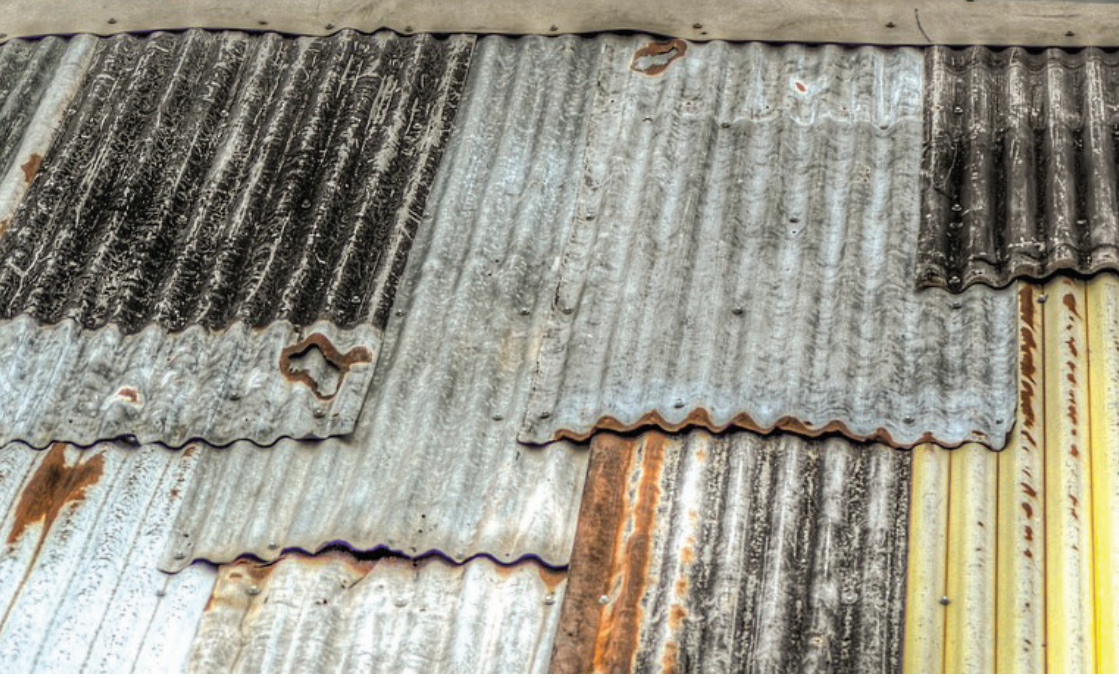
Weathertightness Risk Matrix

GISBORNE DISTRICT COUNCIL



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Establishing the risk

The compliance document E2/AS1 for clause E2 of the New Zealand Building Code requires that a building has each wall (or wall segment if there is a change in the wall) evaluated against the risk matrix scoring system to determine suitable cladding types and whether the chosen cladding requires fixing over a drained and ventilated cavity. This allows the risks related to various features to be aggregated, resulting in a risk score for the design. This guide directly references parts of E2. Paragraph numbers and table references refer to those in E2.

A copy of E2 can be downloaded free from the Ministry of Business Innovation and Employment (MBIE) website www.building.govt.nz.

