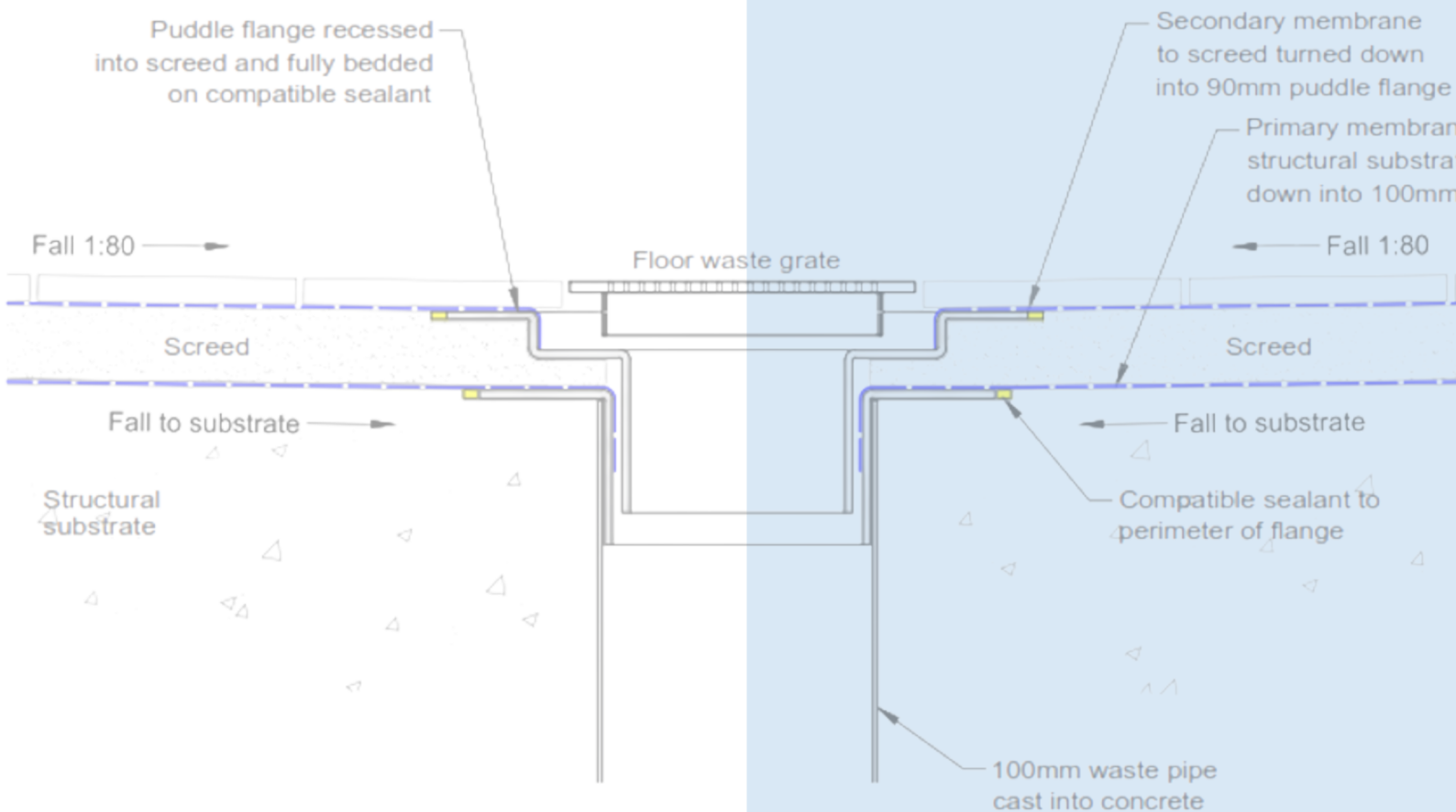




**Master
Builders
Association**

New South Wales



**De"myth"ifying
Clause 4.2 of
AS 3740:2021
Waterproofing of
domestic wet areas**

**Is a dual
waterproofing
membrane system
(above and below a
screed) permissible?**

Author: Sam Parker

Summary

This article aims to clear up confusion in the construction industry about whether using two waterproofing membranes (above and below a screed) is allowed under AS 3740:2021 (Waterproofing of domestic wet areas) and the National Construction Code (NCC).

