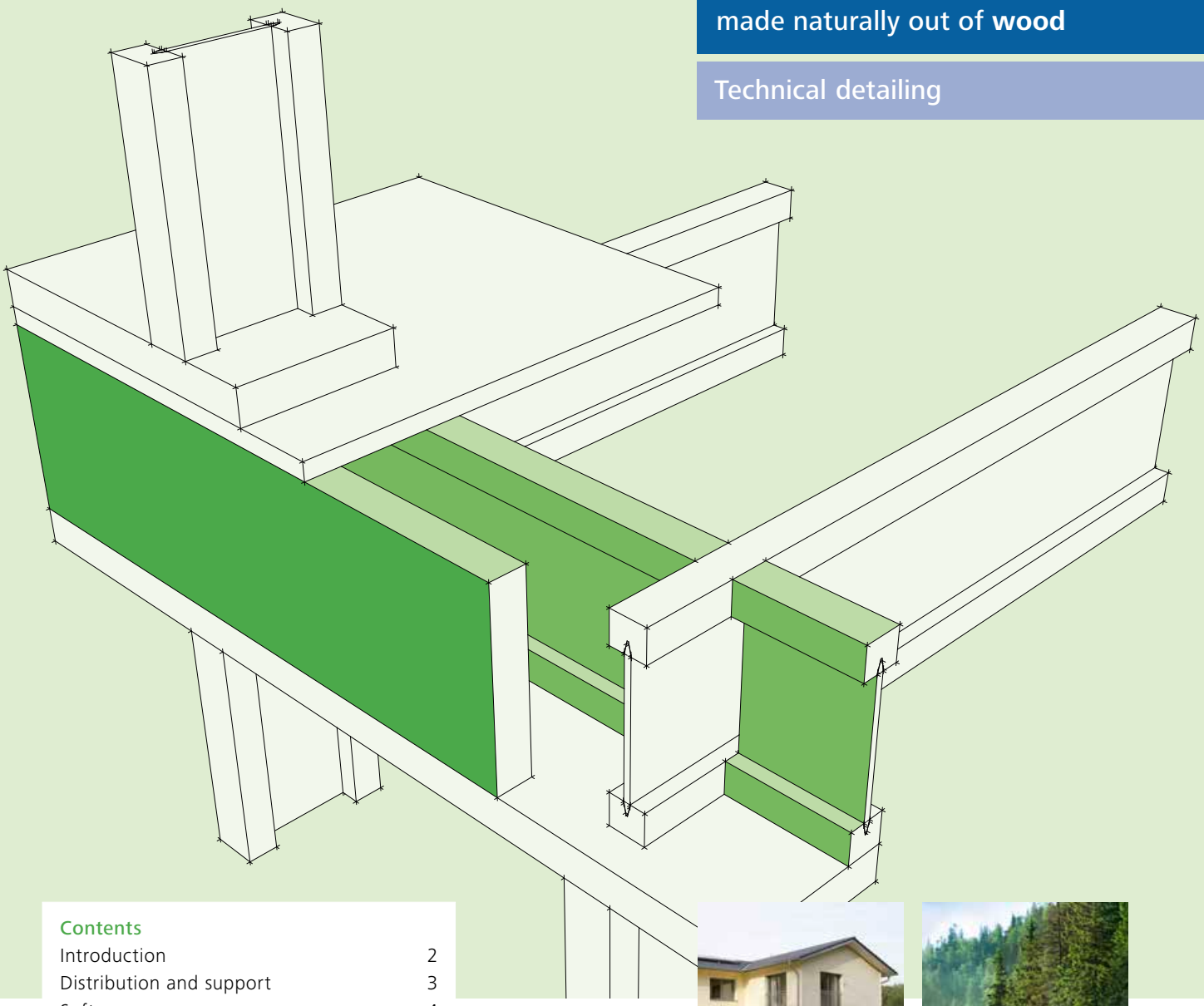
Technical Guide
STEICO*construction*

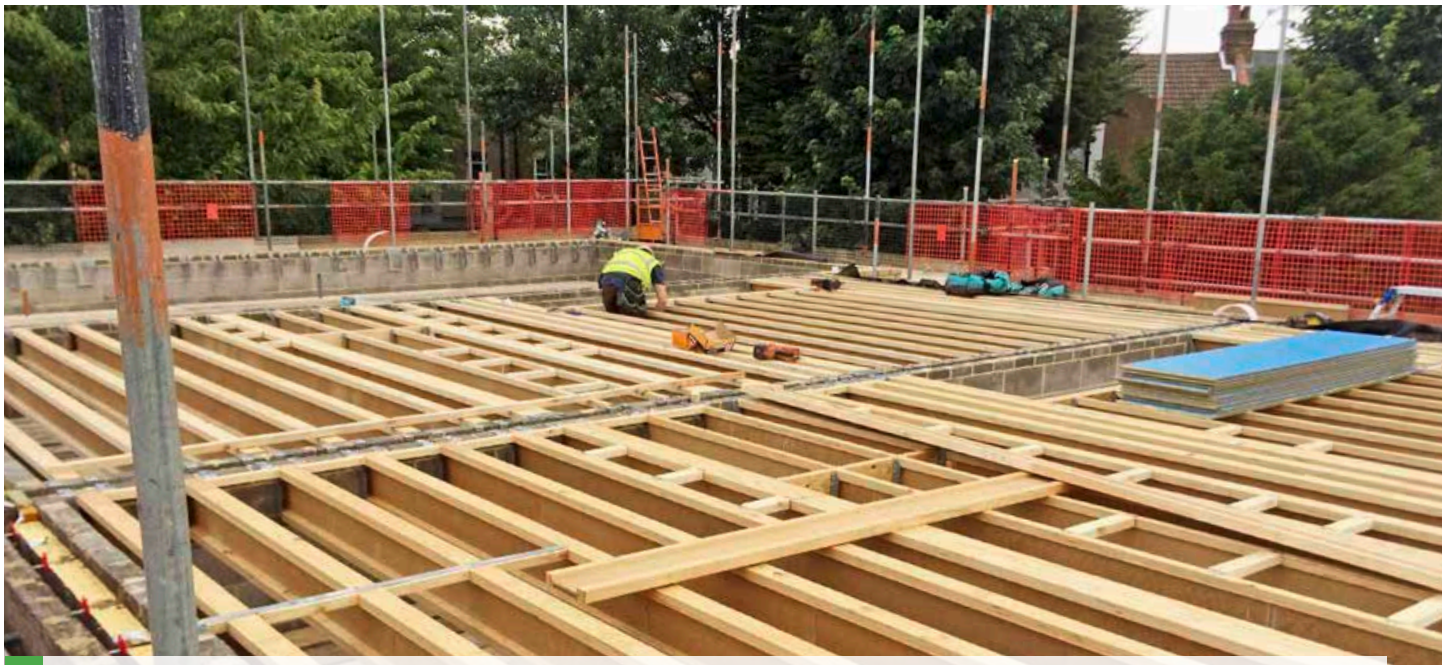
Construction elements – made naturally out of wood

Technical detailing



Contents

STEICO
engineered by nature



STEICO*construction*

Environmentally friendly building products manufactured from sustainable resources

How can we build in an energy efficient, environmentally responsible and sustainable way? This question has fascinated us since the start of our company in 1986, and in asking this we set ourselves a high standard for our products. Stringent tests and voluntary quality checks ensure that our products meet the highest requirements for ecological building and modern methods of construction. We only use PEFC® certified raw materials in our production.

STEICO are the only European producer of timber products to offer a complete building system approach to construction. Our mix of structural and insulating materials is a unique offering and ensures that end users benefit from the inherent strengths of timber as a highly efficient and cost-effective structural material as well as its multi-functional insulating abilities.

The STEICO*joist* is a lightweight engineered I-joist section which enables the specification of multiple structural solutions to suit the most modern of construction processes. In combination with solid section STEICO *LVL* (Laminated Veneer Lumber) even the most structurally demanding engineering details can be accommodated. Our market leading product mix allows for simple building processes which deliver low cost solutions for both new build and renovations without compromising on our core principles of strength and quality.

The ongoing and continued development of the STEICO*construction* building system ensures market leading performance.

Following nature's lead

STEICO*construction* products combine high load bearing capacity with the highest efficiency. Nature shows us the way by producing slender constructions with maximum stability. The functional principles are simple: Reduction. Where no material is required then no material is wasted.

The Result: improved material properties with low weight and low primary energy consumption whilst providing the highest energy efficiency. The STEICO building system follows these principles.

- High dimensional stability through controlled moisture content
- Easier Installation of building technology
- High strength and stiffness provide long spans
- Lightweight and easy to handle
- Precise manufacturing tolerances
- Available in standard joist dimensions and custom depths
- Can be processed using standard wood processing machines
- Available with pre-insulated web
- Reduce thermal bridges
- Environmentally friendly and recyclable

STEICO*joist* has the following certificates:

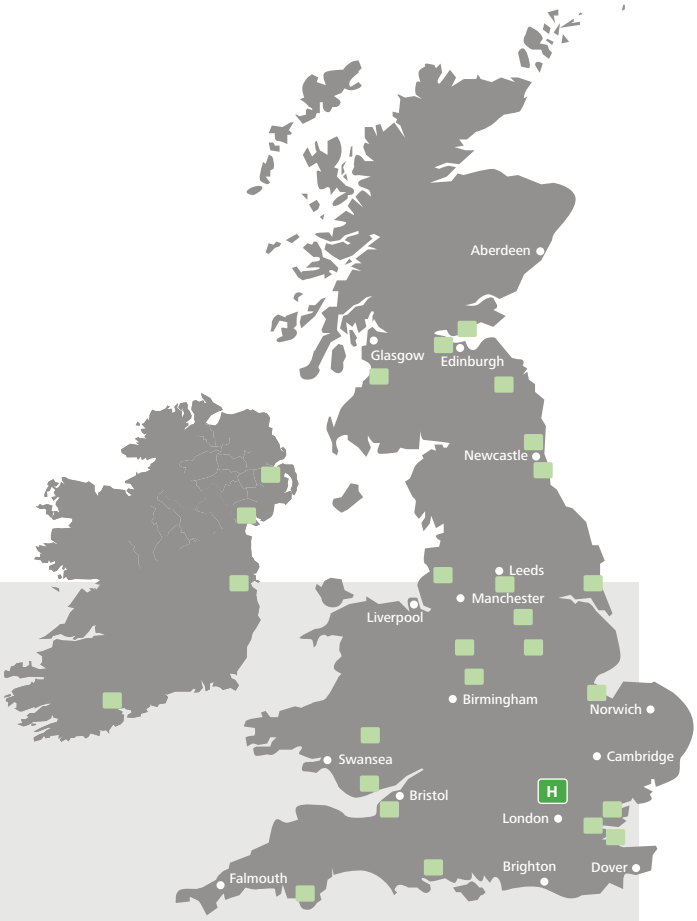
PEFC PEFC/04-31-2550 Promoting Sustainable Forest Management www.pefc.co.uk

CE

STRUCTURAL TIMBER ASSOCIATION *Building solutions in timber*

The STEICO*construction* Building System meets the requirements of:

- The Building Regulations
- NHBC Standards
- Robust Details Ltd.



The structural range of products from STEICO can be sourced via a comprehensive distributor network throughout the UK and Ireland. All STEICO supply partners are able to design, cut and supply a wide variety of projects and are fully trained by STEICO Uk Ltd.

H Head office Steico UK Ltd., Caddington: 01727 515120

Detailed links to individual suppliers are available at www.steico.com/en/distributors

STEICO also provides in house and regional Sales and Technical support through a team of professionals who have many years of experience of the UK EWP market. For full details of your local Sales and Technical support representative please contact the STEICO UK Ltd Head Office.

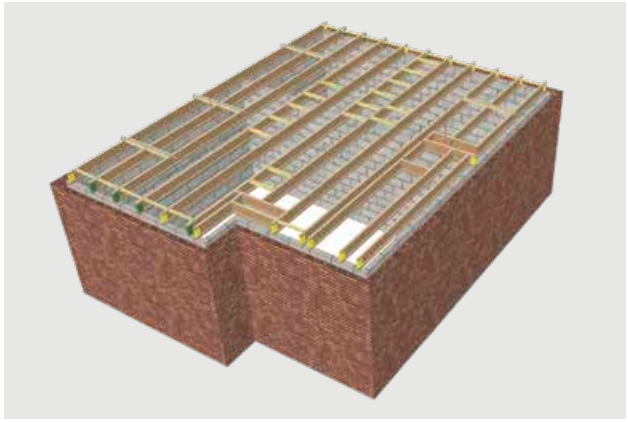
STEICO software

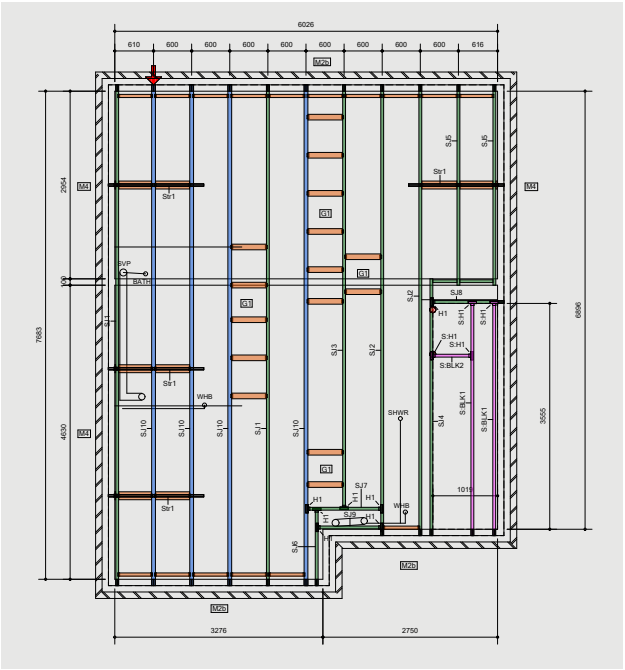
STEICO UK Ltd utilise three bespoke software packages which have been specifically developed to make the specification and utilisation of the STEICO*joist* and STEICO *LVL* as cost effective and structurally robust as possible.

STEICO*konstruct*

Construction software

STEICO*konstruct* is the newest I-joist design software on the UK market. It has been developed by a team with many years of experience in the EWP market and enables users to fully design and engineer full floor and roof solutions.

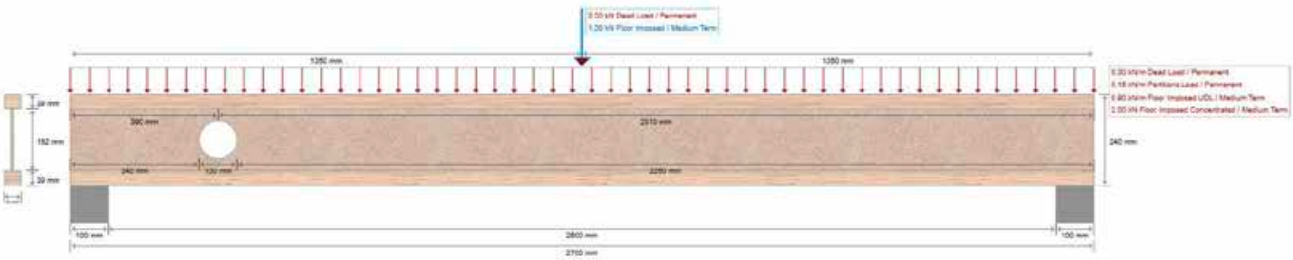




STEICO*kalc*

Single member design software

Fully compatible with STEICO*konstruct*, STEICO*kalc* allows detailed analysis of individual joist and beam members. Suitable for joist dealers, engineers and project specifiers, STEICO*kalc* utilises an intuitive real time specification process which ensures the most cost effective solution for any loading scenario.

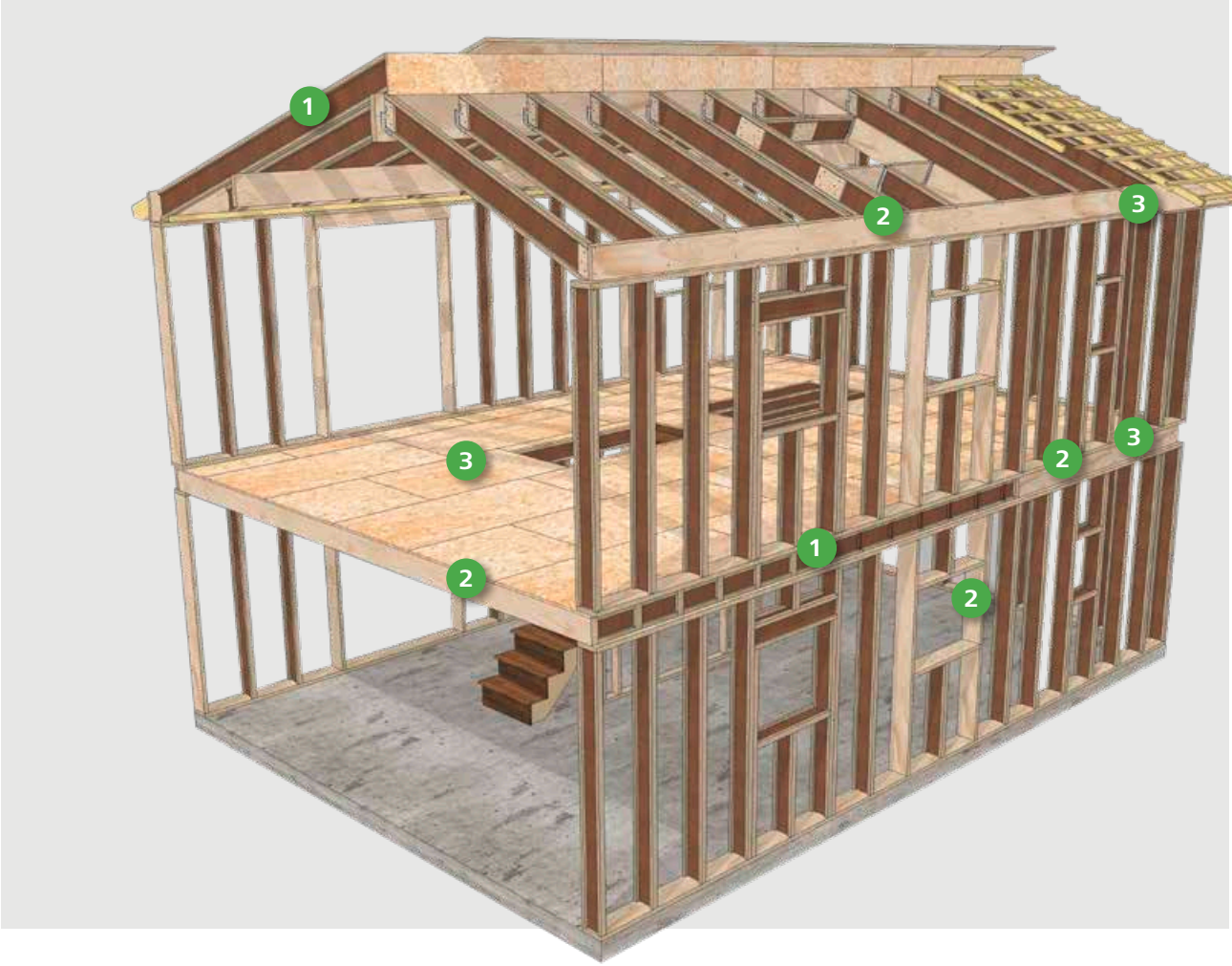


STEICO*stocksave*

Stock Management Software

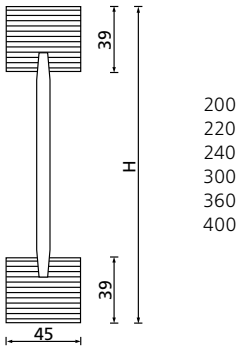
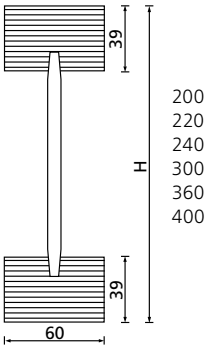
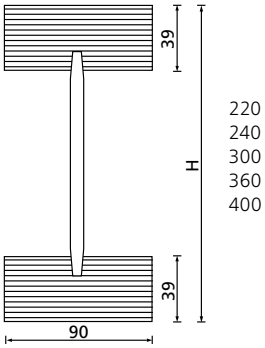
STEICO*stocksave* is a full stock control and optimisation software that allows projects designed in STEICO*konstruct* to be imported and cut from available material, ensuring low wastage. For further details of how the STEICO range of softwares can benefit your business please contact support@steico.com or visit our website at www.steico.co.uk

Individual components



STEICO*I-joists*	**STEICO** *LVL – Laminated Veneer Lumber*	
 1	 2	 3
STEICO*joist*	**STEICO** *LVL R*	**STEICO** *LVL X*
I-joist to European Technical Approval ETA-20/0995	CE certified and manufactured to EN 14374	CE certified and manufactured to EN 14374
For use as floor joists, rafters or wall studs	Laminated Veneer Lumber for joists, beams, studs, purlins, rimboard	Laminated Veneer Lumber for structural panels, rimboard, headers and sole plates
CE	CE	CE

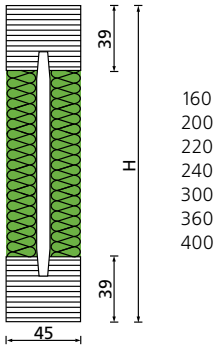
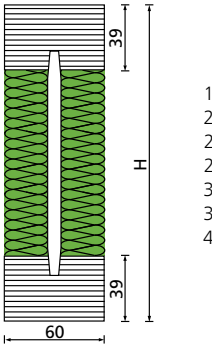
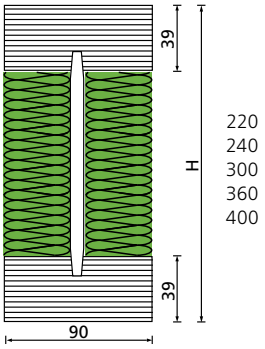
STEICO*joist*

STEICO*joist* SJ$_L$ 45	STEICO*joist* SJ$_L$ 60	STEICO*joist* SJ$_L$ 90
		
Package = 43 pieces/package	Package = 33 pieces/package	Package = 23 pieces/package

STEICO*joist*
I-Joist Building System for floors & roofs

The ideal joist for highly loaded structural elements like rafters or floor joists.

