BUILDING SECTION

GISBORNE DISTRICT COUNCIL

WEATHERTIGHTNESS RISK MATRIX

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, to be 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 Department of Building and Housing website http://www.dbh.govt.nz/compliance-docs-get-copies . An interactive online version of the risk matrix with explanatory diagrams can be found at http://www.design-navigator.co.nz/ExtMoistureMatrix.html.

Figure 1:	**How to assess risk** Paragraph 3.1
Step One: Obtain detailed drawings	Suitably detailed drawings are required to assess weathertightness risk. This documentation may include a site plan, floor plans, elevations, details of junctions and penetrations, and the presence of features like decks and pergolas.
Step Two: Assess each external face against risk factors	Assess the drawings for each external face to determine the risk score for each risk factor. These are: • **Wind zone** • **Number of storeys** • **Roof/wall intersection design** • **Eaves width** • **Envelope complexity** • **Deck design** Refer Table 1
Step Three: Complete the building envelope risk matrix table	Complete the "Building envelope risk matrix" (Table 2) for each face of the building. It is possible for different elevations to have different risk scores.
Step Four: Determine suitable cladding	Consult Table 3: Suitable wall claddings to determine what cladding types are recommended with the risk score for each face. The cladding selected must be appropriate for the score on that face, but can be beyond the minimum required (ie cladding suitable for a higher score can be used).

WALL CLADDINGS

The following wall cladding systems are covered in this Acceptable Solution:

a) Masonry veneer ..... Paragraph 9.2
b) Stucco ..... Paragraph 9.3
c) Timber weatherboards ..... Paragraph 9.4
d) Fibre cement weatherboards ..... Paragraph 9.5
e) Profiled metal ..... Paragraph 9.6
f) Fibre cement sheet ..... Paragraph 9.7
g) Plywood sheet ..... Paragraph 9.8
h) EIFS ..... Paragraph 9.9

Other wall claddings are beyond the scope of this Acceptable Solution.

DEFINITION OF RISK

E2/AS1 gives a definition of risk 6 major factors that limit weathertightness. The 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. There is also a comprehensive series of documents about weathertight construction available to download from the DBH website at http://www.dbh.govt.nz/pub-ba-weathertightness-index

Table 1:	**Definitions of risk** Paragraph 3.1.1, Figure 1	
A: Wind zone	**Low risk**	Low wind zone as described by NZS 3604
	Medium risk	Medium wind zone as described by NZS 3604
	High risk	High wind zone as described by NZS 3604
	Very high risk	Very high wind zone as described by NZS 3604
B: Number of storeys	**Low risk**	One storey
	Medium risk	Two storeys in part
	High risk	Two storeys
	Very high risk	More than two storeys
C: Roof/wall intersection design	**Low risk**	Roof-to-wall intersection fully exposed (eg hip and gable roof with eaves)
	Medium risk	Roof-to-wall intersection partly exposed (eg hip and gable roof with no eaves)
	High risk	Roof-to-wall intersection fully exposed (eg parapets or eaves at greater than 90° to vertical with soffit lining)
	Very high risk	Roof elements finishing within the boundaries formed by the exterior walls (eg lower ends of aprons, chimneys etc)
D: Eaves width (1)	**Low risk**	Greater than 600m at first floor level
	Medium risk	450-600mm at first floor, or over 600mm at second floor level
	High risk	100-450mm at first floor, or 450-600mm at second floor level
	Very high risk	0-100mm at first floor, or 100-450mm at second floor level, or 450-600mm at third floor level (2)
E: Envelope complexity	**Low risk**	Simple rectangular, L, T or boomerang shape, with single cladding type
	Medium risk	More complex, angular or curved shapes (eg Y or arrowhead with single cladding type
	High risk	Complex, angular or curved shapes (eg Y or arrowhead) with multiple cladding types
	Very high risk	As for High risk, but with junctions not covered in C or F of this table (eg box windows, pergolas, multi-storey re-entrant shapes etc)
F: Deck design	**Low risk**	None, timber slat deck or porch at ground level
	Medium risk	Fully covered in plan by roof, or timber slat deck attached at first or second floor level
	High risk	Enclosed deck exposed in plan or cantilevered at first floor level
	Very high risk	Enclosed deck exposed in plan or cantilevered at second floor level or above

Notes:

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

(2) Balustrades and parapets count as 0mm eaves.

