

TECHNICAL NOTE

Use of EWPAА Branded Structural Plywood As Exterior Decking

PRODUCT CERTIFIED



JAS-ANZ

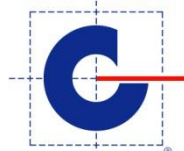


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Introduction

It is intended that this technical note be read in conjunction with the Engineered Wood Products Association of Australasia (EWPAA) design manuals "T & G Structural Plywood for Residential Flooring" and "Structural Plywood for Commercial & Industrial Flooring". These design manuals cover all aspects of the use and installation of EWPAA branded structural plywood flooring in interior applications and contain load span tables. However if structural plywood is to be used in above ground exterior flooring or decking there are additional requirements that need to be considered in order to maximise the service life of the plywood. These additional requirements arise as a result of the effect of rain and sunshine on the timber in plywood. Under favourable moisture and temperature conditions, fungi may decay or rot the timber; wetting and drying of the plywood surface will cause surface checking, and finally if the plywood remains wet for sufficiently long periods of time some reduction in strength and ability to resist deflection may occur.

This technical note briefly reviews the requirements for structural plywood flooring and decking as detailed in the EWPAA design manuals and then looks at the additional requirements for structural plywood used in weather exposed, above ground situations. In particular, it discusses surface protection of the plywood against weathering, protection of the plywood against decay and the implications of high moisture content on dimensional stability, strength and serviceability requirements.

The guidelines and recommendations for the use of plywood in decks given in this technical note only apply to structural plywood bearing the EWPAA brand and manufactured to AS/NZS 2269 "Plywood - Structural".

EWPAA Brand

The Engineered Wood Products Association of Australasia is accredited by the Joint Accreditation Scheme of Australia and New Zealand (JAS-ANZ) as a product certification body for plywood and Laminated Veneer Lumber Products manufactured to Australian and New Zealand Product Standards.

JAS-ANZ is the peak accreditation body in Australia and New Zealand and was formed via treaty to oversee certification bodies for quality management systems and products.

Plywood and LVL products certified by the EWPAA are branded with the EWPAA product certification stamp as well as the JAS-ANZ mark. The EWPAA/JAS-ANZ brand on a plywood or LVL product certifies that the product has been manufactured to the relevant Australian/New Zealand Standard, under a quality control and product certification scheme accredited by the government peak accreditation body JAS-ANZ. This means that purchasers of products stamped with the EWPAA/JAS-ANZ brand will be purchasing a product that is manufactured under an accredited third party audited, process based quality control program that ensures the plywood will be fit for purpose. A complete list of EWPAA plywood and LVL manufacturing members whose products carry the EWPAA brand is Available on the website (www.ewp.asn.au).

Structural Plywood

The only plywood suitable for use in structural applications in Australia and New Zealand is plywood manufactured to AS/NZS 2269- "Plywood- Structural". All EWPAA branded structural plywood manufactured to this standard will be branded with the word "structural", the standard "AS/NZS 2269" the face and back veneer quality, eg. CD, the glue bond type, a stress grade eg. "F11", the plywood identification code, eg. 17-24-7 (where 17=nominal thickness, 24=face veneer thickness x 10, and 7=number of veneers), and the PAA "Tested Structural" stamp. For example a typical brand may be:

Structural to AS/NZS 2269	(Plywood type & Standard)
CD - A Bond	(Face & back veneer quality -glue bond type)
F11	(Stress grade)
17-24-7	(Plywood ID code)
EWPAA Tested Structural	(EWPAA-JAS-ANZ Brand)

Glue Bond

All structural plywood manufactured to AS/NZS 2269 uses a Type A phenolic resin to bond the individual veneers. Type A glue bonds are durable and permanent under conditions of full weather exposure, long term stress, and combinations of exposure and stress.

Face and Back Veneer Quality

Structural plywood can be specified with a range of face and back veneer qualities to suit the plywood application. Veneer qualities range from grade A which is a high quality appearance grade suitable for clear finishing to Grade D which is a non-appearance grade with permitted open defects. The standard face grade for T&G structural plywood flooring is "C" which is a non-appearance grade with a solid surface. All open defects such as holes or splits are filled. The face is suitable for direct covering. The standard grade for the back of panels is "D". The "D" grade surface can contain open defects such as knots and splits. If the underside of the flooring will be visible, a better quality veneer grade can be specified. Further details on the veneer grades can be found on the EWPAA website under technical information and Veneer Quality.

