



NSW OFFICE
109 Kurrajong Avenue
Mt Druitt NSW 2770
Tel: 02 9677 2600
Fax: 02 9677 2500

QLD OFFICE
20-24 Nealdon Drive
Meadowbrook QLD 4131
Tel: 07 3440 5400
Tel: 07 3440 5444

WA OFFICE
10 Cartwright Drive
Forestdale WA 6090
Tel: 08 9248 7643
Fax: 08 9248 3241

Tilling Timber Pty Ltd - Head Office 31 - 45 Orchard Street KILSYTH 3137
Ph: 03 9725 0222 Fax: 03 9725 6569 Web: www.tilling.com.au e-mail: smartdata@tilling.com.au

SmartJoist INSTALLATION GUIDE

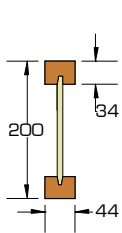


GENERAL

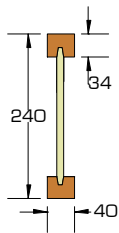
Jobsite handling and storage, erection procedure and erection bracing are the responsibility of the installer. Careful review of this installation guide, project plans and joist layout drawings (where supplied) should be undertaken prior to the installation of the joists. The manufacturers warranty applies only to properly installed undamaged joists, adequately protected from the weather in the completed project.



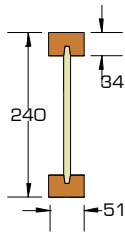
SmartJoist SIZES



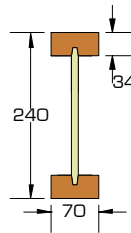
SJ20044



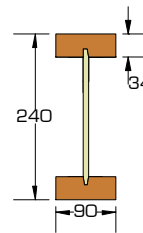
SJ24040



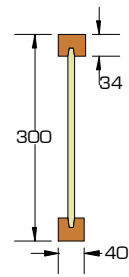
SJ24051



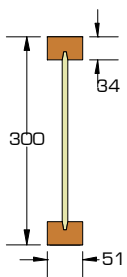
SJ24070



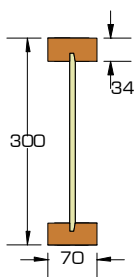
SJ24090



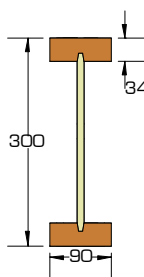
SJ30040



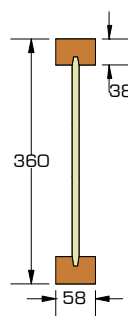
SJ30051



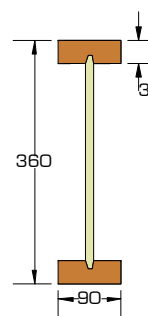
SJ30070



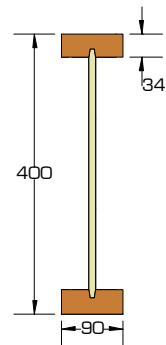
SJ30090



SJ36058



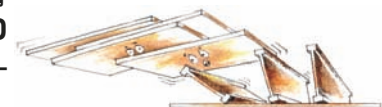
SJ36090



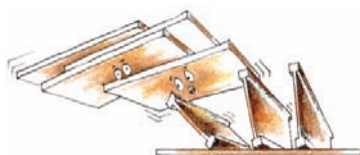
SJ40090

SAFETY WARNING

DO NOT ALLOW WORKERS OR LOADS ON SmartJoists UNTIL ALL BLOCKING, HANGERS, RIM JOISTS, NAILING AND TEMPORARY BRACING ARE INSTALLED AS SPECIFIED. SERIOUS ACCIDENTS OR INJURY CAN RESULT FROM FAILURE TO FOLLOW THESE GUIDELINES.



SAFETY WARNING



DO NOT ALLOW WORKERS OR LOADS ON SmartJoists UNTIL ALL BLOCKING, HANGERS, RIM JOISTS, NAILING AND TEMPORARY BRACING ARE INSTALLED AS SPECIFIED BELOW. SERIOUS ACCIDENTS OR INJURY CAN RESULT FROM FAILURE TO FOLLOW THESE GUIDELINES.

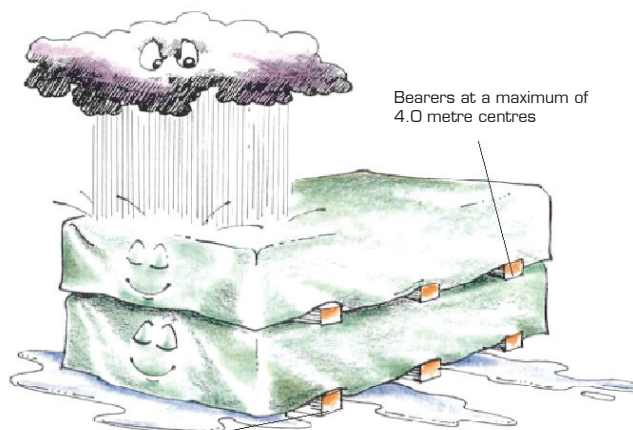
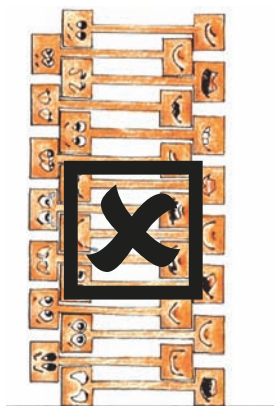
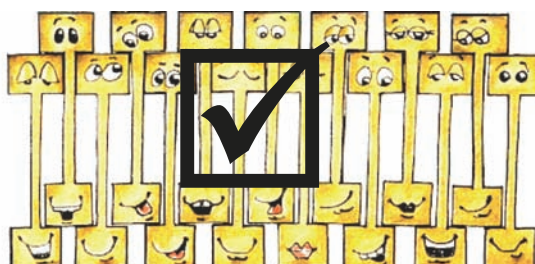


ACCIDENTS CAN BE AVOIDED UNDER NORMAL CONDITIONS BY FOLLOWING THESE GUIDELINES:

1. Brace each joist as it is erected. Joists must be nailed to supports and all hangers, blocking, rim joists. X - bridging at supports must be completely installed and properly nailed. (see general notes and details)
2. Brace the ends of cantilevers (overhangs) with closure panels, rim joist or x - bridging (see general notes and details)
3. Lateral brace the top flange of each joist, to prevent sideways buckling or rollover which may occur under light construction loads, such as a worker and/or a layer of un-nailed sheathing. Fully installed permanent sheathing or temporary struts to the top flange of each joist (see 'typical SmartJoist floor framing) can accomplish lateral bracing.
4. Temporary struts must be nailed to a lateral restraint at the end of bay such as a braced wall or temporary (or permanent) sheathing nailed to the first 1200 mm of the joist at the end of the bay (see typical floor or roof framing)
5. Permanent sheathing must be completely installed and properly nailed before additional loads can be placed on the system.
6. **The integrity and safe use of these products can be seriously impaired if they are damaged. Do not install any damaged products. Contact your Tilling representative or the SmartData Customer Helpline on 1300 668 690 if any product damage is noted.**

HANDLING AND STORAGE OF SmartJoists

SmartJoists should be stacked in the upright position to avoid any damage during handling or storage.

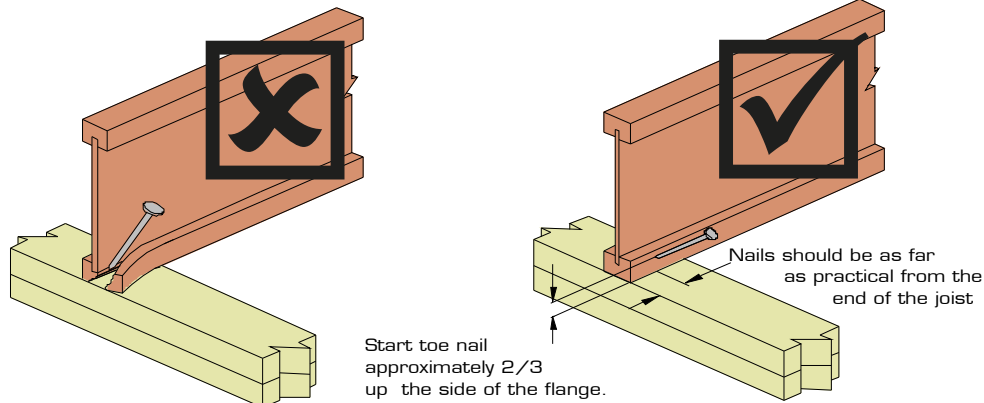


Use bearers to keep stacked material away from damp surfaces.

SmartJoists - GENERAL NOTES

Do NOT start toe nail into the corner of the flange or the top of the flange.

MAXIMUM Nail diameter 3.15 mm



- Except where otherwise noted, 30 mm minimum bearing is required at joist ends and 42 mm minimum bearing is required at intermediate supports.
- Nail joists at each bearing with 2 of 3.15 Φ x 65 nails, using one each side placed 30 mm from the end to avoid splitting.
- SmartJoist blocking or Rimboard - face nail to bearing plate with 3.15 Φ x 65 nails at 150 mm centres. Nail rim joist to the end of the top and bottom flange of each SmartJoist with 1 3.15 Φ x 65 nail, use 1 3.75 Φ x 75 nail top and bottom with joists with 58 or 90 mm wide flanges.
- SmartRim - toe nail to bearing plate with 3.15 Φ x 65 nails at 150 centres or 4.5 Φ x 75 nails at 300 centres. Nail rim to the end of the top and bottom flanges of each SmartJoist with 1 3.15 Φ x 65 nails.
- Sheathing nailing to top flange (Joists must be fully braced before sheathing is nailed)
 - Space 2.8 Φ x 65 and 3.15 Φ x 65 nails no closer than 50 mm per row.
 - Space 3.75 x 75 nails no closer than 75 mm.
 Maximum nail spacing: 300 mm
- Backer blocks at hanger details:
 - 40 mm flanges - 15 mm ply
 - 44 & 51 mm flange - 19 mm ply
 - 58 mm flange - 2 pieces of 12 mm ply
 - 70 mm flange - 2 pieces of 15 mm ply
 - 90 mm flange - 2 pieces of 19 mm ply
- See double SmartJoist detail F15 for filler blocks. Nail Joists together with two rows of 3.75 Φ x 75 nails on each side of double joist at 300 mm centres (Clinch if possible). A total of 4 nails per 300 mm is required. If nails can be clinched, only 2 nails per 300 mm is required.
- All joists require lateral support at end bearings using blocking or rim material.
- The top flanges must be kept straight within 10 mm of the true alignment.
- See web stiffener detail F13 for web stiffener attachment at supports. Web stiffener requirements for concentrated loads in excess of 4.5 kN, applied at the top flange of the joist, requires additional consideration.
- When required, install web stiffeners to joist (see detail F13) prior to placing joist in the hanger, then nail hanger to joist.
- All roof details are valid to a maximum angle of 35° (as per AS1684 - 1999)
- All nails are steel nails complying with AS 2334 - 1980 Steel nails - Metric series. Nail gun nails of similar length and diameter may be substituted for the above provided that they are manufactured with properties equivalent to the nails in the above code.
- Install all hangers to the manufacturers installation instructions, taking particular attention to the use of the correct nails. Never use clouts or brads.
- Prescriptive code requirements for mid span blocking of solid timber joists are not applicable to SmartJoists.

