SmartLVL 19 Design Guide

SUSTAINABLE STRONGER UP TO 12M LENGTHS F27 COMPATIBLE CONSISTENCY TREATABLE

LVL 19

SMARTFRAME®

WOOD
NATURALLY BETTER

Edition 1 2011

SCOPE OF THIS PUBLICATION

This Design Guide and Load Tables assist in the selection of SmartLVL 19 beams for most of the common structural arrangements met in domestic construction in Western Australai

Methods of developing lateral restraint and providing adequate support, adequate anchorage against wind uplift, and overall structural stability are outside the scope of this publication, however some limited examples have been reproduced within this document.

Information on the above matters can be obtained from AS 1684 Residential timber-framed construction or from a structural engineer experienced in timber construction.

Tilling Timber Pty Ltd have structural engineers at the SmartFrame Design Centre who can be contacted for advice on matters concerning the use of its engineered timber products in timber construction at Smartdata@tilling.com.au or on the SmartData Customer HelpLine 1300 668 690.

SUBSTITUTION OF OTHER PRODUCTS

All load tables in this document are designed using in-grade tested properties of SmartLVL 19 as distributed by Tilling Timber Pty Ltd. Other manufacturers' LVL may have different properties and therefore cannot be designed using these span tables.

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CERTIFICATION

As a professional engineer, qualified and experienced in timber engineering, I certify that the use of the SmartLVL 19 members as shown in these tables, and installed in accordance with the provisions of this Design Guide, comply in every respect to the Building Code of Australia. These span tables have been prepared in accordance with standard engineering principles, the relevant test reports and Australian standards, ie:

- AS /NZS 1170.1 Structural Design Actions – Permanent, imposed and other actions
- AS /NZS 1170.2 Structural Design Actions – Wind actions
- AS 4055 Wind loads for houses
- AS 1684 Residential timber-framed construction
- AS 1720.1 Timber structures - design
- AS/NZS 4357 Structural Laminated Veneer Lumber
- AS/NZS 4063 Characterisation of Structural Timber

Craig Kay.

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National Product Manager - EWP

SmartFrame Product Warranty*

Tilling Timber warrants that its SmartFrame Engineered Wood products will be free from manufacturing defects in workmanship and material.

In addition, provided the product is correctly installed and used, Tilling Timber warrants the adequacy of its design for the normal and expected life of the structure.

This warranty is backed by the full resources of Tilling Timber, Pacific Woodtech Corporation and by underwritten product liability insurance.

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INTRODUCTION

SmartLVL 19

SmartLVL 19 is engineered with sheets of thin ultrasonically graded Douglas Fir bonded together with exterior grade adhesives manufactured to AS/NZS 4357.

SmartLVL 19 is H3 treated, dimensionally stable and resists warping and twisting and is machined to consistently uniform sizes. Natural defects are dispersed throughout the member, unlike solid timber with knots. This uniformity provides a rigid, flat surface with good nail holding characteristics. It's a high strength structural member you can cut, fasten and nail with ease.

PRODUCT SPECIFICATION:

Veneer:	Thickness (normal):	2.5 mm
	Species:	Douglas Fir
	Grade:	CD
	Joints:	Face Scarf and overlap

MOISTURE CONTENT: 12-15 %

DIMENSIONAL TOLERANCES:

Length:	± 10 mm
Depth:	≤ 200 mm ± 1 mm
	≥ 201 mm ± 2 mm
Thickness:	+ 2.0, - 0 mm

DENSITY: Approx. 600 kg/m^3

ADHESIVE: Phenol Formaldehyde (Type "A", AS2754.1)

TREATMENT: H3

MAXIMUM SUPPLY LENGTH: 12 metres

CHARACTERISTIC STRENGTHS AND ELASTIC MODULI:

Characteristic short duration modulus of elasticity and strength values[1]

Modulus of Elasticity	E	19000	MPa
Rigidity	G	950	MPa
Bending	$f'_{b,95}$	75[2]	MPa
Tension parallel to grain	f'_t	52[3]	MPa
Compression perpendicular to grain	f'_p	12	MPa
Compression parallel to grain	f'_c	43	MPa
Shear (3 point bending to AS/NZS 4063)	f'_s	6.0	MPa
Joint Group (Nails, screws bolts etc.)		JD3	
(Nailplates)		by nail plate manufacturer	

1. Characteristic values apply to dry service conditions
2. For beams with a depth greater than 95 mm, multiply by $\left(\frac{300}{d}\right)^{0.167}$ where d is the depth of the member
3. For tension members with the larger cross sectional dimension exceeding 150 mm multiply by $\left(\frac{150}{d}\right)^{0.167}$ where d is the larger cross sectional dimension

CAPACITY FACTORS (Φ) FOR USE WITH SmartLVL 19:

The capacity factor (Φ) for calculating the design capacity for a structural member depends upon the type of structural material and the application of the member as described in Table B1.2a of the BCA. SmartLVL 19 used as a structural member for houses for which failure would be unlikely to effect an area greater than 25 m^2 and as a secondary structural element in structures other than houses (as per definition in AS1720.1) has a capacity factor Φ of 0.95. For other structural applications, the values of Φ should be obtained from the above standard. All the tables within this document have been prepared with the value of Φ = 0.95.

RIP SAWING SmartLVL 19

One of the unique properties of SmartLVL 19 is that it may be ripped through the thickness to the smaller section sizes as those given in these span tables without affecting the basic strength properties. It is important that the new members are not cut undersized if the maximum spans in these tables are to be used.

MULTIPLE MEMBER LAMINATIONS

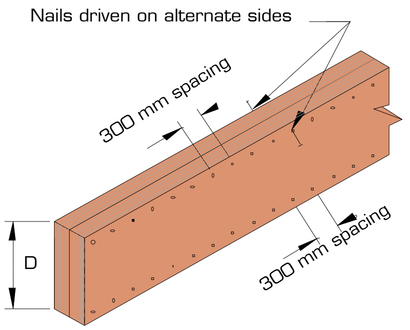
Vertical laminations may be achieved by adopting the procedures described in clause 2.3 of AS1684 however these procedures should be considered as the minimum requirements to achieve the desired effect.

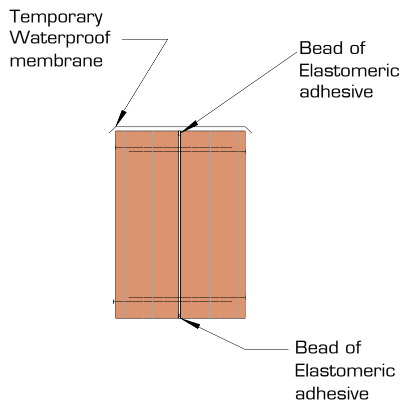
Experience with SmartLVL 19 beams indicates that this degree of fixing may not satisfactorily prevent cupping of individual components as a result of the ingress of moisture between laminates during construction. The suggested method of vertical lamination below provides a greater level of fixity between individual components, and with the use of an elastomeric adhesive, also prevents moisture penetration between the laminates.

MULTIPLE MEMBER LAMINATING OF TOP LOADED BEAMS (Symmetrical loading)