Pre-Insulated joist – All I-joists are available with a pre insulated web

		
Package = 26 pieces/package	Package = 19 pieces/package	Package = 13 pieces/package

The factory applied web insulation ensures a uniform rectangular cross section. This allows efficient insulation with the flexible insulation batt STEICO*flex*.

Standard length: STEICO*joist*: 10.0 / 11.0 / 12.0 / 13.0 m; Additional lengths and cuts available on request
Example SJ$_L$ 45: S = STEICO, J = joist, L = Laminated Veneer Lumber flange, 45 = width of the flange in mm

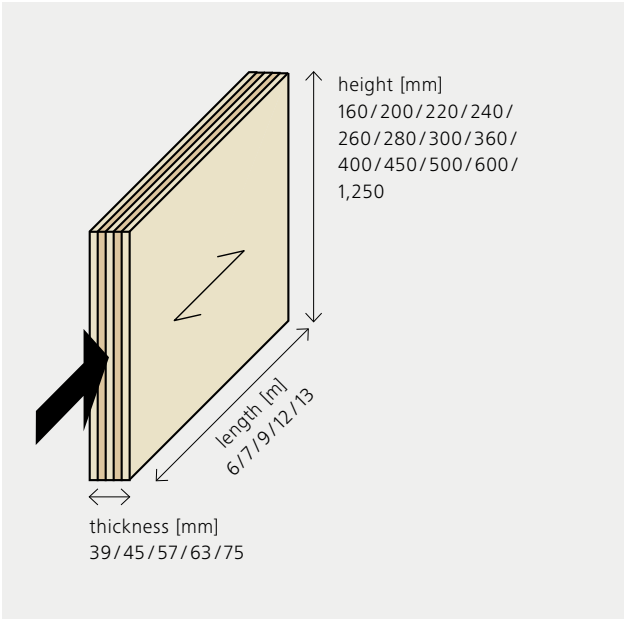
STEICO *LVL* – Laminated Veneer Lumber

STEICO *LVL* is made of multiple 3 mm layers of graded laminated veneers. This disperses knots and irregular growth, producing a practically homogenous cross-section. This construction means that STEICO *LVL* is highly rigid and dimensionally stable.

STEICO *LVL R*

Laminated veneer lumber – ideal for furniture construction

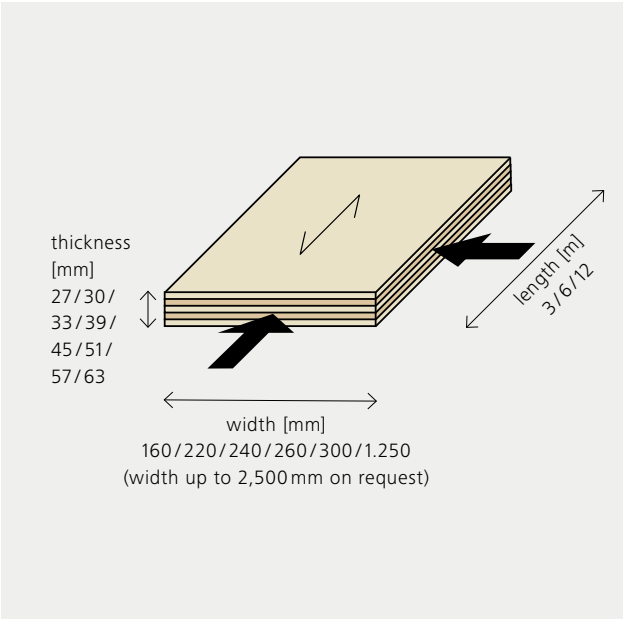
Powerful engineered timber product for rectangular cross-sections. With STEICO *LVL R* elements all veneer layers are glued together longitudinally.



STEICO *LVL X*

Laminated Veneer Lumber with cross-layers

Cross laminated STEICO *LVL X* means that ca. one-fifth of the veneers are glued crosswise – improving the lateral bending strength and stiffness of the joist.



STEICO *LVL R* used for the construction of high load bearing floor structures

STEICO *LVL X* as a stiffening decking element for pre-assembled floor cassettes

Characteristic design values of STEICO*joist* to EC 5

Characteristic design values in accordance with ETA-20/0995

Type	Joist height h [mm]	Characteristic bending moment[a)] [kNm]	Characteristic vertical shear [kN]	Bending stiffness EI_{joist} [N·mm² * 10⁹]	Shear stiffness GA_{joist} [MN]
STEICO*joist* SJ$_L$45	200	7.81	13.01	343	2.50
	220	8.79	14.16	433	2.84
	240	9.78	15.28	536	3.18
	300	12.82	17.61	912	4.18
	360	15.96	18.62	1,397	5.19
STEICO*joist* SJ$_L$ 60	200	10.36	13.73	455	2.50
	220	11.65	14.92	575	2.84
	240	12.94	16.08	709	3.18
	300	16.91	18.47	1,203	4.18
	360	20.98	19.45	1,836	5.19
	400	23.61	20.03	2,337	5.86
STEICO*joist* SJ$_L$90	200	15.47	14.82	679	2.50
	220	17.37	16.09	857	2.84
	240	19.28	17.32	1,056	3.18
	300	25.09	19.83	1,785	4.18
	360	31.02	20.80	2,714	5.19
	400	35.04	21.37	3,447	5.86

Characteristic values prepared in accordance with the recommendations of EAD 130367-00-0304 and BS EN 1995-1-1.
Values are only applicable to STEICO *I-joists* with LVL flange and fibreboard web.
a) The characteristic bending moments are based on the assumption that lateral bracing to the compression flange (at a spacing not exceeding ten times the flange width) is in place.

Characteristic bearing values to EC 5 in accordance with ETA-20/0995 for STEICO*joist*

Refer to detail G6 for web stiffener installation details

Type	Joist height h [mm]	End bearing [kN]					
		35 mm stiffener		45 mm stiffener		89 mm stiffener	
		without	with	without	with	without	with
STEICO*joist* SJ$_L$45	200	8.1	14.6	9.1	16.6	11.3	18.5
	220		14.9		16.9		18.8
	240		15.2		17.2		19.1
	300		16.1		18.1		20.0
	360		17.0		19.0		20.9
STEICO*joist* SJ$_L$60	200	9.5	16.9	12.2	17.7	14.3	18.2
	220		17.2		18.0		18.5
	240		17.5		18.3		18.8
	300		18.4		19.2		19.7
	360		19.3		20.1		20.6
	400		19.9		20.7		21.2
STEICO*joist* SJ$_L$90	200	11.1	21.5	15.6	24.1	16.5	24.0
	220		21.8		24.4		24.3
	240		22.1		24.7		24.6
	300		23.0		25.6		25.5
	360		23.9		26.5		26.4
	400		24.5		27.1		27.0

Type	Joist height h [mm]	Intermediate bearing capacity [kN]					
		45 mm stiffener		75 mm stiffener		89 mm stiffener	
		without	with	without	with	without	with
STEICO*joist* SJ$_L$45	200	15.9	21.4	17.9	21.9	21.2	25.8
	220		21.7		22.2		26.1
	240		22.0		22.5		26.4
	300		22.9		23.4		27.3
	360		23.8		24.3		28.2
STEICO*joist* SJ$_L$60	200	18.9	29.4	22.5	31.6	25.3	35.1
	220		29.7		31.9		35.4
	240		30.0		32.2		35.7
	300		30.9		33.1		36.6
	360		31.8		34.0		37.5
	400		32.4		34.6		38.1
STEICO*joist* SJ$_L$90	200	23.1	37.4	27.1	38.8	31.3	43.1
	220		37.7		39.1		43.4
	240		38.0		39.4		43.7
	300		38.9		40.3		44.6
	360		39.8		41.2		45.5
	400		40.4		41.8		46.1

Values of k_{mod} to be used with EC 5 in accordance with ETA-20/0995 for STEICO*joist*

Duration of load	Bending and axial resistance		Shear resistance		Bearing resistance	
	Service class 1	Service class 2	Service class 1	Service class 2	Service class 1	Service class 2
Permanent	0.60	0.60	0.30	0.20	0.60	0.60
Long term	0.70	0.70	0.45	0.30	0.70	0.70
Medium term	0.80	0.80	0.65	0.45	0.80	0.80
Short term	0.90	0.90	0.85	0.60	0.90	0.90
Instantaneous	1.10	1.10	1.00	0.80	1.10	1.10

γ_m can be taken as 1.3 in general

Values are only applicable to STEICO *I-joists* with LVL flange and fibreboard web.

Mechanical properties of STEICO *LVL*

The following table summarizes the STEICO *LVL* characteristic strength and stiffness properties in N/mm². In addition, other characteristics of STEICO *LVL R* and STEICO *LVL X* are included. The respective symbols are identified in the figures on the next page.

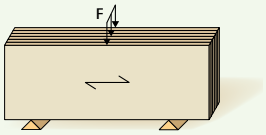
Main parameters	Symbol	Figure	Unit	STEICO *LVL R*	STEICO *LVL X* (t ≤ 24 mm)	STEICO *LVL X* (t ≥ 27 mm)
Bending strength						
Edgewise, parallel to grain (depth 300 mm)	$f_{m,0,edge,k}$	A	N/mm²	44	30	32
Size effect parameter	s	–		0.15	0.15	0.15
Edgewise, perpendicular to grain (depth 300 mm)	$f_{m,90,edge,k}$	B	N/mm²	NPD	10	8
Flatwise, parallel to grain	$f_{m,0,flat,k}$	C	N/mm²	50	32	36
Flatwise, perpendicular to grain	$f_{m,90,flat,k}$	D	N/mm²	NPD	7	8
Tensile strength						
Parallel to grain (length 3 000 mm)	$f_{t,0,k}$	E	N/mm²	36	18	18
Perpendicular to grain, edgewise	$f_{t,90,edge,k}$	F	N/mm²	0.9	7	5
Compression strength						
Parallel to grain	$f_{c,0,k}$	G	N/mm²	40	26	30
Perpendicular to grain, edgewise	$f_{c,90,edge,k}$	H	N/mm²	7.5	9	9
Perpendicular to grain, flatwise	$f_{c,90,flat,k}$	I	N/mm²	3.6	4	4
Shear strength						
Edgewise parallel to grain	$f_{v,0,edge,k}$	J	N/mm²	4.6	4.6	4.6
Edgewise perpendicular to grain	$f_{v,90,edge,k}$	K	N/mm²	NPD	4.6	4.6
Flatwise, parallel to grain	$f_{v,0,flat,k}$	L	N/mm²	2.6	1.1	1.1
Flatwise, perpendicular to grain	$f_{v,90,flat,k}$	M	N/mm²	NPD	1.1	1.1
Modulus of elasticity						
Parallel to grain	$E_{0,mean}$	A C	N/mm²	14,000	10,000	10,600
Parallel to grain	$E_{0,k}$	A C	N/mm²	12,000	9,000	9,000
Perpendicular to grain, edgewise	$E_{90,edge,mean}$	B	N/mm²	NPD	3,500	3,000
Perpendicular to grain, edgewise	$E_{90,edge,k}$	B	N/mm²	NPD	2,700	2,300
Perpendicular to grain, flatwise	$E_{90,flat,mean}$	D	N/mm²	NPD	1,300	2,500
Perpendicular to grain, flatwise	$E_{90,flat,k}$	D	N/mm²	NPD	1,000	1,800
Shear modulus						
Edgewise, parallel to grain	$G_{0,edge,mean}$	J	N/mm²	600	600	600
Edgewise, parallel to grain	$G_{0,edge,k}$	J	N/mm²	400	400	400
Flatwise, parallel to grain	$G_{0,flat,mean}$	L	N/mm²	560	150	150
Flatwise, parallel to grain	$G_{0,flat,k}$	L	N/mm²	400	130	130
Flatwise, perpendicular to grain	$G_{90,flat,mean}$	M	N/mm²	NPD	150	150
Flatwise, perpendicular to grain	$G_{90,flat,k}$	M	N/mm²	NPD	130	130
Density						
Mean value	ρ_{mean}	–	kg/m³	550	530	530
Fifth percentile value	ρ_k	–	kg/m³	480	480	480
Reaction to fire	–	–	–	D-s1, d0	D-s1, d0	D-s1, d0
Release of formaldeyde	–	–	–	E1	E1	E1
Natural durability against biological attack	–	–	–	4	4	4

Note: NPD – No Performance Determined

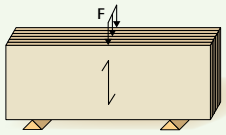
Explanation of the mechanical properties

The following table describes the relation between support, loading and labelling. The symbols refer to the table "Mechanical properties of STEICO *LVL*" on the previous page.

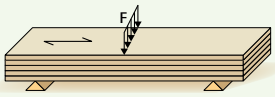
Bending strength f_m and elastic modulus E



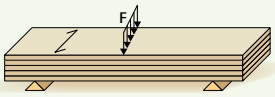
A $f_{m,0,edge}$ and $E_{0,edge}$
Edgewise, parallel to grain♦



B $f_{m,90,edge}$ and $E_{90,edge}$
Edgewise, perp. to grain♦♦

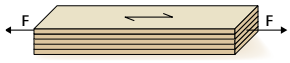


C $f_{m,0,flat}$ and $E_{0,flat}$
Flatwise, parallel to grain♦

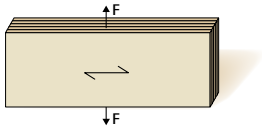


D $f_{m,90,flat}$ and $E_{90,flat}$
Flatwise, perp. to grain♦♦

Tensile strength f_t

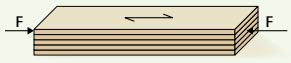


E $f_{t,0}$ parallel to grain♦

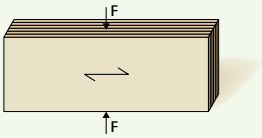


F $f_{t,90,edge}$
Edgewise, perp. to grain♦♦

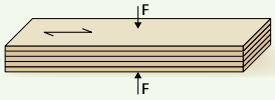
Compressive strength f_c



G $f_{c,0}$ parallel to grain♦

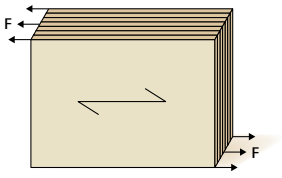


H $f_{c,90,edge}$
Edgewise, perp. to grain♦♦

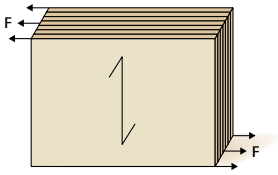


I $f_{c,90,flat}$
Flatwise, parallel to grain♦♦

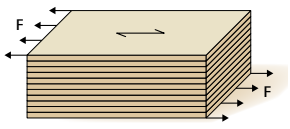
Shear strength f_v and modulus G



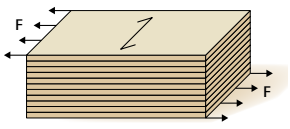
J $f_{v,0,edge}$ and $G_{0,edge}$
Edgewise, parallel to grain♦



K $f_{v,90,edge}$
Edgewise, perp. to grain♦♦



L $f_{v,0,flat}$ and $G_{0,flat}$
Flatwise, parallel to grain♦



M $f_{v,90,flat}$ and $G_{90,flat}$
Flatwise, perp. to grain♦♦

♦ Parallel to the top veneer grain ♦♦ Perpendicular to the top veneer grain

Floor and roof designing

4 Steps to efficient designs

In a market driven by cost it is critical that all aspects of the design process are carefully considered and the engineered range from STEICO can help to provide a cost effective, as well as a robust and high performance end product.

Detailed below are 4 basic principles of floor and roof designing that will enable both new designers and trained professionals to achieve the optimum solution.

Step 1 Get the basics right

Before starting any design work ask yourself the following questions:

- What is being designed?
- Who is it for?
- What does the client want?

These simple questions will help the designer to establish suitable design criteria applicable to the project in hand such as

Design code	BS5268 or EC5?
Live load	These are determined by the end use of the building and laid out in detail in BS6399-1.
Dead load	The weight of the floor/roof structure itself along with any permanent fixtures.
Wind/Snow load	External loads applied to roofs are critical for a correct design. Default loads can be used but these should always be confirmed by the project engineer
Additional loads	Boilers, gym equipment, permanent tiling etc. can all add significant load to a structure and can often be missed.
Service class	Design properties can be affected by the environment in which they are used.
Deflection limit	This is defined by the design code but can be altered in line with the customers' expectations
Joist depth	Generally deeper is cheaper on large spans but the depth may be governed by the architectural specification

Always contact the customer and try to establish the basics in order to ensure that the design is correct first time. This not only reduces the need for re-designing, which costs time, but helps to show the customer that all aspects of the design have been considered and are being dealt with in a professional manner.

Step 2 Careful planning

When first looking at a set of working drawings the optimum solution is not always the most obvious. Going through the following checklist will help to firm up the design.

Load bearing walls
Determine which internal walls are load bearing and which aren't. If the option is still open then look for walls that could be changed to non-load bearing and suggest the change to the customer. This could save them money and increase the amount of STEICO*joist* product used.

Span direction
The shortest span will generally provide the cheapest design but there are other things to consider such as:

- Service runs – trimming details can add cost.
- Dual Span possibilities – STEICO*joists* are available in long lengths and can take advantage of dual spans.

Joist spacing
Try to keep the joist spacing at 600 mm centers. If the joist depth is not set then it is often better to increase the depth than to close up the centers. Keeping the same spacing on a run of joists helps to reduce the time of installing the decking, as less cuts are required.

Stair openings
If there's one thing that always needs double checking it's the size and position of stair openings. It is critical that there is a minimum head room above the stairs of 2.0 m so on a straight flight of stairs a minimum length of approx. 2.8 m is generally required. Always look out for bulkheads as they can appear to make the opening smaller than it is.

Step 3 Detailing – save time, add value

The greatest costs for any house builder when it comes to construction are time and labour. Any steps that can be taken during the design phase to minimize installation time can have significant cost saving benefits. The simplification of installation also reduces the risks of poor workmanship which means snagging issues are less likely to occur. Incorporating some of the following details can add value for both the designer and the customer.

Use STEICO *LVL* instead of double joists.
One of the most common errors during installation is that double joists are not connected properly at incoming members.

Reduce metalwork if possible.
Try to cantilever trimmers around stair openings.

Use backerless hangers where possible.
Incorrectly fitted or missing backer blocks are common site issues. Both Simpson Strong Tie and Cullen offer a range of backerless hangers.

Consider service runs.
SVP pipes and the increased use of MVHR can result in additional trimming details in the floor zone. The use of the Simpson IHS and Cullen SHI can greatly increase the allowable ducting runs.

