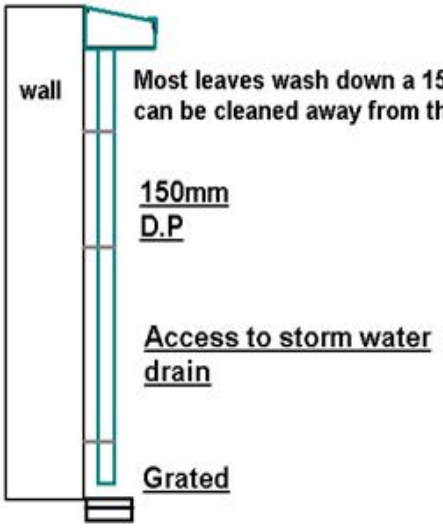


Roof Drainage from Gutters

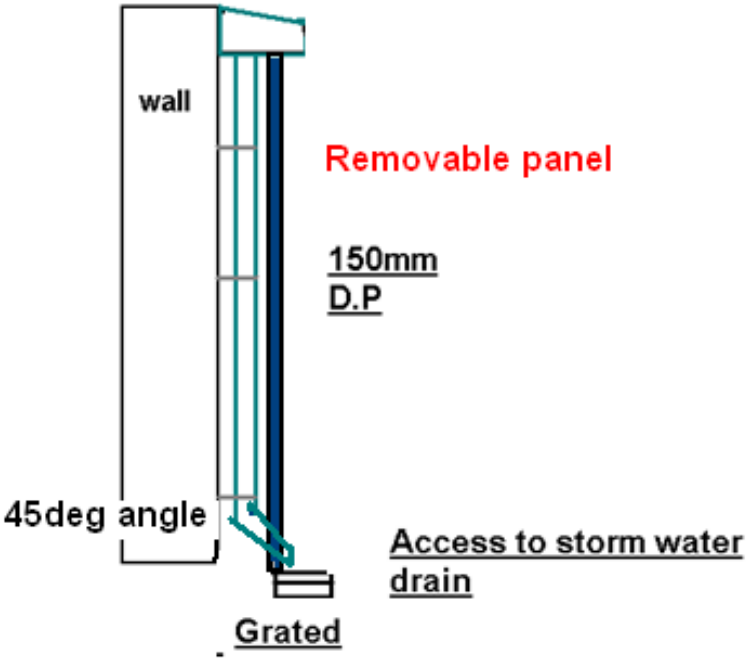
a/ Syphonic systems for roof drainage should not be used where there is any chance of leaf litter.

b/ Recomended down pipe size to be 150mm with grated drain at ground level

c/ Residential buildings such as individual dwellings, 90mm round or 100mmx75mm to be the minimun size and a grated drain still required



d/ Internal downpipes may only be used as per details below.



Mechanical Plant on Roofs

05.026 Where possible, the best location for such plant is not on the roof, as this increases the probability of roof leaks. If such plant is to be placed on the roof, it should be placed on waterproofed concrete roofing slab sections designed to bear the structural live loading of such equipment.

05.027 If mechanical services equipment has to be located on metal deck roofs that have no designated concrete slabs to accommodate the plant, well designed structural steel platforms with galvanised finish shall be provided to accommodate and distribute the weight of mechanical services equipment such as chillers, boilers, air handling units, fan coil units, fans, fume scrubbers, cooling towers, process cooling units, storage tanks, pumps, air cooled condensing units, refrigeration condensing units and switchboards.

05.028 In the specific situation where multiple air cooled condensing units are to be installed, these should be placed on a platform as indicated. This general principle shall be used to accommodate all items of mechanical services equipment.

Spread the weight over the ribs of the sheet so as not to restrict water flow.

Incorrect

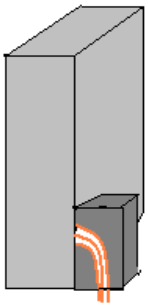
Correct

Rubber boots to roof flashing kits should be pulled up correctly and not placed in the middle of the tray (pan) of the roof sheet.