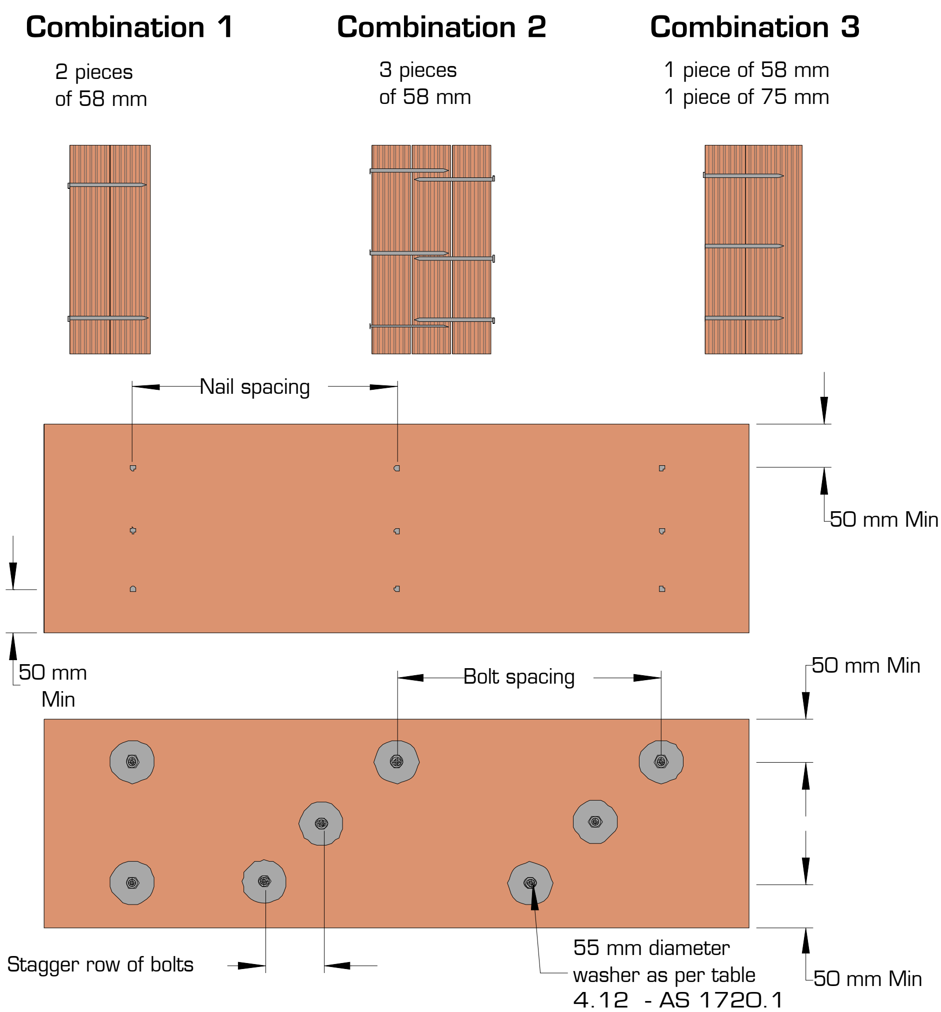
The edges of the individual sections must be carefully aligned to each other so that the composite beam is flat, allowing the applied loads to be equally shared.

Depths up to and including 300 mm: 2 rows of nails as shown above at 300 mm centres
Depths in excess of 300 mm: 3 rows of nails as shown above at 300 mm centres





MULTIPLE MEMBER LAMINATING OF SIDE LOADED BEAMS (Non-symmetrical loading)



MAXIMUM ROOF LOAD WIDTH SUPPORTED BY EITHER OUTSIDE MEMBER (mm)

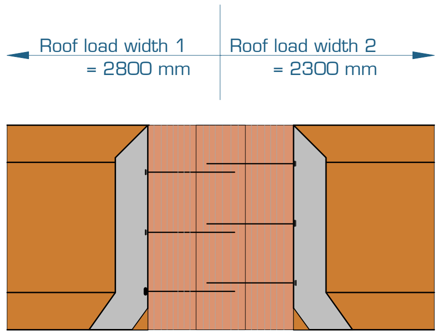
(see details below)	3.75 x 90 mm mails				12 mm bolts			
	2 rows at 300 ctrs		3 rows at 300 ctrs		2 rows at 600 ctrs		2 rows at 300 ctrs	
Roof Mass	(90 kg/m²)	(40 kg/m²)	(90 kg/m²)	(40 kg/m²)	(90 kg/m²)	(40 kg/m²)	(90 kg/m²)	(40 kg/m²)
Combination	Maximum roof load width (RLW) supported by either member							
Combination 1	2800	3400	4200	5100	6100	7500	12300	15000
Combination 2	2300	2900	3300	4000	4600	5600	9200	11000
Combination 3	2300	2900	3300	4000	4600	5600	9200	11000

Notes:
1. The table values for nails may be doubled for nails at 150 mm centres, and tripled for nails at 100 mm centres
2. The nail schedules shown apply to both sides of a three (3) piece beam
3. Bolts are to be grade 4.6 commercial bolts conforming to AS 1111. Bolt holes are to be a maximum of 13 mm diameter and are to located NOT less than 50 mm from either edge.
4. All bolts shall be fitted with a washer at each end, of a size NOT less than that given in AS 1720.1 table 4.12.

HOW TO USE THE MAXIMUM UNIFORM SIDE LOAD TABLE

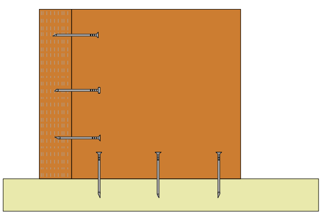
Example: see diagram opposite

Tiled roof - 90 kg/m²
Beam of 2 SmartLVL loaded on both sides (Combination 1)
RLW 1 = 2800 mm, RLW 2 = 2300 mm
Total RLW = 2800 + 2300 = 5100 mm.

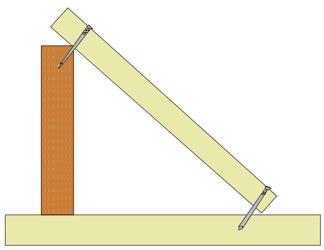


1. Use SmartFrame software or Smart LVL 19 span tables to size the two member section to support the RLW of 5100 mm.
2. Choose the larger of the side RLW's carried by the beam, in this case 2800 mm.
3. Enter the table at the "Combination 1" row, tiled roof 90 kg/m² columns and scan across to a table value greater than 2800 mm. The first value in the row at 2800 mm is equal or greater than the 2800 mm required.
4. Thus adopt 2 rows of 3.75 Φ x 90 mm nails at 300 mm centres

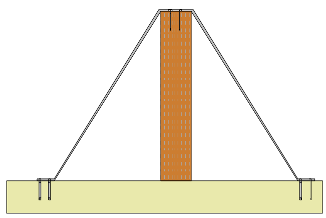
LATERAL RESTRAINT OF HANGING, COUNTER, STRUTTING, STRUTTING/HANGING BEAMS, STRUTTING/COUNTER BEAMS



(a) Block skew nailed to beam and to support with 3/75 mm skew nails to each member

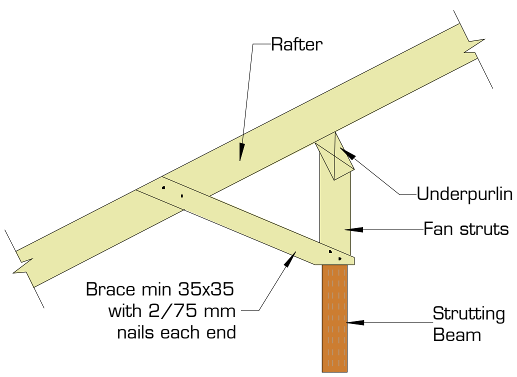


(b) Min 35 x 32 mm tie nailed to top of beam and to support with 2/75 mm nails at each end

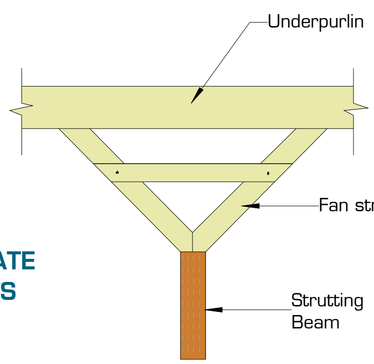


(c) Galvanised strap nailed to support and top of beam with 2/30 x 2.8 mm nails each end and to beam

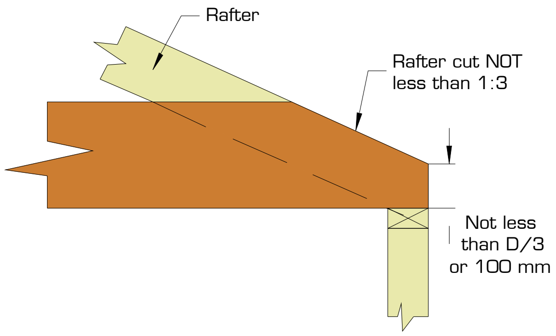
Notes:
1. Method used depends upon whether ceiling joists are perpendicular or parallel to the beam.
2. Methods given in (b) and (c) are particularly suitable for restraining strutting beams and strutting/hanging beams at the intermediate points where the beams are supported, as they also permit these beams to be supported up clear of the ceiling joists by packing under at their supports.



