VMG LIGNUM

VMG LIGNUM JOIST

CONTENTS

ABOUT US

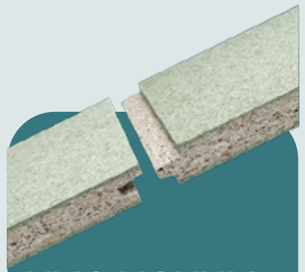
VMG LIGNUM COMPANIES SPECIALIZE IN THE PRODUCTION AND SUPPLY OF SUSTAINABLE ENGINEERED WOOD PRODUCTS FOR CONSTRUCTION.

VMG LIGNUM provides a unique opportunity to obtain three different products from a single source: LVL (laminated veneer lumber), I-joist and structural particle boards (P4-P7). All our high-quality engineered wood products are manufactured in Lithuania and can be ordered directly from our production centre in Naujoji Akmene. VMG LIGNUM develop the building system of prefabricated components for construction for new built projects, as well as renovation using engineered wood products. VMG LIGNUM also offers an extensive range of versatile building design, structural modelling, and consulting services.

PRODUCTION CAPABILITIES:

VMG LIGNUM JOIST
15 million m/year

VMG LIGNUM LVL
120,000 m^3/year



VMG LIGNUM BOARD
200,000 m^3/year

WE PROVIDE ADAPTABLE SOLUTIONS FOR COOPERATION:

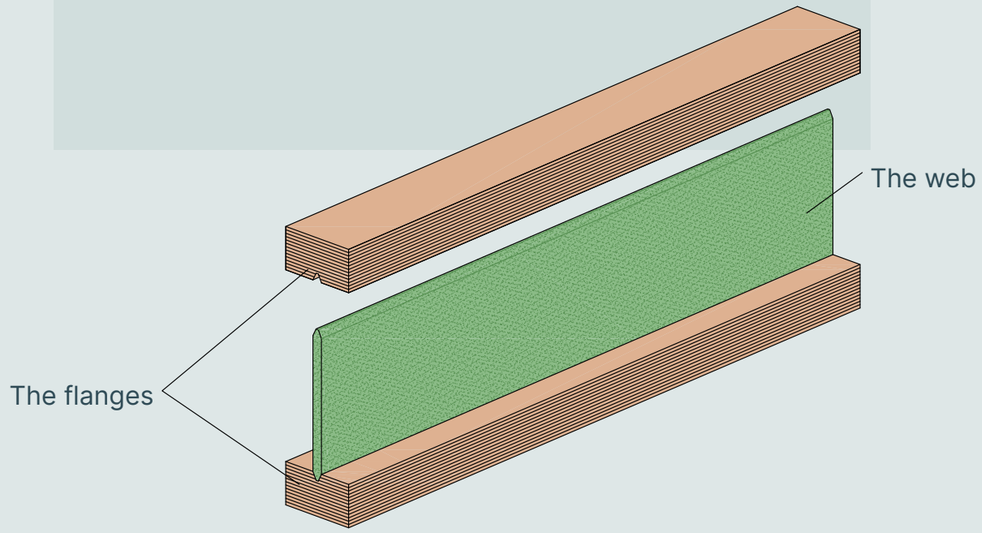
- Technical guidance throughout the production process
- Manufacturing of products in accordance with the specified dimensions
- Certified products that meet international quality requirements
- Production in small, medium and ultra-large volumes
- A comprehensive quality control procedure in our laboratory
- On-time delivery to the desired country and continent

WHAT IS AN I-JOIST?

VMG LIGNUM JOIST (also known as an I-joist or an I-beam) is an engineered wood product that can be used in a wide range of building structures. The I-joist is most commonly used for horizontal structures such as roof beams and floor joists, and less commonly used for vertical structures such as wall studs.

The name “I-joist” comes from its shape, which resembles the letter “I” (a cross-section of two T-shaped elements). The unit consists of two bars (the horizontal elements at the top and bottom of the I-joist) which are hereafter referred to as flanges, and a web, i.e. the vertical element that connects the flanges. The flanges are usually made of laminated veneer lumber (LVL) or solid wood. The web is typically made of oriented strand board (OSB) or structural particle boards (SPB).

VMG LIGNUM CONSTRUCTION produces VMG LIGNUM JOISTS made of VMG LIGNUM LVL flanges and VMG LIGNUM BOARD P5 structural particle boards or OSB3 web.



Timber I-joist and its components

THE EVOLUTION OF I-JOISTS

Timber I-joists were created to maximize the advantages of timber, leveraging its lightweight and robust characteristics, while mitigating the challenges associated with traditional timber joists, including bending, twisting, and splintering.

The “I” shape, also referred to as the “H” shape, of the joist was first introduced in 1849 when Alphonso Halbou of Forges de la Providence (Belgium) patented a steel I-joist. At various times and in different countries, efforts have been made to manufacture I-joists from timber by mechanically connecting the parts. Nonetheless, the breakthrough in timber I-joist development came with the invention of waterproof adhesives in 1934 by chemist Dr. James Nevin at Harbor Plywood (USA).

Even though it was feasible to produce I-joists using waterproof adhesives, the market was not yet ready for this advancement. In 1959, the Douglas Fir Plywood Association, the predecessor of the American Engineered Wood Association (APA), published a study on design recommendations for timber I-joists. Based on this study, the first timber joist was produced by Truss Joist Corporation (USA) in 1969.

The mass production of timber I-joists was driven by architectural trends of the time, as customers sought more spacious and open-plan dwellings. Their floors required longer spans, for which the traditional sawn timber joists were no longer suitable.

Laminated Veneer Lumber (LVL), a significantly stronger material, was introduced in 1977 to replace sawn timber for the flanges of the I-joists. In 1990, plywood, traditionally used for the web, was replaced by oriented strand board (OSB), a more cost-effective material with improved mechanical properties. Later, structural particle board (SPB), an even more efficient building material, was introduced.

THE ESSENTIAL PROPERTIES OF VMG LIGNUM JOISTS

- The product has a cross-section of two T-shaped elements and, due to the thin web, the cold bridging between the flanges is low. The thin wall also allows for better insulation of structures.
- The JOISTS are most commonly used for horizontal structures such as floor joists or roof beams, but can also be used for vertical structures such as wall studs.
- The JOISTS are significantly lighter than other engineered wood products, making them easy to install, drill, and cut.
- The JOISTS experience minimal dimensional changes due to humidity, allowing them to be precisely cut to the required dimensions, thereby reducing the time required on site.
- The JOISTS are constructed from wood, a renewable and easily recyclable raw material. The product also serves as a carbon sink for buildings. For instance, opting for one metre of I-JOIST (300 mm high) can help save up to 4.6 kg of CO2 in the structure (source: The I-joist Handbook, Masonite Beams, 2022). By choosing this type of structure design, you contribute to preserving the environment and combating climate change.
- By using I-JOISTS instead of sawn timber, we can save up to 47% of wood biomass. This indicates that when using I-JOISTS, we can construct two houses from the same harvest of forest timber, whereas conventional sawn timber would only be adequate for a single place of habitation.

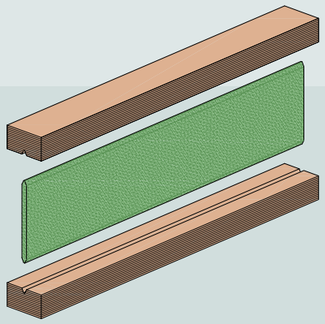
FIRE RESISTANCE OF JOISTS

VMG LIGNUM JOISTS are composed of materials having a reaction to fire class D (s2, d0) or better. Fire resistance is not assessable. (s1-s3 table must go lower than A1-F)

Class	Description	Class	Description
s1	Emissions absent or very little	d0	No burning droplets
s2	Emissions with average volume intensity	d1	Slow dripping droplets
s3	Emissions with high volume intensity	d2	High/Intense dripping droplets

Euroclass	Description	Contribution to fire	Behaviour of the product during testing
A1	Non-combustible materials	No contribution to fire at any stage of the fire	Non-flammable materials
A2	Non-combustible materials	Very limited contribution to fire	Non-flammable materials
B	Combustible materials	Limited contribution to a fire	Non-flammable materials
C	Combustible materials	Minor contribution to a fire	Inflammable after 10 minutes
D	Combustible materials, highly flammable	Medium contribution to a fire	Inflammable after 2-10 minutes
E	Combustible materials, moderately flammable	Stimulates combustion	Inflammable after less than 2 minutes
F	Combustible materials, easily flammable	Stimulates combustion or no data available	Inflammable above Class E or no data available

PRODUCTION OF JOISTS



The principle of JOIST production

VMG LIGNUM JOIST is produced by connecting two LVL flanges to a web. VMG LIGNUM LVL 48P flanges are used for production of VMG LIGNUM JOISTS. The web of the JOIST can be made of OSB/3 or VMG LIGNUM BOARD P5. The flanges of VMG LIGNUM LVL contain a groove for the web. The edges of the web are processed so that they can be connected to the LVL flanges. The completed flanges and webs are connected and pressed in batches of three. Once the VMG LIGNUM JOISTS have been pressed and subjected to quality control, they go into a curing oven. The resulting product is rigid, strong and lightweight. More information on VMG LIGNUM products is available at www.vmg-lignum.eu.

An I-joist is a composite product made of the highest quality engineered wood. Its flanges are usually made of laminated veneer lumber (LVL), which has a higher load-bearing capacity than C24 wood. The LVL is an exceptionally strong material that maintains dimensional stability and is not susceptible to warping and shrinking. The web is positioned between the flanges during the pressing process. It is made of grade P5 structural particle board (SPB), engineered to withstand heavy loads and humid conditions. Adhesives that are resistant to outdoor conditions and environmentally friendly are utilised in the production process.

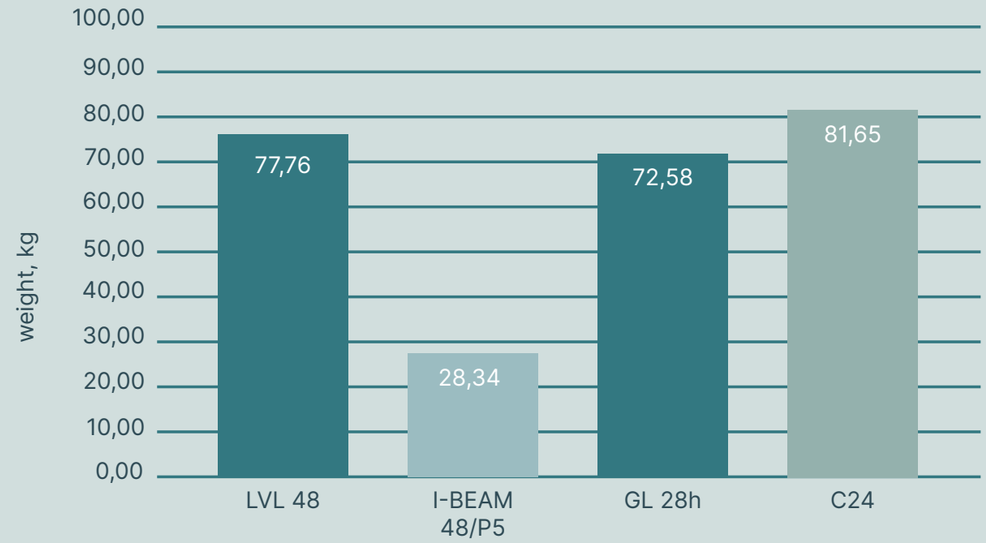
The production of our I-joists begins at the LVL flange production line. For more information on LVL production, please visit www.vmg-lignum.eu. Once produced, the flanges are cut into the specified lengths. A groove is milled along the entire length of their flat surface, which is immediately filled with adhesive and hardener. P5 SPBs are made in parallel to the production of LVL flanges. For more information on their properties and manufacturing process, please visit www.vmg-lignum.eu. OSB/3 can be used instead of P5 SPB. Once produced, the SPBs are cut in accordance with the specified dimensions. The two edges that will be connected to the flanges are cut off. The completed elements, i.e. the flanges and the web, are connected and pressed in batches of three. Quality control is carried out before the I-joists are transferred to the curing oven. The products are removed from the curing oven after about 20 minutes, then packaged and prepared for shipping.

HOW IS JOIST DIFFERENT FROM OTHER MATERIALS?

Because of their cross-sectional shape, I-joists are lighter than other engineered timber construction materials. Taking into account the cross-sectional mass of the different timber joists loaded with 2 kN/m constant load and 3 kN/m variable load, the VMG LIGNUM JOISTS 48/P5 of 6 m span are:

- 61% lighter than plywood 28h;
- 63% lighter than laminated veneer lumber 48;
- 65% lighter than sawn timber C24.

COMPARISON OF JOISTS, 6 m SPAN



WHY CHOOSE VMG LIGNUM JOIST?

As environmental regulations become stricter and energy costs rise, there is a growing motivation to select construction materials with greater care than in the past. It is becoming increasingly more crucial to take into account the eco-friendliness and energy efficiency of products employed in construction.

Timber I-joists provide most optimal utilisation of timber biomass in load-bearing structures among all load-bearing timber construction materials. They are especially suitable in situations where lightweight and efficient structural solutions are required.