Step 4 Review and check before issuing

Make sure that all the following accessory materials have been considered and incorporated where necessary:

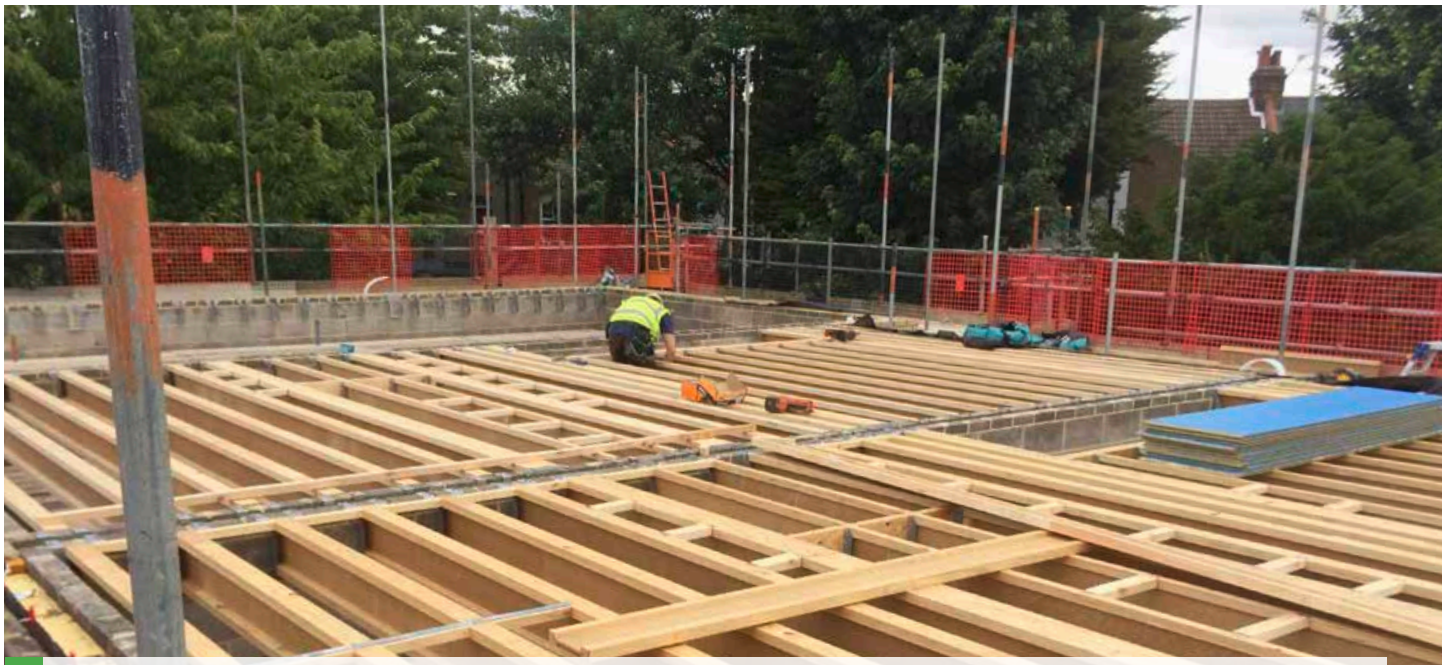
- Perimeter noggins
- Partition noggins
- Restraint straps
- Joist hangers
- End seals
- Multiple joist connectors
- Additional loadings (staircase, water tanks etc.)

Consider additional site issues such as:
Simple installation processes?
Possible hanger clashes?
Complicated connection details?

RE-EVALUATE THE DESIGN IF REQUIRED

And finally

Checking the completed design can make all the difference. Ask a fellow designer to cast their eyes over the design to see if they would have done anything differently. Two pairs of eyes are always better than one!



Floor applications

STEICO*joist* – Lightweight and cost effective.

Engineers have long recognised the advantages of an I-section in structural elements. Suitable material is only used in those places where it meets the needs, resulting in a slender and economical building element for floors, walls and roofs. Modern structures require high performance and cost efficient constructions in which shrinkage and movement are a thing of the past. The carefully selected components used in the flange and web create a high quality engineered wood product, designed to reduce movement and other problems associated with solid timber floors.

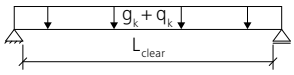
Thanks to its engineered properties the STEICO*joist* is dimensionally stable, avoiding the need for mid span blocking to be installed and reduces the risk of nail popping in plasterboard caused by timber shrinkage. Due to its light-weight properties, new floors are easily incorporated into renovation projects where access is limited and handling issues are important.

Strong and versatile

The unique combination of STEICO *LVL* flanges and natural fibreboard web ensures that the STEICO*joist* has exceptional spanning capacity in conjunction with unparalleled access for service holes. This provides the end user with all the flexibility that they need for the most demanding of structures.

Span tables for STEICO*joist* according to BS EN 1995-1-1

Single spans

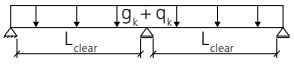


Maximum single spans L_{clear} (m) | Max. final deflection L/250 | Fundamental frequency $f_1 > 8$ Hz — Live load $q_k = 1.5$ kN/m²

Type	Joist height h [mm]	$g_k = 0.75$ kN/m² Joist centers [mm]				$g_k = 1.25$ kN/m² Joist centers [mm]			
		300	400	480	600	300	400	480	600
STEICO*joist* SJ$_L$45	200	4.285	4.170	3.940	3.630	4.280	3.855	3.600	3.310
	220	4.540	4.415	4.235	3.935	4.540	4.175	3.905	3.590
	240	4.785	4.655	4.465	4.240	4.785	4.495	4.205	3.870
	300	5.455	5.305	5.090	4.875	5.455	5.305	5.050	4.650
	360	6.055	5.890	5.650	5.415	6.055	5.890	5.650	5.390
STEICO*joist* SJ$_L$60	200	4.580	4.455	4.270	3.970	4.580	4.215	3.940	3.620
	220	4.855	4.720	4.525	4.310	4.855	4.575	4.275	3.930
	240	5.110	4.970	4.765	4.565	5.110	4.920	4.595	4.225
	300	5.820	5.660	5.430	5.200	5.820	5.660	5.430	5.080
	360	6.455	6.275	6.020	5.765	6.455	6.275	6.020	5.765
	400	6.850	6.660	6.390	6.120	6.850	6.660	6.390	6.120
STEICO*joist* SJ$_L$90	200	5.025	4.885	4.685	4.485	5.025	4.790	4.465	4.100
	220	5.325	5.175	4.960	4.750	5.325	5.175	4.845	4.450
	240	5.605	5.450	5.225	5.000	5.605	5.450	5.215	4.790
	300	6.375	6.200	5.945	5.690	6.375	6.200	5.945	5.690
	360	7.070	6.870	6.590	6.305	7.070	6.870	6.590	6.305
	400	7.495	7.285	6.985	6.685	7.495	7.285	6.985	6.685

Span tables for STEICO*joist* according to BS EN 1995-1-1

Double spans



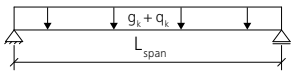
Maximum double spans L_{clear} (m) with mid span support | Max. final deflection L/250 | Fundamental frequency $f_1 > 8$ Hz — Live load $q_k = 1.5$ kN/m²

Type	Joist height h [mm]	$g_k = 0.75$ kN/m² Joist centers [mm]				$g_k = 1.25$ kN/m² Joist centers [mm]			
		300	400	480	600	300	400	480	600
STEICO*joist* SJ$_L$45	200	4.690	4.560	4.375	4.135	4.690	4.455	4.190	3.885
	220	4.970	4.830	4.635	4.440	4.970	4.820	4.535	4.205
	240	5.240	5.095	4.885	4.680	5.240	5.095	4.875	4.520
	300	5.975	5.810	5.575	5.335	5.975	5.810	5.575	4.960
	360	6.640	6.455	6.190	5.930	6.640	6.455	6.190	4.960
STEICO*joist* SJ$_L$60	200	5.015	4.875	4.675	4.470	5.015	4.875	4.610	4.275
	220	5.315	5.165	4.950	4.740	5.315	5.165	4.950	4.630
	240	5.595	5.440	5.215	4.995	5.595	5.440	5.215	4.970
	300	6.375	6.200	5.945	5.690	6.375	6.200	5.945	5.690
	360	7.075	6.880	6.600	6.315	7.075	6.880	6.600	5.945
	400	7.510	7.300	7.000	6.705	7.510	7.300	7.000	5.945
STEICO*joist* SJ$_L$90	200	5.505	5.345	5.125	4.900	5.505	5.345	5.125	4.895
	220	5.830	5.665	5.430	5.195	5.830	5.665	5.430	5.195
	240	6.140	5.965	5.720	5.470	6.140	5.965	5.720	5.470
	300	6.990	6.790	6.510	6.230	6.990	6.790	6.510	6.230
	360	7.750	7.530	7.220	6.905	7.750	7.530	7.220	6.905
	400	8.215	7.985	7.655	7.325	8.215	7.985	7.655	7.325

See notes on page 17.

Load tables for STEICO *LVL R* beams – floors

UDL – Uniformly Distributed Loads



Beam span [m] L_{span}	Maximum total unfactored uniformly distributed load (kN/m) on STEICO *LVL R* floor beams under medium-term loading in service class 1 conditions											
	h=200 mm				h=220 mm				h=240 mm			
	w [mm]				w [mm]				w [mm]			
	39	45	75	90	39	45	75	90	39	45	75	90
2.5	4.60	5.30	8.84	10.61	5.97	6.89	11.48	13.78	7.55	8.71	14.59	17.42
3.0	2.75	3.17	5.29	6.34	3.60	4.15	6.92	8.31	4.59	5.29	8.86	10.59
3.5	-	-	3.38	4.05	-	2.67	4.45	5.34	2.97	3.43	5.73	6.85
4.0	-	-	-	2.73	-	-	3.01	3.61	-	-	3.89	4.66
4.5	-	-	-	-	-	-	-	-	-	-	-	3.12

Beam span [m] L_{span}	Maximum total unfactored uniformly distributed load (kN/m) on STEICO *LVL R* floor beams under medium-term loading in service class 1 conditions											
	h=300 mm				h=360 mm				h=400 mm			
	w [mm]				w [mm]				w [mm]			
	39	45	75	90	39	45	75	90	39	45	75	90
2.5	7.81	9.01	15.02	18.02	7.80	9.00	14.99	17.99	7.79	8.99	14.98	17.97
3.0	6.50	7.50	12.49	14.99	6.48	7.48	12.47	14.96	6.47	7.47	12.45	14.94
3.5	5.54	11.00	10.65	12.78	5.55	6.40	10.66	12.80	5.54	6.39	10.65	12.78
4.0	3.82	4.40	7.34	8.81	4.84	5.59	9.31	11.17	4.83	5.58	9.29	11.15
4.5	-	3.09	5.16	6.19	4.29	4.96	8.26	9.91	4.29	4.94	8.24	9.89
5.0	-	-	3.34	4.00	3.04	3.50	5.84	7.00	3.85	4.44	7.40	8.88
5.5	-	-	-	-	-	-	3.94	4.72	2.83	3.26	5.44	6.53
6.0	-	-	-	-	-	-	-	3.28	-	-	3.79	4.55

NOTES

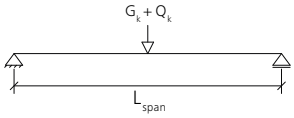
- The load table is for single-span principal STEICO *LVL R* floor beams which are not part of any load-sharing mechanism (i.e. k_{sys} = 1.0)
- Beam spans quoted are 'engineering spans' measured between centres of support lengths.
- Beam spans assume supports of minimum length 45 mm.
- The uniformly distributed loads in the table are unfactored loads and can be compared with the sum of the characteristic permanent (dead) load and the characteristic floor imposed load (as per NA to BS EN 1991-1-1) acting on the beam being designed.
- In determination of the characteristic permanent (dead) load, the self-weight of the STEICO *LVL R* beam need not be included as it has already been allowed for in the load table calculations.
- The permanent (dead) load shall not exceed 40 % of the total unfactored load.
- The tabulated loads are based on limiting the final (i.e. with creep) deflection to 0.004 times the span (as per UK NA to BS EN 1995-1-1).
- Vibration checks carried out in accordance with NA to BS EN 1995-1-1, NA.2.7. In unit point load deflection check modification factor k_{dist} taken as 1.0. Fundamental frequency calculation carried out as for girder joists.
- It is assumed that the STEICO *LVL R* beam has effective lateral restraint at its supports and effective lateral restraint to its compression edge at a maximum of 600 mm spacing.
- The bearing capacity of the supporting material or wallplate has NOT been verified.
- For conditions not shown in table, use STEICO*kalc* software or consult your STEICO distributor.

NOTES (apply to tables on page 16)

- These tables serve as a guide only and do not replace independent structural calculations prepared by a qualified engineer.
- Please pay special attention to the bearing conditions.
- Do not use these tables to calculate point or irregular loads.
- Spans indicated are clear span between supports.
- q_k = Characteristic imposed load. g_k = Characteristic dead loads. The STA Engineered Wood Products Committee recommends a minimum dead load for single occupancy domestic floors of 0.40 kN/m² plus an allowance of 0.35 kN/m² for non-load bearing partitions (up to 29 kg/m²), irrespective of whether they are present on the floor. Where partition positions are known, the final design should reflect the worst case of either the blanket UDL (incl. partitions) or the dead load plus a minimum line load of 0.7 kN/m at partition locations. Where calculated dead loads exceed the recommended minimum (ie: compartment floors and multi-boarded partitions), these must be adopted.
- Dead loads (g_k) include the self-weight of the joists.
- Span tables are for floor joists under service class 1 conditions only.
- Values are only applicable to STEICO*joist* with LVL flange and fibreboard web.

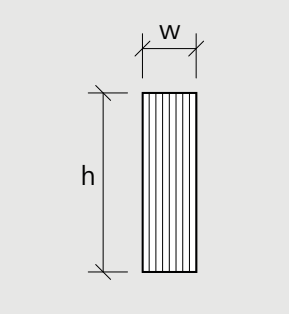
Load tables for STEICO *LVL R* beams – floors

Point loads



Beam span [m] L_{span}	Maximum total point load (kN) on STEICO *LVL R* floor beams under medium-term loading in service class 1 conditions											
	h = 200 mm				h = 220 mm				h = 240 mm			
	w [mm]				w [mm]				w [mm]			
	39	45	75	90	39	45	75	90	39	45	75	90
2,5	7.0	8.0	13.4	16.0	9.0	10.4	17.3	20.7	9.8	11.3	18.8	22.6
3.0	5.0	5.8	9.7	11.6	6.6	7.6	12.6	15.1	8.3	9.6	16.1	19.2
3.5	-	-	7.1	8.5	-	5.7	9.5	11.4	6.3	7.3	12.2	14.6
4.0	-	-	-	5.5	-	-	6.2	7.4	-	-	8.1	9.8
4.5	-	-	-	-	-	-	-	-	-	-	-	6.6

Beam span [m] L_{span}	Maximum total point load (kN) on STEICO *LVL R* floor beams under medium-term loading in service class 1 conditions											
	h = 300 mm				h = 360 mm				h = 400 mm			
	w [mm]				w [mm]				w [mm]			
	39	45	75	90	39	45	75	90	39	45	75	90
2,5	9.8	11.3	18.8	22.5	9.8	11.3	18.8	22.5	9.7	11.2	18.7	22.5
3.0	9.8	11.3	18.8	22.5	9.7	11.2	18.7	22.5	9.7	11.2	18.7	22.4
3.5	9.7	11.2	18.7	22.5	9.7	11.2	18.7	22.4	9.7	11.2	18.7	22.4
4.0	8.5	9.8	16.3	19.5	9.7	11.2	18.7	22.4	9.7	11.2	18.6	22.3
4.5	-	6.7	11.2	13.4	9.7	11.2	18.6	22.3	9.7	11.1	18.6	22.3
5.0	-	-	7.8	9.4	7.3	8.4	14.0	16.8	9.6	11.1	18.5	22.2
5.5	-	-	-	-	-	-	10.2	12.2	7.4	8.5	14.2	17.1
6.0	-	-	-	-	-	-	-	9.0	-	-	10.6	12.7



NOTES

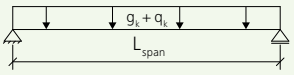
- The load table is for single-span principal STEICO *LVL R* floor beams which are not part of any load-sharing mechanism (i.e. k_{sys} = 1.0)
- Beam spans quoted are 'engineering spans' measured between centres of support lengths.
- Beam spans assume supports of minimum length 45 mm.
- The point loads in the table are unfactored loads and can be compared with the sum of the characteristic permanent (dead) load and the characteristic floor imposed load (as per NA to BS EN 1991-1-1) acting on the beam being designed.
- The point load can be located at any position along the span of the STEICO *LVL R* beam and has a dimension parallel to the beam greater than or equal to 45 mm.
- The self-weight of the STEICO *LVL R* beam has been allowed for in the point load table calculations.
- The permanent (dead) load shall not exceed 40 % of the total unfactored load.
- The tabulated loads are based on limiting the final (i.e. with creep) deflection to 0.004 times the span (as per UK NA to BS EN 1995-1-1).
- Vibration checks carried out in accordance with NA to BS EN 1995-1-1, NA.2.7. In unit point load deflection check modification factor k_{dist} taken as 1.0. Fundamental frequency calculation carried out as for girder joists.
- It is assumed that the STEICO *LVL R* beam has effective lateral restraint at its supports and effective lateral restraint to its compression edge at a maximum of 600 mm spacing.
- The bearing capacity of the supporting material or wallplate has NOT been verified.
- For conditions not shown in table, use STEICO*kalc* software or consult your STEICO distributor.

Worked example

Uniformly distributed line loads – floors

Loading example

Characteristic dead load	$g_k = 3.0\,kN/m^2$
Characteristic live load	$q_k = 5.5\,kN/m^2$
Center spacing	$e = 0.6\,m$
Beam span	$L_{span} = 4.0\,m$



Total characteristic uniformly distributed line load (kN/m) = $(g_k+q_k)*e$

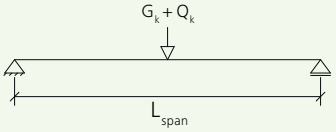
$E_k = (g_k+q_k)*e = (3{,}0\,kN/m^2 + 5{,}5\,kN/m^2)*0.6\,m = 5.1\,kN/m \leq R_d = 7.34\,kN/m$

This value can be directly compared to the values in the table on page 17. Therefore for a 4.0 m design span the shallowest allowable STEICO *LVL R* would be 300 mm with a 75 mm width able to accommodate a total load of 7.34 kN/m.

Point loads – floors

Loading example

Characteristic dead load	$G_k = 4.0\,kN$
Characteristic live load	$Q_k = 6.0\,kN$
Beam span	$L_{span} = 5.0\,m$

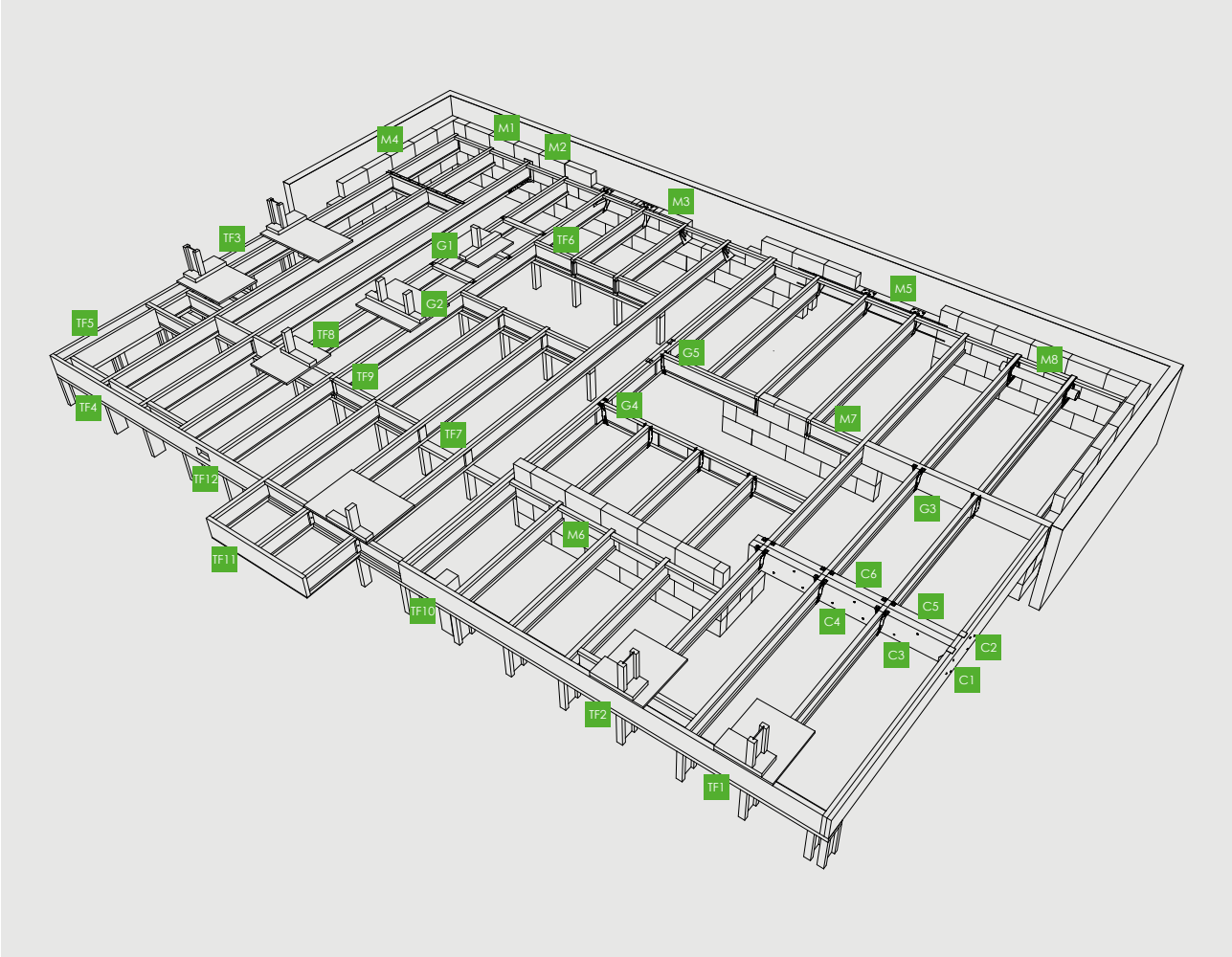


Total characteristic point load (kN) = G_k+Q_k

$E_k = G_k+Q_k = 4.0\,kN + 6.0\,kN = 10.0\,kN \leq R_d = 14.0\,kN$

This value can be directly compared to the values in the table on page 18. Therefore for a 5.0 m design span the shallowest allowable STEICO *LVL R* would be 360 mm with a 75 mm width able to accommodate a total load of 14.0 kN.