Key Takeaways

- Yes, dual waterproofing membranes are compliant with AS 3740:2021 if installed correctly.
- The standard does not prohibit using both an above- and below-screed membrane.
- Concerns about trapping water in the screed are unfounded, as water naturally drains when correct waterproofing principles are applied.
- Misinterpretation of the wording in Clause 4.2 has led to confusion about whether "or" means "one or the other" or "both" – in reality, it does not restrict the use of both.

Preface

This article addresses confusion in the construction industry regarding the compliance of dual waterproofing membrane systems - specifically, the installation of membranes both above and below a tile screed. It has been incorrectly argued that such systems are non-compliant with the provisions of **AS 3740:2021 Waterproofing of domestic wet areas**, particularly Clause 4.2, and Part 10.2 of the ABCB Housing provisions.

The purpose of this article is to clarify that a compliant dual membrane system is indeed achievable. It outlines the reasoning and methodology for ensuring compliance, dispels common misconceptions, and demonstrates how a properly designed system aligns with the intent of AS 3740:2021 and the National Construction Code (NCC). The article also introduces detailed drawings of the double flange system, which enables compliance while ensuring adequate drainage of the screed.

Authored by Sam Parker and reviewed by Stan Giaouris, Master Builders Waterproofing Technical Committee, this article is a comprehensive exploration of the topic. It provides valuable insights for builders, designers, and waterproofing professionals and serves as a teaser for the updated **Master Builders Association of NSW Waterproofing Technical Guide - Book 1 for Internal Bathrooms**, due to be released in 2025.

Builders can now confidently implement a compliant dual membrane system that satisfies the Deemed To Satisfy (DTS) provisions of the NCC and AS 3740:2021, making sure the durability and effectiveness of waterproofing installations are achieved while addressing industry concerns.

Contributors:

- Sam Parker
- Stan Giaouris
- David Solomon
- NSW Master Builders Waterproofing Technical Committee

1. General

The purpose of this paper is to show that under the correct set of conditions, it is permissible from compliance and "waterproofing-principles" points of view, to install a dual membrane system contemporaneously above and below a screed.

The common reasons used to allege that a dual membrane system is a deviation from (DTS) provisions in the NCC will be challenged using critical thinking.

The paper does not set-out to promote dual membrane systems. Nor does it intend to explore whether it is better to install a single membrane system rather than dual membrane system. This is because each methodology has its advantages, depending on context.

2. The Arguments against using a dual membrane system

Arguably, the most popular reasons used to champion the notion that dual membrane systems in wet areas do not comply with DTS provisions include:

- A. That the wording in AS3740:2021, Clause 4.2 - Membrane installation for screed or tile bed, expressly precludes adoption of dual membrane systems.
- B. That one cannot seal the above-screed drainage flange to the riser when installing a dual membrane system. Consequently, this is said to contravene AS3500:2020 Plumbing and drainage standards and AS3740:2021.
- C. That dual membrane systems trap water in the screed.

