Specifiers Guide

The Specifiers Guide will give you details of the various kinds of Glulam, their properties, performance and availability.

Contents

Introduction

In this guide we have set out to give you details of the various kinds of Glulam, their properties, performance and availability.
At the back of the guide, you will find a model specification to assist you in defining precisely what you need.
Naturally, we hope you will find this guide invaluable in helping you to specify Glulam in every type of structure.
Should you need further advice, both the GLTA itself and our individual members will be delighted to provide it.

Possibly the oldest existing glued laminated timber structure in the world.
It is now the wedding ceremony hall at Southampton Registry Office.
The laminated, curved tie beams date back to 1860.

The Fastest Growing Structural Material?

Glulam is probably the fastest growing structural material in Britain. Between 1985 and 1995 consumption doubled.

One of the reasons is the availability of standard Glulam components, often off-the-shelf.

This has given architects and specifiers the opportunity to choose Glulam for almost every kind of building.

Where Glulam was once virtually all purpose-made and specified largely for swimming pools, bridges, churches and the occasional school, today it is appearing everywhere and being accepted as a standard structural material.

Fifteen years ago there were hardly any standard Glulam beams sold in Britain, today they account for more than 50 per cent of total Glulam sales.

This ready availability has helped to take the mystique out of Glulam and has also made it highly competitive.

From the Pyramids
Glulam has been around since the early Egyptians, and its more modern form dates back to the 1800s.

Mechanically laminated timber railway arches designed by Brunel, among others, throughout the 19th Century, and laminated oak in French military riding schools in the 1820s, can all be regarded as clear forerunners of modern Glulam, while some of the earliest structural uses date back as far as 1807, to the bridges of Carl Friedrich von Wiebecking.

But, despite the undoubted durability of these early structures - a lantern roof with laminated curved support beams at the Old Rusholme Chapel in Manchester, survived soundly from 1827 until demolished in 1962, for example-real development of Glulam had to wait another hundred years or so until a suitable waterproof adhesive was available

In 1906, the German, Otto Hetzer obtained a patent and was able to start commercial production of Glulam using casein adhesive.

But it wasn't until after the Second World War that Glulam as we know it today began to emerge, following the arrival of powerful synthetic resin adhesives and the impetus of wartime demands for laminated marine and aircraft components.

Laminated timber was used in the construction of the Mosquito fighter/bomber, for example, and great technical strides were made both in selecting wood of uniform properties and in gluing lamina-tions together under the strin-gent quality control procedures required for aircraft construction.

When Glulam for building first started to be made as a commercial proposition after the war, factories opened up in North America, continental Europe and throughout Scandinavia.

New Era
British manufacture began to flourish as a new era was heralded by the Festival of Britain.

The parabolic entrance arches for the Festival itself were made from Glulam and many of the new geometric forms of the Fifties-including shells, hyperbolic paraboloids and conoids were also formed from Glulam.

But applications tended to be esoteric and specifiers chose Glulam mainly for its aesthetics (in churches, for example), or its non-corrosive properties -hence the ubiquitous Glulam beams in swimming pools and ice hockey stadiums.

This began to change in the 1970s. Curved beam techniques improved and modern high-volume plants were laid down throughout Europe to produce straight beams in a wide choice of standard section sizes. Many of these sizes were made available ex-stock through distributors.

Limitless
This revolutionised the availability and cost of Glulam, and gave it almost limitless potential.

It transformed Glulam from an aesthetic indulgence or an environmental necessity into a basic structural material with substantial benefits over steel and concrete in a host of applications.

And it has given architects and specifiers the freedom of choice that is expanding the use of this most attractive material every day.

Glulam and its Benefits

Glulam has several key benefits for the modern specifier:

Versatility

Glulam can be made to almost any size and used for arches and portals, roof, lintel and floor beams, for columns, rafters and 'A' frames, cross wall purlins and joists.

Members can be of uniform or varying depth. They can be straight or curved to suit aesthetic requirements or to provide more structurally efficient designs than can be achieved with straight members. This scope makes glulam suitable for every type of building.

No Cladding

The choice of glulam allows the design of a building and its structural members to suit the function and use those structural members without individual protection or cladding, sitetime and cost, and add a new aesthetic dimension.

Large Spans

Glulam can be used over spans of more than 50 metres. Size, length and shape are limited only by the capacity of the various manufacturing plants or, more usually, by restrictions governing the transportation to site.

Good Strength to weight Ratio

Glulam is one of the strongest structural materials per unit weight. Compared with structural steel or concrete it can produce a lighter superstructure with a consequent economy in foundation construction.

Superior Fire Performance

Glulam has a high and predictable resistance to fire. Unlike steel and reinforced concrete it will not twist or spall in fire and, in some countries glulam beams attract lower fire insurance premiums than steelwork.

Corrosion Resistant

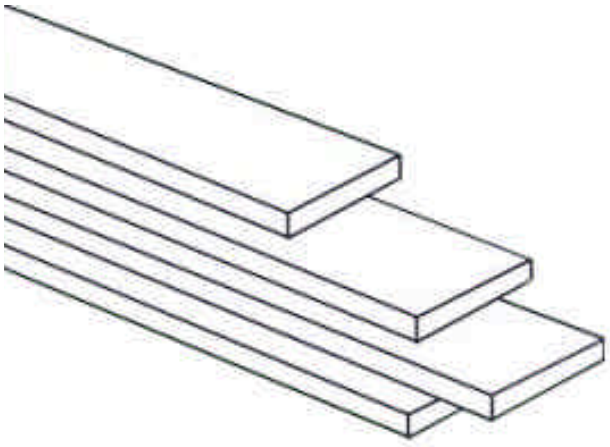
Glulam will not corrode. It also has a high resistance to chemical attack and aggressive and polluted environments.

Manufacturing Process

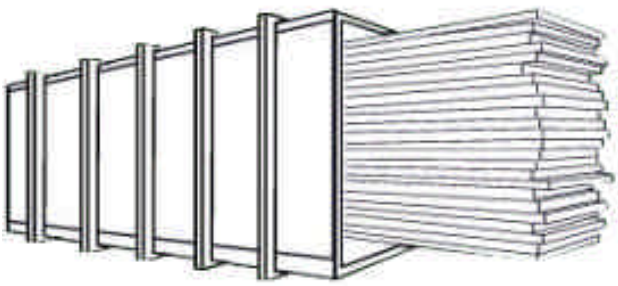
Glulam is precisely designed as an engineered, laminated structural component. It is fabricated by bonding together accurately
planed timber laminations, with their grain in the longitudinal direction of the member.

This forms a structural unit of great strength and dimensional stability.

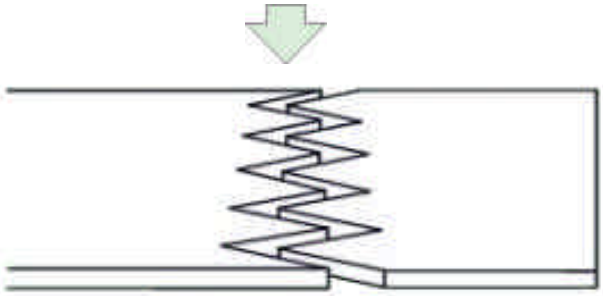
Historically, glulam was fabricated from LA, LB or LC grade timber. Amendment slip No. 1 (1973) to CP112: Part 2:1971 introduced SS and GS grades for structural timber. SS was then included in BS5268: Part 2:1984 as a replacement for LB grade. The advent of DD ENV 1995-1-1: 1994, with its supporting standards introduced the strength class method of strength classification. The properties of C24 are virtually the same as for SS. It follows, therefore, that load and/or span tables produced under the old LB umbrella, may be used provided the laminae are of at least strength class C24.



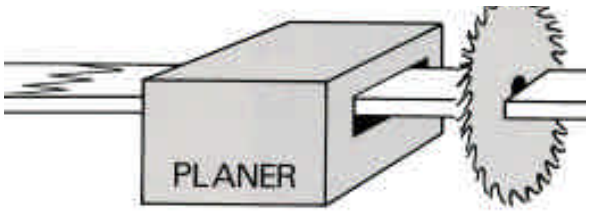
Laminations are stress-graded to ensure they meet the specified structural grade.



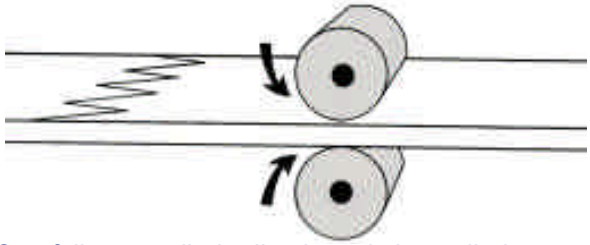
Timber is kiln-dried to a moisture content of 12% ± 2% for maximum bond-strength and glulam stability



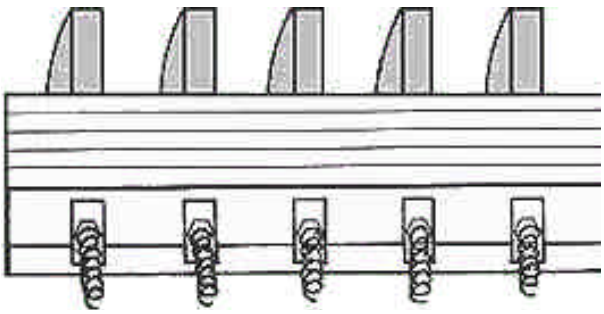
Finger joints are machined and bonded to the appropriate strength grade.