VMG LIGNUM JOISTS are a unique product in that all their components are manufactured in the same geographical location. In VMG LIGNUM CONSTRUCTION's production facility in Naujoji Akmene (Lithuania), round logs of spruce and pine are transformed into VMG LIGNUM LVL laminated veneer lumber or VMG LIGNUM BOARD structural particle boards, and then assembled into VMG LIGNUM JOIST I-joists. After processing the timber, it is milled and converted into durable VMG LIGNUM BOARD structural particle boards, and some of it is further processed into VMG LIGNUM JOIST webs. This maximises the efficient use of timber biomass from the forest, resulting in extremely high wood processing efficiency.

VMG LIGNUM JOIST

DESCRIPTION

VMG LIGNUM JOISTS are produced out of VMG LIGNUM LVL 48P and VMG LIGNUM BOARD grade P5. OSB/3 can also be used as an alternative to VMG LIGNUM BOARD. The finished joists are efficiently utilised, thanks to their I-shaped cross-section, for both horizontal and vertical installation. The joists used for the floors are subjected to downward loads, causing compression of the top flange and tension of the bottom flange. The web is less loaded in its central part, thus making efficient use of the cross-section. The produced joists are cut into products with uniform standard dimensions. If needed, they can be cut according to the dimensions ordered by the customer.

ADVANTAGES OF USING VMG LIGNUM JOISTS

- Lighter when compared to other engineered wood joists
- Easy to process
- Dimensional stability (no twists, cracks or splinters)
- Easy to combine with other products
- Can be used for wide spans of up to 18m long
- Efficient use of materials
- Organic raw materials derived from natural sources
- Low cold bridge (due to I-shaped cross-section)
- Variety of dimensions, large sizes
- Stronger and straighter than traditional sawn timber

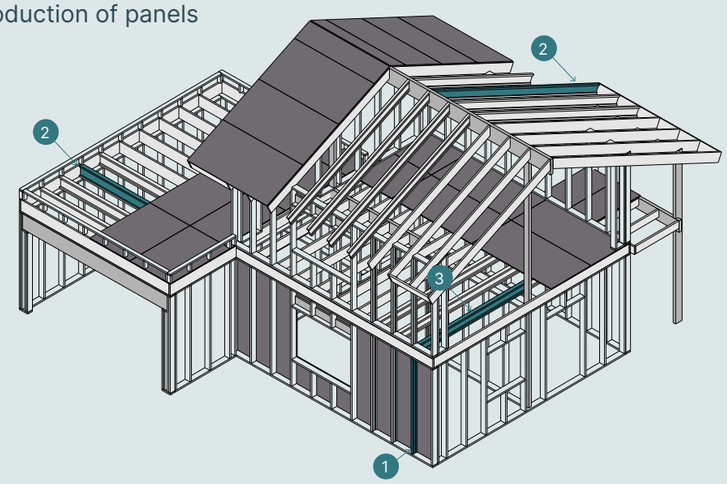
AREAS OF UTILISATION OF VMG LIGNUM JOISTS

VMG LIGNUM JOISTS can be used as single elements, as well as for the production of 2D (flat) wall and floor panels and 3D (volumetric) modules.

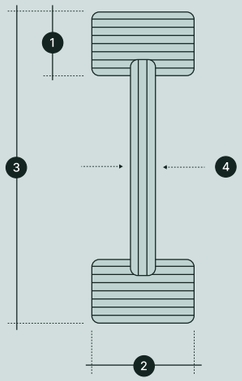
VMG LIGNUM JOISTS can be utilised for roofs, walls, and floors in new construction, renovation, or modernization projects. With appropriate storage, these joists can be employed for on-site construction as well as in the production of panels or modules in a factory setting.

In buildings of light structures, VMG LIGNUM JOIST is used:

1. wall studs
2. roof rafters
3. ceiling beams



STANDARD SIZES OF VMG LIGNUM JOISTS



1. Flange height: 39 mm
2. Flange width: 45/60/90 mm
3. Joist height: 160/200/220/240/250/300/360/400 mm (160 and 200 mm joist heights with 45 or 60 mm flange width)
4. Web thickness: 8/10 mm
5. Standard joist length: 13.6 m
6. Maximum joist length: 18 m

TECHNICAL SPECIFICATIONS

TABLE OF STRENGTHS

Characteristic values of LVL flanges used for VMG LIGNUM JOISTS

Property	
Bending strength	50
Tensile strength (along the fibre)	-*
Compressive strength (along the fibre)	29
Characteristic modulus of elasticity	11 600
Average modulus of elasticity	14 000

Characteristic values of SPB webs used for VMG LIGNUM JOISTS

Property	
Tensile strength	9,4
Compressive strength	12,7
Shear strength, panel shear	7,0
Shear strength, planar shear	1,9
Average modulus of elasticity	14 000
Average modulus of shear	960

TABLE OF TOLERANCES

Nominal size	Maximum deviations
Overall height (h)	± 1,5
Length (L)	-/+10 mm
Flange width bf	± 1,5
Flange height hf	± 2
Web thickness tw	± 0.8

DESIGN GUIDELINES

CALCULATIONS

The strength and stiffness of timber elements are influenced by load duration and moisture content, factors that need to be considered in calculations. Calculations of the maximum joist spans take into account the duration of the average load. The available load duration classes are displayed in the table.

Load duration classes (LST EN 1995-1-1, table 2.1)

LOAD DURATION CLASS	CHARACTERISTIC LOAD CUMULATIVE TIME SERIES
Permanent	Over 10 years
Long-term	From 6 months to 10 years
Medium-term	From 1 week to 6 months
Short-term	Less than one week
Instantaneous	

VMG LIGNUM JOISTS can be used in service classes 1 and 2. The calculations meet the requirements for service class 1. The service classes in accordance with LST EN 1995-1-1:

SERVICE CLASS 1

characterised by a moisture content in the materials corresponding to a temperature of 20°C and the relative humidity of the surrounding air only exceeding 65% for a few weeks per year.

SERVICE CLASS 2

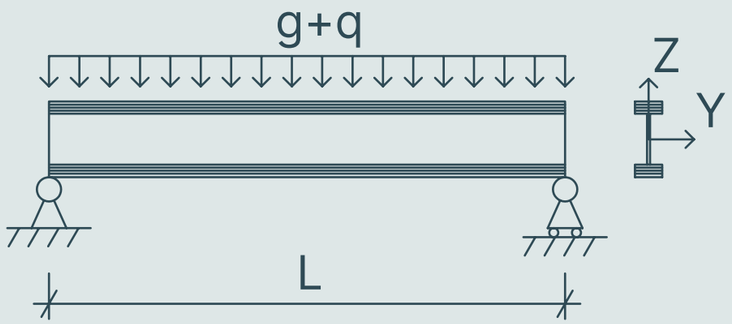
characterised by a moisture content in the materials corresponding to a temperature of 20°C and the relative humidity of the surrounding air only exceeding 85% for a few weeks per year.

SERVICE CLASS 3

due to climatic conditions, is characterised by higher moisture contents than service class 2.

CALCULATIONS OF THE MAXIMUM JOIST SPANS OF VMG LIGNUM JOISTS

The bearing power of VMG LIGNUM JOISTS has been calculated in accordance with LST EN 1995-1-1. Calculation scheme:



The calculation scheme of VMG LIGNUM JOISTS

Where:
g – permanent load;
q – variable load.

The design strength value of the material Xd is calculated according to formula 2.14 of LST EN 1995-1-1:

$$X_d = \frac{k_{mod} \cdot X_k}{\gamma_m}$$

Where:
X_k – characteristic value of the strength property;
γ_m – partial coefficient of the strength property Recommended coefficient value of LVL is 1,2, SPB - 1,3, OSB -1,2;
k_{mod} – a correction factor to take account of the effects of load duration and moisture on the structure. According to LST EN 1995-1-1 3.1 table, under medium-term load and conditions of service class 1: LVL - k_{mod}= 0,8, SPB - 0,65, OSB - 0,7.

The serviceability Limit State (SLS) must be assessed when performing calculations of the maximum joist spans (LST EN 1995-1-1, Chapter 7. The maximum allowable deflection of the joist is L/250. The limiting value of the natural oscillation frequency of the joists is f_{lim} = 8 Hz. The stiffness of the floor structure in the direction perpendicular to the joists has not been taken into account in the calculations.

For the purpose of considering the serviceability limit states, the final average modulus of elasticity $E_{m,fin}$, which is used to calculate the final deformation value, must be calculated in accordance with formula 2.7 of LST EN 1995-1-1:

$$E_{m,\,fin} = \frac{E_m}{1+k_{def}}$$

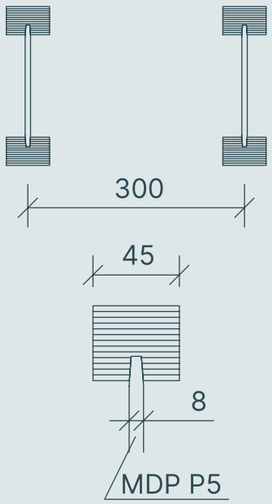
Where:
E_m – average modulus of elasticity;
k_{def} – creep deformation coefficient to be selected according to the service class of the structure. According to LST EN 1995-1-1 3.2 table, the value of k_{def} for service class 1: LVL – 0,6, SPB – 2,25, OSB – 1,5.

→ The impact of joist bearing reactions on the supports has not been assessed.

→ The calculations are based on the assumption that the lateral displacements of the joists are restrained: the joists are restrained by ties at the supports and at intervals of at least 1000 mm along the length of the joist. The vibration calculations for the joists have not taken into account the effect of tie stiffness.

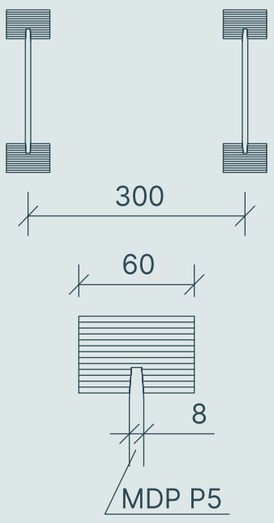
→ The span tables have been developed for different combinations of applied loads: variable loads q_k 1,5;2,0 and 2,5 kN/m² (Load capacities have been selected taking into account the variations of service loads given in EN 1991-1-1) and permanent loads g_k from 0,5 and 2,0 kN/m².

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm, the web is made from 8 mm SPB P5 and joist width is 45 mm:



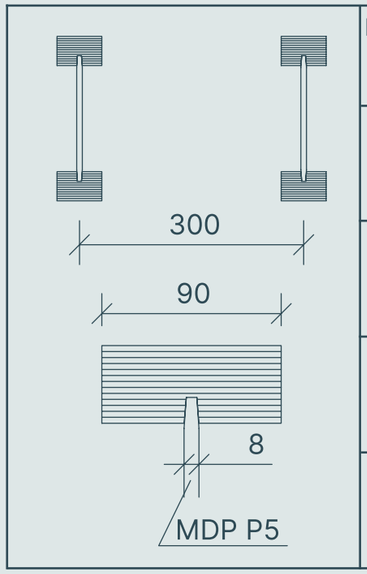
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4869	5131	5258	5855	6506	6910
	2,0	4694	4947	5069	5644	6272	6661
	2,5	4400	4700	4900	5467	6075	6452
1,0	1,5	4380	4616	4731	5267	5853	6217
	2,0	4274	4504	4616	5139	5711	6065
	2,5	4000	4400	4500	5026	5584	5931
1,5	1,5	4068	4287	4393	4891	5435	5773
	2,0	3900	4208	4312	4802	5336	5667
	2,5	3800	4100	4200	4720	5244	5570
2,0	1,5	3800	4049	4149	4620	5134	5453
	2,0	3700	3989	4088	4552	5058	5372
	2,5	3500	3800	4000	4489	4988	5297

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm, the web is made from 8 mm SPB P5 and joist width is 60 mm:



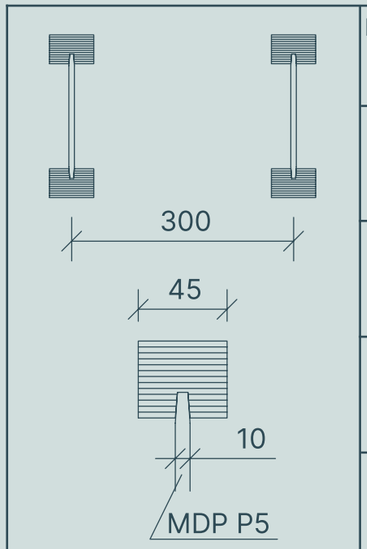
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	5227	5507	5643	6280	6974	7403
	2,0	5038	5309	5440	6054	6723	7137
	2,5	4800	5142	5269	5863	6511	6913
1,0	1,5	4702	4955	5077	5650	6274	6661
	2,0	4588	4834	4953	5512	6122	6499
	2,5	4400	4727	4843	5390	5986	6355
1,5	1,5	4367	4601	4714	5246	5826	6185
	2,0	4286	4517	4628	5150	5719	6072
	2,5	4100	4400	4549	5062	5621	5968
2,0	1,5	4124	4346	4453	4955	5503	5842
	2,0	4000	4282	4387	4882	5422	5756
	2,5	3800	4200	4300	4814	5346	5676