Structural Properties

The structural properties of plywood are tabulated in both AS/NZS 2269 and AS 1720.1 "Timber Structures Design Methods". Standard structural plywood panels are readily available in two stress grades, F11 and F14. Structural plywood panels are available in higher stress grades for more highly loaded commercial and industrial flooring applications. The EWPAA design manual "Structural Plywood for Commercial & Industrial Flooring" has load span tables for plywood flooring for a range of plywood thicknesses and stress grades.

Standard Panel Dimensions

EWPAA branded structural plywood is available in sizes to fit all joist spacing's. Structural plywood is also available with tongue and grooved edges along the length of the panel. The common panel sizes available are:

Length x Width
2400mm x 1200mm
2700mm x 1200mm

Panel widths of 900mm are also available from some manufacturers. A range of standard plywood panel thicknesses are available including 15, 17, 19, 20, 21, and 25mm, however thickness availability will vary between different manufacturers and it is best to check both the thickness and panel sizes locally available before specifying the plywood.

Surface Finishing

To prevent deterioration of the plywood through weathering, all exposed plywood must be surface finished. Unprotected plywood when exposed to the weather will absorb and desorb water. The wetting of the unprotected plywood surface will cause the leaching out of the natural timber colour leaving a greyish or bleached appearance, and the alternate wetting and drying of the unprotected plywood surface will cause checking of the plywood surface. These checks tend to enlarge into cracks that allow water to penetrate even further, increasing mechanical breakdown of the plywood.

Surface finishing to prevent surface checking of plywood flooring and decking can be done in a number of ways. The objective of the surface finish is to seal the plywood surface against moisture ingress. A method of sealing plywood flooring using a paint on type sealant under tiles and a mortar bed is given in the EWPAA design manual "T&G Structural Plywood for Residential Flooring", however any method that provides a permanent impervious surface over the structural plywood, and that will not deteriorate under the effects of weather and pedestrian traffic, will be suitable. In decks, the exposed plywood edges should also be sealed to prevent moisture ingress. Sealing the edges of the plywood panel is good practice as it prevents moisture uptake through the panel end grain. Provided the plywood panel is preservative treated, the underside or unexposed face of the plywood panel can be left unsealed as this will allow any moisture that does come through the top face or ends of the plywood to escape.

Preservative Treatment

Plywood manufactured to AS/NZS 2269 uses a durable, permanent Type A glue bond to bond the timber veneers. However, the timber veneers themselves may not be durable when used in weather exposed situations. To ensure the full service life of plywood in exposed applications it is usual to preservative treat the plywood against decay. Decks present a particularly severe exposure for timber and finishes, and preservative treatment of structural plywood in exterior decks is strongly recommended even if the plywood is to be covered or sealed with an impervious material.

A wide range of treatments are available including copper chrome arsenate (CCA), light organic solvent preservatives (LOSP's), and the veneer treatments, Ruply and Ammoniacal Copper Quaternary Compounds (ACQ). The level of preservative treatment is specified in AS/NZS 1604.3 -2002 "Specification for preservative treatment, Part 3: Plywood" For above ground, exterior use, the appropriate treatment level specified in AS/NZS 1604.3 is H3 hazard level. When specifying preservative treated plywood, specifiers should be aware that some treatments are envelope type treatments, that is, the outer veneers, edge and ends of the sheet are preservative treated but the preservative may not have penetrated to the middle veneers of the plywood. If the plywood sheet is cut then localised paint on preservative treatment will be required to the cut edge. Other preservative treatment types treat each individual veneer prior to assembly and no further treatment should be required if this type of preservative treated plywood is cut.

Effect of High Moisture Content on Structural Plywood Dimensional Stability Strength and Serviceability

The cross laminated structure of plywood gives it superior dimensional stability to all other timber and wood based panels under changes in moisture content and temperature. The hygroscopic expansion and contraction of plywood with change in moisture content can be determined from Table 1 in the EWPAA design manual "Structural Plywood for Commercial and Industrial Flooring".

If the average moisture content of the plywood is to remain higher than 15 percent over a 12 month period, the Timber Structures Code AS 1720.1 provides reduction factors to be applied to plywood design strength and stiffness capacity. This high average moisture content is unlikely to occur unless water remains trapped in or on the plywood. To avoid having to apply these factors the PAA recommends that the plywood be surface finished to minimise moisture uptake and that all exposed decks be designed and constructed to prevent water from ponding on the deck surface and to allow water to escape so that the deck can dry out after wetting occurs.

Installation

Structural plywood flooring and decking must be installed in accordance with the following recommendations:

1. The face grain of the panel and the tongue and grooved edges, must run parallel to the span i.e. perpendicular to the joists.
2. The end joints must be made on a structural sub-floor member, usually a joist.
3. Each panel must be continuous over more than one span.
4. If square edge structural plywood is used instead of T & G, the side edges must be fixed to a common Hogging running between the joists.
5. Panels should be pushed together lightly by hand, cramping is not recommended.