Floor construction details



The following pages (21-29) utilise STEICO*joist* and STEICO *LVL* incorporated in generic floor construction details for both masonry and timber frame construction, which comply fully with all relevant UK Building Standards. Where alternative detailing is required then clarification for its suitability for use should be sought from STEICO UK ltd.

NOTES

Bearing lengths:

- End bearing minimum 45 mm
- Intermediate bearing minimum 75 mm

Fastening:

- Where bearing onto an external timber frame wall, STEICO*joists* must be secured to STEICO *LVL*, a rim joist or other suitable EWP using nails or suitable hangers.
- STEICO*joists* to be nailed to head plates using minimum 2 No. 3.35 * 90 ring shank nails, located a minimum of 38 mm from the end of the joist. Nails may need to be skewed slightly to avoid splitting the bearing plate.
- Where required, compression blocks are to be fixed to each flange using a minimum of one 3.35 dia nail. Ensure the block is cut from graded timber or an EWP to the same depth as the joist.
- The typical details shown are for guidance only and should be used in conjunction with the recommendations and requirements of the STA, British Standards, NHBC, Robust Details Ltd., Building regulations and all other statutory bodies.

Masonry details

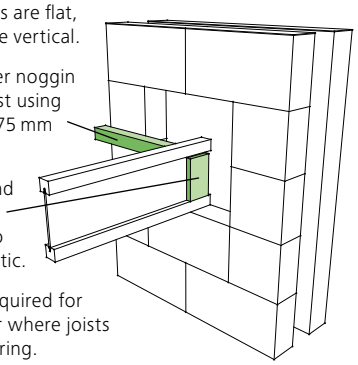
M1 Bearing into blockwork cavity wall

All joists to have a minimum bearing of 90 mm. Ensure all bearings are flat, level and that the joists are vertical.

Minimum 38*38 perimeter noggin skew nailed or fixed to joist using Z-Clip. Noggin to be 25-75 mm from face of wall.

Web stiffeners fitted to end of joists. Junction between wall and joists to be sealed with silicon mastic.

Restraint straps may be required for buildings over 2 storeys or where joists have less than 90 mm bearing.

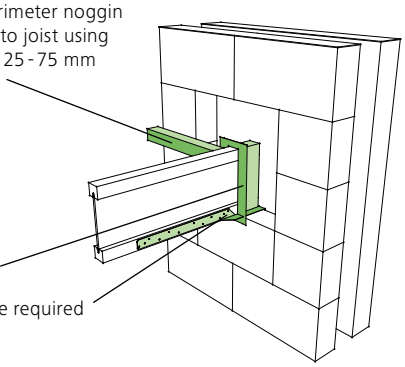


M2a Bearing into blockwork cavity wall using proprietary seal

Minimum 38*38 perimeter noggin skew nailed or fixed to joist using Z-Clip. Noggin to be 25-75 mm from face of wall.

Propietary end seal

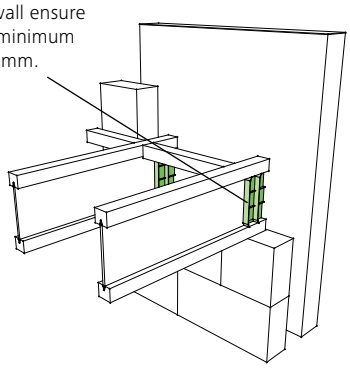
Restraint strap where required



M2b Bearing into blockwork cavity wall using Cullen® Hi-Vis Gripper

When bearing into cavity wall ensure that the STEICO*joist* has a minimum bearing into the wall of 90 mm.

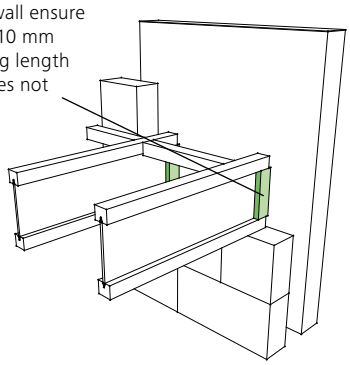
Ensure all bearings are flat, level and that the joists are vertical. Please refer to the manufacturers details for full installation



M2c Bearing into blockwork cavity wall using Energy Stop

When bearing into cavity wall ensure that the STEICO*joist* is cut 10 mm shorter than the full bearing length so that the Energy Stop does not protrude into the cavity.

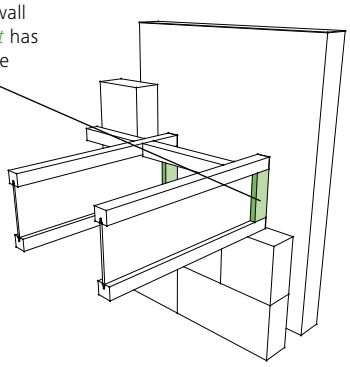
Ensure all bearings are flat, level and that the joists are vertical. Please refer to the manufacturers details for full installation details and restraint strap requirements.



M2d Bearing into blockwork cavity wall using Simpson end seal

When bearing into cavity wall ensure that the STEICO*joist* has a minimum bearing into the wall of 90 mm.

Ensure all bearings are flat, level and that the joists are vertical. Please refer to the manufacturers details for full Installation details and restraint strap requirements.

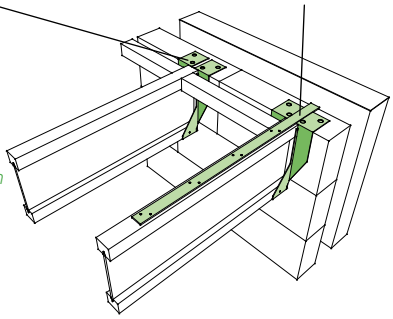


M3a Masonry hanger

Cullen® or Simpson Strong-Tie® masonry hanger

Restraint straps fitted as manufacturers details.

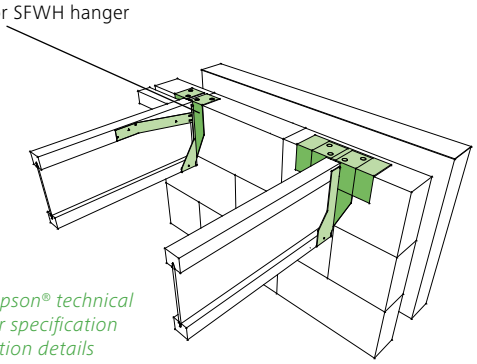
Restraint straps to be fitted at no more than 2 m centers or at spacing specified by the building designer.



Masonry details

M3b Restraint type hanger (Simpson Strong_Tie®)

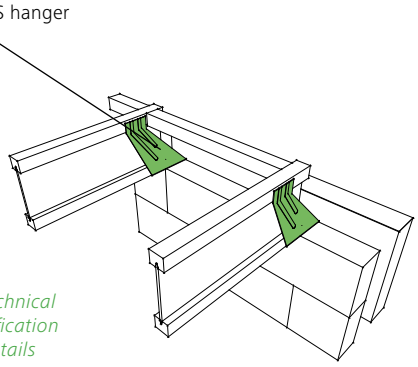
SFLH / SFH or SFWH hanger



Refer to Simpson® technical literature for specification and installation details

M3c Restraint type hanger (Cullen®)

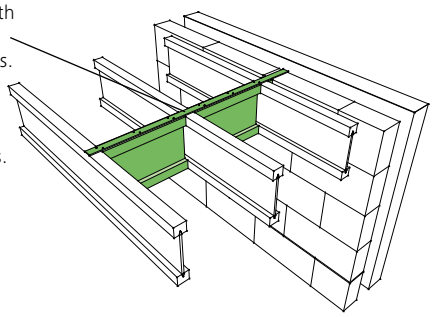
RA / HRAD or RADS hanger



Refer to Cullen® technical literature for specification and installation details

M4a Masonry wall restraint – I-joist blocking

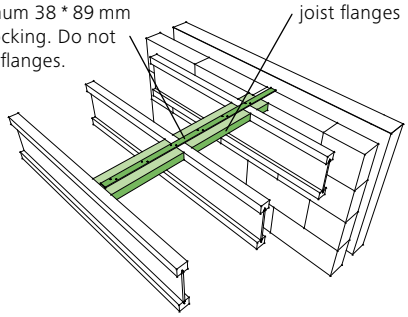
Galvanised masonry restraint strap fixed to minimum 3 joists in accordance with manufacturers recommendations. Use full depth STEICO*joist* blocking. Do not notch the flanges.



M4b Masonry wall restraint – horizontal timber blocking

Galvanised masonry restraint strap fixed to minimum 3 joists in accordance with manufacturers recommendations. Use minimum 38 * 89 mm timber blocking. Do not notch the flanges.

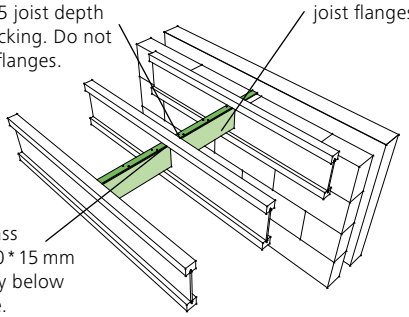
Timber noggin fixed **horizontally** between joist flanges



M4c Masonry wall restraint – vertical timber blocking

Galvanised masonry restraint strap fixed to minimum 3 joists in accordance with manufacturers recommendations. Use 38 * 0.5 joist depth timber blocking. Do not notch the flanges.

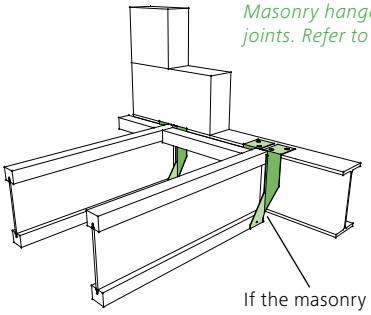
Timber noggin fixed **vertically** between joist flanges



Strap to pass through 40 * 15 mm slot directly below joist flange.

M5a Steel beam masonry above

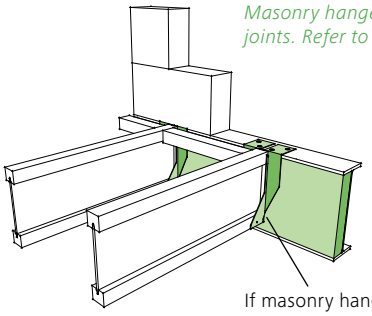
Masonry hanger embedded in mortar joints. Refer to manufacturers details.



If the masonry hanger is tight to the bottom flange of the steel and also drops lower, then no timber packer M5a is required.

M5b **Steel beam masonry above**

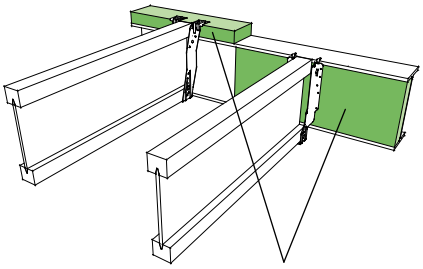
Masonry hanger embedded in mortar joints. Refer to manufacturers details.



If masonry hanger is higher than the bottom flange of the steel then a timber packer is required within the depth of the steel.

M5c **Steel beam no masonry above**

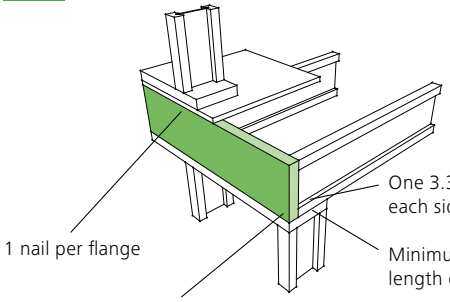
Timber hangers to face of timber packer in steel or on top mounted timber plate



Timber packers and plates to steel beam designers specification

Timber frame floor construction details

TF1 **STEICO *LVL* rim board**



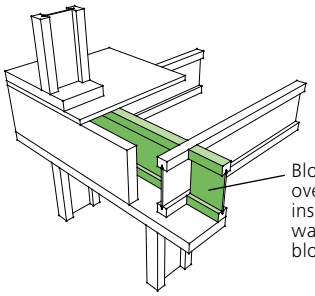
One 3.35 * 90 nail on each side of the web

1 nail per flange

Minimum joist bearing length of 45 mm

*Minimum nailing for class 1 structures to be 3.00 * 75 nails at 300 mm centers which should be applied at each interface where lateral loads are to be transferred. Refer to STA "Design Guidance on Disproportionate Collapse" for further information.*

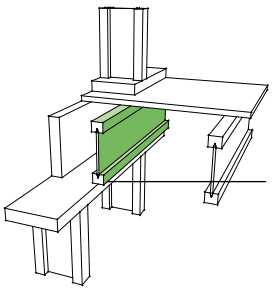
TF2 **STEICO *LVL* rim board with STEICO *joist***



Blocking may overhang the inside face of the wall by half the blocking width

*Minimum nailing for class 1 structures to be 3.00 * 75 nails at 300 mm centers which should be applied at each interface where lateral loads are to be transferred. Refer to STA "Design Guidance on Disproportionate Collapse" for further information.*

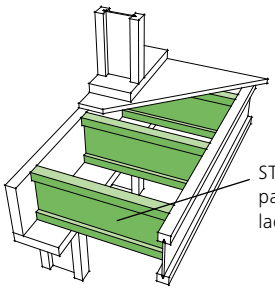
TF3a **Joists parallel to external wall**



Joist may overhang the inside face of the wall by half the blocking width

*Minimum nailing for class 1 structures to be 3.00 * 75 nails at 300 mm centers which should be applied at each interface where lateral loads are to be transferred. Refer to STA "Design Guidance on Disproportionate Collapse" for further information.*

TF3b **Joists parallel to external wall**



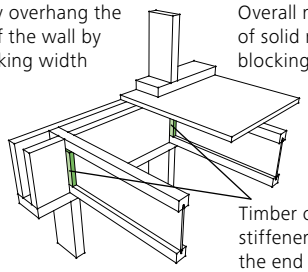
STEICO*joist* blocking panels used to form ladder detail

*Minimum nailing for class 1 structures to be 3.00 * 75 nails at 300 mm centers which should be applied at each interface where lateral loads are to be transferred. Refer to STA "Design Guidance on Disproportionate Collapse" for further information.*

TF4 Joists bearing on party walls

Blocking may overhang the inside face of the wall by half the blocking width

Overall minimum thickness of solid rimboard and blocking to be 76 mm

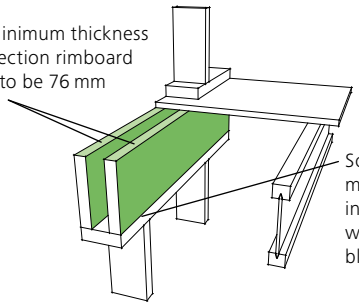


Timber or plywood web stiffeners to be fitted to the end of the I-joists

*Minimum nailing for class 1 structures to be 3.00 * 75 nails at 300 mm centers which should be applied at each interface where lateral loads are to be transferred. Refer to STA "Design Guidance on Disproportionate Collapse" for further information.*

TF5 Joists parallel to party wall

Overall minimum thickness of solid section rimboard and joist to be 76 mm

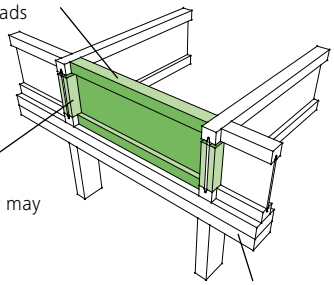


Solid section joist may overhang the inside face of the wall by half the blocking width

*Minimum nailing for class 1 structures to be 3.00 * 75 nails at 300 mm centers which should be applied at each interface where lateral loads are to be transferred. Refer to STA "Design Guidance on Disproportionate Collapse" for further information.*

TF6 Joists ending on internal wall

Blocking from STEICO*joist* or STEICO *LVL* according to transferred loads

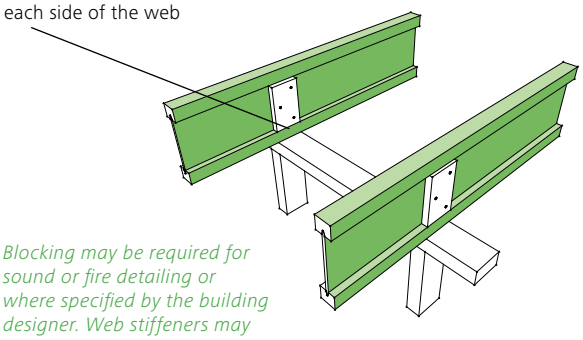


Web stiffener may be required

Load bearing internal wall

TF7 Intermediate bearing with continuous joists

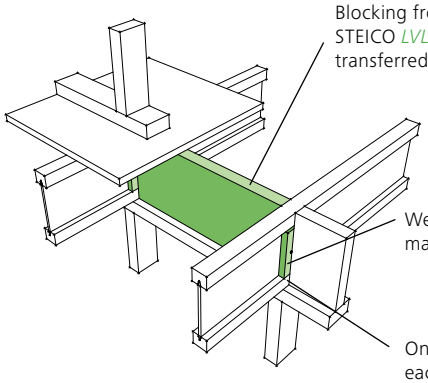
One 3.35 x 90 nail on each side of the web



Blocking may be required for sound or fire detailing or where specified by the building designer. Web stiffeners may be required by design.

TF8 Intermediate bearing with load bearing wall above

Blocking from STEICO*joist* or STEICO *LVL* according to transferred loads

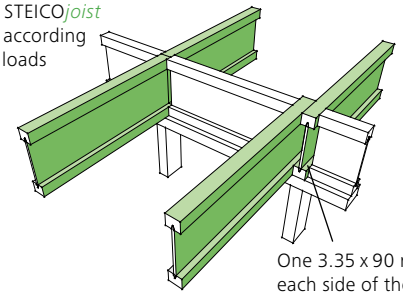


Web stiffeners may be required

One 3.35 * 90 nail on each side of the web

TF9 Discontinuous joists on intermediate bearing

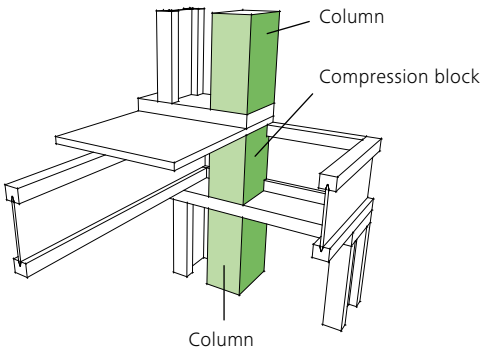
Blocking from STEICO*joist* or STEICO *LVL* according to transferred loads



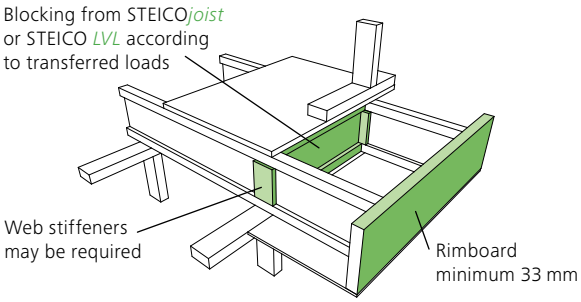
One 3.35 x 90 nail on each side of the web

Joists may be butt jointed where there is a minimum of 45 mm bearing available. If this is not possible joists are to be staggered and provided with full bearing. Web stiffeners may be required.

TF10 Transfer of high point loads

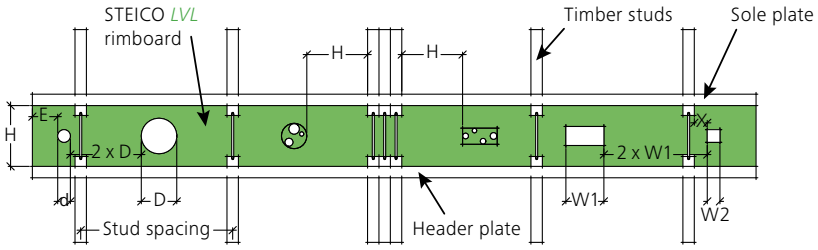


TF11 Cantilever



Care should be taken to ensure that any external areas are adequately protected aginst weathering

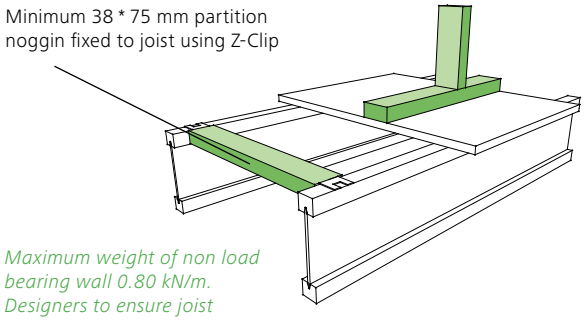
TF12 Allowable holes in STEICO *LVL X* rimboard



H = depth or rimboard / E = 2 x D for circular holes or 3 x W for rectangular holes / X = 50 mm
Maximum diameter of round holes = H less 100 mm / Maximum length of rectangular holes = Stud spacing / 2
No holes can be located within the distance H of concentrated loads from above.