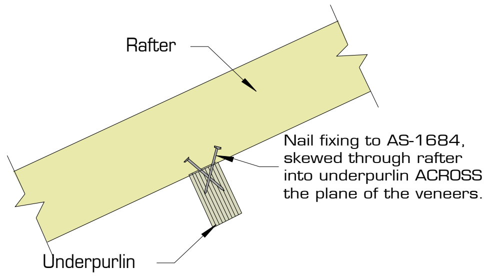
EXAMPLE INTERMEDIATE LATERAL RESTRAINTS



SmartLVL ROOF CONSTRUCTION DETAILING



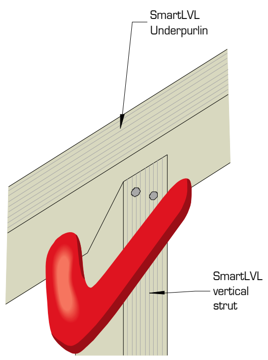
RAFTER CUT DETAIL - May be used for Counter, Hanging and Strutting beams

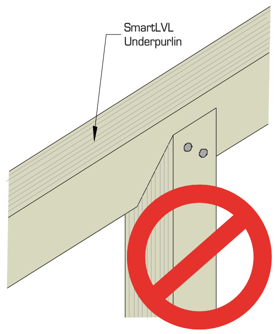


Rafters are NOT to be skew nailed to the underpurlin with the nails parallel to the direction of the veneers.

RAFTER UNDERPURLIN FIXING

VERTICAL SmartLVL ROOF STRUTS





DO NOT cut the birdsmouth in the direction of the SmartLVL veneers

DURABILITY AND EXPOSURE TO MOISTURE

SmartLVL is manufactured from Douglas Fir (Oregon) which has a durability rating of class 4, which is the same rating as some Ash type Eucalypts. Untreated SmartLVL should not be used where the equilibrium moisture content is likely to remain above 20% for an extended period.

Untreated SmartLVL is suitable in the ***internal, fully protected, ventilated*** and the ***external above ground, protected*** zones of the structure as shown on the next page. Untreated SmartLVL is not suitable for ***external above ground, exposed*** or humid indoor conditions, such as swimming pool enclosures.

MOISTURE EFFECTS ON LVL

SmartLVL is supplied WITHOUT any short term construction sealer, but once framed into a structure may be exposed to the weather for a limited time (not greater than 3 months) without negative affect, BUT, it may exhibit some effects of this exposure such as swelling and checking.

SmartLVL, like all wood products, is hygroscopic, which means it has an affinity for water. SmartLVL will readily take up and release moisture in response to changes in the local environment.

Moisture exposure will lead to dimensional change. SmartLVL should be considered as a composite of many pieces of wood, each with different potential swelling.

While the products will withstand normal exposure, excessive exposure during distribution, storage or construction may lead to dimensional changes that affect serviceability. These changes include cupping, bowing or expansion to dimensions to beyond the specified tolerance of the product in the "as-manufactured" condition.

Individual members of a vertically laminated multi member may exhibit some cupping if water becomes trapped between the laminates. This cupping produces more of a visual and possible fixity problem rather than being structurally significant. If not properly dried out, this moisture between laminated members may lead to decay. To prevent this effect, use construction details as shown on page 3.

As an organic material, mold and mildew may grow on untreated wood products if moisture is present. Prolonged periods of high moisture may also support the growth of wood decay fungi, which is another reason to follow proper methods of storage and handling of LVL.

The table below shows the moisture content of LVL as a function of humidity.

1. DIMENSIONAL CHANGE

Moisture content of wood products % [1]

Relative Humidity %	LVL MC
10	1.2
20	2.8
30	4.6
40	5.8
50	7.0
60	8.4
70	11.1
80	15.3
90	19.4

1. Approximate moisture content at 21°C

SmartLVL will shrink and swell in proportion to changes in their moisture content between 0 and 28 % fibre saturation point,

The most significant moisture movement will occur across the grain (tangential and radial directions within a log). Longitudinal (movement in the grain direction) may be a factor depending upon the type of structure. Detailing of SmartLVL to be used where moisture contents will cycle should allow for dimensional instability.

The AVERAGE amount of dimensional change in a piece of LVL to changes in moisture content can be APPROXIMATED by the following formula:

$\Delta D = D_i S\,(MC_i - MC_f)/FSP$

Where:
ΔD = change in dimension
D_i = Initial dimension
S = Shrinkage coefficient = approximately 6%
MC_i = Initial moisture content
MC_f = final moisture content
FSP = fibre saturation point approximately 28%

HOWEVER, these dimensional effect are quite variable. Thickness swell in LVL is erratic along the length because of the densification of the lap joints during manufacture tends to "relieve" when saturated and the total swell in sections containing two (2) laps can be as much as 3 mm.

2. CHANGE IN CHARACTERISTIC STRENGTHS

Changes in moisture content in wood results in changes in mechanical properties, with higher properties at lower moisture contents. Estimates of the effect of moisture differentials on the properties of clear wood may be obtained by the following equation:

$$P = P_{12}\left(\frac{P_{12}}{P_g}\right)^{\left(\frac{12-M}{M_p-12}\right)}$$

Where:
P= Characteristic property at moisture content
P_{12} = same Characteristic property at 12% moisture content

P_g = same Characteristic property for Green wood
M_p = Intersection moisture content = 24% for Doug Fir

The APPROXIMATE affect upon key Characteristic Properties of LVL by changes in MC are outlined in the table below:

Characteristic Property		Reduction in Characteristic Strength at % MC					
		14	16	18	20	22	24
MOE (Stiffness)	E	3.3	6.5	9.7	12.7	15.6	18.4
MOR (Bending)	F'_b	8.4	16.1	23.1	29.6	35.5	40.9
Compression perpendicular to grain	f'_p	9.9	18.9	27.0	34.2	40.8	46.7
Compression parallel to grain	f'_c	11.0	20.7	29.4	37.2	44.1	50.2
Shear	f'_s	6.6	12.8	18.6	24.0	29.0	33.7

The design Characteristic properties of SmartLVL can therefore be considerably reduced by severe increase in MC of the LVL. If the SmartLVL is being built into structures (such as Prefabricated trusses) that are:

1. Likely to experience large increase in MC due to weather exposure or stored on the ground
2. Likely to be loaded to at/or close to design loads while in the high MC state

then the reduced characteristic strengths as detailed above NEED to be used in the design or members may require temporary propping.

Once covered, the SmartLVL will ultimately dry and re-equilibrate to the ambient humidity conditions, but some expansion or swelling will remain after re-drying. The thickness swelling in laps will never fully shrink back and a large piece of LVL can have a final thickness variation along the length of 3-4 mm

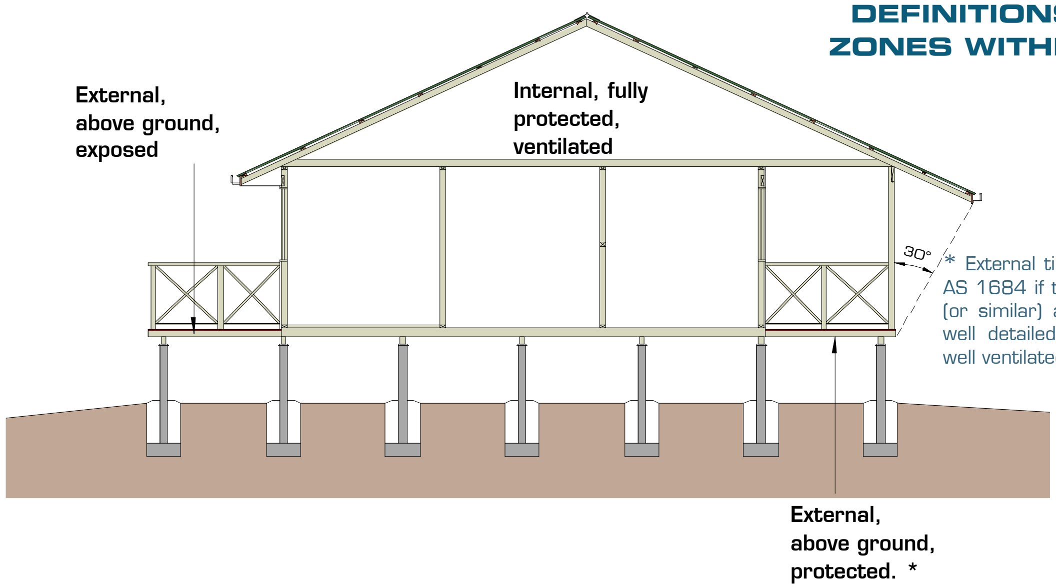
3. DESIGN FOR DURABILITY

Design & Construction detailing tips

i. The use of building overhangs and other structures which protect the beams from excessive moisture movement and sun exposure.
ii. All beams should be provided with adequate ventilation so that moisture content within beams will not exceed 15% and moisture gradients across the beam will not occur.
iii. The use of arrised or round edges on beams to reduce the likelihood of coating failures on sharp edges.
iv. The use of drip edges or other devices which provide a path for free moisture flow away from the timber beam.
v. Joint detailing should, wherever possible, comply with the following:
   - Keep horizontal contact areas to a minimum, in favour of self draining vertical surfaces.
   - Ventilate joint surfaces by using spacers, wherever possible.
   - Always use compatible fasteners which have adequate corrosion protection and do not cause splitting during installation e.g. hot dipped galvanic coatings or stainless steel.
   - Ensure any moisture entering a joint is not trapped but can adequately drain away from the joint.

vi. Allow for thermal expansion/contraction in the joint design.

