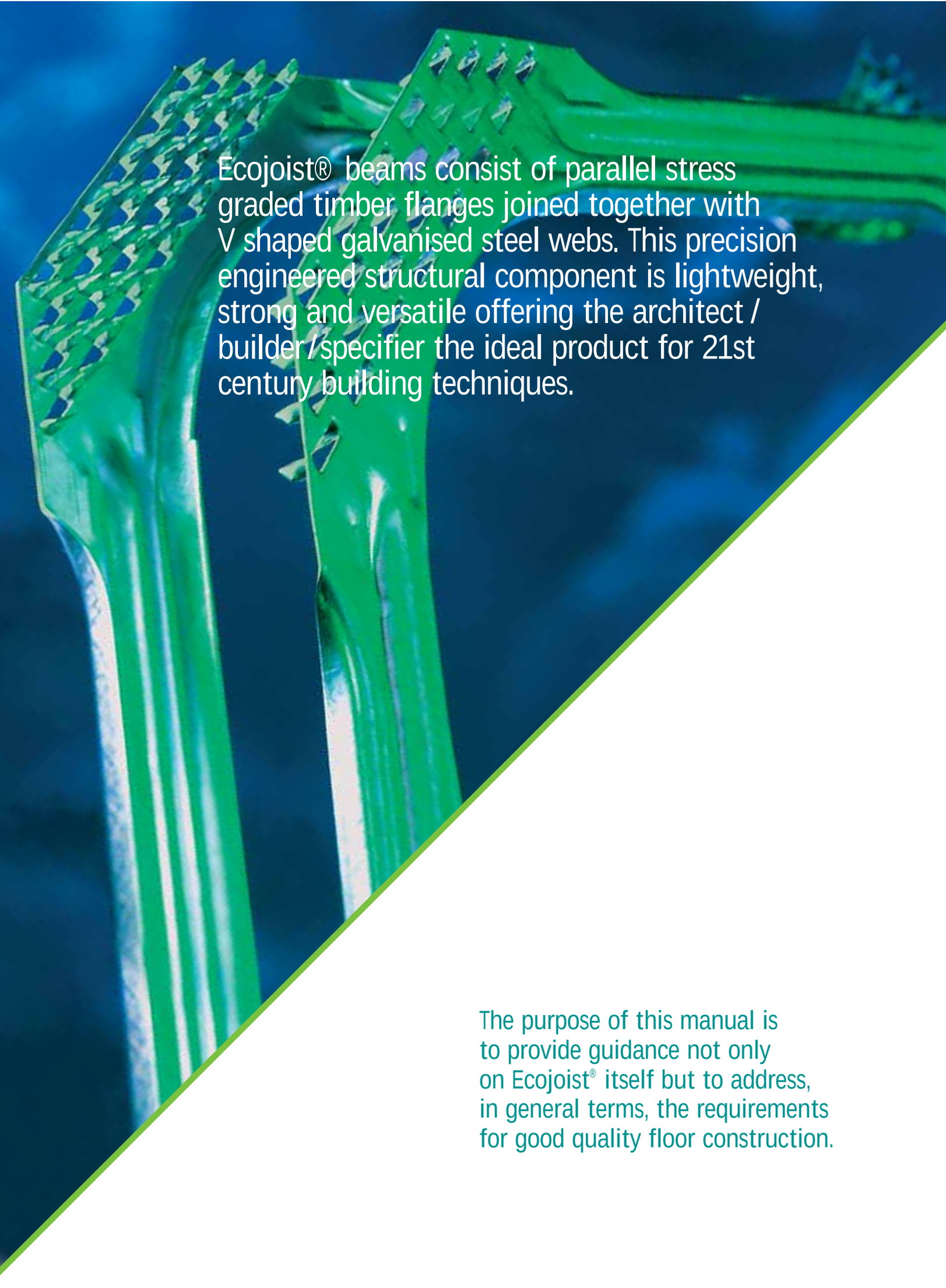
GANG-NAIL

an Eleco plc company

Ecojoist®

Ecojoist® Technical Manual

www.eleco.com/gang-nail



Ecojoist® beams consist of parallel stress graded timber flanges joined together with V shaped galvanised steel webs. This precision engineered structural component is lightweight, strong and versatile offering the architect / builder / specifier the ideal product for 21st century building techniques.

The purpose of this manual is to provide guidance not only on Ecojoist® itself but to address, in general terms, the requirements for good quality floor construction.

