DESIGN CERTIFICATE

Technical basis for structural design methodology contained in designIT for houses - New Zealand.

designIT for houses, New Zealand has been developed by experienced timber engineers to assist designers in selecting appropriate sizes of structural laminated veneer lumber products manufactured by Carter Holt Harvey LVL Limited (including hySPAN, hy90, hyONE and hyJOIST) and other generic stress grades of timber, to be used as structural elements for the construction of buildings that fall within the scope of NZS 3604.

The design methodology used for the software complies with the loading and general design requirements contained within AS/NZS 1170 and with timber structural design in accordance with NZS 3603:1993 including Amendment 4 (Verification method B1/VM1, 6.1).

designIT relies on the accurate input of span and loading information by the user. Where accurate inputs are submitted the product and/or stress grade and the size given will comply with the structural requirements of the New Zealand Building Code (NZBC), provided the installation is in accordance with the installation requirements provided by designIT and/or in product literature and/or NZS 3604, or specific engineering design, as appropriate.

Futurebuild LVL and SG8 components, when used and treated to the required treatment levels prescribed in NZS 3602 and NZS 3604, as modified by Acceptable Solution B2/AS1, will comply with the requirements of the NZBC (Acceptable Solution B2/AS1, 3.2).

References:
1. NZS 3603:1993 Timber Structures Standard.
2. NZS 3604:2011 Timber-framed buildings.
3. AS/NZS 1170:2002 Structural design actions, Parts 0 and 1.
4. AS/NZS 1170:2011 Structural design actions, Part 2: Wind actions.
5. AS/NZS 1170:2003 Structural design actions, Part 3: Snow and ice actions.
6. AS 1720.1:2010 Timber structures. Part 1: Design methods.
7. AS 1720.3:2016 Timber structures. Part 3: Design criteria for timber-framed residential buildings.

This Design Certificate, and any associated warranty/certification, is void where there has been substitution of alternate products not detailed within the Member Specification.

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Specifier details:

Specifier:	Melissa Davidson
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Project & site details:

Project:	Townhouse Development
Site address:	76 Pererika Street Rotorua
For (owner/s):	GT Homes
Design wind zone	Low
Snow loading	Design snow zone: N0

MEMBER DESIGN DETAILS

Member 1

1) Member code and description	Floor Joists - Floor joist - Supporting floor loads only
2) Date prepared	18 December 2020
3) Serviceability criteria	AS 1720.1: 2010 and AS 1720.3: 2016

4) Design inputs

Span	4.2 m - single span
Joist spacing	400 mm
Floor dead load	40 kg/m²
Floor live load	2.0 kPa/1.8 kN
Lateral restraint condition	Bottom edge restrained by ceiling/ceiling battens at 600 crs max.

5) Member specification

Size, stress grade/product	Use HJ300 45 hyJOIST

6) Serviceability

Load case	Limit[3] on average deflection[2]	Estimated average deflection[2]	Rigidity ratio[4]
Long term load - G + $\Psi_L Q$	14.0 mm	6.5 mm (long term)	2.2
Live load - $\Psi_s Q$	9.0 mm	3.8 mm	2.4
Floor flexibility - $\Psi_s Q^*$	2.0 mm	1.2 mm	1.6

*Critical serviceability load case
See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

		Limit States Design Reaction[2,3]
Load case	k_1[1]	End kN[4]
1.35G	0.60	-1.5
1.2G + 1.5Q	0.80	-3.0
1.2G + 1.5Q	0.94	-3.2

8) Installation requirements

- Provide at least 30 mm bearing at end supports (floor loads only)
- Bearing requirements for joists supporting load bearing walls may be greater - refer published literature/ Floor joist calculator for guidance
- Install in accordance with hyJOIST Design and Installation guide

Member 2

1) Member code and description	Mid Floor Beam - Bearer - Supporting single or upper storey external load bearing walls
2) Date prepared	16 March 2021
3) Serviceability criteria	AS 1720.1: 2010 and AS 1720.3: 2016

4) Design inputs

Span	3.3 m - single span
Floor load width 'FLW'	2.7 m
Floor dead load	100 kg/m²
Floor live load	2.0 kPa/1.8 kN
Wall type and height	Medium wall: 2.5 m
Roof load width 'RLW'	3.2 m
Roof type and mass	Light roof and ceiling - 40 kg/m²