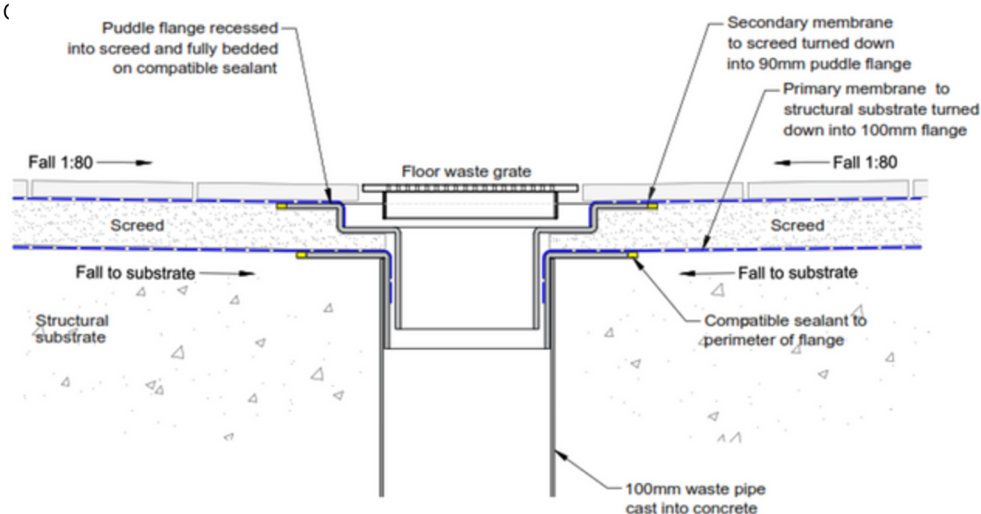
Proponents who hold the view that dual membrane systems are not compliant with DTS provisions claim that it is only possible to adopt a dual membrane system if a suitable Performance Solution has been prepared in accordance with the Australian Building Codes Board publication (ABCB): "Performance Solution Process – Guidance Document".

These points will be addressed in the discussion below.

For consistency, and as identified in Part "10.2 of the ABCB Housing provisions, the term "drainage flange" has been used within this document to describe:

- Puddle flange;
- Drainage flange (AS3740:2021); and
- Leak control flange (AS3740:2021)

An example of



vided below:

3. The wording in Clause 4.2 of AS3740:2021 precludes dual membranes systems

Clause 4.2 states (verbatim)

4.2 Membrane installation for tile bed or screed

Where a tile bed or screed is used, the waterproof membrane shall be installed above or below the tile bed or screed. NOTE 1 Some figures in this section illustrate the membrane below the tile bed or screed; however, where applicable, the membrane may be installed above the tile bed or screed.

NOTE 2 The figures in this document show the membrane applied to flat substrates for illustrative purposes only and are not intended to replace the provisions of Clause 2.3.1.

Myth A:

In Clause 4.2 of AS3740:2021, the use of the word "or" between the words "tile bed" and "screed" dictates that the membrane can only exist in one of the two locations and not both locations simultaneously. If a dual membranesystem was permissible, then the Standard would have clarified to the reader that "or" can also mean "and".

The rebuttal (part A.1):

Many of the requirements and intended outcomes which could be considered ambiguous as per the previous editions of the Standard have been carried through to the current edition.

Noting, that Standards Australia does not permit the use of "and/or" in normative statements within Standards.

The intent of the Standard is articulated in its Preface, where it states (verbatim):

The role of waterproofing is to install waterproofing systems as a combination of waterproof and water-resistant materials in order to retain water within the designated wet area and exclude waterfrom non-water-resistant building elements. It is intended that water be managed to an outfall at surface and substrate. Systems are intended to accommodate expected service conditions of the wet area to prevent damage by water and accumulated moisture to building elements.

Let us critique each of these three sentences, starting with the first:

"The role of waterproofing is to install waterproofing systems as a combination of waterproof and water-resistant materials in order to retain water within the designated wet area and exclude waterfrom non-water-resistant building elements."

One can test whether the intent of the sentence is upheld where a dual membrane system has been used by asking the question: By installing a dual membrane system in a wet area, is one prevented from retaining water within the designed wet area and is one prevented from excluding water from non-water resistant building elements?

The answer is unequivocally "No". Accordingly, a dual membrane system does not contravene, and therefore satisfies, the intent of the first sentence.

Moving now to the second sentence. It requires:

"... that water be managed to an outfall at surface and substrate".