DEFINITIONS OF EXPOSURE ZONES WITHIN A STRUCTURE.



* External timbers are regarded as protected in AS 1684 if they are covered by a roof projection (or similar) at 30° to the vertical and they are well detailed and maintained (painted and kept well ventilated).

DURABILITY AND EXPOSURE TO MOISTURE (Cont'd)

HAZARD CLASS SELECTION GUIDE

HAZARD CLASS	EXPOSURE	SPECIFIC SERVICE CONDITIONS	BIOLOGICAL HAZARD	TYPICAL USES
H1†	Inside, above ground	Completely protected from the weather and well ventilated, and protected from termites	Lyctid borers	Interior beams, staircases, stringers
H2S*	Inside, above ground	Protected from wetting. Nil leaching	Borers and termites	Interior beams, staircases, trusses, joists
H2	Inside, above ground	Protected from wetting. Nil leaching	Borers and termites	Interior beams, staircases, trusses, joists
H3	External, above ground	Subject to periodic moderate wetting and leaching	Moderate decay, borers and termites	Exterior beams

† The timber species in SmartLVL 19 are not susceptible to Lyctid Borer attack.
* H2S treatment is only suitable South of the Tropic of Capricorn

SMARTGUARD® LOSP TREATMENT

SmartLVL 19 is supplied SmartGuard® LOSP treated to H3 hazard class level, as per AS/NZS 1604.4. **To maintain effective treatment it is a requirement that any cuts, notches or penetrations made in LOSP treated LVL be painted with a suitable "brush/spray on" preservative.**

(Note: Water borne treatment processes are NOT suitable for SmartLVL 19). The hazard class number selected is based upon the specific exposure condition for the proposed end use of the SmartLVL 19, as shown in the table above.

A more comprehensive Hazard Class Table is available in AS/NZS1604.4, but it is **NOT** recommended that SmartLVL 19 be used in end uses with exposures requiring treatment in excess of H3.

Experience is showing that LOSP treated timber in the ***external above ground, exposed*** (H3 Hazard Class) may experience some leaching of the active ingredients of the LOSP treatment. To minimize the possibility of timber degradation in these situations, it is recommended that SmartGuard H3 treated LVL 19 NOT be used where the surface is horizontally exposed AND unprotected from water entrapment OR where post-treatment protection cannot be maintained.

Post treatment protection may include:

(i) Protectadeck ™ high density water proof bearer cover or malthoid capping
and
(ii) An impervious membrane such as regularly maintained painting or staining.
(iii) Construction detailing to prevent water entrapment.

H3 treated SmartLVL is NOT recommended for pergolas or other similar ***external above ground, exposed*** applications due to mechanical degradation of the wood fibre causing checking and cracking which is both aesthetically unacceptable and allows ingress of water to inner veneers.

FASTENERS FOR SmartGuard H3 LVL

For SmartGuard H3 LVL to be used in exposed exterior applications, it is recommended that either hot dipped galvanised or stainless steel fasteners are used.

PAINTING of SmartGuard® LOSP TREATED SmartLVL 19

Wait until excess solvents have evaporated and timber is dry. The pressure of the solvent (white spirits) from the LOSP treatment may affect the drying and hardening of paints if there has been insufficient evaporation time after the treatment. It is strongly recommended that the treated timber is left to recondition for at least 7 days in the end use situation before painting.

One coat of premium quality primer as a minimum should be applied to all surfaces prior to erection of beam and to any cuts or holes drilled. If the first coat of primer, sealant paint or stain fails to dry or adhere within the time expected, do not proceed to any further coats until the first coat has achieved satisfactory dryness and adhesion. If the first coat fails to dry it may be necessary to strip back to bare timber and allow it to weather for another week or two.

1. Paint

a. Exterior solid colour acrylic finish. One coat of oil based primer followed by one or two coats of the exterior acrylic finish as required.

or

b. Exterior solid colour oil based enamel. One coat of oil based primer followed by one coat of oil based undercoat (if required) then two coats of the oil based enamel.

2. Stains

Exterior semi-transparent or solid colour penetrating oil based stain or similar. Two or three coats of the stain as required or recommended by the manufacturer.

CHEMICAL RESISTANCE

SmartLVL's (wood in general) has a definite advantage over steel members when exposed to corrosive environments. Timber and wood products are able to withstand mild acid conditions and are more resistant to degradation.

The behaviour of SmartLVL in chemical environments depends upon a number of factors, including PH and temperature. Wood essentially responds by either swelling (Category S), similar to moisture response, or by chemical_degradation (Category D). Damage due to swelling is essentially reversible, but chemical degradation results in breakdown of the wood structure and is non-reversible. Category S agents include alcohol and other polar agents. These agents swell dry wood causing a strength (and stiffness) loss proportional to the swelling.

Category D agents include acids, alkalis and salts and result in a loss of strength and stiffness directly related to the loss of member cross-section. The table below provides a rough guide to performance of SmartLVL in chemical environments.

The effect of chemicals on wood will generally be worsened by increased exposure time, temperature, extremes of pH and chemical concentration. Wood generally offers considerably less resistance to alkalis than acids. Softwoods (includes SmartLVL) generally have better resistance to acids than hardwoods.

Where there is the possibility of chemical attack on SmartLVL members, designers should seek expert advice.

Agent category	Chemical agent	Mode of attack	Damage - Reversible or Permanent	Severity - (loss of strength and/or stiffness)
Neutral	Non-polar liquids such as petroleum hydrocarbons	None	Negligible	Negligible
S (swelling)	Alcohol and other polar solvents	Swelling	Reversible	Proportional to volumetric swelling
D (degrading)	Inorganic acids	Hydrolysis of cellulose	Permanent	Slight to moderate
D	Organic acids such as: Formic, acetic, propionic and lactic acid	Hydrolysis of cellulose	Permanent	Slight (pH 3-6)
D	Alkalis such as: sodium, calcium and magnesium hydroxide	De-lignification of wood and dissolving of hemicellulose	Permanent	Moderate (pH > 9.5) Severe (pH > 11)
D	Salts (considered as weak acids)	Hydrolysis of cellulose	Permanent	Slight

Table reference Williamson T.G 2002 APA Engineered Wood Handbook

WOOD DUST

(for all Wood Dust, Wood and Wood Products Not Preservative Treated)

CAUTION

- WOOD DUST CAN BE PRODUCED BY SAWING, SANDING OR MACHINING WOOD AND WOOD PRODUCTS
- FLAMMABLE - POSSIBLE EXPLOSION HAZARD MAY CAUSE RESPIRATORY, EYE AND SKIN IRRITATION
- SOME SPECIES MAY CAUSE DERMATITIS OR ALLERGIC RESPONSE THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) CLASSIFIES WOOD DUST AS A NASAL CARCINOGEN IN HUMANS

For additional information see the Material Data Sheet (MSDS)
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SmartFrame DESIGN/EFFECTIVE SPAN

Normal structural analysis uses the centreline representation of the member. The term "span" can be defined in a number of ways and these are defined as follows:

Clear Span. This is the distance between the faces of any support. It is generally the one easiest to measure and read from the drawings

Nominal span/centre-line span. This is the distance between the centre of the supports. This span is used to determine bending moments and deflections for continuous spaning members

Design span/Effective span. This is the span used for single span members to determine the bending moment, the slenderness of bending members and the deflections. In AS 1720.1, this is the dimension referred to as "L", and is defined below.