Additional requirements for decks:

6. All panel joints and edges must be flashed with approved flashing at least 100mm wide firmly bonded over flooring joints and edges with an approved epoxy adhesive. The EWPAA design manual "T&G Structural Plywood for Residential Flooring" provides a number of approved flashings and adhesives in Table 3 on page 6.
7. A fall of at least 20mm in 4m i.e. 1:200, must be provided to allow the plywood deck to drain freely.

Fixings

Full fixing details including fastener specifications are provided in the EWPAA design manual "T&G Structural Plywood for Residential Flooring". For plywood decks the structural plywood must be glued with a structural elastomeric adhesive in addition to screw fixing to the sub floor. (Note: Metal fasteners should be suitable for exterior use and compatible with any preservative treatment used for the plywood, eg stainless steel, hot dip galvanized etc.) The adhesive should be applied to the joists in a 6mm bead. Apply two beads to joists where panels butt together. The panels should be placed in position within 10 minutes of applying the adhesive. Plywood fastener spacings shall be 150mm along panel ends and 300mm along intermediate joists. The panels shall be fully fixed within 15 minutes of placement. Additionally a bead of structural elastic adhesive should be applied to the tongue in the tongue and groove joint.

Tiling

If the plywood deck is to be overlaid with ceramic tiles, consideration must be given to minimising the likelihood of cracking the brittle tiles. For example, in residential type flooring applications, 15mm F11 or 14mm F14 plywood provide equivalent stiffness to 19mm particleboard at 450 joist centres. However, when ceramic tiles are to be overlaid on the plywood deck, a minimum thickness of 17mm F11 plywood or equivalent at 450mm joist centres should be used. Alternatively the bonded mortar bed system detailed for wet area flooring in the EWPAA design manual "T&G Structural Plywood for Residential Flooring" can be used without the necessity of increasing the plywood thickness.

Additional Installation Notes for New Zealand

The following information has been sourced from the document entitled “*Compliance Document for New Zealand Building Code, Clause E2, External Moisture*” which was prepared by the New Zealand Department of Building and Housing.

Moisture

Substrates must be dry when membranes are applied. The plywood and the timber substructure shall have a maximum moisture content of 20% when a membrane is adhered.

This will generally require substrates to be covered to prevent rain wetting, or to be pre-primed to avoid moisture uptake. Manufacturers' recommendations should be consulted, as some require a lower moisture content in order to validate guarantees. Plywood substrates shall be fixed according to the following requirements:

- a) Panels shall be laid with staggered joints (brick bond),
- b) The edge of sheets shall be supported with dwangs or framing, unless a structurally tested tongue-in-groove edge provides equivalent support,
- c) The maximum span shall be 400 mm in each direction,
- d) Plywood shall be laid with the face grain at right angles to the supports,
- e) A 20 mm triangular fillet shall be used at the base of any 90° upstand,
- f) External edges shall be chamfered with a minimum radius of 5 mm, and
- g) Plywood shall be fixed:
 - i) with 10 g x 50 mm stainless steel countersunk head screws,
 - ii) with 3 mm gaps between all sheets,
 - iii) at 150 mm centres on edges, and
 - iv) 200 mm in the body of the sheets.

Closed-in construction spaces under membrane roofs and decks shall have adequate ventilation to prevent the accumulation of moisture under the membrane. There should be a minimum gap of 20 mm between the underside of the substrate and any insulation.

For roof or deck areas over 40 m², roof vents will be required. Roof vents are not covered by this Technical Note.

Butyl and EPDM

Seam tapes shall be used on all joints of:

- a) Roofs or decks with falls less than 5° (1:12),
- b) Gutters or where water could pond,
- c) Penetrations through the membrane where butyl or EPDM flashing is required,
- d) EPDM membrane, and
- e) Butyl membranes that contain EPDM.

Coloured butyl membranes contain EPDM, which makes them more difficult to adhere properly. Seams should be aligned parallel to the fall of the deck to minimise ponding. The use of joins in butyl or EPDM should be avoided in gutters. Where this is not possible, the plywood should be rebated to minimise the effect of the seam.

Where a penetration is made through the membrane subsequent to laying, the flashing should be installed by the applicator of the membrane system.

All joints in the plywood and junctions of plywood with other materials shall have 25 mm polyethylene release tape applied before application of the membrane.

