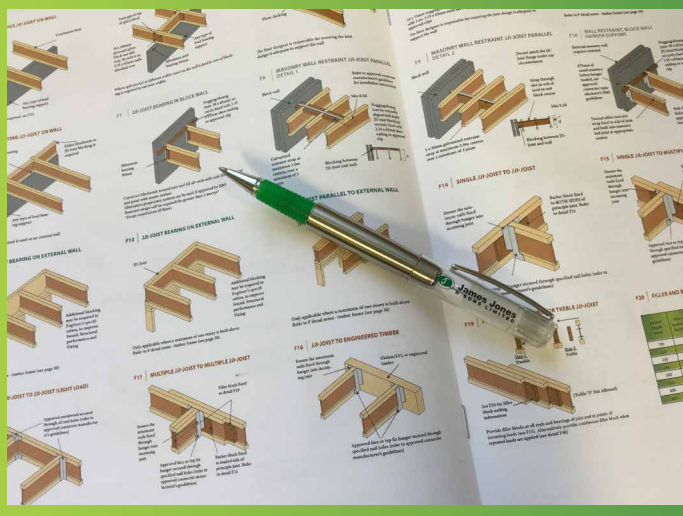
James Jones
& SONS LIMITED
TIMBER SYSTEMS DIVISION



JJI-JOISTS TECHNICAL MANUAL

FIFTH EDITION | JANUARY 2019

UK Manual

www.jamesjones.co.uk

Contents

CPD MEMBER
Construction CPD Certification Service

We currently offer a face to face seminar on engineered wood products for modern methods of construction. These are offered for larger practices in the UK and Ireland. Please visit our website to request a face to face seminar and find out how to take our CPD online.

Russwood offices-Newtonmore

Section 1

The JJI-Joist system

The JJI-Joist system is available from a network of authorised distributors throughout the UK and Ireland, who offer an estimating and design service inclusive of JJI-Joist layout plans, engineering calculations and material costings.

JJI-Joists

A JJI-Joist is a composite engineered timber joist combining 45mm deep high-grade finger jointed softwood flanges with a 9mm thick oriented strand board web. Four flange widths are available at 47, 63, 72 and 97mm wide. Using advance technology these components are combined to produce an innovative alternative to conventional construction timber with many advantages. JJI-Joists are produced to UK preferred dimensions.

The workhorse of the system, a versatile light weight structural member ideal for floor joists, rafters, purlins and wall studs.

Forestry Commission offices-Inverness

JJ-Beam (Glulam)

JJ-Beam, Glue laminated timber (glulam) is a high strength and stiffness beam product that is an ideal choice for demanding applications and heavily loaded members.

binderholz

tiptop timber

www.binderholz.com/en/

JJ-LVL (Laminated Veneer Lumber)

JJ-LVL is an advanced wood product suitable for a wide range of structural applications. Available in two specifications; JJ-LVL-Beam and JJ-LVL-Rim. LVL is exceptionally strong for the most demanding of applications.

rethink.

storaenso

www.storaenso.com/

Metalwork

James Jones and Sons continues to work closely with the UK's leading engineered timber connector manufacturers. Only connectors approved by James Jones and Sons should be used within our system. All connectors are available from JJI-Joist distributors as part of the JJI-Joists system offer.

CULLEN

www.itwcp.com

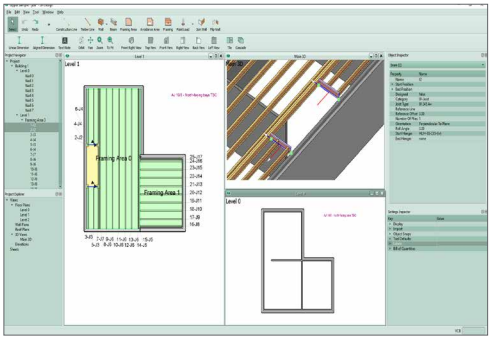
SIMPSON

Strong-Tie

www.strongtie.co.uk

Design tools

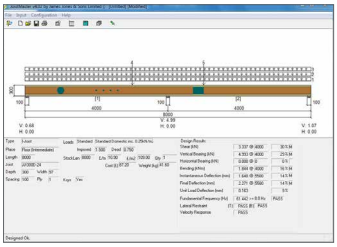
Efficiency of design, manufacturing and on-site installation is key to the success of the JJI-Joist system. Through the development of our own design and optimisation software and its integration with external design and manufacturing software, we continue to remain at the forefront of industry innovation and the push for system integration for both traditional and offsite construction.

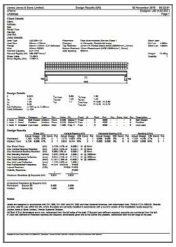


Software

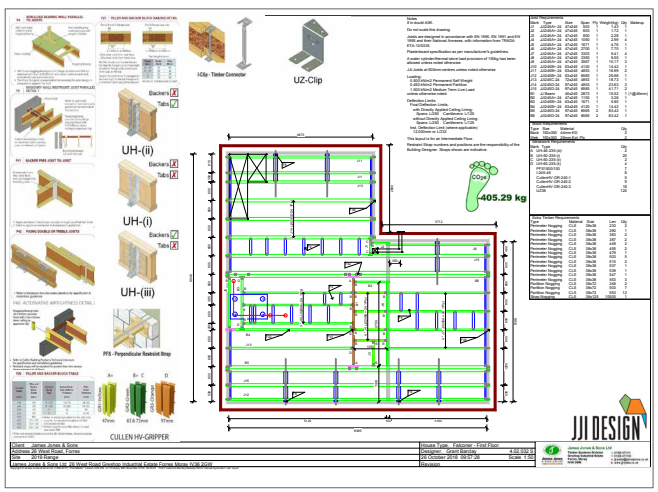
The JJI-Joist system is fully supported by three Windows™ based software packages written in the UK to provide fast and cost effective design solutions for today's construction industry.

JoistMaster is a powerful beam design tool for specification and cost analysis. Freely available to download from www.jamesjones.co.uk



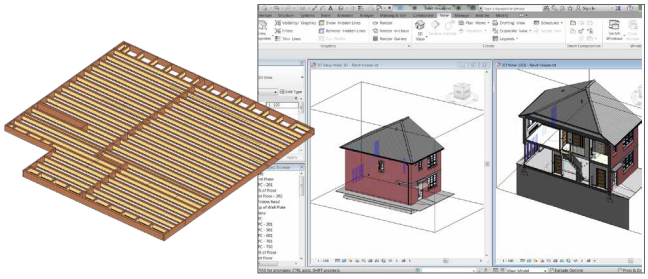


JJI Design is a comprehensive floor design and layout package producing detailed layout drawings, material call-offs and optimisation, installation details and export files for CAD and BIM integration. **OptiMaster** is a stock inventory and material optimisation tool aimed at improving the operational efficiency of the cutting and stock control process.



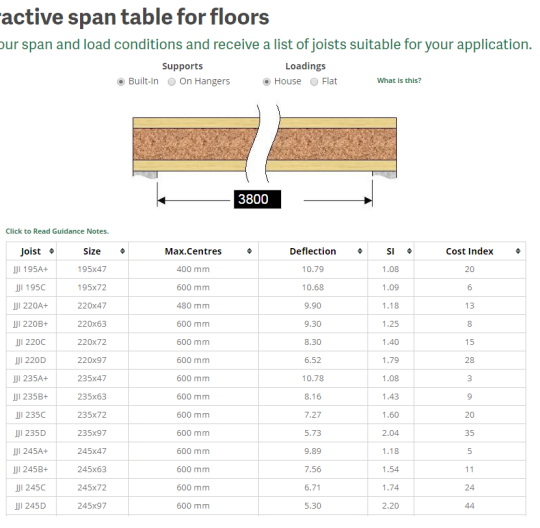
CAD and BIM (Building Information Modelling)

The James Jones software is fully integratable into the latest industry design software allowing both the import and export of design files. We currently export complete joist layouts in compliance with BIM level 2. For more information please contact James Jones and Sons Ltd.



Interactive span table

A helpful interactive span table can be found on the James Jones & Sons website at www.jamesjones.co.uk/interactive-span-table



Interactive span table for floors

Enter your span and load conditions and receive a list of joists suitable for your application.

Supports: Built-In / On Hangers — Loadings: House / Flat — What is this?

Click to Read Guidance Notes.

Joist	Size	Max.Centres	Deflection	SI	Cost Index
JJI 195A+	195x47	400 mm	10.79	1.08	20
JJI 195C	195x72	600 mm	10.68	1.09	6
JJI 220A+	220x47	480 mm	9.90	1.18	13
JJI 220B+	220x63	600 mm	9.30	1.25	8
JJI 220C	220x72	600 mm	8.30	1.40	15
JJI 220D	220x97	600 mm	6.52	1.79	28
JJI 235A+	235x47	600 mm	10.78	1.08	3
JJI 235B+	235x63	600 mm	8.16	1.43	9
JJI 235C	235x72	600 mm	7.27	1.60	20
JJI 235D	235x97	600 mm	5.73	2.04	35
JJI 245A+	245x47	600 mm	9.89	1.18	5
JJI 245B+	245x63	600 mm	7.56	1.54	11
JJI 245C	245x72	600 mm	6.71	1.74	24
JJI 245D	245x97	600 mm	5.30	2.20	44

Environmental considerations

Environmental considerations are a critical factor in the production of our JJI-Joists. Our environmental management system has enabled the company to target key areas to reduce the impacts of our activities on the environment.

ISO 14001

Our commitment to ISO 14001:2004 from start-up, not only guarantees our compliance with all current and forthcoming legislation but delivers a JJI-Joist with excellent and continually improving environmental credentials.

Sustainable timber sourcing & chain of custody

Sustainable timber supply has always been integral to the manufacture of our engineered wood products. Consequently JJI-Joists are able to be specified as FSC® or PEFC™ Certified. All product claims are independently verified by a certification body on an on-going basis.

Carbon Accounting and Life Cycle Assessment (LCA)

Our third key sustainability element is our Environmental product declaration (EPD) which has been independently verified according to the EPD International Method and it is managed by Environdec.

Through this EPD we can calculate the carbon capture within our JJI-Joists from individual house design to full supply contract volumes. Increasingly supply chain partnerships are being developed with key clients to enable our quantified carbon negative supply to support and contribute to downstream Corporate Social Responsibility (CSR) commitments.

To view our EPD please visit: www.environdec.com

Environmental Product Declaration (EPD)

Environmental Products Declarations (EPDs) are voluntary assessment documents that offer quantified information over a range of environmental impacts within the boundaries defined by companies, i.e. (greenhouse gases emissions, water usage and energy). They are produced using a Life Cycle Approach (LCA) using internationally accepted methodologies and they are independently reviewed which makes them more robust to stakeholder criticism.

Our LCA measurements enable our environmental performance profile to be measured and improved upon by assessing all environmental impacts associated with the sourcing, transport and manufacture of our product (i.e. from the forest to the end user).

Improved supply logistics, new resin formulations and improved biomass heating efficiencies are recent examples of targeted and quantifiable improvements within the life-cycle performance of our JJI-Joists.

Russwood offices-Newtonmore

Section 2

JJI-Joists

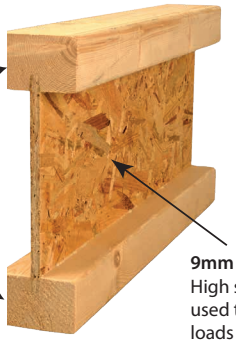
A JJI-Joist is a composite engineered timber joist, combining 45mm deep high-grade finger jointed softwood flanges with a 9mm thick oriented strand board (OSB/3) web.

Introduction

The JJI-Joist relies on a unique combination of engineered products designed to complement each other and deliver outstanding performance. These materials have different specific properties and by combining the two materials in this way to form a composite section you can use the strengths of each one where it is needed most. This results in the new section outperforming the individual materials that it is made from (the sum is greater than its parts) making it more structurally efficient.

Using advanced technology these components are combined to produce an innovative alternative to conventional construction timber with many additional advantages.

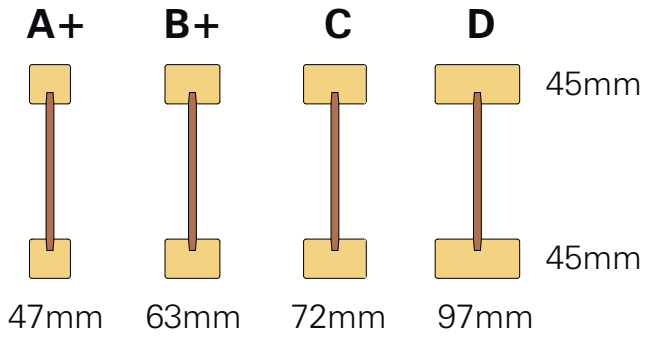
JJI-Joist Composition



Softwood flange
High tensile and compressive strength is used to carry the bending loads which are greatest at the top and bottom

9mm OSB web
High shear strength is used to carry the shear loads which are greatest at the mid depth of the section

JJI-Joist flange sizes



Advantages

JJI-Joists are designed to give a superior strength to weight ratio when compared to traditional solid timber enabling the manufacture of longer and lighter structural members. The JJI-Joist, with a softwood flange:

- Is capable of spanning longer distances
- Is easier to handle
- Is easier to fix and nail
- Is less prone to splitting
- Is quicker to install
- Is extremely stable
- Reduces building maintenance
- Provides a less complex design solution
- Is simple to specify using product specific software
- Has Part E compliant details available
- Is FSC or PEFC accredited
- Has very low embodied energy
- Has independently assured carbon accounting to our Environmental Product Declaration (EPD)

JJI-Joist range

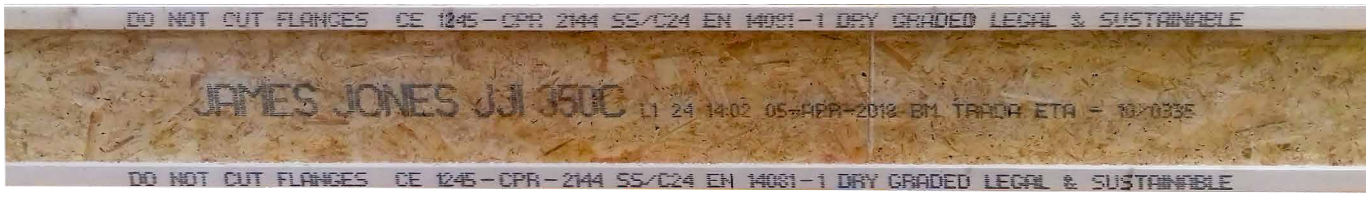
JJI-Joists are available in a comprehensive range of sizes, designed specifically for the UK market.

JJI-Joist Product Range UK				
Joist Depth mm	Flange sizes in mm			
	A+ 47	B+ 63	C 72	D 97
195	✓		✓	
220	✓	✓	✓	✓
235	✓	✓	✓	✓
245	✓	✓	✓	✓
300	✓	✓	✓	✓
350			✓	✓
400			✓	✓
450				✓

Table 1. JJI-Joist product range

JJI-Joist identification and marking

For onsite identification and traceability, all JJI-Joists are clearly marked with product and manufacturing information. The large markings on the OSB web detail the joist depth, flange size, manufacturing time/date and ETA product approval. Further information printed on the top and bottom timber flanges detail the timber strength class, chain of custody confirmation and a warning 'DO NOT CUT FLANGES'.



JJI-Joist properties

It is possible to design JJI-Joist structures using either a Permissible Stress Design Code (BS 5268-2) or a Limit State Design Code (EN1995-1-1/Eurocode 5). Permissible stress design properties, intended for use with BS 5268-2 and characteristic capacities, intended for use with Eurocode 5, can be found in BM TRADA ETA 10/0335.

Joist Type	Depth	Bending moment capacity	Bending stiffness	Shear strength capacity	Shear stiffness	Intermediate bearing capacity – minimum 89mm bearing length		End bearing capacity – minimum 45mm bearing length		End bearing capacity – minimum 89mm bearing length		Weight per metre length
		M	EI	V	GA	N/S	W/S	N/S	W/S	N/S	W/S	W
	(mm)	(kNm)	(10^9 Nmm^2)	(kN)	(10^6N)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kg/m)
JJI 195 A+	195	5.67	305.1	10.64	1.234	16.37	16.37	8.50	8.50	10.33	10.76	2.56
JJI 195 C		8.03	505.6	12.44	1.234	25.07	25.07	12.90	13.02	13.18	16.48	3.57
JJI 220 A+	220	6.60	407.4	11.33	1.477	16.37	16.37	8.50	8.50	10.33	10.76	2.70
JJI 220 B+		8.37	588.5	12.48	1.477	21.94	21.94	11.39	11.39	13.18	14.42	3.35
JJI 220 C		9.32	667.3	13.09	1.477	25.07	25.07	12.90	13.02	13.18	16.48	3.72
JJI 220 D		11.86	941.3	14.71	1.477	26.66	30.00	12.90	17.54	13.18	22.20	4.73
JJI 235 A+	235	7.17	472.4	11.77	1.623	16.37	16.37	8.50	8.50	10.33	10.76	2.79
JJI 235 B+		9.08	678.1	12.90	1.623	21.94	21.94	11.39	11.39	13.18	14.42	3.44
JJI 235 C		10.11	771.3	13.51	1.623	25.07	25.07	12.90	13.02	13.18	16.48	3.80
JJI 235 D		12.85	1088.0	15.12	1.623	26.66	30.00	12.90	17.54	13.18	22.20	4.82
JJI 245 A+	245	7.54	518.0	12.08	1.720	16.37	16.37	8.50	8.50	10.33	10.76	2.85
JJI 245 B+		9.55	737.2	13.19	1.720	21.94	21.94	11.39	11.39	13.18	14.42	3.50
JJI 245 C		10.64	844.4	13.80	1.720	25.07	25.07	12.90	13.02	13.18	16.48	3.86
JJI 245 D		13.52	1195.4	15.40	1.720	26.66	30.00	12.90	17.54	13.18	22.20	4.87
JJI 300 A+	300	9.67	816.3	13.86	2.255	16.37	16.37	8.50	8.50	10.33	10.76	3.17
JJI 300 B+		12.21	1121.9	14.91	2.255	21.94	21.94	11.39	11.39	12.66	14.42	3.82
JJI 300 C		13.58	1319.5	15.49	2.255	25.07	25.07	12.08	13.02	12.66	16.48	4.18
JJI 300 D		17.22	1899.0	17.07	2.255	26.66	30.00	12.08	17.54	12.66	22.20	5.20
JJI 350 C	350	16.31	1899.6	17.16	2.741	25.07	25.07	10.22	13.02	10.93	16.48	4.48
JJI 350 D		20.65	2647.6	18.70	2.741	26.66	30.00	10.22	17.54	10.93	22.20	5.49
JJI 400 C	400	19.09	2673.0	18.91	3.227	25.07	25.07	8.20	13.02	10.17	16.48	4.77
JJI 400 D		24.12	3428.0	20.41	3.227	25.79	30.00	8.20	17.54	10.17	22.20	5.78
JJI 450 D	450	27.64	4170.4	22.18	3.713	21.50	30.00	6.79	17.54	9.23	22.20	6.07

Table 2. Characteristic capacities for JJI-Joists (Eurocode 5)

Notes for Table 2:

1. All strength properties are for joists acting as non-systems. For joist acting as a system multiply values by 1.1 (K_{sys}=1.1)
2. Minimum end bearing length =45mm, minimum intermediate bearing length =89mm
3. N/S: no web stiffeners required, W/S: Web stiffeners required
4. Advice on choosing appropriate partial factors for limit state design can be found in ETA-10/0335
5. Lateral buckling checks should be performed during the design of structures using JJI-Joists if both flanges are not fully restrained

Characteristic JJI-Joist vertical load capacities when fully supported

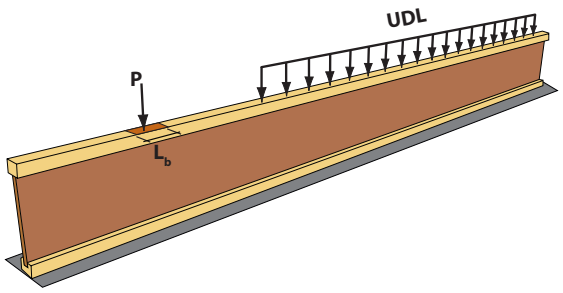
JJI Joist Depth	Characteristic load per metre run (kN/m)
195	75.0
220	75.0
235	71.0
245	64.0
300	60.0
350	41.0
400	32.0
450	31.0

Table 3. JJI-Joist vertical loads

Notes for Table 3:

1. Values for point load can be calculated as P=UDL x (L_b+60)/1000 where L_b is the contact length of the load applied in mm
2. The beam is considered fully restrained, effects of buckling have been ignored
3. Allowance may be made for load spreading of sole plates and bottom rails at the designers discretion

JJI POINT LOAD AND UDL



JJI-Joist hole installation guide: Circular, Square and Rectangular Holes

Service holes **MUST NOT BE CUT** in the JJI-Joist flange.

The maximum size of a service hole that can be cut in the web of a JJI-Joist at a particular location depends on the specific load configuration on the joist. The table below gives the minimum required distance, L (mm), from inside face of support to nearest edge of hole for uniformly loaded, simply supported joists under standard domestic loading of 0.75kN/m^2 dead load and 1.5kN/m^2 imposed load at up to 600mm centres. Where this is not the case, the hole(s) can be assessed using the JoistMaster software. Contact your distributor for advice.