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm,
the web is made from 8 mm SPB P5 and joist width is 90 mm:



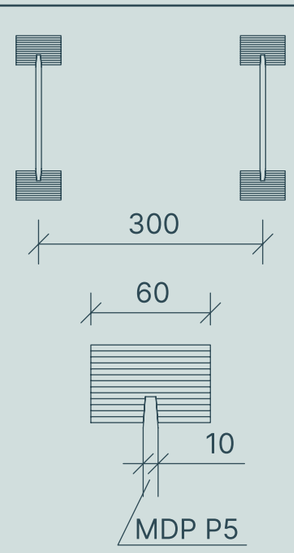
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	5778	6087	6236	6937	7698	8000
	2,0	5570	5868	6012	6687	7421	7875
	2,5	5395	5684	5823	6477	7188	7628
1,0	1,5	5199	5477	5611	6241	6926	7350
	2,0	5072	5343	5474	6086	6758	7171
	2,5	4960	5225	5353	5954	6608	7012
1,5	1,5	4827	5086	5210	5795	6432	6825
	2,0	4739	4992	5115	5689	6314	6700
	2,5	4600	4907	5027	5592	6206	6585
2,0	1,5	4560	4804	4921	5474	6075	6446
	2,0	4492	4733	4849	5393	5985	6351
	2,5	4300	4667	4781	5318	5902	6263

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm,
the web is made from 10 mm SPB P5 and joist width is 45 mm:



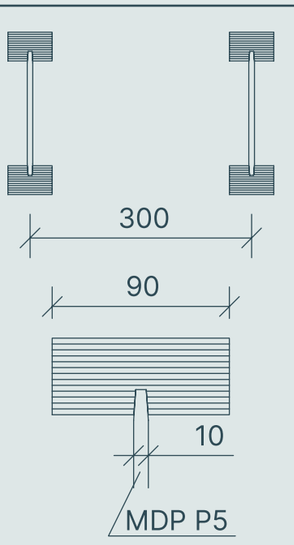
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4874	5137	5265	5866	6522	6930
	2,0	4698	4953	5075	5654	6287	6680
	2,5	4500	4797	4916	5477	6089	6470
1,0	1,5	4385	4622	4737	5277	5868	6234
	2,0	4278	4510	4622	5149	5725	6083
	2,5	4100	4410	4519	5035	5598	5948
1,5	1,5	4072	4292	4399	4900	5449	5789
	2,0	3997	4213	4318	4810	5349	5683
	2,5	3900	4141	4244	4728	5257	5586
2,0	1,5	3846	4054	4155	4629	5147	5468
	2,0	3789	3994	4093	4560	5071	5388
	2,5	3600	3900	4036	4497	5000	5313

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm,
the web is made from 10 mm SPB P5 and joist width is 60 mm:



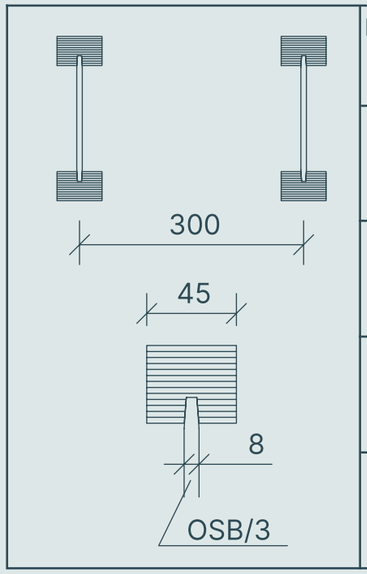
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	5230	5512	5648	6288	6987	7420
	2,0	5042	5314	5445	6062	6735	7153
	2,5	4884	5147	5274	5872	6523	6928
1,0	1,5	4706	4959	5082	5658	6286	6675
	2,0	4591	4839	4958	5520	6133	6513
	2,5	4490	4731	4848	5398	5997	6369
1,5	1,5	4370	4605	4719	5254	5837	6199
	2,0	4290	4521	4632	5157	5730	6085
	2,5	4200	4443	4553	5069	5632	5981
2,0	1,5	4127	4350	4457	4962	5513	5855
	2,0	4067	4286	4391	4889	5432	5769
	2,5	4000	4226	4330	4821	5356	5688

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm,
the web is made from 10 mm SPB P5 and joist width is 90 mm:



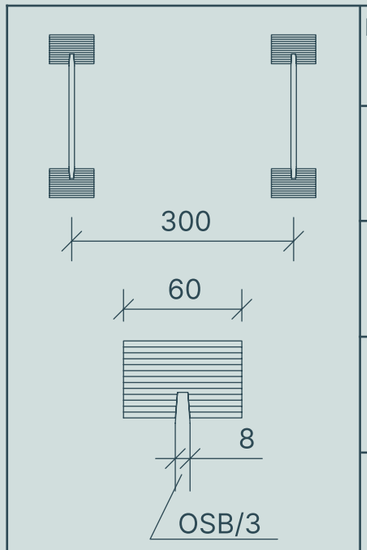
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	5781	6091	6241	6943	7708	8000
	2,0	5573	5872	6016	6693	7431	7887
	2,5	5398	5687	5827	6483	7197	7639
1,0	1,5	5201	5480	5615	6247	6935	7361
	2,0	5075	5347	5478	6095	6766	7182
	2,5	4962	5228	5357	5960	6616	7023
1,5	1,5	4830	5089	5214	5801	6440	6835
	2,0	4741	4995	5118	5694	6322	6710
	2,5	4660	4910	5030	5597	6213	6595
2,0	1,5	4562	4806	4924	5479	6083	6456
	2,0	4495	4736	4852	5398	5993	6361
	2,5	4432	4670	4784	5323	5909	6272

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm,
the web is made from 8 mm OSB/3 and joist width is 45 mm:



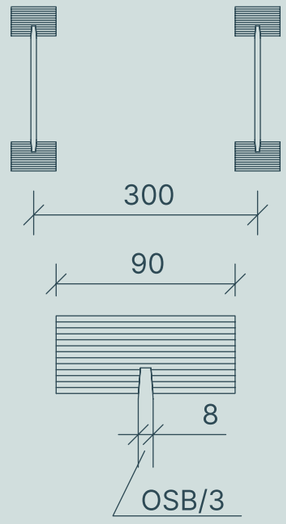
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4870	5133	5260	5858	6511	6917
	2,0	4695	4949	5071	5648	6277	6668
	2,5	4500	4793	4912	5470	6080	6458
1,0	1,5	4382	4618	4733	5271	5858	6223
	2,0	4275	4506	4618	5143	5716	6071
	2,5	4181	4406	4515	5029	5589	5937
1,5	1,5	4069	4289	4395	4894	5440	5778
	2,0	3994	4210	4314	4805	5340	5672
	2,5	3900	4138	4240	4722	5249	5575
2,0	1,5	3843	4051	4151	4623	5138	5458
	2,0	3787	3991	4090	4555	5062	5377
	2,5	3669	3867	3963	4413	4905	5210

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm,
the web is made from 8 mm OSB/3 and joist width is 60 mm:



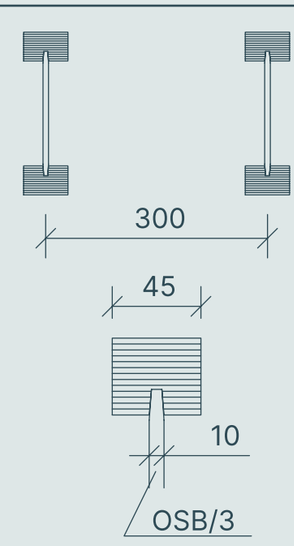
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	5228	5509	5645	6283	6978	7409
	2,0	5040	5311	5441	6057	6727	7142
	2,5	4881	5144	5270	5866	6516	6918
1,0	1,5	4703	4956	5078	5653	6278	6666
	2,0	4589	4836	4955	5515	6126	6504
	2,5	4487	4729	4845	5393	5990	6360
1,5	1,5	4368	4602	4716	5249	5830	6190
	2,0	4287	4518	4629	5153	5723	6076
	2,5	4214	4441	4550	5065	5625	5972
2,0	1,5	4125	4348	4454	4958	5507	5847
	2,0	4065	4283	4389	4885	5425	5760
	2,5	3938	4150	4252	4733	5257	5581

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm,
the web is made from 8 mm OSB/3 and joist width is 90 mm:



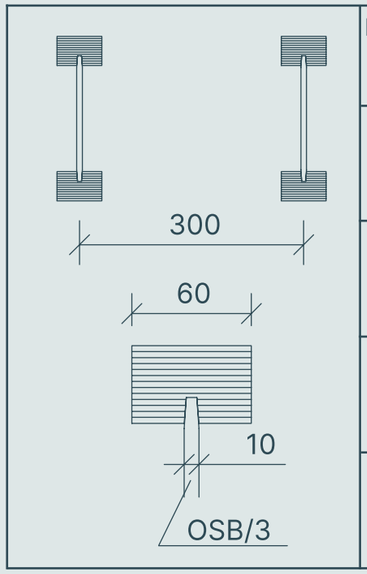
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	5779	6089	6238	6939	7702	8000
	2,0	5571	5869	6013	6689	7425	7879
	2,5	5396	5685	5824	6479	7191	7631
1,0	1,5	5199	5478	5612	6243	6929	7353
	2,0	5073	5345	5476	6091	6761	7175
	2,5	4961	5226	5354	5956	6611	7016
1,5	1,5	4828	5087	5211	5797	6434	6828
	2,0	4740	4993	5116	5691	6316	6703
	2,5	4659	4908	5028	5594	6208	6588
2,0	1,5	4560	4805	4922	5476	6078	6450
	2,0	4493	4734	4850	5395	5988	6355
	2,5	4354	4587	4699	5227	5802	6157

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm,
the web is made from 10 mm OSB/3 and joist width is 45 mm:



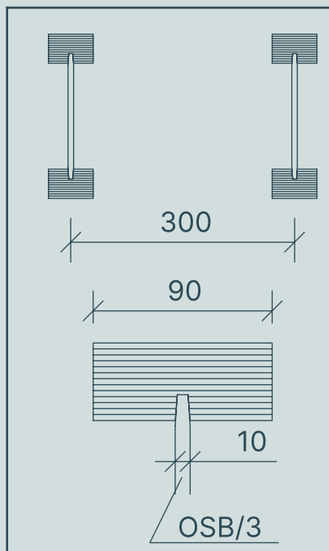
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4876	5140	5268	5870	6529	6938
	2,0	4700	4955	5078	5659	6294	6688
	2,5	4552	4799	4919	5481	6096	6478
1,0	1,5	4387	4624	4739	5281	5874	6242
	2,0	4280	4512	4624	5153	5731	6090
	2,5	4185	4412	4522	5039	5604	5955
1,5	1,5	4073	4294	4401	4904	5454	5796
	2,0	3999	4215	4320	4814	5354	5690
	2,5	3930	4143	4246	4732	5263	5593
2,0	1,5	3847	4056	4157	4632	5152	5475
	2,0	3791	3996	4096	4564	5076	5394
	2,5	3673	3872	3968	4422	4918	5227

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm,
the web is made from 10 mm OSB/3 and joist width is 60 mm:



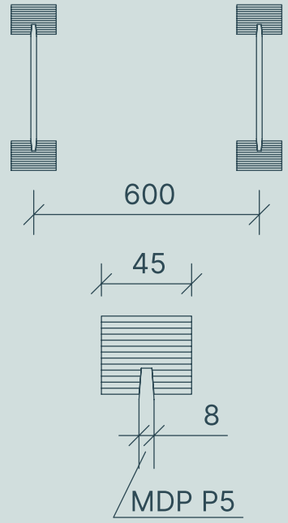
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	5232	5514	5651	6292	6992	7427
	2,0	5044	5316	5447	6066	6741	7159
	2,5	4885	5149	5276	5875	6529	6934
1,0	1,5	4707	4961	5084	5661	6291	6682
	2,0	4593	4841	4960	5523	6138	6519
	2,5	4491	4733	4850	5401	6002	6375
1,5	1,5	4371	4607	4721	5257	5842	6205
	2,0	4291	4522	4634	5160	5735	6091
	2,5	4218	4445	4555	5072	5636	5986
2,0	1,5	4129	4351	4459	4965	5518	5860
	2,0	4068	4287	4393	4892	5436	5774
	2,5	3941	4154	4257	4740	5267	5595

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 300 mm,
the web is made from 10 mm OSB/3 and joist width is 90 mm:



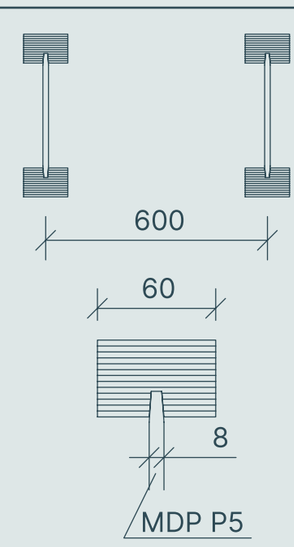
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	5782	6093	6242	6946	7712	8000
	2,0	5574	5873	6018	6696	7435	7892
	2,5	5399	5689	5828	6496	7201	7644
1,0	1,5	5202	5481	5616	6249	6939	7365
	2,0	5076	5348	5480	6097	6770	7186
	2,5	4963	5230	5358	5962	6620	7027
1,5	1,5	4831	5090	5215	5803	6443	6839
	2,0	4742	4997	5119	5697	6325	6714
	2,5	4661	4911	5032	5599	6217	6599
2,0	1,5	4563	4808	4926	5481	6086	6460
	2,0	4496	4737	4853	5400	5996	6365
	2,5	4356	4590	4702	5233	5810	6167

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm,
the web is made from 8 mm SPB P5 and joist width is 45 mm:



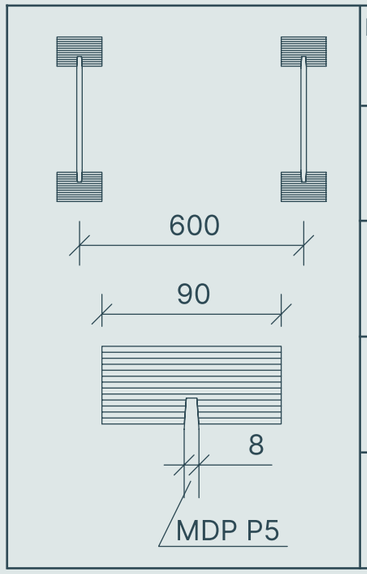
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	3800	4200	4300	4923	5471	5810
	2,0	3500	3800	4000	4600	5245	5245
	2,5	3300	3600	3700	4300	4335	4335
1,0	1,5	3400	3700	3800	4429	4922	5227
	2,0	3200	3400	3600	4200	4518	4518
	2,5	3000	3300	3400	3827	3827	3827
1,5	1,5	3100	3300	3500	4100	4571	4717
	2,0	2900	3200	3300	3900	3968	3968
	2,5	2800	3000	3100	3425	3425	3425
2,0	1,5	2800	3100	3200	3800	4121	4121
	2,0	2700	2900	3000	3538	3538	3538
	2,5	2600	2800	2900	3099	3099	3099

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm,
the web is made from 8 mm SPB P5 and joist width is 60 mm:



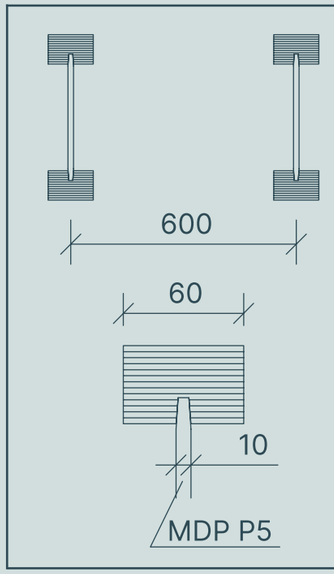
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4200	4500	4700	5281	5864	6226
	2,0	3800	4200	4300	5091	5653	6001
	2,5	3600	3900	4000	4700	5475	5780
1,0	1,5	3700	4000	4200	4751	5874	5601
	2,0	3400	3700	3900	4600	5276	5465
	2,5	3200	3500	3700	4300	5148	5102
1,5	1,5	3300	3600	3800	4400	4899	5201
	2,0	3100	3400	3500	4200	4809	5106
	2,5	3000	3200	3400	4000	4566	4566
2,0	1,5	3000	3300	3400	4100	4628	4913
	2,0	2900	3100	3300	3900	4500	4717
	2,5	2792	3000	3100	3700	4132	4132

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm,
the web is made from 8 mm SPB P5 and joist width is 90 mm:



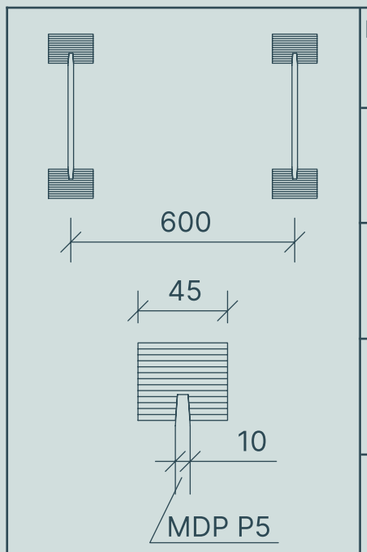
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4700	5100	5244	5833	6474	6869
	2,0	4300	4700	4900	5623	6241	6622
	2,5	3906	4300	4500	5300	6044	6414
1,0	1,5	4100	4500	4700	5248	5824	6180
	2,0	3800	4200	4300	5100	5683	6030
	2,5	3448	3829	4019	4800	5557	5896
1,5	1,5	3700	4000	4200	4873	5408	5739
	2,0	3500	3800	3900	4700	5309	5634
	2,5	3086	3426	3597	4400	5200	5537
2,0	1,5	3400	3700	3800	4500	5108	5421
	2,0	3187	3500	3600	4300	5033	5341
	2,5	2792	3101	3255	4026	4800	5266

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm,
the web is made from 10 mm SPB P5 and joist width is 60 mm:



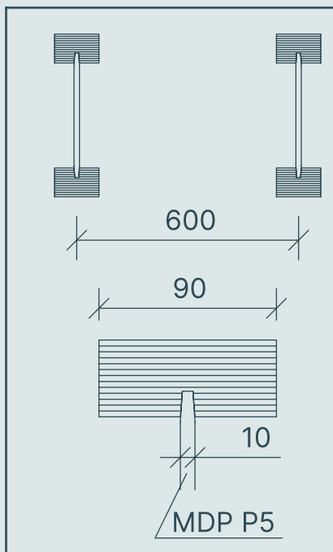
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4300	4600	4750	5288	5875	6239
	2,0	4000	4300	4400	5098	5664	6015
	2,5	3700	4000	4100	4800	5486	5780
1,0	1,5	3800	4100	4273	4757	5286	5613
	2,0	3600	3900	4000	4642	5157	5477
	2,5	3400	3700	3800	4400	5043	5102
1,5	1,5	3500	3800	3900	4418	4908	5213
	2,0	3300	3600	3700	4300	4818	5117
	2,5	3100	3400	3500	4100	4566	4566
2,0	1,5	3200	3500	3600	4173	4636	4923
	2,0	3000	3300	3400	4000	4568	4717
	2,5	2900	3200	3300	3900	4132	4132

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm,
the web is made from 10 mm SPB P5 and joist width is 45 mm:



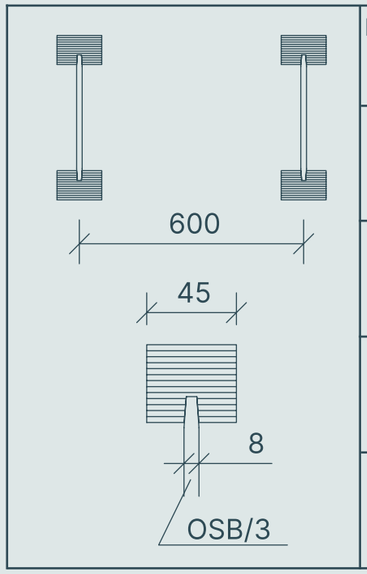
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	3900	4300	4400	4932	5484	5827
	2,0	3600	3900	4100	4700	5245	5245
	2,5	3400	3700	3800	4335	4335	4335
1,0	1,5	3500	3800	3900	4437	4934	5243
	2,0	3300	3600	3700	4300	4518	4518
	2,5	3100	3400	3500	3827	3827	3827
1,5	1,5	3200	3500	3600	4121	4582	4717
	2,0	3000	3300	3400	3968	3968	3968
	2,5	2900	3100	3200	3425	3425	3425
2,0	1,5	2900	3200	3300	3892	4121	421
	2,0	2800	3000	3200	3538	3538	3538
	2,5	2700	2900	3000	3099	3099	3099

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm,
the web is made from 10 mm SPB P5 and joist width is 90 mm:



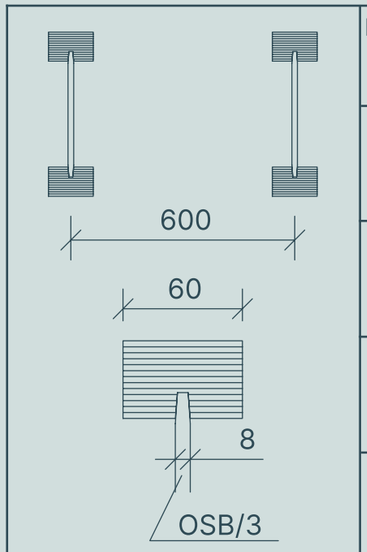
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4861	5122	5248	5839	6482	6880
	2,0	4500	4800	5000	5628	6248	6632
	2,5	4200	4500	4700	5451	6052	6423
1,0	1,5	4300	4600	4721	5253	5831	6189
	2,0	4000	4300	4500	5125	5690	6039
	2,5	3800	4100	4300	5000	5564	5905
1,5	1,5	3900	4200	4384	4878	5415	5748
	2,0	3700	4000	4100	4788	5316	5642
	2,5	3500	3800	3900	4600	5225	5546
2,0	1,5	3600	3900	4000	4607	5115	5429
	2,0	3400	3700	3800	4500	5039	5349
	2,5	3200	3800	3700	4300	4969	5274

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm,
the web is made from 8 mm OSB/3 and joist width is 45 mm:



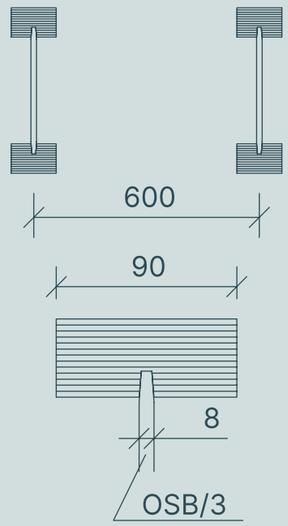
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4000	4300	4400	4926	5475	5816
	2,0	3700	4000	4100	4749	5245	5245
	2,5	3400	3700	3800	4335	4335	4335
1,0	1,5	3500	3800	3980	4432	4926	5233
	2,0	3300	3600	3700	4324	4518	4518
	2,5	3100	3400	3500	3827	3827	3827
1,5	1,5	3200	3500	3600	4116	4575	4717
	2,0	3100	3300	3400	3968	3968	3968
	2,5	2900	3200	3300	3425	3425	3425
2,0	1,5	3000	3200	3400	3887	4121	4121
	2,0	2900	3100	3200	3538	3538	3538
	2,5	2800	3000	3200	3659	3659	3659

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm,
the web is made from 8 mm OSB/3 and joist width is 60 mm:



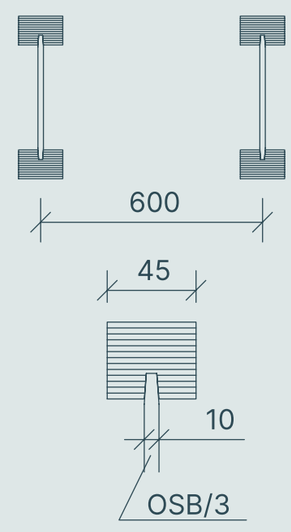
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4300	4632	4747	5283	5868	6230
	2,0	4000	4300	4500	5093	5657	6006
	2,5	3700	4000	4200	4900	5479	5780
1,0	1,5	3900	4168	4270	4753	5279	5605
	2,0	3600	3900	4100	4638	5151	5469
	2,5	3400	3700	3800	4500	5037	5102
1,5	1,5	3500	3800	3966	4414	4902	5205
	2,0	3300	3600	3700	4333	4812	5110
	2,5	3200	3400	3600	4200	4566	4566
2,0	1,5	3300	3500	3700	4169	4630	4916
	2,0	3100	3400	3500	4100	4562	4717
	2,5	3000	3300	3400	3980	4420	4693

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm,
the web is made from 8 mm OSB/3 and joist width is 90 mm:



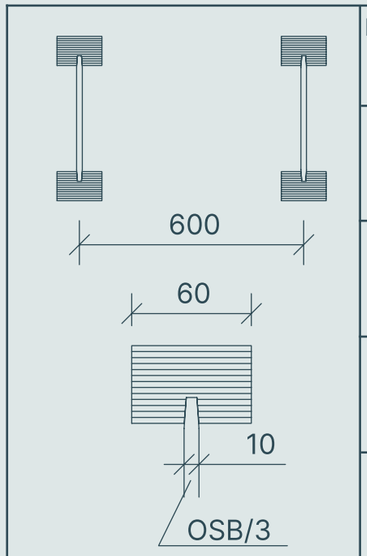
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4860	5120	5245	5835	6476	6873
	2,0	4500	4900	5000	5625	6243	6626
	2,5	4200	4500	4700	5448	6047	6417
1,0	1,5	4372	4606	4719	5250	5827	6183
	2,0	4100	4400	4600	5122	5685	6033
	2,5	3800	4200	4300	5009	5559	5899
1,5	1,5	4000	4277	4382	4875	5411	5742
	2,0	3700	4100	4200	4785	5311	5637
	2,5	3497	3883	4000	4700	5221	5540
2,0	1,5	3600	4000	4100	4604	5111	5424
	2,0	3500	3800	3900	4537	5035	5344
	2,5	3400	3700	3800	4396	4879	5177

