Masonite Beams Technical Guide for Roof Applications

MASONITE BEAMS

About Masonite Beams

Masonite Beams AB has been a pioneer of European based I-Joist manufacturing since 1974 and operates from its original location in Rundvik, Sweden.

In 2006 the company was bought by the Byggma Group, a Norwegian building products manufacturing group as part of a strategic move to strengthen its structural products portfolio. The group is comprised of 6 brands.

Its commitment to manufacturing was further underlined in 2008. After 4 years of research and development and an investment programme of £8m, the company opened a new 'state-of-the-art' I-Joist manufacturing plant with a production capacity of 24 million linear metres per year.

Environmental Credentials

In today's construction industry, the issue of sustainability and minimising the impact on the environment are becoming increasingly important. Masonite Beams operates a comprehensive environmental policy, which covers both the manufacture of its products and the sourcing of the raw materials used.

Manufactured in accordance with the environmental management system ISO 14001, Masonite Beams I-Joists utilise wood fibre certified under PEFC with full chain of custody processes. The high efficiency of the 'wood to I-Joist' conversion process means that for a specific volume of Masonite I-Joists, far fewer trees are harvested than those required to produce an equivalent volume of solid sawn timber joists.

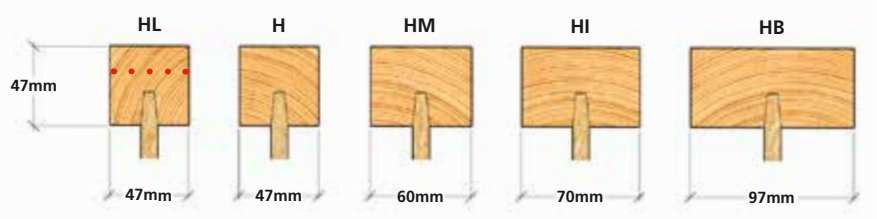
Masonite Beams I-Joists

I-Joists are used as structural components in engineered timber floor, wall and roof systems. The majority of Masonite Beams I-Joists are used as part of the Masonite Beams Floor System.

Masonite Beams I-Joists are a lightweight alternative to conventional timber members, offering time-saving and cost-saving solutions for floor, roof and wall construction to a wide range of private and public sector applications. Unlike traditional timber, which can warp, twist and shrink, Masonite Beams I-Joists have a superior dimensional stability resulting in fewer costly site call-backs.

Masonite engineered timber I-Joists are comprised of slow-grown, high grade white wood flanges combined with OSB for the web. Masonite I-Joists carry the ETA certification and CE marking, together with PEFC chain of custody certification. Masonite Beams I-Joists are manufactured in accordance with the requirements of ISO 9001 and the environmental standard ISO 14001. Masonite Beams I-Joists are manufactured to a wide range of lengths to meet all structural requirements and are available in the following depths: 220mm, 240mm, 300mm, 350mm and 400mm.

NOTE:
The HL Joist is identified by a RED dotted line on the flange.



STANDARD DEPTHS mm	HL	H	HM	HI	HB
220	✓	✓	✓	✓	✓
240	✓	✓	✓	✓	✓
300	✓	✓	✓	✓	✓
350			✓		✓
400			✓		✓

PRODUCT APPROVALS

ROOFS - JOIST PROPERTIES FOR LOADSHARING MEMBERS (4 JOISTS NO MORE THAN 610mm ON CENTRE) SERVICE CLASS 2, MEDIUM TERM DURATION