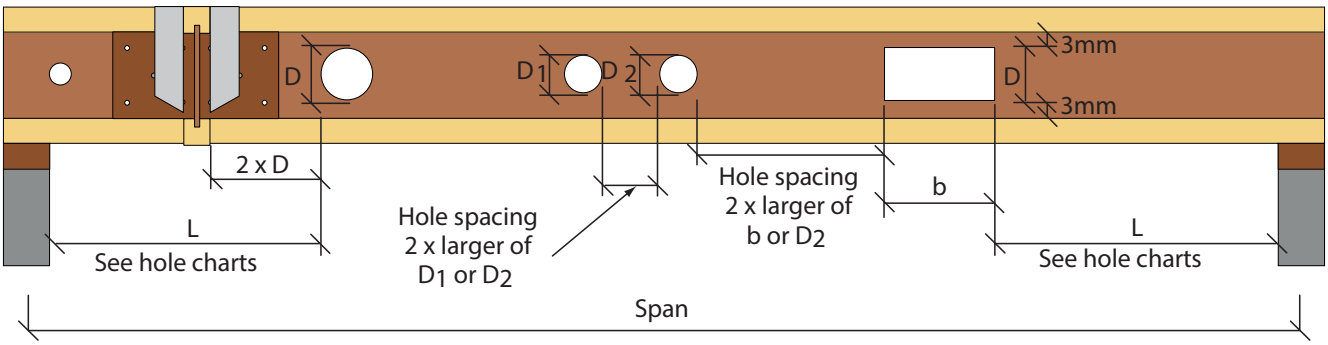
Joist Depth (mm)	Joist Span (mm)	Hole Size (mm)													
		50		75		100		125		150		175		200	
		○+□	□	○+□	□	○+□	□	○+□	□	○+□	□	○+□	□	○+□	□
220	3000	300	300	361	656	721	838	838	1159						
	3500	300	300	500	824	895	1024	1024	1375						
	4000	300	300	651	1001	1078	1216	1216	1596						
	4500	300	449	813	1186	1268	1415	1415	1819						
	4890	300	566	945	1334	1420	1574	1574	1996						
235	3000	300	300	300	566	656	873	873	1217						
	3500	300	300	325	725	824	1062	1062	1440						
	4000	300	300	463	894	1000	1258	1258	1665						
	4500	300	300	612	1072	1185	1460	1460	1893						
	5066	300	382	794	1282	1402	1693	1693	2154						
245	3000	300	300	300	482	586	865	865	1252	955	1252				
	3500	300	300	300	632	747	1053	1053	1478	1152	1478				
	4000	300	300	300	794	918	1248	1248	1706	1355	1706				
	4500	300	300	457	965	1097	1449	1449	1937	1563	1937				
	5184	300	300	666	1212	1353	1731	1731	2256	1854	2256				
300	4000	300	300	300	300	300	803	803	1308	1230	1542	1477	1883	1572	1883
	4500	300	300	300	300	300	975	975	1513	1430	1762	1693	2126	1795	2126
	5000	300	300	300	300	449	1154	1154	1722	1635	1985	1912	2369	2019	2369
	5500	300	300	300	535	670	1341	1341	1935	1844	2210	2135	2613	2247	2613
	5803	300	300	300	687	822	1456	1456	2066	1972	2348	2271	2761	2385	2761

Table 4. Allowable Locations for Circular, Square and Rectangular Holes (Domestic Applications)

Notes for Table 4:

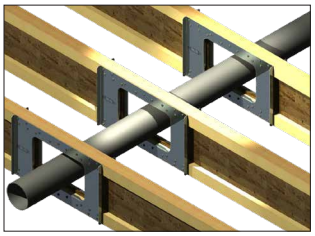
1. Table 4 has been calculated for joists in intermediate domes tic floors (G_k=0.75kN/m^2,q_k=1.5kN/m^2,Q_k=2kN) at 600mm centres
2. Where more than one hole is to be cut, the minimum spacing between holes must be 2 times the width of the largest hole
3. The rectangular hole width b should not exceed 1.5xD
4. Cut all holes carefully, do not overcut and do not cut flanges
5. Where holes are required in rim and header joists of timber frame construction refer to the building designer
6. Plastic plumbing is ideal with JJI-Joists. Where copper plumbing is to be used, careful consideration of the sequence of pipe installation is required
7. The bearing support length used for this table is 45mm
8. A 35mm hole may be drilled any where on the centre line of the web material provided there is a minimum of 35mm from the edge of the hole to the end of the joist and it is not directly over a support

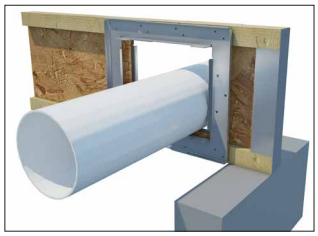
Service hole diagram



Alternative solutions - reinforcing plates

For guidance on using reinforcing plates for large and highly loaded applications please contact your JJI-Joist distributor.





Acoustic requirements

JJI-Joists can be used in both intermediate and separating floors that comply with current building standards.

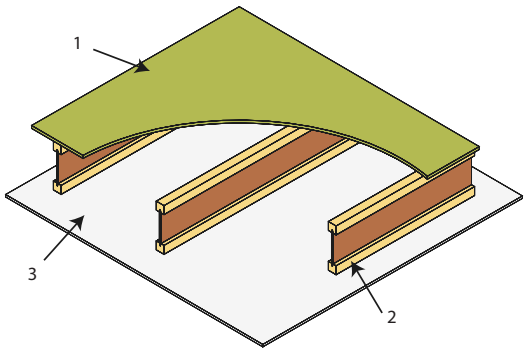
England and Wales, Building Regulations Part E (Resistance to the Passage of Sound), October 2015, Section 5: 5.23 Internal floor type C and Section 3: 3.1 Floor Type 3.1A.

Scottish Building Standards, Section 5 (Noise), October 2011, Scottish Government Example Construction and Generic Internal Constructions, Section 4.c: Floor Type 2 & 2A and Section 10: Floor Type 3B.

Intermediate floors

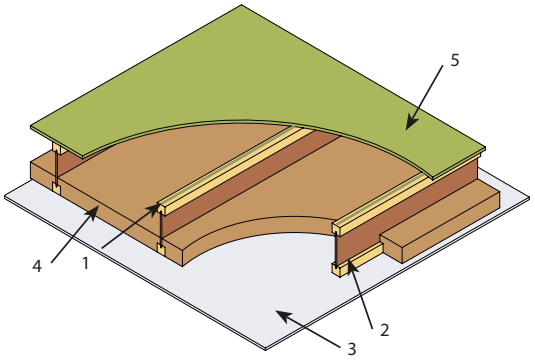
James Jones & Sons Ltd. have undertaken further acoustic tests to provide the builder with alternative solutions to that found in the above national standards. For further information please refer to Technical Bulletin 14 'Resistance to the Passage of Sound' for use in England and Wales and Technical Bulletin 38 '44dB Rw Acoustic Performance of 220mm JJI-Joist floor' for use in Scotland.

ENGLAND AND WALES INTERMEDIATE FLOOR



1. Floor Deck – 18mm flooring grade chipboard
2. Structural Member – 220mm deep JJI-Joists at a minimum 400mm centres
3. Ceiling – 15mm gypsum wall board and no board edge noggings
4. Also see fire requirements

SCOTLAND INTERMEDIATE FLOOR

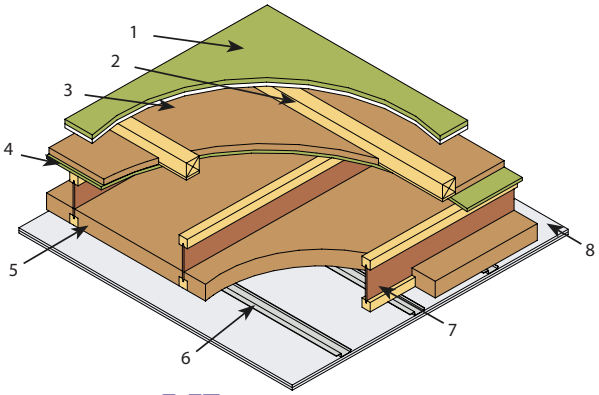


1. 5mm bead of Caberfix joint and joist adhesive
2. 220mm JJI-Joist
3. 15mm Knauf Wallboard
4. 100mm Knauf acoustic roll
5. 22mm Caberdek P5 chipboard peel clean removed

Seperating floor

JJI-Joists can be readily specified for use in separating floors in England and Wales and Scotland. Where increased performance with regard to acoustics, fire and the overall structure is required.

JJI-JOISTS IN TIMBER FRAME CONSTRUCTION COMPLYING WITH PART E1



Robust detail E-FT-1

1. 18mm chipboard and 19mm plasterboard plank
2. 70mm dynamic battens at 600mm centres
3. Minimum 25mm quilt between battens
4. Sub-deck board, minimum 15mm
5. 100mm mineral fibre based quilt
6. Resilient bar at 400mm centres
7. Minimum 235mm deep JJI-Joist at centres to suit span
8. 12.5mm plasterboard and 19mm plasterboard plank or 2 no. layers 15mm plasterboard

robustdetails®

E-FT-1 (England and Wales Generic solution)
E-FT-5 (England and Wales Cellecta® ScreedBoard® 28)
E-FT-7* (England and Wales FFT80)
V-FT-1 (Scotland Generic solution)

There are currently 4 solutions where JJI-Joists can be fully incorporated into the makeup of separating floors to achieve Robust Detail status.
For further information www.robustdetails.com/

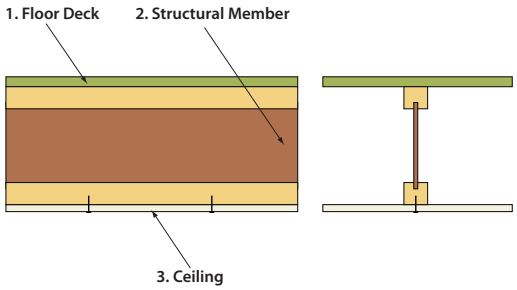
* Recommended that Building Control be consulted to ensure full compatibility with other NI Regulations and Standards.

Fire resistance

Successful fire tests have been carried out on JJI-Joists by International Fire Consultants limited. Various solutions are available for half hour and one hour fire resistance performance to both European and British standards. The following details show examples of the approved floor constructions described in International Fire Consultants Assessment reports PAR/17613/01 to BS 476 and PAR/15150/01 &/02 to BS EN 1365.

Half-hour

30 MIN FIRE RESISTANCE



Ceiling-30 min

- 15mm Type A plasterboard fixed directly to joist
- 15mm Type F plasterboard fixed directly to joist
- 12.5mm Type F plasterboard fixed to resilient bars, maximum 450mm bar centres

  12.5mm Type D plasterboard fixed to resilient bars, maximum 400mm bar centres

Floor Deck-30 and 60 min

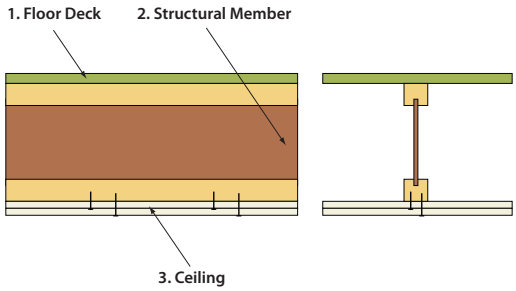
- 22mm (for 600mm centres joists) and 18mm (for less than 450mm centres joists) flooring grade chipboard
- 18mm flooring grade plywood
- 18mm oriented strand board (OSB)
- 21mm T&G softwood flooring

Structural Member-30 and 60 min

- JJI-Joist designed to support the applied loads at 600mm centres

One-hour

60 MIN FIRE RESISTANCE



Ceiling-60 min

- 2no. 15mm Type F plasterboard fixed directly to joist
- 2no. 12.5mm Type F plasterboards fixed direct to joist, plus board edge noggins

Type A, D (enhanced acoustics) & F (enhanced fire resistance) plasterboards to BS EN 520.
Where services penetrate the plasterboard lining, i.e. downlighters, a fire rated unit of equivalent performance must be used. For alternative ceiling options please contact James Jones & Sons for information.

Treatment and durability

JJI-Joists are untreated and when used in a Service Class 1 or 2 environment, the ETA certificate advises that they may be taken to have a service life in excess of 50 years.

Preservative treatment

JJI-Joists are available with preservative treated timber flanges. This allows their use in Use Class 2 conditions in accordance with BS EN335-1, and Hazard Class 2 conditions in accordance with NHBC Standards, i.e. load bearing external wall studs and flat roof joists. This treatment does not affect the structural properties of the JJI-Joist. Please contact James Jones and Sons for further information.

STA design guide to separating distances during construction

Design guidance is available for new JJI-Joists solutions for category C1 and C2 structures covered under the STA (Structural Timber Association) separating distances during construction. The STA's design guide to separating distances during construction is a multi-part document that provides comprehensive guidance on the mitigation of the potential risk posed by a fire in a timber frame structure whilst under construction, i.e. (prior to the installation of the finishings that usually provide fire resistance to the final building). For further information please refer to Technical Bulletin 51 'JJI-Joist fire solutions for use with the STA design guide to separating distances during construction'.

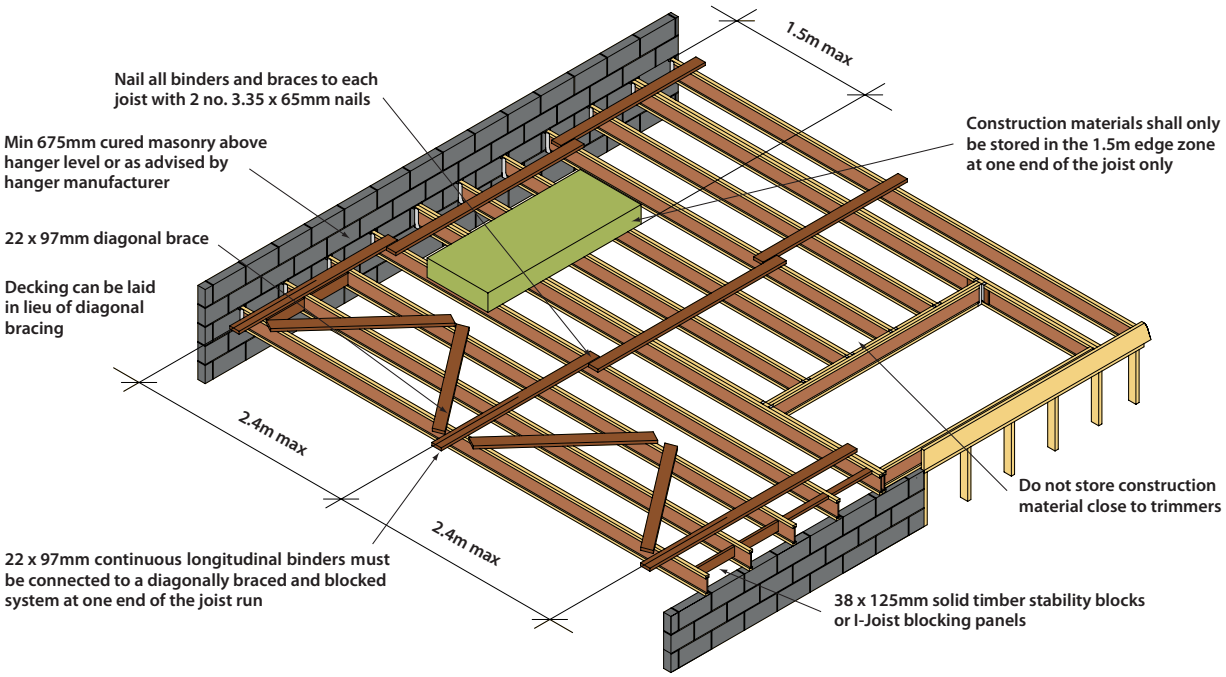
Temporary erection bracing notes

The builder is responsible for identifying and minimising the risks involved in erecting JJI-Joists to ensure that the health and safety of all workers is maintained. Builders should be aware of the health and safety responsibilities imposed on them by the Construction (Design and Management) Regulations 2015. Proper erection procedures and bracing are vital to the safe construction of JJI-Joists floors. The following notes may assist builders in preparing a safety assessment.

1. Do not allow workers to walk on unbraced joists
2. Do not store building materials on unbraced joists
3. JJI-Joists should be erected straight and vertical. The maximum deviation from horizontal should not exceed 10mm and the maximum deviation from the vertical should not exceed 2mm
4. JJI-Joists are unstable until fully braced. Bracing includes: longitudinal binders, diagonal bracing, stability blocking, rim joist/rim boards
5. All longitudinal binders, diagonal braces, stability blocks, and hangers should be completely installed and fully nailed as detailed
6. Lateral strength should be provided by a diagonally braced and blocked system across at least 3 joists as shown in the Erection Bracing Details (diagram below). Additional braced and blocking systems should be provided at 12m spacing in long joist runs
7. Once a JJI-Joist floor has been fully braced, construction materials may be placed on the floor provided that the overall weight of material to be placed on a single joist does not exceed 250kg (200kg for 195mm deep joists). Please refer to Technical Bulletin 47, 'Loading out JJI-Joist Floors'
8. Flooring should be fully fixed to the JJI-Joists before additional loads are placed on the floor
9. The ends of cantilevers should be stabilised with longitudinal binders fixed to the top and bottom flanges

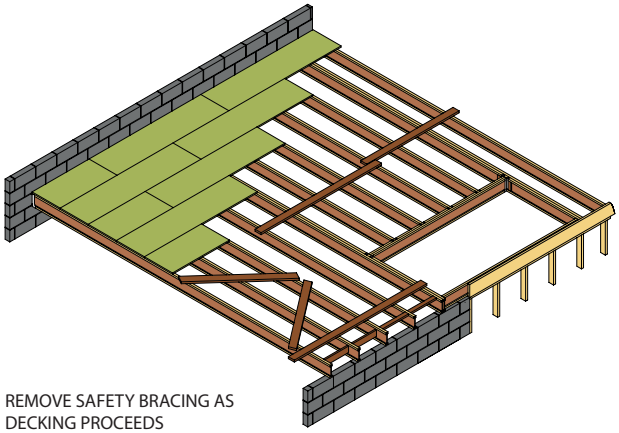
Installation guidelines

This diagram indicates temporary erection bracing only. It is applicable to both timber frame and masonry construction.



Stability blocking notes

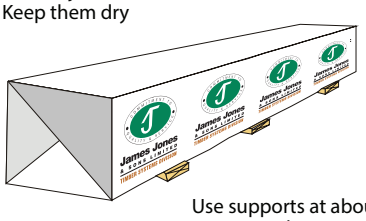
- Use timber blocks or JJI-Joist blocking pieces
- Timber blocks to be minimum 38 x 125mm cut squarely and accurately to maintain joist spacing. Fasten with minimum 2 no. 3.35 x 65mm nails
- Stability blocks need to be fixed to 3 joists and cover a minimum distance of 1200m
- Timber blocks in the diagonally braced systems are required in each run of joists and at cantilever supports
- When joists butt on an interior support, block both sets of joists
- Additional braced and blocked systems should be provided at 12m spacing in long joist runs



REMOVE SAFETY BRACING AS DECKING PROCEEDS

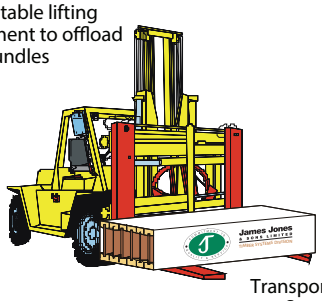
JJI-Joist site storage

Protect joists from the elements. Keep them dry



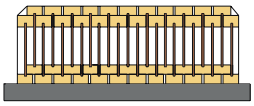
Use supports at about 3.0m spacing to keep joists clean, level and above the ground

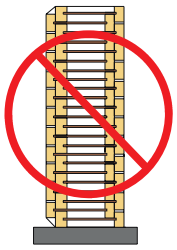
Use suitable lifting equipment to offload joist bundles



Transport joists on edge, not flat

Store joists on edge





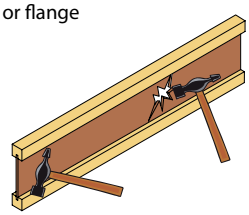
DO NOT store joists flat

DO NOT lift joists by top flange

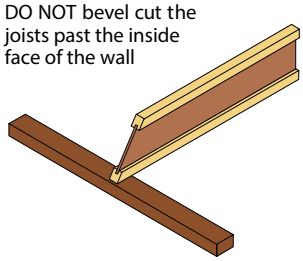
DO NOT lift joists on the flat

Attention! The following conditions are not allowed

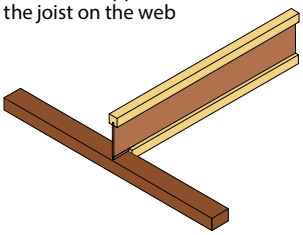
DO NOT hammer on the web or flange



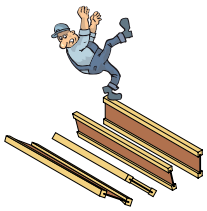
DO NOT bevel cut the joists past the inside face of the wall



DO NOT support the joist on the web

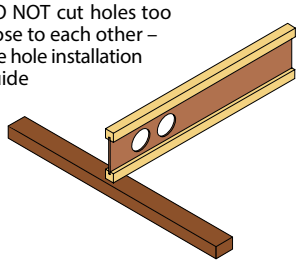


DO NOT walk on joists until proper bracing is in place

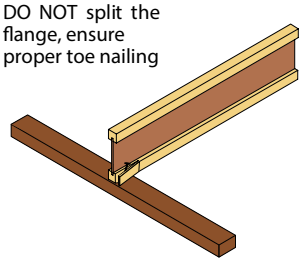


DO NOT stack building materials on unbraced joists

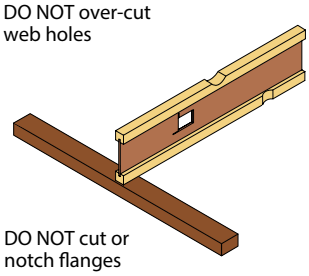
DO NOT cut holes too close to each other – see hole installation guide



DO NOT split the flange, ensure proper toe nailing

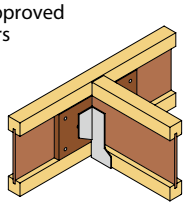


DO NOT over-cut web holes



DO NOT cut or notch flanges

DO NOT use non-approved hangers



Stairwell hatch system

Designed as an alternative to sacrificial stairwell joists, the OCKWELLS Stairwell Hatch System provides a reusable GRP platform over stairwell openings.
For further information contact your JJI-Joist distributor.

