

# Tekton Consulting

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## RT7<sup>®</sup> Roof and Wall Claddings

### Compliance with the Building Code for E2 External Moisture

#### Executive Summary

This report presents arguments supporting the use of **RT7<sup>®</sup>** profile as roofing and vertically and horizontally fixed wall cladding complying with the requirements of the Building Code regarding E2 External Moisture.

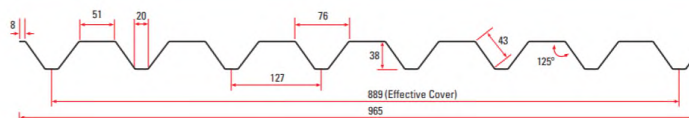
## Background

RT7® is an asymmetric trapezoidal profile roofing and wall cladding.

**RT7 (Roofing and Wall Cladding)**  
Dimensioned Drawing of RT7  
(Manufactured at Taupo and Palmerston North)



**RT7 Reverse Run**  
Dimensioned Drawings of RT7 Reverse Run  
(For wall cladding only)



Acceptable Solution E2/AS1 provides for asymmetric trapezoidal profile roofing with a minimum crest height of 19 mm with a pan width of 210 mm maximum between crests.

It also provides for asymmetric trapezoidal profile to be used as wall cladding when direct fixed horizontally over a drained and ventilated cavity (up to and including Risk Score 20). It does not provide for vertical fixing on cavity<sup>1</sup>.

Acceptable Solution E2/AS1 does not provide for metal cladding of asymmetric trapezoidal profile to be direct fixed as wall cladding.

Compliance with the Building code Clause E2 External Moisture for different profiles and use in alternative applications requires analysis of the profile and its use in those applications.

### RT7RT7® profile and Acceptable Solution E2/AS1

Acceptable Solution E2/AS1 covers a range of profiles:

#### 8.4.4 Profiles

Profiles covered in this Acceptable Solution are shown in Figure 38, and consist of:

- Corrugated** – curved with a crest height of 16.5 mm minimum,
- Trapezoidal** – symmetrical or asymmetrical with a minimum crest height of 19 mm, and for asymmetrical a flat or lightly profiled pan width of 210 mm maximum between crests, and
- Trough profile** – with vertical ribs at a minimum height of 38 mm, and flat or lightly profiled pans of 210 mm maximum between crests

E2/AS1 para 8.4.4	RT7®	
minimum crest height of 19 mm	38 mm	Complies
Maximum crest spacing of 210 mm	127 mm	Complies

<sup>1</sup> Vertical fixing on cavity is not provided for because solid cavity battens would potentially compromise the ventilation and drainage of the cavity. However, using castellated battens (as an alternative solution) overcomes this and is widely accepted.

It also applies to particular grades of material:

**8.4.3.2 Steel**

Materials for the manufacture of profiled steel roof cladding shall:

- a) have a BMT of 0.4 mm minimum
- b) be grade G550, or G300 for rolled, crimped, or trough profile roofing
- c) be selected for corrosion protection according to the intended exposure zone as shown in E2/AS1 Table 20.

(The same requirements are repeated for profiled steel cladding, in para 9.6.3.2)

<b>E2/AS1 paras 8.4.3.2/9.6.3.2</b>	<b>RT7®</b>	
BMT 0.4 mm minimum	0.40 or 0.55 mm	Complies
Grade G550 or G300	G550	Complies
be selected for corrosion protection according to the intended exposure zone.....	Various coating options available.	Complies

The **RT7®** profile meets the characteristics specified in E2/AS1 in all respects for roofing and when used within the limitations of E2/AS1 it complies with E2 External Moisture.

This report also examines how compliance with performance requirements of clause E2 External Moisture of the Building Code could be argued for **RT7®** as an alternative solution for use as wall cladding.

The relevant Building Code requirement is cl E2.3.2:

E2.3.2 Roofs and exterior walls must prevent the penetration of water that could cause undue dampness, damage to building elements, or both.

**Analysis**

**Roofing**

For roofing, the acceptable solution E2/AS1 provides for trapezoidal profile roofing limited to those with a minimum crest height of 19 mm and a maximum crest spacing of 210 mm. It provides for trapezoidal profiles on a minimum roof pitch of 3 degrees where the crest height is 27 mm or greater (as is **RT7®**).

The **RT7®** profile meets the characteristics specified in E2/AS1 in all respects.

**Wall Cladding**

Acceptable Solution E2/AS1 provides for metal cladding of asymmetric trapezoidal profile in the following situations:

	Direct Fixed	On cavity
Horizontal fixing	No	Yes (Risk score 0-20)
Vertical fixing	No	No*

\*Using castellated battens (as an alternative solution) is widely accepted.

The Acceptable Solution provides for trapezoidal profile to be used fixed horizontally on cavity.

The Acceptable Solution differentiates risk based on the trapezoidal profile. It differentiates between trapezoidal (which provide for a flat area in contact at the point of fixing) and corrugated profiles, also between symmetrical and asymmetrical trapezoidal profiles.