END BLOCKING AND SmartJoist

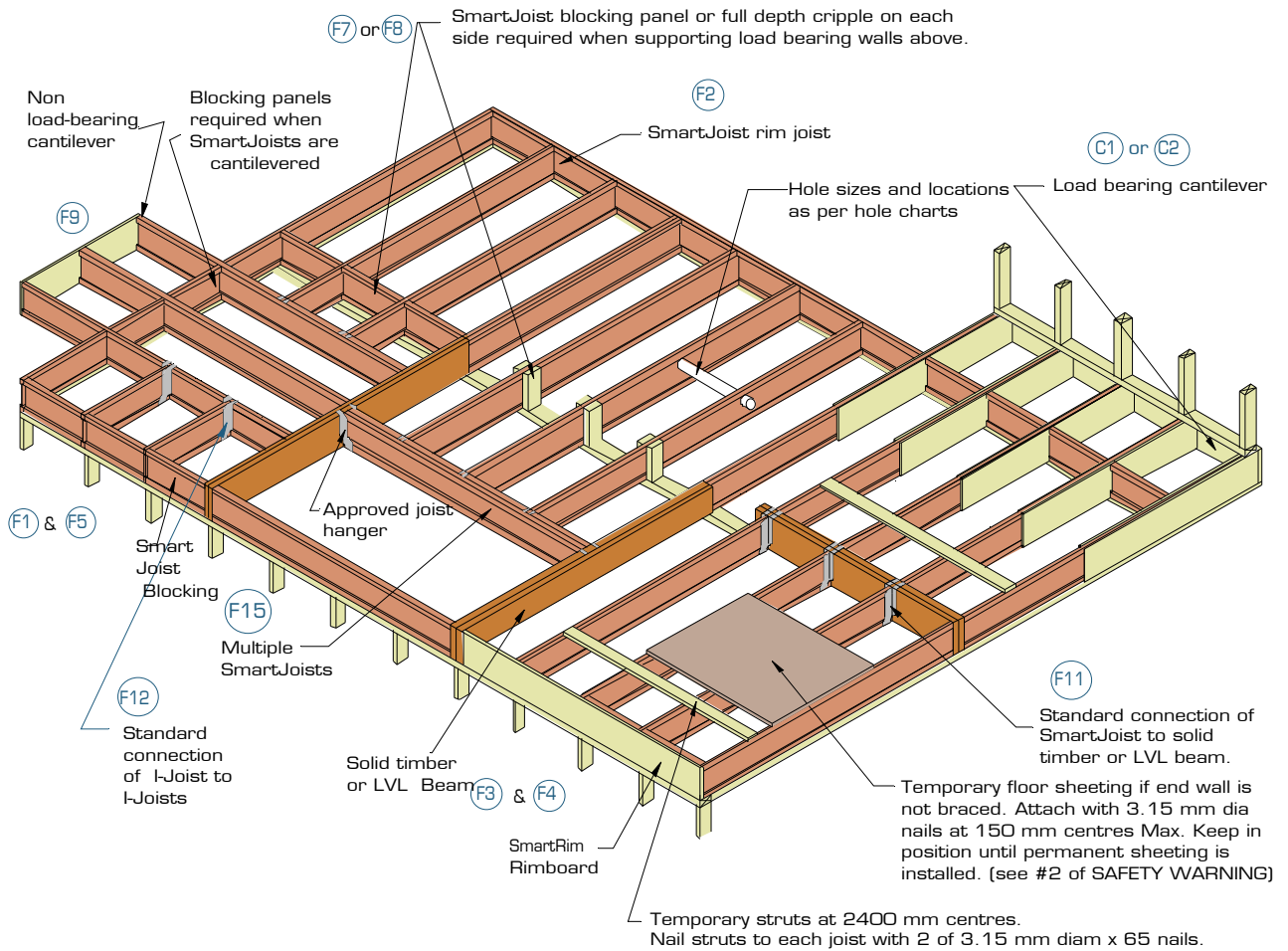
The end blocking of I-Joists performs three (3) essential functions, as well as being an invaluable component of the bracing of the structure as a whole unit. These functions include:

- Keeps joists upright and prevents rollover during construction
- Provides end reaction capacity to the I-Joists and
- Provides extra torsional resistance to the I-Joist to improve floor performance.

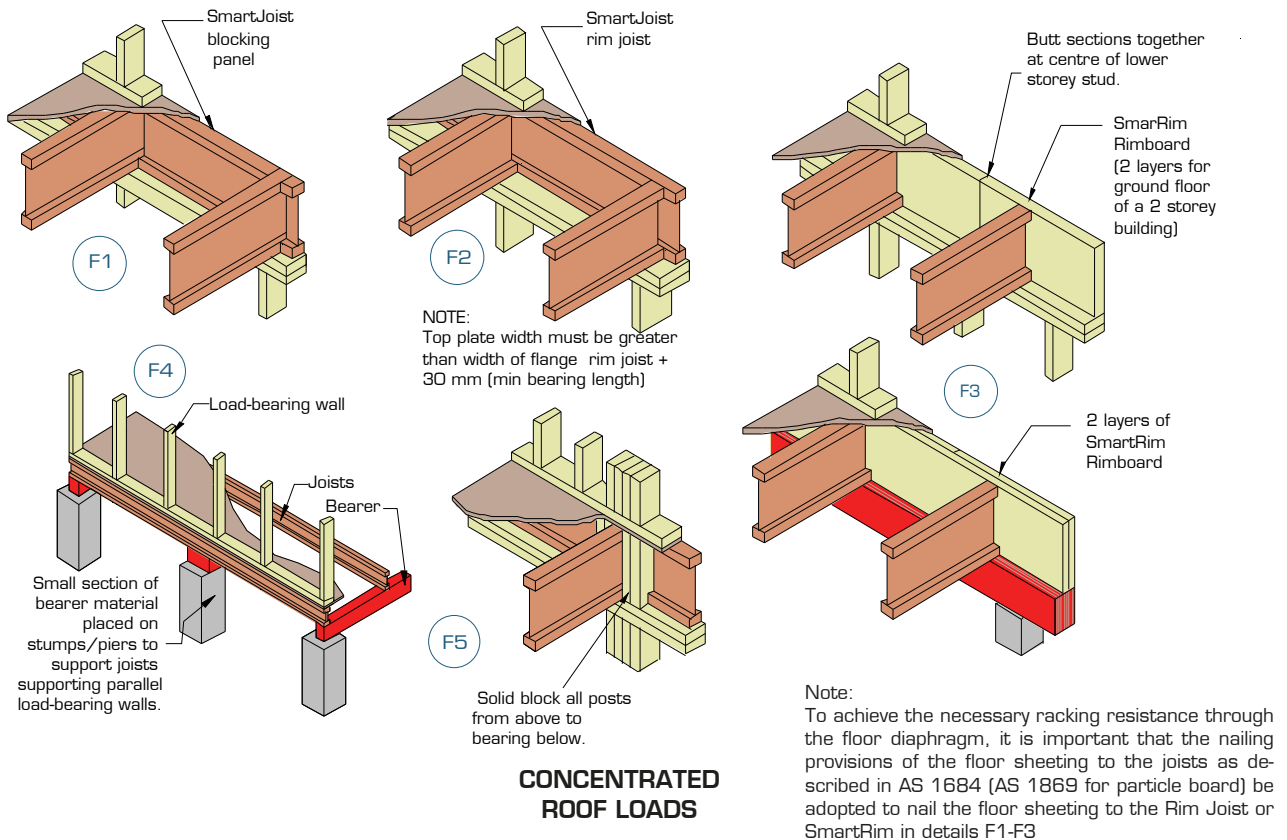
(A full description of the end blocking effects is contained in the SmartJoist Design Guide).

The SmartJoist floor joists should be fully blocked at their end bearing points onto exterior load bearing walls as shown in the blocking options following.

TYPICAL SmartJoist FLOOR FRAMING

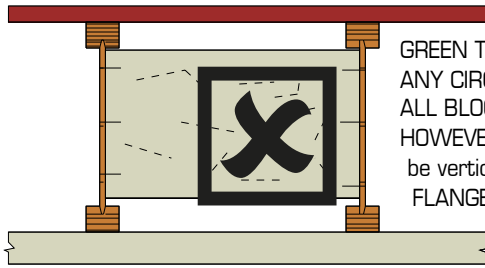


TYPICAL SmartJoist FLOOR CONSTRUCTION DETAILS



TYPICAL SmartJoist FLOOR CONSTRUCTION DETAILS

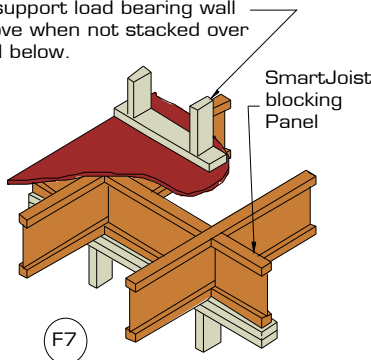
WARNING - CORRECT BLOCKING FOR SmartJoists



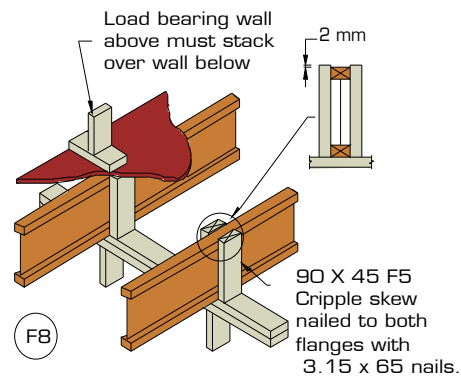
GREEN TIMBER SHALL NOT BE USED AS END BLOCKING UNDER ANY CIRCUMSTANCES. IT IS STRONGLY RECOMMENDED THAT ALL BLOCKING BE CARRIED OUT AS PER DETAILS F1 - F4, HOWEVER: Dry timber blocking may be used but the grain MUST be vertical. BLOCKING OF SmartJoist MUST EXTEND TO BOTH FLANGES. Skew nail with 3.15 x 65 nails, one each side of top and bottom flange.

INTERIOR LOAD BEARING AND BRACING WALLS

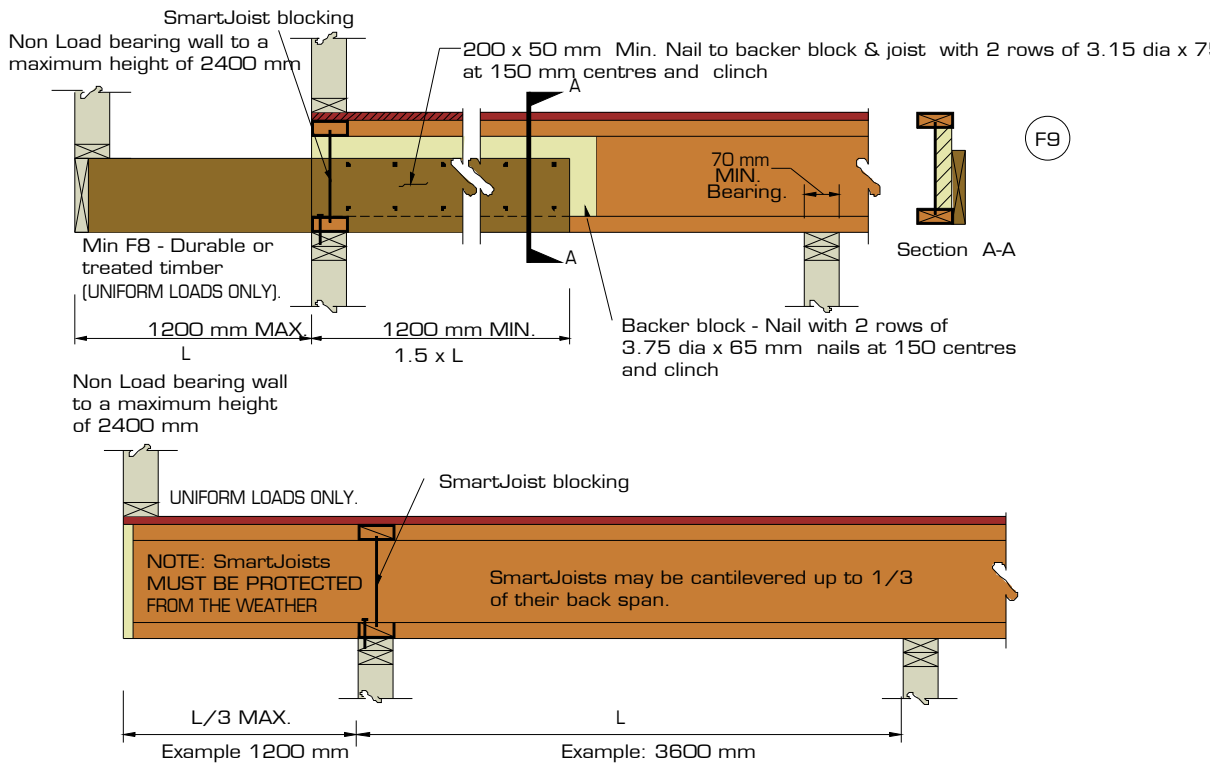
SmartJoist shall be designed to support load bearing wall above when not stacked over wall below.



NOTE: Detail F7 with blocking panel is required for bracing walls.



NON LOAD-BEARING CANTILEVER DETAILS (BALCONIES)



FOR CANTILEVERS SUPPORTING LOAD BEARING WALLS, SEE DETAILS C1 or C2.