OCKWELLS
www.ockwells.co.uk

Section 3

Glulam and LVL

Glue laminated timber (Glulam) is a high grade beam product that is an ideal choice for high strength and stiffness applications for heavily loaded members.

Laminated Veneer Lumber (LVL) is an advanced wood product suitable for a wide range of structural applications. Available in two specifications; JJ-LVL-Beam and JJ-LVL-Rim, LVL is exceptionally strong for the most demanding of applications.

Introduction

JJ-Beam (Glulam) is a high specification engineered timber product made by gluing together strength graded timber laminations to make up larger sections and distribute the natural defects evenly throughout the volume. The laminations are finger jointed to allow long lengths to be formed. This results in a structural unit of great strength and dimensional stability. Glulam beams can be produced in a range of sectional sizes and are available from James Jones & Sons in lengths up to 12m.

Typical Glulam Sections

JJ-Beam product range

JJ-Beam is supplied as part of the JJI-Joist system. It is available in depths that match the JJI-Joist range (Table 1) and three standard widths. See table below for standard range.
Intermediate width can be achieved by fixing multiple settings together with suitably specified fixings.

Section Depth	Width		
	38	45	90
195	✓	✓	✓
220	✓	✓	✓
235	✓	✓	✓
245	✓	✓	✓
300	✓	✓	✓
350		✓	✓
400		✓	✓
450		✓	✓

Table 5. JJ-Beam product range

Characteristic values for JJ-Beam

JJ-Beam should be designed to Eurocode 5 and requires the use of characteristic values as shown in Table 6.

Characteristic Values			JJ- Beam	Units
Bending strength	edgewise, parallel to grain	$f_{m,k}$	32	N/mm²
Tension strength	parallel to grain	$f_{t,0,k}$	19.5	N/mm²
	perpendicular to grain edgewise	$f_{t,90,k}$	0.45	N/mm²
Compression strength	parallel to grain	$f_{c,0,k}$	26.5	N/mm²
	perpendicular to grain edgewise	$f_{c,90,k}$	3	N/mm²
Shear strength	edgewise, parallel to grain	$f_{v,k}$	3.2	N/mm²
Modulus of elasticity	parallel to grain	$E_{0,mean}$	13700	N/mm²
	5% parallel to grain	$E_{0.05}$	11100	N/mm²
	perpendicular to grain edgewise	$E_{90,mean}$	420	N/mm²
Shear modulus	edgewise, parallel to grain	G_{mean}	780	N/mm²
	edgewise, parallel to grain	$G_{0.05}$	540	N/mm²
Density	characteristic	ρ_k	410	kg/m³
	mean	ρ_{mean}	440	kg/m³

Table 6. Characteristic Values for JJ-Beam

Care should be taken to ensure that all partial factors used to convert the characteristic values to design values are correctly chosen for the prevailing design conditions. For example, load duration, member depth, service class, etc.

Service Class	Load Duration Class					
	Permanent	Long term	Medium term	Short term	Instantaneous	K_{def}
1	0.60	0.70	0.80	0.90	1.10	0.6
2	0.60	0.70	0.80	0.90	1.10	0.8
3	0.50	0.55	0.65	0.70	0.90	

Table 8. K_{mod} and K_{def} factors for JJ-Beam and JJ-LVL

Note for Table 8:

1. Values provided in BS EN 1995-1-1

JJ-Beam vertical load characteristic capacities

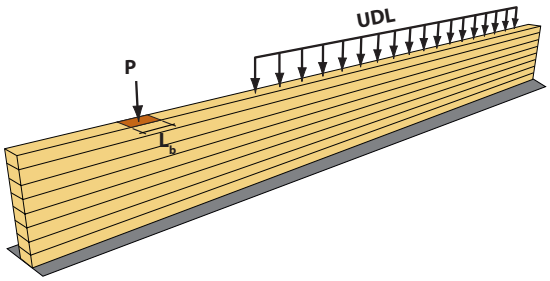
Width	Characteristic load per metre run (kN/m
38	114.0
45	135.0
90	270.0

Table 7. JJ-Beam vertical load characteristic capacities

Notes for Table 7:

1. Values for point load can be calculated as P=UDL x (L_b+60)/1000 where L_b is the contact length of the load applied in mm
2. The beam is considered fully restrained, effects of buckling have been ignored
3. Factor $K_{c,90}$ has been taken as 1, however, allowance may be made for load spreading of sole plates and bottom rails at the designers discretion

JJ-BEAM AND JJ-RIM POINT LOADS AND UDL



Material	γM
Glulam	1.25
LVL	1.20

Table 9. γ_M material factors for JJ-Beam and JJ-LVL

Note for Table 9:

1. Values provided in NA to BS EN 1995-1-1

Introduction

Laminated Veneer Lumber (LVL) is an advanced wood product suitable for a wide range of structural applications, from new build to repair. LVL as a material is exceptionally strong with a great load bearing capacity, homogeneous quality and good workability. JJ-LVL-Beam and JJ-LVL-Rim is available in 12m lengths and in a range of sizes.

Typical LVL Sections

LVL product range

JJ-LVL-Beam and JJ-LVL-Rim is available in depths to suit the JJI-Joist range (Table 1) and four standard widths depending on the grade. See table below for our standard range.

Section Depth	Width			
	JJ-LVL-Rim	JJ-LVL- Beam		
	30	39	45	75
195	✓	✓	✓	✓
220	✓	✓	✓	✓
235	✓	✓	✓	✓
245	✓	✓	✓	✓
300		✓	✓	✓
350			✓	✓
400			✓	✓

Table 11. LVL product range

Characteristic values for JJ-LVL-Beam and JJ-LVL-Rim

JJ-LVL-Beam and JJLVL-Rim should be designed to Eurocode 5 and requires the use of characteristic values as shown in Table 10.

Characteristic Values			JJ-LVL-Rim	JJ-LVL-Beam	Units
Bending strength	edgewise, parallel to grain	$f_{m,k}$	32	44	N/mm^2
Size effect parameter		s	0.15	0.15	-
Tension strength	parallel to grain	$f_{t,0,k}$	26	35	N/mm^2
	perpendicular to grain edgewise	$f_{t,90,k}$	6	0.8	N/mm^2
Compression strength	parallel to grain	$f_{c,0,k}$	26	35	N/mm^2
	perpendicular to grain edgewise	$f_{c,90,k}$	9	6	N/mm^2
Shear strength	edgewise, parallel to grain	$f_{v,k}$	4.5	4.1	N/mm^2
Modulus of elasticity	parallel to grain	$E_{0,mean}$	10500	13800	N/mm^2
	5% parallel to grain	$E_{0.05}$	8800	11600	N/mm^2
	perpendicular to grain edgewise	$E_{90,mean}$	2400	nd	N/mm^2
Shear modulus	edgewise, parallel to grain	G_{mean}	600	600	N/mm^2
	edgewise, parallel to grain	$G_{0.05}$	400	400	N/mm^2
Density	characteristic	ρ_k	510	510	kg/m^3
	mean	ρ_{mean}	480	480	kg/m^3

Table 10. Characteristic Values

Notes for Table 10:

1. nd= Parameter not declared by manufacturer
2. Properties valid for products within 24-75mm thickness
3. Properties declared in certificates 0809-CPR-1203 and 0809-CPR-1214

LVL vertical load capacities when fully supported

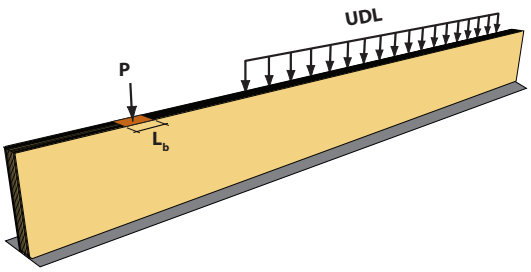
Width [mm]	Characteristic load per metre run (kN/m	
	JJ-LVL Rim	JJ-LVL Beam
30	270	-
39	-	234.0
45	-	270.0
75	-	450.0

Table 12. JJ-LVL-Beam and JJ-LVL-Rim vertical load characteristic capacities

Notes for Table 12:

1. Values for point load can be calculated as P=UDL x (L_b+60)/1000 where L_b is the contact length of the load applied in mm
2. The beam is considered fully restraint, effects of buckling have been ignored
3. Factor $K_{c,90}$ has been taken as 1, however, allowance may be made for load spreading of sole plates and bottom rails at the designers discretion

JJ-LVL BEAM AND JJ-LVL RIM POINT LOADS AND UDL



Design values for domestic flooring applications

Tables of calculated design values for JJ-Beam, JJ-LVL-Rim and JJ-LVL-Beam in all available sections and sizes can be provided on request, please contact James Jones and Sons.

Alternative sizes, grades and profiles

One of the benefits of partnering with two of Europe's largest engineered timber manufacturers is being able to offer an extensive range of Glulam and LVL products direct from their manufacturing bases in mainland Europe.

Glulam

Binderholz is a full-range supplier for glulam products, manufactured in accordance with EN 14080:2013, with beams and profiles available to the following strength classes for both visual and non-visual applications:

GL24c, GL24h, GL28c, GL28h, GL30c, GL30h, GL32c and GL32h

Glulam special profiles and treatments

We are able to offer a range of special architectural profiles including sloped and curved beams, plus a broad spectrum of secondary beam processing (notches, holes, etc). For a full list of products, grade and quality information please visit our website: www.jamesjones.co.uk/glulam

Image courtesy of Sebastian Tombs

LVL

Partnering with Stora Enso allows us to offer their full range of LVL products. Manufactured in accordance with EN 14374, Stora Enso LVL is available in S, X and T grades in various billet sizes. For further information on LVL use and material and structural properties, please visit our website: www.jamesjones.co.uk/lvl/

Image courtesy of Binderholz

Image courtesy of Storaenso

Storage on site

Glulam and LVL will typically arrive on site with a moisture content between 10% and 15%, and will achieve a moisture content of approximately 12% when installed in Service Class 1 conditions.

Glulam and LVL should be stored clear of the ground on a flat level surface and protected from the weather.

Once installed, if the structure will not be weather tight for a prolonged period of time, the Glulam and LVL should be protected from the weather to avoid excessive changes in moisture content, and associated dimensional changes.

Treatment and durability

Our Glulam and LVL products are untreated. When used in a Service Class 1 or 2 environment they will have a natural durability comparable to that of solid European white wood.

Following discussions with the NHBC it has been confirmed that when used as a rim beam in timber frame construction and protected by a layer of sheathing and breather paper, no additional preservative treatment is required.

Check for compatibility before applying any preservative coating/treatment.

JJ-LVL-Beam can be supplied with an optional water-borne wood oil weather guard coating called Teknoshield. For further information contact your JJI-Joist distributor.

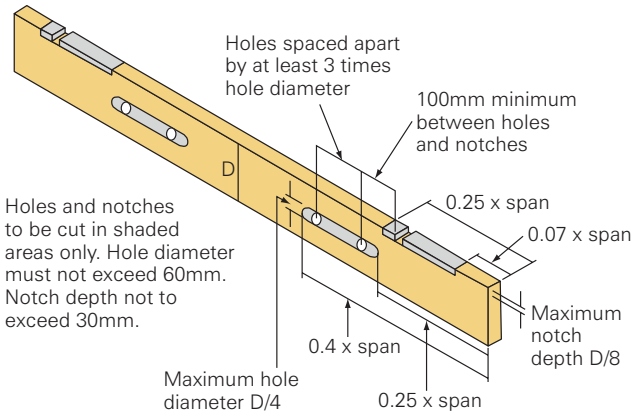
Fire resistance and treatment

For the purpose of calculating the fire resistance of Glulam and LVL members, detailed guidance on charring rate calculation procedures can be found in EN 1995-1-2.

Service holes in Glulam and LVL

Holes or notches should be formed in accordance with the guidelines given for solid timber members in The Building Regulations Approved Document "Timber Intermediate Floors for Dwellings", clause 2.5. The hole and notch diagram is applicable to uniformly loaded single span beams only. For all other applications, consult the JJI-Joist distributor.

Service hole diagram



In addition to the rules given above a 35mm circular hole can be drilled at any location along the centre line of a JJ-Beam and JJ-LVL member provided the following rules are observed:

- The hole must be a minimum of one member depth away from the end of the joist
- The hole must be a minimum of one member depth away from the nearest support
- No two adjacent holes should be located any closer together than 70mm edge to edge
- For holes larger than 35mm contact your distributor for advice

Larger holes and complex loading

PD6933-1-2012 provides a calculation method for larger holes up to 0.4 x depth of the joist. This method can be use for multi span beams and complex loading conditions.

Fixing of multiply JJ-Beam and JJ-LVL-Beam Members

Multiply JJ-Beam and JJ-LVL members can be fixed together using nails, screws or bolts depending on availability and preference.
Screws – Where possible, James Jones & Sons recommend the use of large diameter self tapping screws in preference to nails or bolts. For details of the available screw sizes and advice on how they should be used please refer to the relevant metalwork manufacturer's technical literature (see page 2 for contact details).

For cases where large diameter self-tapping screws are not available this section provides some standard nailing and bolting details for uniformly loaded multiply members loaded from one face only e.g. (incoming joists on hangers at 600mm centres or less).
Nails – For two ply 38mm and 45mm members nails are the most cost effective and easily made fixing. Nails can also be used in three ply 38mm and 45mm members although designers are encouraged to use a screwed connection solution where possible.
Bolts – Bolts can be used to connect together up to 5 ply 45mm and 3 ply 75mm members.

Tables 13 a and b give maximum medium term design line loads that can be carried if the following fixing details are used.

Fixing Ref.	Section Makeup - JJ-Beam	2 ply			3 ply		4 ply		5 ply	
	Ply Thickness (mm)	38	45	90	38	45	38	45	38	45
	Overall width (mm)	76	90	180	114	135	152	180	190	225
A	2 rows of 3.1mm nails (300 centres)	7.49	7.68	-	5.62	5.76	-	-	-	-
B	3 rows of 3.1mm nails (300 centres)	11.24	11.52	-	8.43	8.64	-	-	-	-
C	2 rows of M12 bolts (600 centres)	25.29	27.01	35.20	18.97	20.26	16.86	18.01	15.81	16.88
D	2 rows of M12 bolts (400 centres)	37.93	40.52	52.79	28.45	30.39	25.29	27.01	23.71	25.32
E	2 rows of M12 bolts (300 centres)	50.58	54.02	70.39	37.93	40.52	33.72	36.02	31.61	33.76

Table 13a. Maximum Medium Term Design Line Load (kN/m) for Multiply JJ-Beam Members Loaded from One Face

Notes for Table 13a and b:

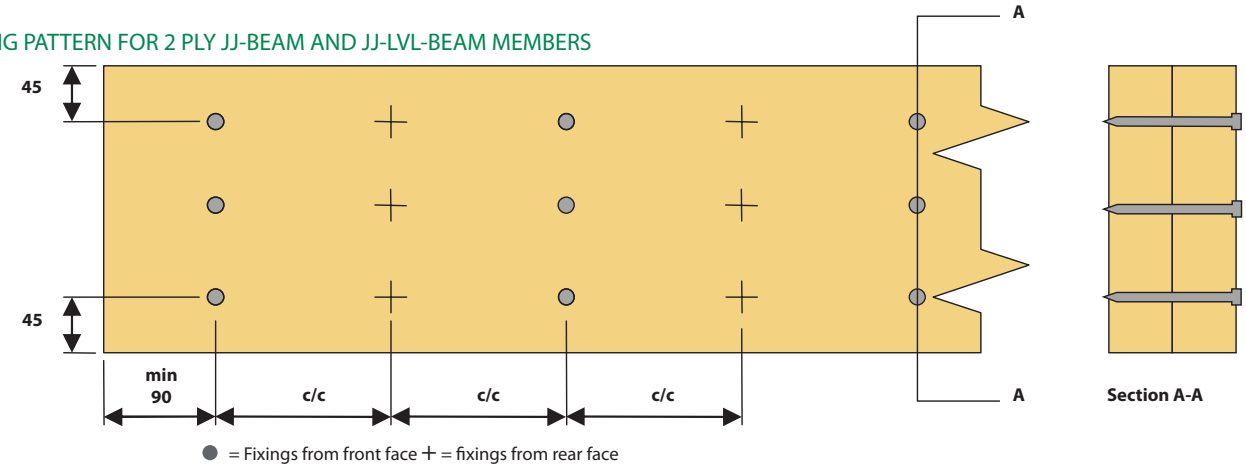
1. The values in the tables above are applicable to members loaded to one face only in floor applications
2. Capacities for nail details are based on 3.1mm diameter power driven nails (75mm long for 38mm thick plies and 90mm long for 45mm plies), hammer driven nails up to 4.5mm diameter may be used
3. 38mm diameter x 3mm thick washers are required under each head and nut on M12 bolts. Bolts to be minimum 4.6 grade
4. Sections over 180mm wide should be loaded equally from both sides unless checked by an Engineer
5. Bolt length to be no less than the overall width of beam + 18mm, e.g. a 2 ply 45mm member would require a 108mm bolt

Fixing Ref.	Section Makeup - JJ-LVL	2 ply			3 ply			4 ply		5 ply	
	Ply Thickness (mm)	39	45	75	39	45	75	39	45	39	45
	Overall width (mm)	78	90	150	117	135	225	156	180	195	225
A	2 rows of 3.1 nails (300 centres)	8.21	8.35	-	6.16	6.26	-	-	-	-	-
B	3 rows of 3.1 nails (300 centres)	12.32	12.53	-	9.24	9.40	-	-	-	-	-
C	2 rows of M12 bolts (600 centres)	28.44	30.33	38.08	21.33	22.74	28.56	18.96	20.22	17.78	18.95
D	2 rows of M12 bolts (400 centres)	42.66	45.49	57.12	32.00	34.12	42.84	28.44	30.33	26.67	28.43
E	2 rows of M12 bolts (300 centres)	56.89	60.65	76.16	42.66	45.49	57.12	37.92	40.43	35.55	37.91

Table 13b. Maximum Medium Term Design Line Load (kN/m) for Multiply JJ-LVL-Beam Members Loaded from One Face

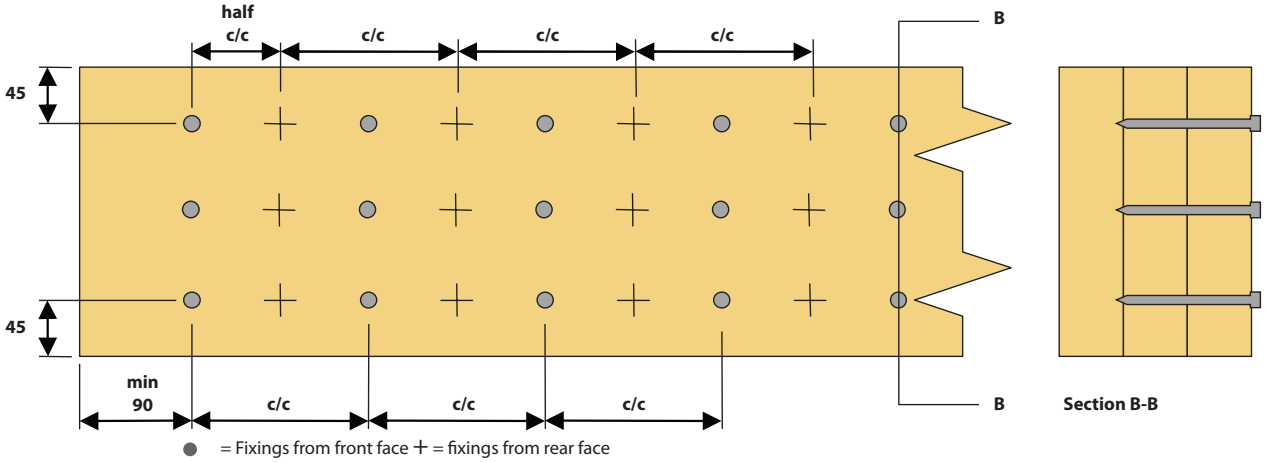
Nails in two ply members should be fixed in two rows 45mm in from the top and bottom edge and one row along the centre line if required, driven from alternate sides.

NAILING PATTERN FOR 2 PLY JJ-BEAM AND JJ-LVL-BEAM MEMBERS



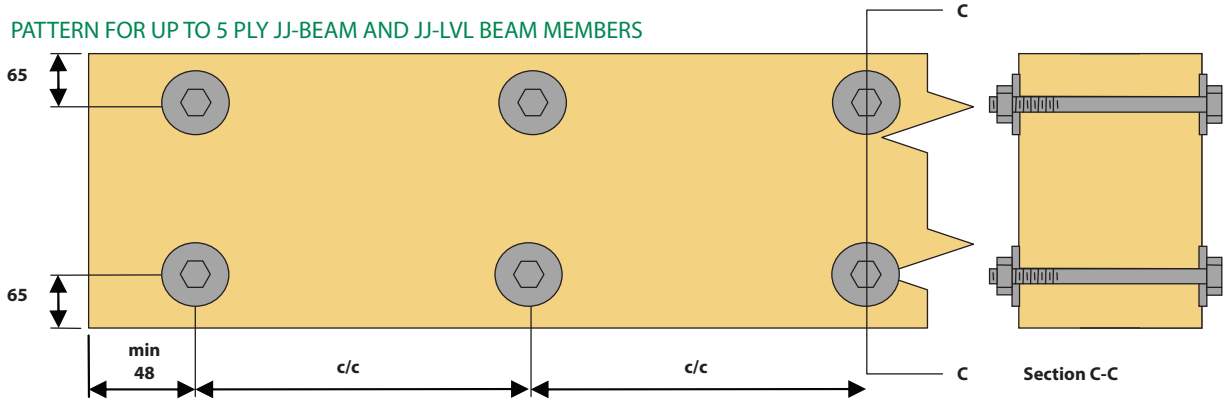
Nails in three ply members should be fixed in two rows 45mm in from the top and bottom edge and one row along the centre line if required, driven through each outer ply into the central one. Note that nails from any one face should be at the specified centres with the nails from the opposite face offset by half the centres distance.