Section 1

Section 2

GANG-NAIL
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Ecojoist® – Economic Benefits

"We save money over solid joists on houses of 900 square feet or greater"

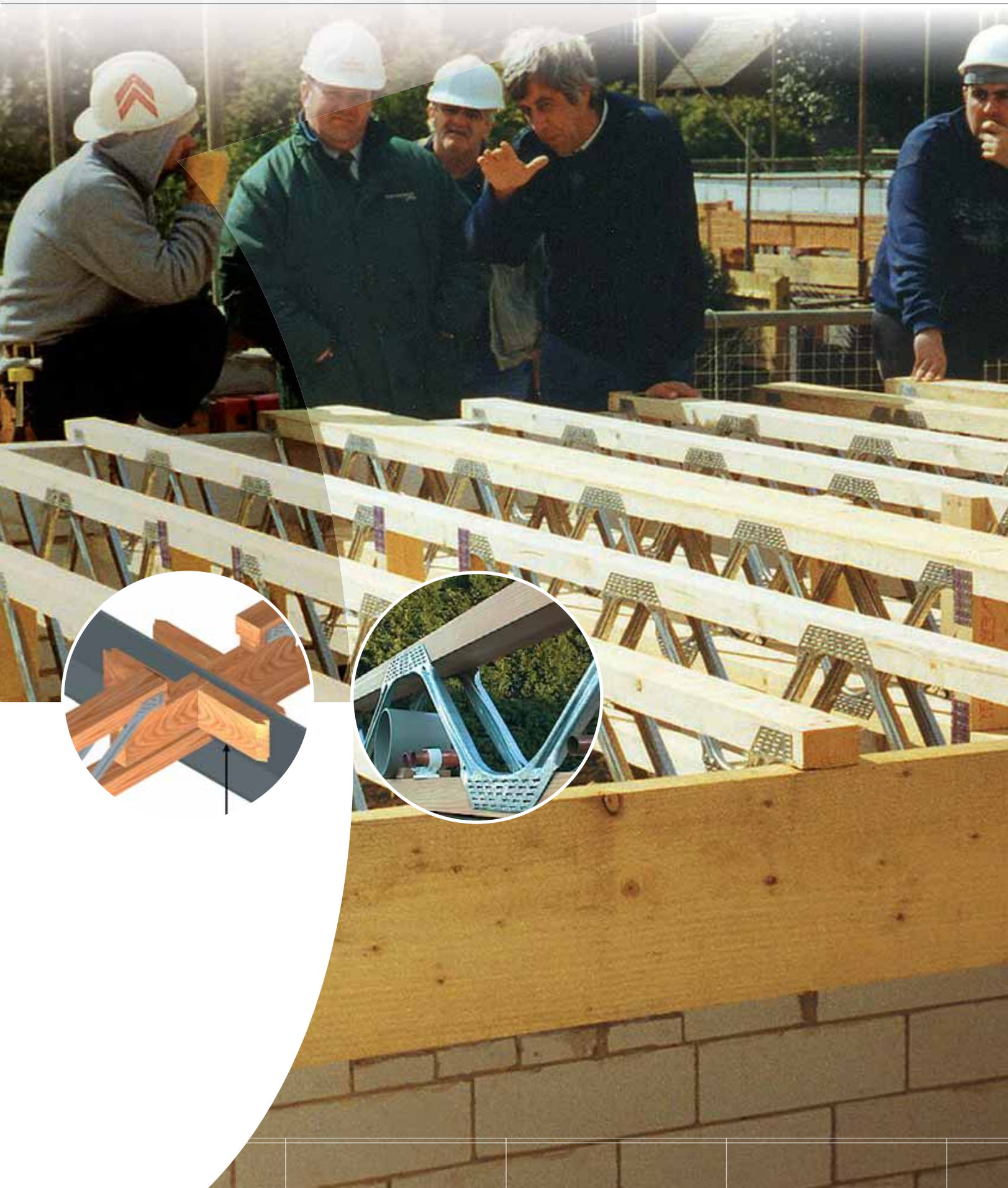
"As far as we are concerned this product has a zero maintenance requirement"

These are typical of the comments made by major housebuilders using Ecojoist®

Practical Benefits

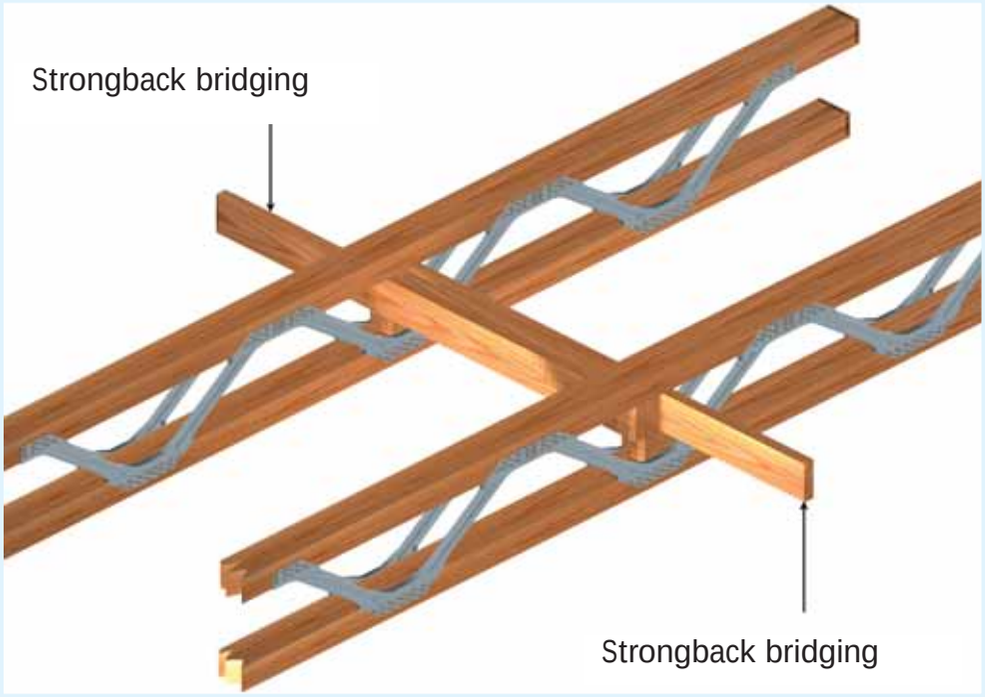
- Open web system gives almost uninterrupted access for the passage of services.
- 72mm wide flanges provide a large area for the fixing of floor deck and ceiling.
- Depth compatible with solid joist sizes.
- Made to measure, reducing on site wastage.
- Minimal shrinkage or swelling.
- Reduction or elimination of surface run pipework.
- Lightweight construction.
- Erected in approximately 50% of the time required for conventional joists.
- Can be top chord supported.