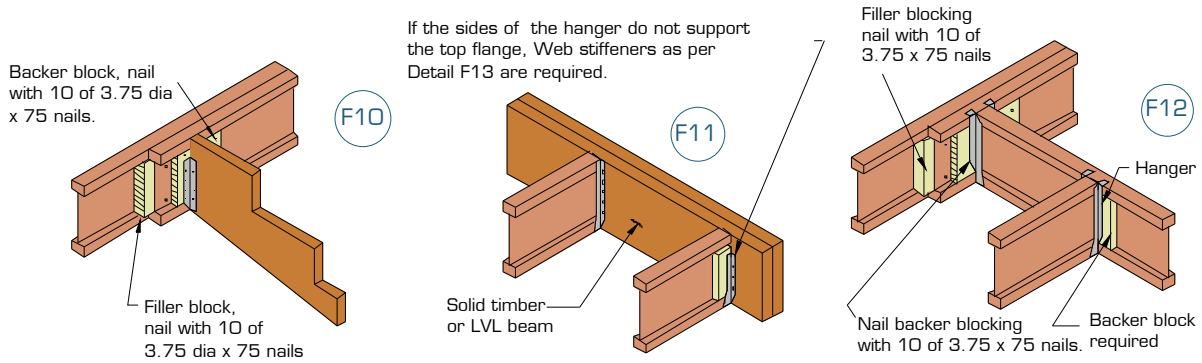
CANTILEVERED BALCONIES as per detail F9

Loadings: Permanent Loading G: self weight + 40 kg/m² + 0.6 kPa of live load permanently applied, live load Q: 2.0 kPa or 1.8 kN point live load , 1.5 kN/m acting at end of cantilever

Balcony Cantilevers - Maximum cantilever and minimum back span (m)

Joist spacing (mm)	300		400		450		600	
	Cantilever	Back span	Cantilever	Back span	Cantilever	Back span	Cantilever	Back span
H3 SmartFrame LVL 15								
150 x 42	1.0	1.5	1.0	1.5	1.0	1.5	0.9	1.4
170 x 42	1.2	1.8	1.1	1.7	1.1	1.7	1.1	1.7
200 x 42	1.4	2.1	1.3	2.0	1.3	2.0	1.3	2.0
240 x 42	1.7	2.6	1.6	2.4	1.6	2.4	1.5	2.3
300 x 42	2.1	3.2	2.0	3.0	2.0	3.0	1.9	2.9
H3 MGP 10								
140 x 45	0.7	1.1	0.7	1.1	0.7	1.1	0.7	1.1
190 x 45	1.1	1.7	1.1	1.7	1.1	1.7	1.1	1.7
240 x 45	1.5	2.3	1.4	2.1	1.4	2.1	1.4	2.1

BACKER and FILLER BLOCKS



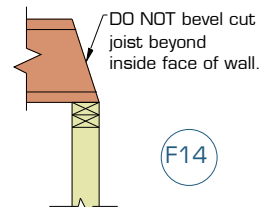
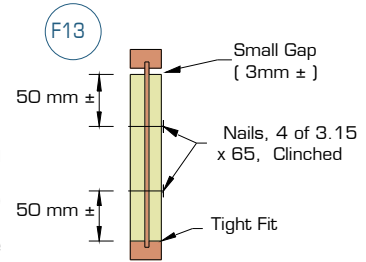
FILLER BLOCKS AND WEB STIFFENERS

SmartJoist code	Recommended filler block	Web stiffener material	
		stiffener	nails
SJ20044	120x35	15x60 mm ply	4-3.15x65
SJ24040	140x35	15x60 mm ply	4-3.15x65
SJ24051	140x45	19x60 mm ply	4-3.15x65
SJ24070	150x58 LVL	2/15x60 mm ply	4-3.15x65
SJ24090	2/140x45	2/19x60 mm ply	5-3.15x65
SJ30040	190x35	15x60 mm ply	4-3.15x65
SL30051	190x45	19x60 mm ply	4-3.15x65
SJ30070	150x58 LVL	2/15x60 mm ply	4-3.15x65
SJ30090	2/190x45	2/19x60 mm ply	5-3.15x65
SJ36058	250x50	2/12x60 mm ply	5-3.15x65
SJ36090	2/240x45	2/19x60 mm ply	5-3.15x65
SJ40090	2/240x45	2/ ply	5-3.15x65

WEB STIFFENERS

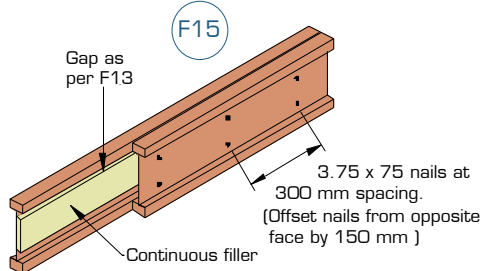
NOTES :

1. Use plywood sheathing for web stiffener with face grain parallel to long axis of the stiffener.
2. Filler blocks noted are for the general requirements of the details within this design guide.
3. Leave 3 mm gap between top of filler blocks and bottom of top flange.



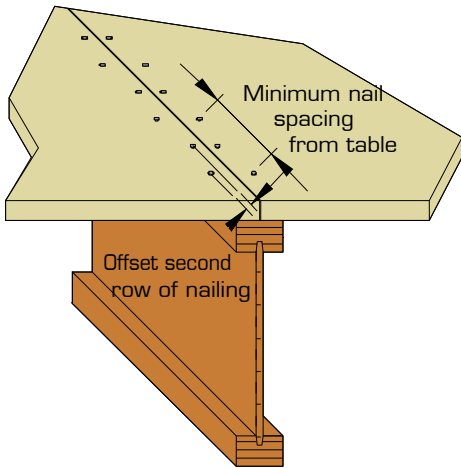
NOTE: SmartJoist blocking or timber X-bracing required at bearing for lateral support.

DOUBLE SmartJoists



1. Support back of web during nailing to prevent damage to web/flange connection
2. Filler block is required full length of joist.
3. Nail Joists together with two rows of 3.75 Φ x 75 nails on each side of double joist at 300 mm centres (Cinch if possible). A total of 4 nails per 300 mm is required. If nails can be clinched, only 2 nails per 300 mm is required.

FASTENER SPACING



Minimum single row nail spacing into SmartJoist flanges

Nail size	SmartJoist Code				
	40 mm flange	44 mm flange	51 mm flange	58-70 mm flange	90 mm flange
2.8 x 65	70	65	50	50	50
3.15 x 65	100	90	75	75	75
3.15 x 75	100	90	75	75	75
3.75 x 75	130	115	100	100	100
4.5 x 100	NA ¹	NA ¹	NA ¹	NA ¹	100

NOTES:

1. Nailing of bottom plate at 100 mm centres through floor sheathing and into top flange is permitted.
2. Minimum nail spacing is shown above, maximum nail spacing is 300 mm centres.
3. Tighter effective nail spacing may be obtained by offsetting nail rows a minimum of 12 mm and maintaining a 10 mm minimum edge distance.

LIMITED END NOTCHING AT SUPPORTS

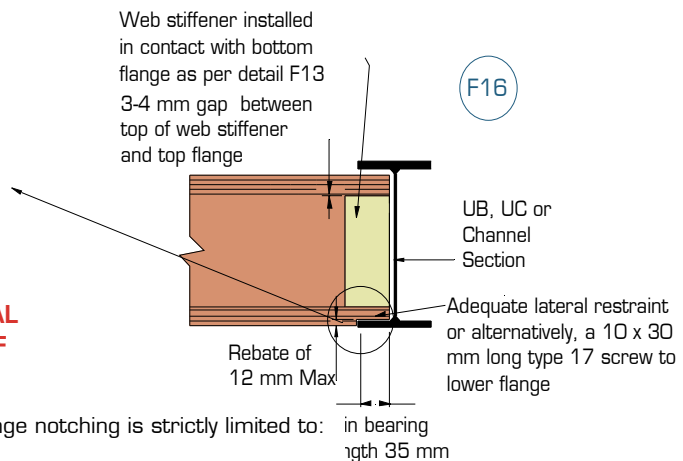
The cutting of notches in the ends of joists may reduce the allowable end reactions.

The amended end reaction capacities of SmartJoists with a 12 mm notch are as follows:

- Without web stiffeners - 80% of end reactions.
- With added web stiffeners (as per detail F13) - Full end reaction capacity



DO NOT OVER CUT FLANGES. SUBSTANTIAL REDUCTIONS IN CAPACITY MAY OCCUR IF FLANGES ARE OVER CUT.



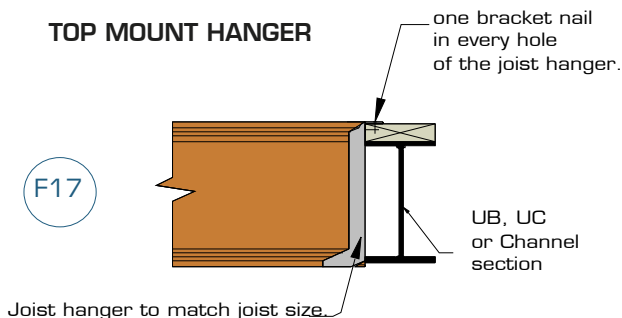
To maintain the end reaction capacities above, end flange notching is strictly limited to:

1. Notch depths NOT greater than 12 mm
2. Notches cleanly cut - NO over cutting
3. Notch length not to exceed more than 5 mm past the support.

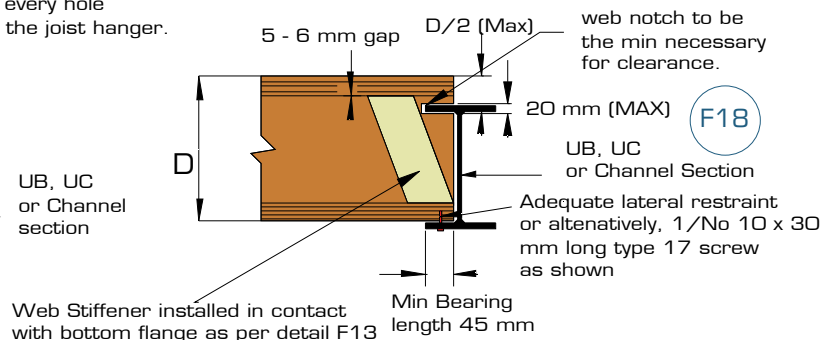
EXAMPLE FIXING OF SmartJoists TO STEEL BEAMS

NOTE: IT IS IMPORTANT TO USE THE CORRECT NAIL SIZE. WOOD MAY SPLIT IF THE NAILS ARE TOO LARGE. Nails should be 3.75 x 40 mm, with a nail in EACH bracket hole.

TOP MOUNT HANGER



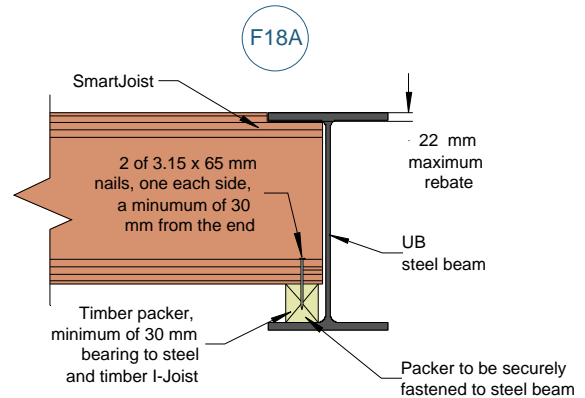
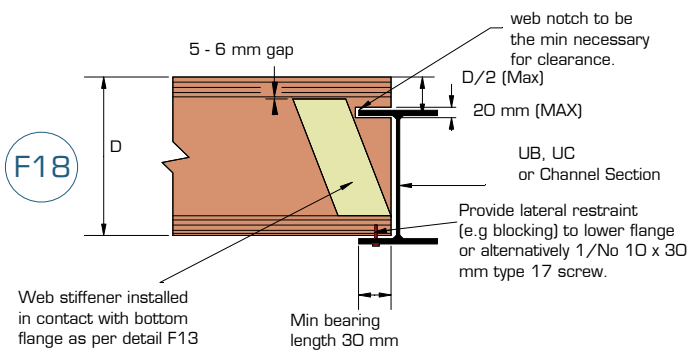
LOWER FLANGE BEARING



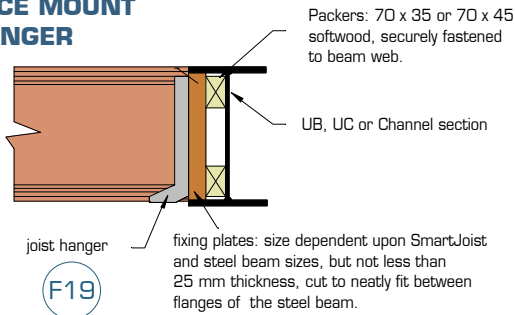
Webs may be cut to accommodate the top flange of steel sections, provided that web stiffeners are installed both sides of the web as shown above and detail F13.