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm,
the web is made from 10 mm OSB/3 and joist width is 45 mm:



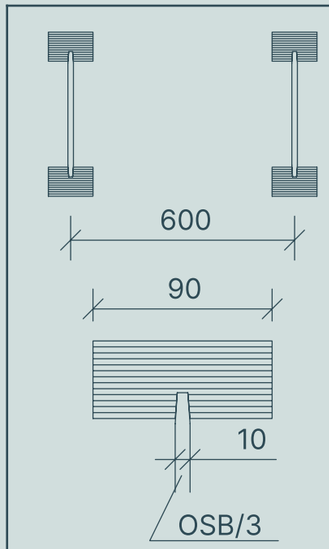
Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4000	4322	4430	4936	5490	5834
	2,0	3700	4000	4200	4759	5245	5245
	2,5	3500	3800	3900	4335	4335	4335
1,0	1,5	3600	3889	3985	4441	4939	5249
	2,0	3400	3700	3800	4333	4518	4518
	2,5	3200	3500	3600	3827	3827	3827
1,5	1,5	3300	3600	3700	4124	4587	4717
	2,0	3200	3400	3500	3968	3968	3968
	2,5	3000	3300	3400	3425	3425	3425
2,0	1,5	3100	3300	3496	3895	4121	4121
	2,0	300	3200	3300	3538	3538	3538
	2,5	2900	3100	3300	3659	3659	3659

Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm, the web is made from 10 mm OSB/3 and joist width is 60 mm:



Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4400	4637	4752	5291	5880	6245
	2,0	4100	4400	4581	5101	5668	6020
	2,5	3800	4100	4300	4940	5490	5780
1,0	1,5	3958	4172	4275	4760	5290	5618
	2,0	3700	4000	4171	4645	5161	5482
	2,5	3500	3800	3900	4542	5047	5102
1,5	1,5	3600	3874	3970	4420	4912	5217
	2,0	3400	3700	3897	4339	4822	5122
	2,5	3300	3500	3700	4265	4566	4566
2,0	1,5	3400	3600	3750	4175	4640	4928
	2,0	3200	3500	3600	4114	4571	4717
	2,5	3100	3400	3500	3986	4429	4704

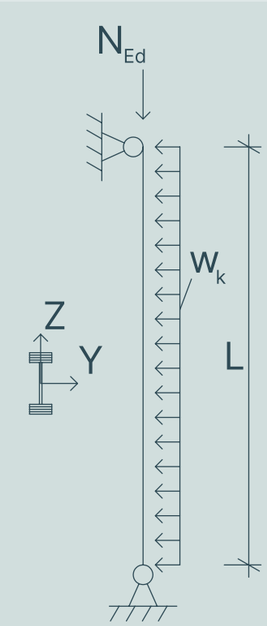
Maximum joist spans of VMG LIGNUM JOISTS, when joist spacing is 600 mm, the web is made from 10 mm OSB/3 and joist width is 90 mm:



Permanent load, kN/m²	Service load, kN/m²	Joist height, mm					
		220	240	250	300	360	400
0,5	1,5	4862	5123	5249	5841	6485	6884
	2,0	4600	4939	5060	5631	6252	6636
	2,5	4300	4700	4800	5454	6055	6427
1,0	1,5	4375	4609	4723	5255	5835	6193
	2,0	4200	4497	4608	5127	5693	6043
	2,5	4000	4300	4400	5014	5567	5909
1,5	1,5	4062	4280	4385	4880	5418	5751
	2,0	3900	4200	4300	4790	5319	5646
	2,5	3700	4000	4100	4708	5228	5549
2,0	1,5	3800	4043	4142	4609	5118	5432
	2,0	3600	3900	4081	4541	5042	5352
	2,5	3500	3800	3954	4400	4885	5186

CALCULATIONS OF THE BEARING POWER OF VMG LIGNUM JOIST WALL STUDS

The calculations of the bearing power of VMG LIGNUM JOIST wall studs must be carried out accordance with LST EN 1995-1-1 standard. Calculation scheme:



Where:

N_{Ed} = g+q – axial force;

W_k – wind load.

It is assumed that the LVL wall studs are subjected to axial force and bending moment.

The relative slenderness ratios are calculated in accordance with LST EN 1995-1-1 formulae 6.21 and 6.22:

$$\lambda_{rel,y} = \frac{\lambda_y}{\pi}\sqrt{\frac{f_{c,0,k}}{E_{0,05}}} \qquad \lambda_{rel,z} = \frac{\lambda_z}{\pi}\sqrt{\frac{f_{c,0,k}}{E_{0,05}}}$$

Where:

λ_y – lslenderness ratio around the y-axis;
λ_z – slenderness ratio around the z-axis;
$f_{(c,0,k)}$ – characteristic compressive strength along the fibre;
$E_{0,05}$ – the fifth percentile value of the modulus of elasticity.

If $\lambda_{rel,z} \leq 0,3$ and $\lambda_{rel,y} \leq 0,3$, the stresses must comply with the conditions in accordance with LST EN 1995-1-1 formulae 6.19 and 6.20:

$$\left(\frac{\sigma_{c,0,d}}{f_{c,0,d}}\right)^2 + \frac{\sigma_{m,y,d}}{f_{m,y,d}} + k_m \frac{\sigma_{m,z,d}}{f_{m,z,d}} \leq 1,0$$

$$\left(\frac{\sigma_{c,0,d}}{f_{c,0,d}}\right)^2 + k_m \frac{\sigma_{m,z,d}}{f_{m,z,d}} + \frac{\sigma_{m,y,d}}{f_{m,y,d}} \leq 1,0$$

Where:

$\sigma_{c,0,d}$ – derived compressive stress along the fibre;
$f_{c,0,d}$ – derived compressive strength along the fibre;
$\sigma_{m,y,d}$ – derived bending stress around the principal y-axis;
$f_{m,y,d}$ – derived bending strength around the principal y-axis;
$\sigma_{m,z,d}$ – derived bending stress around the principal z-axis;
$f_{m,z,d}$ – derived bending strength around the principal z-axis;
k_m – a coefficient to take account of the redistribution of bending stresses in the cross-section. The value of the coefficient must be taken as 0.7 for rectangular cross-sections and 1.0 for cross-sections of other shapes.

In all other cases, (when λ_rel>0,3) the stresses must comply with the following conditions in accordance with LST EN 1995-1-1 formulae 6.23 and 6.24:

$$\frac{\sigma_{c,0,d}}{k_{c,y} f_{c,0,d}} + \frac{\sigma_{m,y,d}}{f_{m,y,d}} + k_m \frac{\sigma_{m,z,d}}{f_{m,z,d}} \le 1$$

$$\frac{\sigma_{c,0,d}}{k_{c,z} f_{c,0,d}} + k_m \frac{\sigma_{m,z,d}}{f_{m,z,d}} + \frac{\sigma_{m,y,d}}{f_{m,y,d}} \le 1$$

Where:

$k_{c,y}$ ir $k_{c,z}$ – coefficients of variation.

The coefficient of variation is calculated in accordance with LST EN 1995-1-1 formulae 6.25, 6.26, 6.27 and 6.28:

$$k_{c,y} = \frac{1}{k_y + \sqrt{k_y^2 - \lambda_{rel,y}^2}} \qquad k_{c,z} = \frac{1}{k_z + \sqrt{k_z^2 - \lambda_{rel,z}^2}}$$

$$k_y = 0{,}5(1+\beta_c(\lambda_{rel,y}-0{,}3)+\lambda_{rel,y}^2) \qquad k_z = 0{,}5(1+\beta_c(\lambda_{rel,z}-0{,}3)+\lambda_{rel,z}^2)$$

β_c – the coefficient to be applied to elements with straightness limits defined as follows, according to LST EN 1995-1-1 formula 6.29:

$$\beta_c = \begin{cases} 0{,}2\text{-solid timber} \\ 0{,}1\text{-glued laminated timber and LVL} \end{cases}$$

Where:

$\lambda_{rel,y}$ – slenderness ratio corresponding to bending about the y-axis (deflection towards z);
$\lambda_{rel,z}$ – slenderness ratio corresponding to bending about the z-axis (deflection towards y).

The relative slenderness ratios are calculated as follows:

$$\lambda_{rel,y} = \frac{\lambda_y}{\pi}\sqrt{\frac{f_{c,0,k}}{E_{0,k}}} \qquad \lambda_{rel,z} = \frac{\lambda_z}{\pi}\sqrt{\frac{f_{c,0,k}}{E_{0,k}}}$$

Where:

λ_y and λ_z – slenderness ratios;
$E_{0,k}$ – modulus of elasticity (towards the fibre).

Other assumptions used in the calculations, the results of which are presented in the following tables:

- Load w_k in the calculations is assessed as 0.6 kN/m (1kPa to a wall of 1m^2).
- The weight of the wall stud is considered as part of the permanent load.
- The calculations for wall studs in a frame house are presented in the tables below.
- The maximum bearing power is calculated according to EN 1995-1-1 for a stronger cross-sectional axis (towards z).
- The assessment of the buckling of the wall stud around the weak axis (towards y) is conducted under the assumption that the sides of the wall studs are restrained at least every 1 metre along their height.
- The height of the calculated wall stud is 3 metres.

Maximum bearing power of wall studs of VMG LIGNUM JOISTS with OSB/3 web (Fk, kN):

VMG LIGNUM JOIST OSB/3		Maximum characteristic axial force when the web is 8 mm	Maximum characteristic axial force when the web is 10 mm
b, mm	h, mm	F_k, kN	F_k, kN
45	220	63,12	65,23
	240	64,36	66,76
	250	64,97	67,52
	300	68,04	71,31
	360	71,70	75,82
	400	74,13	78,81
60	220	132,95	135,66
	240	134,65	137,72
	250	135,43	138,68
	300	139,29	143,39
	360	143,81	148,88
	400	146,77	152,45
90	220	254,15	256,26
	240	255,80	258,21
	250	256,58	259,13
	300	260,10	263,39
	360	263,79	267,95
	400	266,17	270,90

Maximum bearing power of wall studs of VMG LIGNUM JOISTS with SPB P5 web (Fk, kN):

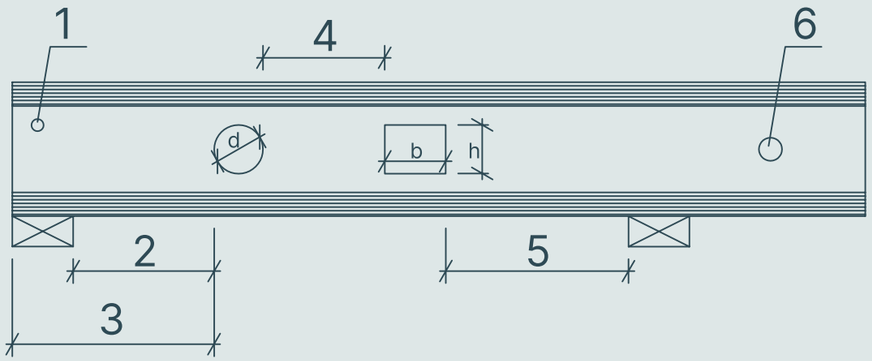
VMG LIGNUM JOIST MDP P5		Maximum characteristic axial force when the web is 8 mm	Maximum characteristic axial force when the web is 10 mm
b, mm	h, mm	F_k, kN	F_k, kN
45	220	63,21	65,33
	240	64,45	66,87
	250	65,07	67,64
	300	68,17	71,47
	360	71,87	76,02
	400	74,32	79,04
60	220	133,06	135,79
	240	134,77	137,87
	250	135,57	138,84
	300	139,46	143,59
	360	144,02	149,13
	400	147,00	152,73
90	220	254,23	256,37
	240	256,68	258,33
	250	256,58	259,26
	300	260,23	263,56
	360	263,95	268,16
	400	266,36	271,13

HOLE DRILLING METHODS AND CALCULATIONS

Do not drill or cut holes in the flange.

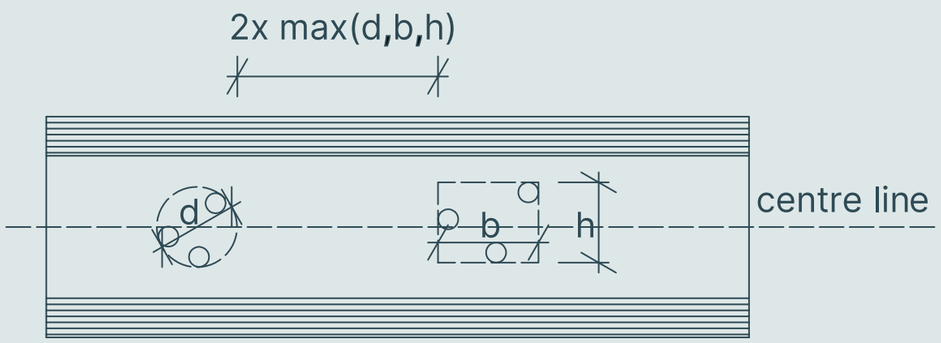
Holes must be drilled in the horizontal axis, except for smaller holes when the diameter of the circle is ≤20mm and the sides of the rectangle are ≤20mm.