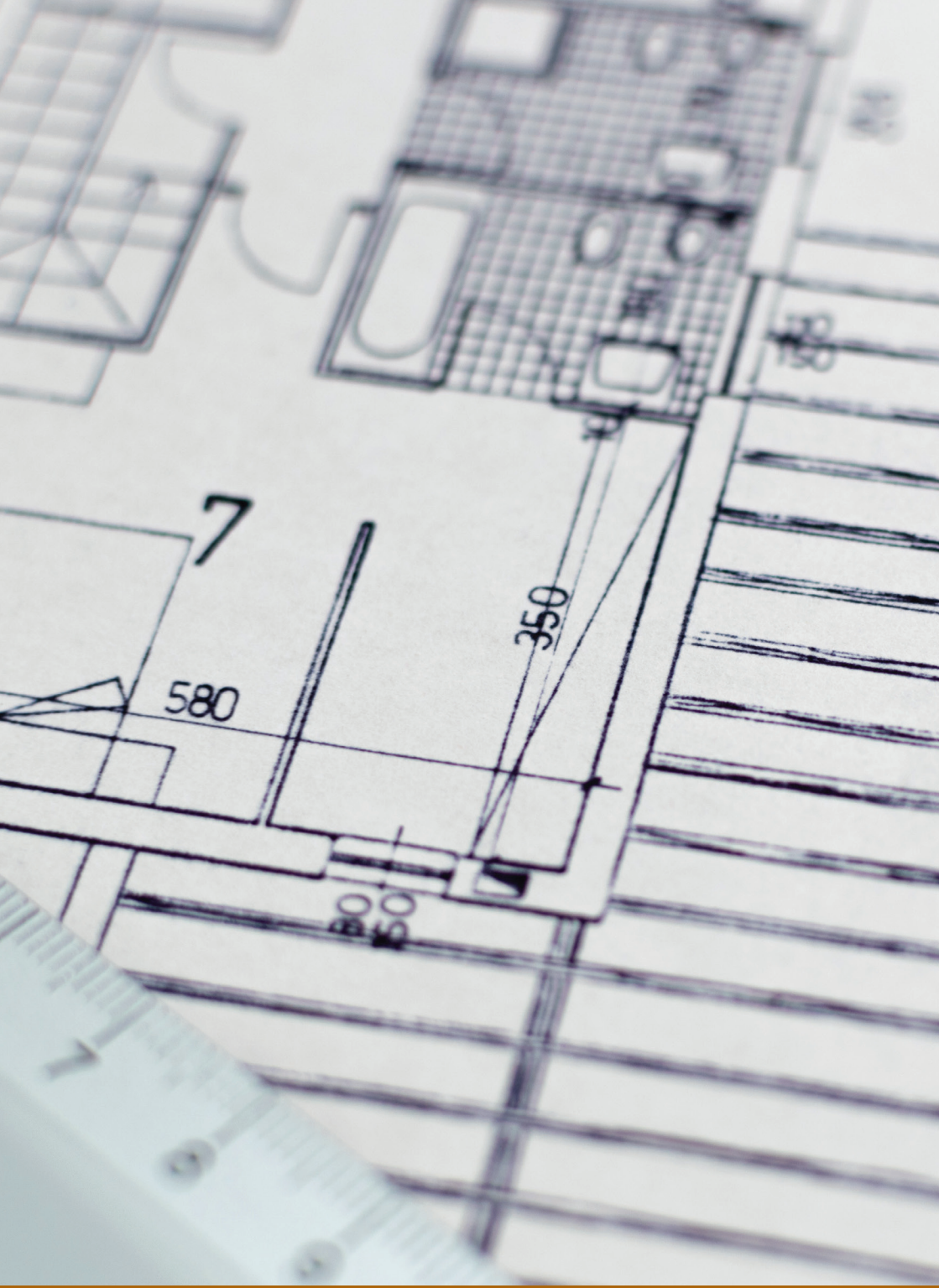
An interactive online version of the risk matrix with explanatory diagrams can be found at www.designnavigator.co.nz/ExtMoistureMatrix.html

Wall claddings

The following wall cladding systems are covered in E2/AS1:

a) Masonry veneer
b) Stucco
c) Timber weatherboards
d) Fibre cement weatherboard
e) Profiled metal
f) Fibre cement sheet
g) Plywood sheet
h) EIFS

Other wall claddings are beyond the scope.


7
580
350

How to assess risk

Step 1:

Obtain detailed drawings

Suitably detailed drawings are required to assess weathertightness risk. Detailed drawings may include a Site plan, Floor plans, Elevations, details of junctions and penetrations, and the presence of features like decks and pergolas.

Step 2:

Refer to Table 1: Definitions of risk levels

Assess each external face against risk factors. Use the drawings for each external face to determine the risk score for each risk factor:

- Wind zone
- Number of storeys
- Roof/wall intersection design
- Eaves width
- Envelope and complexity
- Deck design

Step 3:

Complete Table 2: Building envelope risk matrix

The table must be completed for each face of the building. It's possible for different elevations to have different risk scores.

Step 4:

See Table 3: Determine suitable cladding

The table outlines suitable wall cladding to determine what cladding types are recommended with the risk scores for each face.

The cladding selected must be appropriate for the score on that face, but can be beyond the minimum required (for example cladding suitable for a higher score can be used).