Section 1



Standard Details

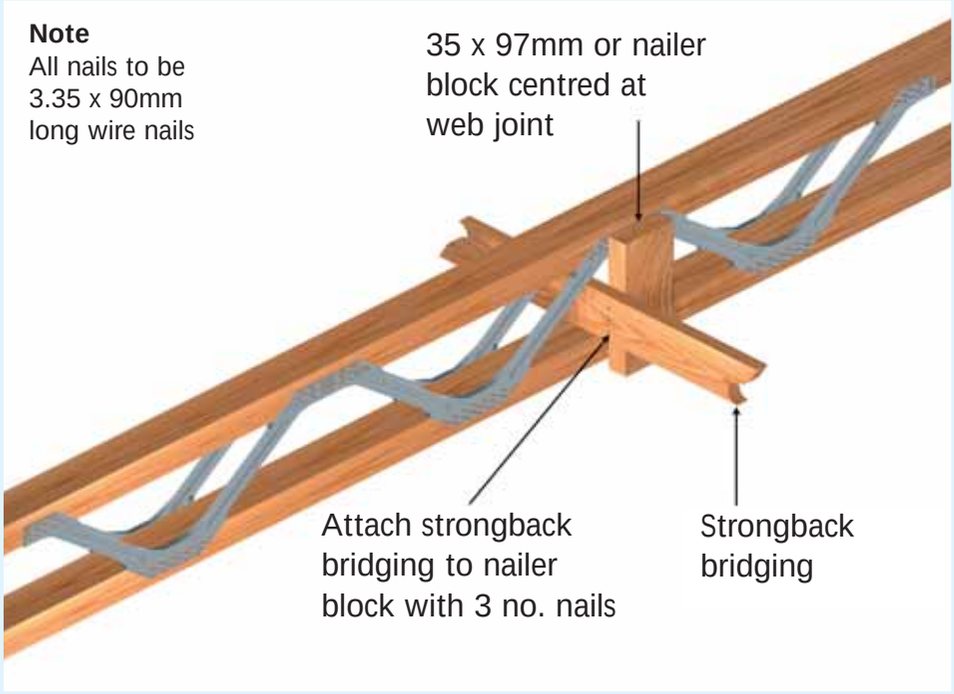
Strongbacks: Bridging Detail



Standard Details

Strongbacks: Nailer Block Detail

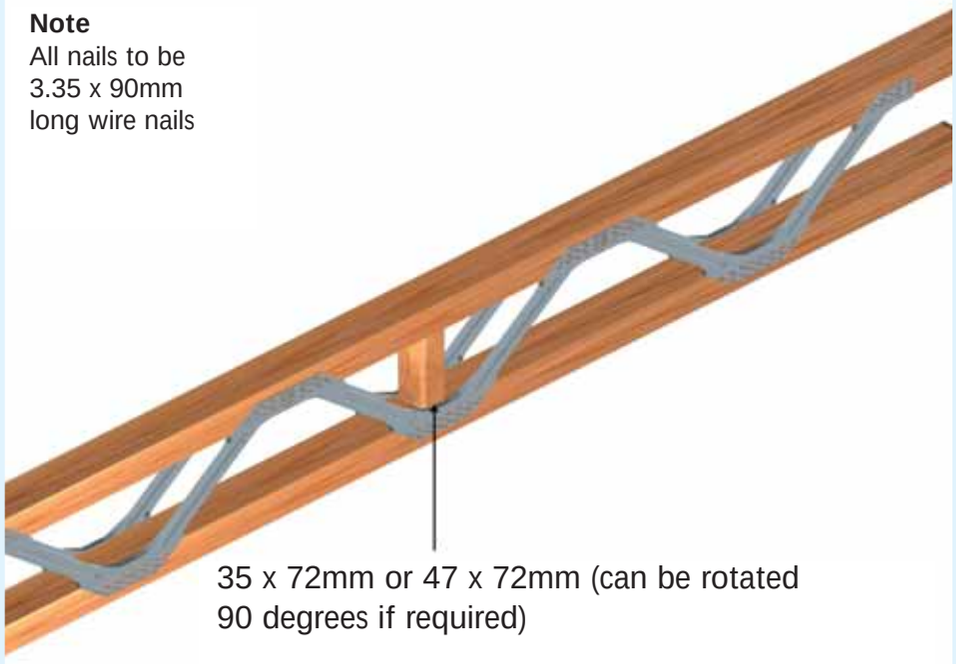
Note
All nails to be 3.35 x 90mm long wire nails