THE RISK SCORE

The factors in table 1 must be assessed for each face of the building. One elelevation 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 is 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 two of E2/AS1 shows scores for each factor. When submitting your building consent application to the 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 matrix
Paragraph 3.1.2, Figure 1

Elevation or Wall		Risk Severity								
Risk factor		Low	Score	Medium	Score	High	Score	Very High	Score	Subtotals for each risk factor
Wind zone (per NZS 3604		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		
[Enter the appropriate risk severity score for each risk factor in the score columns. Transfer these figures across to the right-hand column. Finally, add up the figures in the right-hand column to get the total risk score.]								Total risk score:		

Once the risk matrix has been completed for all faces of the building Table 3 from E2 can be checked to see which claddings can be used on that face and whether they can be direct fixed or will require fixing over a drained and ventilated cavity.

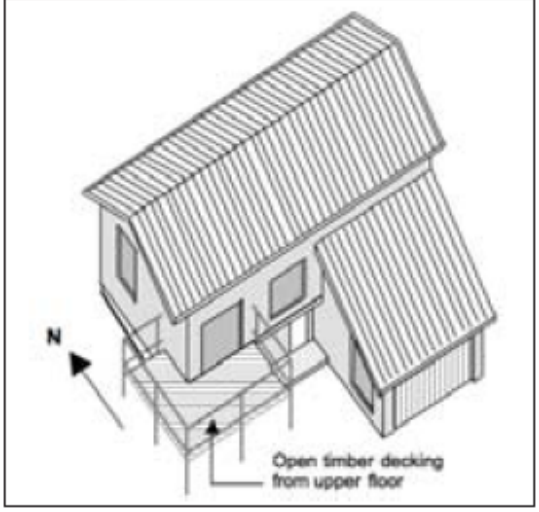
EXAMPLE

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 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 450 mm 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 5: Risk matrix example 2 – south elevation

	Risk severity								
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	*3*	5		*3*
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:		***10***

Figure 3: Risk matrix example 2



The scores are now considered against Table 3 and a suitable (allowable) cladding chosen. As the score is 10 there are only 3 choices for direct fix, bevel back weatherboards, verticle board and batten, or vertical corrugated iron; any other cladding requires a drained and ventilated cavity.

Table 3:	**Suitable wall claddings** Paragraphs 3.1.2, 3.4.1.1, 3.4.2.1, 3.4.2.2, 3.4.3.2, 9.1.1, 9.4.1.2, 9.4.1.3, 9.6, Figure 1

Risk Score	Suitable wall claddings (1)	
	Direct fixed to framing	**Over 20mm minimum drained cavity**
0 - 6	a) Timber weatherboards - all types b) Fibre cement weatherboards c) Vertical profiled metal (3) - corrugated and symmetrical trapezoidal only d) Fibre cement sheet (4) e) Plywood sheet c) EIFS	a) Masonry veneer (2) b) Stucco c) Horizontal profiled metal (3) - corrugated and trapezoidal only
7 - 12	a) Bevel-back weatherboards b) Vertical board and batten c) Vertical profiled metal (3) - corrugated only	a) Masonry veneer (2) b) Stucco c) Horizontal profiled metal d) Rusticated weatherboards e) Fibre cement weatherboards f) Fibre cement sheet g) Plywood sheet h) EIFS
13-20	a) Vertical profiled metal (3) - corrugated only	a) Masonry veneer (2) b) Stucco c) Horizontal profiled metal d) Rusticated weatherboards e) Fibre cement weatherboards f) Fibre cement sheet g) Plywood sheet h) EIFS i) Bevel-back weatherboards
Over 20	a) Redesign the building to achieve a lower score, or b) Specific design - The design may need changing to reduce the risk - The territorial authority or building certifier will require more comprehensive details and documentation providing evidence of weathertightness - The territorial authority, building certifier, designer or owner may require more inspections - A third party audit of design by a weathertightness expert may be required	
NOTES:	(1) The wall claddings in this table are limited to those covered in this Acceptable Solution. (2) Traditional masonry veneer as per SNZ HB 4236, with minimum 40mm cavity. (3) Refer Figure 38 for profiles. (4) Except stucco over a fibre cement backing.	