Definition of risk levels

E2/AS1 gives definitions of risk levels. There are six major factors that limit weathertightness. There is also a comprehensive series of documents about weathertight construction available to download from the MBIE website at www.building.govt.nz

Table 1: Definitions of risk levels

Risk Factor	Score	Risk Severity	Comments
A: Wind Zone (6)	0	Low Risk	Low wind zone as described by NZS 3604
	0	Medium Risk	Medium wind zone as described by NZS 3604
	1	High Risk	High wind zone as described by NZS 3604
	2	Very High Risk	Very high wind zone as described by NZS 3604
	2	Extra High Risk	Extra high wind zone as described by NZS 3604 (4)
B: Number of storeys	0	Low Risk	One storey
	1	Medium Risk	Two storeys in part
	2	High Risk	Two storeys
	4	Very High Risk	More than two storeys
C: Roof/wall junctions	0	Low Risk	Roof-to-wall intersection fully protected (i.e. hip and gable roof with eaves)
	1	Medium Risk	Roof-to-wall intersection partly exposed (i.e. hip and gable roof with no eaves)
	3	High Risk	Roof-to-wall intersection fully exposed (i.e. parapets, enclosed balustrades or eaves at greater than 90° to vertical with soffit lining)
	5	Very High Risk	Roof elements finishing within the boundaries formed by the exterior walls (i.e. lower ends aprons, chimneys, dormers etc)
D: Eaves width (1) (2)	0	Low Risk	Greater than 600mm for single storey
	1	Medium Risk	451–600mm for single storey, or over 600mm for two storey

Risk Factor	Score	Risk Severity	Comments
	2	High Risk	101–450mm for single storey, or 451–600mm for two storey, or greater than 600mm above two storey
	5	Very High Risk	0–100mm for single storey, or 0–450mm for two storey, or less than 600mm above two storey
E: Envelope complexity	0	Low Risk	Simple rectangular, L, T or boomerang shape with single cladding type
	1	Medium Risk	Moderately complex, angular or curved shapes (i.e. Y or arrowhead) with no more than two cladding types
	3	High Risk	Complex, angular or curved shapes (i.e. Y or arrowhead) with multiple cladding types
	6	Very High Risk	As for High risk, but with junctions not covered in C or F of this table (i.e. box windows, pergolas, multi storey re-entrant shapes etc)
F: Decks (3)	0	Low Risk	None, timber slat deck or porch at ground floor level
	2	Medium Risk	Fully covered in plan by roof, or timber slat deck attached at first or second floor level
	4	High Risk	Enclosed deck exposed in plan or cantilevered at first floor level
	6	Very High Risk	Enclosed deck exposed in plan or cantilevered at second floor level or above

Notes:

(1) Eaves width measured horizontally from external face of wall cladding to outer edge of overhang, including fascia and external gutters/spoutings.

(2) Balustrades and parapets count as 0mm eaves

(3) The term 'deck' includes balconies, as described in the definitions

(4) Buildings in Extra High winds zones require rigid underlays and drained cavities, refer to Table 3

(5) Refer also to Table 2

(6) Gisborne District Council has mapped the wind zones within the city. Any area outside the mapped zones must be assessed using the method outlined in New Zealand Standard 3604 – Timber Framed Buildings.

The risk score

The factors in Table 1 must be assessed for each face of the building. One elevation could have more than one assessable face. Common sense will often indicate when one side of the building should have more than one assessment. If it's to difficult to determine which factor applies to a building face because of design changes in that side, then the side should probably be split into separate parts. Table 2 of E2/AS1 shows scores for each factor. When submitting your building consent application to Council you must include the assessments for all building sides. If these are incomplete the application will be deferred for further information.

Table 2: Building envelope risk scores

Risk Factor	Low	score	Medium	score	High	score	Very High	score	Subtotals for each risk factor
Wind zone (per NZS 3604) (1)	0		0		1		2		
Number of storeys	0		1		2		4		
Roof/Wall Intersection Design	0		1		3		5		
Eaves Width	0		1		2		5		
Envelope Complexity	0		1		3		6		
Deck Design	0		2		4		6		
							Total risk score for use in Table 3:		

Enter the appropriate risk severity score for each risk factor in the score columns. Transfer these figures across to the right-hand column. Add up the figures in the right-hand column to get the total risk score.