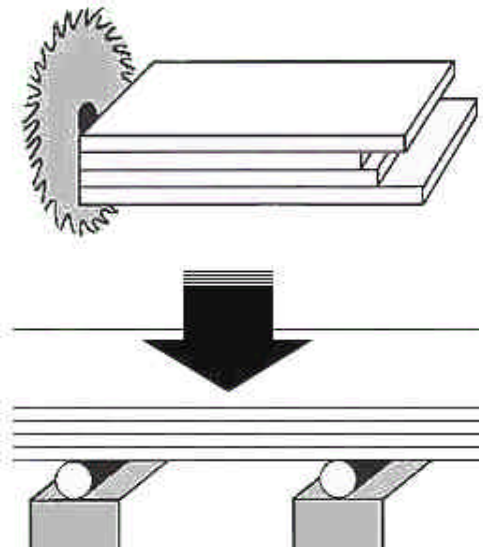
Finger jointed laminations are planed to required thickness and cut to length.



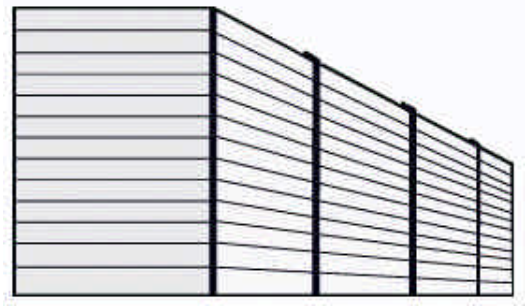
Carefully controlled adhesive mix is applied to faces of the lamination.



Glulam is placed in mechanical or hydraulic jigs of the appropriate shape and pressure applied to specification



Glulam member is trimmed to size and the bond strength is tested to specification



Cured Glulam member is planed to size and to remove any glue squeezed out in the jigs.

Any appearance defects, where it is necessary within the grade, are made good and the Glulam member is cut, shaped and drilled if required, and any specified preservative and finishing treatments are applied.

Finished Glulam members are usually wrapped and packed for delivery to site to maintain structural and appearance grade.

Bending Radii
The radius of curved glulam is governed by the thickness of the laminations. Costs increase with tighter curves and many manufacturers prefer not to go below about 2500mm.

Clause 3.5.3 of BS 5268: Part 2 1996 gives rules for the ratios of lamination thickness to radius of curvature.

Enquiries should state radius required to avoid ambiguity.

Finger Jointing
Since the length of glulam members normally exceeds the length of commercially available solid timber, pieces are fingerjointed together to make laminations of the required length.

These finger-joints will occur randomly throughout the glulam component.

The finger joints vary in length according to the manufacturer but the resultant joints are always as strong as the strength graded timber. For the method of assessing joint efficiency, see: BS 5291: 1984, 'Manufacture of Finger Joints of Structural Softwood'.

Confidence in modern finger jointing techniques is such that the quality of material in a component can be upgraded by sawing out any significant strength-reducing defects before jointing.

Adhesives
The most widely used is phenol-resorcinol-formaldehyde (PRF), which was developed out of the resorcinol-formaldehyde, (RF), adhesives introduced in the 1940s, and almost all the 'resorcinol' adhesives used today are PRF. They produce distinctive brown gluelines and are suitable for the most severe conditions.

The urea-formaldehyde adhesives, (UF), developed in the 1930s, are rarely used in the UK today.

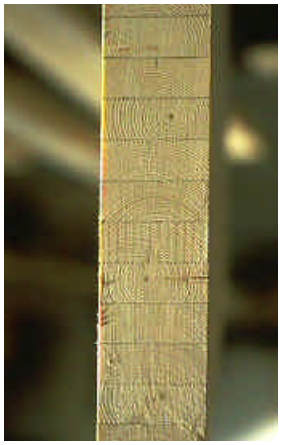
Adhesives should to be in accordance with BS EN 301: Adhesives, phenolic and amino plastic for load bearing timber structures.

It is important to use only those adhesives that meet official standards in the country of glulam manufacture and which are applied in accordance with regulations and standards and in strict conformity with the adhesive manufacturer's instructions.

Section Sizes
Glulam members are available in a wide range of section sizes to suit every application. In straight beams the depth increases in increments of 45mm. In curved beams the depth increases as a function of the radius.

Most glulam members are laminated to form what is known as horizontal glulam in which the laminations are arranged so that their wider surfaces are parallel to the neutral plane of the member.

Nominal economical breadths are: 65mm, 90mm, 115 mm, 140 mm, 165 mm, 190 mm, 215 mm.



This is a typical cross-section of a horizontal Glulam flexural member.

A typical cross-section of a horizontal glulam flexural member could be a beam (whether straight, curved or tapered) or a section of a glulam portal rafter, for example. Some manufacturers supply beams with rounded edges or chamfers to help prevent damage in handling.

Surface finishes
Glulam is normally planed to a clean finish with significant defects made good, (see BS 4169 clause 7.2 AMD. 3453). This provides an appearance at least as good as that of second fixing timber.

Sanding adds cost and is not usually necessary with modern planing machinery.

Glulam can be supplied to site with one coat of treatment, such as a water repellent, to protect against moisture pick-up during construction. The specifier should discuss his specific requirement with his supplier, and advise the supplier at the time of the enquiry what further finish will be applied on site by the main contractor - bearing in mind that some glulam components will be purely structural and not on plain view, and will, therefore, not require a costly decorative finish.

Preservative Treatments
Where preservative is required it is normally applied by flood coat after manufacture and followed by application of a water-repellent, which also has fungicidal additives.

Glulam members can be pressure-impregnated, provided that their size can be accommodated by pressure impregnation tanks.

Whitewood treated as detailed above is suitable for the majority of uses. However, Redwood species allow better preservative penetration and, in some instances, a species with extra natural durability, such as Iroko, may be recommended for particularly vulnerable locations, but this will increase the cost of the glulam components.

Standards
Glulam is manufactured to comply with relevant British and European standards where they apply. The recommended British Standard reference for the manufacture and application of glulam are:

Recommended British Standard References
Synthetic resin adhesives (phenolic and amino plastic) for wood. BS EN 301

Manufacture of glued-laminated timberstructural members. BS EN 386

Timber grades for structural use. BS EN 518 and BS EN 519

Structural use of timber : Part 2. Code of practice for permissible stress design, materials and workmanship. BS 5268: Part 2.1996

Code of practice for the structural use of timber : Part 5. Preservative treatments for constructional timber. BS 5268 : Part 5.

Manufacture of finger joints of structural softwood. BS EN 385

Tropical hardwoods graded for structural use. BS 5756. 1980.

Glulam supplied in compliance with BS EN 386 will be manufactured from a species of timber whose mechanical properties are given in BS 5268 : Part 2.

This requires that, where softwoods are used, they are strength graded in accordance with BS EN 518, BS EN 519. Hardwood laminations must be strength graded in accordance with BS 5756.

Timber Species available
BS EN 386 gives the specifier an apparently large choice of timbers for glulam. However, most normal production glulam is made from European whitewood (Picea abies) because it has a clear, bright appearance, the knot sizes are much smaller than in redwood, it is widely available in suitable grades and it has excellent bonding properties.

Moisture Content
Manufacturers follow the guidelines of BS EN 386 on control of moisture content in the lamination at the time of bonding, to ensure a similar moisture content in adjacent laminations and to limit the moisture content of each glulam member overall.

It is important that all glulam members are manufactured to take account of the expected moisture content during service, and their relationship with other elements of the finished structure. In commissioning a building, the heating services, as is normal for all other materials, should be brought up to temperature over a period of weeks.

Glulam members may pick up moisture during transportation and the construction period. Then, during the drying down to the ambient moisture content of the building, surface shakes may develop. These, however, are seldom of structural significance and may normally be left without treatment.

Properties of Glulam

Strength and weight
Depending on specific loading conditions, a structural steel beam may be 20% heavier, and a reinforced concrete beam 600% heavier than an equivalent glulam beam of the same load-carrying capacity.

Durability
In most structural applications, the life of Glulam can be considered virtually unlimited. The use of modern phenolic synthetic resin adhesives also ensures an indefinite life for the bond between the laminations.

The main threat to unlimited service life is a rise in moisture content to more than 22%-25% for prolonged periods. However, sound maintenance procedures and good initial design including the avoidance of moisture traps and the provision of ventilation where it is applicable will prevent the glulam from being affected.