NAILING PATTERN FOR 3 PLY JJ-BEAM AND JJ-LVL BEAM MEMBERS



Bolts should be fixed in two rows 65mm in from the top and bottom edge. Bolt holes should be drilled at Ø12mm and bolts tapped into place.

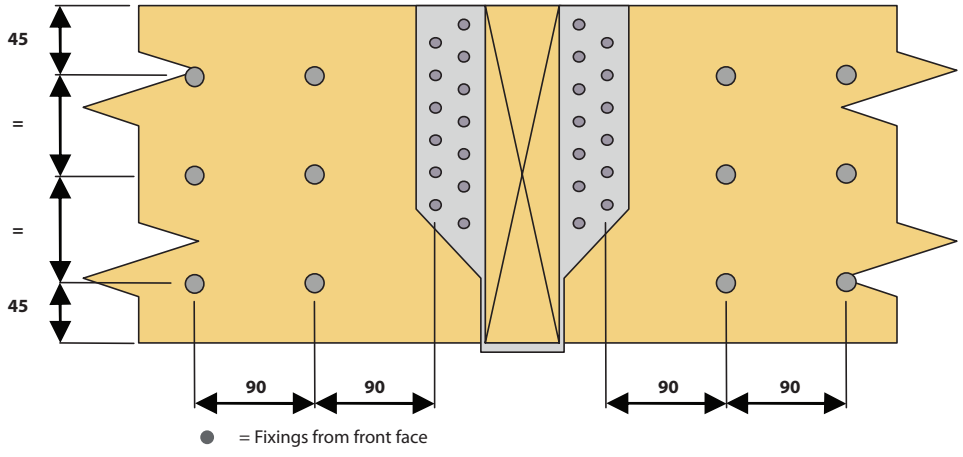
BOLTING PATTERN FOR UP TO 5 PLY JJ-BEAM AND JJ-LVL BEAM MEMBERS



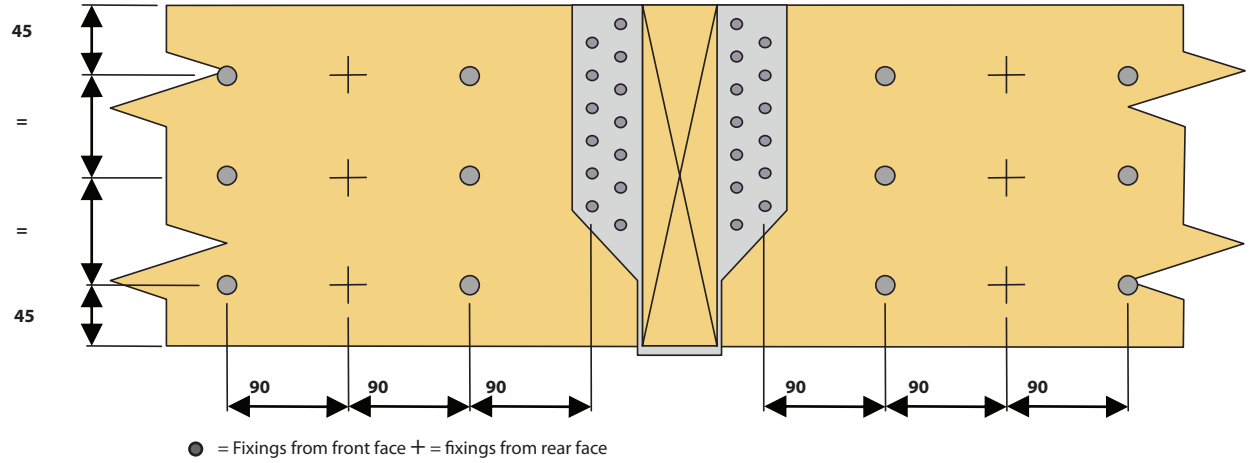
Point loads

Multiply JJ-Beam and JJ-LVL members are often used as trimming joists parallel with the short edge of stair wells resulting in significant point loads from the trimmer. In situations like this where an isolated point load is to be carried by a multiply member, the designer needs to consider a localised fixing close to the incoming member. Tables 14 a and b give maximum medium term isolated design point loads that can be carried if the following fixing details are used.

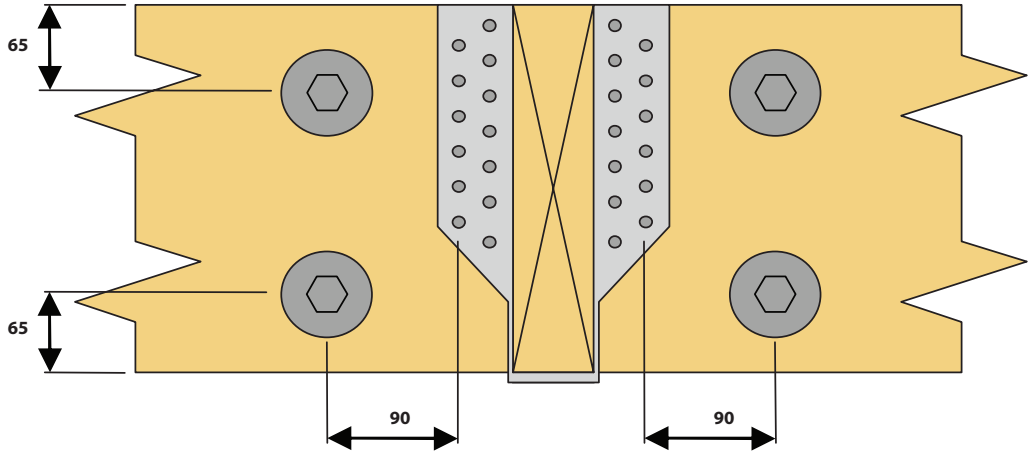
NAILING PATTERN FOR 2 PLY JJ-BEAM AND JJ-LVL BEAM MEMBERS WITH AN ONCOMING POINT LOAD



NAILING PATTERN FOR 3 PLY JJ-BEAM AND JJ-LVL-BEAM MEMBER WITH AN INCOMING POINT LOAD



BOLTING PATTERN FOR JJ-BEAM AND JJ-LVL-BEAM MEMBERS (UP TO 4 PLY) WITH AN INCOMING POINT LOAD



Fixing Ref.	Section Makeup	2 ply			3 ply		4 ply	
	Ply Thickness (mm)	38	45	90	38	45	38	45
	Overall width (mm)	76	90	180	114	135	152	180
F	Nail Detail	13.50	13.80	-	10.10	10.40	-	-
G	Bolt Detail	30.30	32.40	42.20	22.80	24.30	20.20	21.60

Table 14a. Maximum Medium Term Isolated Design Point Load (kN) for Multiply JJ-Beam Members Loaded from One Face

Fixing Ref.	Section Makeup	2 ply			3 ply			4 ply	
	Ply Thickness (mm)	39	45	75	39	45	75	39	45
	Overall width (mm)	78	90	150	117	135	225	156	180
F	Nail Detail	14.78	15.04	-	11.09	11.28	-	-	-
G	Bolt Detail	34.13	36.39	45.70	25.60	27.29	34.27	22.75	24.26

Table 14b. Maximum Medium Term Isolated Design Point Load (kN) for Multiply JJ-LVL Members Loaded from One Face

Notes for Table 14a and b:

1. The values in the tables above are applicable to members loaded to one face only in floor applications
2. Capacities for nail details are based on 3.1mm diameter power driven nails (75mm long for 38mm thick plies and 90mm long for 45mm plies), hammer driven nails up to 4.5mm diameter may be used
3. 38mm diameter x 3mm thick washers are required under each head and nut on M12 bolts. Bolts to be minimum 4.6 grade
4. Bolt length to be no less than the overall width of beam + 18mm, e.g. a 2 ply 45mm member would require a 108mm bolt

Section 4

Floor design

Since their introduction into the UK in 1999, I-Joists have become the floor system of choice for the majority of the major house builders and JJI-Joists are the market leader. The JJI Design system ensures that the optimum combination of performance and price is achieved first time every time.

Factors affecting floor performance

The following list describes factors that affect floor performance and consideration of these factors may be helpful when designing and installing a JJI-Joist floor system:

Joist depth
Deeper joists create a stiffer floor thereby reducing deflection. A deep floor joist solution may in fact be cheaper than a shallow joist solution as you may be able to use thinner joists at wider centres.

Deck fixing
A correctly nailed/screwed floor deck will improve floor performance by about 12%*. Gluing the floor deck to the joists, and gluing tongued and grooved joints is required by NHBC Standards Section 6.4.19. In addition, the floor performance can improve by as much as 70% when the floor deck is glued to the joists*.

Deck thickness
Thicker floor deck material will improve the floor performance.

Ceiling treatments
Directly applied ceiling finishes will improve floor performance by about 3%*.

Blocking
Full depth blocking will improve floor performance.

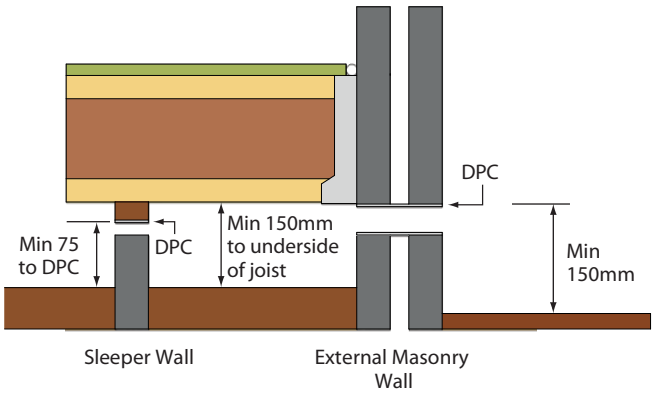
Workmanship
Good quality workmanship is essential to achieve good floor performance. The provision of well prepared and level bearings, methodical erection procedure, diligent installation of all fixings and in particular fixing of the floor deck (including gluing where required) will have a significant effect on floor performance. The maximum acceptable tolerance on the level of bearings is +/- 3mm.

* Figures obtained from independent laboratory tests originating from a government (DETR) research project.

Special consideration for ground floor design

Timber in ground floor construction is in a more moist environment than timber in an upper floor. As such, JJI-Joists for use in ground floors should be designed using joist properties for Service Class 2 conditions.

F44 | TYPICAL MASONRY GROUND FLOOR DETAIL



- Internal ground covering to comply with Building Regulations
- Insulation in floor void omitted for clarity

Insulation
Thermal insulation is required in all ground floors and each different building type should be assessed individually to identify the specific U-value requirements and thus the corresponding thickness of insulation to be used. Three options for providing ground floor insulation are as follows:

- Quilt insulation supported on plastic netting or breather membrane
- Quilt insulation supported on a board fixed to the top side of the bottom flange of the JJI-Joist
- Solid insulation supported on bottom flange of the JJI-Joist

Most heat loss through a ground floor occurs around the floor perimeter and so the inclusion at the edges helps maintain overall insulation levels.

Resistance to moisture
All suspended ground floors should be constructed to resist the ingress of moisture. Where external ground level is above the ground cover level, then the ground cover should be laid to fall to a suitable drainage outlet.

Ventilation
All parts of the void underneath the suspended floor require a ventilation path to the outside. The ventilation openings should be at least 1500mm^2 for each metre run of two opposite sides of the floor, or alternatively in Scotland, an opening area 500mm^2 for every 1m^2 of floor area may be provided.

Radon gas
The construction of suspended timber ground floors in areas affected by Radon gas requires specialist advice.

Domestic floor span tables

The domestic intermediate floor span table below is based on the following design criteria:

- Dead Load including partition allowance is 1.35kN/m² for apartments or 0.75kN/m² for houses
- The spans given are for simply supported and uniformly loaded joists only
- Where the load conditions are different to those described, refer to the JJI-Joist supplier for further assistance
- The joists are designed using the principles of EN1995-1-1 (Eurocode 5)
- Adequate lateral restraint to the top flange of the joists is assumed to be provided by the floor deck.

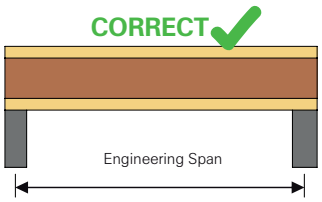
Further details are provided in the notes below the table

Joist Type	Apartments			Houses		
	Dead Load up to 1.35kN/m2			Dead Load up to 0.75kN/m2		
	Joists Centres (mm)			Joists Centres (mm)		
	400	480	600	400	480	600
JJI-195A+	3621	3372	3086	4024	3768	3459
JJI-195C	4223	3926	3582	4552	4377	4031
JJI-220A+	4012	3740	3427	4318	4152	3834
JJI-220B+	4493	4183	3826	4724	4542	4292
JJI-220C	4669	4345	3970	4871	4683	4459
JJI-220D	5182	4815	4391	5297	5093	4890
JJI-235A+	4228	3944	3615	4477	4305	4042
JJI-235B+	4728	4405	4031	4890	4702	4514
JJI-235C	4919	4580	4188	5046	4852	4658
JJI-235D	5462	5078	4635	5488	5277	5066
JJI-245A+	4368	4076	3737	4579	4403	4176
JJI-245B+	4873	4541	4157	4991	4799	4607
JJI-245C	5081	4732	4330	5158	4960	4762
JJI-245D	5615	5255	4798	5615	5399	5184
JJI-300A+	5116	4783	4393	5116	4919	4723
JJI-300B+	5529	5278	4841	5529	5316	5104
JJI-300C	5752	5531	5085	5752	5531	5310
JJI-300D	6286	6044	5673	6286	6044	5803
JJI-350C	6287	6045	5780	6287	6045	5804
JJI-350D	6817	6555	6293	6817	6555	6293
JJI-400C	6833	6570	6308	6833	6570	6308
JJI-400D	7260	6981	6703	7260	6981	6703
JJI-450D	7616	7323	7031	7616	7323	7031

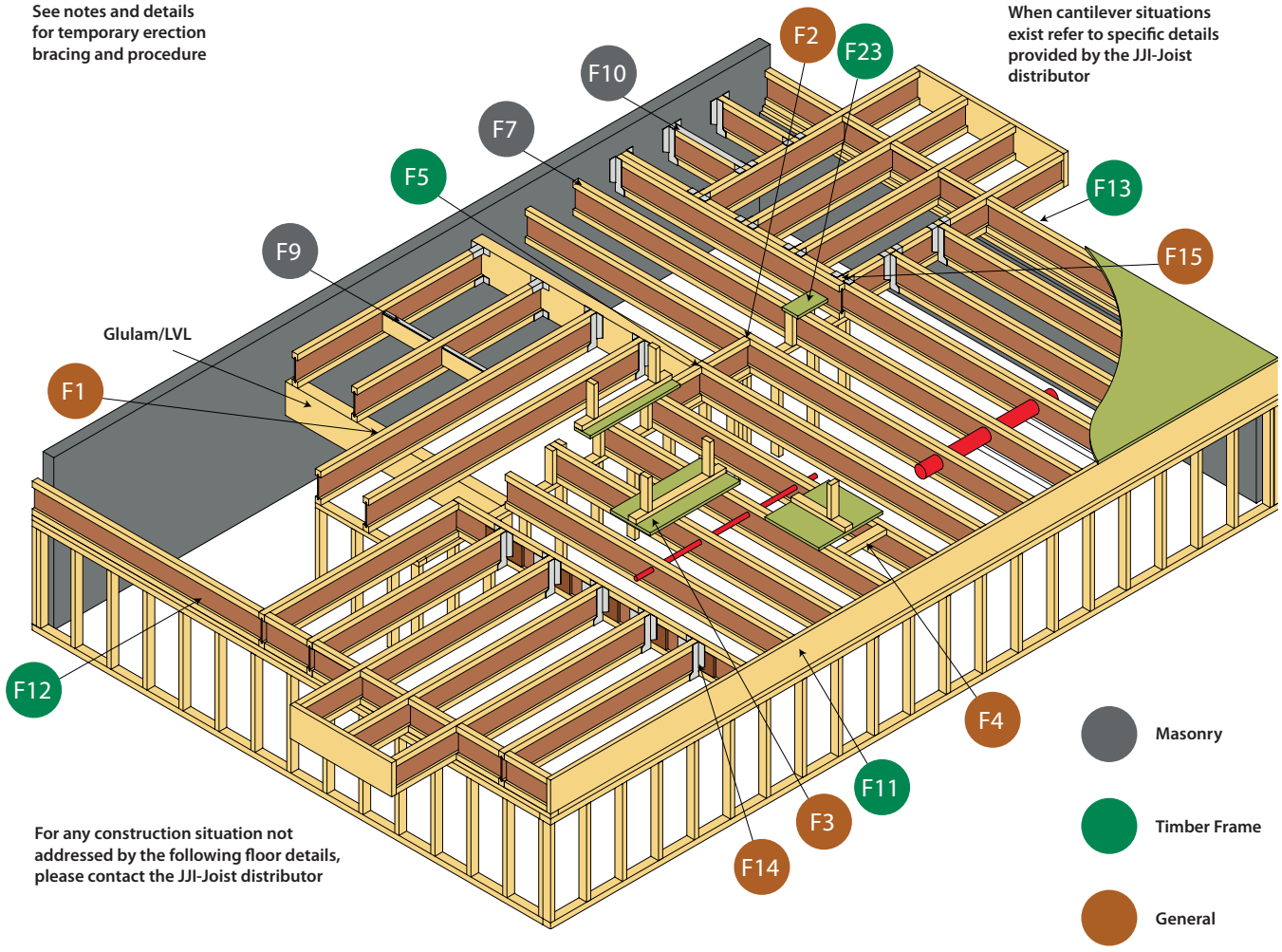
Table 15. Maximum Engineering Span for Domestic Intermediate Floors

Notes for Table 15:

1. This table serves as guidance only. For a more detailed JJI-Joist appraisal contact a JJI-Joist distributor. The caculated spans are engineering spans in mm
2. This table has been calculated for domestic intermediate floors (Service Class 1)
3. Load combinations equations 6.10aSTR 6.10bSTR (EN1990) have been used in this table
4. The effect of partition load has been included where the self-weight of the floor does not exceed 1.0kN/m² for apartments or 0.4kN/m² for houses
5. The calculated spans are engineering spans for simply supported joists with a medium term imposed load (qk=1.5kN/m²,Qk=2.0kN)
6. Adequate lateral restraint is provided by the floor deck (22mm chipboard and 15mm plasterboard)
7. It is assumed that load can be shared between floor joists (K_{sys}=1.1)
8. Joists design values have been calculated using Kmod factors from table 3.1 (EN1995) and $\gamma_{M,timber}$=1.3,$\gamma_{M,osb}$=1.2
9. Final deflection limit has been taken as L/250. No additional instantaneous deflection limit has been applied
10. The unit load deflection limit is 1.8mm for spans below 4000 and 16500/$L^{1.1}$ for spans over 4m
11. Fundamental frequency has been limited to 8Hz
12. The modal dampening ratio is 0.02
13. The floor width has been taken as 4m for velocity response checks
14. To achieve stated span, adequate bearing will be required. Web stiffeners may be necessary
15. Permissible web holes to be drilled in accordance to Joistmaster software or hole chart

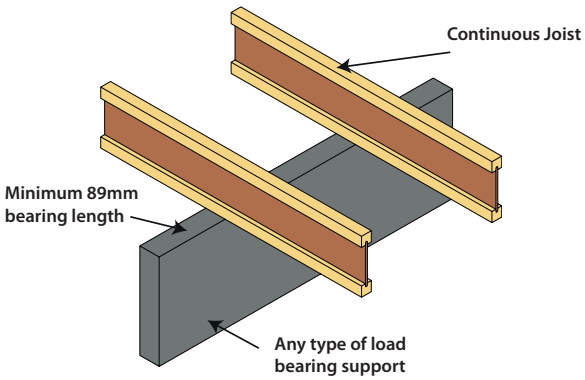


Example of JJI-Joist floor system



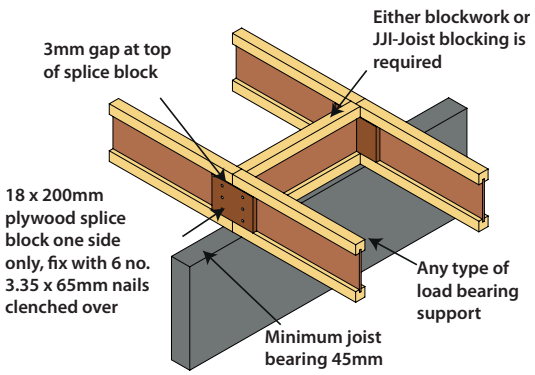
Refer to table 4 for hole installation chart

F1 CONTINUOUS JJI-JOIST ON WALL



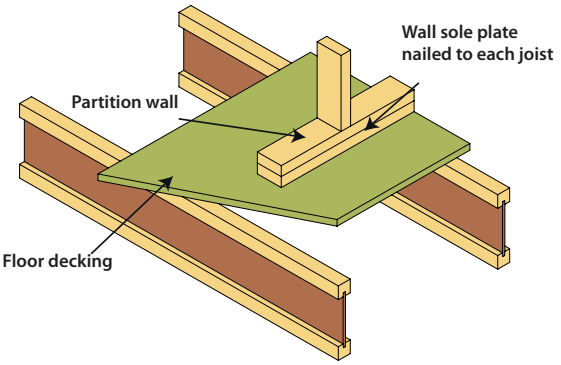
Web stiffeners may be required, see F22

F2 SPLIT JJI-JOIST ON WALL



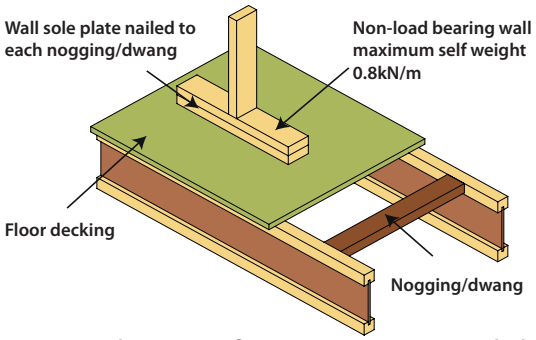
Where split joist(s) of different widths meet on the wall a double row of blocking is required to suit joist widths