					PERMISSIBLE RESISTANCES [1] – ROOFS WITH LOADSHARING [2]			
							45mm END BEARING kN	89mm INTERMEDIATE BEARING kN
JOIST SERIES	DEPTH H mm	JOIST WEIGHT kg/m	FLEXURAL RIGIDITY EI N.mm²x10⁹	SHEAR RIGIDITY GA Nx10⁶	BENDING MOMENT [3] kN.m	VERTICAL SHEAR kN	NO WEB STIFFENERS	NO WEB STIFFENERS
HL	220	2.99	280	1.026	2.39	4.95	4.51	11.31
HL	240	3.14	348	1.156	2.66	5.39	4.51	11.31
HL	300	3.59	602	1.546	3.49	6.73	4.51	11.31
H	220	3.23	399	1.026	4.65	4.95	4.78	11.90
H	240	3.38	494	1.156	5.19	5.39	4.78	11.90
H	300	3.83	851	1.546	6.74	6.73	4.78	11.90
HM	220	3.84	512	1.026	5.96	4.95	6.01	14.59
HM	240	3.99	635	1.156	6.64	5.39	6.01	14.59
HM	300	4.44	1090	1.546	8.63	6.73	6.01	14.59
HM	350	4.82	1568	1.871	10.23	7.83	6.01	14.59
HM	400	5.19	2139	2.196	11.81	8.93	6.01	14.59
HI	220	4.31	599	1.026	6.99	4.95	6.90	14.89
HI	240	4.46	742	1.156	7.78	5.39	6.90	14.89
HI	300	4.91	1273	1.546	10.06	6.73	6.90	14.89
HB	220	5.58	833	1.026	9.71	4.95	9.55	22.33
HB	240	5.73	1033	1.156	10.80	5.39	9.55	22.33
HB	300	6.18	1767	1.546	13.99	6.73	9.55	22.33
HB	350	6.56	2536	1.871	16.54	7.83	9.55	22.33
HB	400	6.93	3450	2.196	19.06	8.93	9.55	22.33

DESIGN NOTES:

1. Permissible resistances are for medium term duration ($k_3 = 1.25$)
2. Permissible resistances already incorporate the loadsharing factor $k_8 = 1.1$
3. Permissible moments assume full lateral support of the compression flange. This is assumed to be provided by battens at no more than 400mm centres or by mechanically fixed sheathing or sarking board. Restraint of the bottom joist flange may also be required if wind uplift causes stress reversal to occur.

Roof Design Criteria

Masonite Beams I-Joists can be used to create open roof voids in buildings by acting as free-spanning rafters between a ridge beam at the roof apex and the wallplate at eaves level.

Masonite Beams I-Joist suppliers involved in roof applications assume a role similar to that of the trussed rafter designer, as outlined in BS5268-3. The Building Designer remains responsible for the roof design, including specification of all holding down fixings at support positions, and the stability and wind bracing systems, unless otherwise agreed or a roof designer has been employed. I-Joist roofs should be braced, or arranged, to form a coherent structure. The bracing can be in the form of a structural diaphragm (sarking) or triangulating members, the specification of which remains the responsibility of the Building Designer.

Masonite Beams I-Joists are designed for roof applications using the principles of BS5268-2 and the joist properties contained in the ETA. In general, it can be assumed that well-ventilated roofs in the UK will achieve a Service Class 2 moisture condition. Uniformly distributed dead and imposed loads will be assumed across the whole roof unless otherwise directed. For small buildings, as detailed in BS6399-3, imposed loads (snow loading) will generally be taken as 0.75 kN/m² (measured on plan) up to pitches of 30 degrees, reducing linearly to zero at 60 degree pitch, unless specific guidance in the aforementioned code would suggest alternative imposed roof loadings may apply. Snow loading will be assumed to be of medium term duration. Dead loads from coverings may be taken from the sche-dule of standard tile weights tabulated below.

Span tables are given for roofs covered with concrete interlocking tiles with the dead load taken as 0.935kN/m², including an allowance for the self weight of battens, felt and rafters, plus 0.25kN/m² ceiling load.

Since ceiling finishes may often be directly applied to the underside of Masonite Beams I-Joists to create open roof voids, we recommend that Masonite Beams rafters be designed with a 0.25 kN/m² ceiling dead load, including further allowance for self weight of the rafter and a deflection limit of 0.3% x span under the total (dead + imposed) load.