Design span/Effective span is the distance between -

- **The centre of the bearing at each end of a beam where the bearing lengths have NOT been conservatively sized**
- **The centre of notional bearing that have been sized appropriately, where the size of the bearing IS conservative.**

Diagram (a) shows beam where bearings have been designed appropriately. The effective span is taken as the distance between the centre of each bearing area

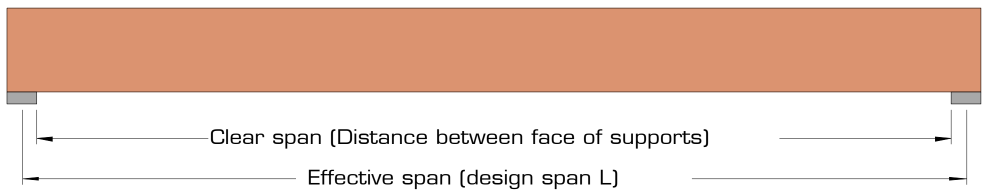
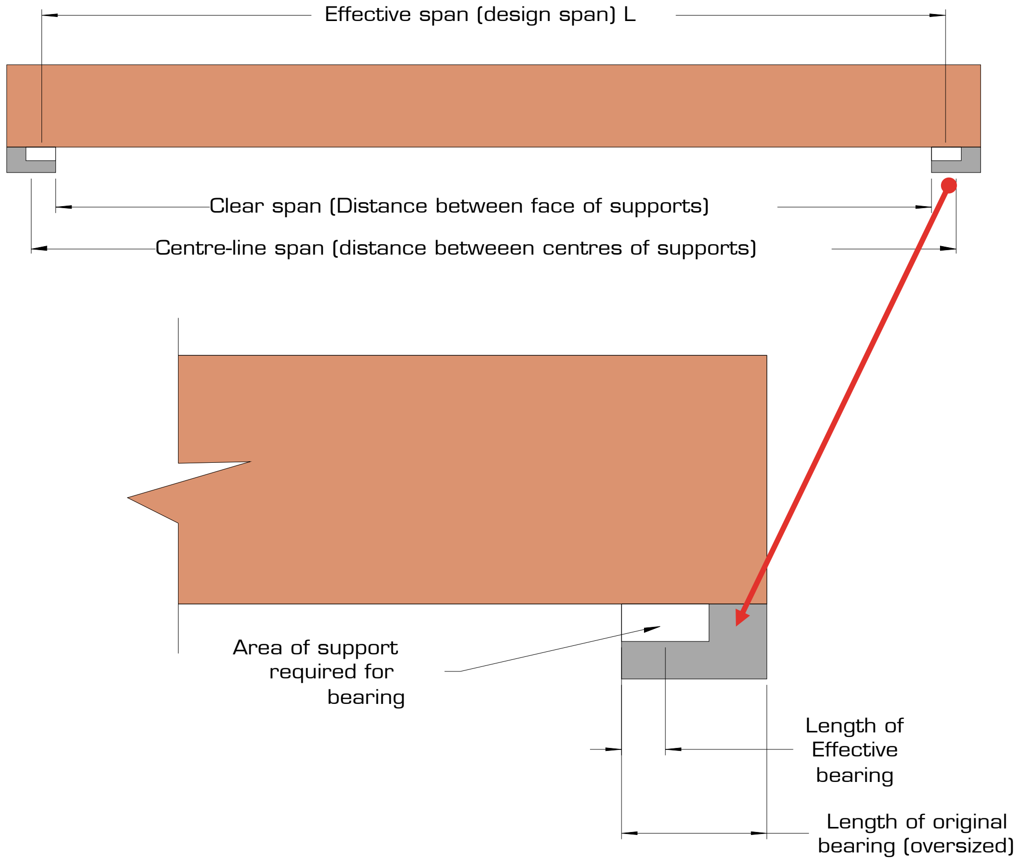


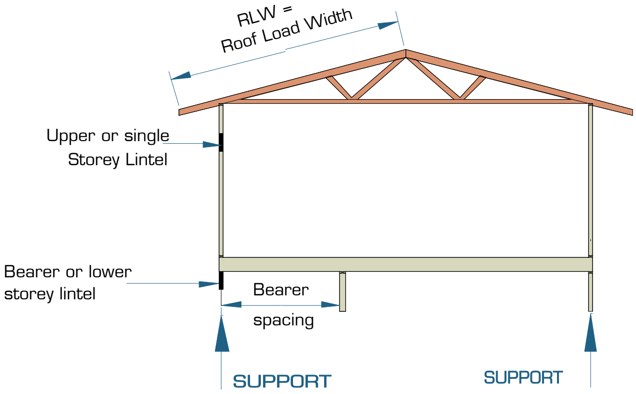
Diagram (b) below shows beam where bearings at each end have been oversized. (This is frequently the case for beams that bear onto brickwork or concrete walls where the thickness of the wall is in excess of the area required to give the beam bearing capacity).
To find the correct effective span:

1. Calculate the minimum bearing required to carry the loads satisfactorily
2. Add minimum bearing length to "clear span" distance

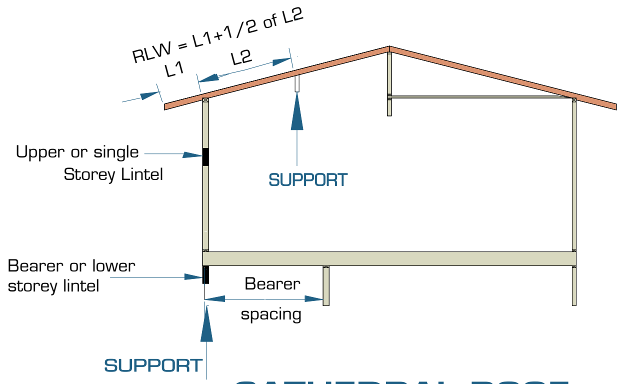


DETERMINATION OF ROOF LOAD WIDTHS

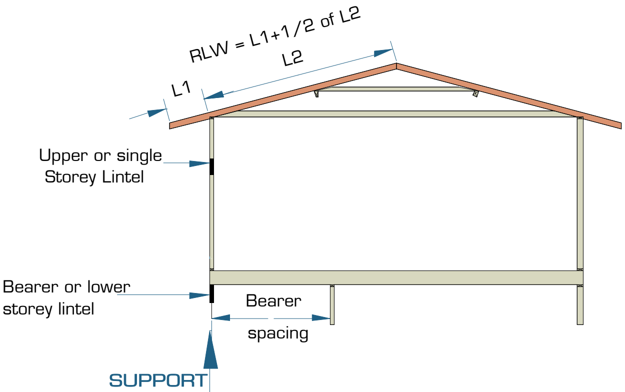
"ROOF LOAD WIDTH" applies to garage beams only (eg: bearers under walls, lintels etc) and determines the loads carried by the walls. Typical examples of the RLW are shown below, a far more comprehensive list is shown in AS1684.2