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5) Member specification

Size, stress grade/product	Use 3/300 x 45 hySPAN
Material type	Structural Laminated Veneer Lumber to AS/NZS 4357

6) Serviceability

Load case	Limit[3] on average deflection[2]	Estimated average deflection[2]	Rigidity ratio[4]
Long term load - $G + \Psi_L Q^*$	11.0 mm	6.8 mm (long term)	1.6
Live load - $\Psi_s Q$	9.0 mm	1.6 mm	5.8
Live load - $\Psi_s Q$	4.5 mm	0.3 mm	13.4

*Critical serviceability load case
See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

		Limit States Design Reaction[2,3]
Load case	k_1[1]	End kN[4]
1.35G	0.60	-19.7
1.2G + 1.5Q	0.80	-26.6
1.2G + 1.5Q	0.94	-15.9
$1.2G + W_u + \Psi_c Q$	1.00	-19.3
$0.9G + W_u$	1.00	-9.5

8) Installation requirements

- Provide at least 30 mm bearing at end supports
- For floor level bearer, vertical lamination in accordance with Detail H2.
- Floor joists to be framed into the side of bearers - see Detail H18

Member 3

1) Member code and description WD106 Lintel - Lintels in lower storey load bearing walls

2) Date prepared 16 March 2021

3) Serviceability criteria AS 1720.1: 2010 and AS 1720.3: 2016

4) Design inputs

Span	1.8 m
Floor load width 'FLW'	2.6 m
Floor dead load	100 kg/m²
Floor live load	2.0 kPa/1.8 kN
Wall type and height	Medium wall: 2.5 m
Nominal wall thickness	90 mm
Roof load width 'RLW'	3.3 m
Roof type and mass	Light roof and ceiling - 40 kg/m²

5) Member specification

Size, stress grade/product	Use 200 x 90 hy90
Material type	Structural Laminated Veneer Lumber to AS/NZS 4357

6) Serviceability

Load case	Limit[3] on average deflection[2]	Estimated average deflection[2]	Rigidity ratio[4]
Long term load - $G + \Psi_L Q^*$	6.0 mm	4.1 mm (long term)	1.5
Live load - $\Psi_s Q$	5.0 mm	0.9 mm	5.4

*Critical serviceability load case
See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

		Limit States Design Reaction[2,3]
Load case	k_1[1]	End kN[4]
1.35G	0.60	-10.4
1.2G + 1.5Q	0.80	-16.2
$1.2G + W_u + \Psi_c Q$	1.00	-10.2
$0.9G + W_u$	1.00	-4.9

8) Installation requirements

- Provide at least 30 mm bearing at end supports

Notes for interpretation of serviceability data

1. 'average deflection' is an engineering concept based upon a notional estimated load, notional member rigidity and, in some cases, an approximate model of material response to environmental conditions. These parameters are, 'standardised' in AS 1170 and AS 1720.
2. Deflection is the flexural response to load 'out-of-level' measurements of installations are not necessarily deflections and can incorporate 'initial out-of-straightness', whether intended or not. Furthermore, loads can be higher/lower than the notional estimate and in any comparison with measured levels, material variability needs to also be considered. AS 1720 gives the following basis for estimation of upper bound deflections for various materials.

No 1 Framing – visually graded to NZS 3631	Average + 100%
SG grades - mechanically graded to AS/NZS 1748	Average + 43%
GL grades for glulam to AS 1328	Average + 33%
LVL to AS/NZS 4357 (includes hySPAN and hyJOIST)	Average +18%

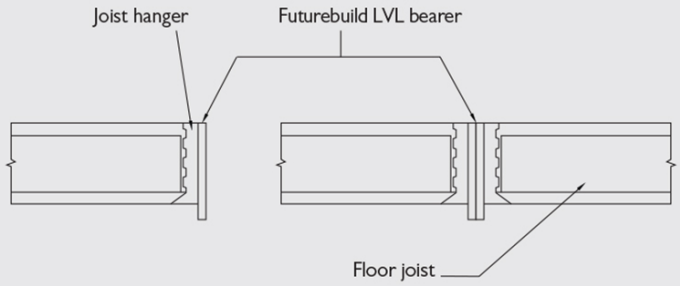
As can be seen, comparison of the 'average deflection' for different materials, even if calculated on the same basis, does not give the whole picture!