F3 WALL AT 90° TO JJI-JOISTS



The floor designer is responsible for ensuring the joist design is adequate to support the wall

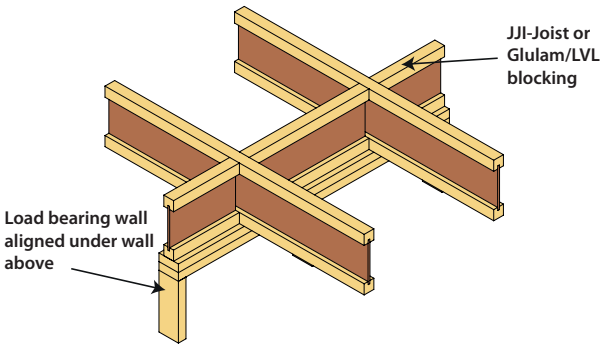
F4 NON-LOAD BEARING WALL PARALLEL TO JJI-JOISTS



38 x 75mm nogging/dwang or JJI-C flange at maximum 600 c/c attached with 2 no. 3.35 x 65mm nails skew nailed at each end, alternatively use approved clips

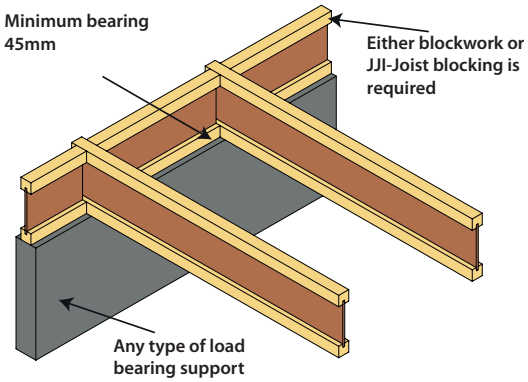
The floor designer is responsible for ensuring the joist design is adequate to support the wall

F5 INTERMEDIATE BEARING WITH LOAD BEARING WALL ABOVE



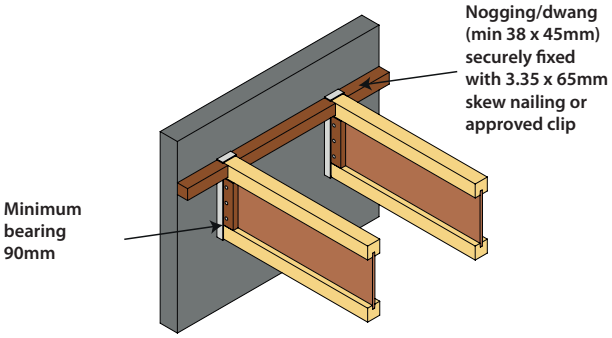
Refer to F detail notes - timber frame (see page 30)

F6 TERMINATING JJI-JOIST ON WALL



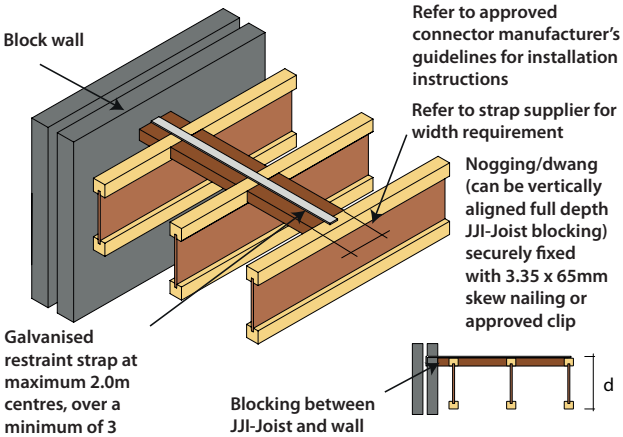
Suitable detailing required if used on an external wall

F7 JJI-JOIST BEARING IN BLOCK WALL



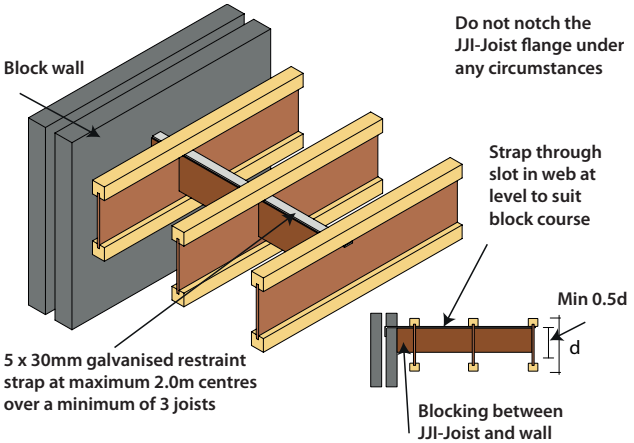
Construct blockwork around joist and fill all voids with web fillers, mortar and point with mastic sealant
Alternative proprietary systems my be used if approved by JJ&S
Restraint straps will be required for greater than 2 storeys*
*Straps required on all floors

F8 MASONRY WALL RESTRAINT JJI-JOIST PARALLEL DETAIL 1

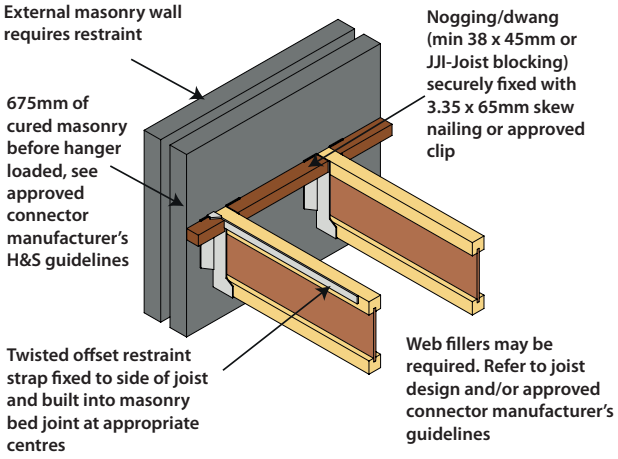


RESTRAINT STRAPS ARE THE RESPONSIBILITY OF THE BUILDING DESIGNER

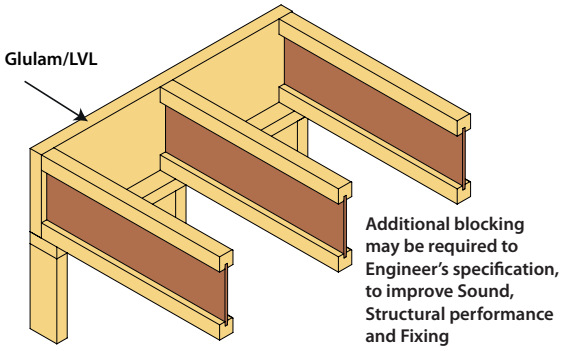
F9 MASONRY WALL RESTRAINT JJI-JOIST PARALLEL DETAIL 2



F10 WALL RESTRAINT, BLOCK WALL HANGER SUPPORT

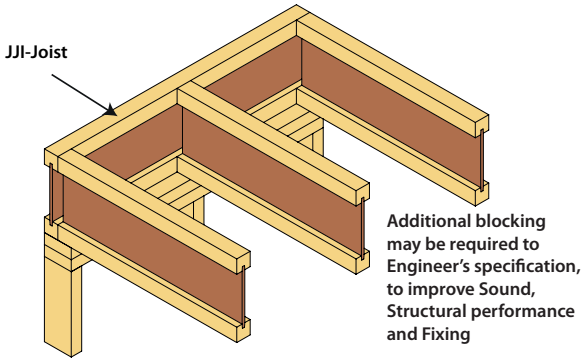


F11 JJI-JOIST BEARING ON EXTERNAL WALL



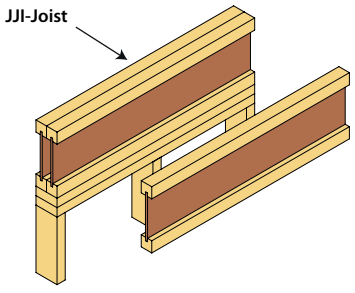
Refer to F detail notes - timber frame (see page 30)

F12 JJI-JOIST BEARING ON EXTERNAL WALL



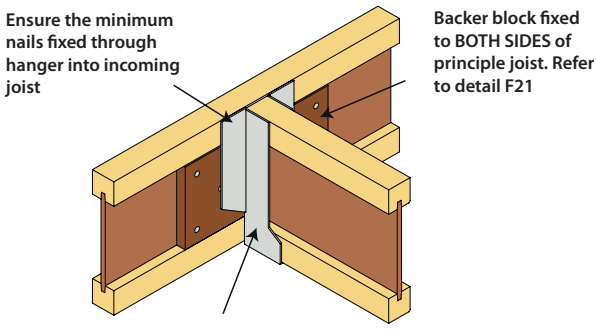
Only applicable where a maximum of one storey is built above
Refer to F detail notes - timber frame (see page 30)

F13 JJI-JOIST PARALLEL TO EXTERNAL WALL



Only applicable where a maximum of one storey is built above
Refer to F detail notes - timber frame (see page 30)

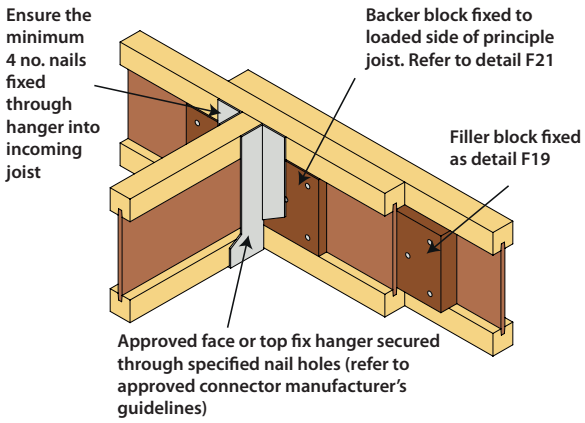
F14 SINGLE JJI-JOIST TO JJI-JOIST



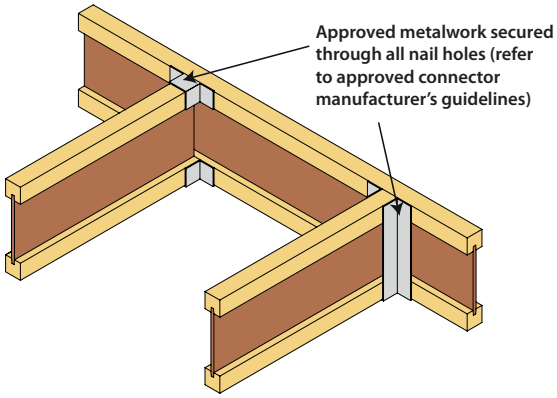
Approved face or top fix hanger secured through specified nail holes (refer to approved connector manufacturer's guidelines)

RESTRAINT STRAPS ARE THE RESPONSIBILITY OF THE BUILDING DESIGNER

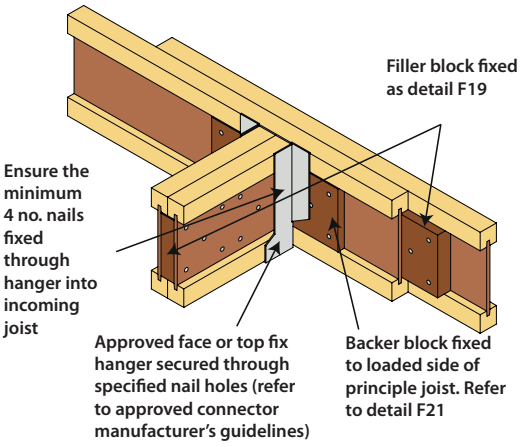
F15 SINGLE JJI-JOIST TO MULTIPLE JJI-JOIST



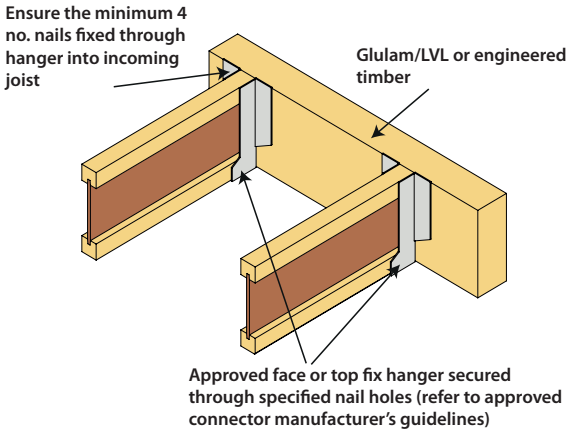
F16 SINGLE JJI-JOIST TO JJI-JOIST (LIGHT LOAD)



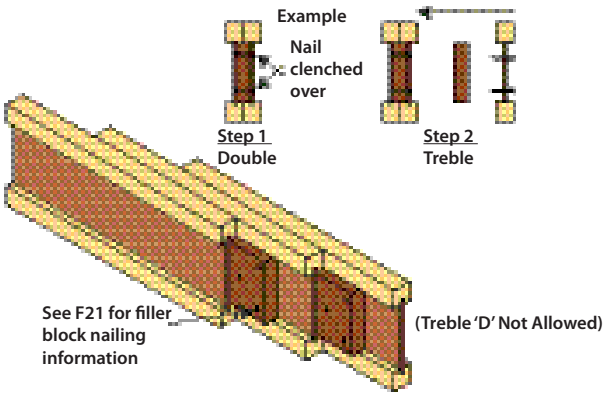
F17 MULTIPLE JJI-JOIST TO MULTIPLE JJI-JOIST



F18 JJI-JOIST TO ENGINEERED TIMBER



F19 FILLER BLOCK – DOUBLE OR TREBLE JJI-JOIST



Provide filler blocks at all ends and bearings of joist and at points of incoming loads (see F15). Alternatively provide continuous filler block when repeated loads are applied (see detail F40)

F20 FILLER AND BACKER BLOCK TABLE

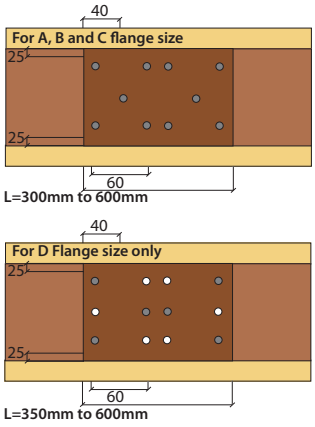
JJI-Joist Depth (mm)	Filler and backer block depth (mm)
195	100
220	125
235	145
245	150
300	200
350	125+125
400	150+150
450	200+150

JJI-Joist Flange Type	Backer block/web stiffner thickness (mm)	Filler block thickness (mm)
A+	19	38
B+	27	54
C	32	63
D	44	2x44

Refer to details provided by the JJI-Joist supplier for required locations of filler and backer blocks
Where a continuous filler block is used (see detail F40)

Filler and backer blocks should be kiln dried timber, structural grade plywood or OSB/3

F21 FILLER AND BACKER BLOCK NAILING DETAIL



● Denotes nails from rear face
○ Denotes nails from front face

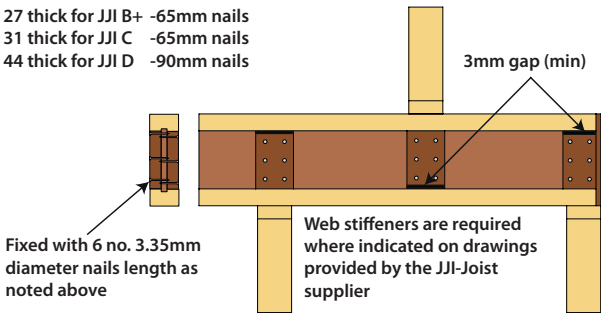
All filler and backer blocks for face fix hangers to be fixed tight to bottom flange with a minimum 3mm gap at the top
Backer blocks for top fix hangers to be fixed tight to the top flange with a minimum 3mm gap at the bottom

Flange Spec	Backer Block	Filler Block
A+	65	65
B+	65	90
C	90	90
D	90	90

Minimum nail diameter 3.1mm

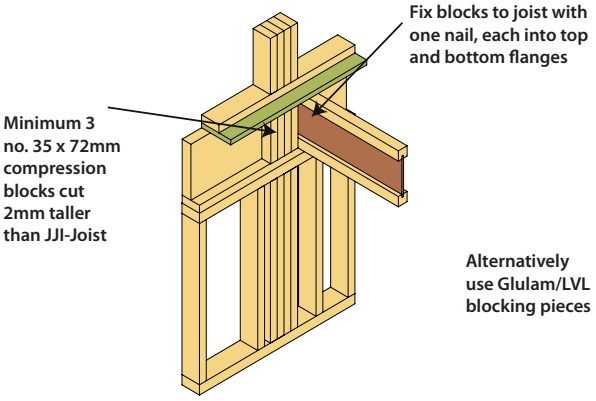
F22 WEB STIFFENER

19 thick for JJI A+ -65mm nails
27 thick for JJI B+ -65mm nails
31 thick for JJI C -65mm nails
44 thick for JJI D -90mm nails



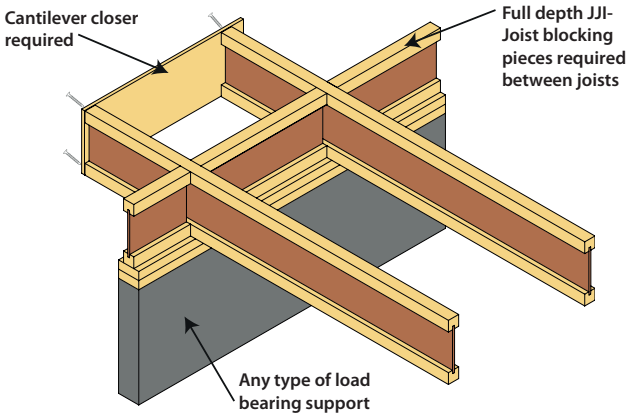
100mm wide plywood, OSB/3 or kiln dried timber stiffener block fitted to both sides

F23 COMPRESSION BLOCK



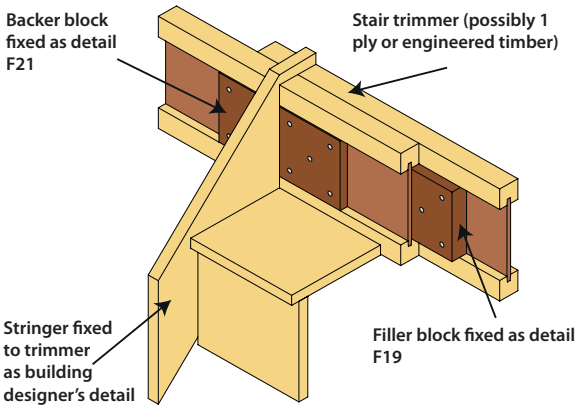
Compression blocks are required where indicated on details provided by JJI-Joist supplier

F24 CANTILEVER

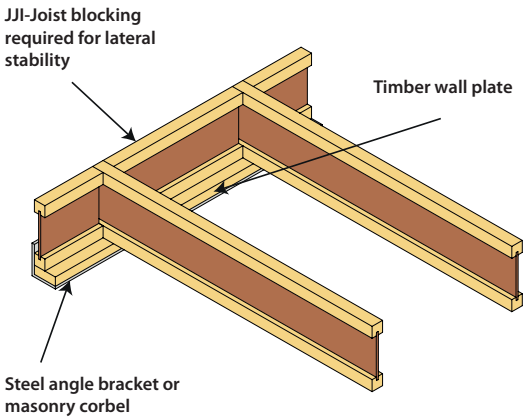


Back span of cantilever must be at least 3 times the cantilever length
1.2m maximum cantilever length

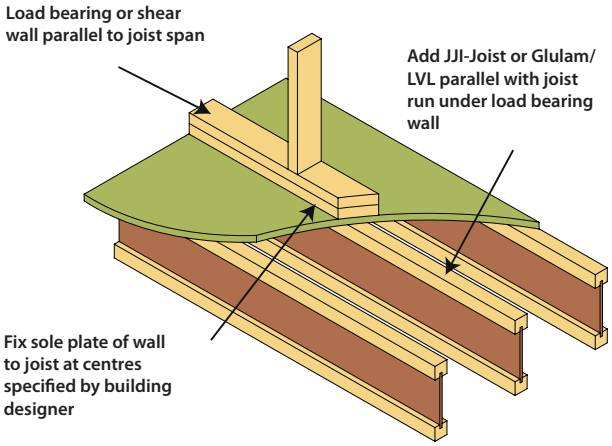
F25 STAIR STRINGER CONNECTION



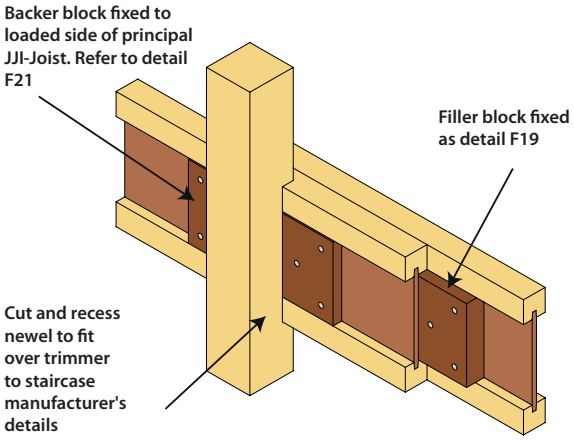
F26 JJI-JOIST SUPPORTED ON STEEL/CORBEL WALL