SCHEDULE OF ROOF DEAD LOADS

TILE MANUFACTURER AND PRODUCT	WEIGHT ON SLOPE (INCLUDING SW ALLOWANCE OF 110 N/m²)
Marley Modern	640 N/m²
Marley Plain	835 N/m²
Marley Double Roman	571 N/m²
Redland Cambrian	306 N/m²
Redland Renown	565 N/m²
Redland Rosemary	890 N/m²
Thatching (305mm thick)	560 N/m²

Pitched Roof Span Chart

0.935kN/m^2 DEAD LOAD + 0.75kN/m^2 IMPOSED LOAD, 89mm BEARINGS, CLEAR SPAN

PRODUCT		400mm ccs			600mm ccs		
DEPTH mm	SERIES	PITCH			PITCH		
		30°	35°	45°	30°	35°	45°
220		4052	3943	3514	3490	3402	3031
220	H	4541	4419	3940	3908	3803	3389
220	HM	4919	4788	4270	4230	4121	3677
220	HI	5170	5035	4490	4445	4330	3865
220	HB	5745	5595	4991	4928	4803	4289
240	HL	4365	4247	3785	3762	3659	3260
240	H	4892	4761	4243	4205	4092	3646
240	HM	5300	5158	4599	4561	4442	3964
240	HI	5572	5423	4835	4792	4668	4165
240	HB	6192	6028	5376	5315	5179	4625
300	HL	5266	5122	4562	4523	4400	3918
300	H	5895	5730	5103	5054	4916	4380
300	HM	6384	6210	5535	5490	5343	4761
300	HI	6708	6529	5819	5778	5623	5012
300	HB	7454	7254	6468	6412	6245	5573
350	HM	7230	7033	6264	6211	6043	5384
350	HB	8440	8212	7321	7268	7078	6314
400	HM	8031	7808	6953	6900	6712	5980
400	HB	9379	9125	8132	8081	7866	7012

DESIGN NOTES:

1. All spans quoted are 'clear spans' measured on plan between bearings.

2. Linear interpolation may be used for intermediate roof pitches between those tabulated.

3. Spans assume rafters are restrained via battens at centres no greater than 400mm.

4. Dead loads quoted are measured on slope and allow for tiles, felt, battens,
rafter self-weight and plasterboard ceiling. A ceiling dead load allowance of 0.25kN/m2 has been included.

5. Imposed load assumed is 0.75kN/m2 (measured on plan) up to 30o pitch, reducing linearly thereafter to zero at 60o pitch.

6. All spans quoted relate to medium-term load duration. K3=1.25

7. Deflection limited to 0.3% of the span.

8. Stability and wind bracing should be provided in the form of diagonal bracing or sarking boards.
The specification of this is the responsibility of the Building Designer.

Flat Roof Span Chart

0.5kN/m2 DEAD LOAD + 0.75kN/m2 IMPOSED LOAD, 89mm BEARINGS, CLEAR SPAN

PRODUCT		400mm ccs	600mm ccs
DEPTH mm	SERIES	PITCH 0°	PITCH 0°
220	HL	4840	4175
220	H	5425	4674
220	HM	5878	5060
220	HI	6181	5317
220	HB	6868	5898
240	HL	5213	4500
240	H	5845	5039
240	HM	6332	5454
240	HI	6658	5731
240	HB	7400	6360
300	HL	6287	5431
300	H	7038	6068
300	HM	7624	6577
300	HI	8014	6911
300	HB	8905	7668
350	HM	8633	7448
350	HB	10080	8689
400	HM	9598	8273
400	HB	11201	9662

DESIGN NOTES:

1. All spans quoted are ‘clear spans’ measured on plan between bearings.

2. Flat roof table covers pitches up to 10o.

3. Maximum spans assume that the joist flanges are adequately restrained laterally by deck and ceiling.

4. Spans are calculated for the uniformly distributed loads indicated only. This allows for the dead load of the roof with a single ply membrane over a 18mm OSB deck, 15mm ceiling plasterboard and insulation. An imposed load of 0.75kN/m2 has been included. This does not make allowance for snow drift loading against on higher buildings. This condition must be assessed by an Engineer or Building Designer.

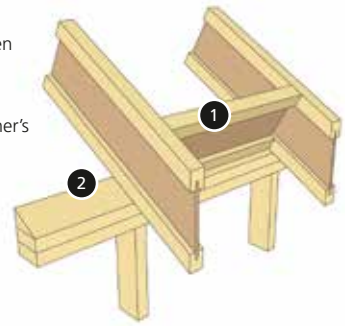
5. All spans quoted relate to medium-term load duration. K3=1.25

6. Deflection limited to 0.3% of the span.

7. The roof may need strapping down to resist wind uplift. The specification of this is the responsibility of the Building Designer.