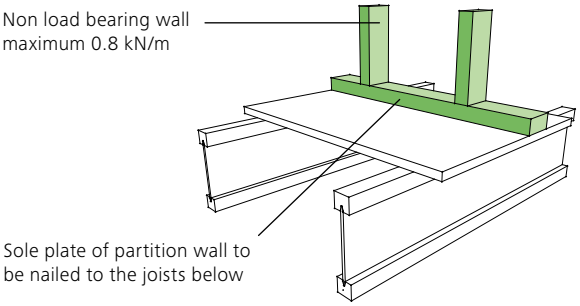
General details

G1 Non load bearing wall parallel to joists



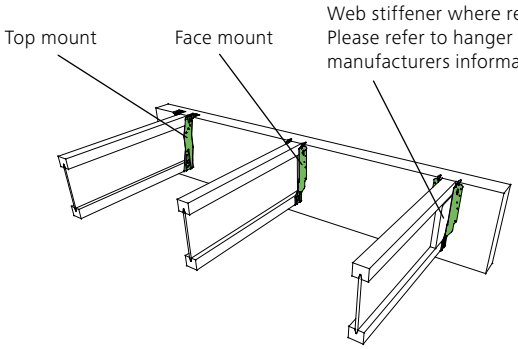
Maximum weight of non load bearing wall 0.80 kN/m. Designers to ensure joist design includes an allowance for the weight of walls above.

G2 Non load bearing wall across joists



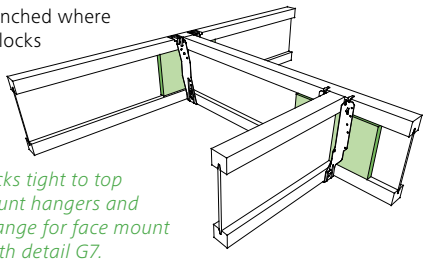
The designer is responsible for ensuring the I-joist design is adequate to support the wall.

G3 Different hanger applications



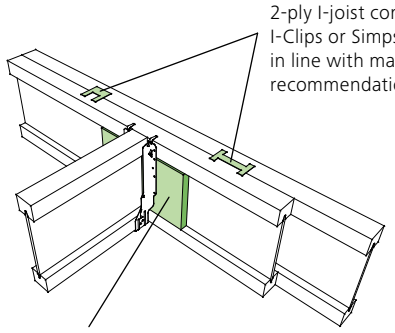
G4 STEICO*joist* to STEICO*joist* connection

Install backer blocks on both sides of STEICO*joist*. Attach with 10 no. 3.75 * 75 nails, clenched where possible. Backer blocks to be a minimum of 250 mm wide.



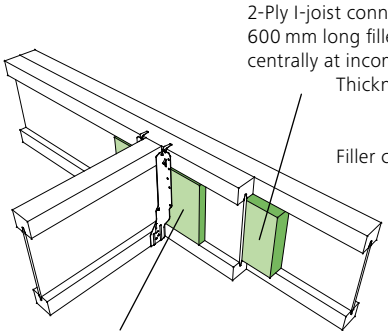
Install backer blocks tight to top flange for top mount hangers and tight to bottom flange for face mount hangers in line with detail G7. Backerless hangers are available. Please follow hanger manufacturers guidance for installation.

G5a 2-ply I-joist connection



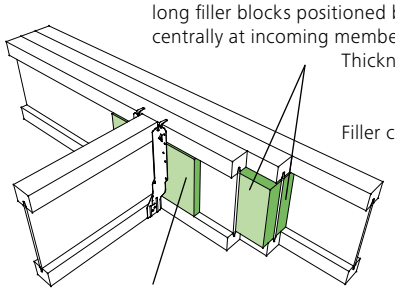
Backer blocks may be required. Backer blocks to be fitted as detail G4 and G7 or refer to hanger manufacturers details.

G5b 2-ply I-joist connection



Backer blocks may be required. Backer blocks to be fitted as detail G4 and G7 or refer to hanger manufacturers details.

G5c 3-ply I-joist connection

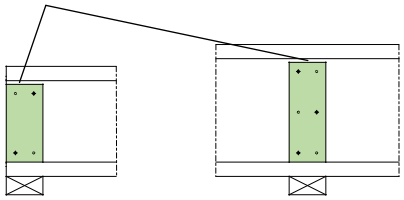


Backer blocks may be required. Backer blocks to be fitted as detail G4 and G7 or refer to hanger manufacturers details.

General details

G6 Web stiffener – end and intermediate bearing

5 - 10 mm gap
Where load comes in from above the gap should be at the bottom.



4 fixings
for joists < 300 mm
2 from each side

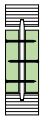
6 fixings
for joists > 300 mm
3 from each side

STEICO*joist* SJ_L45

18 mm
Ply / OSB

4.5 * 45 mm
Screws

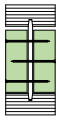
STEICO*joist* SJ_L60



25 mm
Ply / OSB

5.0 * 55 mm
Screws

STEICO*joist* SJ_L90



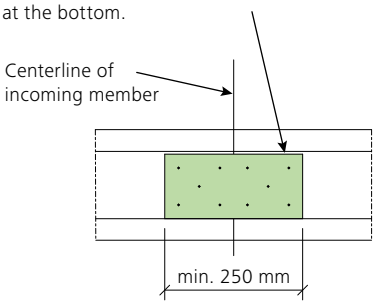
38 mm
Timber

5.5 * 80 mm
Screws

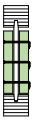
	Joist depth [mm]					
Web Stiffener	200	220	240	300	360	400
Height [mm]	115	135	155	215	275	315
Width [mm]	≥ 100					
No. of screws	4	4	4	4	6	6

G7 Backer blocks

5 -10 mm gap for face fix hangers
For top fix hangers the gap should be at the bottom.



STEICO*joist* SJ_L45

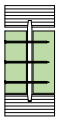


18 mm
Ply / OSB
3.75 * 75 mm
Nails

STEICO*joist* SJ_L60

25 mm
Ply / OSB
3.75 * 75 mm
Nails

STEICO*joist* SJ_L90



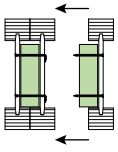
38 mm
Timber
3.75 * 75 mm
Nails

	Joist depth [mm]					
Backer Block	200	220	240	300	360	400
Height [mm]	115	135	155	215	275	315
Width [mm]	≥ 250					
No. of nails	10	10	10	10	10	10

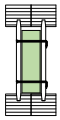
All nails should be clenched where possible

G8 Filler blocks

For 3 ply members the second filler block should be attached from the rear.

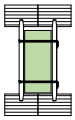


2 x STEICO*joist* SJ_L45



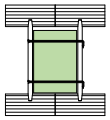
38 mm
Timber
3.75 * 75 mm
Nails

2 x STEICO*joist* SJ_L60



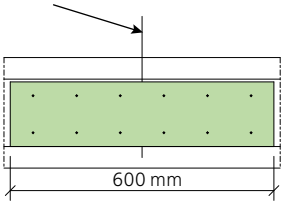
50 mm
Timber
3.75 * 75 mm
Nails

2 x STEICO*joist* SJ_L90



75 mm
(2 * 38 mm)
Timber
3.75 * 100 mm
Nails

Centerline of incoming member



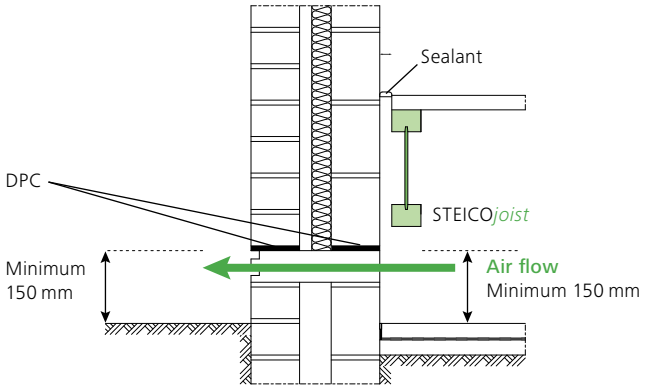
	Joist depth [mm]					
Filler Block	200	220	240	300	360	400
Height [mm]	115	135	155	215	275	315
Width [mm]	≥ 600					
No. of nails	12	12	12	12	12	12

All nails should be clenched where possible

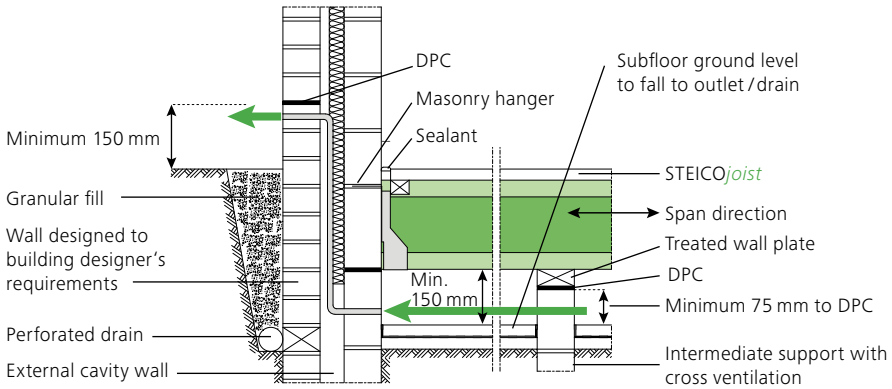
Ground floor details

Joists to be designed to service class 2

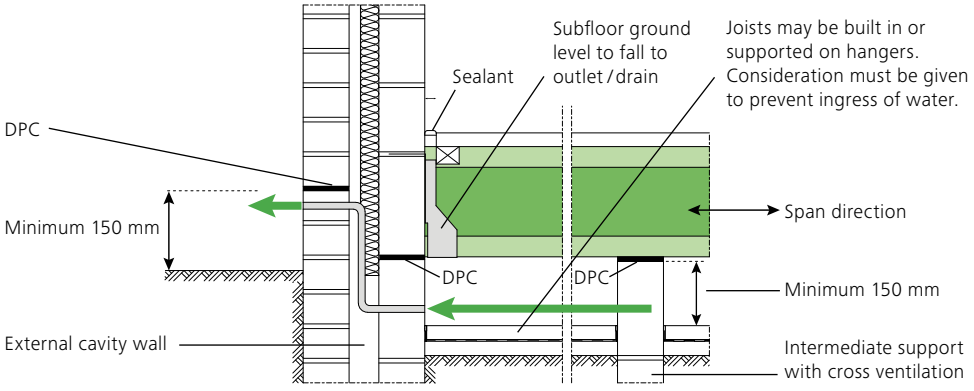
GF1 STEICO*joist* parallel to wall



GF2 STEICO*joist* bearing on external wall



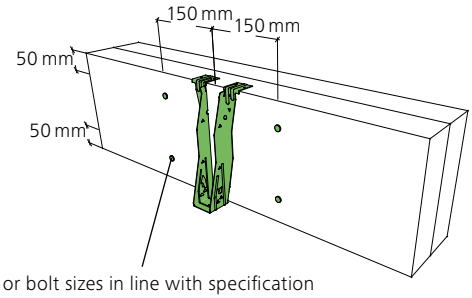
GF3 STEICO*joist* bearing on external wall



Connection

C1 Multi-ply LVL connection at point load

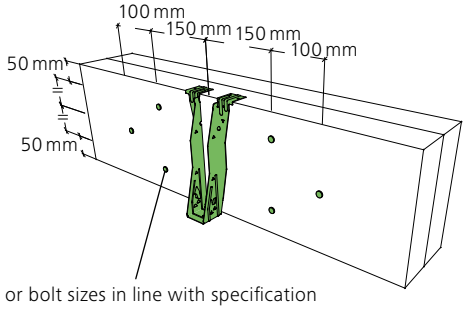
Two fixings either side of incoming load



Nail or bolt sizes in line with specification detailed in relevant STEICO Technical Bulletin

C2 Multi-ply LVL connection at point load

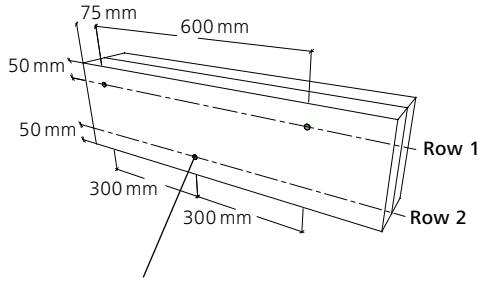
Three fixings either side of incoming load



Nail or bolt sizes in line with specification detailed in relevant STEICO Technical Bulletin

C3 Multi-ply LVL connection with uniform loading

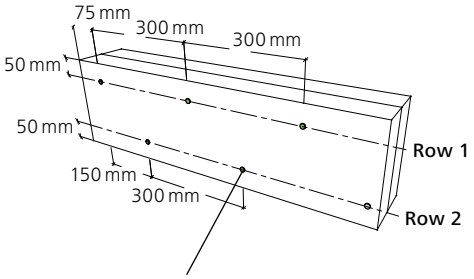
2 rows at 600 mm centers



Nail or bolt sizes in line with specification detailed in relevant STEICO Technical Bulletin

C4 Multi-ply LVL connection with uniform loading

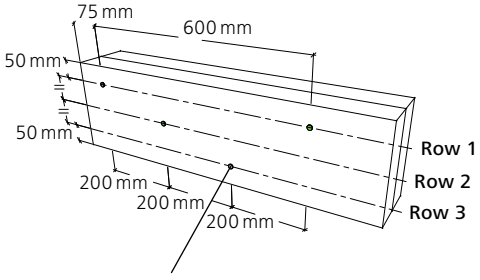
2 rows at 300 mm centers



Nail or bolt sizes in line with specification detailed in relevant STEICO Technical Bulletin

C5 Multi-ply LVL connection with uniform loading

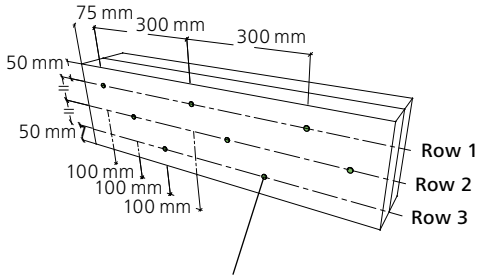
3 rows at 600 mm centers



Nail or bolt sizes in line with specification detailed in relevant STEICO Technical Bulletin

C6 Multi-ply LVL connection with uniform loading

3 rows at 300 mm centers



Nail or bolt sizes in line with specification detailed in relevant STEICO Technical Bulletin

Exact nailing/bolting specification detailed on pages 40 - 45

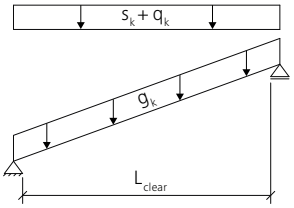
Roof applications

STEICO*joist* – Long spans where you need them.

The STEICO*joist* is lightweight, easy to install and can provide clear spanning solutions in excess of 10 m. This allows fast and efficient installation by the end user and provides highly insulated roof constructions.

High strength means long spans

The long spanning capacity of the STEICO*joist* is particularly useful in roof applications. Long rafter spans can be achieved which limit the requirement for intermediate load bearing support whilst also providing the ideal insulation zone for highly thermally efficient modern structures.



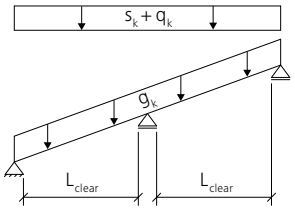
Span tables for STEICO*joist* according to BS EN 1995-1-1

Single spans

Different roof constructions require varying dead loads and pitches from 5 degrees upwards. In the tables these dead loads are summarised, with a difference made for light roofs (e.g. metal roofs) and heavier roofs (e.g. tiled roofs) and guidance on pitches between 5 degrees up to 45 degrees.

Maximum single spans L_{clear} (m) | Max. final deflection L/250 — Live load q_k = 0.60 kN/m² | Snow load s_k = 0.75 kN/m²

Type	Height h [mm]	0.5 kN/m² < g_k ≤ 0.75 kN/m²						0.75 kN/m² < g_k ≤ 1.0 kN/m²					
		α < 5°		5° ≤ α < 30°		30° ≤ α < 45°		α < 5°		5° ≤ α < 30°		30° ≤ α < 45°	
		Joist centers [mm]											
		400	600	400	600	400	600	400	600	400	600	400	600
STEICO*joist* SJ_L45	**200**	4.675	4.035	4.280	3.700	3.710	3.210	4.365	3.760	3.995	3.450	3.470	3.000
	220	5.065	4.375	4.635	4.010	4.015	3.475	4.730	4.080	4.330	3.740	3.760	3.250
	240	5.445	4.710	4.985	4.315	4.315	3.740	5.090	4.390	4.660	4.025	4.045	3.500
	300	6.530	5.650	5.975	5.175	5.170	4.485	6.100	5.270	5.585	4.830	4.845	4.195
	360	7.545	6.535	6.905	5.985	5.975	5.180	7.055	6.100	6.455	5.585	5.600	4.855
STEICO*joist* SJ_L60	**200**	5.125	4.420	4.690	4.050	4.060	3.510	4.780	4.115	4.380	3.775	3.805	3.285
	220	5.550	4.795	5.085	4.395	4.405	3.810	5.180	4.465	4.745	4.095	4.125	3.560
	240	5.965	5.150	5.460	4.720	4.730	4.095	5.570	4.800	5.100	4.400	4.430	3.830
	300	7.145	6.180	6.540	5.660	5.660	4.905	6.675	5.760	6.110	5.280	5.305	4.590
	360	8.250	7.140	7.545	6.535	6.535	5.665	7.710	6.660	7.055	6.100	6.125	5.305
	400	8.955	7.750	8.190	7.095	7.090	6.150	8.370	7.235	7.660	6.625	6.645	5.755
STEICO*joist* SJ_L90	**200**	5.830	5.020	5.340	4.605	4.630	4.000	5.435	4.670	4.980	4.285	4.330	3.735
	220	6.315	5.445	5.785	4.995	5.015	4.335	5.890	5.065	5.395	4.645	4.690	4.045
	240	6.785	5.850	6.215	5.365	5.385	4.655	6.330	5.445	5.800	4.995	5.040	4.350
	300	8.120	7.010	7.435	6.425	6.440	5.575	7.580	6.530	6.940	5.990	6.030	5.210
	360	9.365	8.095	8.570	7.415	7.425	6.430	8.750	7.545	8.010	6.915	6.955	6.015
	400	10.160	8.785	9.295	8.045	8.050	6.975	9.490	8.195	8.690	7.510	7.545	6.525



Span tables for STEICO*joist* according to BS EN 1995-1-1

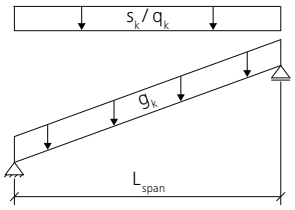
Double spans

Maximum double spans with mid span support L_{clear} (m) | Max. final deflection L/250 Live load q_k = 0.60 kN/m² | Snow load s_k = 0.75 kN/m²

Type	Height h [mm]	0.5 kN/m² < g_k ≤ 0.75 kN/m²						0.75 kN/m² < g_k ≤ 1.0 kN/m²					
		α < 5°		5° ≤ α < 30°		30° ≤ α < 45°		α < 5°		5° ≤ α < 30°		30° ≤ α < 45°	
		Joist centers [mm]											
		400	600	400	600	400	600	400	600	400	600	400	600
STEICO*joist* SJ$_L$45	200	5.715	4.980	5.200	4.535	4.535	3.955	5.365	4.570	4.880	4.255	4.260	3.710
	220	6.180	5.390	5.625	4.905	4.910	4.280	5.800	4.975	5.280	4.605	4.610	4.015
	240	6.640	5.790	6.045	5.270	5.275	4.600	6.235	5.370	5.675	4.950	4.950	4.320
	300	7.940	6.930	7.230	6.305	6.310	5.505	7.455	6.220	6.790	5.920	5.925	5.180
	360	9.165	8.000	8.345	7.280	7.285	6.355	8.605	6.645	7.835	6.570	6.840	5.965
STEICO*joist* SJ$_L$60	200	6.285	5.480	5.720	4.990	4.990	4.350	5.900	4.800	5.370	4.685	4.685	4.085
	220	6.800	5.930	6.190	5.400	5.400	4.710	6.385	5.220	5.810	5.070	5.070	4.420
	240	7.295	6.365	6.640	5.795	5.795	5.055	6.850	5.630	6.235	5.440	5.440	4.745
	300	8.715	7.605	7.935	6.925	6.920	6.040	8.185	6.500	7.450	6.435	6.505	5.675
	360	10.040	8.765	9.140	7.980	7.985	6.965	9.435	6.915	8.590	6.840	7.500	6.540
	400	10.890	9.330	9.920	8.655	8.660	7.555	10.230	7.165	9.315	7.080	8.130	6.980
STEICO*joist* SJ$_L$90	200	7.190	6.275	6.545	5.710	5.710	4.980	6.750	5.155	6.145	5.115	5.365	4.675
	220	7.775	6.785	7.080	6.175	6.180	5.390	7.300	5.600	6.650	5.555	5.800	5.060
	240	8.340	7.280	7.595	6.625	6.630	5.785	7.835	6.030	7.130	5.980	6.225	5.430
	300	9.950	8.685	9.060	7.905	7.910	6.900	9.345	6.940	8.510	6.875	7.425	6.480
	360	11.455	9.600	10.430	9.100	9.105	7.945	10.725	7.350	9.795	7.275	8.550	7.180
	400	12.410	9.910	11.300	9.825	9.865	8.605	11.070	7.600	10.610	7.515	9.265	7.410

NOTES

- These tables serve as a guide only and do not replace independent structural calculations prepared by a qualified structural engineer.
- Please pay special attention to the bearing conditions.
- Do not use these tables to calculate point or irregular loads.
- Spans indicated are horizontal clear span between supports.
- Calculations are based on EC5.
- Lateral bracing is required to the flange at a spacing not exceeding ten times the flange width.
- q_k = Characteristic imposed loads, vertical on plan. Imposed loads are from BS6399-3 clause 4.3.2 for small buildings.
- g_k = Characteristic dead loads, vertical, along joist length. Dead loads will vary for differing roof finishes and manufacturers technical literature should be consulted to ensure adequate allowance is made when assessing the design dead load.
- Span tables are for roof joists under service class 2 conditions only and assume continuous lateral restraint is provided to the top flange from either tiling battens combined with suitable diagonal bracing or from a sheathing board. Where load reversal due to wind uplift is probable, suitable restraint from sheathing of plasterboard must be provided to the bottom flange.
- Values are only applicable to STEICO*joist* with LVL flange and fibreboard web.