EXAMPLE FIXING OF SmartJoists TO STEEL BEAMS (Cont'd)

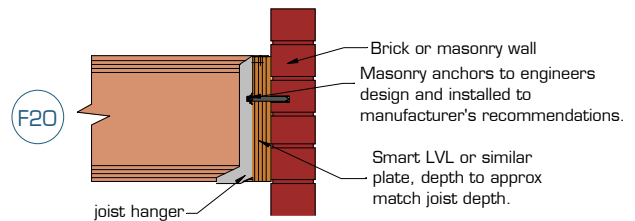
LOWER FLANGE BEARING



FACE MOUNT HANGER

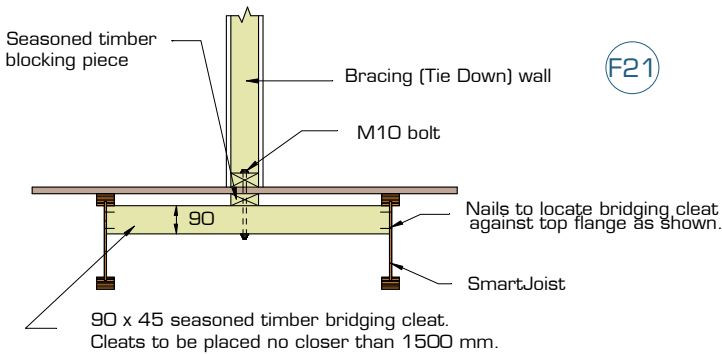


EXAMPLE FIXING OF SmartJoists TO BRICK OR MASONRY WALLS

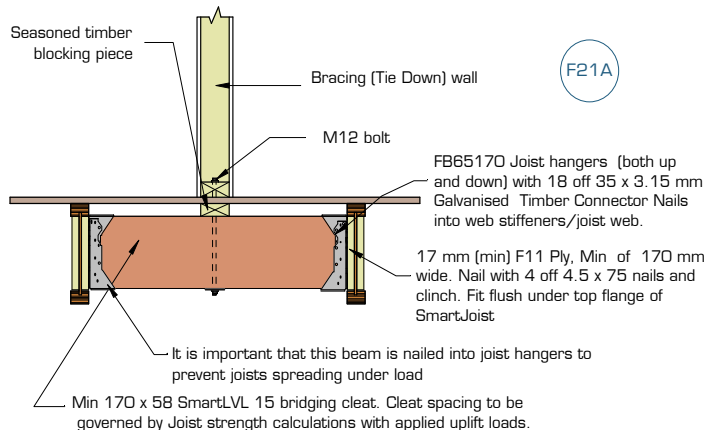


TIE DOWN (BRACING WALL) DETAILS

The tie-down needs of the structure are related to the applied wind loads. Reference should be made to AS 1684 for further guidance on this issue. The general details relating to the tie-down provisions of solid end section timber may be adopted for SmartJoists, except that under NO circumstances is it permitted to bolt through either the top or bottom flange, except when the joist is fully supported upon a wall plate or similar as shown below.

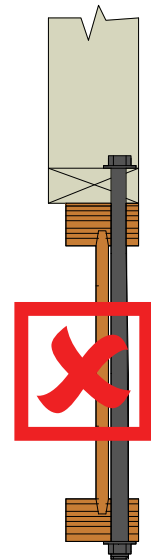


NOTE : CHARACTERISTIC UPLIFT CAPACITY 11.9 kN

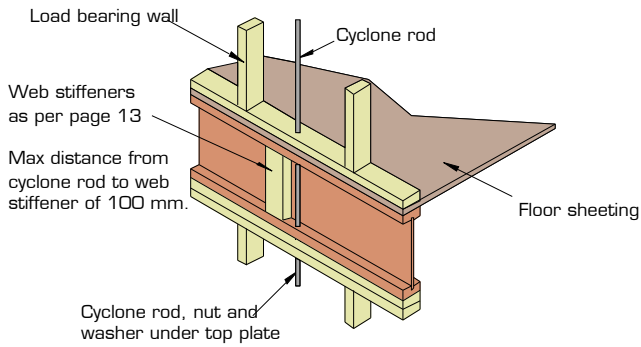


NOTE: MAX force transfer of system 30.0 kN
(It is essential that SmartJoist is analysed for these extreme loads)

DO NOT DRILL THROUGH EITHER FLANGE OF SmartJoists unless they are fully supported on wall plate or similar

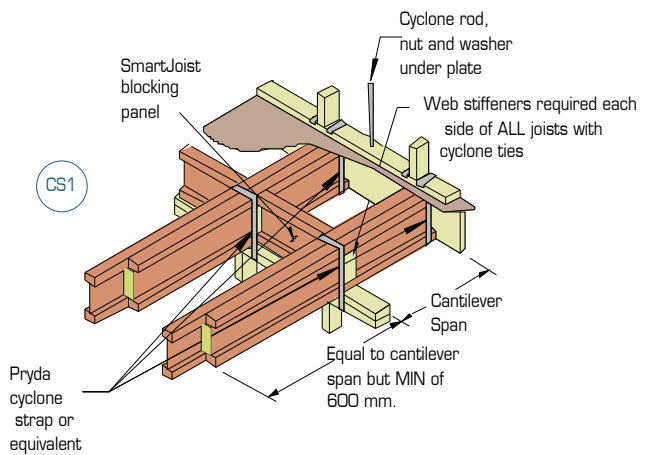
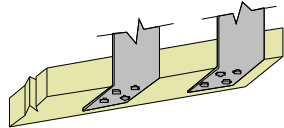


CYCLONE ROD TIE DOWN FOR CANTILEVERED SmartJoist FLOORS



CYCLONE STRAP CAPACITIES

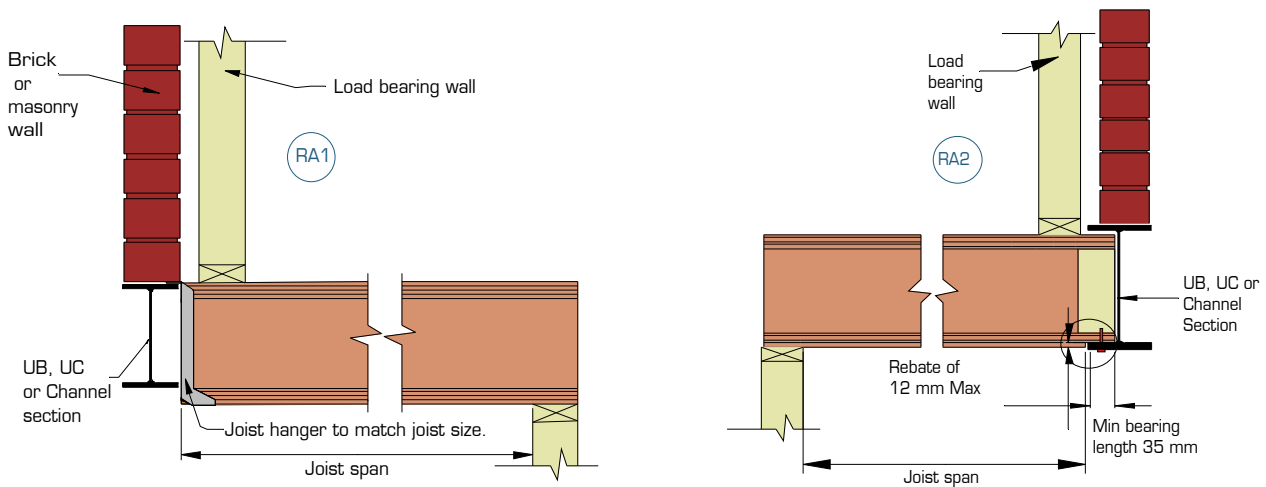
Where the strap ends of the cyclone strap are wrapped around the wall plate or other timber member and are fixed with 4 of 3.15 Ø x 35 nails, the design capacity ϕN_t of 15.3 kN is applicable, regardless of the timber joint group. Tests have proven that bending the legs of cyclone straps around the timber increases the ultimate load capacity.



While double joists shown in the above diagram, it is only necessary when loads exceed the capacities of single joist cantilevers.

JOIST/BEAM CONNECTIONS SUPPORTING OFFSET LOAD BEARING WALLS

Modern building designs frequently call for the upper storey of a two storey dwelling to be set back from the lower wall to allow sufficient light access to all areas of the building. Provided that the SmartJoists have been designed to support this offset load, no special provisions need to be made for their support EXCEPT in the following support conditions:



Maximum Roof Area Supported (m²)

- based upon worst case of 40 mm flange width (conservative for wider flanged joists)

Joist spacing (mm)	Joist supported on joist hanger RA1								Lower flange bearing RA2																							
	300				400				450				600				300				400				450				600			
Joist span (mm)	Sheet								Tile								Sheet								Tile							
3500	21.7	15.0	12.8	8.2	9.6	6.7	5.7	3.6	6.9	6.4	6.2	5.3	3.1	2.9	2.8	2.4	6.9	6.4	6.2	5.3	3.1	2.9	2.8	2.4								
4000	21.1	14.5	12.3	6.9	9.4	6.4	5.5	3.1	6.7	6.2	6.0	4.6	3.0	2.8	2.7	2.0	6.7	6.2	6.0	4.6	3.0	2.8	2.7	2.0								
4500	20.5	13.9	11.7	5.7	9.1	6.2	5.2	2.5	6.6	6.0	5.7	3.9	2.9	2.7	2.5	1.7	6.6	6.0	5.7	3.9	2.9	2.7	2.5	1.7								
5000	20.0	13.4	10.4	4.4	8.9	5.9	4.6	2.0	6.4	5.8	5.1	3.1	2.9	2.6	2.3	1.4	6.4	5.8	5.1	3.1	2.9	2.6	2.3	1.4								
5500	19.4	12.1	9.1	3.2	8.6	5.4	4.1	1.4	6.3	5.3	4.6	2.4	2.8	2.4	2.0	1.1	6.3	5.3	4.6	2.4	2.8	2.4	2.0	1.1								

SUPPORT FOR CONCENTRATED LOADS - JOIST/BEAM CONNECTIONS SUPPORTING OFFSET LOAD BEARING WALLS

RA3

Concentrated loads from any source such as girder trusses MUST be transferred through the floor space WITHOUT adding extra vertical loads to the ends of the SmartJoist at its bearing support.

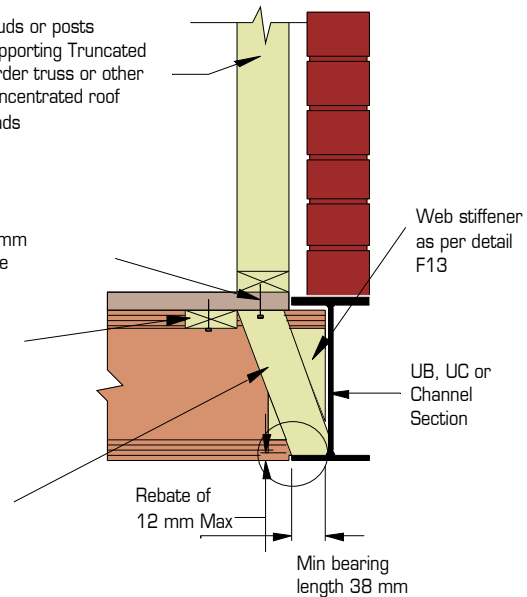
One example of transferring these loads is the use of inclined timber struts as shown in the detail opposite. Struts must be a tight fit and at a minimum angle of 60° to the horizontal

Studs or posts supporting Truncated Girder truss or other concentrated roof loads

Skew nail 2 of 3.15 x 75 mm nails through to lower plate

70 x 35 F5 nailed to underside of top flange of adjacent joists with 3.15 x 60 nails

90 x 45 F5 strut under concentrated load. Number of struts to match number of members in jamb stud or post.



BEAMS SUPPORTING SmartJoists - MULTIPLE MEMBER LAMINATIONS

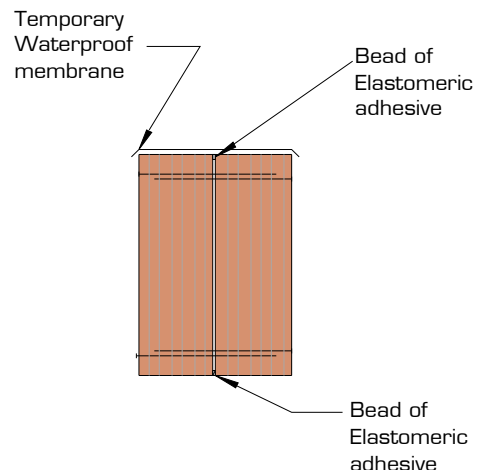
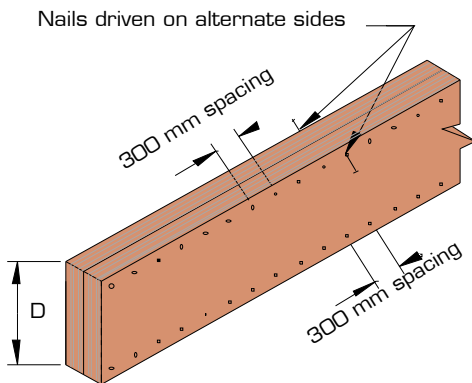
Vertical laminations may be achieved by adopting the procedures described in clause 2.3 of AS1684, however these procedures should be considered as the minimum requirements to achieve the desired effect.

Experience with SmartLVL 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.