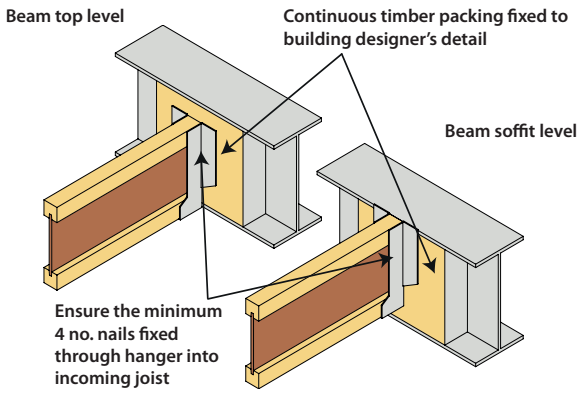
F27 LOAD BEARING WALL PARALLEL TO JJI-JOIST RUN



F28 NEWEL POST TO JJI-JOIST TRIMMER

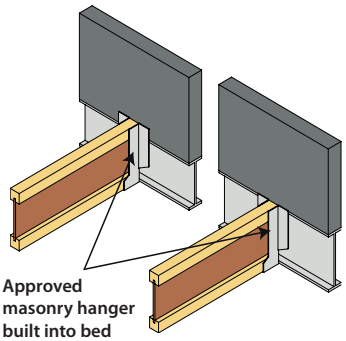


F29 JJI-JOIST TO STEEL BEAM FACE FIXING



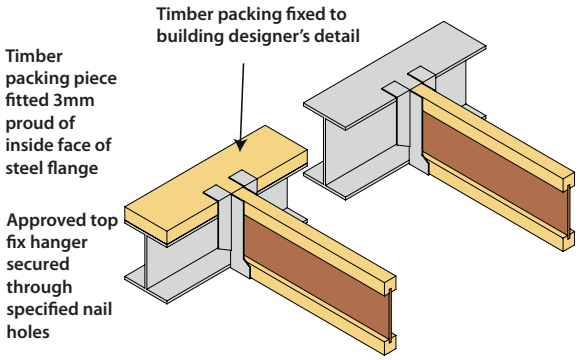
Approved face fixed hangers fixed through all nail holes
Refer to approved metalwork supplier's literature for further information

F30 JJI-JOIST TO STEEL BEAM/MASONRY



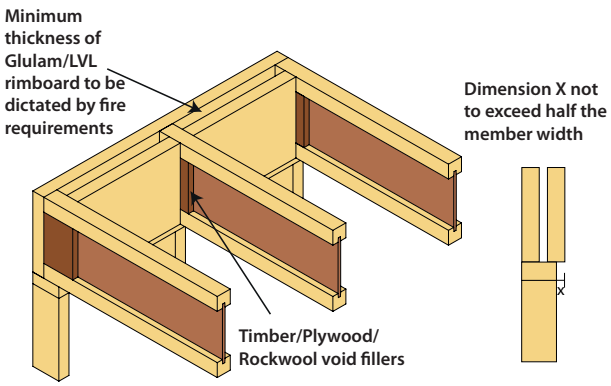
Do not fix joist to steel lintels unless approved by lintel manufacturer
Bottom of hanger must rest against bottom flange of steel beam
Refer to approved metalwork supplier's literature for further information

F31 JJI-JOIST TO STEEL BEAM TOP FIXING



Bottom of flange must rest against bottom flange of steel beam
Do not fix joist to steel lintels unless approved by lintel manufacturer
Refer to approved metalwork supplier's literature for further information

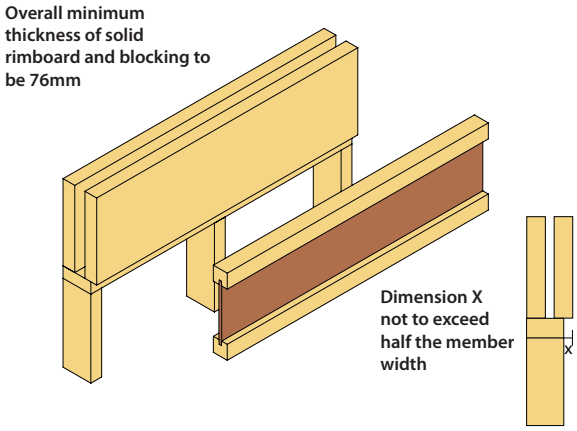
F32 JJI-JOIST BEARING ON PARTY WALL



Refer to F detail notes - timber frame (see page 30)

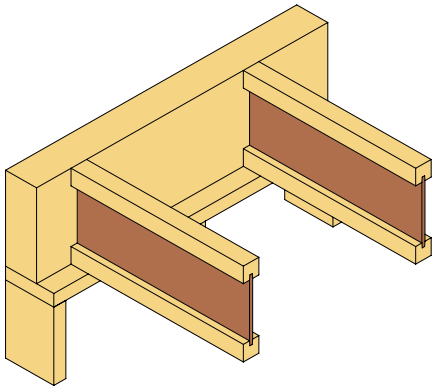
RESTRAINT STRAPS ARE THE RESPONSIBILITY OF THE BUILDING DESIGNER

F33 JJI-JOIST PARALLEL TO PARTY WALL



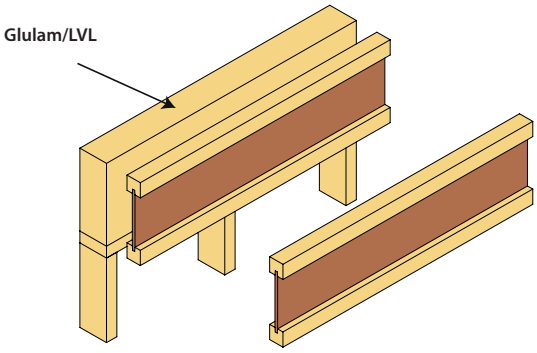
Refer to F detail notes - timber frame (see page 30)

F34 INDICATIVE DISPROPORTIONATE COLLAPSE JJI-JOISTS AT 90° TO WALL



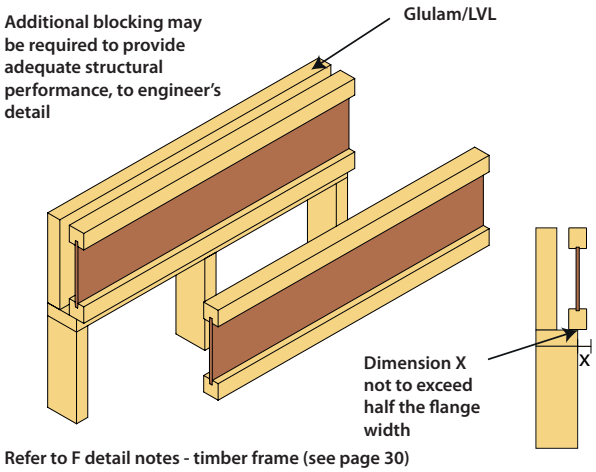
Specification to Engineer's detail

F35 INDICATIVE DISPROPORTIONATE COLLAPSE JJI-JOIST PARALLEL TO WALL



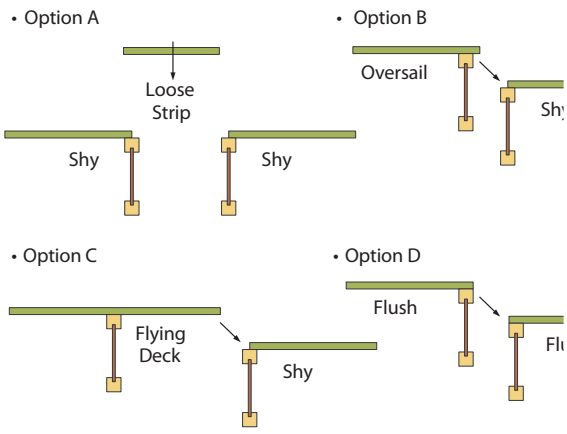
Specification to Engineer's detail

F36 JJI-JOIST PARALLEL TO EXTERNAL WALL



Refer to F detail notes - timber frame (see page 30)

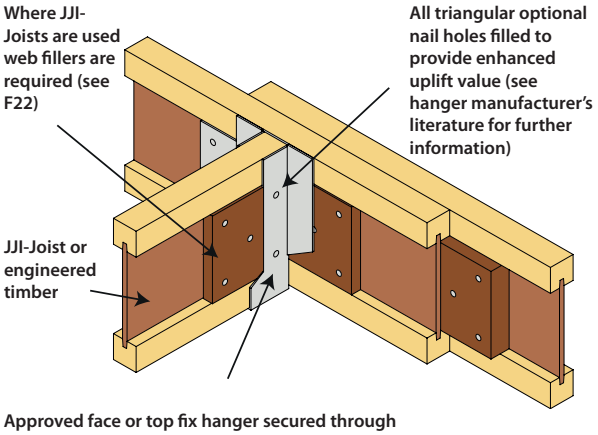
F37 FLOOR CASSETTE JOINING DETAIL



TIMBER FRAME DETAIL NOTES

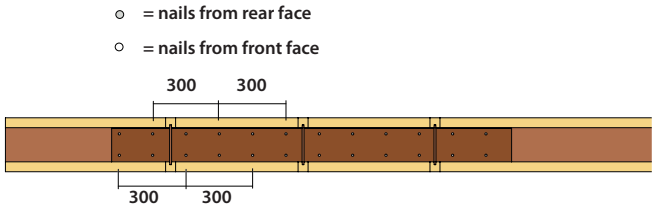
1. See Tables 3, 7 and 12 for vertical load capacities
2. Rimboard thickness to timber frame kit manufacturer's Consulting Engineer's specification/approval
3. Rimboard fixed to bearing with 3.35 x 65mm nails at 150mm c/c
4. Secure rimboard to JJI-Joist with 2 no 3.35 x 65mm ring shank nails, one each to top and bottom flanges
5. Fix JJI-Joist to bearing with 2 no. 3.35 x 65mm nails, 40mm from joist end
6. Minimum joist bearing length 45mm
7. Ensure the Building Designer is satisfied with fixing between the wall and floor

F39 ENHANCED HANGER UPLIFT



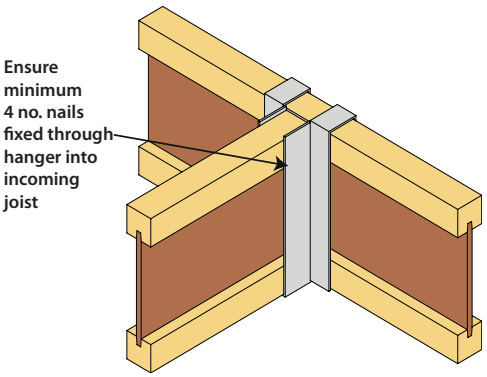
Approved face or top fix hanger secured through specified nail holes

F40 CONTINUOUS FILLER BLOCKS



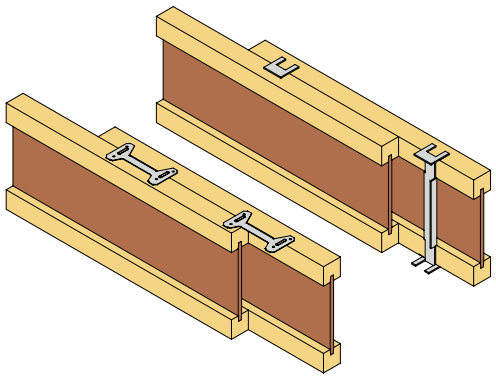
A continuous filler block should be utilised with multiple incoming loads
A continuous backer block could also be provided
Where continuous filler block is used, fix with 2 rows of nails at 300mm centres from both faces

F41 BACKER FREE JJI-JOIST TO JJI-JOIST



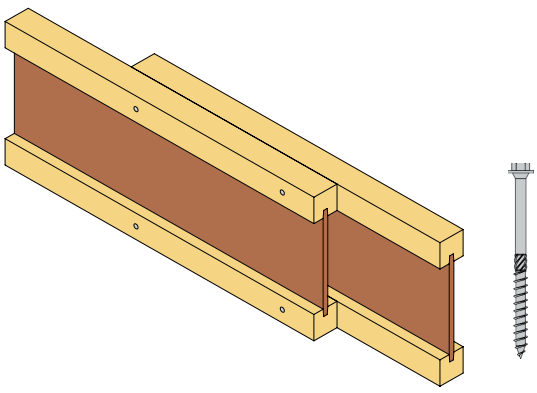
Approved backer free hanger secured through specified nail holes
Refer to approved connector manufacturer's guidelines

F42 FIXING DOUBLE OR TREBLE JJI-JOISTS



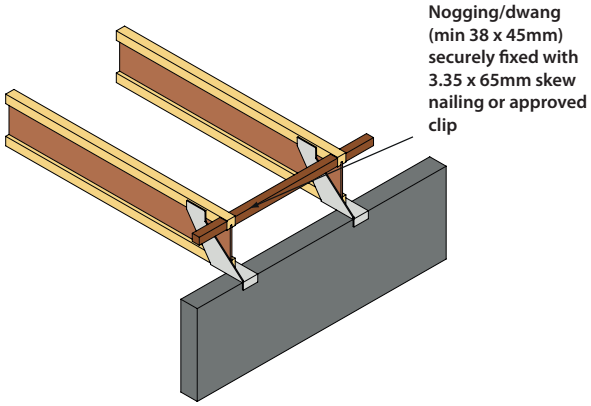
Refer to approved metalwork supplier's technical literature for specification and installation guidelines

F43 FIXING DOUBLE JJI-JOISTS



Refer to approved metalwork supplier's technical literature for specification and installation guidelines

F45 MASONRY RESTRAINT HANGER DETAIL 1

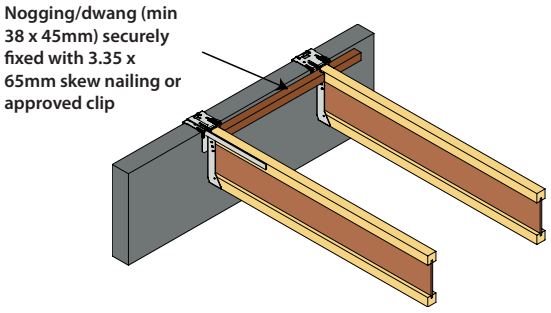


Refer to approved metalwork supplier's technical literature for specification and installation guidelines

FOR F44 SEE PAGE 22

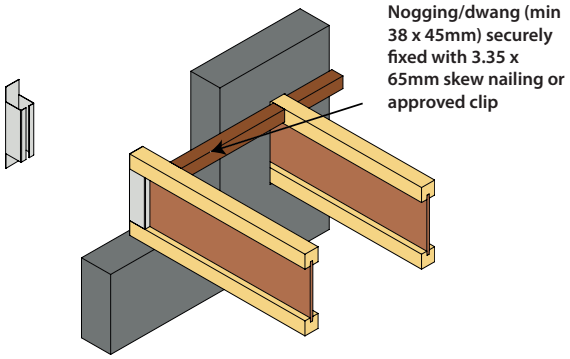
RESTRAINT STRAPS ARE THE RESPONSIBILITY OF THE BUILDING DESIGNER

F46 MASONRY RESTRAINT HANGER DETAIL 2



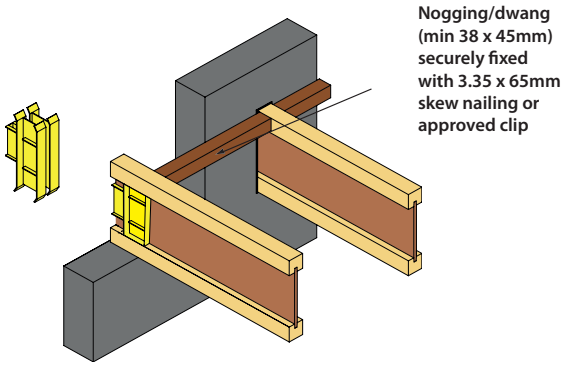
Refer to Simpson Strong-Tie's technical literature for specification and installation guidelines

F47 SST END CAP AIRTIGHTNESS DETAIL



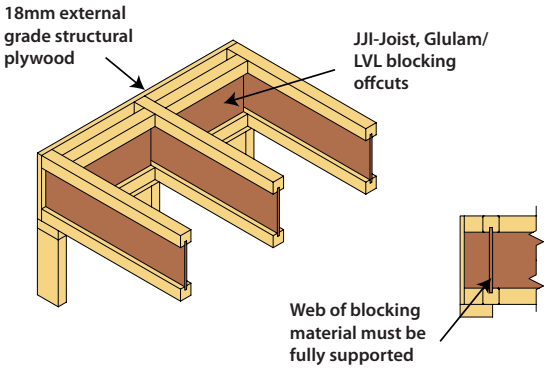
Refer to Simpson Strong-Tie's technical literature for specification and installation guidelines

F48 ITW GRIPPER AIRTIGHTNESS DETAIL



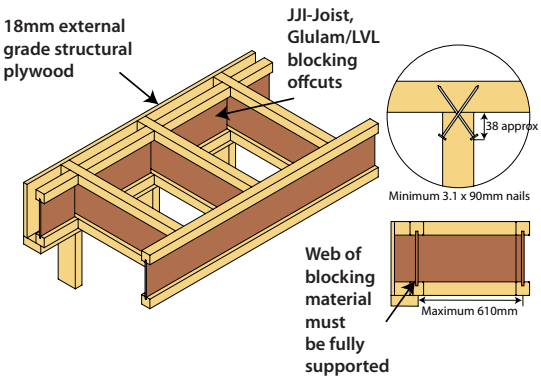
Refer to ITW's technical literature for specification and installation guidelines

F49 JJI-JOIST BEARING ON EXTERNAL WALL LOW LOAD

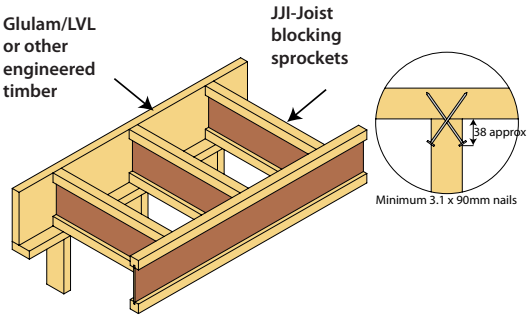


Alternatively use Glulam/LVL blocking in lieu of JJI-Joists
JJI-Joist blocking offcuts can be of any joist width

F50 JJI-JOIST PARALLEL TO EXTERNAL WALL LOW LOAD



F51 JJI-JOIST PARALLEL DETAIL – SPROCKETS



Refer to F detail notes - timber frame (see page 30)

RESTRAINT STRAPS ARE THE RESPONSIBILITY OF THE BUILDING DESIGNER

Section 5

Roof design

By making the most of their long spanning capabilities, JJI-Joists are ideally suited for use in roofs. This allows the designer the freedom to create large open room spaces without the need for additional supports.

Design considerations

Unlike a floor design, a full roof design requires many additional considerations due to its location on the exposed envelope of the building and potentially complex geometry. Unlike floors, a roof is exposed to direct wind and snow loading.

Loading

Dead loads should be calculated for each job based on the specific roof makeup. Refer to BS 648 Weights of Building Materials or manufacturers literature for material data.
Imposed snow and wind loads should be based on the location of the building if known or alternatively on conservative estimates. EN 1991-1-3 and EN 1991-1-4 should be used for snow and wind loading respectively.

Joist Stability

Roofs should be braced during the erection process. Refer to temporary erection bracing notes, (See page 11).
The compression flange of the JJI-Joist requires lateral restraint at regular centres to prevent lateral buckling. This can be achieved by using a permanent structural sarking layer directly fixed to the joist or alternatively by battens/firring strips fixed perpendicular to each joist.

Where a wind load analysis indicates that the rafters will experience a stress reversal under wind suction loads, care should be taken to ensure that the bottom flange of the joist is suitably restrained. This can be achieved by, for example, directly applying a ceiling/soffit lining to the underside of the joists.

Blocking or cross-bracing (see Roof Detail R10) may be required at support locations unless joists are held in place by alternative means.

Building Stability

Lateral restraint to gable walls etc. can be provided using details similar to those used for floors.

Racking of the whole roof structure should be prevented by the use of structural sarking or a system of triangulated bracing (this is required where only felt and tiling battens are used).

Deflection Limits

When considering member deflection a maximum limit of L/250 as defined in the UK national annex to EC5 is recommended.
When a finished ceiling is applied to the underside of the roof, for long spans, the designer should consider restricting the maximum deflection further to avoid damage to the finishing. The designer should also consider a more strict deflection limit for principal members such as ridge beams and purlins to minimise combined deflection.