Roof and Deck Drainage

In this section, the Figure references are from the document entitled “*Compliance Document for New Zealand Building Code, Clause E2, External Moisture*” which was prepared by the New Zealand Department of Building and Housing. These figures have been reproduced at the end of this document.

Roofs and decks shall be constructed to provide falls as shown in Figure 56. Roofs and decks shall be constructed so that:

- a) The highest point of the roof or deck is a minimum of 100 mm below an adjoining floor as shown in Figure 56,
- b) Membrane upstands extend to a minimum level of 50 mm above the floor level at all walls or parapets as shown in Figure 62,

This will lead to a minimum total membrane upstand of 150 mm which, if the clearance of the cladding from the deck or roof surface is at the minimum of 35 mm, gives an overlap of 115 mm.

- c) Water discharges either:
 - i) directly into roof outlets with a minimum diameter of 75 mm as shown in Figure 64, or
 - ii) via scupper openings, into a rainwater head, or a gutter with a minimum width of 300 mm as shown in Figure 63,
- d) Where the discharge is through a parapet or enclosed balustrade, the scupper opening shall have a minimum clear opening of 200 mm wide and 75 mm high, with a lip as shown in Figure 63,
- e) External corner upstands in the membrane around the scupper opening are formed as shown in Figure 57, and
Refer to E1/AS1 for specific drainage requirements, as minimum sizes for outlets and gutters may be higher than shown in this Technical Note.
- f) When an internal outlet is used, allowance for additional run-off shall be provided by:
 - i) an overflow in addition to the outlet, or
 - ii) an extra outlet, with both outlets sized to take the full required capacity.

When an overflow is provided in addition to the outlet, a lip to the overflow shall be formed as shown in Figure 63.

Figure 56: Falls in membrane roofs and decks
Paragraphs 8.5.6 and 8.5.6 a)

NOTE: (1) Refer Figure 62 for thresholds and clearances.
(2) Junction *saddle flashing* – refer Figure 13.

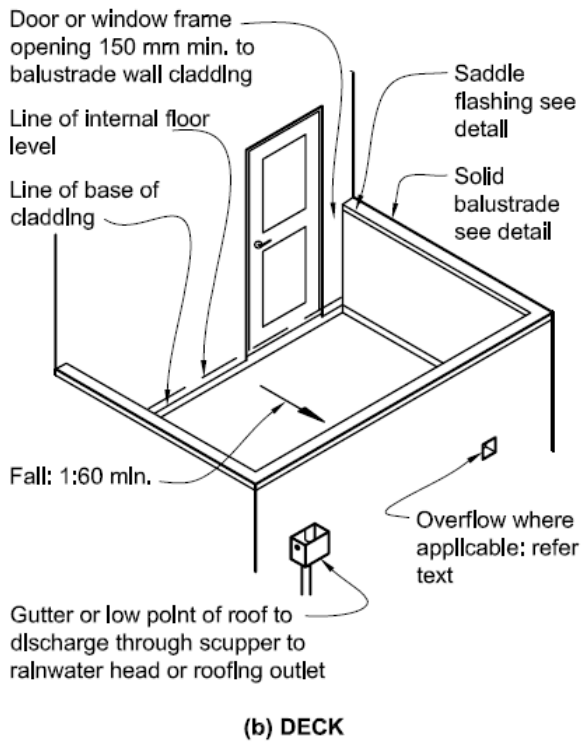
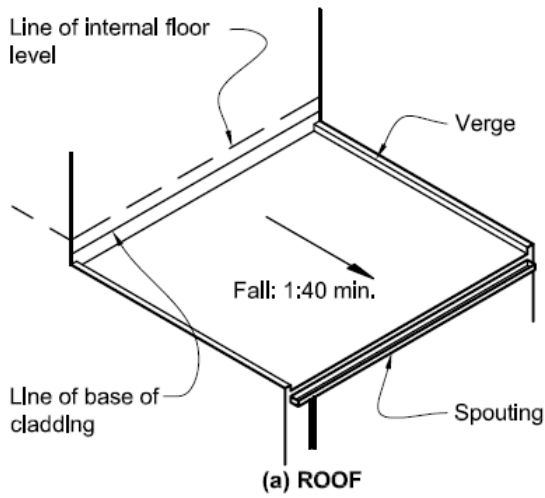


Figure 57: External corner in upstand
Paragraphs 8.5.6 e) and 8.5.8 a),
Figures 59 and 63

