DECK DRAINAGE DESIGN

Deck drainage relies on several crucial design and construction requirements for effective performance. In this article, we focus on the key requirements for decks up to 40 m² in size.

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Waterproof decks with a membrane surface over an interior or exterior space have a high risk of weathertightness failure. This risk increases when solid balustrades fully enclose the deck area so that it contains any water. Failure often results in water entering the building assemblies and interior.

The design of waterproof decks involves the consideration of:

- selection of the membrane and its substrate
- substrate installation quality
- membrane transitions
- upstands and joints
- junctions with claddings
- drainage system
- provision of a trafficable surface.

This article discusses the drainage system design, which needs to effectively collect often substantial amounts of rainwater and drain it into a stormwater disposal system.

E2/AS1 for decks up to 40 m²

The size of the catchment area of the deck is important for drainage design. Generally, waterproof decks should be kept to a maximum size of 40 m² – the maximum allowed when E2/AS1 is used as a means of Building Code compliance.

Where designing decks larger than 40 m², consider increasing the fall of the deck surface to ensure sufficient runoff and increasing the number of outlets, overflows and size of gutters to suit the calculated discharge.

The focus of this article is the design of drainage for decks up to 40 m² in size.

3° fall recommended

A key factor in deck design is having sufficient fall across the deck’s waterproof surface for surface water to be quickly removed (see Figure 1).

E2/AS1 requires a minimum fall of 1:60 (1°) across the waterproof surface. However, building to achieve a 1° fall is difficult, so BRANZ recommends a minimum fall of 3°. With 3°, any inconsistency in construction or sag in the structure should not compromise the drainage.

An increase in fall may be noticeable when walking on the deck, but this can be overcome by installing a removable deck raft as a level trafficable surface above the deck membrane.

No deflection or sagging in structure

With all membrane decks, it is important that the substrate is well supported to ensure a consistent fall across the deck surface and no deflection or sagging between supports that may cause ponding or slow drainage and drying.

Reducing the spans of the framing by 25% for a given joist size is one way of minimising the deflection or sagging risk.

Open-sided waterproof decks

Waterproof decks with open balustrades pose less of a drainage problem than fully enclosed decks. The deck membrane should be supported by a substrate set to fall towards the external edge of the deck. Ensure a minimum set down of 100 mm from the interior floor level of the building to the highest point on the deck membrane surface.

At the external edges, the waterproof membrane needs to be turned down and terminated to form a drip edge 50 mm beyond the face of any cladding. An external gutter is then installed along the entire length of the lowest side of the deck (the side that the water is falling towards), to collect water that will drain off the edge. The gutter needs sufficient flow.

Figure 1: Key drainage design parameters.
capacity for the deck area and with fall to a 
drainage downpipe connected to the stormwater 
disposal system.

The deck is typically open on two or three 
sides so excess water can discharge over the 
sides of the deck or overflow from the external 
gutter during extreme weather conditions.

Enclosed waterproof decks

Waterproof decks fully enclosed with a solid 
balustrade rely on internal gutter systems to 
collect and discharge rainwater, sometimes 
under extreme conditions.

RAINFALL INTENSITIES

It is recommended that design rainfall intensity 
is doubled for the locality of the building (used 
in the calculation of the drainage load) when 
the deck surface is fully enclosed, for example, 
for designing internal gutters. See E1/AS1 for 
design rainfall intensities.

GUTTER LOCATION AND SIZE

Construct the deck membrane to fall towards 
the internal gutter. The gutter must be located 
to collect water from the entire deck surface, 
and the fall in the deck needs to be constructed 
so the entire surface drains towards the gutter.

The gutter may be located along one edge of 
the deck (see Figure 1) or in the centre, with the 
deck falling from two directions – away from the 
building and from the opposite direction at the 
same slope towards the central gutter. Falling 
from two directions reduces the level difference 
between the highest and lowest point on the 
deck surface.

The gutter, formed internally into the surface 
of the deck with the deck membrane, needs to 
be a minimum width of 300 mm and a 
minimum depth of 50 mm. The internal gutter 
can either drain into a vertical internal outlet 
pipe or horizontally via a scupper through the 
solid balustrade into an external rainwater 
head. In either case, the gutter needs to have 
a minimum fall of 1:60 (from E2/AS1) towards 
the outlet point.

OUTLET PIPE DETAILS

A minimum of two outlets (each with an 
overflow) is considered good design practice for 
enclosed decks – if one blocks, the other should 
still operate. This may seem excessive, but it 
provides drainage capacity to deal with even 
extreme weather events.

Where the gutter discharges into an outlet 
pipe, the pipe needs to be dressed into the sole 
of the gutter ensuring a waterproof junction 
between the pipe and the gutter membrane. 
The pipe should be a minimum diameter of 
75 mm (suitable capacity for a 100 m² deck 
with a rainfall intensity of 200 mm per hour) – 
more than adequate drainage for a 40 m² deck. 
The opening of the pipe should be protected 
to prevent blockage and be connected to a 
stormwater disposal system.

If the pipe is to be concealed within a wall 
of the building, it must be fully sealed and 
pressure tested before enclosure.

Where an outlet pipe is used, allow for 
additional rainwater disposal with an overflow 
pipe sized the same as the outlet, capable of 
managing the full drainage capacity. An overflow 
can be installed as a scupper type outlet pipe, 
terminating 50 mm beyond the face of the 
balustrade cladding and with the maximum 
flood level at least 50 mm below floor level.

SCUPPER AND RAINWATER HEAD DECK 
DRAINAGE

When the internal gutter discharges through a 
scupper formed through the solid balustrade, 
the scupper opening needs to be a minimum 
width of 200 mm and a minimum height of 
75 mm. (A 300 mm wide × 100 mm high outlet 
is significantly easier to construct when formed 
on site in membrane and has a reduced risk 
of being blocked.) The scupper can be formed 
with a proprietary outlet and membrane or from 
membrane only. Watertight junctions are the 
key between the gutter and deck membrane and 
the scupper outlet, and the balustrade cladding 
where the scupper penetrates.

The scupper needs to incorporate a 50 mm 
discharge lip that forms a drip edge that ensures 
the efficient drainage of water off the edge into 
the rainwater head.

The rainwater head should be sized 100 mm 
wider than the scupper outlet width (50 mm 
each side) and be drained by a downpipe – 
both the downpipe and the rainwater head need 
to be of sufficient capacity for the calculated 
discharge. The opening of the downpipe should 
be protected to prevent blockage and be 
connected to a stormwater disposal system.

The rainwater head needs an overflow outlet 
positioned below the outlet level of the scupper, 
sized so excess water will drain from the overflow 
preventing the rainwater head filling beyond the 
scupper outlet level.

When using a scupper and rainwater head 
system for enclosed deck drainage, consider 
a scupper overflow pipe as extra protection. 
This is similar to having an outlet pipe for deck 
drainage.

EXTRA CAPACITY EQUALS EXTRA PROTECTION

Good design practice for enclosed waterproof 
decks less than 40 m² includes:

- providing more drainage outlets than 
  required, with a minimum of two – this 
  ensures that there is extra capacity for 
  extreme weather events
- increasing the fall beyond the 1:60 require-
  ment – while this may be enough to ensure 
  deck drainage occurs, an increase in fall 
  will enhance deck water runoff in extreme 
  conditions.

There are other key aspects of waterproof deck 
design to consider for a watertight assembly, 
but following these basic deck drainage design 
principles will ensure water falling on the deck is 
efficiently collected and discharged.

BRANZ Bulletin 509 Sizing gutters and 
downpipes may be of interest.