Fire Resistance
Glulam has a high and predictable performance in fire because timber chars at a slow and known rate: 40mm per hour for European white-wood. More importantly, it retains its structural integrity.

The high thermal insulation characteristics of timber, and the charcoal layer that forms on it, both ensure that the interior of a fire-exposed member remains cool and structurally sound over the design period. A glulam member also behaves as a single unit throughout its exposure to fire because of the high resistance of laminating adhesives to fire temperatures.

This reliability of Glulam's performance in fire means that it is possible to predict the inherent fire resistance of a particular component, or to design a component to resist fire for a specified period without the need of expensive testing.

The method of designing structural timber members, including glulam, to provide a stipulated period of fire resistance is given in. The Standard also provides information on the charring rates of various timbers in given structural situations.

The sacrificial timber included in fire resistance calculations is not necessarily additional to the designed structural section. Modification factors in design, giving increased stresses under fire conditions, will often mean that no increase in section size is required for shorter periods of fire resistance.

Metal connections, depending on the fire period required, may need special protection, which should be discussed with the supplier.

Class 0 and 1 surface spread of flame, can usually be achieved for glulam members by the application of a proprietary treatment on site after the building is dry and watertight. Care needs to be taken to ensure compatibility between specified treatments.

Chemical Resistance
Timber generally has a remarkable resistance to chemical attack in polluted atmospheres and to contact with chemical solutions. Indeed, it has long been used for for vats containing chemicals and for aggressive processes like leather tanning. Glulam is equally resistant. A recent application is in the construction of barns to store salt for de-icing roads.

The synthetic adhesives used in bonding glulam are equally resistant to most chemicals.

However, glulam is not totally immune Oxidising agents, sulphides and alkalis, for example, will exert a 'pulping' action on the timber and lead to loss of fibre and strength. But these are unusual agents in most service environments and if you do wish to use glulam in such conditions you are advised to seek specialist advice as to the most appropriate types of timber and adhesive to specify.

Types of Glulam

Glulam is available curved, straight or cambered.

Curved and cambered members are purpose-designed and manufactured for specific applications and performance criteria.

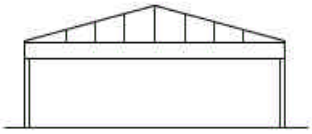
Straight, non-cambered, glulam is available from most manufacturers as a stock item in the most popularly specified section sizes ready for immediate use.

Straight glulam can also be purposemade for specific applications and, as well as the stock sizes, there is also a large range of standard sizes for economy.

To view tables indicating typical standard and ex-stock sizes of straight beams see chapter “Permissible load tables for standard straight Glulam beams”.

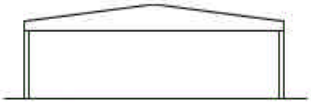
Types of Structure

Glulam can be used for beams and columns in all these types of structure .



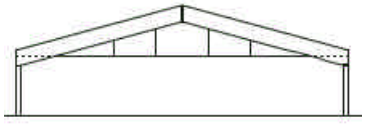
Simply supported beams

Monopitched beam

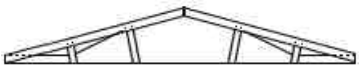


Duopitched beam

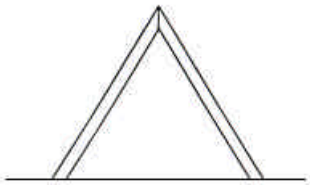
Pitched cambered beam



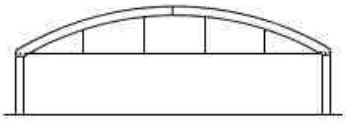
Tied rafters



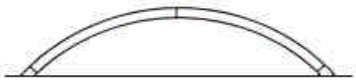
Trussed beam



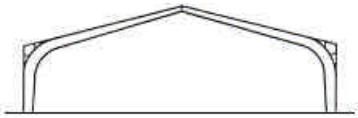
Three-pinned 'A' frame

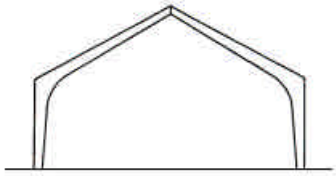


Roof arch with tie rod

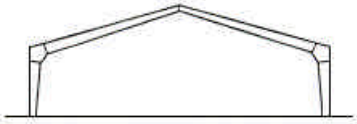


Arch fixed to foundation

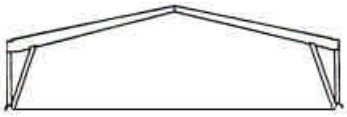




Three-pinned portal



Portal frame with jointed haunches



Economy frame

Types of Application

Glulam structural members can be used for-but are obviously not limited to-any of the structures shown opposite.

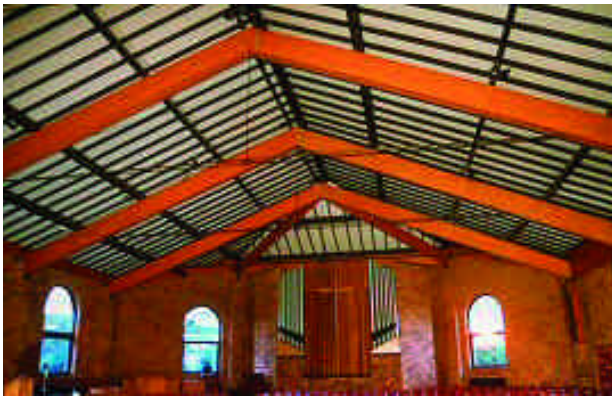
Applications range from one or more small timber beams used as lintels in houses and flats, right up to sports stadiums and leisure centres.

Within these structures, clear spans in excess of 67m are possible with glulam, and member sizes vary up to 214mm x 1620mm, with the lengths of members ranging up to 36m.

These are not minimum or maximum limits. They merely indicate the range for existing glulam structures in Britain. Even larger structures exist in other parts of the world. The 162m diameter dome for the Tacoma Sports and Convention Centre in Washington State, USA, is a good example.

Glulam has been used in Britain for over 100 years and, more recently, with the benefit of fully water-proof adhesives, it has been used for more than 50 years in the construction of a huge variety of buildings, including:

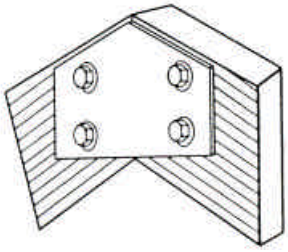
Residences	Libraries
Motels	Garden Centres
Hotels	Shops
Day-Centres	Showrooms
Clinics	Shopping Centres
Hospitals	Restaurants
Crematoria	Churches
Swimming Pools	Schools
Leisure Centres	Commercial buildings
Gymnasium	Offices
Ice rinks	Industrial buildings
Curling Rinks	Warehouses
Facilities at national and provincial parks	Air terminal buildings
Bridges	Aviation hangars



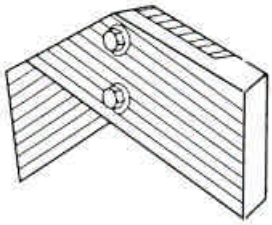
Typical Connection Details

Simple fixing is one of the major benefits of glulam. Timber is traditionally easy to handle, work and fix to, and glulam carries that tradition into modern times, bringing time and cost advantages to every type of structure.

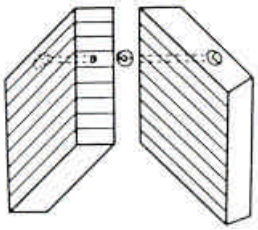
The fixing methods illustrated here are examples of the ease with which glulam members can be connected neatly, effectively and economically.



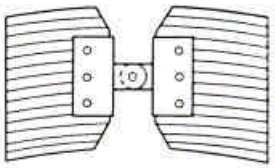
Industrial Portal Frame
Apex Connection



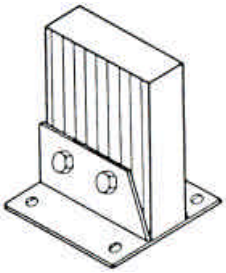
Half Lapped Portal Frame
Apex Connection



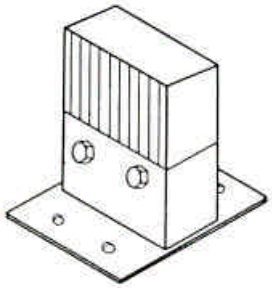
Steep Pitch Portal Frame
Apex Concealed
Connection