Standard Details

Strongbacks: Nailer Block Detail

Note
All nails to be
3.35 x 90mm
long wire nails

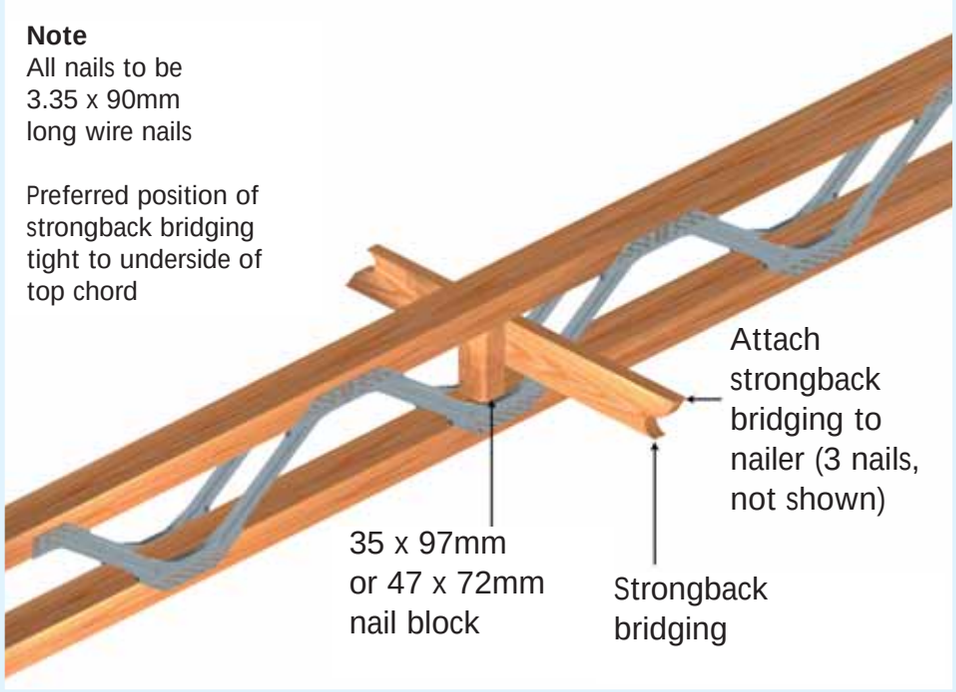


Standard Details

Strongbacks

Note
All nails to be
3.35 x 90mm
long wire nails

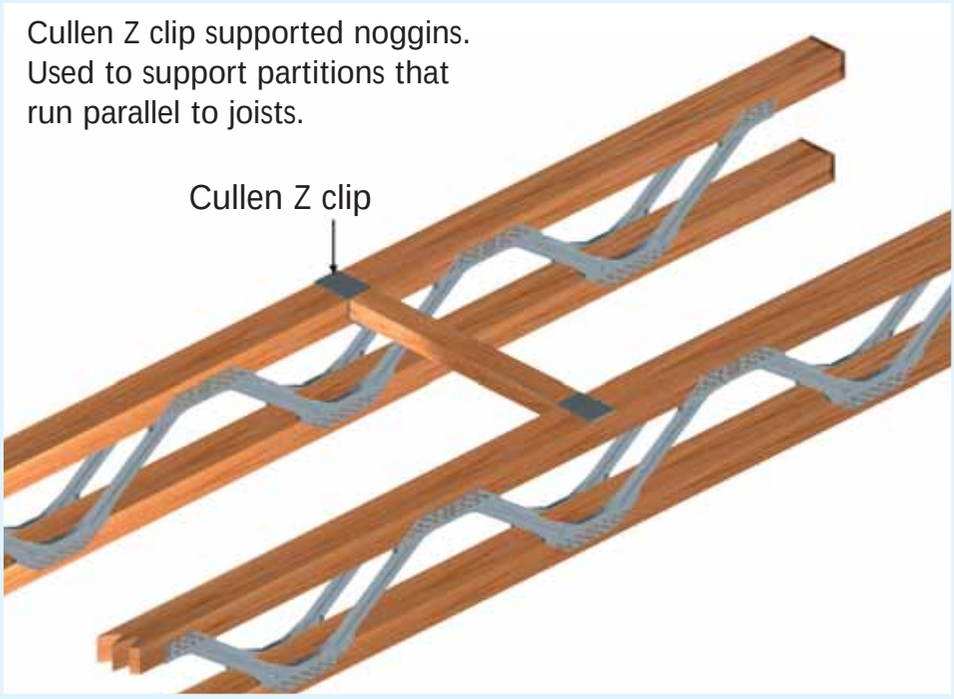
Preferred position of
strongback bridging
tight to underside of
top chord