Load tables for STEICO *LVL R* beams – roofs

UDL – Uniformly Distributed Loads

Beam span [m] L_{span}	Maximum total unfactored uniformly distributed load (kN/m) on STEICO *LVL R* roof beams under short-term loading in service class 2 conditions											
	h = 200 mm				h = 220 mm				h = 240 mm			
	w [mm]				w [mm]				w [mm]			
	39	45	75	90	39	45	75	90	39	45	75	90
3.0	2.50	2.88	4.81	5.77	3.27	3.78	6.30	7.55	4.17	4.82	8.06	9.63
3.5	1.60	1.84	3.07	3.68	2.10	2.43	4.05	4.86	2.70	3.12	5.21	6.23
4.0	1.07	1.24	2.06	2.47	1.42	1.64	2.73	3.28	1.83	2.11	3.53	4.23
4.5	0.75	0.86	1.44	1.73	1.00	1.15	1.92	2.30	1.29	1.49	2.49	2.98
5.0	0.54	0.62	1.03	1.24	0.72	0.83	1.39	1.66	0.94	1.08	1.81	2.17
5.5	-	-	0.76	0.91	0.53	0.62	1.03	1.23	0.70	0.80	1.34	1.61
6.0	-	-	0.57	0.68	-	-	0.77	0.93	0.53	0.61	1.02	1.22
6.5	-	-	-	-	-	-	0.59	0.71	-	-	0.78	0.94
7.0	-	-	-	-	-	-	-	0.55	-	-	0.61	0.73

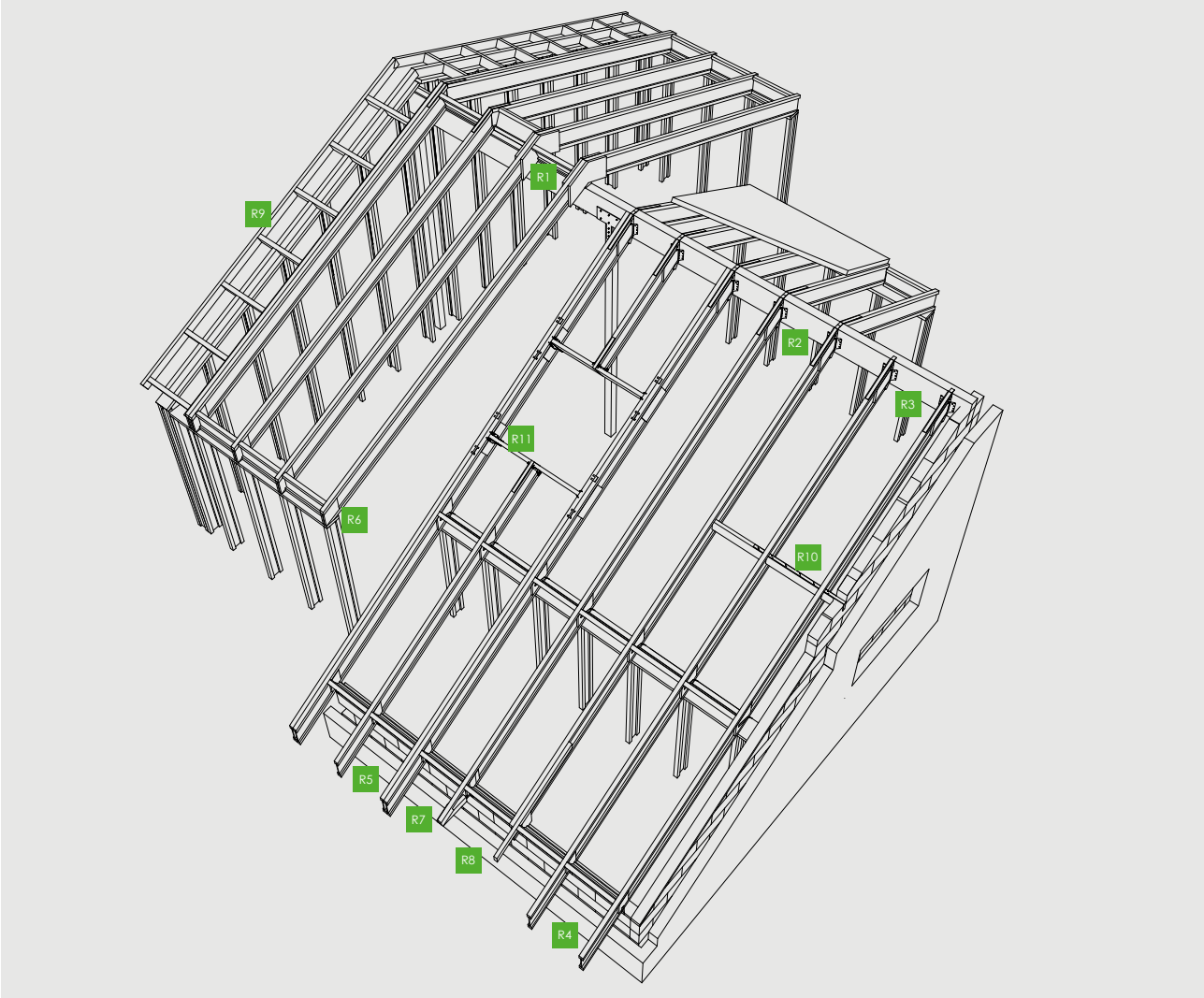
Beam span [m] L_{span}	Maximum total unfactored uniformly distributed load (kN/m) on STEICO *LVL R* roof beams under short-term loading in service class 2 conditions											
	h = 300 mm				h = 360 mm				h = 400 mm			
	w [mm]				w [mm]				w [mm]			
	39	45	75	90	39	45	75	90	39	45	75	90
3.0	7.32	8.44	14.07	16.89	7.30	8.43	14.05	16.85	7.29	8.42	14.03	16.83
3.5	5.04	5.81	9.69	11.63	6.25	7.21	12.02	14.42	6.24	7.20	12.00	14.40
4.0	3.47	4.00	6.67	8.01	5.46	6.30	10.49	12.59	5.45	6.29	10.48	12.57
4.5	2.48	2.86	4.76	5.71	4.15	4.78	7.97	9.57	4.83	5.58	9.29	11.15
5.0	1.82	2.10	3.50	4.20	3.08	3.55	5.91	7.10	4.14	4.77	7.96	9.55
5.5	1.37	1.58	2.63	3.16	2.33	2.69	4.49	5.39	3.16	3.64	6.07	7.28
6.0	1.05	1.21	2.02	2.42	1.81	2.08	3.47	4.17	2.45	2.83	4.72	5.66
6.5	0.82	0.94	1.57	1.89	1.42	1.64	2.73	3.27	1.94	2.24	3.73	4.47
7.0	0.65	0.74	1.24	1.49	1.13	1.30	2.17	2.61	1.55	1.79	2.98	3.58
7.5	0.51	0.59	0.99	1.19	0.91	1.05	1.75	2.10	1.26	1.45	2.41	2.90
8.0	-	-	0.80	0.96	0.74	0.85	1.42	1.71	1.03	1.18	1.97	2.37

For worked examples please see page 19.

NOTES

- The load table is for single-span principal STEICO *LVL R* roof beams which are not part of any load-sharing mechanism (i.e. k_{sys} = 1.0)
- Beam spans quoted are 'engineering spans' measured between centres of support lengths.
- Beam spans assume supports of minimum length 45 mm.
- The uniformly distributed loads in the table are unfactored loads and can be compared with the sum of the characteristic permanent (dead) load and the characteristic value of either a snow load (as per NA to BS EN 1991-1-3) or a roof imposed load for normal maintenance/repair (as per NA to BS EN 1991-1-1, NA.2.10) acting on the beam being designed.
- In determination of the characteristic permanent (dead) load, the self-weight of the STEICO *LVL R* beam need not be included as it has already been allowed for in the load table calculations.
- The permanent (dead) load shall not exceed 60 % of the total unfactored load.
- The tabulated loads are based on limiting the final (i.e. with creep) deflection to 0.004 times the span (as per UK NA to BS EN 1995-1-1).
- It is assumed that the STEICO *LVL R* beam has effective lateral restraint at its supports and effective lateral restraint to its compression edge at a maximum of 600 mm spacing.
- The bearing capacity of the supporting material or wallplate has NOT been verified.
- For conditions not shown in table, use STEICO*kalc* software or consult your STEICO distributor.

Roof construction details



The following pages (35 - 37) utilise STEICO*joist* and STEICO *LVL* incorporated in generic roofing construction details which comply fully with all relevant UK Building Standards. Where alternative detailing is required then clarification for its suitability for use should be sought from STEICO UK Ltd.

NOTES

Bearing lengths:

- A minimum end bearing of 45 mm is required
- Intermediate bearing minimum 75 mm

Fastening:

- STEICO*joist* to be nailed to head plates using a minimum of 2 No. 3.35 * 90 ring shank nails, located a minimum of 38 mm from the end of the joist. Nails may need to be skewed slightly to avoid splitting the bearing plate. For roofs pitched > 25 degrees, lateral forces may be significant and additional fixings to prevent roof spread may be required.
- Typical details shown are for guidance only and should be used in conjunction with the recommendations and requirements of the STA, British Standards, NHBC, Robust Details Ltd., Building regulations and all other statutory bodies.

Web stiffeners:

- Web stiffeners are required for birdsmouth cuts and should be independently verified by a suitably qualified structural engineer.
- Web stiffeners should be applied where the sides of the hanger do not laterally support the top flange of the joist.

Blocking:

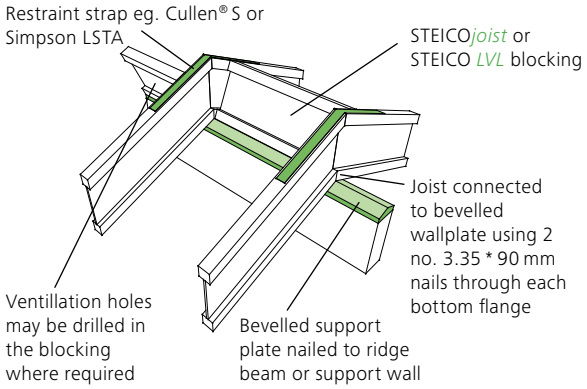
- Blocking to provide lateral restraint must be installed at bearings. Blocking can be from EWP such as STEICO *LVL* or STEICO*joist*.

Cantilevers:

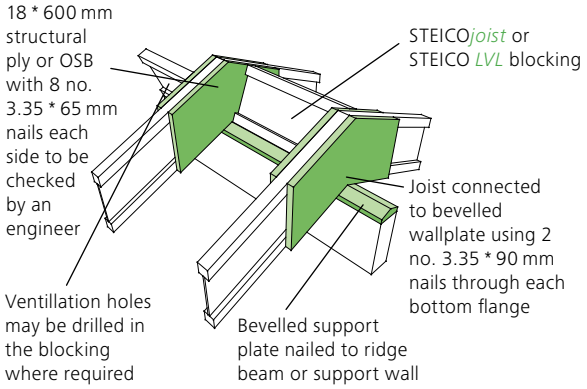
- Cantilevers should be restricted to a maximum of 750 mm past the centre of the bearing to the end of the joist. Ensure that blocking is installed at the bearing and that the top and bottom flanges are restrained by sheathing.

Roof construction details

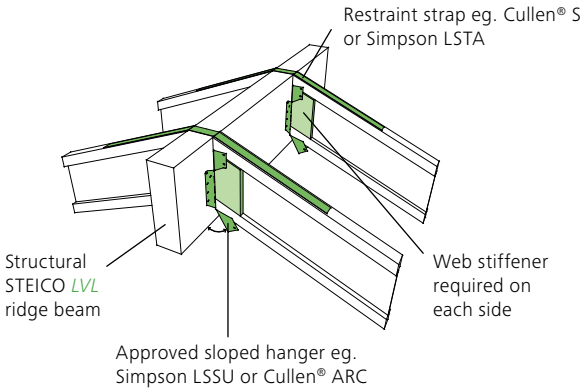
R1a Ridge beam with bevelled plate



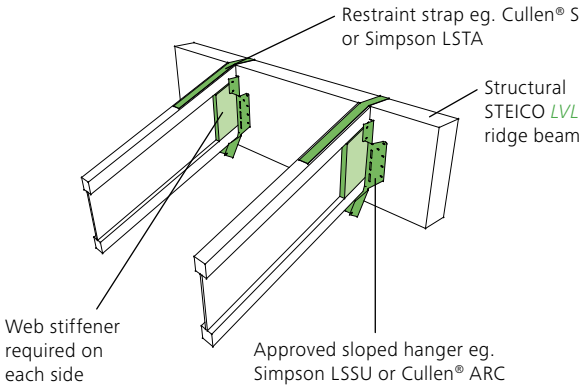
R1b Ridge beam with bevelled plate



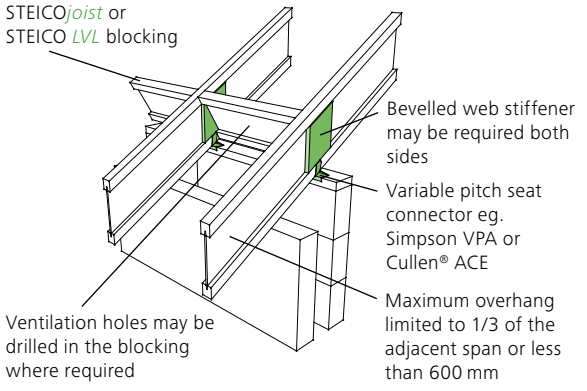
R2 Ridge beam with sloped hangers



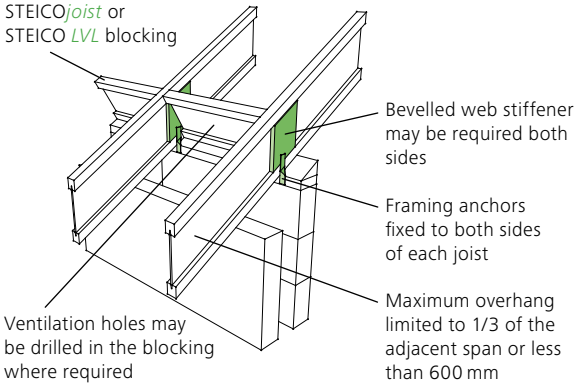
R3 Mono pitched ridge beam with sloped hangers



R4a Adjustable hanger at eaves

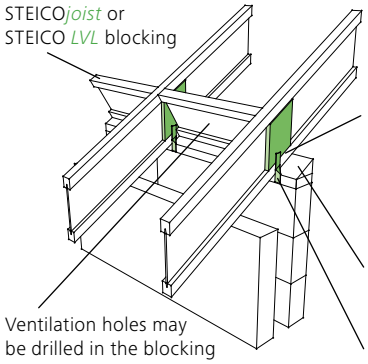


R4b Bevelled wallplate at eaves

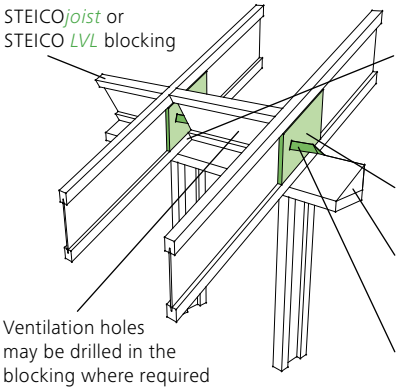


Roof construction details

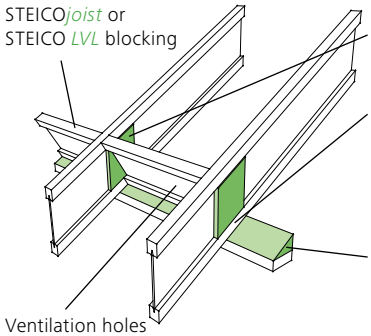
R4c Bevelled wallplate at eaves



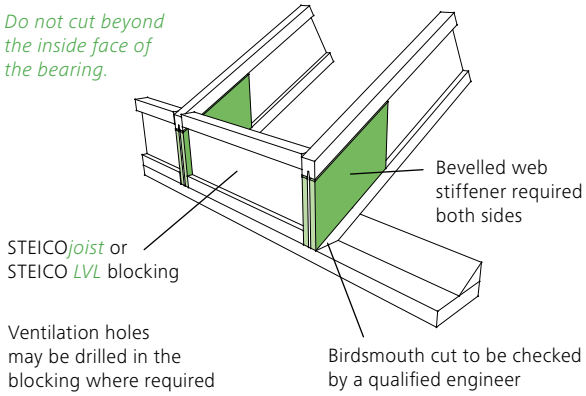
R5a Bevelled wallplate at eaves



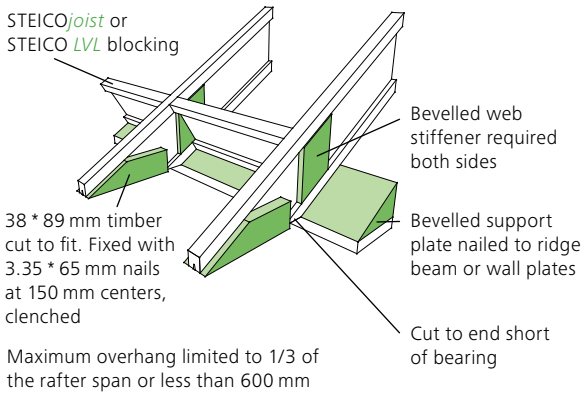
R5b Bevelled wallplate at eaves



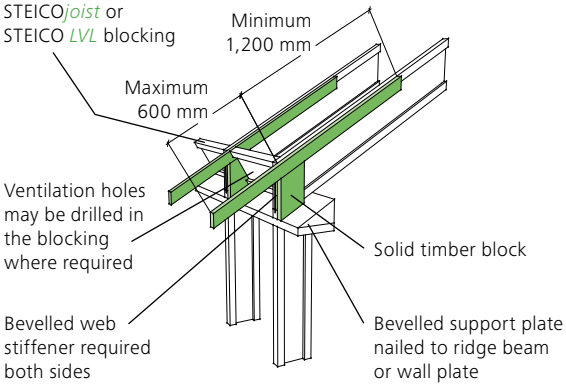
R6 Birdsmouth cut at eaves



R7 STEICO*joist* cut to form eaves

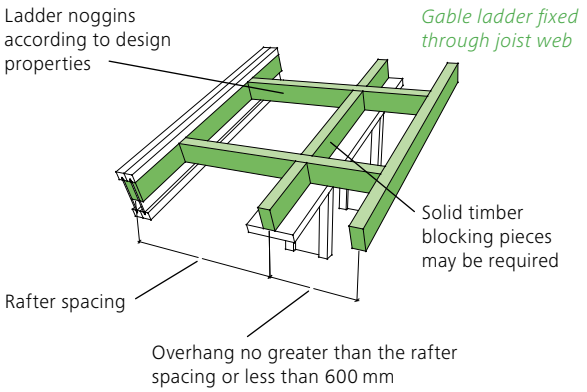


R8 Site fitted overhangs

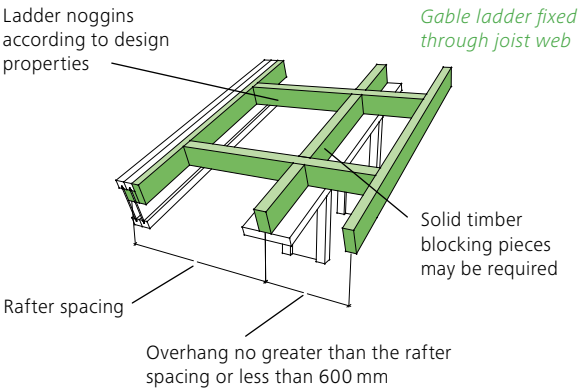


Roof construction details

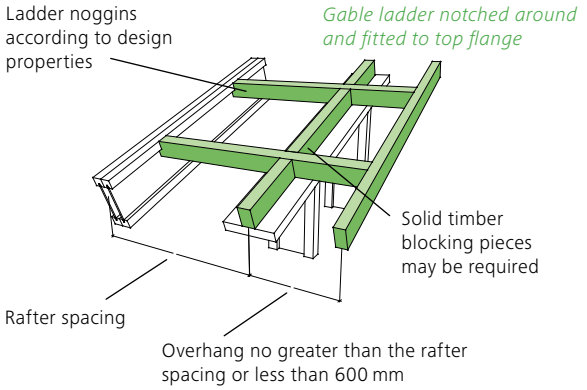
R9a Gable ladder



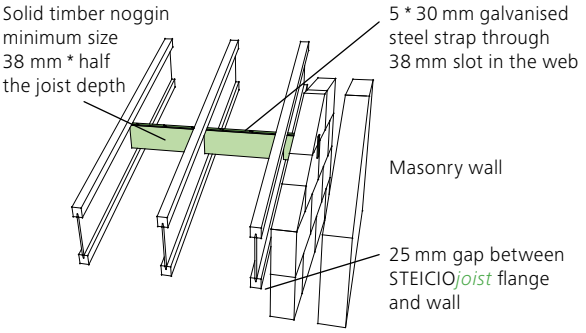
R9b Gable ladder



R9c Gable ladder

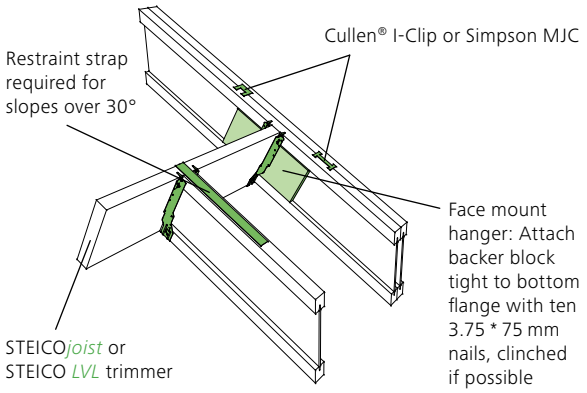


R10 Restraint strap



Do not cut the flange. Restraint strap from an approved connector supplier. Install as per manufacturers instructions.