Incorrect

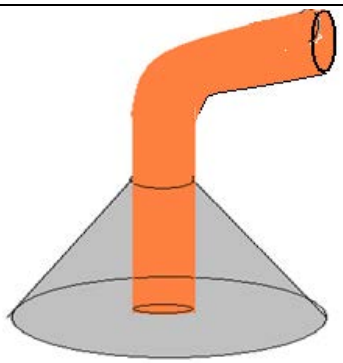
Correct

Have pipe and conduits enter as close to the condenser as possible and install metal protective cover

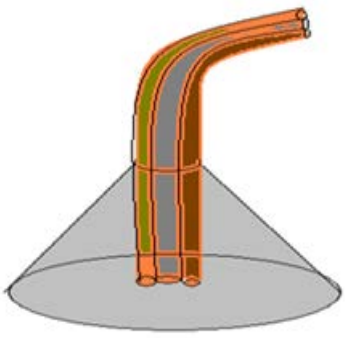


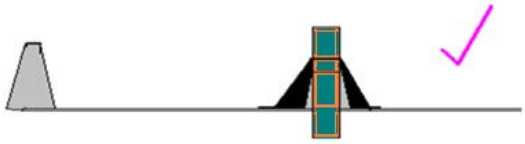
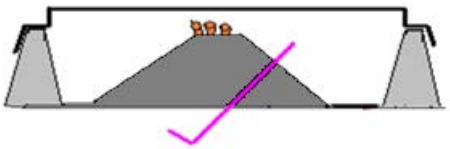
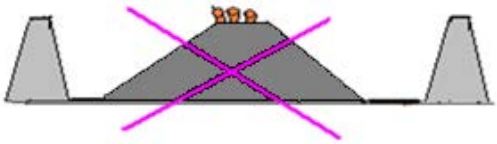
Single pipe or conduit is the only time a proprietary roof flashing kit is to be used without a protective cover

Protection from potential damaged caused by birds must be provided



Must have a metal protective cover, or encased in a PVC or metal pipe and elbow

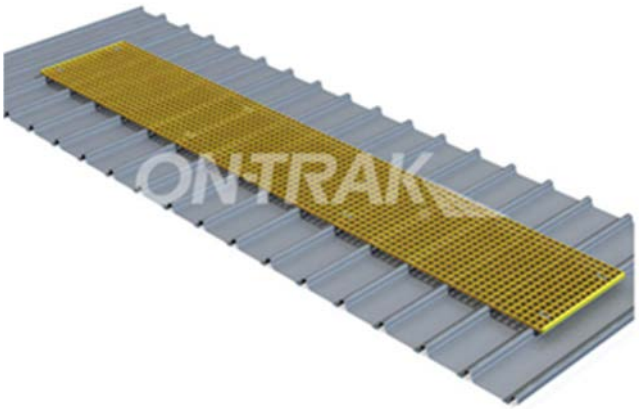


Correct installation using a proprietary roof flashing kit	
Correct installation of an over flashing	
Installation of penetrations and flashing should not result in restricted water flow from the roof desk/surface	

Roof Safety Requirements on ANU roofs and PV Panels

05.029 The following principals should be applied where a roof on the ANU campus is to have PV (Photovoltaic system) installed.

- PV panel must have a clear space of 3M Safe Zone from the edge of all roofs
- A clear exit and maintenance path should be provided between every four rows of panels
- A walkway made from FRP Fiberglass Reinforced Polymer (ON-TRAK Yellow) shall be installed between and around PV panels .
- The walkway layout shall to be submitted to ANU for approval.



- Roof safety static Lifelines is to be installed 2.4 metres from the edge of the roof and beside the walkway- non-propriety systems are to be used only
- All walkway is to be installed with Trak-Tite mounting clips where possible
- No Anchor points and safety Lifelines are to be used in the middle of the PV panels (No height safety equipment is to be used over panels)

05.030

ANU Height Safety Specifications

05.031 All Current Australian Standards, Work Health Safety laws and compliance with manufacturers installation requirerments are to be followed.

05.032 The Height Safety designers shall work with the architect's concept on alterations to the building design to eliminate risks and reduce the need for specialist multiple height safety systems. Consider Safety in Design principles for roof safety construction, roof access and roof maintenance at the Concept stage of the structure.

05.033 ANU with only except non-proprietary items, all roof safety system are to be installed and certified by an accredited installer.

05.034 On completion of any whole roof safety system on new/refurbished/existing roof an independent Height safety consultant (Facilities and Services to nominate) will provide a report and recommendation specifically for the University's handover process with all cost to be paid by the principle contractor. Note section Commissioning, Operations & maintenance requirements section (Roofing and Roof safety) of the CBRM

05.035 All ANU safety lines and roof safety components are to be an off the shelf non-proprietary system/asset for ongoing rectification of the system;

05.036 All systems where possible should be capable of two person operation, where lines are very short a single person capability will be accepted, providing this is clearly indicated on system data plates.