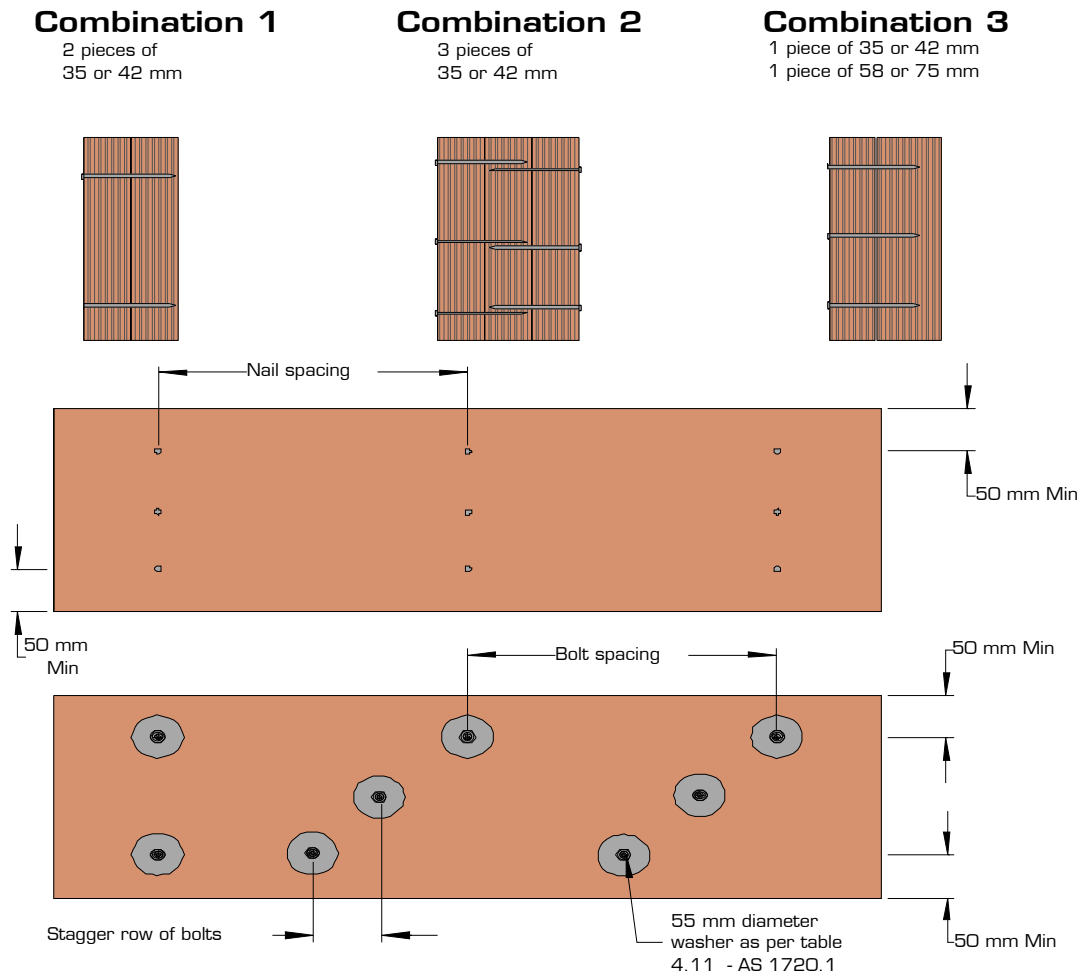
MULTIPLE MEMBER LAMINATING OF TOP LOADED BEAMS (Symmetrical loading)

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 centre
- 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 FLOOR LOAD WIDTH SUPPORTED BY EITHER OUTSIDE MEMBER (mm)

Combination (see details above)	3.75Φ x 90 mm nails		12 mm Φ bolts	
	2 rows at 300 ctrs	3 rows at 300 ctrs	2 rows at 600 ctrs	2 rows at 300 ctrs
Combination 1	3400	5100	7500	15000
Combination 2	2900	4000	5600	11000
Combination 3	2900	4000	4500	11000

Notes:

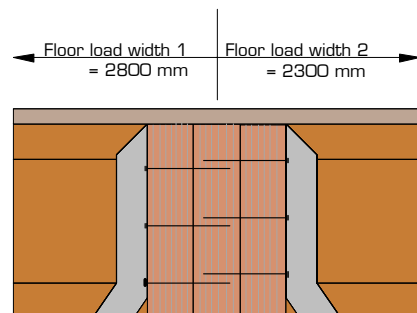
1. Table values are for 40 kg/m² floors.
2. The table values for nails may be doubled for nails at 150 mm centres, and tripled for nails at 100 mm centres
3. The nail schedules shown apply to both sides of a three (3) piece beam
4. Bolts are to be grade 4.6 commercial bolts conforming to AS 1111. Bolt holes are to be a maximum of 13 mm diameter and are to be located NOT less than 50 mm from either edge.
5. All bolts shall be fitted with a washer at each end, of a size NOT less than that given in AS 1720.1 table 4.11.

HOW TO USE THE MAXIMUM UNIFORM SIDE LOAD TABLE

Example: see diagram opposite

Beam of 2 SmartLVL loaded on both side (Combination 1)
 FLW 1 = 2800 mm, FLW 2 = 2300 mm
 Total FLW = 2800 + 2300 = 5100 mm.

1. Use SmartFrame software or SmartLVL safe load tables to size the two member section to support the FLW of 5100 mm.
2. Choose the larger of the side FLW's carried by the beam, in this case 2800 mm.
3. Enter the table at the "Combination 1" row and scan across to a table value greater than 2800 mm. The first value in the row at 3600 mm is greater than the 2800 mm required.
4. Thus adopt 2 rows of 3.75Φ x 90 mm nails at 300 mm centres



SmartRim HOLE SPECIFICATIONS

The maximum allowable hole size for a SmartRim shall be $\frac{1}{3}$ of the Rim Board depth as shown below.

The length of the Rim Board segment containing a hole shall be at least 8 times the hole size.

RIM BOARD HOLE SIZES AND MINIMUM LENGTH

SmartRim Depth (mm)	Maximum allowable hole size ^(a) ^(b) (mm)	Minimum length of SmartRim board segment ^(c) for the maximum allowable hole size (mm)
200	130	1050
240	160	1280
300	200	1600
360	235	1900
400	265	2100

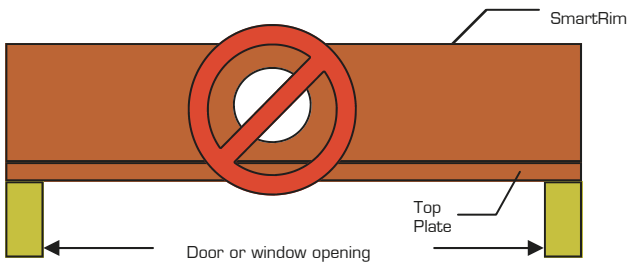
- (a) These hole provisions do not apply to SmartRim installed over openings such as doors or windows
- (b) The diameter of the round hole or the longer dimension of the rectangular hole
- (c) The lengths of the SmartRim segment per wall line. For multiple holes, the minimum length of SmartRim segment shall be 8 times the sum of all hole sizes

Application Notes.

1. Do not cut holes in SmartRim installed over openings, such as doors or windows, where the SmartRim is not fully supported, except that holes of 40 mm or less in size are permitted provided they are positioned at the middle depth and in the middle $\frac{1}{3}$ of the span (see note 5 for minimum hole spacing).
2. Field-cut holes should be vertically centred in the Rim Board and at least one hole diameter or 150 mm whichever is less, clear distance away from the end of the wall line. Holes should never be placed such that they interfere with the attachment of the Rim Board to the ends of the floor joist, or any other code-required nailing.

RIM BOARD OVER AN OPENING

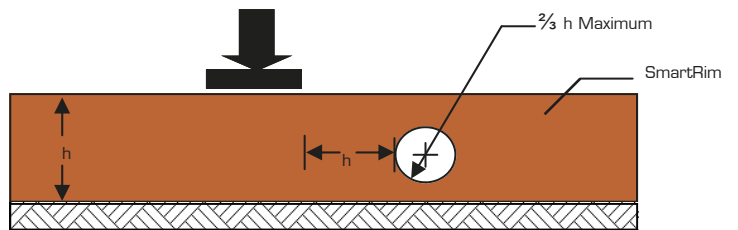
Do not cut holes in SmartRim over an opening except for holes of 40 mm or less in size (see note 1).



3. While round holes are preferred, rectangular holes may be used providing the corners are not over-cut. Slightly rounding corners or pre-drilled corners with a 25 mm diameter bit is recommended.

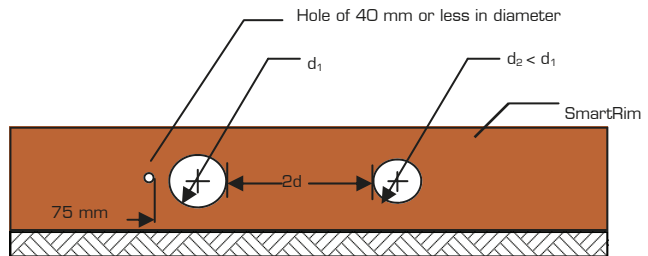
4. When concentrated loads are present on the Rim Board (loads not supported by any other vertical-load-carrying members such as squash blocks), holes should not be placed in the Rim Board within a distance equal to the depth of the Rim Board from the area of loading.

RIM BOARD NEAR CONCENTRATED VERTICAL LOAD



5. For multiple holes, the clear spacing between holes shall be at least two times the diameter of the larger hole, or twice the length of the longest rectangular hole. This minimum hole spacing does not apply to holes of 40 mm or less in diameter, which can be placed anywhere in the Rim Board (see note 1 for holes over opening) except that the clear distance to the adjacent hole shall be 75 mm minimum.

MULTIPLE HOLES FOR RIM BOARD



6. All holes shall be cut in a workman-like manner in accordance with the limitations listed above.

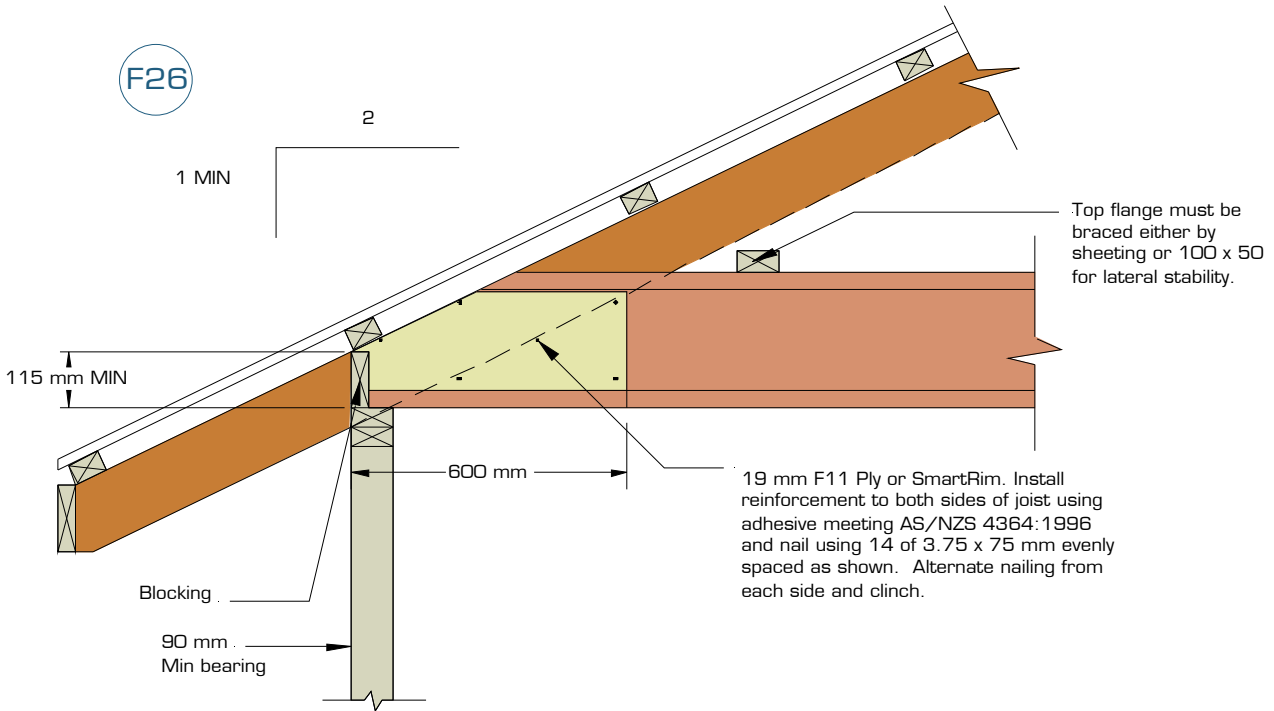
RAFTER CUTS OF SmartJoists

SmartJoists can be "rafter cut" but only within the limitation shown below.