R11 Hanger applications



STEICO *LVL R* multi-ply fixing

Dimensional stability, strength and load bearing capacity

For high load carrying applications, where a single ply STEICO *LVL R* member may not be sufficient or available, it is possible to connect multiple members in order to provide a robust structural solution.

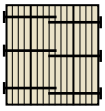
This document gives guidance on connecting together 2-ply or 3-ply STEICO *LVL R* members to ensure that they act as an integral unit capable of resisting loading transmitted from an outer ply. More specifically, for a range of connection specifications joining the LVL plies, the document gives maximum values of either uniformly distributed load or concentrated load (e.g. reaction of a trimmer joist onto a trimming joist) that can act on either ply.

These loads are unfactored loads and can be compared with the sum of the characteristic permanent (dead) load and the characteristic variable load (e.g. the floor imposed loads given in the NA to BS EN 1991-1-1) acting on the beam being designed.

These loads apply under the following conditions:

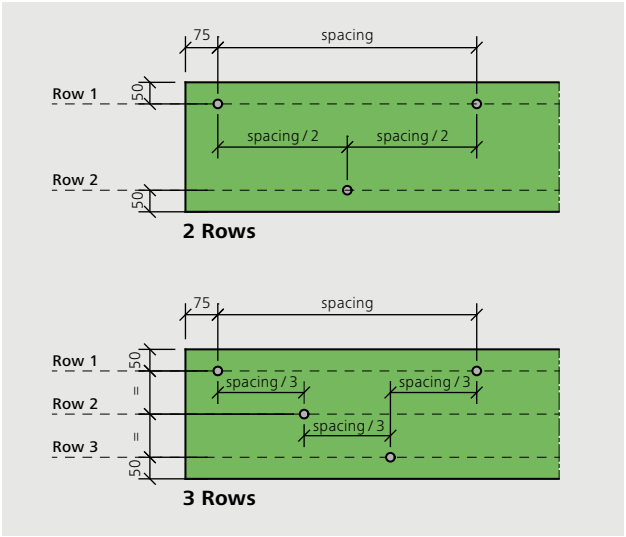
1. The permanent load does not exceed 75 % of the total load.
2. The duration of load is medium-term as defined in EN1995-1-1 (though the loads can conservatively be used for shorter load terms).
3. The member is located in either service class 1 or service class 2 environments.
4. It has been assumed that all loading on the multi-ply member is acting on one of its outer plies.

The maximum loads that can act on the outer plies of multi-ply members have been determined in the following guidance document for the following combinations of fastener type and number of plies:

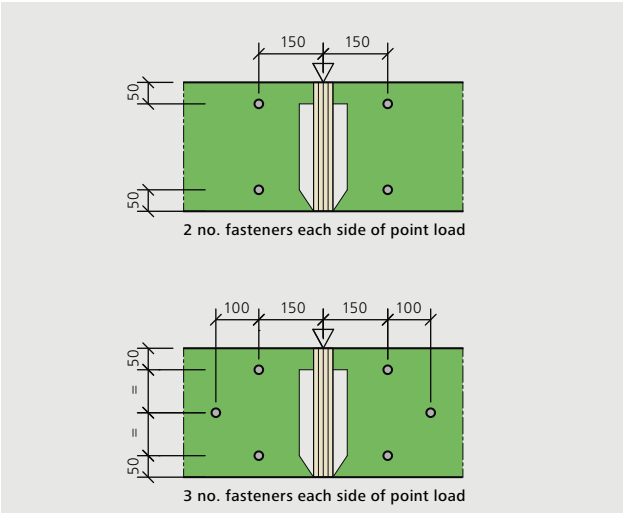
1. 2-ply member joined by nails all inserted from one side
2.  3-ply member joined by nails inserted with the same pattern from both sides but with the nail pattern on one side staggered by a half-spacing or third-spacing from the nail pattern on the opposite side.
3. 2-ply or 3-ply members joined together by bolts

All fixings detailed in the guidance are manufacturer generic. For specific requirements for either Simpson or Cullen ITW screws the manufacturers guidance should be followed.

Layout of fasteners for multi-ply members resisting uniformly distributed loading.
It should be noted that the spacing referred to is the spacing between fasteners within the same row.



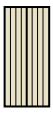
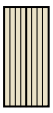
Layout of fasteners for multi-ply members resisting a concentrated load.



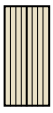
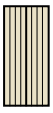
Connecting a 2-ply STEICO *LVL R* with nails

The maximum loads in the table below are based on all the nails being inserted from one side of the multi-ply member.

Maximum total (i.e. permanent + variable) unfactored uniformly distributed load (kN/m) that can be applied to either outer ply

Total beam width [mm]		**78**			**90**		
STEICO *LVL R* – thickness [mm]		**2*39**			**2*45**		
							
Fastener type		Nail	Nail	Nail	Nail	Nail	Nail
Fastener size		3.1 * 75	3.75*75	4.0*75	3.1*90	3.75*90	4.0*90
2 rows	300 c/c	5.55	7.48	8.28	5.57	7.62	8.48
	600 c/c	2.77	3.74	4.14	2.78	3.81	4.24
3 rows	300 c/c	8.32	11.22	12.42	8.35	11.43	12.72
	600 c/c	4.16	5.61	6.21	4.18	5.72	6.36

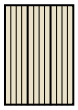
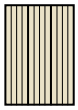
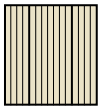
Maximum total (i.e. permanent + variable) unfactored concentrated load (kN) that can be applied to either outer ply

Total beam width [mm]	**78**			**90**		
STEICO *LVL R* – thickness [mm]	**2*39**			**2*45**		
						
Fastener type	Nail	Nail	Nail	Nail	Nail	Nail
Fastener size	3.1*75	3.75*75	4.0*75	3.1*90	3.75*90	4.0*90
2 no. nails each side of point load	3.33	4.49	4.97	3.34	4.57	5.09
3 no. nails each side of point load	4.99	6.73	7.45	5.01	6.86	7.63

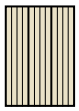
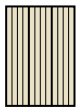
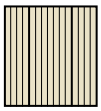
Connecting a 3-ply STEICO *LVL R* with nails

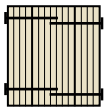
The maximum loads in the tables below are based on the same pattern of nails being inserted into both sides of the multi-ply member. The nailing patterns on opposite sides of the multi-ply member should be staggered from one another by a half-spacing (for 2 rows of nails) or a third-spacing (for 3 rows of nails).

Maximum total (i.e. permanent + variable) unfactored uniformly distributed load (kN/m) that can be applied to either outer ply

Total beam width [mm]		**117**			**135**			**180**		
STEICO *LVL R* – thickness [mm]		**3x39**			**3x45**			**45+90+45**		
										
Fastener type		**Nail**	**Nail**	**Nail**	**Nail**	**Nail**	**Nail**	**Nail**	**Nail**	**Nail**
Fastener size		**3.1x75**	**3.75x75**	**4.0x75**	**3.1x90**	**3.75x90**	**4.0x90**	**3.1x90**	**3.75x90**	**4.0x90**
2 rows	300 c/c	4.16	5.61	6.21	4.18	5.72	6.36	3.70	5.07	5.64
	600 c/c	2.08	2.80	3.11	2.09	2.86	3.18	1.85	2.53	2.82
3 rows	300 c/c	6.24	8.41	9.32	6.26	8.58	9.54	5.55	7.60	8.46
	600 c/c	3.12	4.21	4.66	3.13	4.29	4.77	2.78	3.80	4.23

Maximum total (i.e. permanent + variable) unfactored concentrated load (kN) that can be applied to either outer ply

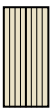
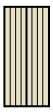
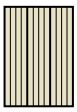
Total beam width [mm]	**117**			**135**			**180**		
STEICO *LVL R* – thickness [mm]	**3x39**			**3x45**			**45+90+45**		
									
Fastener type	**Nail**	**Nail**	**Nail**	**Nail**	**Nail**	**Nail**	**Nail**	**Nail**	**Nail**
Fastener size	**3.1x75**	**3.75x75**	**4.0x75**	**3.1x90**	**3.75x90**	**4.0x90**	**3.1x90**	**3.75x90**	**4.0x90**
2 no. nails each side of point load	2.50	3.37	3.73	2.51	3.43	3.82	2.22	3.04	3.38
3 no. nails each side of point load	3.74	5.05	5.59	3.76	5.15	5.72	3.33	4.56	5.08



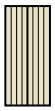
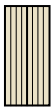
For 3 ply members the nailing pattern should be from both sides as shown.

Connecting a 2 or 3-ply STEICO *LVL R* with bolts

Maximum total (i.e. permanent + variable) unfactored uniformly distributed load (kN/m) that can be applied to either outer ply

Total beam width [mm]		150	180	225
STEICO *LVL R* – thickness [mm]		2x75	2x90	3*75
				
Fastener type		Bolt	Bolt	Bolt
Fastener size		M12	M12	M12
2 rows	300 c/c	45.41	45.41	34.05
	600 c/c	22.70	22.70	17.03
3 rows	300 c/c	68.11	68.11	51.08
	600 c/c	34.05	34.05	25.54

Maximum total (i.e. permanent + variable) unfactored concentrated load (kN) that can be applied to either outer ply

Total beam width [mm]	150	180	225
STEICO *LVL R* – thickness [mm]	2x75	2x90	3*75
			
Fastener type	Bolt	Bolt	Bolt
Fastener size	M12	M12	M12
2 no. bolts each side of point load	27.24	27.24	20.43
3 no. bolts each side of point load	40.87	40.87	30.65

Additional comments

The above guidance is based on 2 and 3-ply members of the same thickness. The values can also be used for 2 and 3-ply members of mixed product. The designer should ensure that where this is done that the fixing length is amended to ensure that the fixing is fully embedded within the member and does not penetrate the rear face. When using the table values for 2 and 3-ply members with mixed thicknesses the designer should use the values as detailed below:

Ply combination	Member thickness [mm]	min. Fixing length [mm]	Ply option when Nailing[1]	Ply option when bolting[2]
39 + 45	84	75	39 / 39	-
39 + 75	114	75	39 / 39	-
39 + 90	129	75	39 / 39	-
45 + 75	120	90	45 / 45	-
45 + 90	135	90	45 / 45	-
75 + 90	165	-	-	75 / 75
39 + 45 + 39	123	90	39 / 39 / 39	-
39 + 75 + 39	153	90	45 / 90 / 45	-
39 + 90 + 39	168	90	45 / 90 / 45	-
45 + 39 + 45	129	90	39 / 39 / 39	-
39 + 75 + 45	159	90	45 / 90 / 45	-
39 + 90 + 75	174	-	-	75 / 75 / 75
45 + 75 + 45	165	90	45 / 90 / 45	-
75 + 45 + 75	195	-	-	75 / 75 / 75
75 + 45 + 90	210	-	-	75 / 75 / 75
90 + 45 + 90	225	-	-	75 / 75 / 75

[1] For mixed ply nailing use a reduction factor of 0.71. | [2] For mixed ply bolting use a reduction factor of 0.59.

Worked example 1

The following process should be followed in order to ensure that the correct fixing detail is specified depending on application.

Example 1

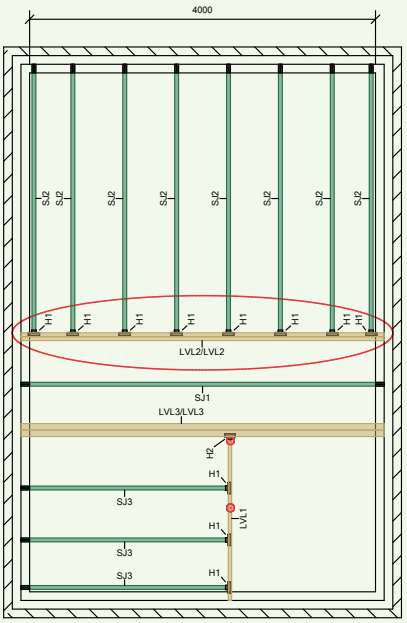
Uniformly loaded beam LVL2/LVL2.

Specification:
2-ply 45 mm STEICO *LVL R* @ 4200 mm

The unfactored uniformly distributed load along the beam is calculated as follows:
Sum of transfer load reactions/beam length

Using the tooltip view of the calcs for the member (shown below) add the values shown in the transf. column. In this case there are 2 values as there are 2 bearings:
8.819 kN + 8.819 kN = 17.638
17.638/4.2 m = 4.2 kN/m

This value can be compared with the relevant table as shown below:



Design Passed
Label: LVL/LVL
Engineering ID: 14
Product: STEICO LVL R - 45x240mm * 2

	Utilisation	Existing Value (d)	Allowed Value (d)	Location	Bearing	Min. Bearing	Combination	Duration	Char. Strength	γM	kSys	kmod	Transf. (k)	WS
Shear ULS	0.246	10.872 kN	44.160 kN	100 mm	-	-	γgG+γqQ	Medium Term	66.240 kN	1.2	1	0.80	-	-
Shear (conc.) ULS	0.145	6.399 kN	44.160 kN	100 mm	-	-	γgG+γqQconc	Medium Term	66.240 kN	1.2	1	0.80	-	-
Moment (+) ULS	0.478	12.523 kNm	26.207 kNm	2,101 mm	-	-	γgG+γqQ	Medium Term	39.310 kNm	1.2	1	0.80	-	-
Moment (+) (conc.) ULS	0.273	7.146 kNm	26.207 kNm	2,101 mm	-	-	γgG+γqQconc	Medium Term	39.310 kNm	1.2	1	0.80	-	-
Bearing (1) ULS	0.218	12.761 kN	58.500 kN	0 mm	100 mm	30 mm	γgG+γqQ	Medium Term	87.750 kN	1.2	1	0.80	8.819 kN	No
Bearing (2) ULS	0.218	12.761 kN	58.497 kN	4,100 mm	100 mm	30 mm	γgG+γqQ	Medium Term	87.746 kN	1.2	1	0.80	8.819 kN	No
Bearing (conc.) (1) ULS	0.123	7.205 kN	58.500 kN	0 mm	100 mm	30 mm	γgG+γqQconc	Medium Term	87.750 kN	1.2	1	0.80	-	No
Bearing (conc.) (2) ULS	0.123	7.205 kN	58.497 kN	4,100 mm	100 mm	30 mm	γgG+γqQconc	Medium Term	87.746 kN	1.2	1	0.80	-	No
Inst. Deflection SLS	0.900	10.795 mm	12.000 mm	2,100 mm	-	-	G+Q	-	-	-	-	-	-	-
Final Deflection SLS	0.889	14.338 mm	16.120 mm	2,100 mm	-	-	G+Q	-	-	-	-	-	-	-

Max total unfactored uniform load on member = 4.2 kN/m.
Therefore any of the fixing patterns highlighted in **red** can be used.

Total beam width [mm]		78			90		
STEICO *LVL R* – thickness [mm]		2*39			2*45		
							
Fastener type		Nail	Nail	Nail	Nail	Nail	Nail
Fastener size		3.1*75	3.75*75	4.0*75	3.1*90	3.75*90	4.0*90
2 rows	300 c/c	5.55	7.48	8.28	5.57	7.62	8.48
	600 c/c	2.77	3.74	4.14	2.78	3.81	4.24
3 rows	300 c/c	8.32	11.22	12.42	8.35	11.43	12.72
	600 c/c	4.16	5.61	6.21	4.18	5.72	6.36

Worked example 2

The following process should be followed in order to ensure that the correct fixing detail is specified depending on application.

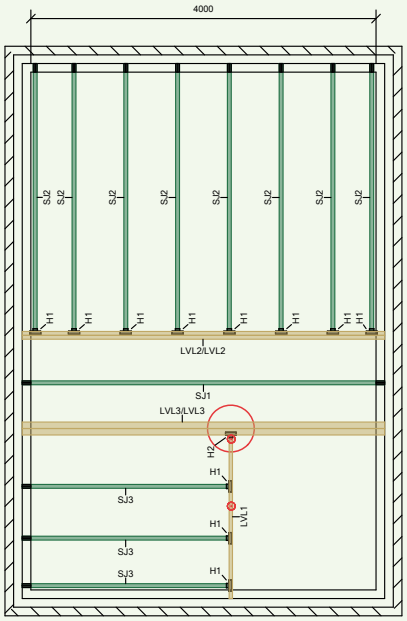
Example 2

Concentrated load on beam LVL3/LVL3.

Specification:
2-ply 75 mm STEICO *LVL R* @ 4200 mm

The unfactored concentrated load at the connection is calculated as follows:
Select the incoming member LVL1 and establish the end reaction from the transf. column. in the tooltip. (shown below)

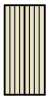
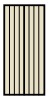
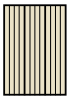
When the member is selected the arrow highlighted points from bearing 1 to bearing 2. The relevant reaction is therefore at bearing 2.



Design Passed
Engineering ID: 13
Product: STEICO LVL R - 39x240mm
End Hanger: UH-39-235

	Utilisation	Existing Value (d)	Allowed Value (d)	Location	Bearing	Min. Bearing	Combination	Duration	Char. Strength	γM	ksys	kmod	Transf. (k)	WS	BB
Shear ULS	0.208	3.975 kN	19.136 kN	1,621 mm	-	-	ygG+yqQ1+yqψ0Q2	Medium Term	28.704 kN	1.2	1	0.80	-	-	-
Shear (conc.) ULS	0.246	4.713 kN	19.136 kN	1,638 mm	-	-	ygG+yqQconc+yqψ0Q2	Medium Term	28.704 kN	1.2	1	0.80	-	-	-
Moment (+) ULS	0.231	2.621 kNm	11.356 kNm	1,070 mm	-	-	ygG+yqQ1+yqψ0Q2	Medium Term	17.034 kNm	1.2	1	0.80	-	-	-
Moment (+) (conc.) ULS	0.253	2.873 kNm	11.356 kNm	1,070 mm	-	-	ygG+yqQconc+yqψ0Q2	Medium Term	17.034 kNm	1.2	1	0.80	-	-	-
Bearing (1) ULS	0.191	4.832 kN	25.348 kN	0 mm	100 mm	30 mm	ygG+yqQ1+yqψ0Q2	Medium Term	38.023 kN	1.2	1	0.80	3.542 kN	No	-
Bearing (2) ULS	0.371	6.872 kN	18.525 kN	1,860 mm	65 mm	30 mm	ygG+yqQ2+yqψ0Q1	Medium Term	27.788 kN	1.2	1	0.80	5.130 kN	No	-
Bearing (conc.) (1) ULS	0.208	5.262 kN	25.348 kN	0 mm	100 mm	30 mm	ygG+yqQconc+yqψ0Q2	Medium Term	38.023 kN	1.2	1	0.80	-	No	-
Bearing (conc.) (2) ULS	0.409	7.573 kN	18.525 kN	1,860 mm	65 mm	30 mm	ygG+yqψ0Qconc+yqQ2	Medium Term	27.788 kN	1.2	1	0.80	-	No	-
Inst. Deflection SLS	0.226	1.217 mm	5.376 mm	1,042 mm	-	-	G+Q1+ψ0Q2	-	-	-	-	-	-	-	-
Final Deflection SLS	0.228	1.631 mm	7.161 mm	1,043 mm	-	-	G+Q1+ψ0Q2	-	-	-	-	-	-	-	-
Hanger - End	0.517	11.167 kN	21.580 kN	-	-	-	-	Medium Term	-	-	-	-	-	No	No

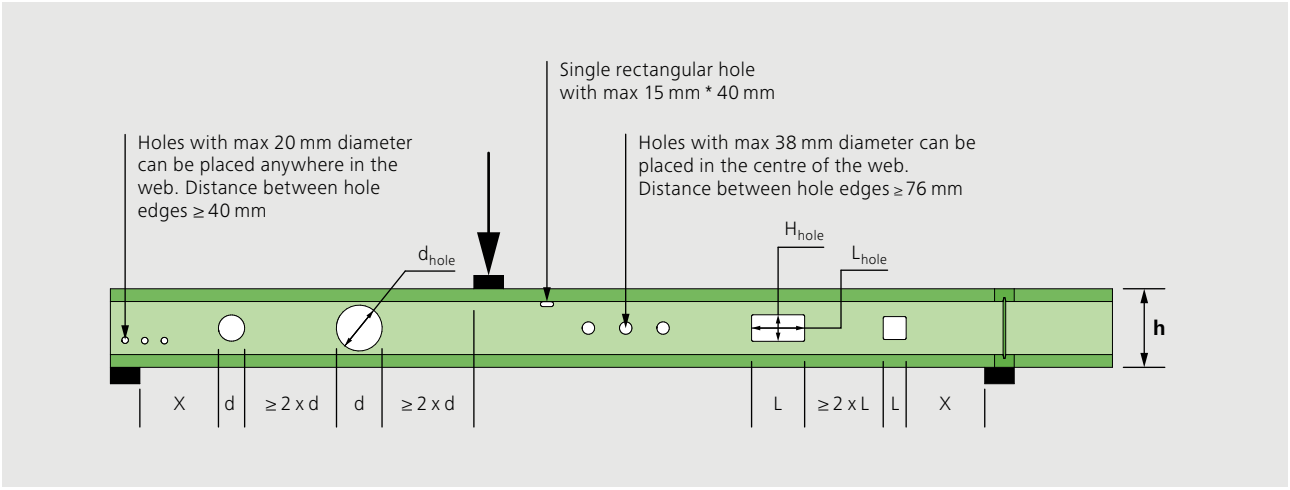
Max total unfactored concentrated point load on member = 5.13 kN.
Therefore any of the fixing patterns highlighted in **red** can be used.