3. The limits referred are those specified in AS 1720.3 for the stated load case.
4. 'Rigidity ratio' expresses the rigidity of the specified beam relative to the rigidity of a notional beam just meeting the serviceability requirements detailed.

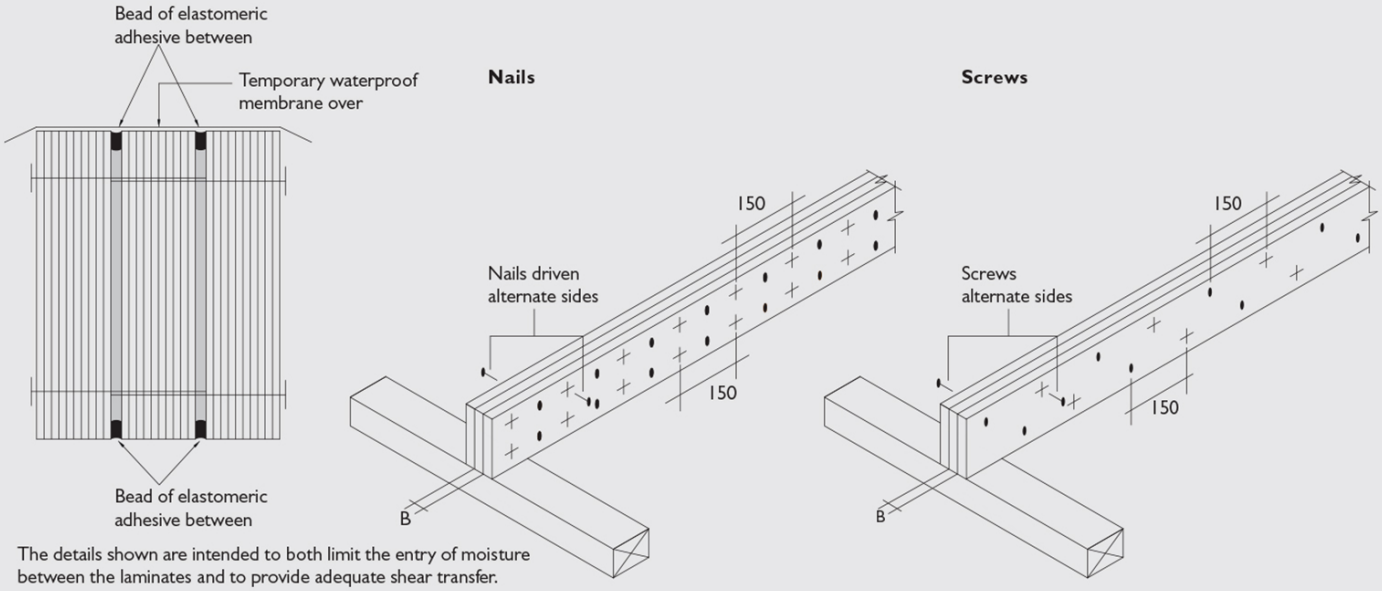
Notes for interpretation of reaction data

1. Duration of load factor 'k_1' for strength as per NZS 3603:1993
2. Negative (-) reactions relate to the 'gravity' or 'downwards' force on the support
3. Positive reactions relate to the 'upwards' forces or 'tie-down' requirement on the support
4. End reaction includes allowance for overhang/cantilever where one has been designed

Detail H18: Joists Framed Into the Side of Bearers - Floor Level Bearers



Detail H2: Vertical Lamination - Three Pieces



The details shown are intended to both limit the entry of moisture between the laminates and to provide adequate shear transfer.

Section Size 'B'	Minimum Nail Diameter	Minimum Nail Length	Minimum Screw gauge	Minimum Screw Length
35	3.06 mm	75 mm	-	-
45	3.30 mm	90 mm	14 g	75 mm
63	3.30 mm	100 mm	14 g	100 mm
90	-	-	14 g	150 mm