1. 20mm holes can be drilled according to requirements, subject to minimum distances from the edges.
2. The minimum distance from the edge of the support to the edge of the circular hole must be at least h/2 (half the height of the joist).
3. For holes of diameter ≤38mm, the distance is measured from the edge of the joist to the edge of the hole.
4. The minimum distance between two holes must be twice the maximum dimension (2d, 2b, 2h).
5. The minimum distance between the edge of the support and the rectangular hole is 300mm.
6. Do not cut or drill into the bracket.



Possible holes in the web (d - diameter, b - width, h - height, 1-6 see above).

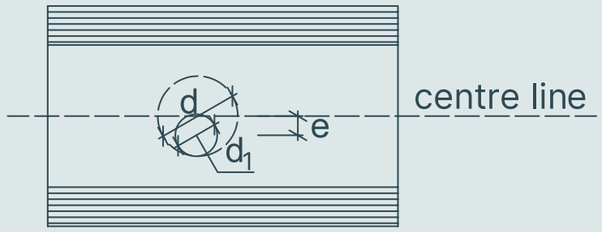
The distance between the two holes must be at least twice the maximum dimension (d,b,h). Otherwise, the holes are grouped together and treated as one large hole, defined as a circle or rectangle.



The theoretical size of the hole that defines groups of holes.

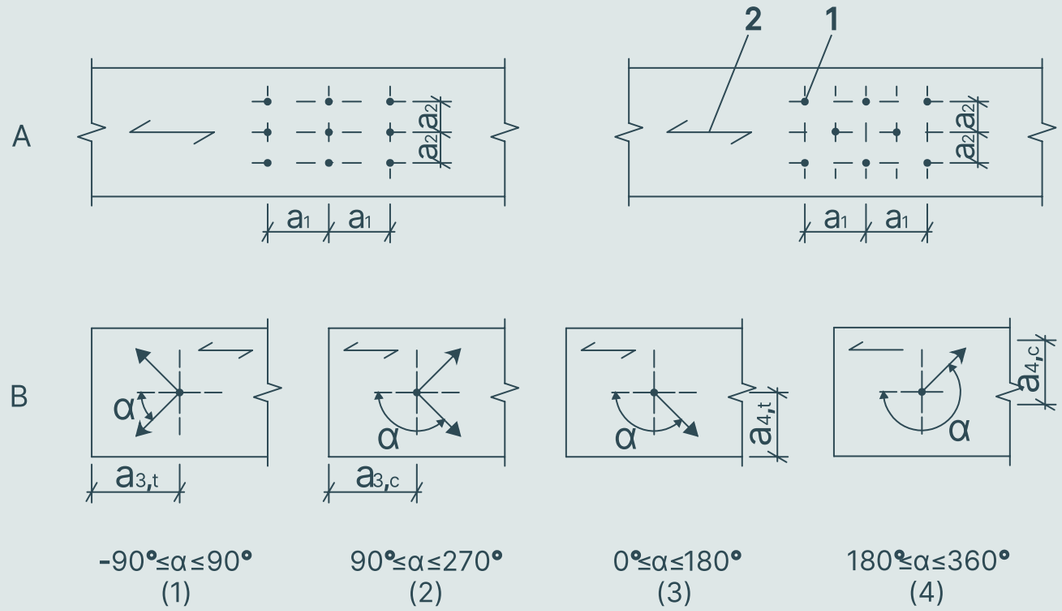
Holes whose centre does not coincide with the centre line of the wall are treated as holes of larger dimensions with a diameter equal to d1+2e, where d1 is the diameter of the hole and e is the eccentricity.

$d=d_1+2\cdot e$



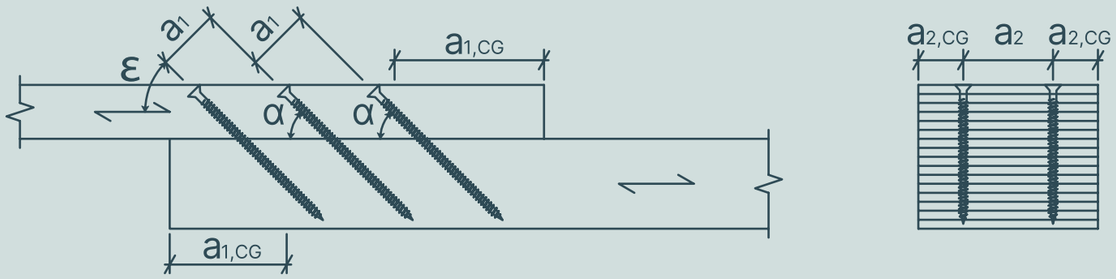
The theoretical size of the hole when the hole is eccentric.

SPACING AND DISTANCES BETWEEN FASTENERS



Spacing and distances from the end and the edge when the fasteners are subjected to a transverse force (1 - connectors, 2 - direction of the fibre (LST EN 1995-1-1 Figure 8.7))

(A) Distances of fasteners in a row along and perpendicular to the fibre;
(B) Distances from the end and the edge, (1) loaded end, (2) loadless end, (3) loaded edge, (4) loadless edge.



Spacing and distances from the end and the edge when the fasteners are subjected to axial force.

α angle between the shear plane and the axis of the bolt,
ε angle between the axis of the bolt and direction of the fibre.

Minimum spacing of transversely loaded nails and screws and their distances from the edge and the end (LST EN 1995-1-1, table 8.2):

Spacing or distance	Angle α	Undrilled holes		Drilled holes
		Flat surface	Edge	
a_1(parallel to the fibre)	0°≤α≤360°	d<5 mm: (5+5|cos α|)d; d≥5mm: (5+7|cos α|)d;	(7+8|cos α|)d;	(4+|cos α|)d
a_2(perpendicular to the fibre)	0°≤α≤360°	5d	7d	(3+|sin α|)d
$a_{3,t}$(to the loaded end)	-90°≤α≤90°	(10+5 cos α)d	(15+5 cos α)d	(7+5 cos α)d
$a_{3,c}$(to the loadless end)	90°≤α≤270°	10d	15d	7d
$a_{4,t}$(to the loaded end)	0°≤α≤180°	d<5 mm: (5+2 sin α)d; d≥5mm: (5+5 sin α)d;	d<5 mm: (7+2 sin α)d; d≥5mm: (7+5 sin α|)d;	d<5 mm: (3+2 sin α)d; d≥5mm: (3+4 sin α)d;
$a_{4,c}$(to the loadless end)	180°≤α≤360°	5d	7d	3d

Minimum spacing of axially loaded screws and their distances from the edge (LST EN 1995-1-1, table 8.6):

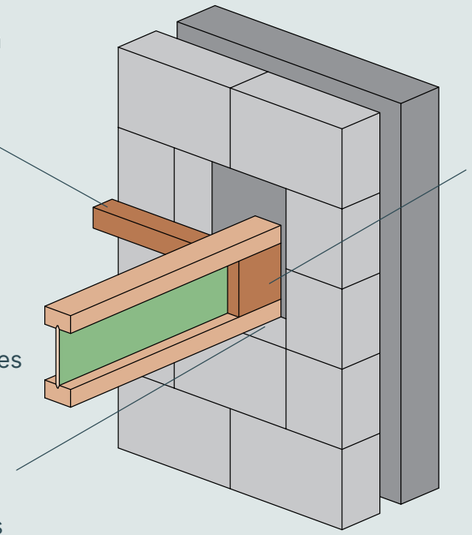
Screw-in screws	Minimum spacing	Minimum distance from the edge
At right angle to the fibre	4d	4d
At the end of the fibre	4d	2,5d

EXAMPLES OF APPLICATION

Support of load-bearing structures in a masonry wall:

A beam with a minimum cross-section of 38x38 must be secured to the joist using fasteners. The beam must be 35-75 mm away from the wall

All load-bearing structures must be supported by a minimum of 90 mm. It is necessary to ensure that the supports are flat and level and that the supported structures are vertical



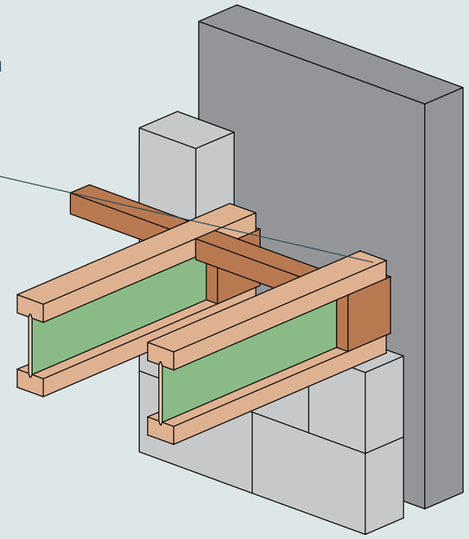
Sienelės sąstanda yra pritaikyta pagal siją. Sandūra tarp sienos ir sijos turi būti pritvirtinama su silikono mastika

Additional restraint of the joists is required when the building is two storeys high, or when the joist support is less than 90 mm

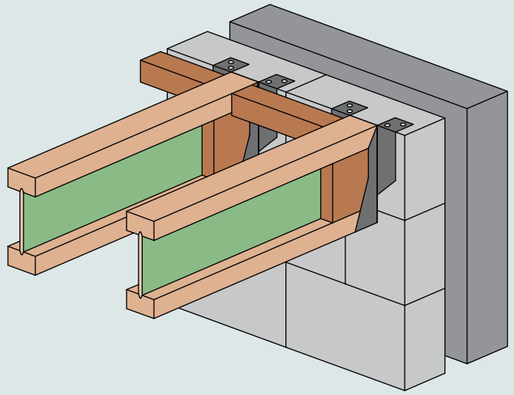
Support of load-bearing structures in a masonry wall:

To prevent the transmission of internal force to the wall, it is essential to ensure that the joist is 10 mm shorter than the length of the support when load-bearing structures are supported on a masonry wall

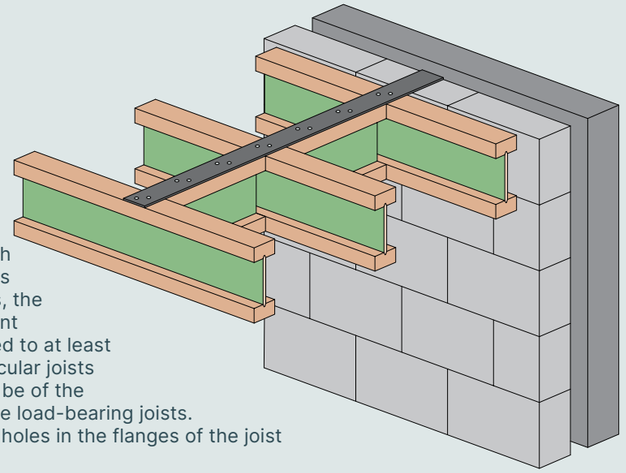
It is necessary to ensure that all supports are flat and level so that the joist is vertical



Supporting of load-bearing structures in masonry:

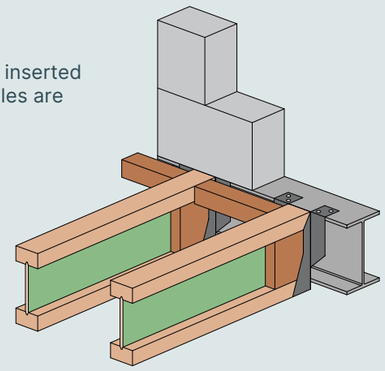


Restraint of load-bearing structures by a joist connected to a masonry wall:



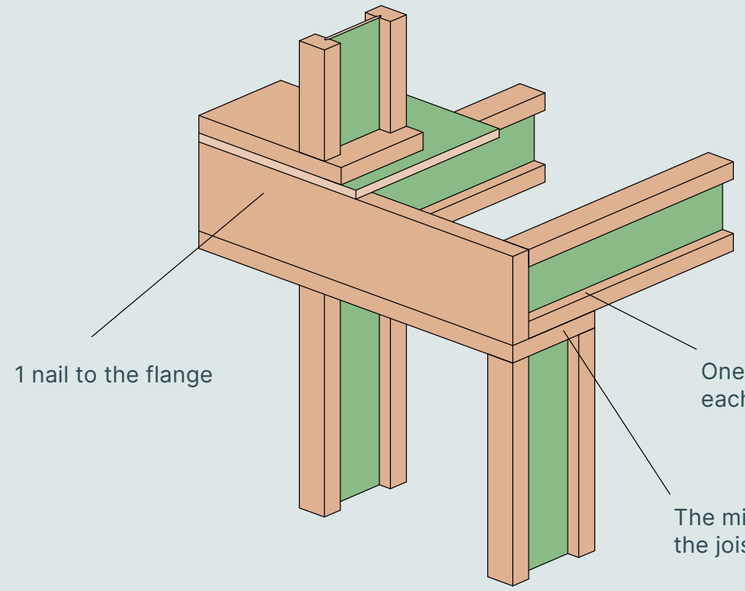
In accordance with the manufacturer's recommendations, the galvanised restraint must be connected to at least 3 joists. Perpendicular joists for restraint must be of the same height as the load-bearing joists. Do not drill or cut holes in the flanges of the joist