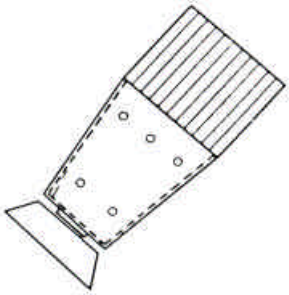
Arch Pinned
Apex Connection



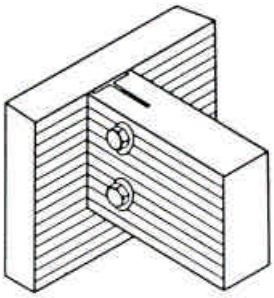
Portal Frame Base Shoe



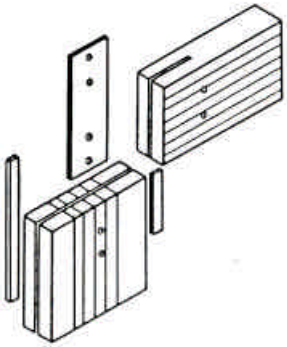
Post Base Flush Fitted Connection



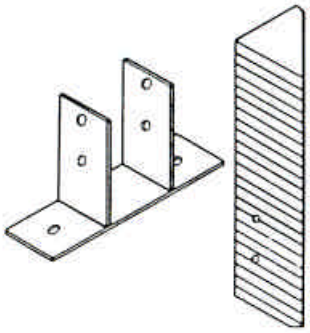
Externally Exposed Arch
Base Connection



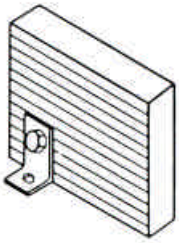
Concealed Beam to
Beam Connection



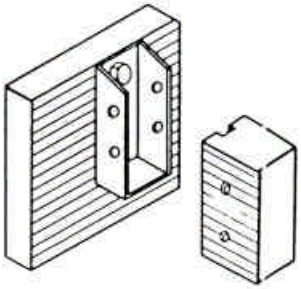
Concealed Beam to
Post Head Connection



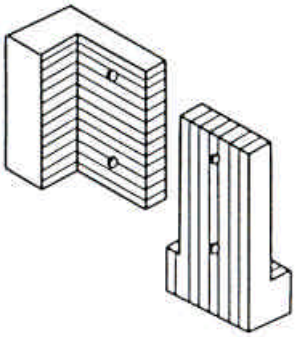
Beam to wall Connection



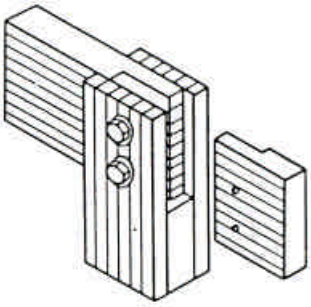
Beam to Wall Connection



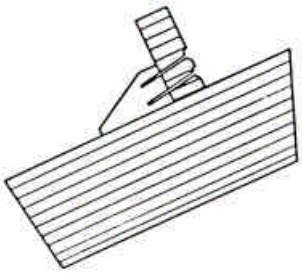
Beam to Beam Connection



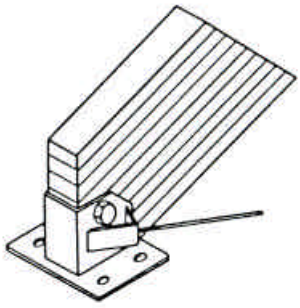
Half Check Beam to Post Head Connection



Double Beam to
Composite Post Head Connection



Purlin to Portal Frame Connection



Tied Arch Base Connection

Permissible Load Tables For Standard Straight Glulam Beams

The tables are calculated in accordance with BS 5268 : Part 2 : 1996, using grade stresses and moduli of elasticity for European Redwood and Whitewood. As explained in the code, the grade stresses are taken as the products of the SS grade stresses (equivalent to C24 strength class) for the species and a series of modification factors which depend upon the grade of the laminations, the number of laminations, and the property concerned. The tables are applicable to horizontally laminated beams fabricated using SS (C24) grade laminations of 45mm thickness.

Clause 2.10.8 of BS 5268: Part 2 1996 gives rules relating to depth to breadth ratios for solid and laminated members.

The depth factor, explained in Clause 2.10.8 of BS 5268: Part 2 1996, has been included in the calculations. Shear deflection has also been taken into account, as required by Clause 14.7. The total deflection under the tabulated beam load has been restricted to 0.003 times the span. The code allows for the possibility of pre-cambering members to offset the deflection under dead or permanent loads, in which case only the deflection due to live or inter-mittent imposed load need be compared with 0.003 of the span. This provision has not been included in the tables, however, since the designer will need to consider each particular case.

The permissible loads are expressed in kilonew-tons per metre run of the beam. The self-weight of the beam has been allowed for in the tables, hence it need not be included when estimating the applied load. The applied load should be determined as the sum of the imposed roof or floor loads, plus the mass of supported dead loads such as secondary members, floor or roof sheathing etc.

The table for floor beams gives permissible long term loads, whilst that for roof beams gives medium term loads. The latter allow an additional factor of 1.25 to be applied to the bending and shear stresses. Each tabulated figure is the minimum of three values, limited by bending stress, deflection, or shear.

Permissible Loads

Roof Beams

- Breadth:65mm/90mm/115mm
- Breadth: 140mm/165mm
- Breadth:190mm/215mm

Floor Beams

- Breadth:65mm/90mm/115mm
- Breadth:140mm/165mm
- Breadth:190mm/215mm

Permissible Loads - Breadth: 65, 90 and 115mm
Roof Beams

Kilonewtons per metre run of beam for:

Standard Glulam Straight Roof Beams

Typical Glulam Section available off-shelf

Breadth: 65mm

Span	Depth			
	180	225	270	315
4.0	1.15	1.58	3.86	5.46
4.5		1.14	2.72	4.28
5.0			1.98	3.14
5.5			1.48	2.35
6.0			1.12	1.80
6.5				1.40

Breadth: 90mm

Span	Depth					
	225	270	315	360	405	450
4.0	3.13	5.35	7.57	9.7	12.1	14.7
4.5	2.19	3.77	5.93	7.63	9.52	11.6
5.0	1.58	2.74	4.34	6.15	7.68	9.39
5.5	1.17	2.05	3.26	4.85	6.31	7.73
6.0		1.56	2.5	3.73	5.27	6.46
6.5		1.2	1.95	2.92	4.16	5.47
7.0			1.54	2.32	3.32	4.55
7.5			1.23	1.87	2.68	3.69
8.0				1.52	2.19	3.03
8.5				1.24	1.8	2.5
9.0				1.02	1.5	2.09
9.5					1.25	1.75
10.0					1.05	1.48
10.5						1.25

Breadth: 115mm

Span	Depth					
	315	360	405	450	495	540
4.0	9.67	12.30	15.4	18.90	22.6	26.8
4.5	7.58	9.75	12.1	14.80	17.8	21.1
5.0	5.55	7.85	9.81	12.00	14.4	17.0
5.5	4.17	6.19	8.07	9.87	11.8	14.0
6.0	3.19	4.77	6.74	8.25	9.91	11.7
6.5	2.49	3.74	5.32	6.99	8.40	9.96
7.0	1.97	2.97	4.25	5.82	7.21	8.54
7.5	1.57	2.39	3.34	4.72	6.24	7.40
8.0	1.27	1.94	2.8	3.87	5.16	6.47
8.5	1.03	1.59	2.31	3.2	4.28	5.56
9.0		1.31	1.97	2.67	3.58	4.67
9.5		1.08	1.6	2.24	3.02	3.94
10.0			1.34	1.89	2.56	3.35
10.5			1.13	1.6	2.18	2.87
11.0				1.36	1.86	2.46
11.5				1.16	1.6	2.12
12.0					1.38	1.84
12.5					1.19	1.59
13.0					1.02	1.38

Permissible Loads - Breadth: 140 and 165mm
Roof Beams

Kilonewtons per metre run of beam for:

Standard Glulam Straight Roof Beams

Breadth:140mm

Span	Depth							
	360	405	450	495	540	585	630	675
4.0	15.0	18.8	23.0	27.6	32.6	38.1	44.1	50.6
4.5	11.8	14.8	18.1	21.7	25.7	30.0	34.7	39.9
5.0	9.56	11.9	14.6	17.5	20.7	24.2	28.0	32.2
5.5	7.54	9.82	12.0	14.4	17.0	19.9	23.1	26.5
6.0	5.81	8.22	10.0	12.0	14.2	16.7	19.3	22.2
6.5	4.55	6.48	8.52	10.2	12.1	14.1	16.4	18.8
7.0	3.62	5.17	7.08	8.77	10.4	12.1	14.1	16.2
7.5	2.91	4.18	5.75	7.6	9.01	10.5	12.2	14.00
8.0	2.36	3.41	4.71	6.28	7.87	9.23	10.7	12.3
8.5	1.93	2.81	3.9	5.21	6.77	8.13	9.43	10.8
9.0	1.59	2.33	3.25	4.36	5.68	7.20	8.36	9.63
9.5	1.32	1.95	2.72	3.67	4.8	6.12	7.46	8.58
10.0	1.1	1.63	2.3	3.11	4.08	5.22	6.54	7.70
10.5		1.37	1.95	2.65	3.49	4.48	5.62	6.93
11.0		1.16	1.66	2.27	3	3.86	4.85	6.00
11.5			1.41	1.95	2.58	3.34	4.21	5.21
12.0			1.21	1.68	2.24	2.9	3.67	4.55
12.5			1.04	1.45	1.94	2.52	3.21	3.99
13.0				1.25	1.69	2.2	2.81	3.51
13.5				1.08	1.47	1.93	2.47	3.09
14.0					1.28	1.69	2.17	2.73
14.5					1.12	1.48	1.92	2.42
15.0						1.3	1.69	2.14
15.5						1.14	1.49	1.9
16.0						1.00	1.32	1.69
16.5							1.17	1.5
17.0							1.03	1.33