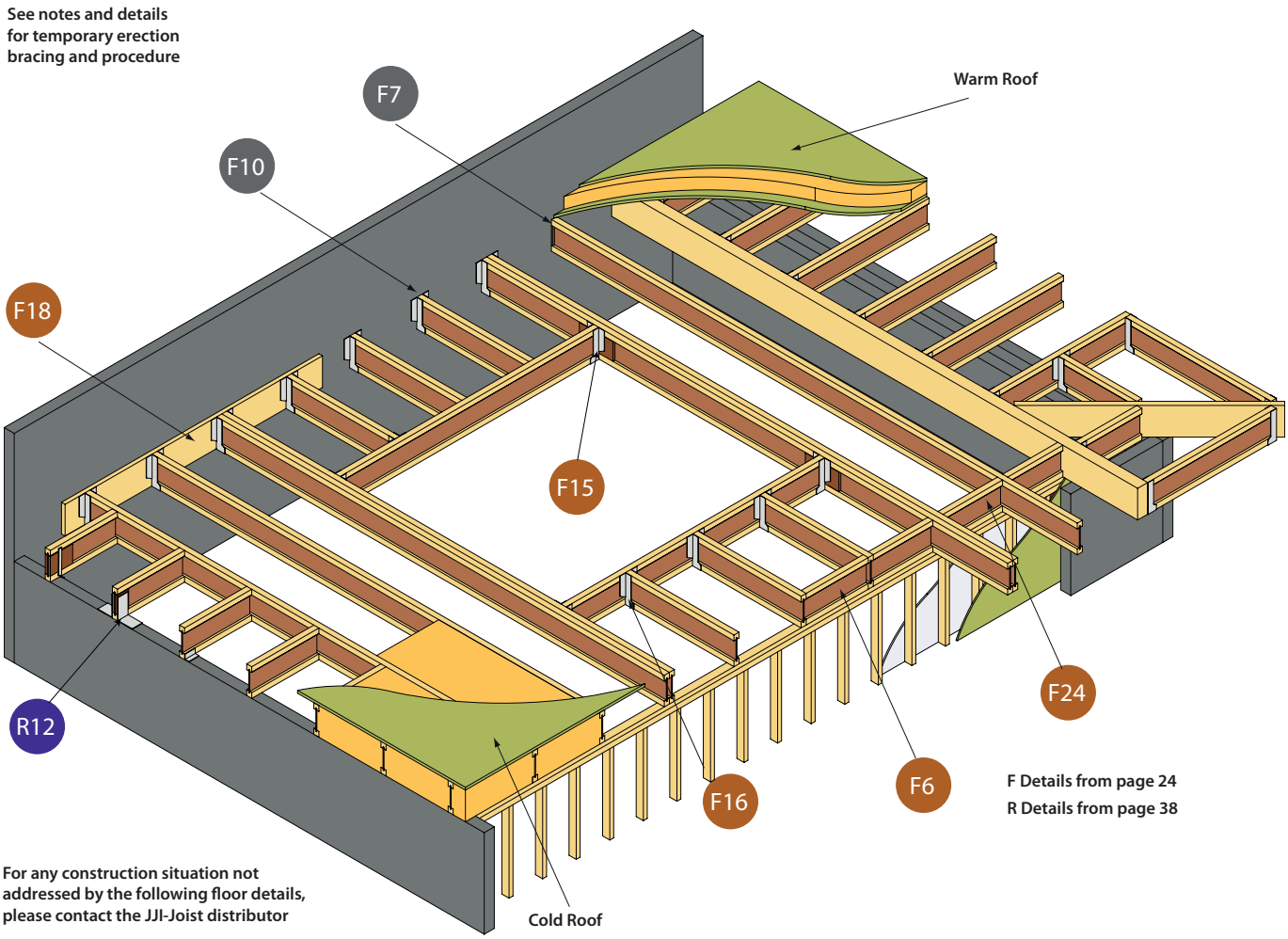
Fixings

Fixing JJI-Joists to supports needs careful consideration to account for axial, tangential, horizontal and vertical loads. Particular care should be taken when considering uplift forces due to wind suction.

Responsibilities

A full roof design will address all the above issues, however, they may be dealt with by different parties (Roof Component Designer, Roof Designer, Building Designer). It is vital that the responsibility of each party is clearly defined at the start of the design process.

Example of JJI-Joist flat roof system

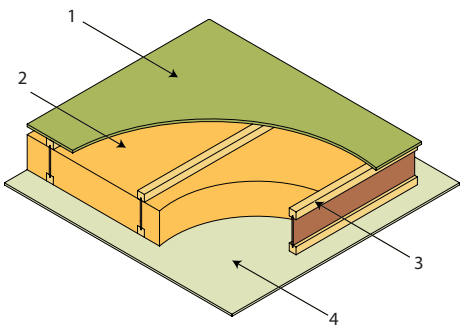


Cold roof vs warm roof design

A traditional cold roof design positions the insulation layer between or below the JJI-Joist rafters. This places parts of the roof structure above the insulation in a cold environment, with the potential for condensation when warm air permeates through. Adequate roof space ventilation must be provided to remove this air.

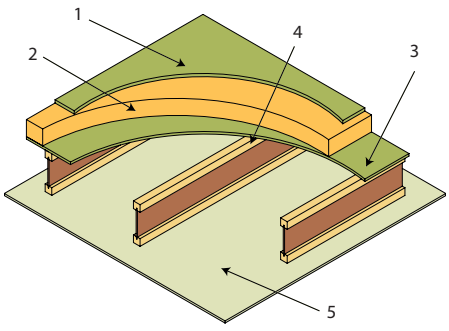
A warm roof is a modern alternative to a cold roof. A warm roof design places the insulating layer above the JJI-Joist rafters, or above and between the JJI-Joist rafters. A warm roof designs will make the entire structure of the building warm in order to avoid cold bridging (an element of the building that allows heat or energy loss).

COLD ROOF



1. Deck/roof covering
2. Insulation
3. JJI-Joist rafter
4. Ceiling lining

WARM ROOF



1. Deck/roof covering
2. Insulation
3. Vapour control layer/sub-deck
4. JJI-Joist rafter
5. Ceiling lining

JJI-Joist flat rafters

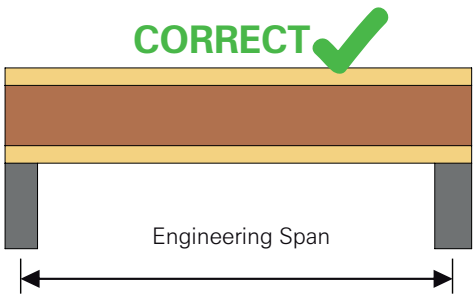
The following span table is for JJI-Joists in flat rafter applications, joists designed using the principles of Eurocode 5 limit state design code (BS EN1995-1-). Alternative span tables, including those to BS5268-2 can be found on our website.

Joist Type	Dead Load up to 0.5kN/m^2				Dead Load up to 0.75kN/m^2				Dead Load up to 1kN/m^2				Dead Load up to 1.5kN/m^2			
	Joists Centres (mm)				Joists Centres (mm)				Joists Centres (mm)				Joists Centres (mm)			
	300	400	480	600	300	400	480	600	300	400	480	600	300	400	480	600
JJI-195A+	5543	4998	4677	4307	5072	4564	4265	3920	4716	4237	3954	3627	4203	3764	3504	3203
JJI-195C	6517	5868	5485	5044	5953	5348	4990	4577	5527	4955	4616	4225	4912	4386	4074	3713
JJI-220A+	6122	5523	5171	4765	5605	5048	4720	4342	5216	4690	4380	4022	4654	4172	3888	3559
JJI-220B+	6891	6212	5811	5350	6302	5670	5296	4866	5859	5261	4908	4500	5218	4670	4345	3970
JJI-220C	7174	6465	6046	5564	6559	5898	5507	5057	6095	5470	5101	4674	5425	4852	4512	4119
JJI-220D	8008	7209	6737	6193	7313	6567	6126	5618	6788	6083	5665	5183	6029	5381	4997	4551
JJI-235A+	6441	5813	5444	5018	5899	5315	4971	4575	5491	4940	4615	4240	4903	4398	4100	3756
JJI-235B+	7237	6526	6107	5624	6621	5960	5569	5119	6158	5533	5163	4737	5488	4915	4576	4184
JJI-235C	7542	6799	6361	5856	6898	6206	5797	5326	6413	5759	5373	4926	5712	5112	4757	4346
JJI-235D	8421	7583	7089	6520	7693	6912	6451	5919	7144	6406	5970	5465	6351	5673	5271	4806
JJI-245A+	6648	6001	5620	5182	6090	5488	5134	4726	5670	5102	4767	4381	5064	4545	4238	3883
JJI-245B+	7449	6719	6288	5793	6817	6138	5737	5275	6342	5700	5321	4883	5655	5067	4719	4316
JJI-245C	7781	7016	6565	6045	7119	6406	5986	5501	6620	5947	5549	5090	5899	5282	4916	4494
JJI-245D	8699	7836	7326	6740	7949	7145	6670	6122	7384	6624	6174	5654	6568	5869	5455	4976
JJI-300C	9067	8183	7662	7062	8303	7481	6996	6437	7729	6952	6494	5966	6899	6188	5768	5282
JJI-300D	10195	9192	8601	7921	9327	8394	7843	7208	8673	7792	7270	6669	7729	6920	6442	5888
JJI-350A+	8629	7799	7311	6750	7916	7146	6692	6170	7380	6654	6226	5733	6607	5944	5553	5102
JJI-350B+	9474	8558	8019	7400	8686	7835	7334	6757	8093	7291	6818	6273	7238	6505	6072	5572
JJI-350C	10261	9265	8678	8004	9402	8476	7930	7302	8756	7882	7367	6773	7823	7024	6552	6006
JJI-350D	11423	10306	9648	8891	10458	9419	8806	8100	9731	8750	8171	7503	8682	7784	7252	6638
JJI-400C	11515	10400	9744	8989	10555	9519	8908	8206	9832	8856	8279	7615	8791	7897	7369	6760
JJI-400D	12480	11266	10551	9729	11433	10304	9638	8872	10645	9579	8950	8226	9507	8532	7956	7290
JJI-450D	13353	12059	11298	10422	12238	11037	10328	9513	11400	10267	9598	8828	10191	9155	8542	7835

Table 16. Maximum engineering span for JJI-Joist flat rafters

Notes for Table 16:

1. This table serves as guidance only. For a more detailed JJI-Joist appraisal contact a JJI-Joist Distributor. The caculated spans are engineering spans in mm
2. This table has been calculated for cold flat roof (Service Class 2), category H (access only for maintenance)
3. Load combinations equations 6.10aSTR 6.10bSTR (EN1990) have been used in this table
4. Loads include imposed loads q_k=0.6kN/m^2, Q_k=0.9kN and snow load 0.75kN/m^2. No wind allowance has been considered in this table
5. The calculated spans are engineering spans for simply supported joists
6. It has been assumed that adequate lateral restraint is provided to top and bottom flanges
7. It is assumed that load can be shared between floor joists (K_{sys}=1.1)
8. Joists design values have been calculated using K_{mod} factors from table 3.1 (EN1995) and $\gamma_{M,timber}$=1.3,$\gamma_{M,osb}$=1.2
9. Final deflection limit has been taken as L/250. No additional instantaneous deflection limit has been applied
10. There is no allowance for overhangs within this table
11. To achieve stated span, adequate bearing will be required. Web stiffeners may be necessary
12. Permissible web holes to be drilled in accordance to Joistmaster software



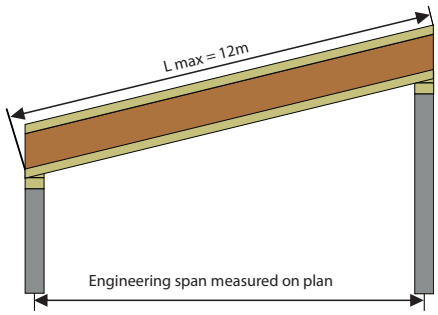
JJI-Joist pitched rafters

The following span table is for JJI-Joists in pitched rafter applications, joists designed using the principles of Eurocode 5 limit state design code (BS EN1995-1-1). Alternative span tables, including those to BS5268-2 can be found on our website

Support Requirements

When designing a JJI-Joist pitched rafter the designer should ensure that there are at least two vertical supports under the rafter. Typically these would be a load bearing wall or ridge beam at the top end and a load bearing wall at the lower end. Additional intermediate supports may be provided by, for example, purlins. It is possible to design the JJI-Joist rafters with only one support at the lower end if the top end (Ridge) is resting on another rafter leaning in the opposite direction. This, however, leads to horizontal reactions at the lower end and higher axial loads that need to be considered by a qualified engineer.

Definition of engineering span for JJI-Joist rafters



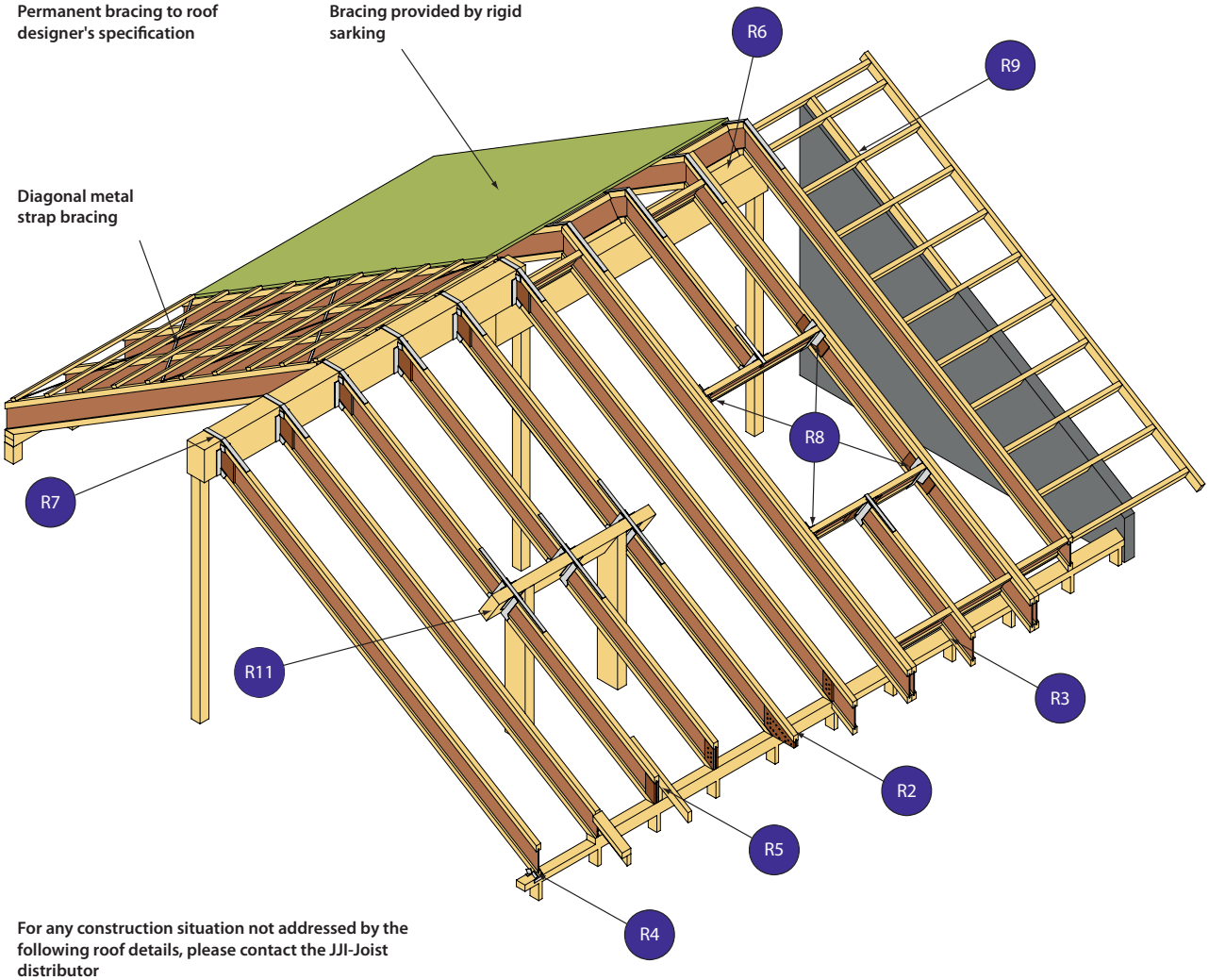
Joist Type	Dead Load up to 0.5kN/m^2			Dead Load up to 1kN/m^2			Dead Load up to 0.5kN/m^2			Dead Load up to 1kN/m^2		
	400mm centres						600mm centres					
	Joists Centres (mm)			Joists Centres (mm)			Joists Centres (mm)			Joists Centres (mm)		
	15°	30°	45°	15°	30°	45°	15°	30°	45°	15°	30°	45°
JJI-195A+	4916	4660	4205	4161	3927	3516	4237	4022	3636	3564	3370	3025
JJI-195C	5772	5476	4947	4868	4598	4124	4964	4715	4269	4153	3932	3537
JJI-220A+	5431	5148	4643	4606	4345	3887	4688	4447	4018	3952	3733	3349
JJI-220B+	6109	5792	5228	5168	4878	4369	5264	4997	4519	4422	4182	3756
JJI-220C	6359	6029	5444	5373	5073	4546	5475	5199	4703	4594	4346	3905
JJI-220D	7092	6728	6079	5976	5646	5065	6095	5791	5244	5095	4824	4341
JJI-235A+	5716	5416	4884	4851	4575	4092	4936	4682	4229	4165	3934	3527
JJI-235B+	6418	6084	5489	5433	5128	4591	5534	5251	4747	4655	4400	3950
JJI-235C	6687	6339	5722	5656	5340	4782	5762	5470	4946	4841	4578	4111
JJI-235D	7459	7075	6391	6293	5945	5330	6417	6094	5517	5372	5084	4573
JJI-245A+	5901	5590	5040	5009	4725	4225	5097	4834	4365	4304	4064	3643
JJI-245B+	6607	6262	5649	5598	5282	4727	5699	5408	4887	4798	4534	4069
JJI-245C	6900	6541	5903	5840	5512	4935	5948	5645	5104	5002	4728	4245
JJI-245D	7707	7310	6601	6506	6145	5508	6632	6298	5700	5558	5259	4728
JJI-300A+	6894	6530	5884	5864	5529	4940	5963	5652	5101	5048	4765	4266
JJI-300B+	7638	7236	6523	6486	6117	5469	6598	6258	5650	5573	5264	4717
JJI-300C	8046	7624	6876	6826	6440	5760	6947	6589	5952	5860	5536	4964
JJI-300D	9040	8570	7734	7652	7223	6467	7793	7397	6688	6554	6195	5562
JJI-350C	9110	8630	7780	7739	7298	6524	7872	7465	6739	6652	6281	5628
JJI-350D	10134	9604	8663	8592	8107	7253	8746	8297	7497	7371	6964	6247
JJI-400C	10225	9685	8729	8693	8196	7325	8841	8382	7565	7479	7060	6323
JJI-400D	11078	10496	9463	9405	8871	7933	9569	9076	8195	8080	7631	6840
JJI-450D	11857	11231	9544L	10079	9503	8493	10250	9718	8772	8670	8185	7330

Table 17. Maximum engineering span for JJI-Joist pitched rafters (400 and 600 centres)

Notes for Table 17:

1. This table serves as guidance only. For a more detailed JJI-Joist appraisal contact a JJI-Joist Distributor. The caculated spans are engineering spans in mm
2. This table has been calculated for cold pitched roof (Service Class 2), category H (access only for maintenance)
3. Load combinations equations 6.10aSTR 6.10bSTR (EN1990) have been used in this table
4. Loads for roof with 15° and 30° pitch include imposed loads q_k=0.6kN/m^2, Q_k=0.9kN and snow load 0.75kN/m^2
5. Loads for roof with 45° pitch include imposed loads q_k=0.3kN/m^2, Q_k=0.9kN and snow load 0.75kN/m^2
6. No wind allowance has been considered in this table
7. The calculated spans are engineering spans measured on plan for simply supported joists
8. It has been assumed that adequate lateral restraint is provided to top and bottom flanges
9. It is assumed that load can be shared between floor joists (K_{sys}=1.1)
10. Joists design values have been calculated using K_{mod} factors from table 3.1 (EN1995) and $\gamma_{M,timber}$=1.3,$\gamma_{M,osb}$=1.2
11. Final deflection limit has been taken as L/250. No additional instantaneous deflection limit has been applied
12. There is no allowance for overhangs within this table
13. To achieve stated span, adequate bearing will be required. Web stiffeners may be necessary
14. Permissible web holes to be drilled in accordance to Joistmaster software
15. Figures followed by L denote engineering spans limited by maximum manufactured length of 12m

Example of JJI-Joist roof system

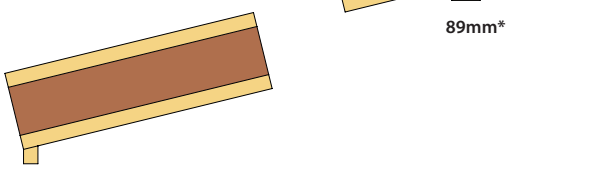


For any construction situation not addressed by the following roof details, please contact the JJI-Joist distributor

R1 JJI-JOIST BEARING LENGTHS

Minimum end bearing

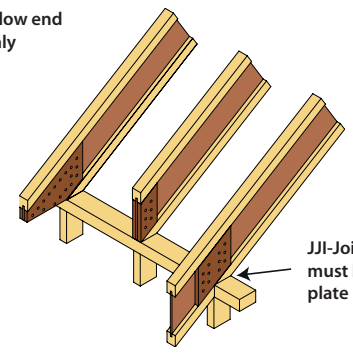
Minimum intermediate bearing



*Minimum bearing required by JOIST DESIGN. Consult building/roof designer for building stability requirements

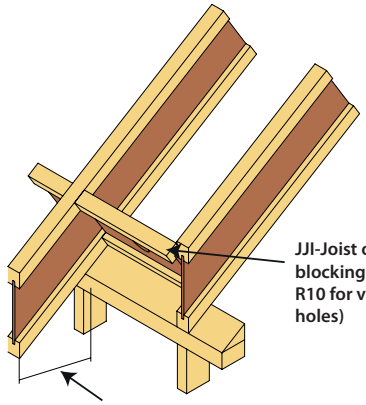
R2 BIRDSMOUTH CUT

Permitted at low end of JJI-Joist only



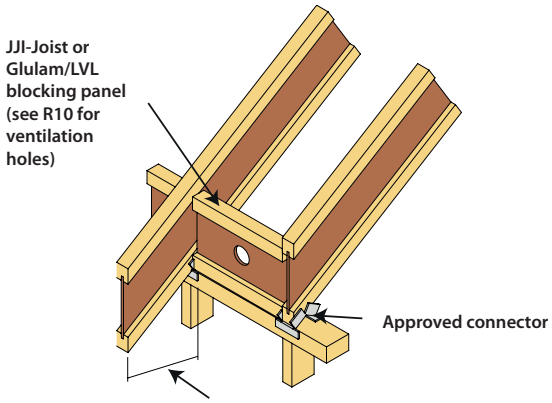
Bevelled ply/timber web stiffener each side of JJI-Joist web. Fix in accordance with detail F22
Do not bevel cut the JJI-Joist past the inside face of wall
Blocking omitted for clarity