By installing a dual membrane system in a wet area, is one prevented from capturing and directing water to an outfall at surface and substrate?

The answer again is "No". The intent of the second sentence can be satisfied if appropriate waterproofing design principles are adopted into the waterproofing solution. Refer to the discussion related to Myths B and C where further detail is provided on this point.

Lastly, looking at the third sentence, it requires:

"...accommodation of expected service conditions of the wet area to prevent damage by water and accumulated moisture to building elements."

By installing a dual membrane system in a wet area, is one prevented from accommodating expected service conditions of the wet area so that it prevents damage by water and accumulated moisture to building elements?

The answer again is "No". The intent of the third sentence can be satisfied if appropriate waterproofing design principles are adopted in the waterproofing solution. Refer to the discussion related to Myths B and C where further detail is provided on this point.

The rebuttal (part A.2):

It is useful to agree on the meaning of the terms "screed" and "tile bed". AS3740:2021, Clause "1.3.27 defines "screed" as being (verbatim):

layer of material, usually cement based, which sets in situ and which may be interposed between the structural base and the bedded finish.

Where used, screeds are typically installed on a structural floor to create (or maintain) falls and provide an acceptably flat finish for tiles (or other finishes) to be adhered to the composite floor build-up. AS3740:2021 does not define "tile bed". Nevertheless, a tile bed is understood to be either the adhesive placed on top of the screed to bond the tiles, the screed itself, or a combination of both.

It is currently common practice in the construction industry for a tiled floor build-up in a wet area to have a screed and a tile bed at the same time. For example, if a waterproof membrane was installed on top of the screed only, a floor build-up would look something like:

- Structural floor, then screed, then membrane, then adhesive (that is, tile bed), then tiles and grout.

On the other hand, if the waterproof membrane was installed below the screed only, then the system would look something like:

- Structural floor, then membrane, then screed and adhesive (that is, tile bed), then tiles and grout.

In both examples, the membrane exists in one location only, but both a screed and a tile bed exist at the same time.

In context of the aforementioned floor build-up examples, let us look once again at the words in Clause AS 3740:2021 4.2. States the following (verbatim):

Where a tile bed or screed is used, the waterproof membrane shall be installed above or below the tile bed or screed.

If the words (verbatim): "the membrane shall be installed above or below"

means that the membrane can only exist at one of the two locations but not both at the same time, then for consistency, the two occurrences of the phrase "a tile bed or screed" must also mean that only a tile bed can exist or only a screed can exist, but both cannot exist at the same time in a floor build-up.

Contrary to this however, the construction industry reads the word "or" in the phrase "tile bed or screed" as being "and/or" and not just "or" because both tile bed and screed often exists in a floor build-up.

If "and/or" applies to the "or's" between "tile bed" and "screed", then for consistency, it must also be applied to the "or" between "above" and "below".

That is, AS 3740:2021 Clause 4.2 reads:

"Where a tile bed and/or screed is used, the waterproof membrane shall be installed above and/or below the tile bed and/or screed".

It follows that a membrane installed both above and below screed does not deviate from Part 10.2 of the ABCB Housing provisions nor AS3740:2021.

