

To Whom It May Concern

**Re: Gerard<sup>®</sup> Roof Tiles in NZS 3604:2011 and Specific Engineering Design – Wind Zone Environments**

NZBC B1 requires that the performance of the building elements shall have low probability of failure when exposed to conditions that the building element could be exposed to. The tiles produced by AHI Roofing and sold in the New Zealand market under the Gerard<sup>®</sup> brand are designed to be suitable for all environments including Wind Zones outlined in NZS3604:2011 and those classified as being Specific Engineered Designed when installed and maintained as specified by AHI Roofing/Gerard Roofs.

Construction of the roof includes connection of the truss/rafters to the top plate, Batten to rafter fastenings and tile to batten fastenings.

**Truss – Top Plate Connection**

The connection of the truss/rafters to the top plate is outside the control of Gerard Roofs and is the responsibility of the builder/designer to ensure this connection is specified and installed correctly. NZS3604:2011 has data on this for wind speeds up to the Extra High Wind Zone (55 m/s); wind speeds above this require specific design by an Engineer.

**Tile Batten – Rafter Connection**

Connection of the tile battens to the rafter is carried out by the roof installer.

Gerard Roofs require that the installer fasten the tile battens using the fasteners that will withstand the wind loads that would occur at the periphery of a roof to all batten rafter junctions.

NZS3604:2011 Table 10.12 Tile Battens for all Wind Zones outlines the fasteners required for periphery wind zones up to and including Extra High (55 m/s). This means that in the lower wind zones the fastening of Gerard Roofs exceed the requirements of NZS3604:2011.

Wind Zones above 55 m/s require specific design to ensure that the batten rafter connection will withstand the loads applied. AHI Roofing has conducted testing establishing batten rafter connection maximum loadings based on the requirements of AS/NZS1170.2 up to wind loads of 7.5 kPa. The connection strengths of fasteners are lower than those specified in NZS3604:2011 as these reflect the limits of the testing.



The maximum connection strength of fasteners which AHI Roofing have evaluated is shown in Table 1 - Batten Rafter Connections.

### Tile – Tile Batten Connection

Connection of the tiles to the tile battens is carried out by the roof installer.

Gerard Roofs require that the installer fasten tiles using the fasteners specified by Gerard roofs. AHI Roofing has conducted testing establishing tile to tile batten connection maximum loadings based on the requirements of AS/NZS1170.2 up to wind loads of 7.5 kPa. The maximum wind load fasteners can withstand is shown in Table 2 - Tile Fasteners.

Table 1 Batten Rafter Connections

Batten - Rafter Fastener	Batten spacing (mm)	Rafter Span (mm)	Batten Size (mm)	Fastener Load Capacity (kN)	Maximum Design Pressure of periphery load on roofing system (kPa)	Maximum Wind Speed (m/s)	Factors used in determining loads $K_t$ , $C_{pi}$ , $C_{pe}$ .
2x 90 x3.15 mm Gun Nails	370	900	40 x 50	0.9	2.48	50	$K_t = 1.5$ , $C_{pi} = 0.3$ , $C_{pe} = 0.9$ NZS 3604:2011
	320	900	40 x 50	0.9	2.68	52	
	370	1200	50 x 50	0.8	1.75	42	
	320	1200	50 x 50	0.8	2.00	45	
1 x 80 mm 10 g screw	370	900	40 x 50	1.83 *	5.58	61	$K_t = 2$ , $C_{pi} = 0.7$ , $C_{pe} = 0.9$ AS/NZS 1170.2
	320	900	40 x 50	1.83 *	6.34	65	
	370	1200	50 x 50	1.5 *	4.06	52	
	320	1200	50 x 50	1.5 *	5.22	59	
1 x 100 mm 14 g screw	370	900	40 x 50	4.0 *	7.50 **	71	$K_t = 2$ , $C_{pi} = 0.7$ , $C_{pe} = 0.9$ AS/NZS 1170.2 ** Ultimate Design Pressure load to which roofing system has been tested
	320	900	40 x 50	4.0 *	7.50	71	
	370	1200	50 x 50	4.0 *	7.50	71	
	320	1200	50 x 50	4.0 *	7.50	71	

\* Design loads for these fasteners are higher in NZS 3604:2011, use these figures for Gerard Roofs



**Table 2 Tile Fasteners**

Batten - Rafter Fastener	Batten spacing (mm)	Rafter Span (mm)	Tile nails per tile	Maximum Design Pressure of periphery load on roofing system (kPa)	Maximum Wind Speed (m/s)	Factors used in determining loads $K_t$ , $C_{pi}$ , $C_{pe}$ .
50 mm x 2.8 mm HDG Painted Tile Nail	370	900	4 <sup>*1</sup>	3.8 <sup>**</sup>	62	$K_t = 1.5$ , $C_{pi} = 0.3$ , $C_{pe} = 0.9$ AS/NZS 1170.2
	320	900	4 <sup>*1</sup>	4.4	66	
	370	1200	4 <sup>*1</sup>	2.9	54	
	320	1200	4 <sup>*1</sup>	3.4	58	
	370	900	5 <sup>*2</sup>	5.2 <sup>**</sup>	59	$K_t = 2$ , $C_{pi} = 0.7$ , $C_{pe} = 0.9$ AS/NZS 1170.2
	320	900	5 <sup>*2</sup>	6.0	63	
	370	1200	5 <sup>*2</sup>	3.9	51	
	320	1200	5 <sup>*2</sup>	4.5	55	
	370	900	7 <sup>*3</sup>	7.5 <sup>**</sup>	71	$K_t = 2$ , $C_{pi} = 0.7$ , $C_{pe} = 0.9$ AS/NZS 1170.2 <sup>**</sup> Ultimate Design Pressure load to which roofing system has been tested
	320	900	7 <sup>*3</sup>	7.5	71	
	370	1200	7 <sup>*3</sup>	5.6	61	
	320	1200	7 <sup>*3</sup>	6.4	65	

- \*1 Nails spaced every second module and at each lap on tiles or 320 mm spacing
- \*2 Nails spaced every 250 mm on shakes or shingles, Tiles refer to \*3
- \*3 Nails located at every module or 180 mm.
- \*\* Ultimate design load to which roofing system has been tested for 4, 5 or 7 nail fastening.

The installation and maintenance requirements required to meet the needs of NZBC are also covered in the Gerard Roofs 50 year warranty.

In summary, we have confidence that roofs installed as per AHI Roofing Installation guide and maintained in accordance with our warranty will last in excess of 50 years.

Should this not address your concerns, please feel free to contact me in person so I can better understand your reservations.



Regards

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