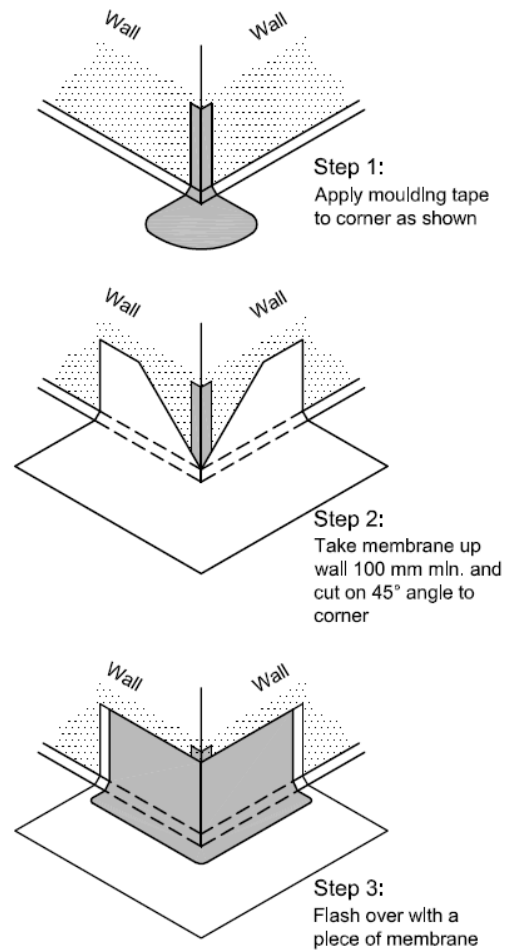


Figure 58: Internal corner in upstand
Paragraph 8.5.8 b), Figure 62

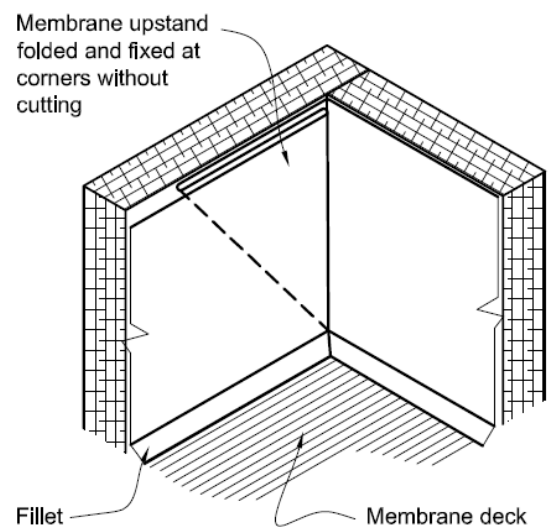
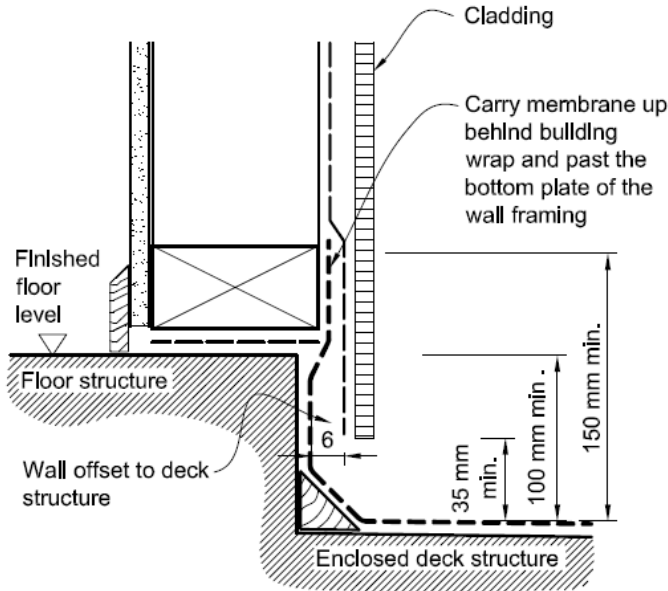
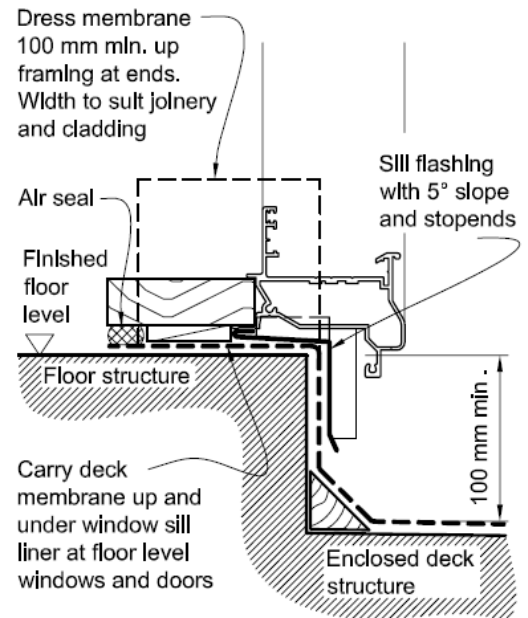