R3 BEVELLED SUPPORT PLATE FOR PITCHES UP TO 45°



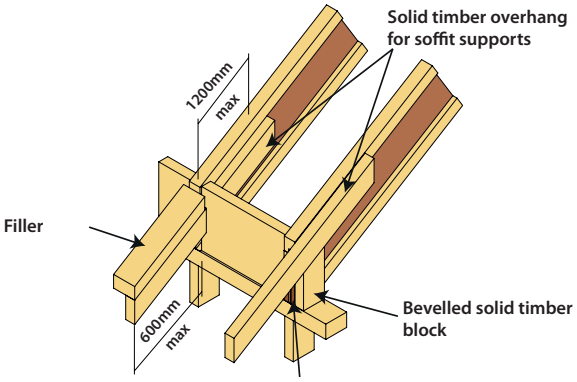
Maximum overhang to be 1/3 of adjacent span. If overhang to be modified use detail R5

R4 ADJUSTABLE SEAT CONNECTOR FOR PITCHES 15°–45°



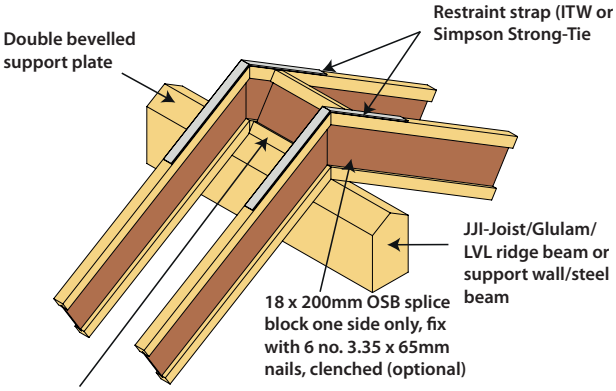
Maximum overhang to be 1/3 of adjacent span.
If overhang to be modified use detail R5

R5 LOOSE TIMBER OVERHANGS



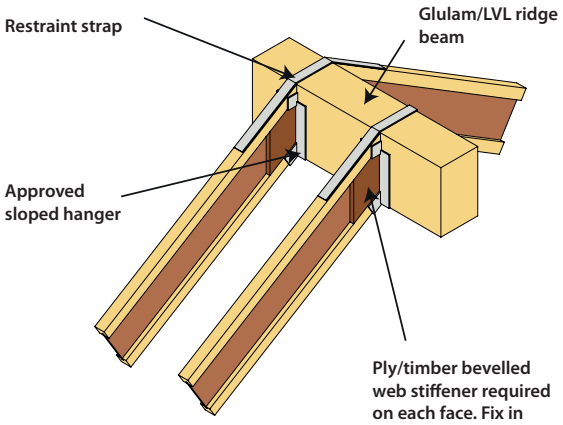
Bevelled web stiffeners on both sides if joist birdsmouthed over wallplate

R6 DOWNSTAND RIDGE BEAM

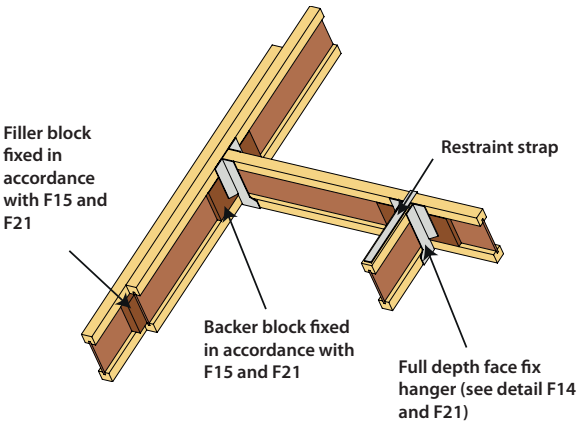


JJI-Joist/Glulam/LVL blocking panels
(For ventilation guidance, see R10)

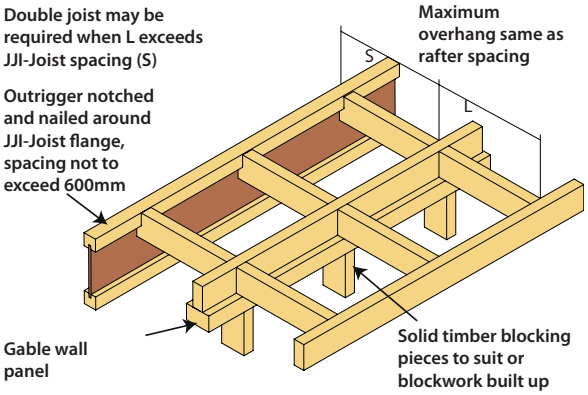
R7 FLUSH RIDGE BEAM



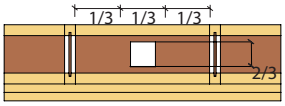
R8 OPENING IN ROOF



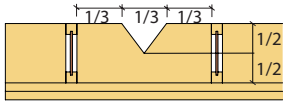
R9 GABLE LADDER



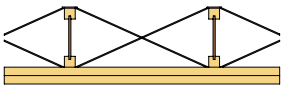
R10 BLOCKING AND VENTILATION HOLES



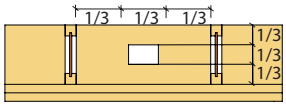
Maximum permissable ventilation hole in JJI-Joist blocking



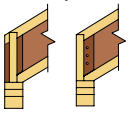
Maximum permissable ventilation V-cut for Glulam/LVL blocking



Braced by Simpson HSA or ITW TJS straps

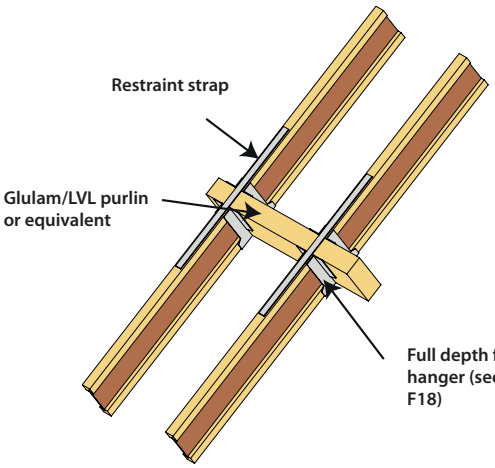


Maximum permissable hole zone for round, square or rectangular holes

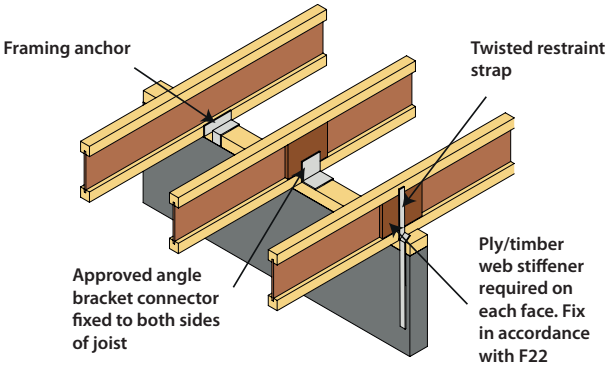


Vertical Glulam/LVL blocking panels may be site trimmed to match JJI-Joist depth at outer edge of wall or positioned on wall to match JJI-Joist depth

R11 FLUSH PURLIN BEAM

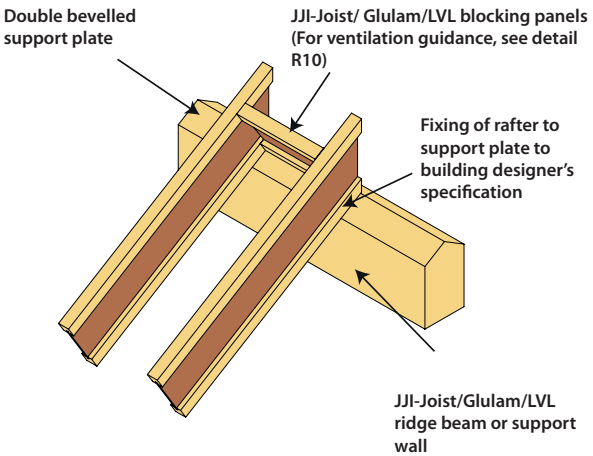


R12 JJI-JOIST RAFTER FIXING TO WALL PLATE

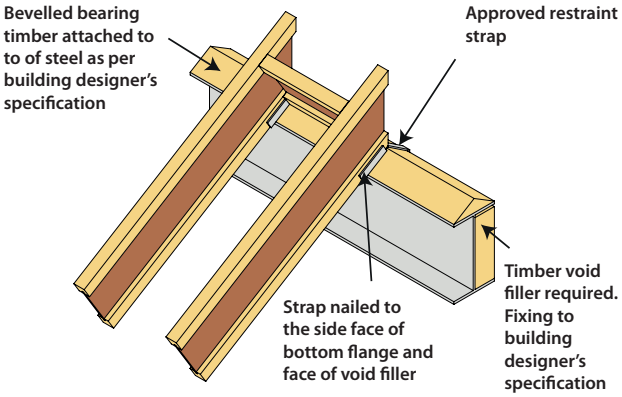


Roof connectors to be determined by roof designer

R13 JJI-JOIST RAFTER TERMINATING ON DOWNSTAND RIDGE BEAM



R14 JJI-JOIST RAFTER TERMINATING ON DOWNSTAND STEEL BEAM



One strap required on each side of the rafter bottom flange

Section 6

Wall design

JJI-Joists are ideally suited for use as wall studs where their availability in depths up to 450mm allows designers to insulate external walls to unprecedented levels. Even when shallower joists are used the narrow web profile provides a restricted path to heat transfer (reduced repeated thermal bridging) when compared with solid timber.

Design considerations

Where the wall is subjected only to horizontal wind loads with no vertical axial loads (e.g. ground level to eaves level infill panels in a portal frame structure) JJI-Joists allow very tall walls to be built using a continuous structural member.

James Jones & Sons recommend that JJI-Joists are incorporated into prefabricated wall panels in order to take advantage of the improved precision and quality typically available in a factory environment.

For further information on axial compression strengths please contact James Jones & Sons.

Each timber frame kit manufacturer will typically produce their own set of standard details to suit their specific production, manufacturing and technical requirements.

The structural design of JJI-Joist studs should be undertaken by a suitably qualified engineer who should pay particular attention to buckling restraint, axial load distribution between inner and outer flanges and member to member fixings.

It is our recommendation that the use of JJI-Joist studs is best suited to external wall closed panel type manufacturing with a separate service zone on the inside face of the internal sheathing. The lightweight nature of JJI-Joists permits the construction of larger panels than might otherwise be possible reducing the number of site lifts required.

Particular care should be taken when insulating to avoid cold spots.

Image courtesy of Touchwood Homes

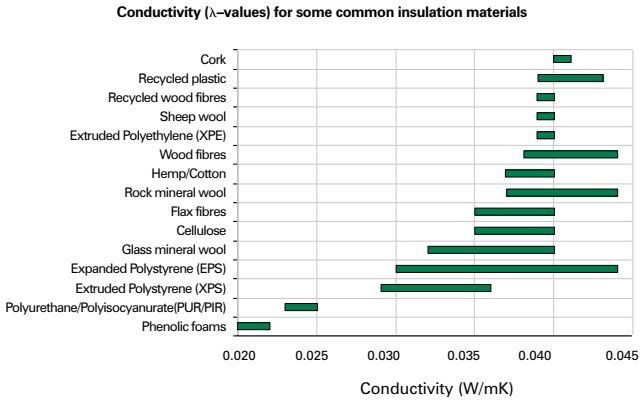
Image courtesy of Roel Reuben

Image courtesy of Touchwood Homes

Thermal performance of JJI-Joists used in the external envelope of a building

There are many possible ways to utilise JJI-Joists in the external envelope of a building. The thermal performance of any chosen configuration and material combination should be assessed by a suitably qualified person.

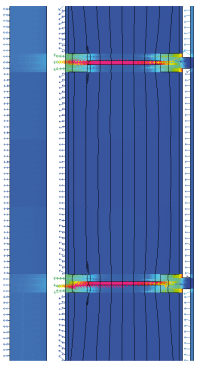
The U-Value of a detail is highly dependant on the quality of the insulation material used. The key property of the insulation in this respect is the conductivity (λ– Value) which varies from material to material and across different forms and densities of the same material. A selection of common insulation materials is provided below showing the range of λ– Values indicated in the manufacturer's literature.



Notes:

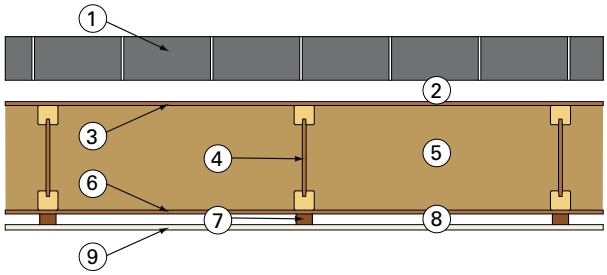
1. Values shown were obtained from a review of publicly available product information
2. List of materials is not intended to be exhaustive
3. These materials can be purchased in different forms (i.e slabs, batt, roll, loose…)
4. Always refer to manufacturer's published data

The following illustration details the heat transference through a typical JJI-Stud wall, construction as shown above right.



Whilst it can be seen that the JJI-Joist web conducts more heat than the surrounding insulation, the limited cross section of the 9mm OSB web, when compared to a typical solid timber stud, greatly reduces repeated thermal bridging.

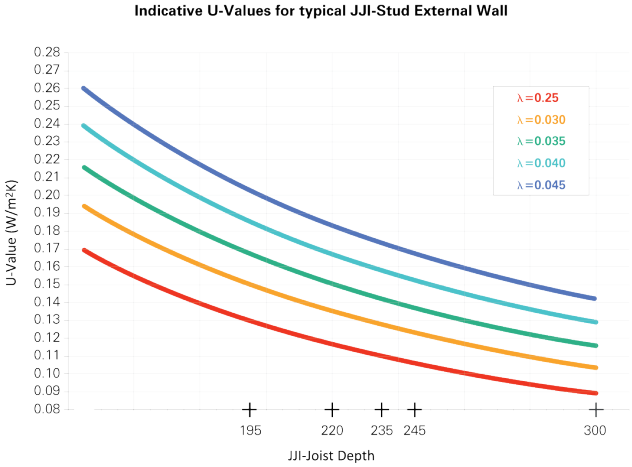
Typical JJI-stud external timber frame wall



1. Masonry 100mm
2. Air Cavity 50mm
3. Wood based board 9mm
4. JJI-Stud
5. Insulation material
6. Wood based board 9mm
7. Softwood batten 38 x 25
8. Service void
9. Plasterboard 12.5mm

Note: Vapour barriers, breather paper and wall ties omitted for clarity

The graph below can be used to relate the U-Value for a wall based on its thickness (JJI-Joist depth) and λ– Value of the chosen insulation.

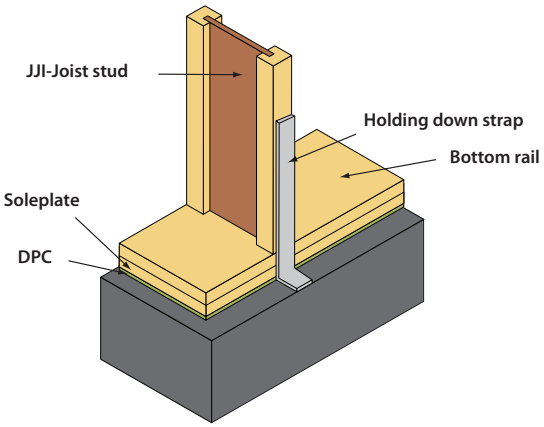


Notes:

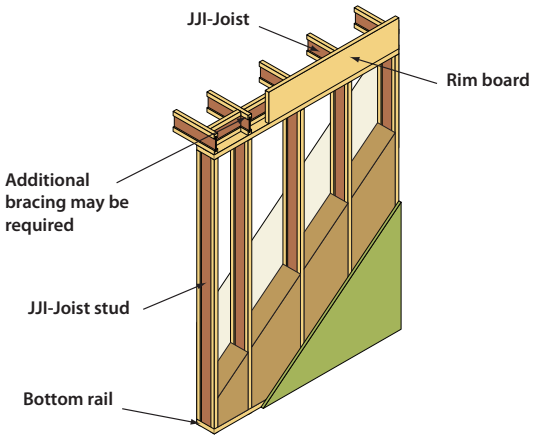
1. U-Values are calculated for the typical JJI-stud external wall detail (see above)
2. All U-Values have been calculated according to BS EN ISO 6946
3. JJI A+ studs at 600mm centres
4. Insulation is assumed to completely fill the JJI-Joist web void
5. Conductivity (λ-Values) are given in W/mK

For further information on thermal performance of JJI-Joists structures please contact James Jones & Sons.

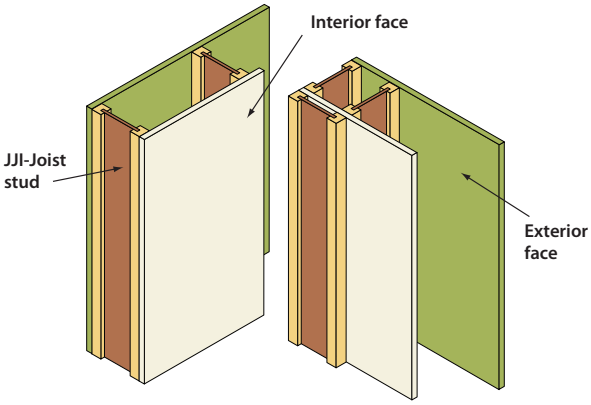
W1 GROUND FLOOR TO WALL JUNCTION



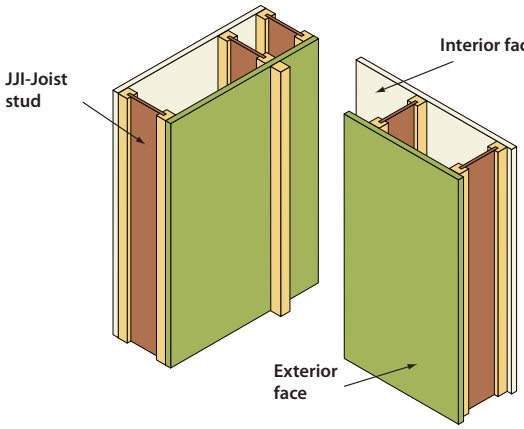
W2 INTERMEDIATE FLOOR TO WALL JUNCTION



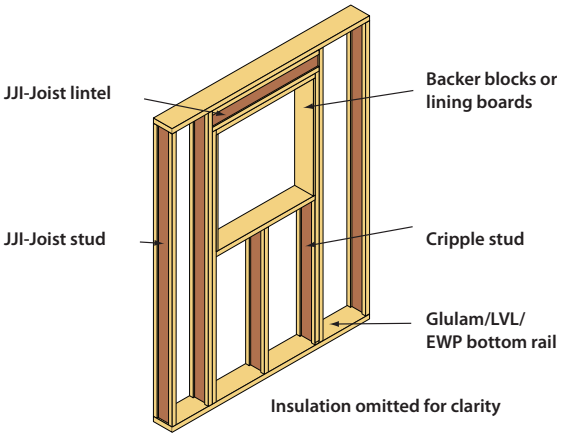
W3 EXTERNAL WALL CORNER JUNCTION



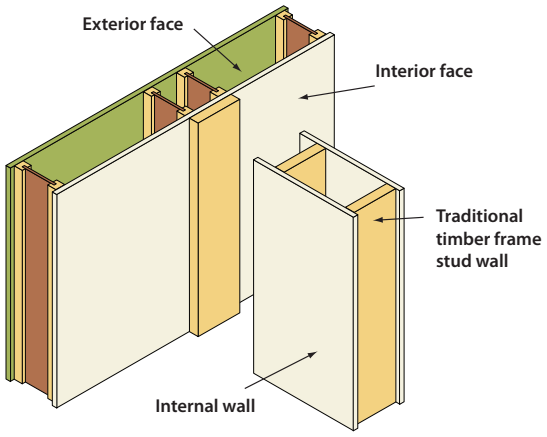
W4 EXTERNAL WALL, INVERTED CORNER

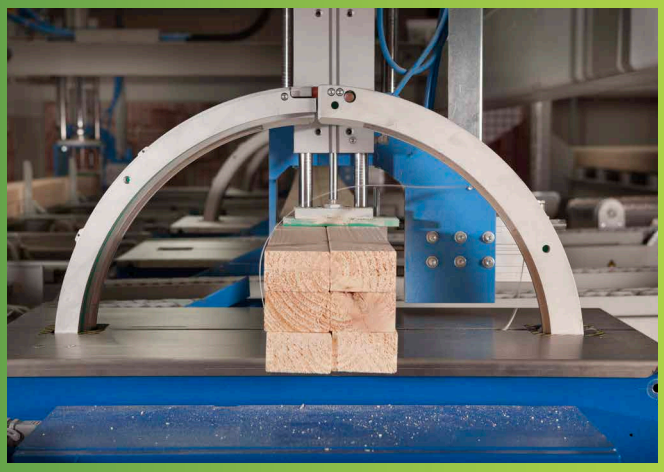


W5 STRUCTURAL OPENING



W6 INTERNAL TO EXTERNAL WALL JUNCTION





James Jones & Sons Ltd is one of the UK's largest and most progressive timber companies with core activities in sawmilling, JJI-Joist and pallet manufacture. We operate five sawmills in Scotland; an engineered wood manufacturing plant in the north of Scotland and have pallet and packaging operations at twelve sites across the UK. We produce high quality, British grown sawn timber for the construction, pallet, packaging, fencing and agricultural sectors and pallets and packaging for blue chip domestic and exporting businesses. In addition, we are the market leaders in the supply of JJI-Joists to many of the UK's top house builders.

Our Timber Systems Division is the UK's largest manufacturer of FSC® certified I-Joists, branded as JJI-Joists.

Certification/Approvals:

JJI-Joists are an accepted building material within the European construction industry due to third party accreditation and certification.

BM TRADA

CE
1244-CPD-0205
ETA10/0335

BM TRADA CERTIFICATION
ISO 9001:2008
UKAS MANAGEMENT SYSTEMS 012

STRUCTURAL TIMBER ASSOCIATION
Member

NHBC

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COMMITMENT TO QUALITY & SERVICE

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