Breadth:165mm

Span	Depth							
	495	540	585	630	675	720	765	810
4.0	32.5	38.4	44.9	52.0	59.6	64.3	68.3	72.3
4.5	25.6	30.3	35.4	41.0	47	53.4	60.3	64.2
5.0	20.6	24.4	28.6	33.1	37.9	43.1	48.7	54.7
5.5	17.0	20.1	23.5	27.2	31.3	35.5	40.1	45.1
6.0	14.2	16.8	19.7	22.8	26.2	29.8	33.6	37.7
6.5	12.0	14.2	16.7	19.3	22.2	25.3	28.5	32.1
7.0	10.3	11.6	14.3	16.6	19.1	21.7	24.5	27.5
7.5	8.96	10.6	12.4	14.4	16.5	18.8	21.3	23.9
8.0	7.40	9.28	10.8	12.6	14.5	16.5	18.6	20.9
8.5	6.14	7.98	9.58	11.1	12.7	14.5	16.4	18.4
9.0	5.14	6.70	8.49	9.86	11.3	12.9	14.6	16.4
9.5	4.33	5.66	7.22	8.79	10.1	11.5	13	14.6
10.0	3.67	4.81	6.16	7.71	9.07	10.3	11.7	13.1
10.5	3.13	4.11	5.28	6.62	8.16	9.33	10.5	11.8
11.0	2.67	3.53	4.55	5.72	7.07	8.45	9.57	10.7
11.5	2.29	3.05	3.93	4.96	6.15	7.49	8.7	9.8
12.0	1.98	2.64	3.42	4.32	5.37	6.55	7.88	8.94
12.5	1.7	2.29	2.98	3.78	4.7	5.75	6.93	8.19
13.0	1.47	1.99	2.6	3.31	4.13	5.07	6.12	7.3
13.5	1.27	1.73	2.27	2.91	3.64	4.48	5.42	6.48
14.0	1.10	1.51	1.99	2.56	3.22	3.97	4.81	5.76
14.5		1.32	1.75	2.26	2.85	3.52	4.28	5.14
15.0		1.15	1.54	1.99	2.52	3.13	3.82	4.59
15.5		1.00	1.35	1.76	2.24	2.79	3.41	4.11
16.0			1.19	1.56	1.99	2.49	3.05	3.69
16.5			1.04	1.38	1.77	2.22	2.73	3.31
17.0				1.22	1.57	1.98	2.45	2.98
17.5				1.07	1.4	1.77	2.2	2.68
18.0					1.24	1.58	1.97	2.41
18.5					1.1	1.41	1.77	2.17
19.0						1.26	1.59	1.96
19.5						1.12	1.42	1.77
20.0						1	1.28	1.59

Permissible Loads - Breadth: 190 and 215mm
Roof Beams

Kilonewtons per metre run of beam for:

Standard Glulam Straight Roof Beam

Breadth:190mm

Span	Depth						
	675	720	765	810	855	900	945
6.0	30.1	34.3	38.7	43.5	48.5	53.9	59.2
6.5	25.6	29.1	32.9	36.9	41.2	45.8	50.3
7.0	22	25	28.2	31.7	35.4	39.3	43.3
7.5	19	21.7	24.5	27.5	30.7	34.2	37.6
8.0	16.6	19	21.4	24.1	26.9	29.9	32.9
8.5	14.7	16.7	18.9	21.2	23.7	26.4	29
9.0	13	14.8	16.8	18.9	21.1	23.4	25.8
9.5	11.6	13.2	15	16.8	18.8	21	23.1
10.0	10.4	11.9	13.4	15.1	16.9	18.8	20.7
10.5	9.4	10.7	12.1	13.6	15.3	17	18.7
11.0	8.14	9.73	11	12.4	13.8	15.4	17
11.5	7.08	8.62	10	11.2	12.6	14	15.4
12.0	6.18	7.54	9.08	10.3	11.5	12.8	14.1
12.5	5.42	6.62	7.99	9.43	10.5	11.7	12.9
13.0	4.76	5.84	7.05	8.41	9.7	10.8	11.9
13.5	4.2	5.16	6.24	7.46	8.81	9.96	10.9
14.0	3.71	4.57	5.54	6.63	7.85	9.19	10.1
14.5	3.28	4.06	4.93	5.92	7.01	8.22	9.4
15.0	2.91	3.61	4.4	5.29	6.28	7.37	8.58
15.5	2.58	3.21	3.93	4.73	5.63	6.63	7.72
16.0	2.29	2.87	3.52	4.25	5.06	5.97	6.96
16.5	2.04	2.56	3.15	3.81	4.56	5.38	6.29
17.0	1.81	2.28	2.82	3.43	4.11	4.86	5.69
17.5	1.61	2.04	2.53	3.09	3.71	4.4	5.16
18.0	1.43	1.82	2.27	2.78	3.35	3.98	4.68
18.5	1.27	1.63	2.04	2.5	3.03	3.61	4.25
19.0	1.12	1.45	1.83	2.26	2.74	3.27	3.86
19.5		1.29	1.64	2.03	2.48	2.97	3.52
20.0		1.15	1.47	1.83	2.24	2.69	3.2

Breadth:215mm

Span	Depth						
	765	810	855	900	945	990	1035
6.0	43.8	49.2	54.9	61	67.1	73.4	79.9
6.5	37.2	41.8	46.6	51.8	57	62.4	68.1
7.0	32	35.9	40.1	44.5	49	53.6	58.5
7.5	27.7	31.2	34.8	38.7	42.5	46.6	50.8
8.0	24.3	27.3	30.5	33.9	37.3	40.8	44.5
8.5	21.4	24	26.9	29.9	32.9	36	39.3
9.0	19	21.4	23.9	26.5	29.2	32	34.9
9.5	17	19.1	21.3	23.7	26.1	28.6	31.2
10.0	15.2	17.1	19.1	21.3	23.5	25.7	28.1
10.5	13.7	15.4	17.3	19.2	21.2	23.2	25.4
11.0	12.4	14	15.7	17.4	19.2	21.1	23
11.5	11.3	12.7	14.2	15.9	17.5	19.2	21
12.0	10.2	11.6	13	14.5	16	17.5	19.1
12.5	9.04	10.6	11.9	13.3	14.6	16.1	17.6
13.0	7.98	9.51	10.9	12.2	13.4	14.8	16.1
13.5	7.06	8.44	9.97	11.2	12.4	13.6	14.9
14.0	6.27	7.51	8.88	10.4	11.4	12.6	13.8
14.5	5.58	6.69	7.93	9.3	10.6	11.6	12.7
15.0	4.98	5.98	7.1	8.34	9.71	10.8	11.8
15.5	4.45	5.36	6.37	7.5	8.74	10	11
16.0	3.98	4.81	5.73	6.75	7.88	9.11	10.3
16.5	3.56	4.32	5.16	6.09	7.12	8.25	9.47
17.0	3.19	3.88	4.65	5.5	6.44	7.47	8.6
17.5	2.87	3.49	4.2	4.98	5.84	6.78	7.82
18.0	2.57	3.15	3.79	4.51	5.3	6.17	7.12
18.5	2.31	2.83	3.43	4.08	4.81	5.61	6.49
19.0	2.07	2.55	3.1	3.7	4.37	5.11	5.92
19.5	1.86	2.3	2.8	3.36	3.98	4.66	5.41
20.0	1.66	2.07	2.53	3.05	3.62	4.25	4.94

Permissible Loads - Breadth: 65, 90 and 115mm
Floor Beams

Kilonewtons per metre run of beam for:

Standard Glulam Straight Floor Beams

Typical Glulam Section available off-shelf

Breadth:65mm

Span	Depth			
	180	225	270	315
4.0	1.15	2.26	3.86	5.46
4.5		1.58	2.72	4.28
5.0		1.14	1.98	3.14
5.5			1.48	2.35
6.0			1.12	1.80
6.5				1.40

Breadth:90mm

Span	Depth					
	225	270	315	360	405	450
4.0	3.13	5.35	8.35	12.1	15.1	18.5
4.5	2.19	3.77	5.93	8.71	11.9	14.6
5.0	1.58	2.74	4.34	6.42	9.01	11.7
5.5	1.17	2.05	3.26	4.85	6.83	9.25
6.0		1.56	2.5	3.73	5.29	7.19
6.5		1.2	1.95	2.92	4.16	5.68
7.0			1.54	2.32	3.32	4.55
7.5			1.23	1.87	2.68	3.69
8.0				1.52	2.19	3.03
8.5				1.24	1.8	2.5
9.0				1.02	1.5	2.09
9.5					1.25	1.75
10.0					1.05	1.48
10.5						1.25