05.037 All safety Anchors components are to be a off the shelf non-proprietary system/asset for ongoing rectification of the system;

05.038 The first man up Strop must be used where entry to the roof is from a ladder/ladder hatch; reduces the amount of entry access anchors required. Attachment end should be secured with a strop hook when not in use to ensure it can be accessed from a safe area for next use.

05.039 The University's preference is for internal roof access via compliant roof access stairs

05.040 Roof access hatches are to be a compliant non proprietary product with dry pan back trays flashings to be used only, with support timber/foam used under the flashings. Guard railing are to be proprietary aluminium roof mounted system, power coated only to match the roof colour. Walkway are to be fitted on the excite points and continued around the roof, this eliminates trip and slip hazards on a safe path to any roof mounted systems, gutters etc. where a roof safety system is installed this must be on the lower side of the walkway and will nominate the potentially hazardous area.

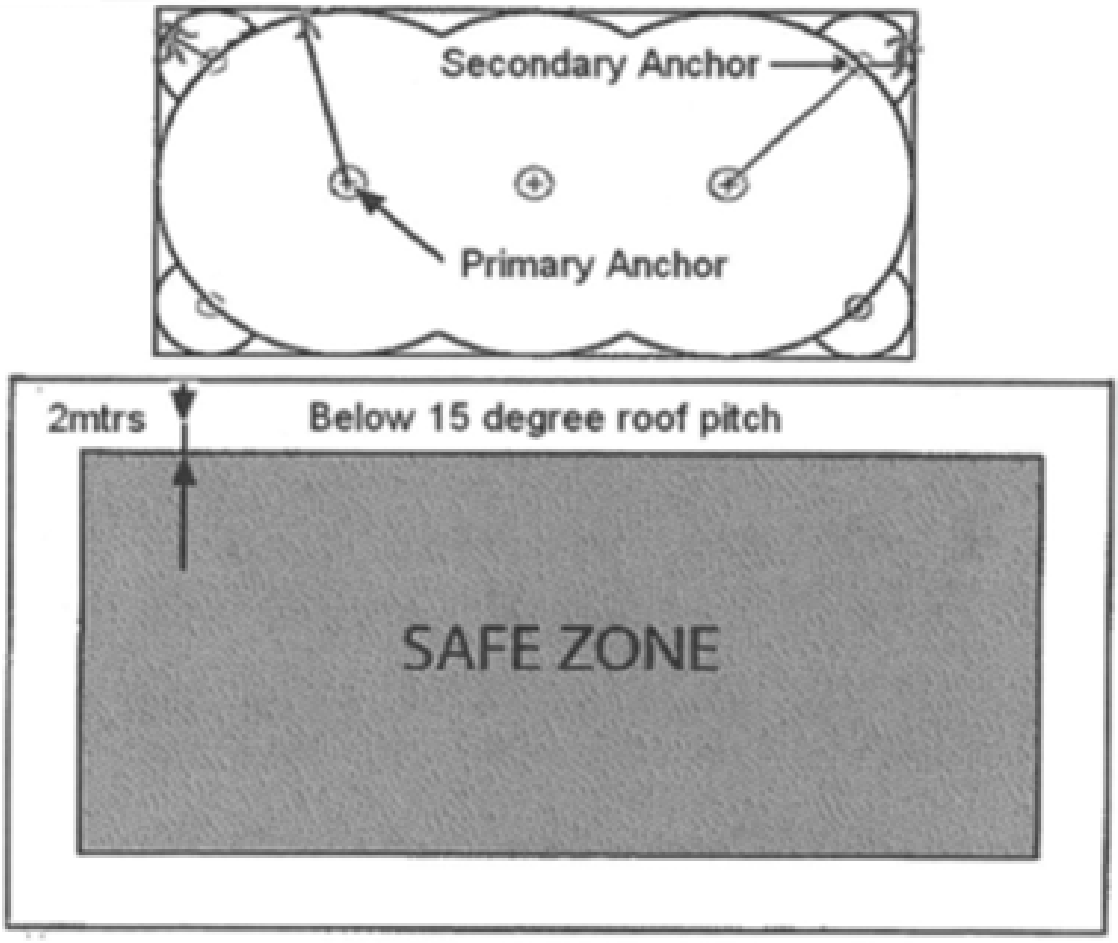
05.041

Personal Protection Equipment (PPE)