Standard Details

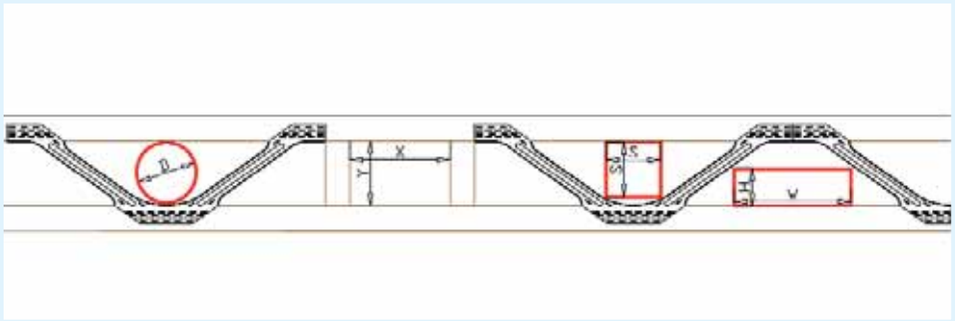
Z Clip Detail

Cullen Z clip supported noggins. Used to support partitions that run parallel to joists.



Standard Details

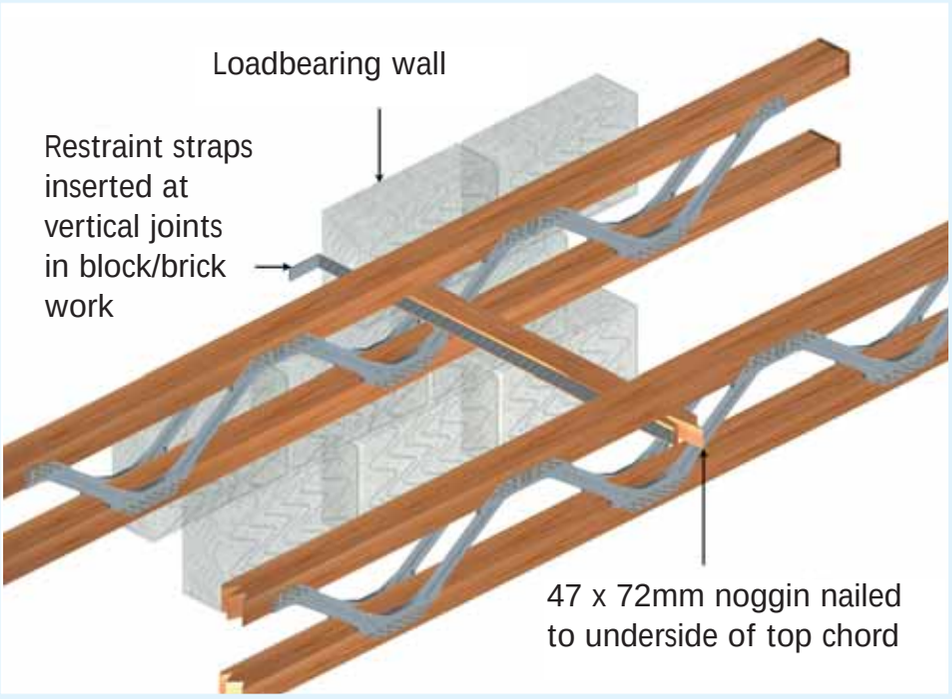
Aperture Details



Web size	D	X max.	Y	S	H	W
V2-8	120	505	125	105	75	210
V2-10	154	505	158	133	97	208
V2-12	192	505	209	155	121	215
V2-14	252	505	285	204	160	283
V2-16	263	505	323	212	176	266

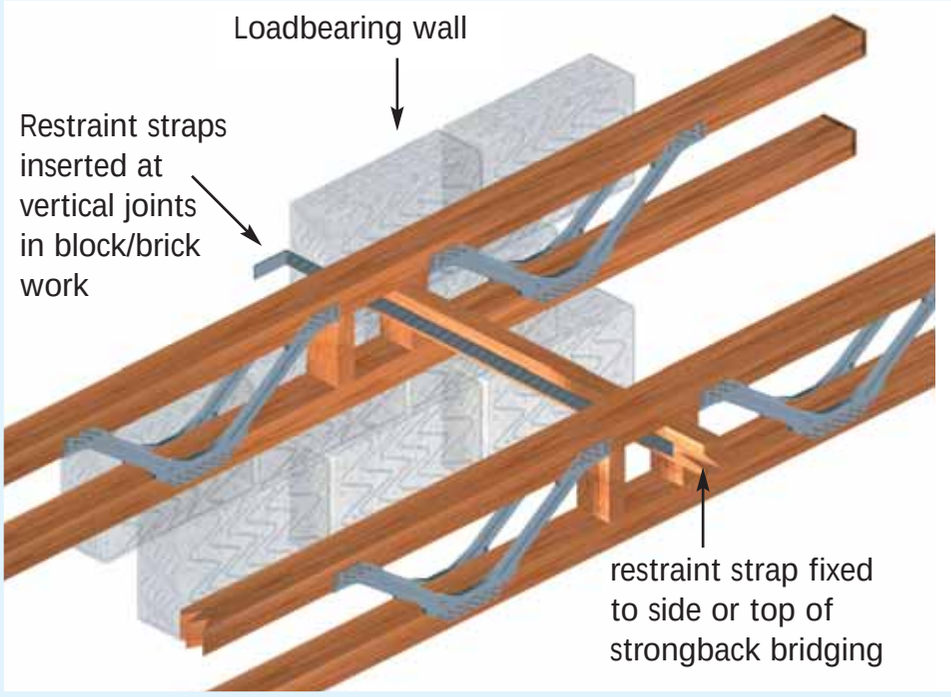
Standard Details

Restraint Straps: Detail L (1)