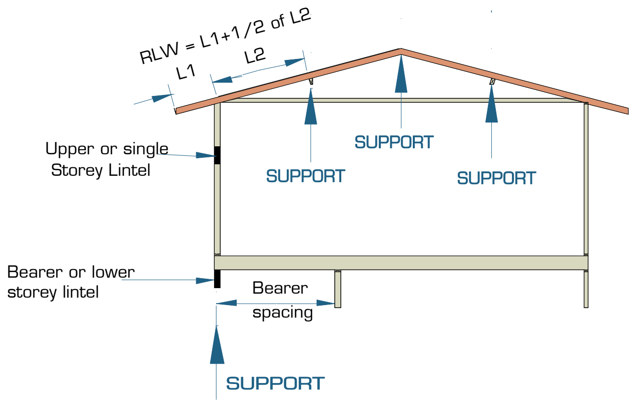
TRUSSED ROOF



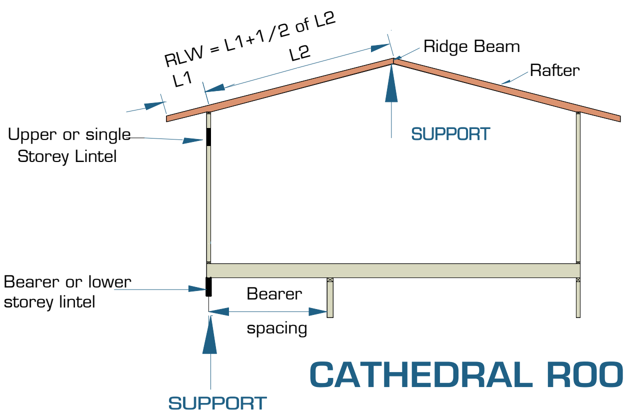
CATHEDRAL ROOF



CONVENTIONAL ROOF
COUPLED, UNSTRUTTED RIDGE



CONVENTIONAL ROOF
COUPLED, STRUTTED RIDGE



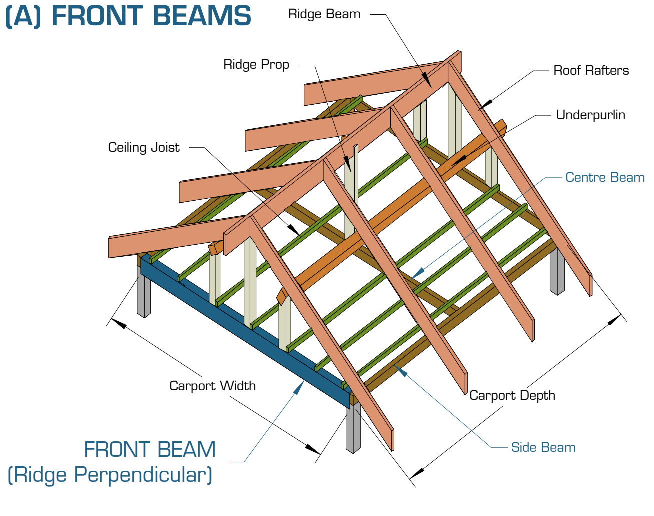
CATHEDRAL ROOF

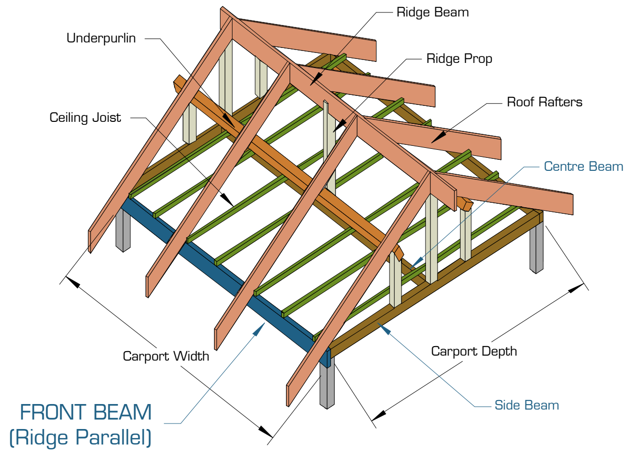
CARPORT BEAMS
AS 4055 CLASSIFICATION N1, N2 AND N3

Basis of Carport beam span table

1. The above tables have been developed for the most severe case likely to be encountered in the roof diagrams below
2. Front beam tables are also suitable for dutch gable applications (not shown)

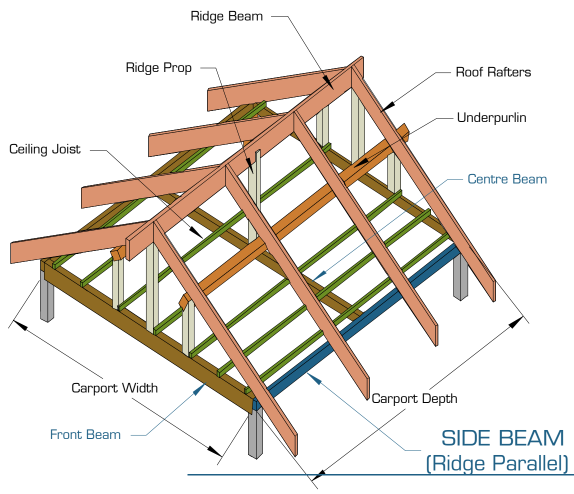
(A) FRONT BEAMS

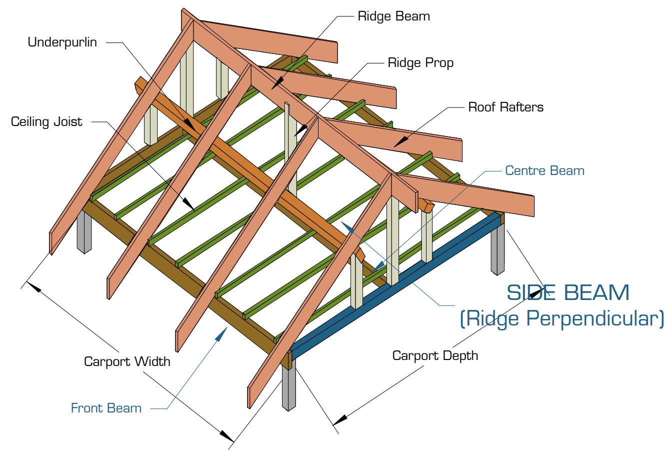




Carport depth (mm)	Maximum opening width (mm)					
	Sheet roof and ceiling			Tiled roof and ceiling		
	Beam size DxB (mm)					
	200x58	240x58	300x75	200x58	240x58	300x75
5600	5200	5900	7300	4200	4900	6100
5800	5150	5850	7250	4150	4850	6050
6000	5100	5800	7200	4100	4800	6000

(B) SIDE BEAMS

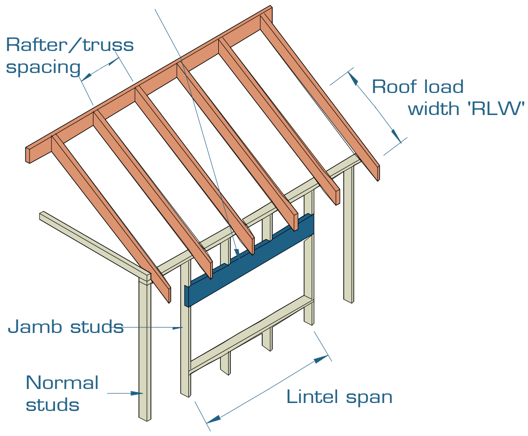




Carport width (mm)	Maximum side beam span (mm)					
	Sheet roof and ceiling			Tiled roof and ceiling		
	Beam size DxB (mm)					
	200x58	240x58	300x75	200x58	240x58	300x75
5600	3800	4550	5650	3050	3650	4850
5800	3750	4500	5650	3000	3600	4800
6000	3700	4450	5600	2950	3550	4750

SINGLE SPAN LINTELS IN SINGLE/UPPER STOREY WALLS
AS 4055 CLASSIFICATION N1, N2 AND N3

Single/Upper storey lintel



EXAMPLE:

sheet roof - 40 kg/m^2
rafter/truss spacing = 600 mm
lintel span = 3500 mm
roof load width = 3900 mm
Enter span table at 4500 roof load width column, rafter/truss spacing 600 mm, and read down to a span equal to or greater than 3500 mm

SmartLVL 19
240 x 58

Basis of lintel span table

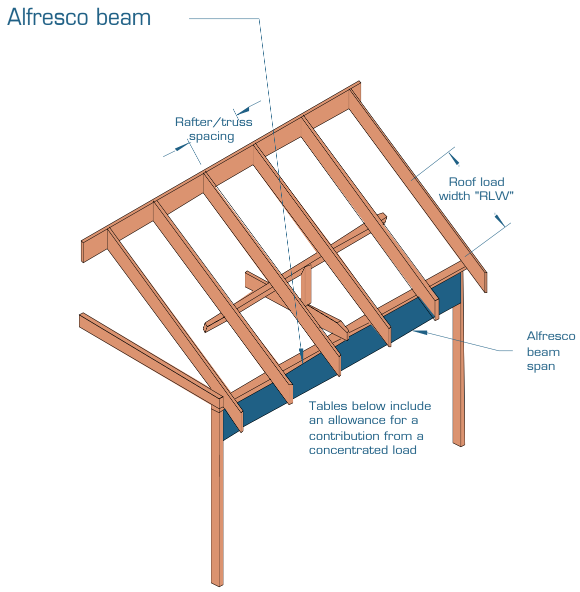
1. Normal lintel strength and serviceability provisions as contained with AS 1684.1
2. Includes extra provisions drawn from strutting and hanging beams that can accommodate point loads