Breadth:115mm

Span	Depth					
	315	360	405	450	495	540
4.0	10.6	15.5	19.3	23.6	28.4	33.5
4.5	7.58	11.1	15.2	18.6	22.3	26.4
5.0	5.55	8.2	11.5	15	18	21.3
5.5	4.17	6.19	8.73	11.8	14.8	17.6
6.0	3.19	4.77	6.79	9.19	12	14.7
6.5	2.49	3.74	5.32	7.26	9.58	12.3
7.0	1.97	2.97	4.25	5.82	7.7	9.92
7.5	1.57	2.39	3.34	4.72	6.27	8.1
8.0	1.27	1.94	2.8	3.87	5.16	6.68
8.5	1.03	1.59	2.31	3.2	4.28	5.56
9.0		1.31	1.97	2.67	3.58	4.67
9.5		1.08	1.6	2.24	3.02	3.94
10.0			1.34	1.89	2.56	3.35
10.5			1.13	1.6	2.18	2.87
11.0				1.36	1.86	2.46
11.5				1.16	1.6	2.12
12.0					1.38	1.84
12.5					1.19	1.59
13.0					1.02	1.38

Permissible Loads - Breadth: 140 and 165mm
Floor Beams

Kilonewtons per metre run of beam for:

Standard Glulam Straight Floor Beams

Breadth:140mm

Span	Depth							
	360	405	450	495	540	585	630	675
4.0	18.9	23.6	28.8	34.5	40.8	47.7	55.2	63.4
4.5	13.5	18.5	22.7	27.2	32.2	37.6	43.5	50
5.0	9.99	14	18.3	22	26	30.4	35.2	40.4
5.5	7.54	10.6	14.4	18.1	21.4	25	29	33.3
6.0	5.81	8.23	11.1	14.7	17.9	21	24.3	27.9
6.5	4.55	6.48	8.84	11.6	14.9	17.8	20.6	23.7
7.0	3.62	5.17	7.08	9.38	12	15.2	17.7	20.3
7.5	2.91	4.18	5.75	7.63	9.86	12.4	15.4	17.6
8.0	2.36	3.41	4.71	6.28	8.14	10.2	12.7	15.4
8.5	1.93	2.81	3.9	5.21	6.77	8.59	10.6	13
9.0	1.59	2.33	3.25	4.36	5.68	7.23	9.01	11
9.5	1.32	1.95	2.72	3.67	4.8	6.12	7.65	9.39
10.0	1.1	1.63	2.3	3.11	4.08	5.22	6.54	8.04
10.5		1.37	1.95	2.65	3.49	4.48	5.62	6.93
11.0		1.16	1.66	2.27	3	3.86	4.85	6
11.5			1.41	1.95	2.58	3.34	4.21	5.21
12.0			1.21	1.68	2.24	2.9	3.67	4.55
12.5			1.04	1.45	1.94	2.52	3.21	3.99
13.0				1.25	1.69	2.2	2.81	3.51
13.5				1.08	1.47	1.93	2.47	3.09
14.0					1.28	1.69	2.17	2.73
14.5					1.12	1.48	1.92	2.42
15.0						1.3	1.69	2.14
15.5						1.14	1.49	1.9
16.0						1	1.32	1.69
16.5							1.17	1.5
17.0							1.03	1.33

Breadth:165mm

Span	Depth							
	495	540	585	630	675	720	765	810
6.0	17.3	21.1	24.7	28.6	32.9	37.4	42.2	47.4
6.5	13.7	17.6	21	24.3	27.9	31.7	35.9	40.2
7.0	11	14.2	17.9	20.9	24	27.3	30.8	34.6
7.5	9	11.6	14.6	18.1	20.8	23.7	26.8	30
8.0	7.4	9.59	12.1	15	18.2	20.7	23.4	26.3
8.5	6.14	7.98	10.1	12.5	15.3	18.3	20.7	23.2
9.0	5.14	6.7	8.52	10.6	13	15.6	18.4	20.6
9.5	4.33	5.66	7.22	9.02	11	13.3	15.9	18.5
10.0	3.67	4.81	6.16	7.71	9.48	11.4	13.7	16.1
10.5	3.13	4.11	5.28	6.62	8.16	9.9	11.8	14
11.0	2.67	3.53	4.55	5.72	7.07	8.59	10.3	12.2
11.5	2.29	3.05	3.93	4.96	6.15	7.49	8.99	10.6
12.0	1.98	2.64	3.42	4.32	5.37	6.55	7.88	9.37
12.5	1.7	2.29	2.98	3.78	4.7	5.75	6.93	8.25
13.0	1.47	1.99	2.6	3.31	4.13	5.07	6.12	7.3
13.5	1.27	1.73	2.27	2.91	3.64	4.48	5.42	6.48
14.0	1.1	1.51	1.99	2.56	3.22	3.97	4.81	5.76
14.5		1.32	1.75	2.26	2.85	3.52	4.28	5.14
15.0		1.15	1.54	1.99	2.52	3.13	3.82	4.59
15.5		1	1.35	1.76	2.24	2.79	3.41	4.11
16.0			1.19	1.56	1.99	2.49	3.05	3.69
16.5			1.04	1.38	1.77	2.22	2.73	3.31
17.0				1.22	1.57	1.98	2.45	2.98
17.5				1.07	1.4	1.77	2.2	2.68
18.0					1.24	1.58	1.97	2.41
18.5					1.1	1.41	1.77	2.17
19.0						1.26	1.59	1.96
19.5						1.12	1.42	1.77
20.0						1	1.28	1.59

Permissible Loads - Breadth: 190 and 215mm
Floor Beams

Kilonewtons per metre run of beam for:

Standard Glulam Straight Floor Beams

Breadth:190mm

Span	Depth						
	675	720	765	810	855	900	945
6.0	37.8	43	48.6	54.5	60.9	67.6	74.3
6.5	32.1	36.6	41.3	46.3	51.7	57.5	63.2
7.0	27.6	31.4	35.5	39.9	44.5	49.4	54.3
7.5	24	27.3	30.8	34.6	38.6	42.9	47.2
8.0	21	23.9	27	30.3	33.9	37.6	41.4
8.5	17.7	21.1	23.8	26.8	29.9	33.2	36.5
9.0	14.9	18	21.2	23.8	26.6	29.5	32.5
9.5	12.7	15.4	18.3	21.3	23.8	26.4	29.1
10.0	10.9	13.2	15.7	18.6	21.4	23.8	26.1
10.5	9.4	11.4	13.6	16.1	18.8	21.5	23.6
11.0	8.14	9.89	11.8	14	16.4	19.1	21.4
11.5	7.08	8.62	10.3	12.2	14.4	16.7	19.3
12.0	6.18	7.54	9.08	10.7	12.6	14.7	17
12.5	5.42	6.62	7.99	9.51	11.1	13	15
13.0	4.76	5.84	7.05	8.41	9.91	11.5	13.3
13.5	4.2	5.16	6.24	7.46	8.81	10.3	11.9
14.0	3.71	4.57	5.54	6.63	7.85	9.19	10.6
14.5	3.28	4.06	4.93	5.92	7.01	8.22	9.55
15.0	2.91	3.61	4.4	5.29	6.28	7.37	8.58
15.5	2.58	3.21	3.93	4.73	5.63	6.63	7.72
16.0	2.29	2.87	3.52	4.25	5.06	5.97	6.96
16.5	2.04	2.56	3.15	3.81	4.56	5.38	6.29
17.0	1.81	2.28	2.82	3.43	4.11	4.86	5.69
17.5	1.61	2.04	2.53	3.09	3.71	4.4	5.16
18.0	1.43	1.82	2.27	2.78	3.35	3.98	4.68
18.5	1.27	1.63	2.04	2.5	3.03	3.61	4.25
19.0	1.12	1.45	1.83	2.26	2.74	3.27	3.86
19.5		1.29	1.64	2.03	2.48	2.97	3.52
20.0		1.15	1.47	1.83	2.24	2.69	3.2