Standard Details

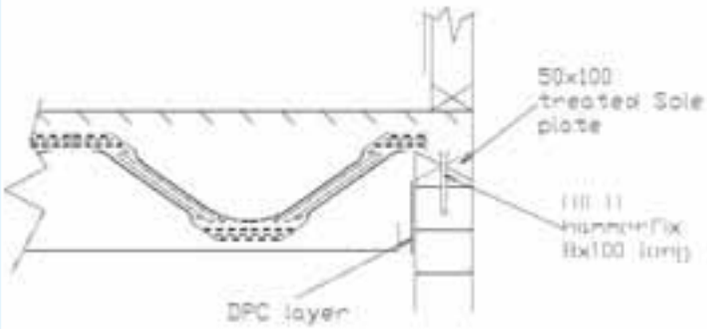
Restraint Straps: Detail L (2)



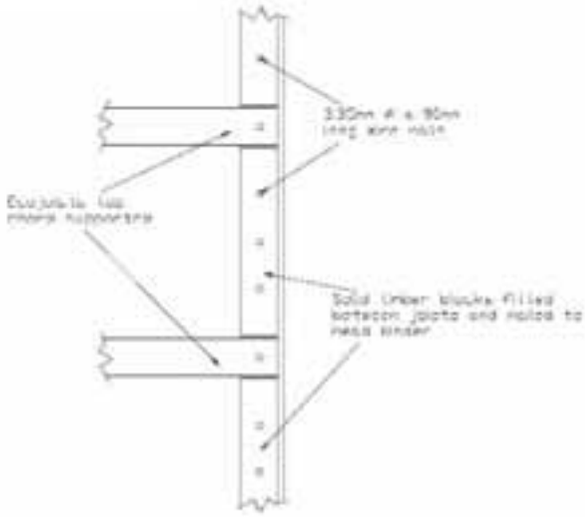
Standard Details

Timber Frame Details

Top chord support detail at ground floor

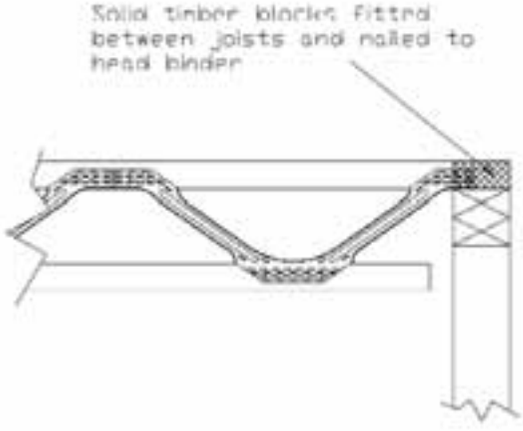