Figure 62: Junctions with walls for membrane
 Paragraphs 7.4.3, 8.5.6 b), 8.5.8 d) and 8.5.8.1

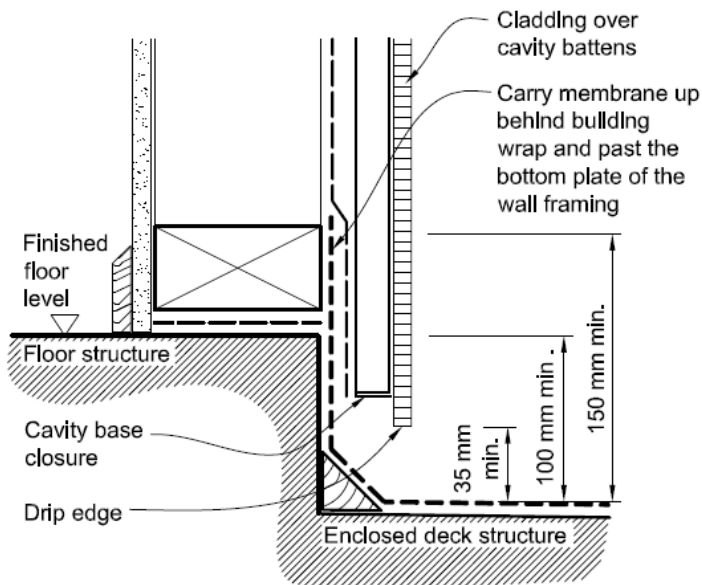
NOTE: (1) Internal corners to be formed as shown in Figure 58.
 (2) Dimensions are shown to *membrane*. However, where there is an additional material applied over the *membrane*, all dimensions shall apply to the highest level of the wearing surface.



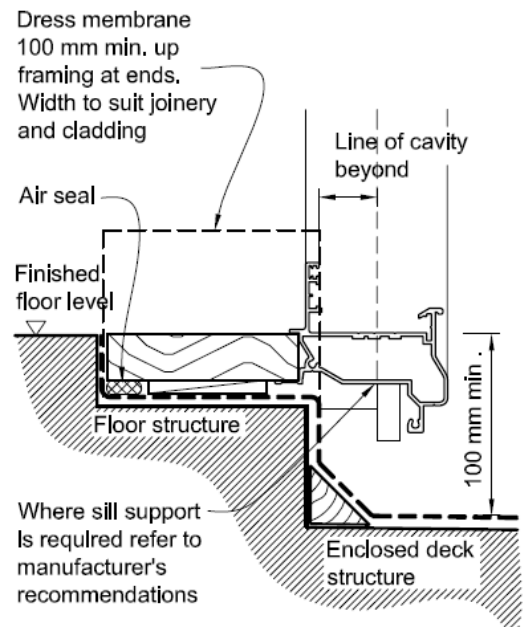
(a) DIRECT FIX THRESHOLD AT WALL



(b) DIRECT FIX THRESHOLD AT OPENING



(c) CAVITY THRESHOLD AT WALL



(d) ALTERNATIVE CAVITY THRESHOLD AT OPENING

Figure 63: Rainwater head and scupper opening in membrane
 Paragraphs 8.5.6 d) and f)

NOTE: (1) A preformed *scupper* unit may be used, but this will require *specific design*.
 (2) External corners of *scupper* opening to be formed as shown in Figure 57.