Breadth: 215mm

Span	Depth						
	765	810	855	900	945	990	1035
6.0	55	61.7	68.9	76.5	84.1	92.1	100
6.5	46.7	52.5	58.5	65	71.5	78.3	85.4
7.0	40.2	45.1	50.3	55-9	61.5	67.3	73.5
7.5	34.9	39.2	43.7	48.6	53.4	58.5	63.8
8.0	30.6	34.3	38.3	42.6	46.8	51.3	56
8.5	27	30.3	33.8	37.6	41.4	45.3	49.4
9.0	24	26.9	30.1	33.4	36.8	40.3	44
9.5	20.7	24.1	26.9	29.9	32.9	36	39.3
10.0	17.8	21.1	24.2	26.9	29.6	32.4	35.4
10.5	15.4	18.2	21.3	24.3	26.7	29.3	32
11.0	13.4	15.9	18.6	21.6	24.3	26.6	29.1
11.5	11.7	13.9	16.3	18.9	21.8	24.2	26.5
12.0	10.2	12.2	14.3	16.7	19.2	22	24.2
12.5	9.04	10.7	12.6	14.7	17	19.5	22.2
13.0	7.98	9.51	11.2	13	15.1	17.3	19.8
13.5	7.06	8.44	9.97	11.6	13.5	15.5	17.6
14.0	6.27	7.51	8.88	10.4	12	13.8	15.8
14.5	5.58	6.69	7.93	9.3	10.8	12.4	14.2
15.0	4.98	5.98	7.1	8.34	9.71	11.1	12.8
15.5	4.45	5.36	6.37	7.5	8.74	10	11.5
16.0	3.98	4.81	5.73	6.75	7.88	9.11	10.4
16.5	3.56	4.32	5.16	6.09	7.12	8.25	9.47
17.0	3.19	3.88	4.65	5.5	6.44	7.47	8.6
17.5	2.87	3.49	4.2	4.98	5.84	6.78	7.82
18.0	2.57	3.15	3.79	4.51	5.3	6.17	7.12
18.5	2.31	2.83	3.43	4.08	4.81	5.61	6.49
19.0	2.07	2.55	3.1	3.7	4.37	5.11	5.92
19.5	1.86	2.3	2.8	3.36	3.98	4.66	5.41
20.0	1.66	2.07	2.53	3.05	3.62	4.25	4.94

Glulam Properties and Stresses

Specification

Species	-	Whitewood
Strength Class	-	C24
Laminated	-	Horizontally
Laminations	-	45 mm
Bonding	-	Resorcinol
Mass	-	500 kg/m³
Finish	-	Clean planed

Permissible Stesses

Based on	-	C24 Red/Whitewood
to	-	BS 5268 : Part 2 : 1996
at	-	18% moisture content or below
for	-	Long and medium term duration

Bending Parallel to Grain

f = 7.5 N/mm²
x K3 = Load dur. (1.0 long/1.25 med.)
x K7 = Beam depth factor
x K15 = No. of laminations

Modulus of Elasticity

E = 10800 N/mm²
x K20 = 1.07 for C24
= 11556 N/mm²

Compression Perp To Grain (Bearing)

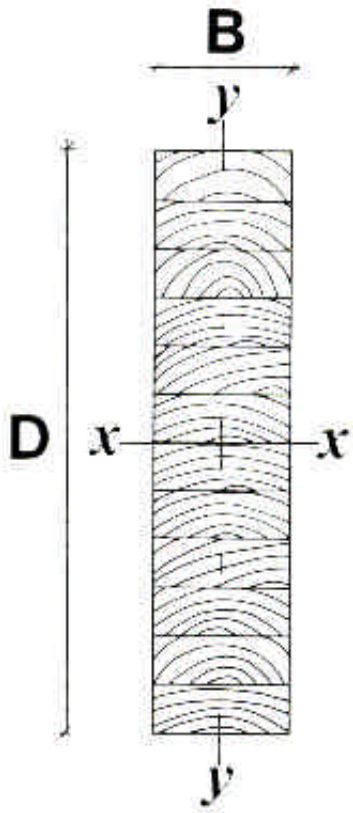
c,adm = 1.9 N/mm²
x K3 = Load dur. (1.0 long/1.25 med.)
x K18 = 1.55
= 2.95 N/mm² ; 3.68 N/mm² med.

Bearing Lengths

From the above the maximum load on a typical 100mm long support would be:

Beam Breadth	Long term (floor) Kn	Medium Term (roof) kN
65	19.18	23.92
90	26.55	33.12
115	33.93	43.32
140	41.30	51.52
165	46.68	60.72
190	56.05	69.92
215	63.43	74.12

For higher loads the bearing length should be increased pro - rata. Whilst this can be achieved with a steel spreader plate care should be taken to ensure adequate crushing capacity in the supporting masonry.



Glulam Properties and Stresses

Typical Glulam Section available off-shelf

SIZES mm B D	No. of Lams	Sectional Properties: Self Weight kN/M³	Area A mm, x 10³	Moment of inertia 1 mm, x 10 6	Selection Modulus z MM³ x 10 6	Bending Stresses: K7	K15	f Medium Term N/mm²	f Long Term N/mm²
65 x 180	4	0.058	11.7	31.59	0.351	1.05	1.26	12.49	9.996
65 x 225	5	0.073	14.6	61.69	0.548	1.03	1.34	12.96	10.37
65 x 270	6	0.087	17.5	106.6	0.789	1.01	1.36	12.94	10.35
65 x 315	7	0.102	20.4	169.3	1.07	0.994	39	12.95	10.36
90 x 225	5	0.101	20.2	85.42	0.759	1.03	1.34	12.96	10.37
90 x 270	6	0.121	24.3	147.6	1.09	1.01	1.36	12.94	10.35
90 x 315	7	0.141	28.3	234.4	1.48	0.994	1.39	12.95	10.36
90 x 360	8	0.162	32.4	349.9	1.941	0.964	1.4	12.68	10.14
90 x 405	9	0.182	36.4	498.2	2.46	0.94	1.41	12.48	9.989
90 x 450	10	0.202	40.5	683.4	3.03	0.92	1.43	12.34	9.876
115 x 315	7	0.181	36.2	299.5	1.9	0.994	1.39	12.95	10.36
115 x 360	8	0.207	41.4	447.1	2.48	0.964	1.4	12.68	10.14
115 x 405	9	0.232	46.5	636.6	3.14	0.94	1.41	12.48	9.989
115 x 450	10	0.258	51.7	873.2	3.88	0.92	1.43	12.34	9.876
115 x 495	11	0.284	56.9	1162	4.69	0.905	1.44	12.22	9.776
115 x 540	12	0.31	62.1	1509	5.58	0.892	1.45	12.13	9.706
140 x 360	8	0.252	50.4	544.3	3.02	0.964	1.4 0	12.68	10.14
140 x 405	9	0.283	56.7	775	3.82	0.94	1.41	12.48	9.989
140 x 450	10	0.315	63	1063	4.72	0.92	1.43	12.34	9.876
140 x 495	11	0.346	69.3	1415	5.71	0.905	1.44	12.22	9.776
140 x 540	12	0.378	75.6	1837	6.8 0	0.892	1.45	12.13	9.706
140 x 585	13	0.409	81.9	2335	7.98	0.882	1.46	12.07	9.658
140 x 630	14	0.441	88.2	2917	9.26	0.873	1.47	12.03	9.629
140 x 675	15	0.472	94.5	3588	10.6	0.866	1.48	12.01	9.613
165 x 495	11	0.408	81.6	1667	6.73	0.905	1.44	12.22	9.776
165 x 540	12	0.445	89.1	2165	8.01	0.892	1.45	12.13	9.706
165 x 585	13	0.482	96.5	2752	9.41	0.882	1.46	12.07	9.658
165 x 630	14	0.519	103	3438	10.9	0.873	1.47	12.03	9.629
165 x 675	15	0.556	111	4228	12.5	0.866	1.48	12.01	9.613
165 x 720	16	0.594	118	5132	14.2	0.859	1.48	11.99	9.597
165 x 765	17	0.631	126	6155	16 .0	0.854	1.49	11.98	9.59
165 x 810	18	0.668	133	7307	18 .0	0.85	1.5 0	11.98	9.591
190 x 675	15	0.641	128	4869	14.4	0.866	1.48	12.01	9.613
190 x 720	16	0.684	136	5909	16.4	0.859	1.48	11.99	9.597
190 x 765	17	0.726	145	7088	18.5	0.854	1.49	11.98	9.59
190 x 810	18	0.769	153	8414	20.7	0..850	1.5	11.98	9.591
190 x 855	19	0.812	162	9896	23.1	0.846	1.51	11.99	9.599
190 x 900	20	0.855	171	11542	25.6	0.843	1.52	12.01	9.612
190 x 945	21	0.897	179	13361	28.2	0.84	1.52	11.97	9.579
215 x 765	17	0.822	164	8021	20.9	0.854	1.49	11.98	9.59
215 x 810	18	0.87	174	9521	23.5	0.85	1.5 0	11.98	9.591
215 x 855	19	0.919	183	11198	26.1	0.846	1.51	11.99	9.599
215 x 900	20	0.967	193	13061	29 .0	0.843	1.52	12.01	9.612
215 x 945	21	1.01	203	15120	32 .0	0.84	1.52	11.97	9.579
215 x 990	22	1.06	212	17384	35.1	0.837	1.52	11.93	9.55
215 x 1035	23	1.11	222	19864	38.3	0.835	1.52	11.9	9.524

Solid Timber Decking

Solid timber decking used in conjunction with glulam members produces a pleasant,natural timber ceiling with clear spans between the main structural members.

It can be installed quickly and economically; it has good insulation properties and readily accepts screw fixings.

Solid timber decking can also act as a shear diaphragm to transfer loads to flanking walls, but this may require additional fixings.

Decking is normally manufactured from European whitewood, strength class C24, which has grade stresses virtually the same as SS.