Suspension of load-bearing structures on a metal joist and a masonry wall on top of it:



If the joist is securely inserted into the bracket, staples are not necessary

Floor framing joist assembly:

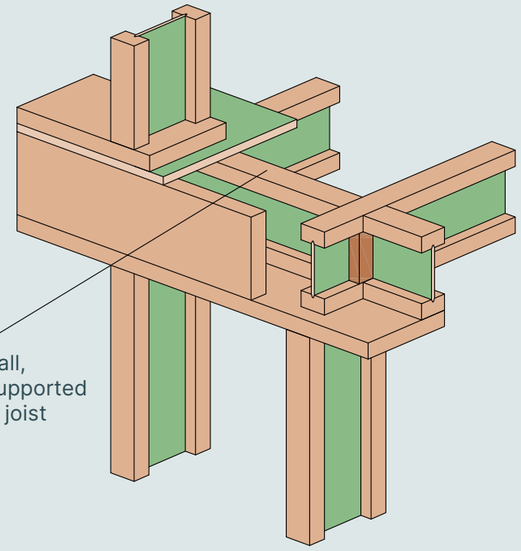


1 nail to the flange

One nail (3.35x90) on each side of the web

The minimum length of the joist support is 45 mm

Floor framing joist assembly with the restraining joist:

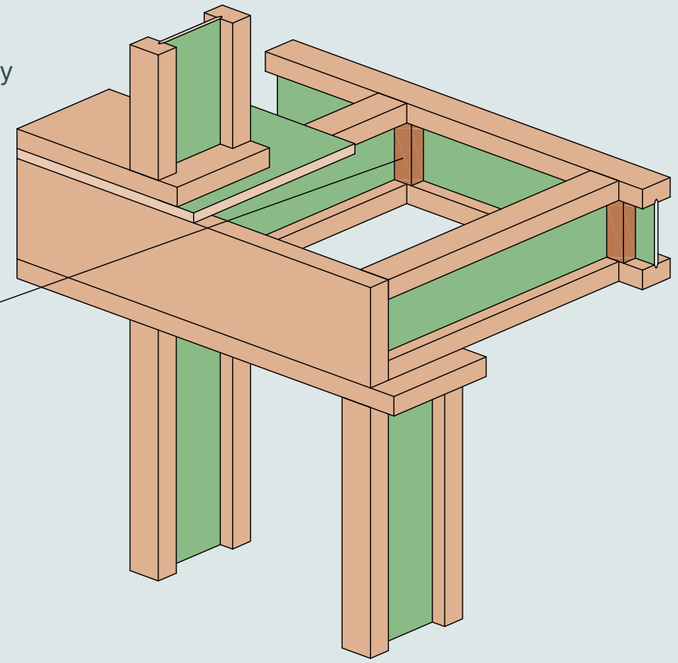


On the inner side of the wall, restraining joists can be supported up to half the width of the joist

An external web assembly where the joists are perpendicular to the wall:

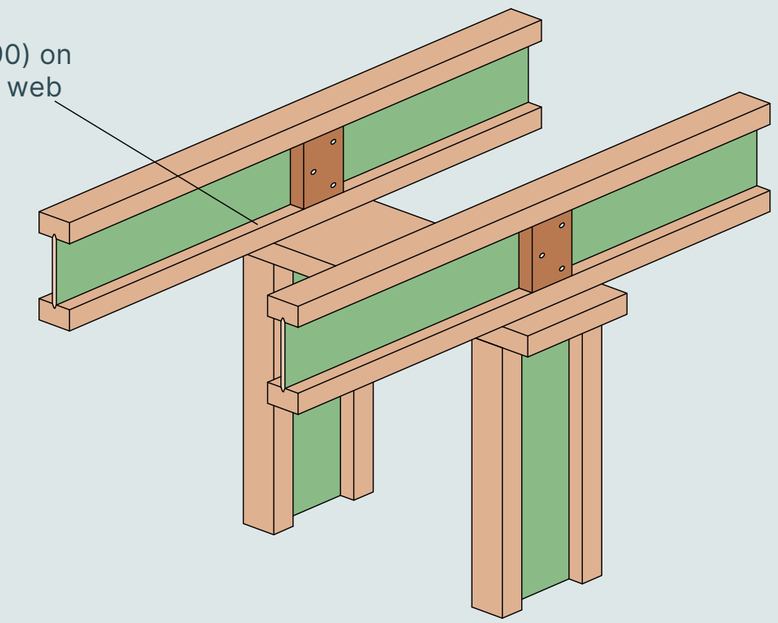
Joists may be used to create a “ladder” assembly

The sawn or glued timber webs or plywood staples must be adapted to the joist



Intermediate support of a whole joist:

One nail (3.35x90) on each side of the web

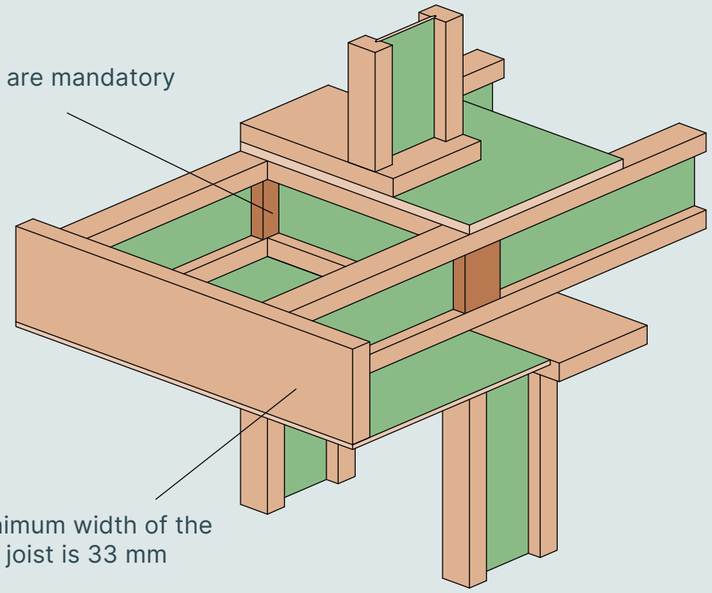


Cantilever assembly:

Web staples are mandatory

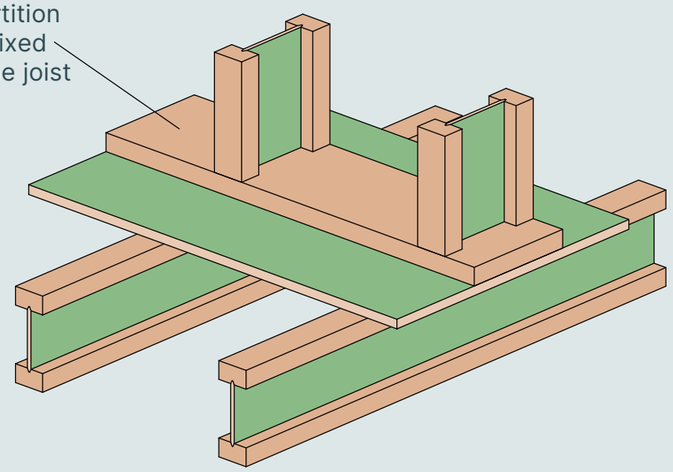
The restraining joists can be made of LVL or JOIST depending on the loads

The minimum width of the framing joist is 33 mm

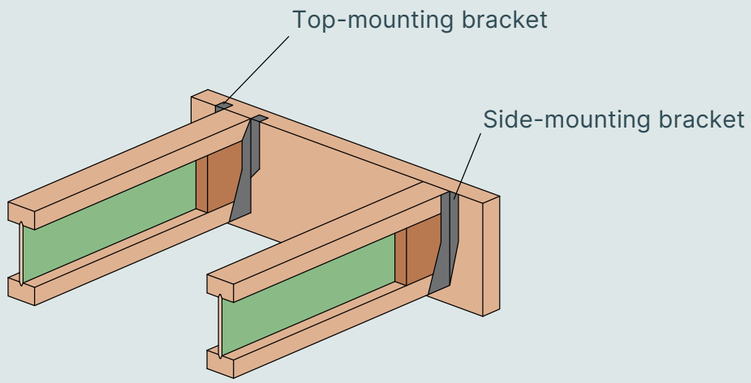


Wall framing on joists perpendicular to the wall:

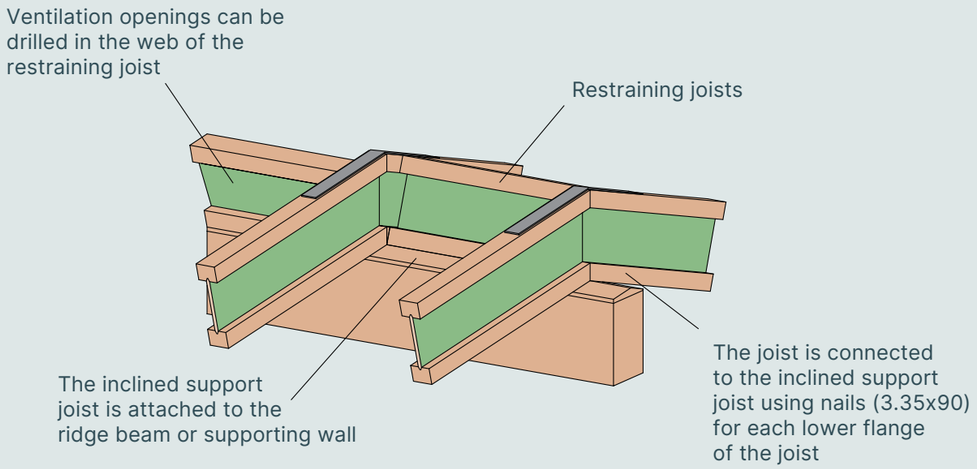
The joist of the partition wall sole must be fixed to the bottom of the joist



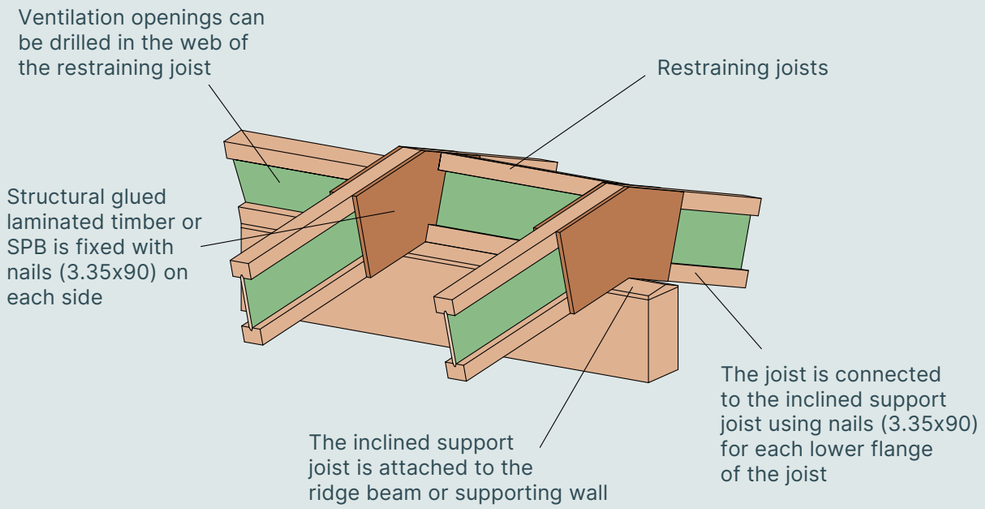
Different brackets:



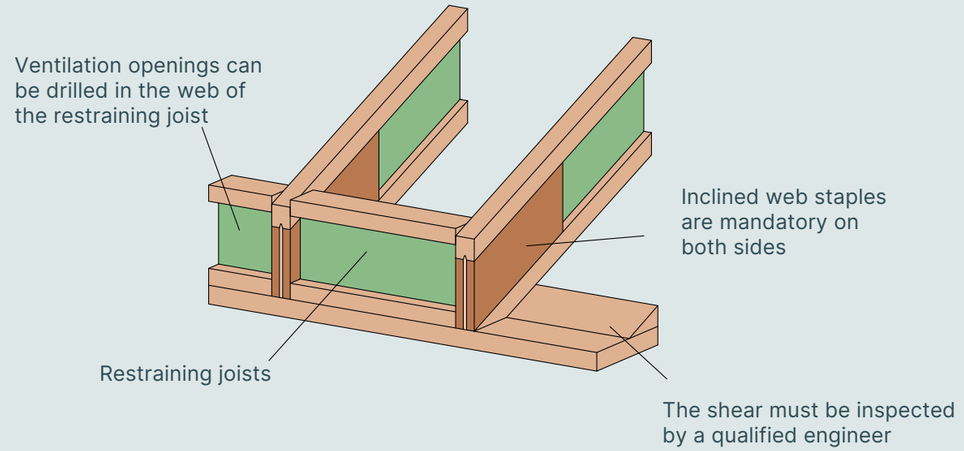
Ridge joist with inclined joist assembly:



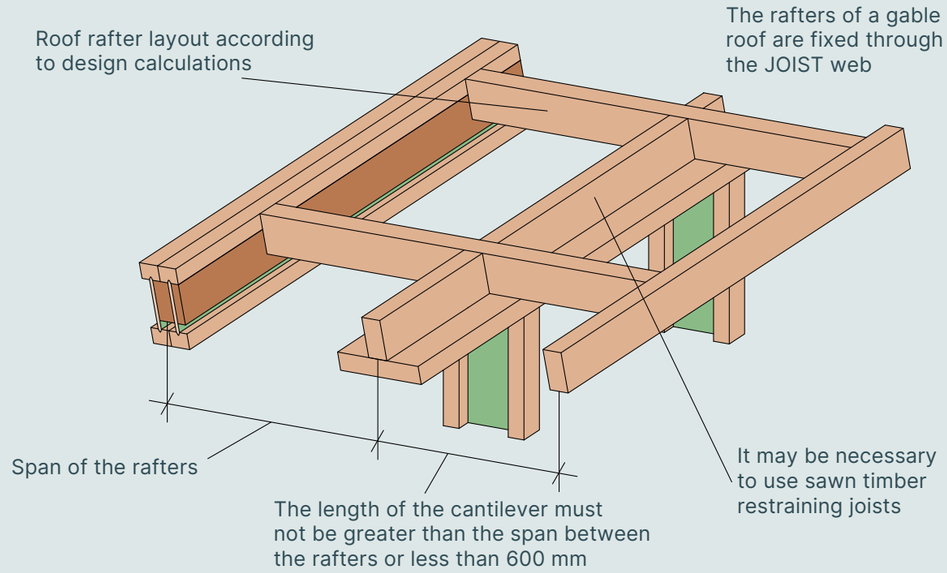
Ridge joist with inclined joist assembly:



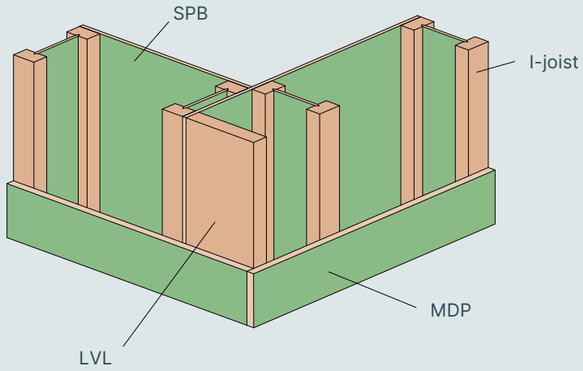
Roof eaves joist shear assembly:



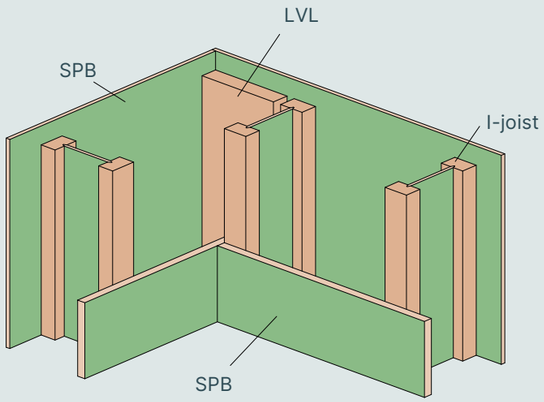
Gable roof structure:



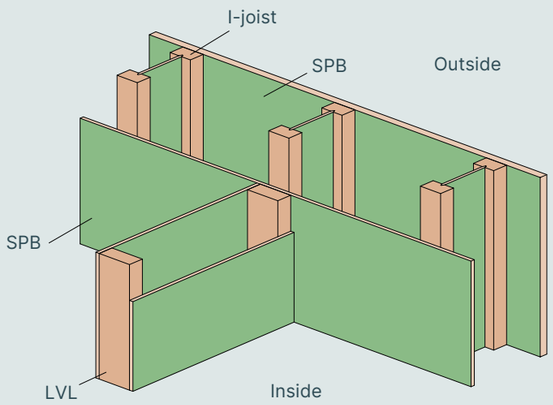
Outer wall corner assembly:



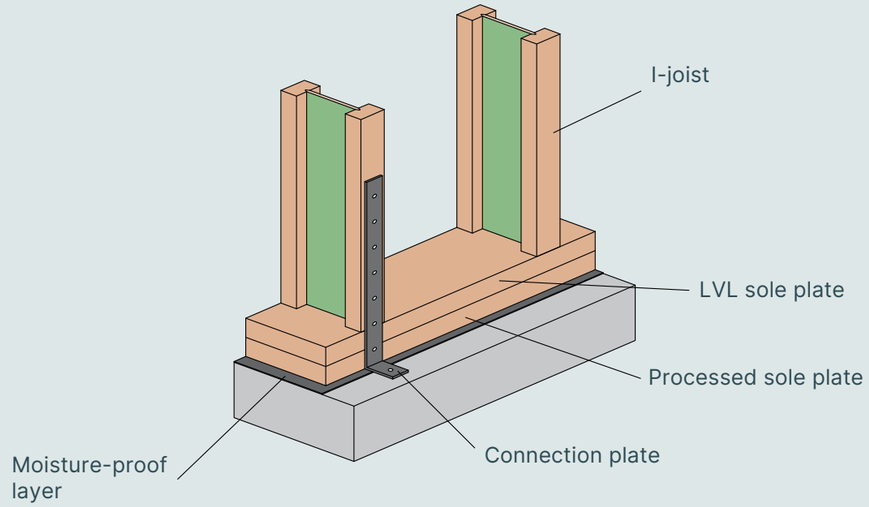
Inner wall corner assembly:



External and partition wall assembly:

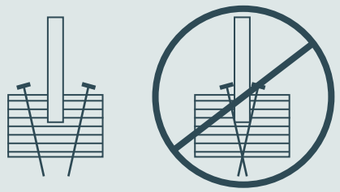


Wall to concrete connection assembly:



INSTALLATION RECOMMENDATIONS

- Before installation, it is important to inspect the products for any damage that may have occurred during transport and storage. Any damaged articles must be replaced.
- Do not use VMG LIGNUM JOISTS if they are damaged.
- Do not install VMG LIGNUM JOISTS in the event of direct precipitation. Cover is required.
- Except for cutting lengthwise, no holes must ever be cut or drilled in JOIST flanges.
- JOISTS are not stable until they are fully assembled and do not bear loads until they are completely connected.
- Workers are prohibited from walking on JOISTS that have not been installed. There is no storage or placement of other materials possible on joists that have not been installed.
- Temporary anchorages should be used to install restraints for the compression flange during installation. Bending moments must be permitted when the compressible webs are restrained.
- The length of the support must be a minimum of 35 mm for end supports and a minimum of 45 mm for intermediate supports, but the necessary anchorages must be calculated.
- Recommended assembly guidelines must be followed for reinforcing the web.
- When applying additional floor layers to the VMG LIGNUM JOIST frame, make sure that the brackets or other fixings with the specified width and height are properly positioned and secured using the required wooden studs or nails as per the design specifications.
- VMG LIGNUM JOISTS must be installed vertically. The maximum difference between the verticality of the top and bottom flange is up to 2 mm.
- Avoid attaching any unintended objects to the bottom flange of the JOIST, as this may create an excessively high point load. When applying point loads from above or below, ensure that the fixing is done through both the top and bottom flanges at these locations. If necessary, fill in these JOIST areas and at web level on both sides.
- Do not hammer nails or drive wooden studs into JOIST flanges closer than 5 mm from the web on either side.



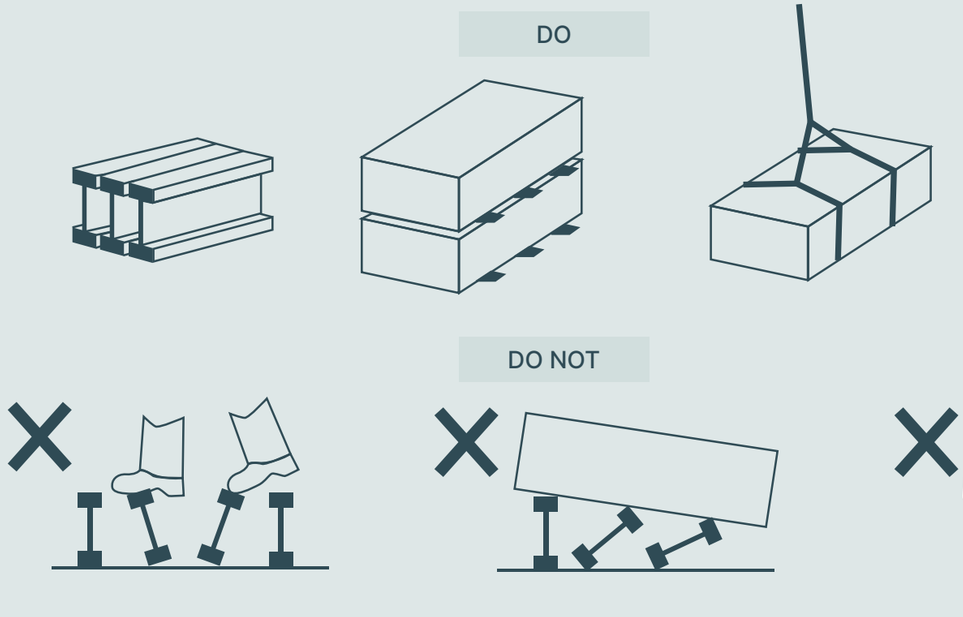
DO NOT:

- Drill holes above the support.
- Cut flanges or drill holes in them.
- Use sawn timber for edge wedging.
- Use a hammer to make holes

STORAGE AND TRANSPORTATION

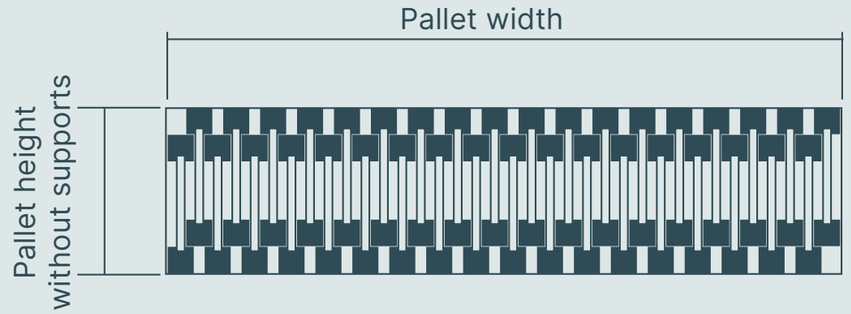
Store all joists horizontally on a pallet or a dry flat surface, either indoors or outdoors. Cover them on at least three sides, leaving the underside exposed to allow for ventilation, and protect them from direct exposure to sunlight and precipitation. The height of the pallets must be at least 30 cm when stored outdoors and a minimum of 10 cm when stored indoors. If the distance between the pallets is not more than 3 metres, the minimum width of the pallets must be 45 mm.

If the original packaging is removed, both the film and the strapping, safe storage must be ensured. Do not store other construction materials on non-original VMG LIGNUM JOIST packaging. Standard VMG LIGNUM JOIST packages weigh up to 2 tonnes, therefore it is necessary to have the necessary loading equipment on site, i.e. loaders, cranes. The package must be lifted from the bottom, and under no circumstances should it be suspended from the top flange.



PACKAGING FORMATS

Standard VMG LIGNUM JOIST packaging scheme:



The height of the package depends directly on the height of the product. Package lengths can range from 6.0 to 13.0 metres, depending on the lengths ordered.

The maximum weight of the package may be 2.0 tonnes.

CERTIFICATES

VMG LIGNUM JOISTS are certified in accordance with the current EAD documents and have a European technical approval (ETA) certificate under which CE marking is permitted.

VMG LIGNUM JOISTS are also FSC and PEFC certified. All VMG LIGNUM products will also have an EPD certificate.

CE
EN 13986

PEFC
PEFC/01-32-1177

FSC
www.fsc.org
FSC® C166244
The mark of responsible forestry

EPD®

WE DELIVER OUR JOIST PRODUCTS TO OUR CLIENTS TO ALL OF EUROPE

The main countries to which we export our production are: Norway, Finland, Sweden, Estonia, Denmark, United Kingdom, Poland, Germany, France, Spain, and other countries

COMPANY STRUCTURE:

VMG LIGNUM

Engineered wood product sales and distribution

VMG LIGNUM CONSTRUCTION

Engineered wood product manufacturing

VMG LIGNUM SYSTEMS

Structural engineering design and consultancy services

EUROVESTA

Round wood purchasing

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