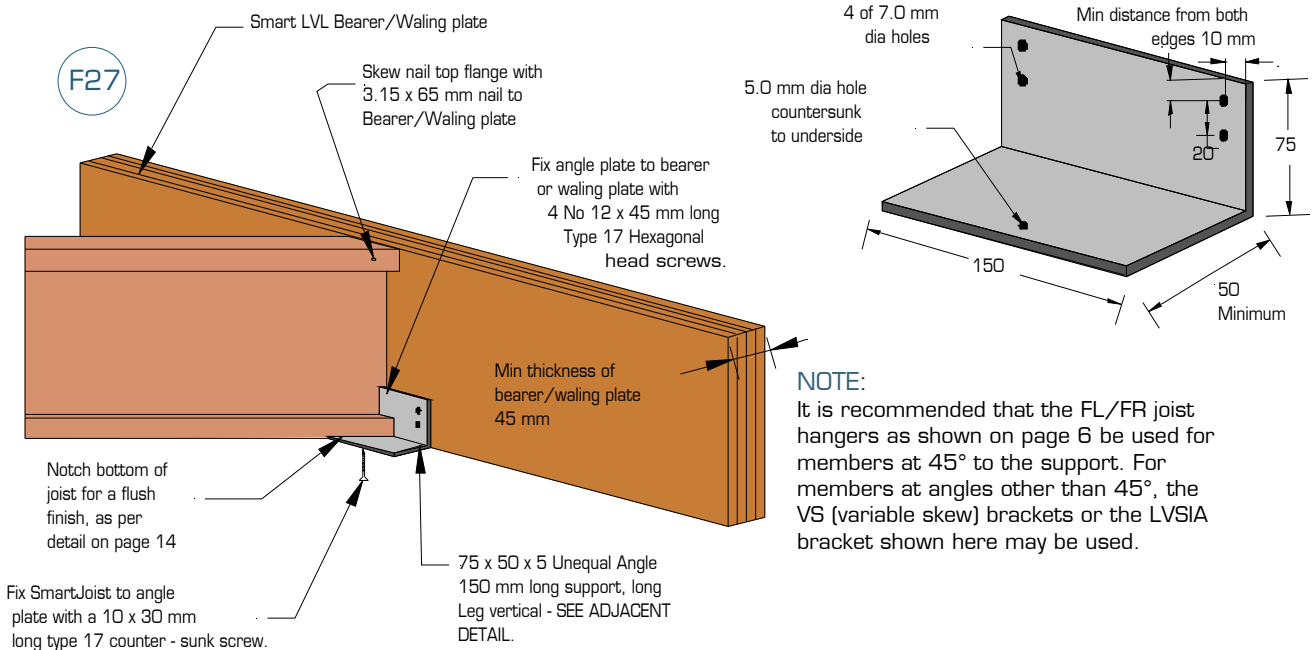
Rafter cuts are limited to:

- 1) 115 mm MINIMUM end height
- 2) MINIMUM Roof Slopes of 1 in 2 (approximately 26.5°),
and
- 3) Must be blocked at the end to prevent rotation of the joist.

Joists without reinforcement are limited to design shear and end reactions up to 6.5 kN Ply reinforcement can be added to joists with rafter cuts to increase the shear and end reaction capacity of the joist. The detail below shows the proper installation of the reinforcement. With the reinforcement added, the end reaction and shear capacity increase to 12.7 kN Duration of load increases are permitted as per AS1720.1.

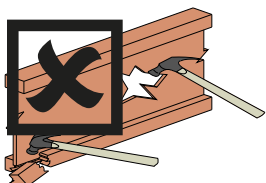


OBLIQUE CONNECTION OPTIONS

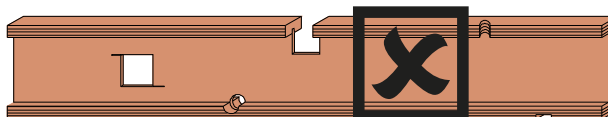


SmartJoist HOLE CHARTS

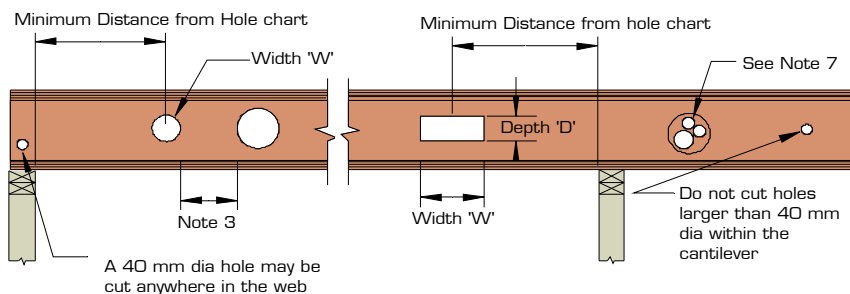
**DON'T
MAKE HOLES
WITH HAMMER
OTHER THAN
PRE-PUNCHED
KNOCKOUTS**



**DON'T
HAMMER ON
FLANGES AND
DAMAGE
JOINT**



**DO NOT CUT OR NOTCH FLANGES
DO NOT OVER CUT HOLES IN WEB**



Note: The most accurate method to design the allowable web penetration size and distance from support for SmartJoists is to use the Smart-Frame software. The table below will give conservative results in some instances. Also, advice on hole size and location may be obtained by contacting the SmartData Customer Helpline on 1300 668 690 or at smartdata@tilling.com.au.

Joist Code	Joist span (mm)	Joist spacing (mm)	Circular Holes								Rectangular Holes			
			Hole Diameter/Square Hole Width (mm)								Depth x Width (mm)			
			75	100	125	150	175	200	225	250	125x150	150x300	175x350	200x400
Minimum distance from any support to the centre of the hole (mm)														
SJ20044	3000	600	300	400	-	-	-	-	-	-	-	-	-	
	3500	600	300	700	-	-	-	-	-	-	-	-	-	
SJ24040	3000	600	300	300	300	900	-	-	-	-	1350	1500	-	
	3500	600	300	300	300	1200	-	-	-	-	1700	1750	-	
SJ24051	3500	600	300	300	300	1200	-	-	-	-	1600	1750	-	
	4000	600	300	300	600	1500	-	-	-	-	1950	2000	-	
SJ24070	3500	600	300	300	300	1100	-	-	-	-	1450	1750	-	
	4000	600	300	300	300	1400	-	-	-	-	1800	2000	-	
	4500	600	300	300	600	1600	-	-	-	-	2250	2250	-	
SJ24090	4000	600	300	300	300	1300	-	-	-	-	1650	1900	-	
	4500	600	300	300	300	1550	-	-	-	-	1950	2250	-	
	4700	600	300	300	400	1600	-	-	-	-	2150	2350	-	
SJ30040	4000	600	300	300	300	300	600	1300	-	-	1600	2000	2000	
	4500	600	300	300	300	300	800	1550	-	-	1950	2250	2250	
SJ30051	4000	600	300	300	300	300	500	1250	-	-	1400	1900	2000	
	4500	600	300	300	300	300	650	1500	-	-	1750	2150	2250	
	4700	600	300	300	300	300	800	1600	-	-	1900	2350	2350	
SJ30070	4500	600	300	300	300	300	450	1400	-	-	1550	2100	2200	
	5000	600	300	300	300	300	700	1650	-	-	2000	2400	2500	
SJ30090	5000	600	300	300	300	300	400	1500	-	-	1600	2350	2400	
	5300	600	300	300	300	350	600	1650	-	-	1850	2500	2600	
SJ36058	5000	600	300	300	300	300	350	400	1100	1700	400	2000	2350	
	5500	600	300	300	300	350	400	600	1250	1950	700	2250	2600	
SJ36090	5500	600	300	300	300	300	300	300	700	1600	400	1950	2450	
	5800	600	300	300	300	300	300	300	850	1750	700	2150	2650	
SJ40090	6000	600	300	300	300	300	300	300	300	800	400	550	2100	
	6300	600	300	300	300	300	300	300	400	1000	700	950	2400	

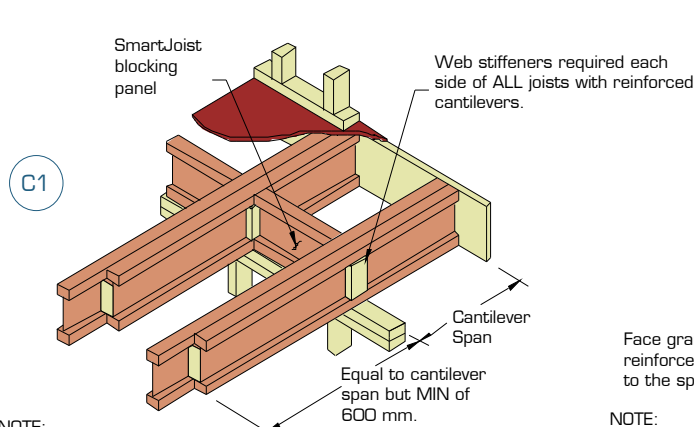
Notes:

1. The hole chart is generated on a maximum floor dead load of 40 kg/m with no wall or roof loads. It therefore does not apply for joists supporting either parallel or perpendicular load bearing walls. These scenarios can be analysed by using the appropriate model within the SmartFrame software. Help can be obtained by contacting the SmartFrame Customer Helpline on 1300 668 690 or at smartdata@tilling.com.au
2. Hole locations are suitable for joist spacings up to 600 mm centres. Holes may be permitted closer to supports for some member when spacings of 450 or 300 mm are used
3. The clear distance between holes must equal or exceed twice the diameter of the largest hole, or twice the longest side of a rectangular hole and no more than 3 holes in excess of 75 mm are allowed in any span
4. Do not cut or damage flanges under any circumstances
5. Except as noted in 1 and 2 above, a 40 mm hole at a minimum of 450 mm centres is allowed to be drilled anywhere in the web EXCEPT in cantilevered spans
6. If possible, holes in web should be positioned mid height, minimum edge clearance from any flange is 6 mm
7. A group of round holes at approximately the same location shall be permitted if they meet the requirements for a single round hole circumscribed around them.

EXAMPLE CONSTRUCTION DETAILS FOR LOAD BEARING CANTILEVERS

Note: Option 1 with cantilever reinforced with an extra SmartJoist is equivalent to option 2 with 2 sheets of ply reinforcement.

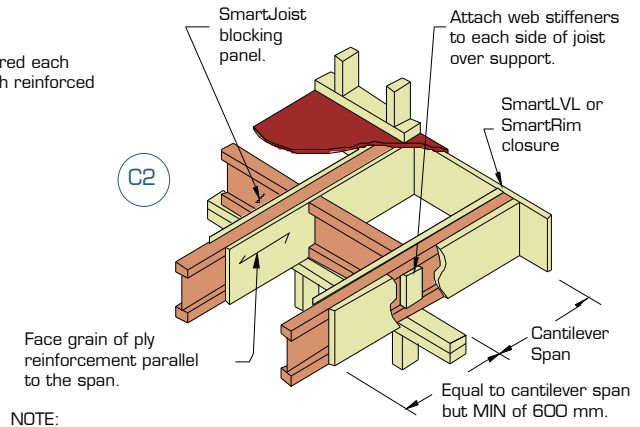
OPTION 1 - CANTILEVER REINFORCED WITH EXTRA SmartJoist



NOTE:

Block together full length with filler blocks as per detail F15 of the SmartJoist Design Guide.

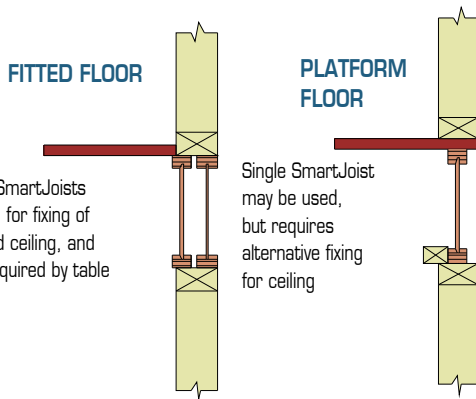
OPTION 2 - CANTILEVER REINFORCED WITH 1 or 2 SHEETS OF REINFORCING PLY.



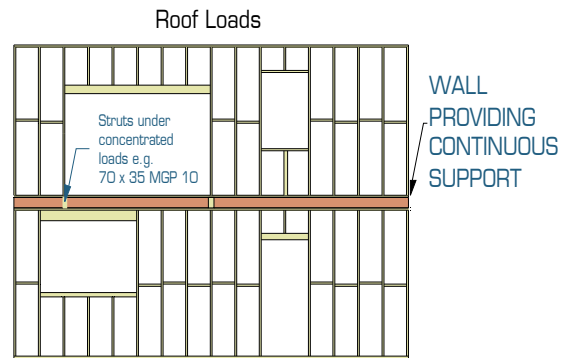
NOTE:

15 mm F11 structural ply is required on one (P1) or both sides (P2) of the joist. (See Tables). Depth shall match the full height of the SmartJoist. Nail with 3.15 x 65 Nails at 100 mm ctrs in a staggered pattern.

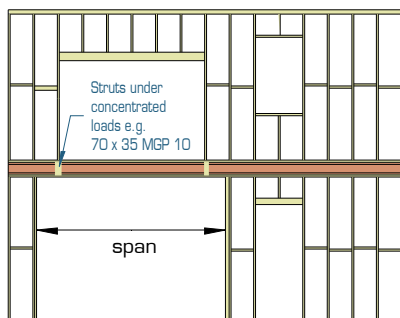
SmartJoists SUPPORTING PARALLEL LOAD BEARING WALLS



JOISTS CONTINUOUSLY SUPPORTED BY WALL



JOISTS NOT CONTINUOUSLY SUPPORTED BY WALL



Single (and Double) SmartJoists are adequate to transfer uniformly distributed compression loads up to 29 kN/m per joist from load bearing walls to a continuous rigid support below. Detail F5 is to be used where concentrated loads are to be transmitted through the SmartFrame floor system.