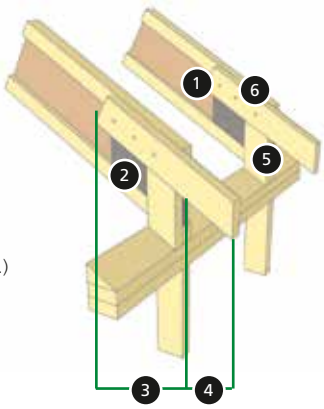
R1 BEVEL PLATE EAVES DETAIL

1. I-Joist blocking between each rafter
2. Bevelled plate fixed to wall to Building Designer's specification



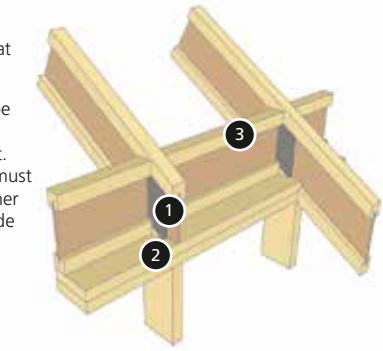
R1a BEVEL PLATE WITH RAFTER EXTENSION

1. 3.75 x 75mm nails at 150mm centres
2. Fit backer block behind rafter extension (Fix as R7a)
3. 1200mm Horiz.
4. 750mm Horiz.
5. Timber block (38 x 89mm min.)
6. 38 x 89mm rafter extension one side



R2 BIRDSMOUTH EAVES DETAIL

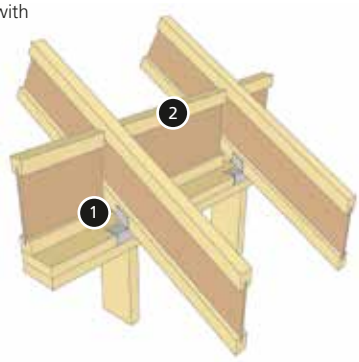
1. Web stiffeners required at each side
2. Flange of I-Joists may be birdsmouth cut only at the low end of the joist. Birdsmouth cut I-Joist must bear fully on plate, rather than overhang the inside face of plate
3. I-Joist blocking



R3 METAL CONNECTOR EAVES DETAIL

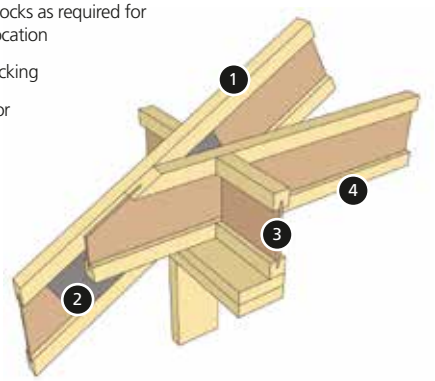
1. Variable pitch metal connector fixed strictly in accordance with manufacturer's instructions
2. I-Joist blocking

i Pitch limitations: 15° to 45°



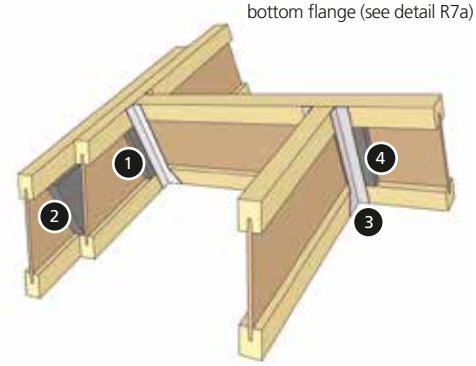
R4 ROOF EAVES & FLOOR JUNCTION

1. I-Joist rafter fixed to wallplate as detail R2 or R3
2. Timber blocks as required for specific location
3. I-Joist blocking
4. I-Joist floor

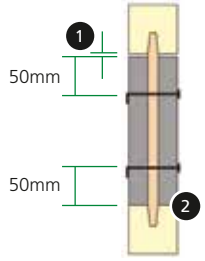


R5 ROOF-LIGHT TRIMMING

1. Backer block
2. Filler block (see detail R8)
3. Face mount hangers
4. Backer block required on both sides of web. Install tight to bottom flange (see detail R7a)



R6 WEB STIFFENER ATTACHMENT



DEPTH	FIXINGS
220	2 – 3.35 x 65mm
240	2 – 3.35 x 65mm
300	3 – 3.35 x 65mm
350	5 – 3.35 x 65mm
400	6 – 3.35 x 65mm

1 Small gap: 3 to 50mm 2 Tight fit to bottom

i For web stiffener sizes, please refer to Floor Technical Guide.