ELEVATION

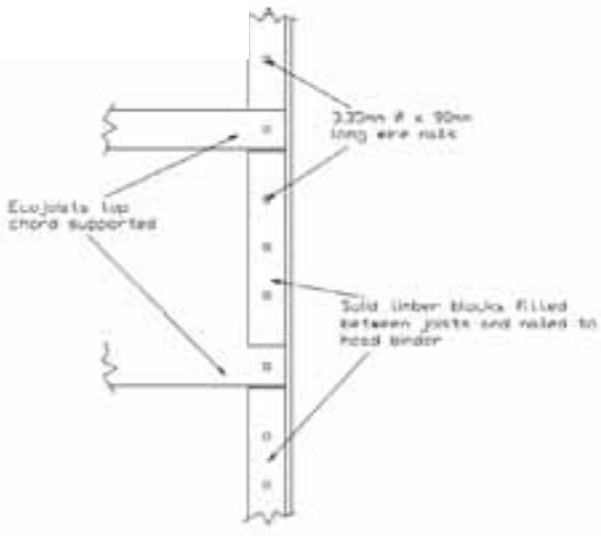


PLAN

Top chord support detail at upper floor



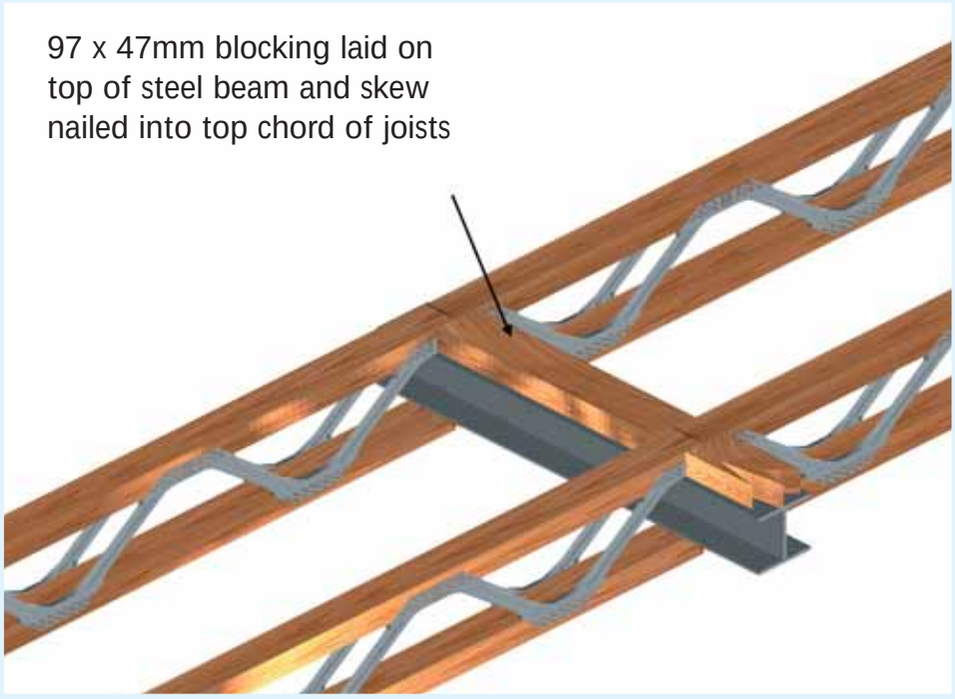
ELEVATION



PLAN

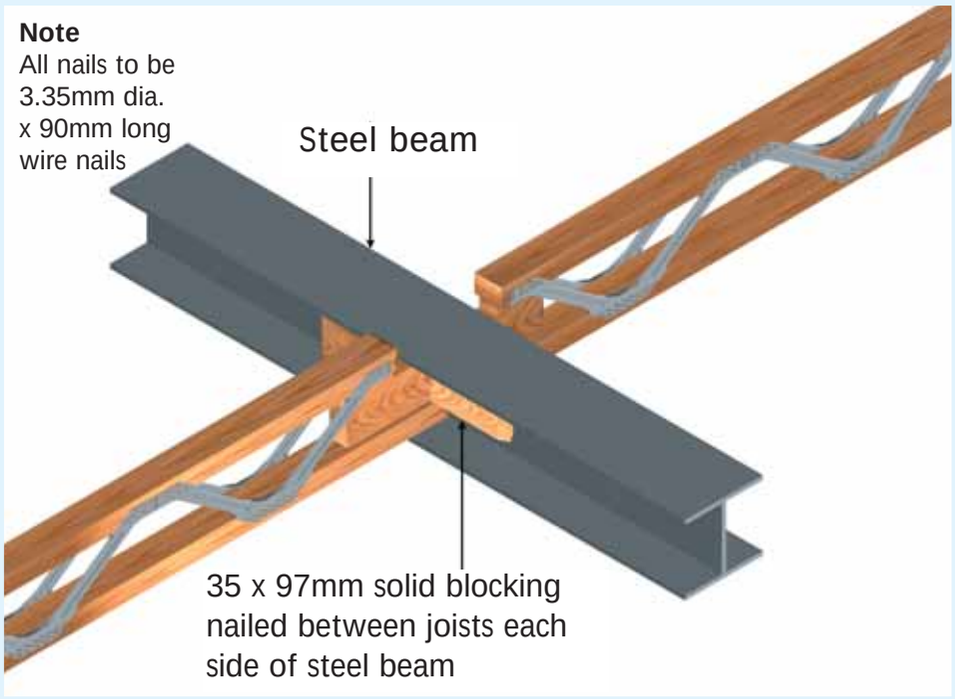
Standard Details

Steel Beams: Detail J