Roof load width (mm)		1500		3000		4500		6000		7500	
Rafter/truss spacing (mm)		600	1200	600	1200	600	1200	600	1200	600	1200
Member size DxB (mm)	Roof mass (kg/m^2)	Maximum single/upper storey lintel span (mm)									
200x58	40	4300	4300	3700	3600	3300	3300	3100	3100	2900	2900
	90	3700	3600	3100	3100	2700	2800	2500	2500_{5}	2300	2300
240x58	40	4900	4900	4200	4200	3800	3800	3500	3500	3400	3300
	90	4200	4200	3500	3500	3200	3200	3000	3000_{5}	28005	2800_{10}
300x75	40	6100	6100	5200	5300	4800	4800	4500	4400	4200	4200
	90	5200	5300	4500	4400	4000	4000	3800	3700	3600_{10}	3500

NOTES:

1. D = member depth, B = member breadth, NS = not suitable
2. Minimum bearing length = 35 mm at end supports. Subscript values indicate the minimum additional bearing length where required to be greater than 35 mm

ALFRESCO BEAMS IN SINGLE/UPPER STOREY WALLS AS 4055 CLASSIFICATION N1, N2 AND N3



EXAMPLE:

sheet roof - 40 kg/m^2
rafter/truss spacing = 600 mm
Alfresco beam span = 3500 mm
roof load width = 3900 mm
Enter span table at 4500 roof load width column, rafter/truss spacing 600 mm, and read down to a span equal to or greater than 3500 mm

SmartLVL 19

240 x 35

Basis of Alfresco beam span table

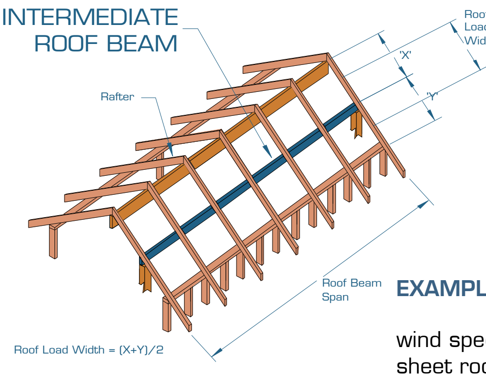
1. Normal lintel strength and serviceability provisions as contained with AS 1684.1
2. Includes extra provisions drawn from strutting and hanging beams that can accommodate point loads

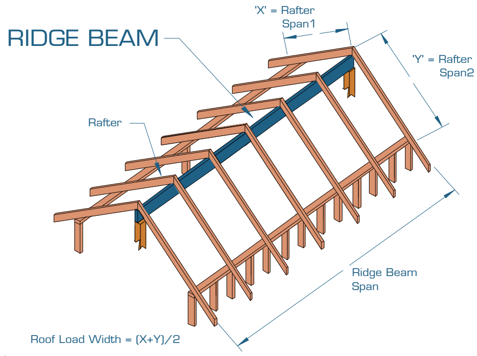
Roof load width (mm)		1500	3000	4500	6000	7500	1500	3000	4500	6000	7500
Member size DxB (mm)	Roof mass (kg/m^2)	Maximum single span Alfresco beam span (mm)					Maximum continuous span Alfresco beam span (mm)				
200x58	40	4800	3800	3300	2900	2700	6400	5200	4400	4000	3600
	90	3900	3100	2700	2400	2200	5300	4200	3600	3300_{10}	3000_{30}
240x58	40	5700	4500	3900	3500	3200	7300	6100	5300	4800	4400_{10}
	90	4700	3700	3200	2900	2600_{5}	6200	5000	4400_{10}	3900_{30}	3600_{55}
300x75	50	7200	6100	5300	4800	4400	9100	7700	6900	6300	5900_{15}
	100	6200	5000	4400	3900	3600_{5}	7800	6600	5900_{15}	5300_{40}	4900_{65}

NOTES:

1. D = member depth, B = member breadth, NS = not suitable.
2. End bearing lengths = 35 mm at end supports and 70 mm at internal supports for continuous members. Subscript values indicate the minimum additional bearing length where required to be greater than 35 mm at end supports and 70 mm at internal supports
3. rafter spacing up to 1200 mm

RIDGE/INTERMEDIATE ROOF BEAM
AS 4055 CLASSIFICATION N1, N2 AND N3





EXAMPLE:

wind speed = N3
sheet roof - 40 kg/m^2
beam span = 4500 mm (single span)
X = 2000 mm   Y = 3000 mm
roof load width = (X+Y)/2 = 2500 mm

Enter single span table at 3000 roof load width with column and read down to span equal to or greater than 4500 mm

ADOPT:

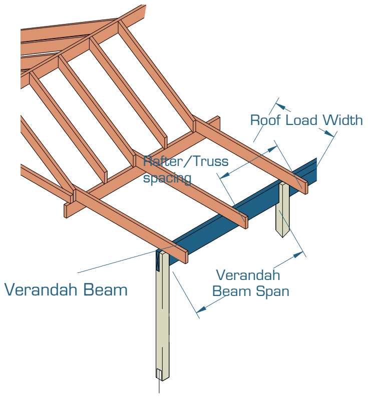
SmartLVL 15 — 2/240x58

Roof load width (mm)		1500		3000		4500		6000		7500	
Member size DxB (mm)	Roof mass (kg/m^2)	Span	O/H	Span	O/H	Span	O/H	Span	O/H	Span	O/H
		Maximum SINGLE span Ridge or Intermediate beam									
200x58	10	6600	1900	5500	1900	4700	1850	4100	1600	3600	1450
	40	5100	1900	4000	1900	3500	1750	3100	1500	2800	1400
	60	4500	1900	3600	1800	3100	1500	2800	1400	2500	1200
	90	4000	1900	3200	1600	2700	1300	2500	1200	2300	1100
240x58	10	7600	2300	6400	2300	5600	2200	4900	1900	4400	1700
	40	6100	2300	4800	2250	4200	2000	3700	1850	3400	1700
	60	5400	2300	4300	2100	3700	1800	3300	1600	3000	1500
	90	4800	2300	3800	1900	3300	1600	3000	1500	27005	13005
300x75	10	9500	3100	8000	3100	7200	3000	6600	2650	5900	2350
	40	8100	3100	6500	2850	5600	2550	5000	2350	4600	2200
	60	7300	3100	5800	2650	5000	2400	4500	2200	4200	2050
	90	6500	2950	5200	2450	4500	2200	4000	2000	37005	18005
		Maximum CONTINUOUS span Ridge or Intermediate beam									
200x58	10	8300	1900	7000	1900	5700	1850	5000	1600	4500	1450
	40	6900	1900	5500	1900	4700	1750	4200	1600	3800	1500
	60	6200	1900	4900	1800	4200	1600	3800	1500	3500	1400
	90	5500	1900	4300	1700	3700	1500	34005	1400	310020	130020
240x58	10	9500	2300	8000	2300	6800	2200	5900	1900	5300	1700
	40	8300	2300	6600	2250	5600	2000	5000	1850	4600	1700
	60	7400	2300	5800	2100	5100	1900	4500	1700	420020	1600
	90	6500	2300	5200	1950	45005	1750	400025	160025	370045	150045
300x75	10	12000	3100	10100	3100	9100	3000	8200	2650	7400	2350
	40	10900	3100	8800	2850	7600	2550	6800	2350	62005	2200
	60	9900	3100	7900	2650	6900	2400	620010	2200	570025	2050
	90	8800	2950	7000	2450	610010	2200	550030	205030	510055	190055

NOTES:

1. D = member depth,   B = member breadth,   NS = not suitable.
2. End bearing lengths = 35 mm at end supports and 70 mm at internal supports for continuous members. Subscript values indicate the minimum additional bearing length where required to be greater than 35 mm at end supports and 70 mm at internal supports
3. Minimum backspan = 200 % of overhang Maximum overhang = 50 % of backspan
4. rafter spacing up to 1200 mm

SINGLE SPAN VERANDAH BEAM
AS 4055 CLASSIFICATION N1, N2 AND N3



EXAMPLE:

sheet roof - 40 kg/m^2
rafter/truss spacing = 600 mm
verandah span = 3500 mm
roof load width = 3900 mm
Enter span table at 4500 roof load width column, rafter spacing of 600 mm, and read down to a span equal to or greater than 3500 mm