Web stiffeners are not required unless used with hangers that do not extend up to restrain the top flange of the joist, or as required by design.

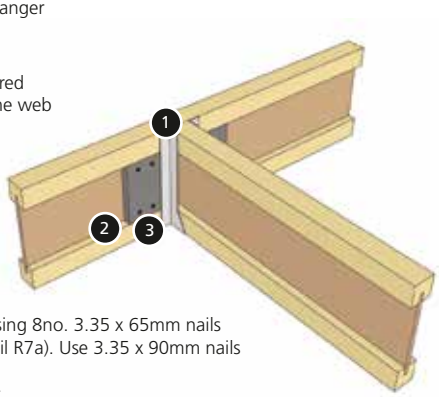
Use 3.75 x 90mm nails for HB series Joists

R7 BACKER BLOCK APPLICATION

1 Face mount joist hanger

2 Tight fit

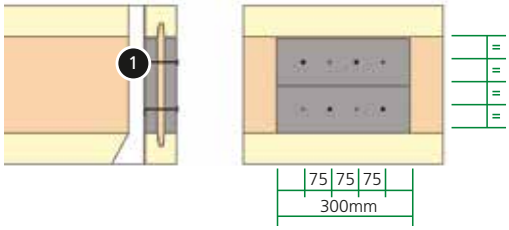
3 Backer block required on both sides of the web



Fix backer block using 8no. 3.35 x 65mm nails clenched (see detail R7a). Use 3.35 x 90mm nails for HB series joists.

R7a BACKER BLOCK (FIXING & SPECIFICATION)

1 3.35 x 65mm nails clenched (3.35 x 90mm nails for HB Joists)



SERIES	FILLER BLOCK THICKNESS
HL/H	18mm wood panel
HM	25mm wood panel
HI	30mm wood panel
HB	44mm wood panel

DEPTH	FILLER BLOCK DEPTHS
220	120mm
240	140mm
300	200mm
350	250mm
400	300mm

i Total thickness may be made up of 2 panels.

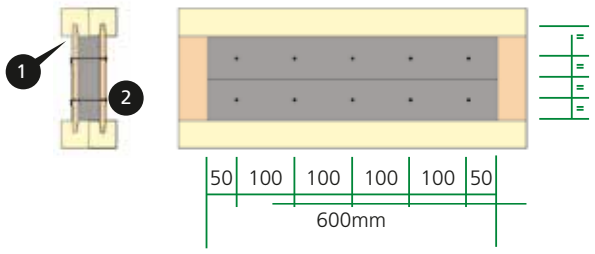
R8 FILLER BLOCK APPLICATION

1 Fix 2-ply I-Joists together using filler blocks at all bearing points, at incoming load positions and at max. 3.6m centres

i See detail R8a for fixing details.

R8a FILLER BLOCK (FIXING & SPECIFICATION)

1 Gap required to avoid forced fit 2 3.35 x 65mm nails clenched (3.35 x 90mm nails for HB Joists)



SERIES	FILLER BLOCK THICKNESS
HL/H	36mm timber
HM	50mm timber
HI	60mm timber
HB	80mm timber