This analysis compares **RT7®** with the characteristics of corrugated with respect to the building physics behind these profiles installed vertically directly to the framing as wall cladding.

It considers

- comparative likelihood of ingress of external moisture
- mechanisms for drainage and ventilation
- the characteristics of underlay between the profile and timber framing

### **Ingress of moisture behind the cladding:**

The asymmetrical **RT7®** profile is no more likely to allow penetration of external moisture than a corrugated profile. Penetration can be considered under three scenarios:

Penetrations – such as windows etc. Flashing details etc are no more complex for **RT7®** than they are for corrugated.

Profile sidelaps – this can be discounted as the channels do not run with any significant depth of water (unlike, potentially, a roofing application). The capillary break incorporated in the side lap provides a drainage path down the lap joint for moisture before it can track to the reverse side of the profile. There is no technical difference between **RT7®** and corrugated with respect to sidelaps.

Fixings – wall claddings are typically fixed through the pan of the profile. The fixings specified for **RT7®** are TEKs with neos which incorporate a seal between the head of the fixing and the face of the profile, to prevent moisture tracking through the fixing penetration.

There is no reason to believe **RT7®** is any more likely to allow the ingress of external moisture than corrugate, which is allowed as an acceptable solution.

### **Mechanisms for drainage and ventilation**

Ventilation and drainage generally are provided by the cavities formed by the **RT7®** profile. The cross-sectional area of each void formed by the profile against underlay or RAB is approximately 1625 mm<sup>2</sup>, compared with a void of 685mm<sup>2</sup> for a standard corrugated profile. So **RT7®** provides drainage and ventilation at least as good as a standard corrugated profile.

### **Characteristics of the Cladding/Fixing interface**

When a profile is direct fixed there is direct contact between the profile and the building underlay or RAB. The area of this contact is greater for a trapezoidal profile than it is for a corrugate profile.

There is also direct contact between the underlay and the fixing framing.

So the issue is whether moisture is likely to migrate to and be retained within the underlay or RAB where the profile is fixed to the framing, and what the effect of that moisture would be.

Ideally, the underlay/RAB should a) have a high resistance to liquid water – to minimise passage of liquid water through the underlay, and b) be highly permeable to water vapour – to facilitate the diffusion of water from the underlay over time, minimising moisture gain by the fixing framing timbers.

NZS2295 provides some insights into the appropriate characteristics of underlays. For direct fixing non-absorbent cladding on timber it specifies Type W2 (Heavy Kraft) or W4 (Absorbent Synthetic) underlay. It does not limit the “non-absorbent cladding” to any particular profile, and **RT7®** would be classified as this.

The relevant requirements of NZS2295 for wall and roofing underlays are tabulated below:

Property	Wall Underlay	Roof Underlay
Water vapour resistance	7 MN s/g or less	Kraft: 7 MN s/g or less Synthetic: 0.5 MN s/g or less
Resistance to water penetration	20mm or greater	100mm or greater
Absorbency	100g/m <sup>2</sup> or greater	150g/m <sup>2</sup> or greater

The high permeability to water vapour and high resistance to liquid water are met by these specifications and provide mitigation of any risk to fixing timbers should water pass through the metal wall cladding.

The parameters of underlays relevant to the management of external moisture are more critical for roofing underlay than for wall underlay, and the properties exceed the requirements for wall underlays. The use of a roofing underlay in the place of a wall underlay could provide an even more conservative option.

Designers and specifiers should refer to the manufacturer’s technical literature for instructions for the installation of **RT7®** and to the NZ Metal Roof and Cladding Code of Practice.

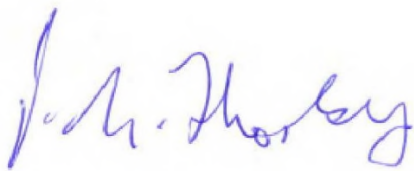
The properties of underlays complying with NZS2295 mitigate the risk of damage to fixing timbers for **RT7®** fixed vertically either direct fixed or over a cavity.

## Conclusions

**RT7®** meets the requirements in Acceptable Solution E2/AS1 for asymmetric trapezoidal profile metal roofing and meets the performance requirements of E2 External Moisture.

**RT7®** fixed horizontally as cladding over a nominal 20 mm drained cavity meets the requirements in Acceptable Solution E2/AS1 for trapezoidal profile metal roofing and meets the performance requirements of E2 External Moisture.

**RT7®** fixed vertically as cladding (up to and including Risk Score 20) either direct fixed or over a nominal 20 mm drained cavity meets the performance requirements of E2 External Moisture. Absorbent synthetic wall underlay Type W4 or heavy kraft wall underlay Type W2 specified in NZS2295 allows the direct fixing of a non-absorbent cladding, such as **RT7®** on timber framing. A roofing underlay (Types R1, R2, R3, or R4) in the place of wall underlay would provide at least equivalent performance.



P N Thorby