Dimensions of Solid Timber Decking

Thickness		Width	
Nominal	**Actual**	**Nominal**	**Cover**
38	**34**	**150**	**135**
50	**45**	**150**	**135**
63	**58**	**150**	**135**
75	**70**	**150**	**135**

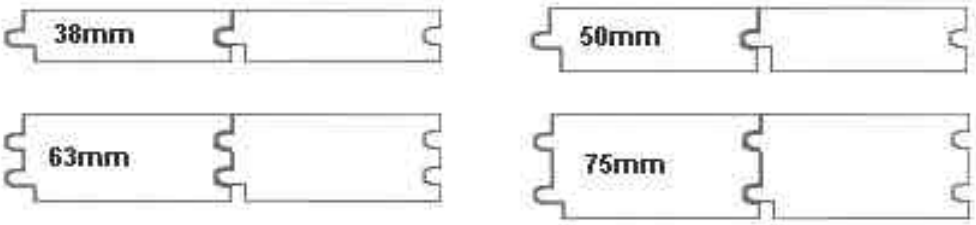
Span Tables for Solid Timber Decking

Total Distributed Load	SINGLE SPAN				DOUBLE SPAN				ALTERNATE SINGLE & DOUBLE SPAN			
	Spans in metres for nominal thickness				Spans in metres for nominal thickness				Spans in metres for nominal thickness			
kN/m²	38 mm	50 mm	63 mm	75 mm	38 mm	50 mm	63 mm	75 mm	38 mm	50 mm	63 mm	75 mm
1.00	2.1	2.9	3.7	4.5	2.9	3.8	5.0	6.0	2.4	3.2	4.1	5.0
1.25	2.0	2.6	3.4	4.1	2.7	3.6	4.6	5.6	2.2	3.0	3.8	4.7
1.50	1.9	2.5	3.2	3.9	2.5	3.3	4.3	5.2	2.1	2.8	3.6	4.4
1.75	1.8	2.4	3.1	3.7	2.4	3.2	4.1	5.0	2.0	2.6	3.4	4.1
2.00	1.7	2.2	2.9	3.5	2.3	3.0	3.9	4.7	1.9	2.5	3.3	4.0
2.25	1.6	2.1	2.8	3.4	2.2	2.9	3.8	4.6	1.8	2.4	3.1	3.8
2.50	1.6	2.1	2.7	3.3	2.1	2.8	3.6	4.4	1.8	2.4	3.0	3.7
2.75	1.5	2.0	2.6	3.2	2.0	2.7	3.5	4.3	1.7	2.3	2.9	3.6
3.00	1.5	2.0	2.5	3.1	2.0	2.6	3.4	4.1	1.7	2.2	2.9	3.5

Span tables based upon a deflection limitation of span/240.
Value of E used in calculations = 10,500 N I mm² . Grade bending stress = 7.5 N / mm².
All spans shown are limited by deflection. Spans for other support conditions are available on request.

NOTE: While BS 5268 recommends deflection to span / 333, these tables assume a deflection limit of span / 240, which is normally considered viable for roof applications. For guide purposes these tables may be interpolated. Refer to your supplier for actual sections to suit the end use.

Typical Decking Profiles
(Guide only - profiles vary according to manufacturer)

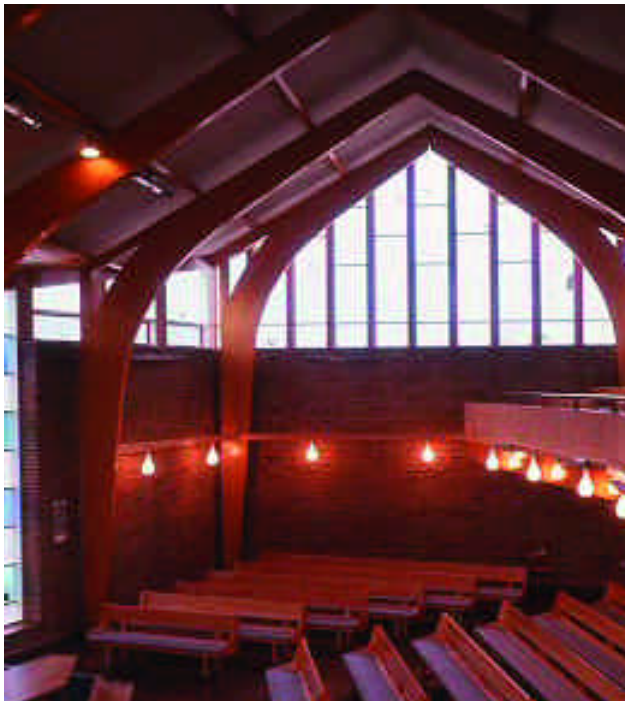


It may be finger jointed to length, and is available in various thicknesses, either single or double T&G grooved.

Decking can be supplied pressure impregnated with a spirit-borne preservative if required.

The table shows typical section sizes and profiles although these will vary among GLTA members and you are asked to consult your supplier before specifying.

Care should be taken on site by the main contractor to ensure that decking is protected once erected and prior to the building being made watertight.

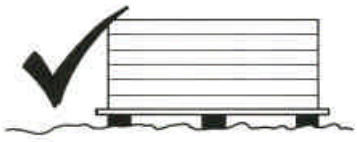


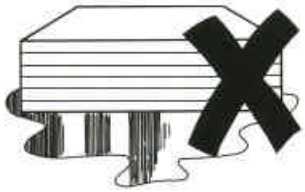
Site Handling and Storage

Every care is taken during manufacture and delivery to ensure that the quality, moisture content and appearance of glulam members is maintained.

The following care on site is necessary to maintain that quality and appearance:

Storing
Glulam must be stored on level well clear of the ground.





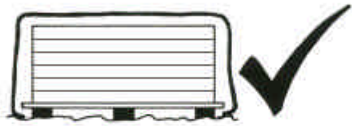
Use clean dry timber for bearers, free from or grease, and supported high enough to clear rain and mud splashes.

Space the supports evenly.

Locate the bearers so that self-weight is unifor mly supported to avoid distortion.

Use strips or blocks as spacers, in line vertically, between components.

Spacers help to avoid dirt or water being trapped between timber faces.



Cover with dark sheets secured against the wind.

Exposure to rain can lead to swelling and staining. Exposure to sunlight can darken timber quite quickly.

Watch the wrapping
Delivery wrappings seldom provide adequate site protection. Water often gets in but not out. Wrapping should be slit to provide drainage and glulam should always be stored with additional cover.

Handling and Erection

Support evenly
Use webbing slings to avoid local bruising. Locate the slings carefully to ensure balanced support and control the glulam with guy lines when lifting.

Expose evenly
Mud, mortar, plaster, banding, temporary bracing, partial wrapping etc., can all leave light patches when removed. Wrappings should be fully removed or made good and other materials should be removed promptly.

Use rustproof fittings
Rain can create dark stains from unprotected, ordinary steel. Use rustproof fittings, especially in temporary bracings or nearby timbers.

Brace securely
Erection bracing may need to be considered as well as the permanent bracing that is included in the building design.

Cover for prolonged exposure
For normal protection of glulam, it is recommended that the first coat is applied at works, with further coats added on site by the main contractor. If prolonged exposure is likely during construction the main contractor should provide additional protection.

Model Specification

This recommended specification is designed to help you specify glulam effectively at all times.

1. MATERIALS

1.1 Timber

1.1.1 Timber shall comply with the following - BS EN 518 and BS EN 519 [normally Whitewood; Strength Class C24.

1.1.2 The timber shall be good, sound structural timber free from active attack by insects or fungi.

1.1.3 Moisture content at time of manufacture will not exceed 14%

1.1.4 Normal lamination thickness will not be greater than 45mm. Lamination thickness for curved members to be governed by bending radii.

1.2 **Adhesives**

1.2.1 For acceptable adhesives and their require ments, reference should be made to BS EN 386 and BS EN 301.

1.3 **Durability and Preservative Treatment**

1.3.1 If required, the treatment to be used shall be in accordance with Section 4, Clause 4.1 of BS EN 1995-1-1 : 2004

2. DESIGN

2.1 The design of glulam shall comply with BS 5268 : Part 2: 2002

2.2 Glulam requiring fire resistance shall be designed to BS 5268: Part 4: 1978.

2.3 The building designer will be responsible for checking the interaction between the glulam and the remainder of the building.

3. LOADINGS

3.1 Loadings will comply with the following - Dead and imposed loads BS 6399 Part 1 : 1984; Part 3: 1988
Schedule of weights of building materials BS 648 (1964).

3.2 The client shall provide in writing complete details of cladding and any other loads.

4. FABRICATION

4.1 Fabrication of glulam shall be in accor dance with BS EN 386

4.2 Finger joints shall be in accordance with BS EN 385.

5. GENERAL

5.1 The supplier will if required afford the client or his agents reasonable access to the works during fabrication

5.2 The supplier will be responsible for the accuracy of glulam dimensions allowable within BS EN 390, but will not be responsi ble for incorrect information provided or approved by the client or his agents