DEPTH	FILLER BLOCK DEPTHS
220	120mm
240	140mm
300	200mm
350	250mm
400	300mm

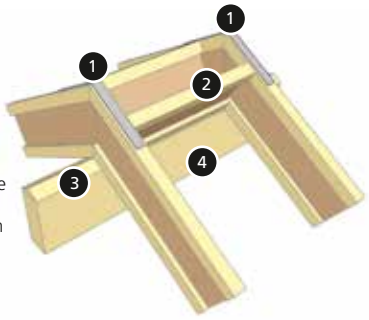
R9 DOWNSTAND RIDGE BEAM

1 Simpson LSTA24 or similar strap as required by design

2 I-Joist blocking required on each side of ridge

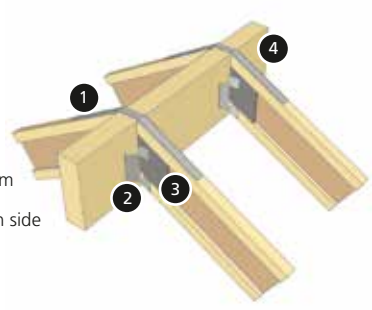
3 Double bevelled timber plate

4 LVL or Glulam support beam



R10 FLUSH RIDGE BEAM

1. LSTA or similar strap as required by design
2. LSSU hanger or equivalent
3. LVL or Glulam support beam
4. Bevelled web stiffener each side



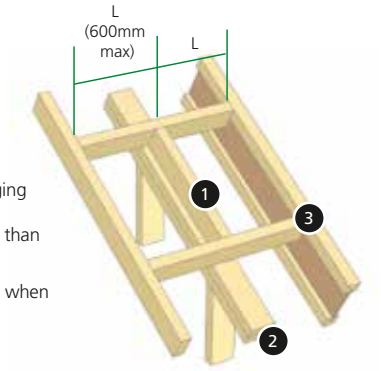
R11 GABLE LADDER

1. Blocking as required
2. End wall
3. Nail outrigger ladder nogging through web

i 50mm outrigger ladder nogging notched around top flange. Outrigger spacing no greater than 600mm centres.

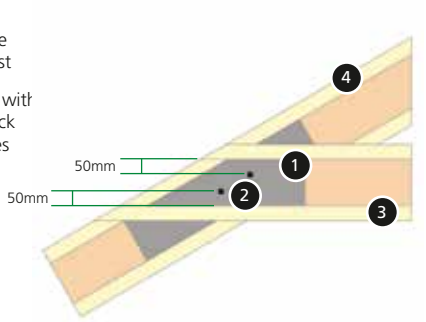
Double Joist may be required when

L exceeds rafter spacing.



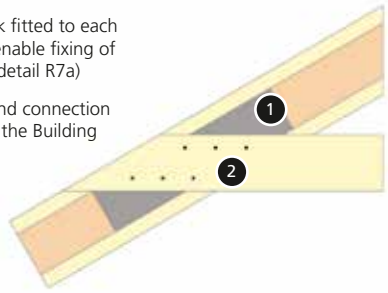
R12 RAISED CEILING JUNCTION

1. Ply packs on each side of both rafter and joist
2. 2no. 12mm dia bolts with 36mm dia x 3mm thick washers on both faces
3. I-Joist ceiling joist
4. I-Joist rafter



R12a RAISED CEILING JUNCTION (TIMBER)

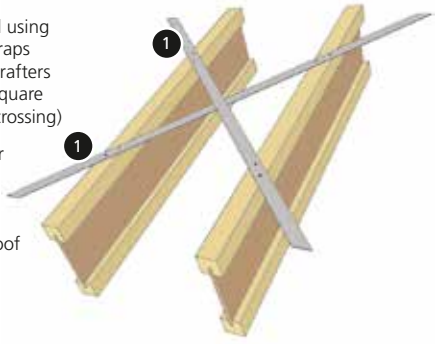
1. Plywood backer block fitted to each side of the rafter to enable fixing of ceiling member (see detail R7a)
2. Ceiling joist design and connection detail as specified by the Building Designer



R13 METAL STRAP CROSS BRACING

1. Cross bracing formed using 1.0mm steel fixing straps fixed to top of I-Joist rafters using 3.75 x 32mm square twist nails (2no. per crossing)

i The Building Designer is responsible for the arrangement and quantity of bracing required to provide roof stability.