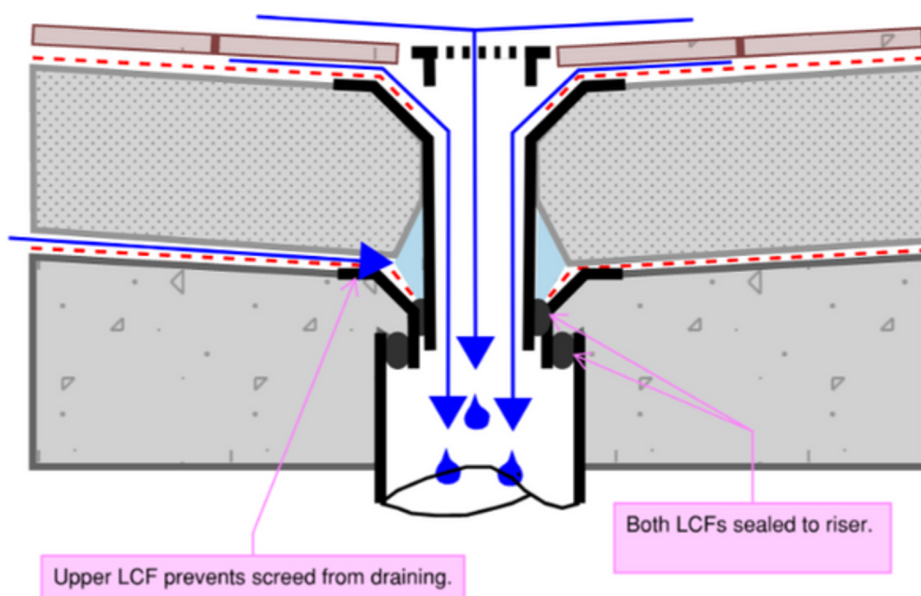
4. Dual membrane systems prevent the drainage flange from being sealed to the riser

Myth B:

AS3740:2021 requires that the membrane system laps onto the drainage flange. Furthermore, AS3500.2: 2020 and AS3740:2021 require that the drainage flange must be sealed to the riser. In a dual membrane system, there are two drainage flanges (one above the screed and one below the screed, at structural floor level).

While it is possible to lap the membranes above and below the screed to the drainage flanges above and below the screed, respectively, it is only possible to seal one of the two drainage flanges to the riser because sealing both will prevent water in the screed from draining. However, AS3500.2:2020 and AS3740:2021 require both drainage flanges to be sealed to the riser and hence there is a deviation from Part 10.2 of the ABCB Housing provisions DTS provisions and AS3740:2021. Furthermore, this construction methodology does not adequately address the risk of surcharge backflow.

The premise of the myth is shown figuratively below:



The rebuttal (part B.1):

Contrary to the petitio principii, AS3500.2:2020 does not specify a type of connection to risers for floor wastes or floor flanges. Clause 2.8.2 of AS3500.2:2020 does however cover elastomeric seals. It states: *"Where an elastomeric seal gasket is provided in the line or in a fitting, it shall not be replaced with mastic or sealant compounds"*. This is far from saying that drainage flanges must be "sealed" to the riser.

AS3500.2:2018 does cross reference AS2887:1993 (Plastic waste fittings) and AS1589:2001 (copper and alloy waste fittings). Clauses 1.6.2 to 1.6.10 of AS2887:1993 provides guidance on typical plumbing joints, and they include: plain spigot end, solvent cement socket end, threaded end, loose nut union end, compression union end, tapered spigot end, rubber ring joint end, mortar joint end, and leak by-pass joint end (which the authors of AS 3740 refer to the term leak control flange).

Nowhere does it state that the drainage flange must be "sealed" to the riser. Even if it did, sealing the bottom drainage flange to the riser would satisfy such a hypothetical requirement.

There are also of course drainage flange systems available on the market that contain perforations (drainageholes) in the sleeve of the drainage flange. This feature allows the above screed drainage flange to be sealed to the riser and allows drainage of the screed, if required.

It is noteworthy to highlight that sealing to a riser is primarily focused on preventing backflow (in the case of surcharge). Backflow is mainly considered in vacuum soil fixtures and for hazard prevention on the water-supply side. It is not a big focus for drainage.