Total beam width [mm]	150	180	225
STEICO *LVL R* – thickness [mm]	2*75	2*90	3*75
			
Fastener type	Bolt	Bolt	Bolt
Fastener size	M12	M12	M12
2 no. bolts each side of point load	27.24	27.24	20.43
3 no. bolts each side of point load	40.87	40.87	30.65

STEICO*joist* allowable holes

Location and sizing of circular and rectangular holes

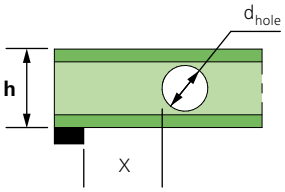
The STEICO*joist* offers unique flexibility with regards to the size and placement of service holes due to the high shear capacity and homogenous nature of the natural fiberboard web material. Both the STEICO*konstruct* and STEICO*kalc* softwares allow detailed analysis of individual members under any loading scenario and hence allow the STEICO*joist* designer to produce a bespoke services layout for any application.



1. Spacing between hole edges must be at least two times the diameter of the largest circular hole or two times the greatest horizontal or vertical dimension of the largest rectangular hole.
2. The distance between a hole edge and the nearest edge of any support must exceed the joist depth.

In order to assist with the process for locating holes for additional service runs the following document details generic guidance for simply supported joists under the following residential loading conditions: Dead load: 0.75 kN/m² | Imposed load: 1.50 kN/m² or an imposed concentrated load of 2 kN | Service class 1 environment

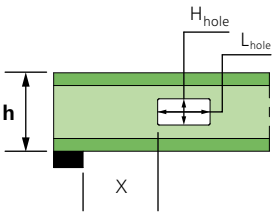
Size and location of **circular** holes in STEICO*joists* in residential intermediate floors



Minimum distance (X) from hole edge to nearest edge of end support (m).

Joist height h [mm]	Joist span [m]	Hole diameter d_{hole} [mm]					
		75	100	125	150	175	200
200	3.50	0.20	0.77	-	-	-	-
	4.00	0.28	0.94	-	-	-	-
	4.50	0.42	1.13	-	-	-	-
	5.00	0.58	1.32	-	-	-	-
220	3.50	0.22	0.29	0.88	-	-	-
	4.00	0.22	0.43	1.07	-	-	-
	4.50	0.22	0.58	1.26	-	-	-
	5.00	0.22	0.74	1.46	-	-	-
240	4.00	0.24	0.24	0.56	1.18	-	-
	4.50	0.24	0.24	0.72	1.38	-	-
	5.00	0.24	0.29	0.89	1.59	-	-
	5.50	0.24	0.54	1.07	1.80	-	-
300	4.50	0.30	0.30	0.30	0.30	0.60	1.18
	5.00	0.30	0.30	0.30	0.30	0.76	1.38
	5.50	0.30	0.30	0.30	0.50	0.94	1.58
	6.00	0.30	0.30	0.38	0.75	1.13	1.79
360	5.00	0.36	0.36	0.36	0.36	0.36	0.36
	5.50	0.36	0.36	0.36	0.36	0.36	0.56
	6.00	0.36	0.36	0.36	0.36	0.49	0.81
	6.50	0.36	0.36	0.36	0.42	0.74	1.06
400	5.50	0.40	0.40	0.40	0.40	0.40	0.40
	6.00	0.40	0.40	0.40	0.40	0.40	0.44
	6.50	0.40	0.40	0.40	0.40	0.40	0.69
	7.00	0.40	0.40	0.40	0.40	0.65	0.94

Size and location of **rectangular** holes in STEICO*joists* in residential intermediate floors



Minimum distance (X) from hole edge to nearest edge of end support (m).

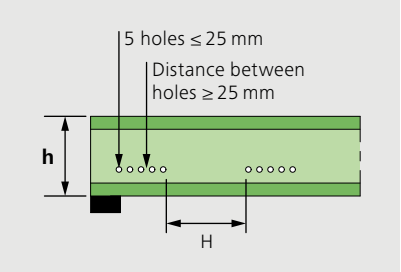
Joist height h [mm]	Joist span [m]	Hole size H_{hole} * L_{hole} [mm]						
		100 * 100	100 * 200	125 * 125	125 * 250	150 * 150	150 * 300	200 * 200
200	3.50	0.66	1.15	-	-	-	-	-
	4.00	0.82	1.35	-	-	-	-	-
	4.50	0.99	1.56	-	-	-	-	-
	5.00	1.17	1.77	-	-	-	-	-
220	3.50	0.58	1.09	0.71	1.19	-	-	-
	4.00	0.74	1.29	0.88	1.40	-	-	-
	4.50	0.91	1.49	1.06	1.61	-	-	-
	5.00	1.08	1.70	1.24	1.82	-	-	-
240	4.00	0.66	1.23	0.81	1.34	0.93	1.43	-
	4.50	0.83	1.43	0.98	1.55	1.11	1.64	-
	5.00	1.00	1.63	1.16	1.76	1.29	1.86	-
	5.50	1.18	1.84	1.35	1.98	1.49	2.08	-
300	4.50	0.76	1.38	0.92	1.50	1.05	1.60	1.23
	5.00	0.93	1.58	1.10	1.71	1.23	1.81	1.42
	5.50	1.10	1.78	1.28	1.92	1.42	2.03	1.62
	6.00	1.28	2.00	1.47	2.14	1.61	2.25	1.83
360	5.00	1.03	1.66	1.20	1.79	1.32	1.88	1.51
	5.50	1.21	1.87	1.39	2.00	1.52	2.11	1.72
	6.00	1.40	2.09	1.58	2.22	1.72	2.33	1.92
	6.50	1.59	2.30	1.78	2.45	1.92	2.56	2.13
400	5.50	1.28	1.92	1.45	2.05	1.58	2.15	1.77
	6.00	1.47	2.14	1.65	2.27	1.78	2.38	1.98
	6.50	1.67	2.36	1.85	2.50	1.99	2.60	2.19
	7.00	1.87	2.58	2.05	2.72	2.20	2.83	2.41

Special conditions

Holes ≤ 20 mm can be positioned anywhere within the span of the joist and depth of the web. Distance between holes should be ≥ 40 mm.

Holes ≤ 38 mm can be positioned anywhere within the span of the joist but must be in the center of the depth of the web. Distance between holes should be ≥ 76 mm.

A group of 5 holes ≤ 25 mm can be positioned anywhere within the span of the joist and depth of the web. Distance between individual holes should be ≥ 25 mm. Additional groups of 5 holes should be a minimum of the joist depth away.

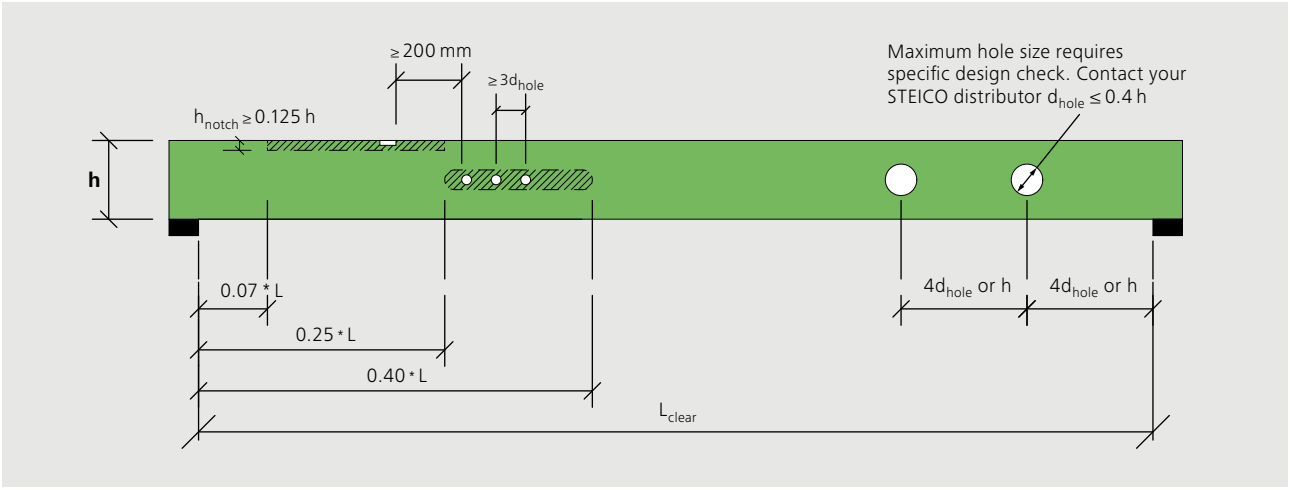


STEICO *LVL* holes

Location of notches and circular holes

STEICO *LVL* is generally specified in areas where higher load bearing capacity is required and therefore special rules apply where service holes need to be accommodated.

The guidance detailed below is in line with the general rules laid out in PD 6693-1:2012.



For simply supported STEICO *LVL R* of depth, h, less than 250 mm and at centers not exceeding 610 mm with a notch of depth, h_{notch}, the effect of notches need not be calculated where:

a) $h_{notch} \leq 0.125\,h$; and
b) The notch is located at the top of the joist between 0.07 and 0.25 of the span from the nearest support.

For simply supported STEICO *LVL R* of depth, h, less than 250 mm and at centers not exceeding 610 mm with a hole of diameter, d_{hole}, the effect of holes need not be calculated where all of the following apply:

a) $d_{hole} \leq 0.25\,h$
b) The hole centre is equidistant from the top and bottom edges of the joist
c) The hole is located within 0.25 and 0.4 of the span from the nearest support
d) Centres of adjacent holes are at least $3\,d_{hole}$ apart

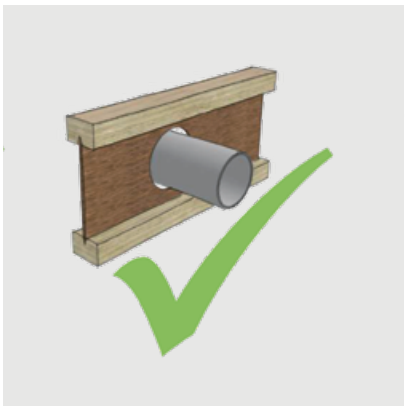
If a design check is undertaken then the maximum hole size allowed in a STEICO *LVL R* of depth, h, can be ≤ 0.4 h where the following rules apply:

a) The axis of the hole runs parallel to the width of the beam
b) The hole centre is equidistant from the top and bottom edges of the beam
c) The distance from the hole centre to the nearest end of the beam is a minimum of $4\,d_{hole}$ or h
d) The distance from the hole centre to an adjacent hole centre is a minimum of $4\,d_{hole}$ or h
e) Design checks to be undertaken are detailed in PD 6693-1:2012 section 11

For more detailed analysis of hole allowances and positions please contact your STEICO distributor or STEICO UK Ltd.

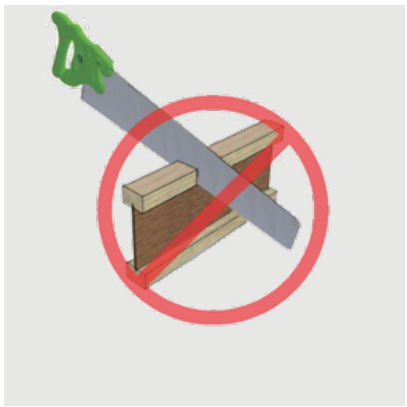
Do’s and don’ts of I-joist cutting

Do run pipes and cables through the web

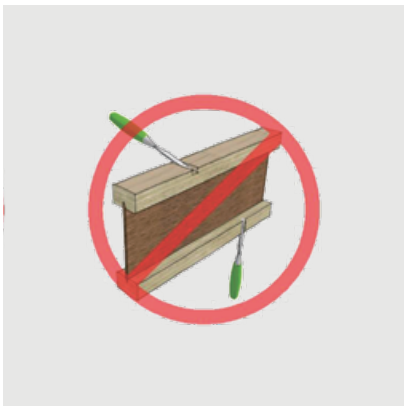


Do run SVP pipes through the web

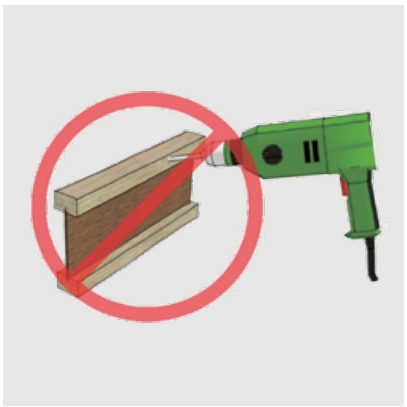
Do run MVHR through the web



Do not cut the flange



Do not notch the flange



Do not drill the flange

Any cutting or drilling of the joist which is outside of the STEICO UK Ltd. guidance may render the STEICO*joist* or STEICO *LVL* unusable and require the installation of an additional member. Please contact your STEICO distributor or STEICO UK Ltd. should you require any clarification of the published guidance.

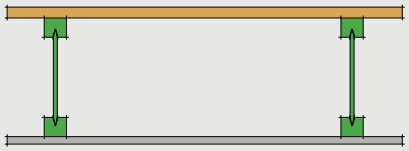
Fire resistance

STEICO*joist* floors have been extensively tested and assessed to both BS476 and EN1365-2 for their fire resistance levels and details for both 30 minute and 60 minute floors are available.

Examples

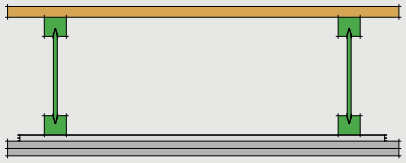
30 minute floor to BS476 – IFCA/07154

- 22 mm chipboard
  STEICO*joist* minimum 200 mm
  @ maximum 600 mm centers
- 15 mm standard plasterboard
  (Type A to EN520)



60 minute floor to EN1365-2 – PAR/15150/02

- 22 mm chipboard
  STEICO*joist* minimum 200 mm
  @ maximum 600 mm centers
- Resilient bar @ 450 mm centers
- 2 x 15 mm fire resistant plasterboard
  (Type F to EN520)



Where services penetrate the integrity of the plasterboard lining, ie Downlighters, then a fire rated unit equivalent to the fire resistance rating of the floor should be used. Other detailing options are available. Please contact STEICO UK Ltd. for more information.

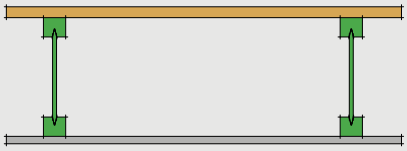
Acoustic performance

Part E of the Building Regulations requires that floors within in a single dwelling demonstrate the ability to provide airborne sound insulation > 40 dB. The Building Standards in Scotland require an airborne sound insulation > 43 dB.

Examples

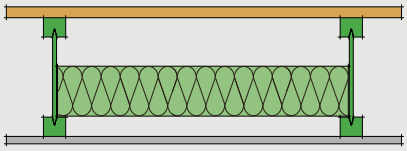
R_w = 40 dB

- 22 mm chipboard STEICO*joist* minimum 200 mm @ maximum 600 mm centers
- 15 mm standard plasterboard (Type A to EN520)



R_w = 45 dB

- 22 mm chipboard STEICO*joist* minimum 200 mm @ maximum 600 mm centers
- 100 mm STEICO*flex* (alt. mineral/glass wool)
- 15 mm standard plasterboard (Type A to EN520)



Where there are increased performance requirement for both airborne and impact sound, such as in flats and apartments then the STEICO*joist* can be utilised in various systems shown in the Robust Details.

robustdetails®

www.robustdetails.com
Other detailing options are available. Please contact STEICO UK Ltd. for more information.

Joist connectors

Additional joist connectors and metalwork accessories are required as part of the standard detailing of STEICO*joist*. The STEICO group works closely together with both Simpson Strong Tie® and Cullen ITW® to allow the specification of the full range of associated materials.

Further information

Further information on all available products can be found at:

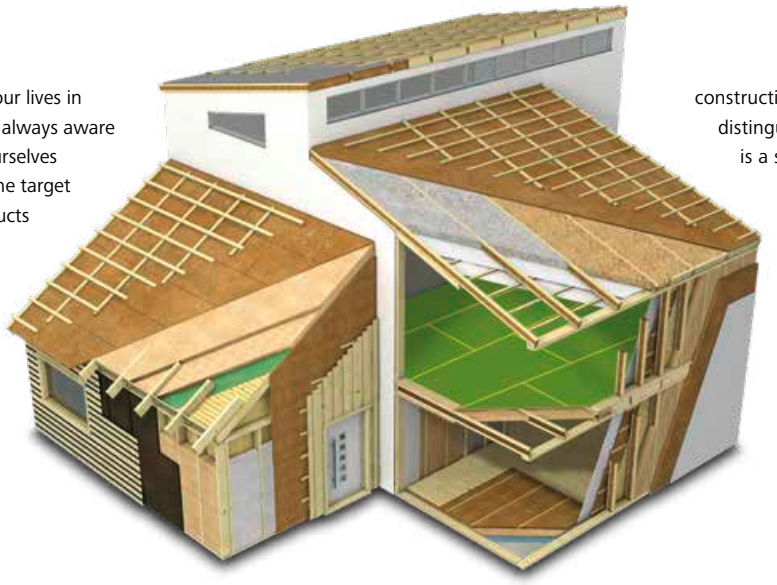
Simpson Strong-Tie®
Winchester Road
Cardinal Point
Tamworth
Staffordshire B78 3HG

Telephone: +44 (0) 1827 255600
Email: uktechnical@strongtie.com
www.strongtie.co.uk

Cullen ITW®
1 Wheatstone Place
Southfield Industrial Estate
Glenrothes
Fife KY6 2SW

Telephone: +44 (0) 1592 771132
Email: cullentechnical@itwcp.com
www.itwcp-offsite.co.uk

We spend approx. 80 % of our lives in enclosed rooms. But are we always aware what we are surrounding ourselves with? STEICO has set itself the target of developing building products which consider the needs of both man and nature. Our products are therefore produced using sustainable natural materials. They help reduce energy use and add considerably to a natural healthy internal climate. Steico insulation and construction materials, carry a number of distinguished 'seals of approval' which is a sign of high quality, healthy and functional building products. The raw materials used in Steico products are certified by PEFC (Programme for the Endorsement of Forest Certification), ensuring a traceable and fully sustainable usage of the raw materials. STEICO, the number 1 choice for your sustainable building solutions.



Natural insulation and construction systems for new builds and renovations – roof, ceiling, wall and floor

- Renewable raw materials without harmful additives
- Excellent cold protection in winter
- Excellent summer heat protection
- Energy saving and increased property worth
- Weather tight and breathable
- Excellent fire protection
- Excellent sound protection
- Environmentally friendly and recyclable
- Light and easy to handle
- High dimensional stability through controlled moisture content
- High strength and stiffness provide long spans
- Compatible insulation and structural building systems

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CERTIFIED COMPONENT Passive House Institute

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TIMBER DEVELOPMENT UK MEMBER

Quality Management ISO 9001:2015

Environmental Management ISO 14001:2015

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