The table below gives allowable spans for single or double floor joists NOT continuously supported by a parallel wall under. Care must be taken to adequately support the web of the joists from concentrated point loads, by the use of detail F5.

TYPICAL SmartJoist ROOF DETAILS

WARNING: Do not allow workers or loads on roof until ALL blocking, hangers, bracing and nailing is completed. SEE SAFETY WARNING.

BIRDSMOUTH CUT (At low end of joist ONLY)

(Limited to Joist spacing of MAX of 600 mm)

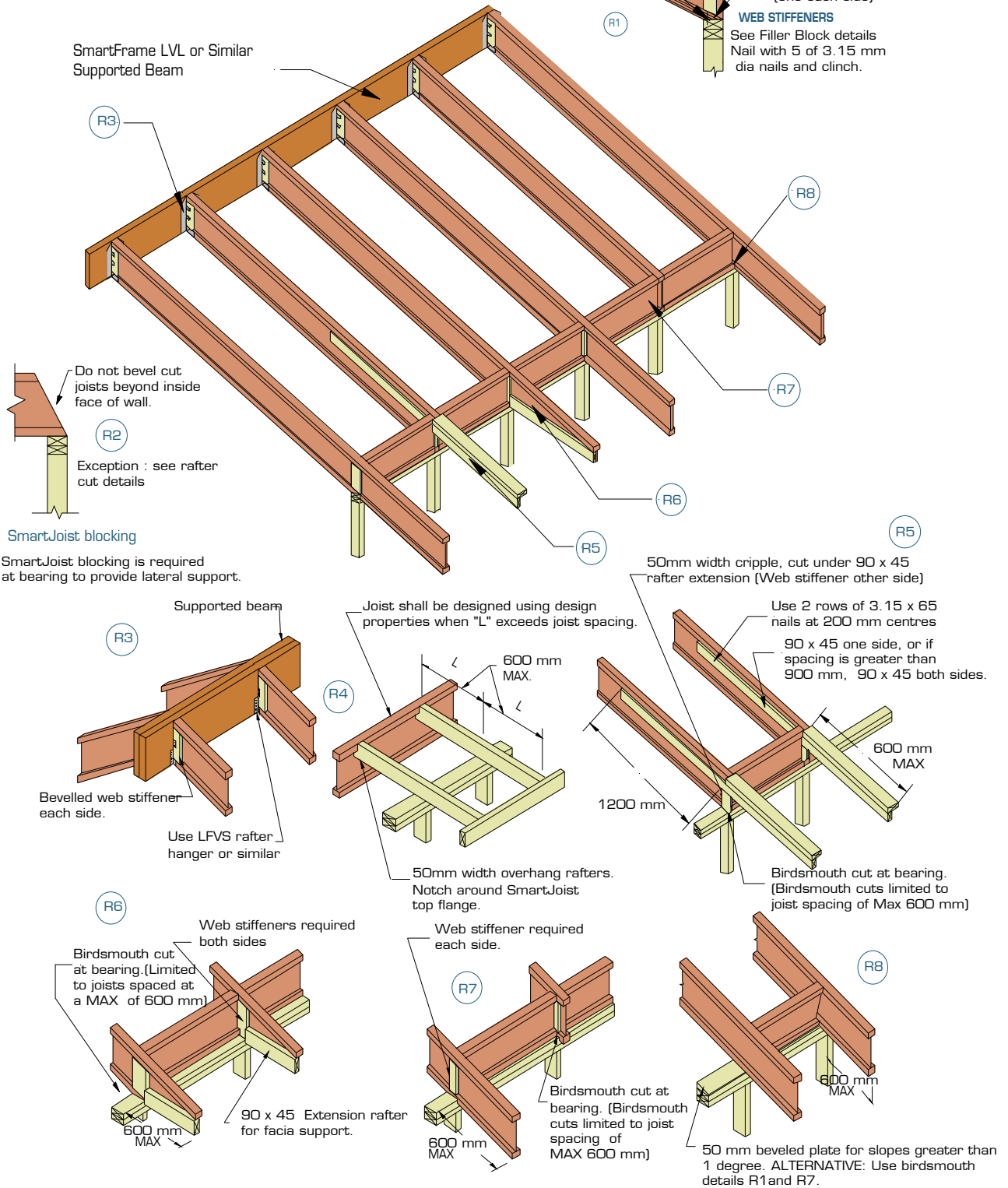
Birdsmouth cut shall bear fully and not overhang the inside face of the plate.

Web stiffeners required each side of SmartJoist. Bevel cut stiffeners to match roof slope. See Detail F13.

2 of 3.15 x 65 nails (one each side)

WEB STIFFENERS

See Filler Block details Nail with 5 of 3.15 mm dia nails and clinch.



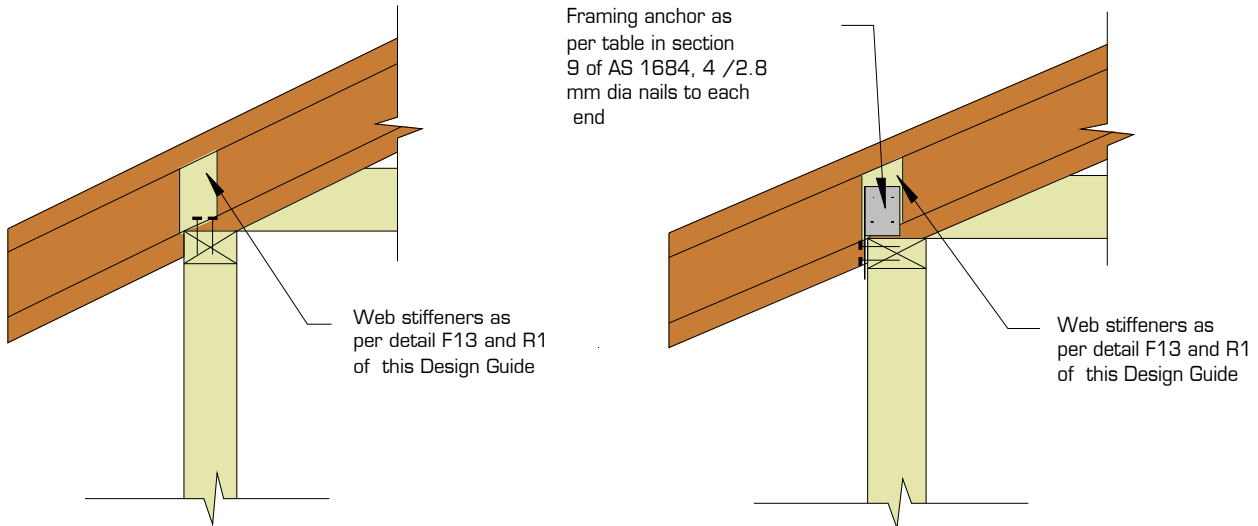
SmartJoist blocking

SmartJoist blocking is required at bearing to provide lateral support.

SmartJoist RAFTER TIE DOWN

SmartJoist rafters need to be tied down in wind uplift situations in a similar manner to solid timber as shown in section 9 of AS 1684. The examples shown in this section are equally applicable to SmartJoists except that web stiffeners as per detail F13 and R1 must be installed to the SmartJoists where either skewed nails or framing anchors are chosen as the tie down method before the uplift capacities in the tables in section 9 of AS 1684 can be adopted.

All tie down types that involve a strap over the top of the SmartJoist rafters, or involving the bolting down of a member above the rafter running in the perpendicular direction, require no modification to the SmartJoist and the uplift capacities in the tables in section 9 of AS 1684 may be used.



TYPICAL SmartJoist RAFTER BOX GUTTER REBATE DETAILS

BOX GUTTER REBATES

Rebates for box gutters are permissible within a roof constructed with SmartJoist rafters to the MAXIMUM rebate limits as shown below.

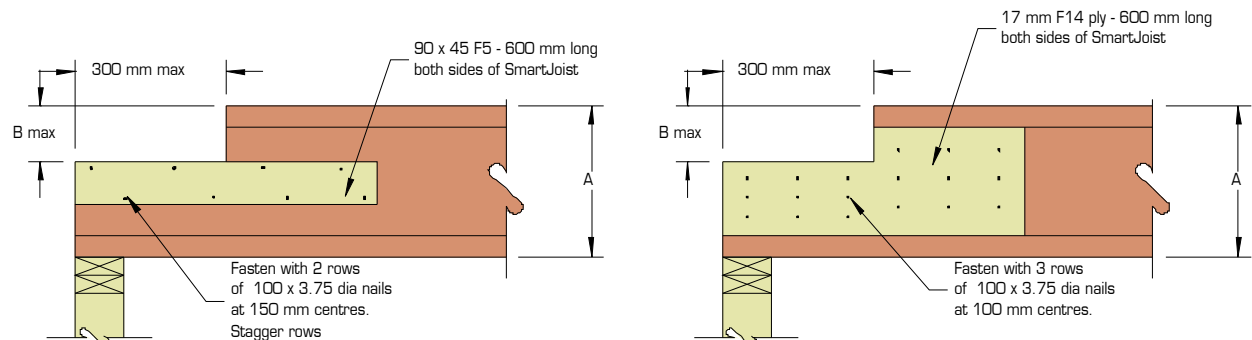
Fig BG1 with 2 pieces of 90 x 45 nailed to the web reduces shear capacity by 40%
 Fig BG2 with 2 pieces of 17 mm F14 ply nailed to the web maintains full shear capacity

Given that the design shear values at the end of rafters with lightweight roofs are usually very low compared to the allowable shear, in most instances fig BG1 is satisfactory

to provide a box gutter rebate within the SmartJoist rafters, however the remaining shear capacity MUST be checked.

It is recommended that designers wishing to cut box gutter rebates in SmartJoist rafter contact the SmartData Customer Helpline on 1300 668 690 or at smartdata@tilling.com.au for further advice on this issue.

SmartJoist box gutter rebate details



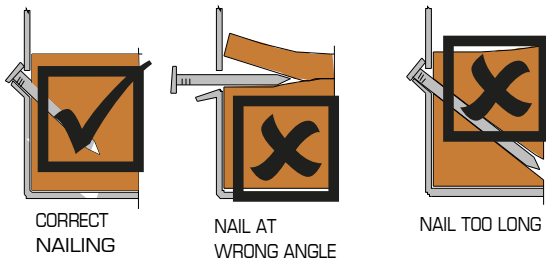
A = 200*, 240 & 300 mm depth

B = 50 mm when A = 200* & 240 mm
 B = 100 mm when A = 300 mm

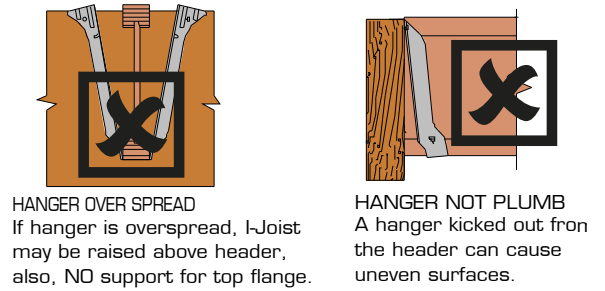
* 200 mm - Requires ply infill, 90 x 45 solid timber reinforcement is NOT suitable

GENERAL CONNECTOR INSTALLATION DETAILS

POSITIVE ANGLE NAILING

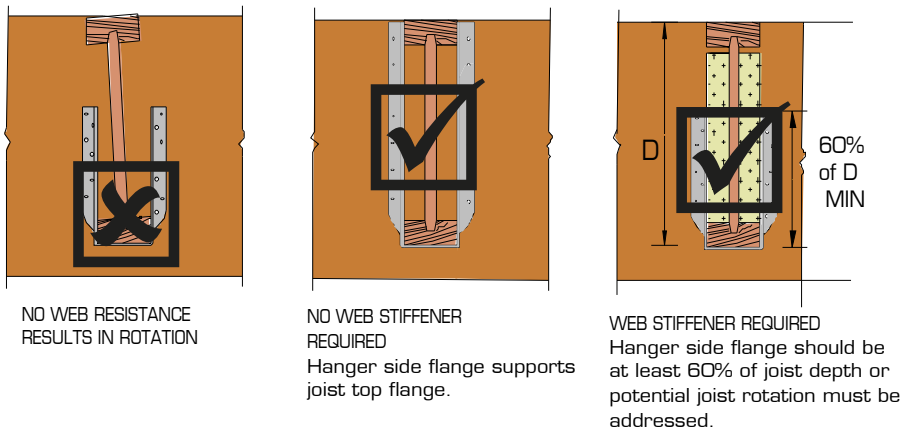


TOP MOUNT HANGERS



PREVENT ROTATION

Hangers provide some joist rotation resistance; however, additional lateral restraint may be required for deep joists.