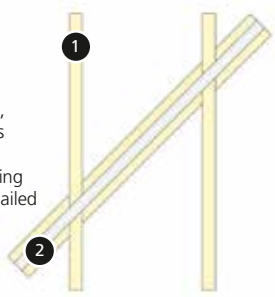


R14 SINGLE RUN BRACING

1. I-Joist rafter
2. 35 x 72mm nogging

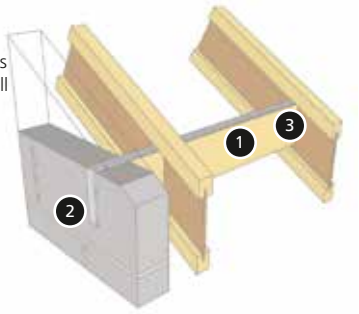
i Roof stability provided by installing 35 x 72mm timber noggings between rafters, cut to ensure a tight fit. Secure to rafters using 1no. 3.35 x 65mm nail per end. Continuity of bracing provided by installing 1.0mm MS Fixing Strip over noggings, nailed continuously. Bracing to be installed at approx. 45° to rafters on the roof slope

The Building Designer is responsible for the arrangement and quantity of bracing required to provide roof stability



R15 MASONRY WALL RESTRAINT

1. 35 x 145mm C16 noggings to be fixed tightly between I-Joists and also between joist and wall
2. Restraint strap to be fixed to block
3. Strap to pass though slot carefully cut in joist web (joist flanges must NOT be cut)

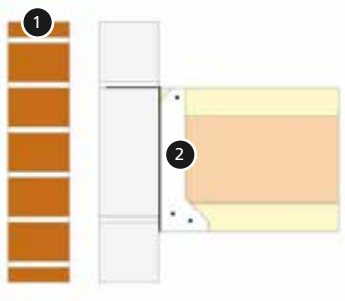


R16 FLAT ROOF PARAPET EAVES

1. Parapet wall
2. Masonry hanger installed into wall in accordance with manufacturer's instructions

i Roof covering and gutter details as specified by the Building Designer

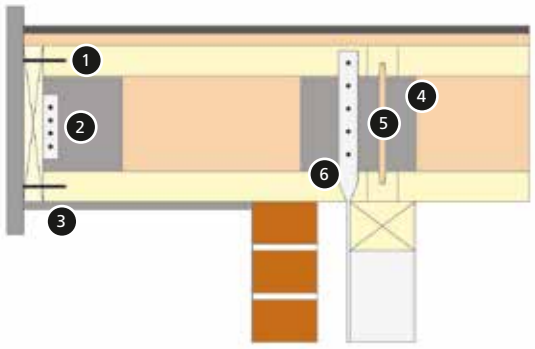
The Builder is to ensure that there is sufficient masonry above the hanger to meet the manufacturer's specifications.



R17 FLAT ROOF OVERHANGING EAVES

1. Rimboard fixed to each joist using 1no. 3.35 x 65mm lg galv (or approved) wire nail to each joist flange
2. Additional fixing to rimboard at max. 2.0m centres comprising 2no. framing anchors and plywood backers
3. LVL or glulam rim board
4. Plywood web stiffener
5. I-Joist Blocking required if masonry does not restrain the top flang
6. Holding down strap by Builder to Building Designer's specification

i Roof covering and gutter details as specified by the Building Designer.

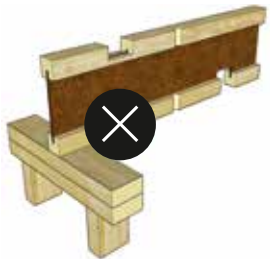


THESE CONDITIONS ARE NOT PERMITTED UNDER ANY CIRCUMSTANCES

If in doubt, please ask for advice before you cut.

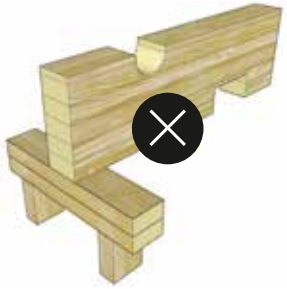
NO holes close to joist ends
Use hole chart for max. size & min. distance to wall.

NO notches in flanges of Masonite joists



NO bevel cuts beyond the inside face of wall

NO notches or holes in Glulam
Except as advised in hole chart for the product.



BS5268 Version

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MASONITE BEAMS