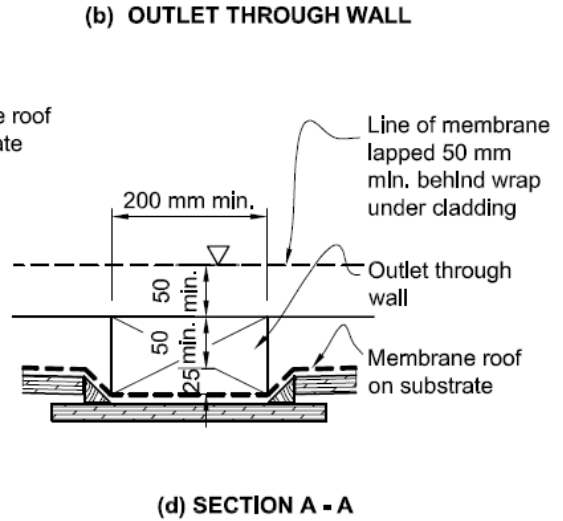
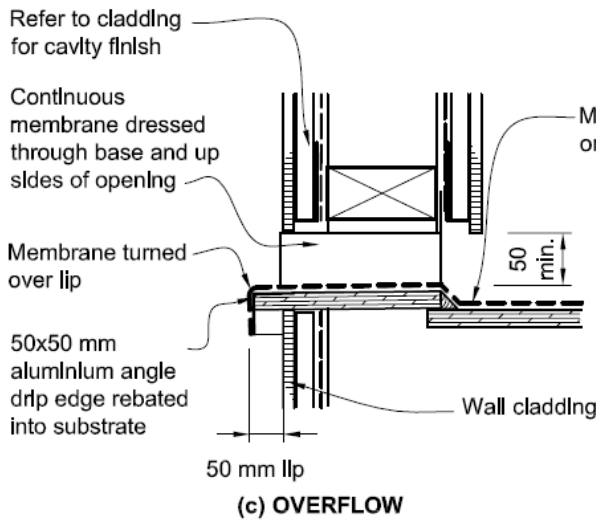
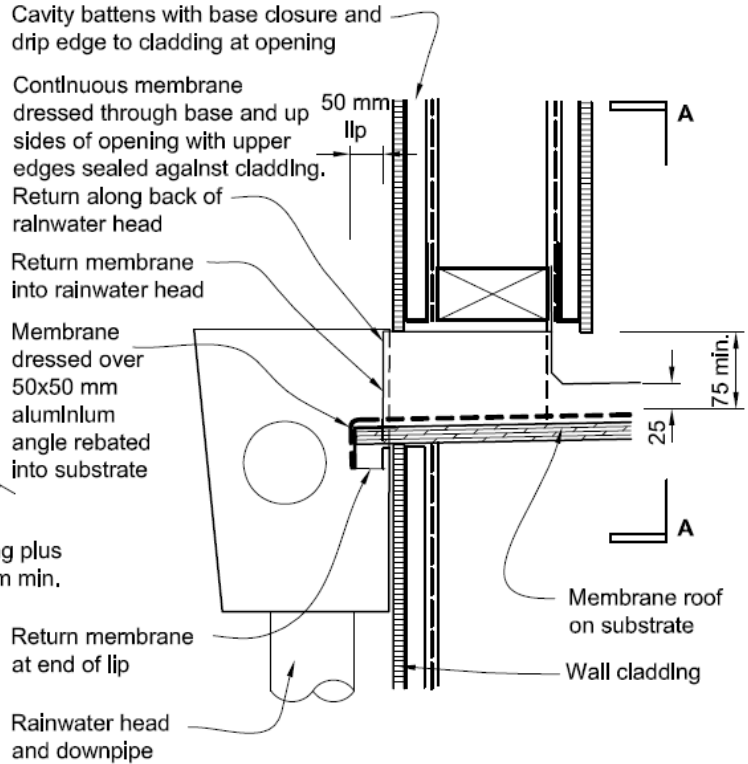
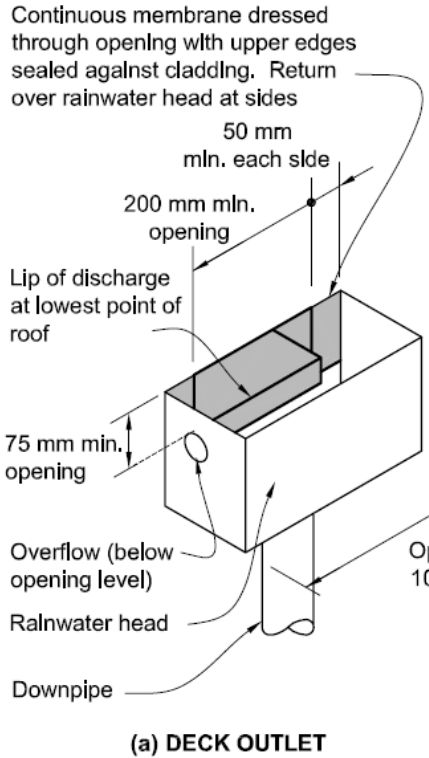
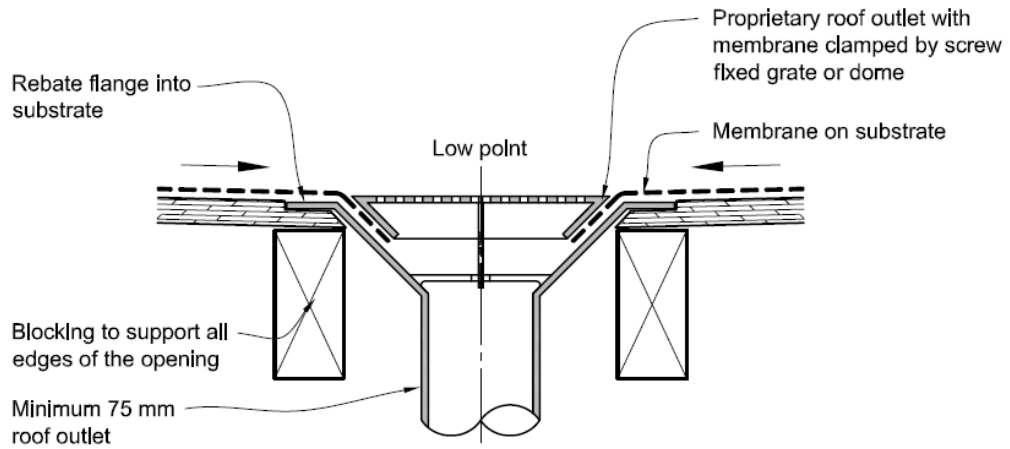
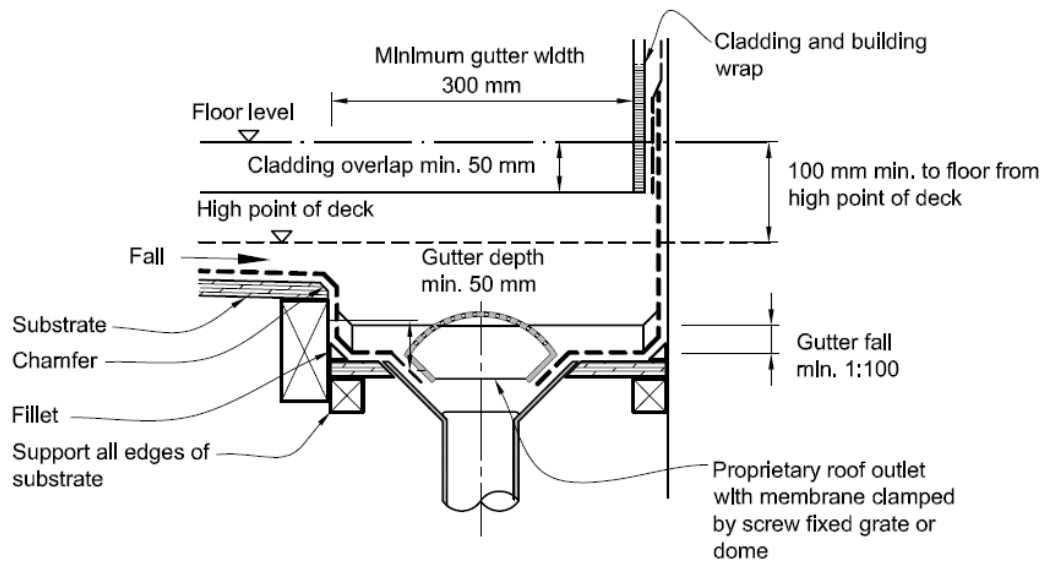