Note:

(1) for buildings and extra high wind zones, refer to Tables 1 and 3 for rigid underlay and drained cavity requirements.

Table 3: Suitable wall claddings (1)

Risk score from Table 2	Direct fixed to framing	Over nominal 20mm drained cavity
		Claddings on parapets, enclosed balustrades, and in Extra High winds zones shall be installed over drained cavities. (5) (6)
0–6	a) Timber weatherboards – all types b) Fibre cement weatherboards c) Vertical profiled metal – corrugated and symmetrical trapezoidal (3) d) Fibre cement sheet (4) (jointed finish) e) Plywood sheet	a) Masonry veneer (2) b) Stucco c) Horizontal profiled metal(3) – corrugated and trapezoidal only d) Fibre cement – flush-finished e) EIFS
7–12	a) Bevel–back timber weatherboards b) Vertical timber board and batten c) Vertical profiled metal – corrugated only (3) (6)	a) Masonry veneer (2) b) Stucco c) Horizontal profiled metal – corrugated and trapezoidal only d) Rusticated weatherboards e) Fibre cement weatherboard f) Fibre cement sheet – flush and jointed finish g) Plywood sheet h) EIFS
13–20	a) Vertical profile metal – corrugated only (3) (6)	a) Masonry veneer (2) b) Stucco c) Horizontal profiled metal – corrugated and trapezoidal only d) Rusticated weatherboards e) Fibre cement weatherboard f) Fibre cement sheet – flush and jointed finish g) Plywood sheet h) EIFS i) Bevel-back weatherboards

Risk score from Table 2	Direct fixed to framing	Over nominal 20mm drained cavity
Over 20	a) redesign the building to achieve a lower score, or b) specific design c) the design may need changing to reduce the risk d) Council may require more comprehensive details and documentation providing evidence of weathertightness e) Council, the designer or owner may require more inspections f) a third party audit of the design may be required.	

Notes:

(1) The wall cladding and this table are limited to those covered in E2/AS1.

(2) Traditional masonry veneer as per SNZ HB 4236, with minimum 40mm cavity.

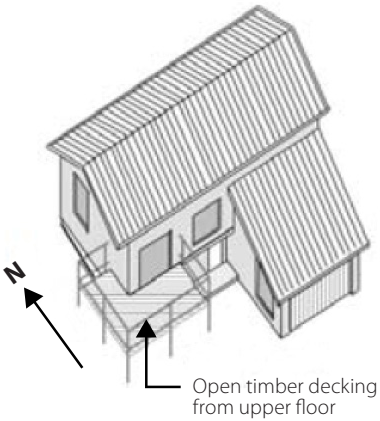
(3) Refer figure 38 in E2/AS1 for profiles.

(4) Except stucco over a fibre cement backing.

(5) Cladding in Extra High winds zones require rigid underlays – refer to Paragraph 9.1.7.2 in E2/AS1

(6) Direct fix vertical corrugated steel is included as cavity construction.

Risk score example



The house in this example is a relatively simple design with a single cladding type. It would be considered to be medium risk in terms of envelope complexity. The lean-to style room on the ground floor introduces a roof-to-wall intersection which requires the correct flashing and particular care with the kick-out at the west end of the junction. This makes this factor very high risk. The timber deck connects to the house at the first floor level, and so is considered to be medium risk. Any leaks at the connection points have an opportunity to enter the wall below. The eaves are less than 450mm wide, and the site is in a high wind zone. The calculations have been done for the south elevation. The other elevations are simpler and will score lower.

Table 2: Building envelope risk scores

Risk Factor	Low	score	Medium	score	High	score	Very High	score	Subtotals for each risk factor
Wind zone (per NZS 3604)	0		0		1	**1**	2		**1**
Number of storeys	0		1	**1**	2		4		**1**
Roof/Wall Intersection Design	0		1		3		5	**5**	**5**
Eaves Width	0		1		2	**2**	5		**2**
Envelope Complexity	0		1	**1**	3		6		**1**
Deck Design	0		2	**2**	4		6		**2**
							Total risk score for use in Table 3:		**12**

The scores are now considered against Table 3 and a suitable (allowable) cladding chosen. As the score is 12 there are only 3 choices for direct fix, bevel back weatherboards, vertical board and batten weatherboards, or vertical corrugated metal. Any other cladding requires a drained and ventilated cavity.

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