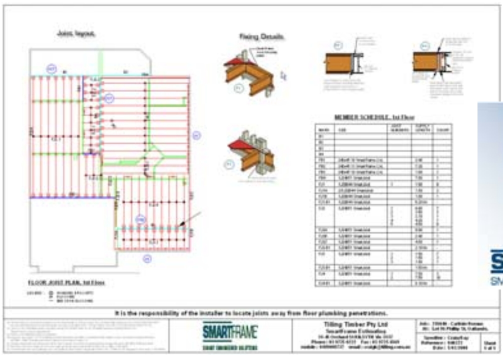
SmartLVL 19
240 x 58

Roof load width (mm)		900		1200		1800		2400		3000		3600	
Rafter/truss spacing (mm)		600	900	600	900	600	900	600	900	600	900	600	900
Member size DxB (mm)	Roof mass (kg/m^2)	Maximum SINGLE span verandah beam (mm)											
200x58	10	6500	6500	6200	6200	5800	5800	5500	5500	5200	5300	5100	5100
	20	5800	5800	5500	5500	5100	5100	4800	4700	4500	4500	4300	4300
	40	5100	5100	4800	4700	4300	4300	4000	4000	3800	3800	3600	3600
	60	4600	4600	4300	4300	3900	3900	3600	3600	3300	3300	3100	3100
	90	4200	4200	3900	3900	3500	3400	3100	3100	2900	2900	2700	2700
240x58	10	7300	7300	7000	7000	6500	6500	6200	6200	6000	6000	5800	5800
	20	6500	6500	6200	6200	5800	5800	5400	5400	5200	5200	5000	5000
	40	5800	5800	5400	5400	5000	5000	4700	4600	4400	4400	4200	4200
	60	5300	5300	5000	5000	4500	4500	4200	4200	4000	4000	3800	3800
	90	4800	4800	4500	4500	4100	4100	3800	3800	3500	3500	3300	3300
300x75	10	8600	8600	8300	8300	7900	7900	7600	7600	7300	7300	7100	7100
	20	7900	7900	7600	7600	7100	7100	6700	6700	6400	6400	6200	6100
	40	7100	7100	6700	6700	6200	6100	5800	5800	5500	5500	5300	5300
	60	6500	6500	6200	6100	5600	5600	5300	5300	5000	5000	4800	4800
	90	6000	6000	5600	5600	5100	5200	4800	4800	4600	4500	4400	4300
		Maximum CONTINUOUS span verandah beam (mm)											
200x58	10	12000	12000	10400	10400	8500	8400	7300	7300	6500	6500	5900	5900
	20	12000	12000	10600	10600	8600	8600	7500	7500	6700	6700	6100	6100
	40	12000	12000	11200	11200	9100	9100	7800	7800	7000	7000	6400	6400
	60	12000	12000	10500	10500	8700	8700	7600	7600	6800	6800	6300	6200
	90	10000	9900	8700	8700	7200	7100	6300	6200	5600	5600	5100	5100
240x58	10	12000	12000	12000	12000	10000	9900	8600	8600	7700	7700	7000	7000
	20	12000	12000	12000	12000	10200	10200	8800	8800	7900	7800	7200	7200
	40	12000	12000	12000	12000	10800	10800	9300	9300	8300	8300	7500	7500
	60	12000	12000	12000	12000	10200	10200	8900	8900	8000	8000	7400	7300
	90	11600	11600	10200	10200	8500	8400	7400	7300	6600	6600	6000	6000
300x75	10	12000	12000	12000	12000	12000	12000	12000	12000	10700	10800	9800	9800
	20	12000	12000	12000	12000	12000	12000	12000	12000	11000	11000	10000	10000
	40	12000	12000	12000	12000	12000	12000	12000	12000	11600	11600	10500	10500
	60	12000	12000	12000	12000	12000	12000	12000	12000	11000	11000	10100	10100
	90	12000	12000	12000	12000	11600	11500	10100	10100	9100	9000	8400	8300

NOTES:

1. D = member depth, B = member breadth, NS = not suitable
2. End bearing lengths = 35 mm at end supports and 70 mm at internal supports for continuous members.
3. Overhangs shall not exceed 25% of the actual backspan.

SmartFrame TOOLS



SmartFrame Software

You really do need to see our software to believe it. This state of the art *FREE* software is world leading technology. Not only does it provide the services noted previously, but you also have the benefit of being able to 'size' specific members for your project—fast. No other software package can give you all these benefits at no charge.

Quick Design -
Can't get a particular timber? Just enter the spans and you have a SmartFrame alternative. It's that easy.

Take-Off -
This is the module from which we produce our designs. Either use this yourself, or send the plans to us and we'll do it for you. The take-off is provided in A3 full colour easy to read layouts.

Bracing -
More for Designers and Engineers, this module will work out force summaries for wind bracing and more.

Connection Details -
Ever wondered how to connect an I-Joist to a steel PFC? If you have, this is the module for you. Over 30 different types of connection details all with easy to read graphics and detailed notes.

Select Bracket -
Want to be sure you've got the hardware? Visit 'select bracket' and you'll get all the info you need i.e.: size, the joists it suits and order code. Choose from straight face mount hangers, top mounts, 45° offsets, rafter to ridge hangers and even heavy duty hangers for our LVL.

Tie Down -
A powerful tool to enable users to quickly calculate the uplift forces on a structure and to assign suitable tie down solutions as contained in Chapter 9 of AS 1684

Reports -
Need a certificate report for council? Easy—just switch on your PC, bring up the job and hit the reports button. In one or two minutes, you'll have complete computer generated certifications suitable for most councils and inspectors. Of course, if they aren't satisfied, send the job to us and our Engineer will look over it, ensure it's correct and then issue you an Engineer's Certificate.

SmartFrame Design Service

Tilling offer a comprehensive design service to builders as part of our SmartFrame builders program—at no charge. Simply give us your plans and we'll supply you with the following:

floor Beam/Post/Lintel Layout - This is clearly show where members go, what they bear onto and how they connect within the frame, all in easy to read colour graphics.

Joist Layout - Showing the layout of joists, bearing points, where to start your layout and other site specific details such as joist hangers and rimboard/end blocking. These layouts can include location of service holes so the tradesman can adjust the joists as necessary.

Member Schedule - Our member schedule illustrates the direction of each member, size, length, count, how it bears left and right and any other information deemed to be needed.

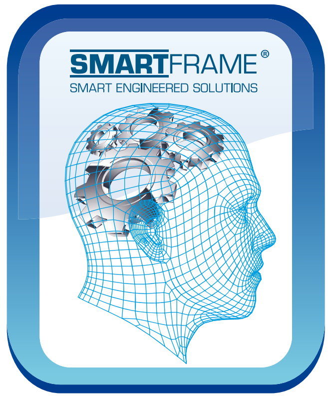
Order Schedule - This is the take off to build the floor. Simply take a look at it to check everything is included, then fax it to your merchant for supply.

Training

Installation Training - It's not always easy for carpenters to keep up to date on new products, however to produce a well built, strong home, it's a necessity. At Tilling, we realize that education and training are lynch pins of the SmartFrame range. If you've ever used our products before, or you've just started a new chippie crew, give us a call. Given either on site, in your office or ours, installation training runs through all the details required to install our joists and LVL, including shortcuts to save time and money. Once again this service is provided at no charge to SmartFrame users. It's all part of the service to ensure you can work with confidence.

SMARTFRAME DESIGN COMPENDIUM

Design Compendium Contents	Interactive	Printable	PC
Specification Software	✓	✓	✓
- Technical Support	✓		✓
Design Guides (pdf)	✓	✓	✓
Technical Illustrations (dxf/dwg for CAD)		✓	✓
Fixing Details - fixing details/hangers (jpg)			✓
Video Clips - installation/company (mpg)			✓
Software Tutorial	✓		✓



Never before has so much user friendly computer power been unleashed into the hands of building industry professionals to allow the design and detailing of engineered timber products. This software, in conjunction with the SmartFrame Design Centre and SmartFrame engineered timber products themselves, combines to form the most sophisticated structural timber option ever available to the Australian market. The SmartFrame Engineered Timber Solution represents an entirely new and revolutionary concept in the delivery of 21st century technology and service to the building industry.

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