05.042 One full PPE Roof safety system kit is to be supplied with every new system installed

Roof Safety Layout and Roof Safe Area

05.043 Examples of roof safety layout and roof safe area.



05.044 When designing a roof safety system on the ANU building stock, every safe zone must have trafficable access walkways installed from the access point around the roof perimeter back to the access point 2.5 metres from any on the roofs edges (this also acts as a hail prevention add). All height safety systems must be on the lower side of the walkways as a rule. Any asset placed in the safe zone must have its own risk assessments to eliminate any height safety ard created by these assets, roof safety system are not to be used as an option for any items in this safe zone. E.g. where a skylight is present cover/mesh installed, signage etc. , mechanical plant installed on roof must have a platform installed , guardrails, access steps etc. Eliminating the hazards all together in this space must be a design specification.

Correct Installation of Safety Systems

05.045 Included below are pictures and diagrams illustrating ANU requirements. The aim is to have continuity throughout the ANU. Facilities and Services are responsible for the maintenance of ANU roofs while reducing the amount of ongoing maintenance required.

- Contractors are to comply with all Australian Standards, authorities and State Government Regulations/Requirements as well as ANU installation practices.
- Seek technical advice from the Principal's Representative (the Principal or the Principal's Project Manager) before installing an anchor points
- Only of the shelf non-proprietary roof safety items are to be used for ongoing rectification of the system
- ANU Preferred Roof Safety system assets are SafetyLink and SAYA systems