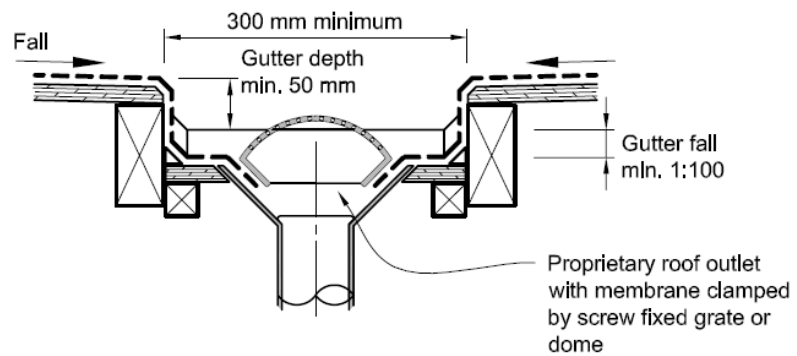
Figure 64: Gutters and outlets in membrane
 Paragraphs 8.5.6 c) and 8.5.10



(a) TYPICAL GUTTER OUTLET



(b) EDGE GUTTER



(c) CENTRAL GUTTER

Revision History

Revision	Changes	Date	Who
4	Update formatting to standard Technical note format	05-12-2011	MB
3	Further formatting and spelling corrections. Change in PAA name to EWPAA and associated references	27-03-2008	BL
2	General Formatting update Included section on NZ requirements.	03-05-2007	MB
1	Initial Release	01-05-1997	LP