The rebuttal (part B.2):

It is acknowledged that Clause 4.3.1.(b) of AS3740 requires that the drainage flange be sealed to the riser. The clause states:

Leak control flanges shall be sealed to the riser

Let us consider two scenarios:

Scenario 1, where a membrane is only installed below the screed level. In this scenario there is a single membrane system and the drainage flange below the screed is sealed to the riser, but the drainage flange above the screed is not sealed to the riser. It has to be agreed that this scenario is contemplated and accepted in AS3740:2021 no matter how one chooses to interpret Clause 4.2. The floor build-up is:

- Structural floor, membrane, screed, adhesive (that is, the tile bed), tiles and grout

Scenario 2, where a dual membrane system is installed. In this scenario, the drainage flange below the screed is sealed to the riser but the drainage flange above the screed is not sealed to the riser. The floor build-up is:

- Structural floor, membrane, screed, membrane, adhesive (that is, the tile bed), tiles and grout



Puddle Flanges installed Flush into screed. Membrane installed above screed

In essence, there is no difference in the floor build-up between scenarios 1 and 2, save that the latter has an additional membrane layer introduced above the screed.

In the first scenario, any floor build-up layers above the membrane may be affected by backflow. This is also the case for scenario two. Therefore, neither scenario mitigates the risk caused by potential backflow more than the other. Furthermore, from a functional point of view, both scenarios allow water below screed level to drain to the outlet.

It follows that a dual membrane system satisfies the intent of Clause 4.2 of AS3740:2021.

5. Dual membrane systems trap water in the screed Myth C:

A dual membrane system will/can cause water to be trapped in the screed because: (i) the upper drainage flange is not sealed to the riser; and (ii) the trapped water will consequently become sandwiched between two layers of waterproofing which will cause the screed to become saturated and consequently cause the membrane above the screed to fail due to it being exposed to negative vapour pressure.

The rebuttal:

Let us consider an example of a shower recess in a family bathroom that is used multiple times a day by household members. Let us further assume that the shower recess only has one membrane below the screed. This, as we have stated below, is permitted in AS3740:2021 no matter how one chooses to interpret the word "or" in Clause 4.2.

In this example, the screed will always be in a state of full saturation (that is, "100% relative humidity (RH)) due to frequent use of the shower.

Let us now compare this to the example of a dual membrane system. One could argue that the screed in a dual membrane system is likely to be dryer than in the case where a membrane is installed below the membrane only. For interest's sake only however, let us assume that the screed becomes saturated. In this scenario, the screed can only saturate to its maximum "100% RH.

Therefore, there is no difference in the saturation level of the screed whether one considers example one or example two.

As to the allegation that a second membrane above the screed will inherently fail due to being exposed to negative pressure, there is little evidence to support this claim. If it does occur, the cause is usually due to improper installation practices, and it is undeniable that all membrane systems, whether single or double, have unwanted consequences if the waterproofing has been poorly designed and/or installed.

Nevertheless, it can be considered prudent to install a membrane system which is more tolerant to elevated moisture levels (for example by using water-based epoxies as a primer prior to the membrane layer in the waterproofing system). Doing so reduces the perceived risk caused by induced elevated moisture in the screed.

In summary, a dual membrane system satisfies the intent of Clause 4.2 of AS3740.

6. Final Comments

Waterproofing, in all cases, should be designed and installed by those who are qualified, licenced and registered.

If dual membrane systems are adopted on projects stakeholders/interested parties need to ensure that:

- Correct falls are maintained at both planes (above and below screed);
- The lower drainage flange must be sealed to the riser and the upper drainage flange must not be sealed to the riser. Or that both drainage flanges must be sealed to the riser as long as the upper drainage flange has drainage holes in its sleeve to provide reserve capability for the screed to drain; and
- A waterproofing system which is more tolerant to elevated moisture levels should be used above the screed.

A floor build-up which includes a properly designed and installed dual membrane system does not contravene AS3740:2021.

The principles of fluid dynamics and physics do not support the notion that a properly designed and installed dual membrane system will cause premature failure.

A correctly designed and installed dual membrane system fully meets the intent of AS 3740:2021. As it aligns with the standard without deviation, nor does it breach Part 10.2 of the ABCB Housing Provisions or the NCC, and therefore does not require a Performance Solution.