Location of Harness Anchor Points

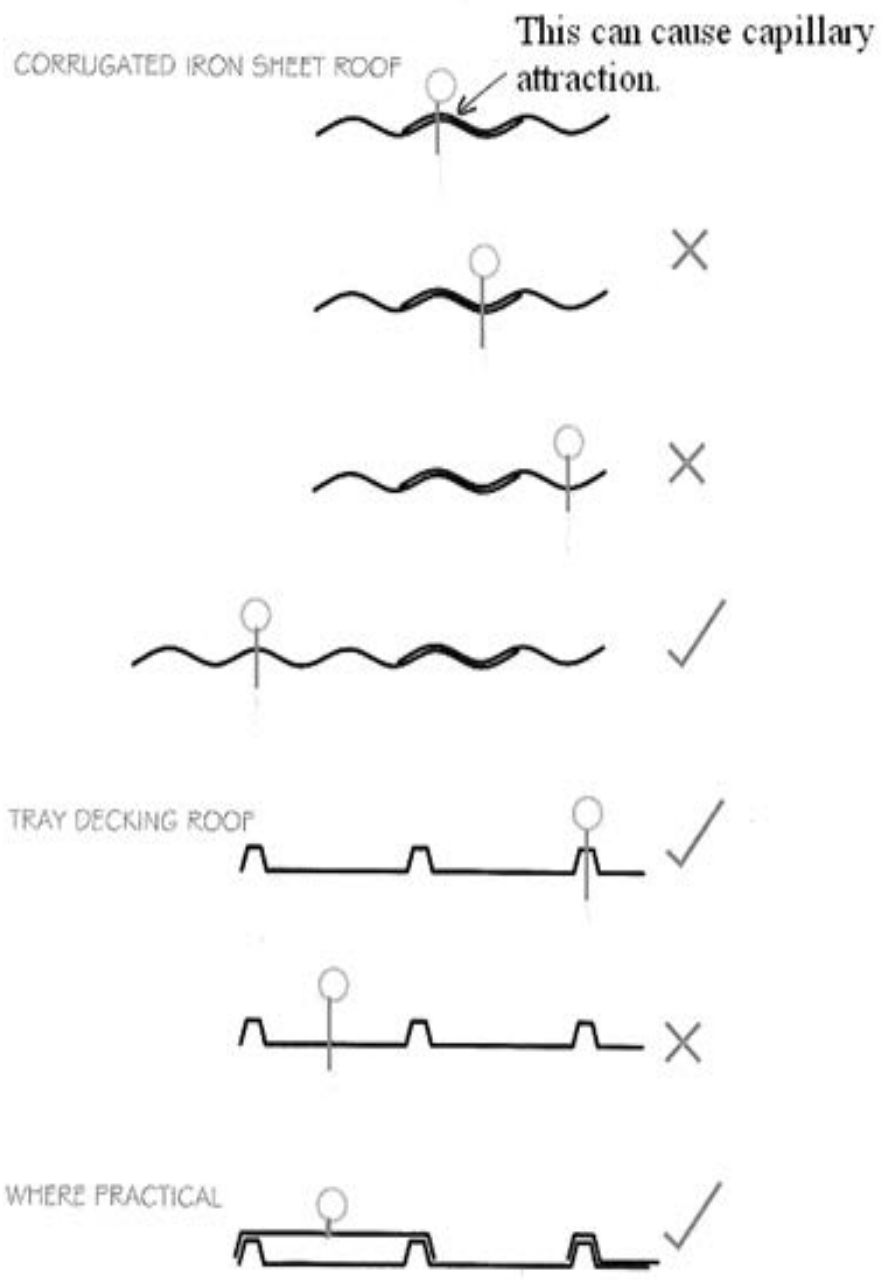


Figure 1

Indicates preferred method of no fixing in the tray.

This applies to anchor points as well as static points.

Figure 2

Indicates static line which is the ANU preferred method for safety systems.

Figure 3

If fixing into the structure under the roof sheet, go through the rib of the sheet as indicated.

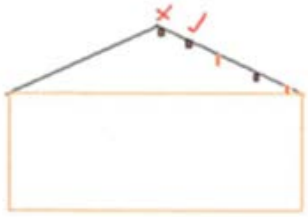
Figure 5

Fixing into the pan must be carried out using a stainless steel plate as indicated.

Note: Do not use a proprietary roof flashing kit designed for pipework.

Figure 6

Do not place fixing plate too high on the roof as indicated

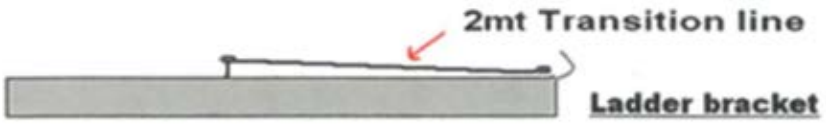


Roof safety systems certification

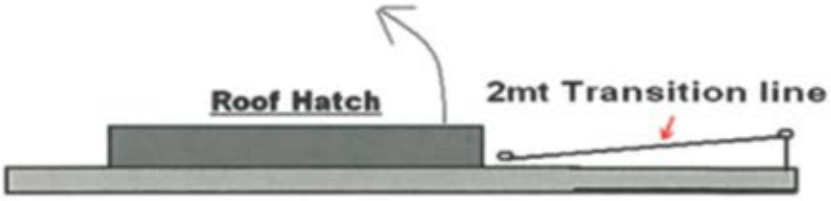
05.046 All roof safety systems must be certified on an annual basis in accordance with the relevant State or Territories requirements.

05.047 All safety lines and roof safety components are to be off the shelf proprietary system/asset for ongoing rectification of the system

05.048 Preferred method of roof entry is via internal access doors from stairs when a ladder access or roof hatch system is required then the following notes /photes are required,



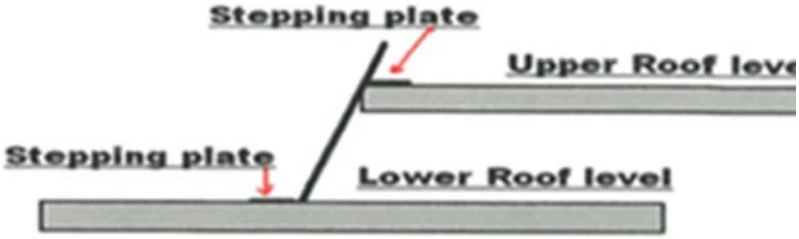
If hatch is 2mts or closer to the edge where you step out.



Supply and install a locating hook for easy access

05.049

Fixed Ladder Installations



- Adhere to applicable Australian Standards.
- Step-through styles extend to 1000 mm above upper roof level.
- Only have ladder at 90 degrees if no other option.
- Stepping plate to be 900 x 600 mm.

Stairs and Platform systems

05.050 Modular stairs and platform Aluminium systems are to be used on the ANU (Kombi SAYFA group or approved equal)

- Purpose built platform structures , cooling towers, water tanks etc, where the manufacturer doesn't offer a suitable proprietary platform.
- Platform single or dual stairs
- Suspended platforms
- Crossover used for access over ducts, machinery etc. and
- Multi stage stairway – Access up to 6 metre with change of direction.