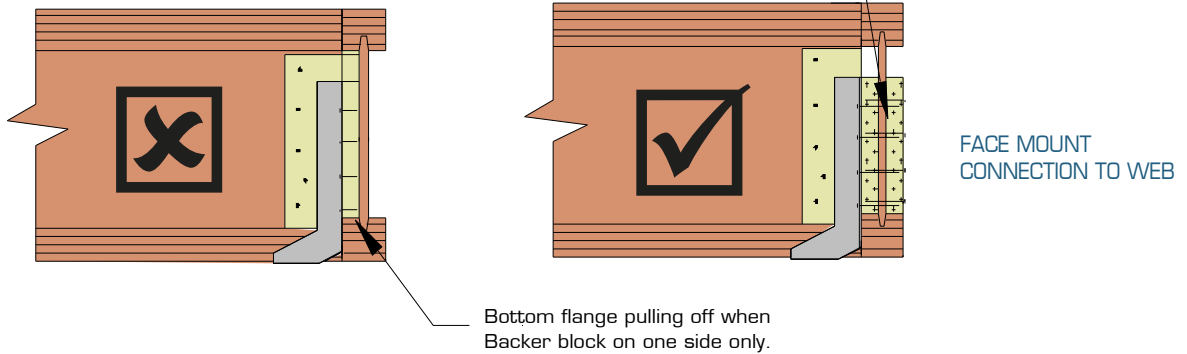
CORRECT FASTENERS



Bracket capacities are based upon using the correct bracket nail as per the table on page 14. Bracket nails have special heads to provide strength. Clouts, brads etc are NOT suitable as bracket nails

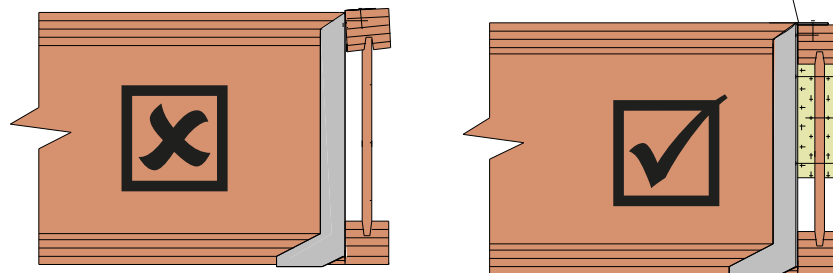
I-JOIST HEADERS

Backer blocking each side, hanger nails must extend past the supporting joist's web member into the backer blocking.



The top flange of the supporting joist must be supported by backer blocks to prevent cross grain bending and rotation.

TOP MOUNT CONNECTION



JOIST HANGER DETAILS

NAILING

Use only the listed galvanised bracket nails. All holes are to be filled with the specified nails in order to achieve the stated hanger capacity. Alternatively, screw with 35 x 6 gauge bugle-head or wafer-head wood screws. The joist hangers below have been developed specifically for SmartJoists. The joist hangers and nails are available from Tilling Timber as part of a SmartFrame order. It is not recommended that joist hangers other than those listed below be used with SmartJoists.

SmartJoists brackets in areas shaded require web stiffeners as per detail F13

SmartJoist	face mount code	hanger capacity ϕ kN *	face nail holes	nail size	top mount code	hanger capacity ϕ kN *	face nail holes to support	top nail holes	nails to joist	nail size
Single joist face mounts					Single joist top mount					
SJ20044	20044F	6.2	8	3.75 x 40	20044T	4.8	2	4	2	3.75 x 40
SJ24040	24040F	7.8	10	3.75 x 40	24040T	4.8	2	4	2	3.75 x 40
SJ24051	24051F	7.8	10	3.75 x 40	24051T	4.8	2	4	2	3.75 x 40
SJ24070	24070F	7.8	10	3.75 x 40	24070T	4.8	2	4	2	3.75 x 40
SJ24090	24090F	7.8	10	3.75 x 40	24090T	4.8	2	4	2	3.75 x 40
SJ30040	30040F	9.3	12	3.75 x 40	30040T	4.8	2	4	2	3.75 x 40
SJ30051	30051F	9.3	12	3.75 x 40	30051T	4.8	2	4	2	3.75 x 40
SJ30070	30070F	9.3	12	3.75 x 40	30070T	4.8	2	4	2	3.75 x 40
SJ30090	30090F	9.3	12	3.75 x 40	30090T	4.8	2	4	2	3.75 x 40
SJ36058	36058F	10.9	14	3.75 x 40	36058T	4.8	2	4	2	3.75 x 40
SJ36090	36090F	10.9	14	3.75 x 40	36090T	4.8	2	4	2	3.75 x 40
SJ40090	40090F	10.9	14	3.75 x 40	40090T	4.8	2	4	2	3.75 x 40
Double joist face mounts					Double joist top mounts					
2/SJ20044	20044DF	6.2	8	3.75 x 40	N/A					
2/SJ24040	N/A				24040DT					
2/SJ24051	24051DF	7.8	10	3.75 x 40	24051DT	4.8	2	2	4	3.75 x 40
2/SJ24070	24070DF	7.8	10	3.75 x 40	24070DT	4.8	2	2	4	3.75 x 40
2/SJ24090	24090DF	7.8	10	3.75x40	24090DT	5.7	2	4	2	3.75 x 40
2/SJ30040	N/A				N/A					
2/SJ30051	30051DF	8.7	12	3.75 x 40	30051DT	4.8	2	2	4	3.75 x 40
2/SJ30070	30070DF	8.7	12	3.75 x 40	30070DT	4.8	2	2	4	3.75 x 40
2/SJ30090	30090DF	8.7	12	3.75 x 40	30090DT	5.7	2	4	2	3.75 x 40
2/SJ36058	N/A				36058DT	4.8	2	4	2	3.75 x 40
2/SJ36090	N/A				36090DT	5.7	2	4	2	3.75 x 40
Skewed left or right (face mount)										
SmartJoist	SmartFrame code	hanger capacity ϕ kN *	face nail holes	Nails to joist	nail size					
SJ20044	20044FR or FL	6.2	8	2	3.75 x 40					
SJ24040	N/A									
SJ24051 - SJ30051	240-30051FR or FL	6.2	8	2	3.75 x 40					
SJ24070	N/A									
SJ24090	24090FR or FL	6.2	8	2	3.75 x 40					
SJ30040	N/A									
SJ30051	30051FR or FL	7.8	10	2	3.75 x 40					
SJ30090	30090FR or FL	7.8	10	2	3.75 x 40					
SJ36058	36058RR or FL	7.8	10	2	3.75 x 40					
SJ36090	36090FR or FL	7.8	10	2	3.75 x 40					
ALL	LVSIA	5.5	4	1	12 g x 35 screw					
Variable Slope (face mount - usually for rafters)										
SmartJoist	SmartFrame code	hanger capacity ϕ kN *	face nail holes	Nails to joist	nail size					
SJ20044	20044VS	4.6	10	7	3.75 x 40					
SJ24051 - SJ30051	240-30051VS	4.6	10	7	3.75 x 40					
SJ24070 - SJ30070	N/A									
SJ24090 - SJ40090	240-40090VS	9.9	18	12	3.75 x 40					
SJ36058	36058VS	4.6	10	7	3.75 x 40					

NOTES:

* Hanger capacity is based upon dead load + floor live load for a supporting beam of joint strength JD5.

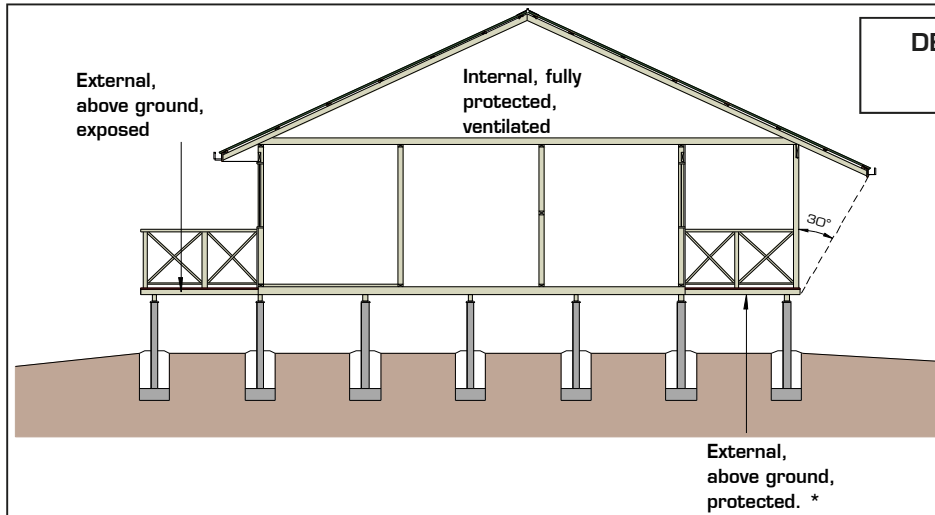
$k_1 = 0.69$, Capacity factor $\phi = 0.85$. For permanent loads, the above value should be multiplied by $0.57/0.69 = 0.82$.

DURABILITY AND EXPOSURE TO MOISTURE

- Untreated SmartFrame EWP

SmartLVL and SmartJoists are manufactured from Douglas Fir (Oregon) which has a durability rating of class 4, which is the same rating as some Ash type Eucalypts. Untreated SmartJoists and 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.

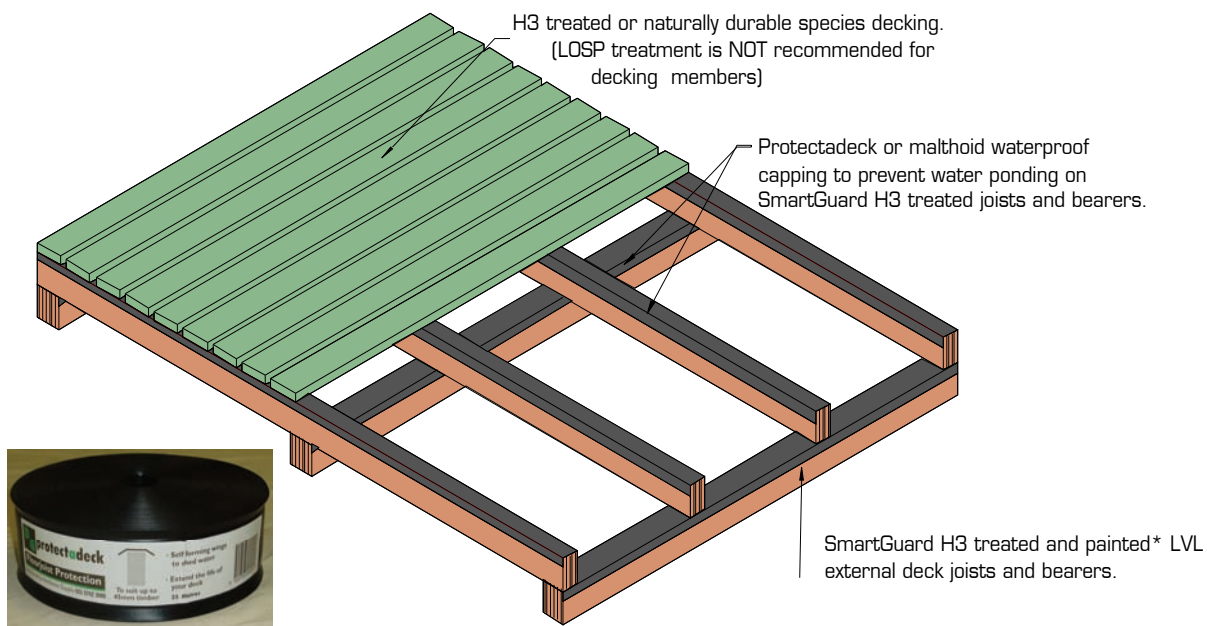


DEFINITIONS OF EXPOSURE ZONES WITHIN A STRUCTURE

* 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).

SMARTGUARD™ H3 DECK BEARERS AND JOISTS

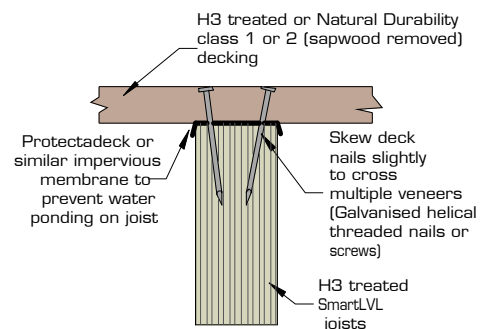
SmartGuard H3 Treated Deck joists and bearers are a common application for treated SmartLVL 15. The diagram demonstrates the minimum construction detailing for SmartGuard LOSP H3 treated joists and bearers. Failure to follow these guidelines may render treatment warranties void.



Recommended proprietary top protection for joists and bearers

It is a requirement that any cuts, notches or penetrations made in LOSP treated LVL be painted with a suitable "brush/spray on" preservative such as "Enseal". (Enseal is available as part of any Smart-Frame H3 LOSP order)

* Painting as per "Painting of SmartGuard LOSP Treated SmartLVL 15" in the SmartLVL 15 Design Guide



Recommended Fastening to SmartLVL Deck Joists.