Skylights and Walkways

05.051 Cages/protective mesh over skylights are an ANU standard on any trafficable roof

05.052 Cages are to be Aluminium with the Proprietary systems are to be SAYA (protex) and or Spektra.

05.053 protective mesh must be Aluminium or Stainless Steel have specification

05.054 Walkway are to be standardised with FRP (Fibre Reinforced Polyester) walkway grating and use Trak-tile mounting clips (No roof penetrating)

05.055 Safety yellow is to be used in non-visual areas and Grey is to be used in visual areas.

05.056 Where Guardrail systems are to be used then a high quality proprietary aluminium walkway can be used, painted surfaces are not permitted on any guardrail/walkway system and only powder coated surfaces are to be used if the roof colour is to be used on any safety equipment.

Signage Requirements

05.057 Signage must be provided by contractor for certifying contractor's safety system;

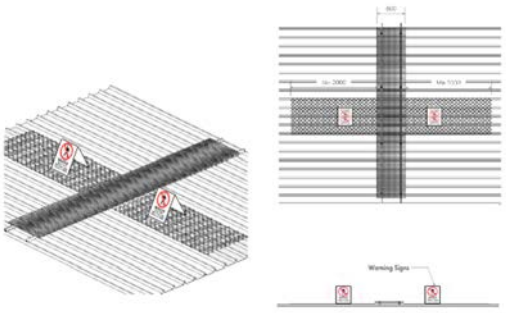
05.058 If there are skylights there must be signage in two locations

Skylight Signage at the entry point this will give the person a visual hazard awareness before starting the roof access process

Skylight signage at the asset is a standard ANU requireremnt

05.059 Where a Sheet of clear roof material (Laser lite, polycarbonate etc.) A standard brittle roof sign is below, fall protection will be needed over this material via guard rails, Aluminium mesh etc.

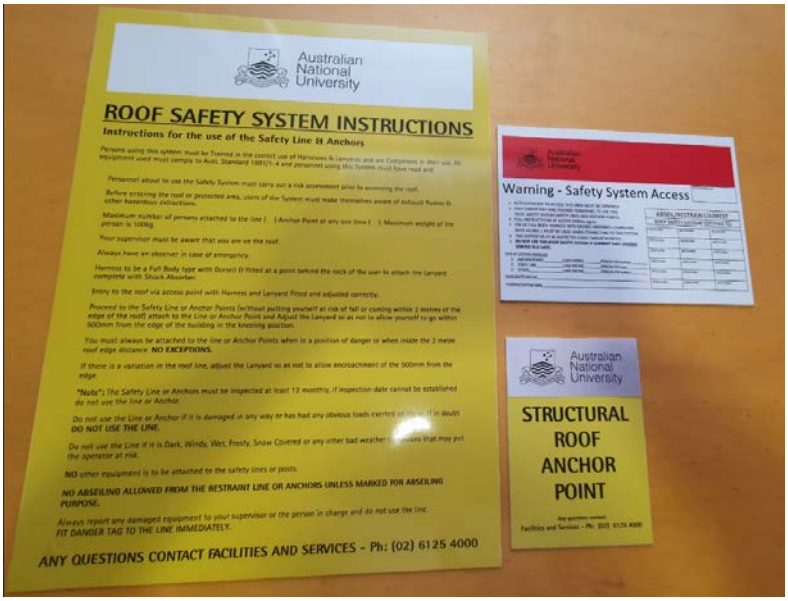
05.060 All fragile roofing material will need visible and clear signage with guardrail and FRP(Fibre Reinforced Polyester yellow) walkway access pathway over the brittle roof area e.g.



05.061 The ANU has three standard ANU signs which will be provided for the contractor to install at the entry points to the roof access as shown in below

05.062 ANU standard compliance plaque needs to be install and updated an Annual base

Roof Safety System Instruction and process sign and ANU structural roof anchor point



Maintenance and Recertification

05.063 To be completed as per Australian Standards, State based legislation and Manufacturer requirements.

05.064 Height safety and fall protection systems on the ANU building stock must be certified by a qualified licenced person only

05.065 The minimum requirement to be given after a recertification is Compliance certificate clearly nominating the Inspecting Company, ANU Building name with the number, dates of inspection, expiry date, clear asset identification numbers on the elements, roof plan with assets clearly marked, reportable items listed, recommendations if required and System Status.

05.066 When compliance have changed or been superseded provide a quote and the relevant regulation upgrade to the business contact to upgrade the site requirements.