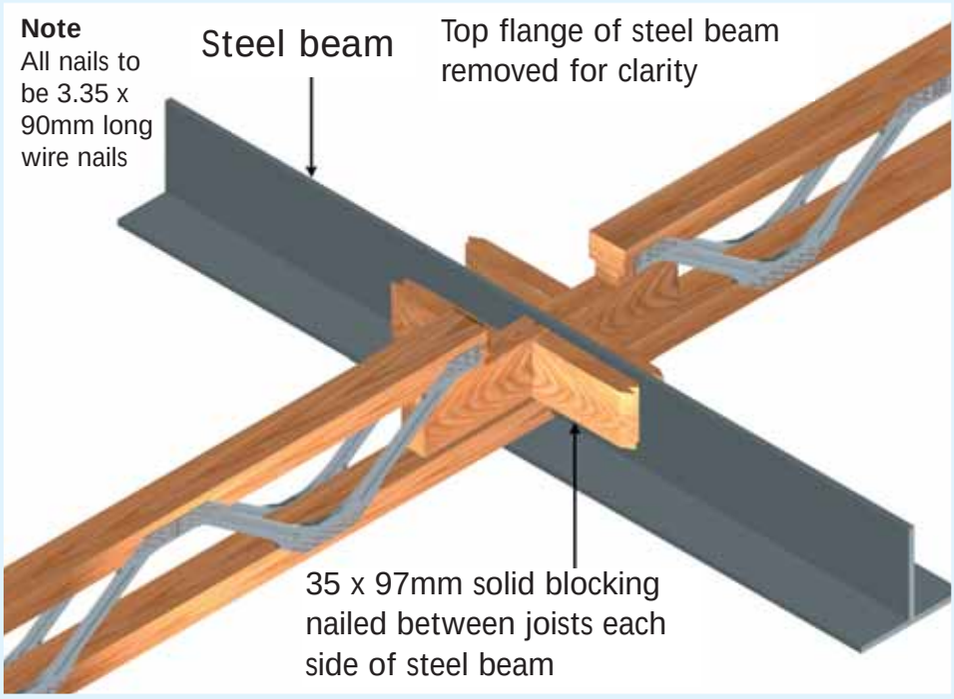
Standard Details

Steel Beams: Detail K



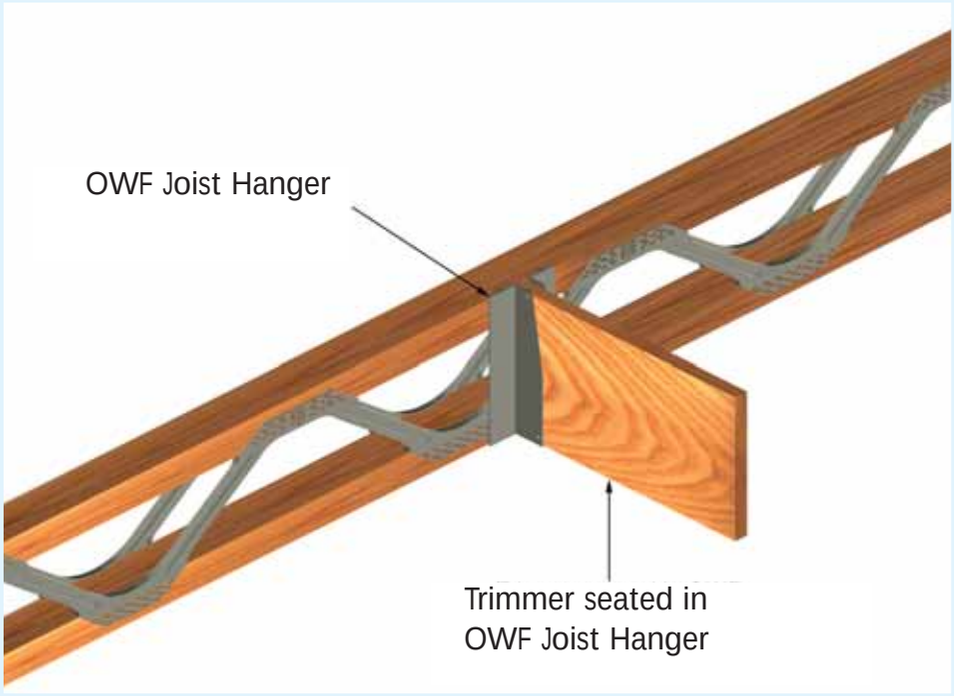
Standard Details

Steel Beams: Detail K (1)



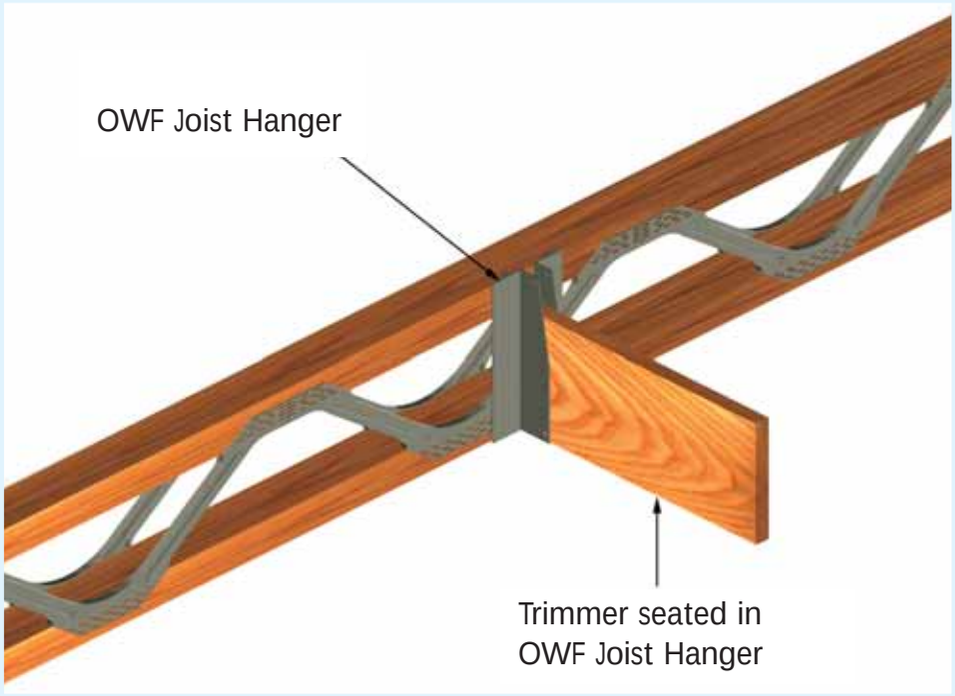
Standard Details

Detail E



Standard Details

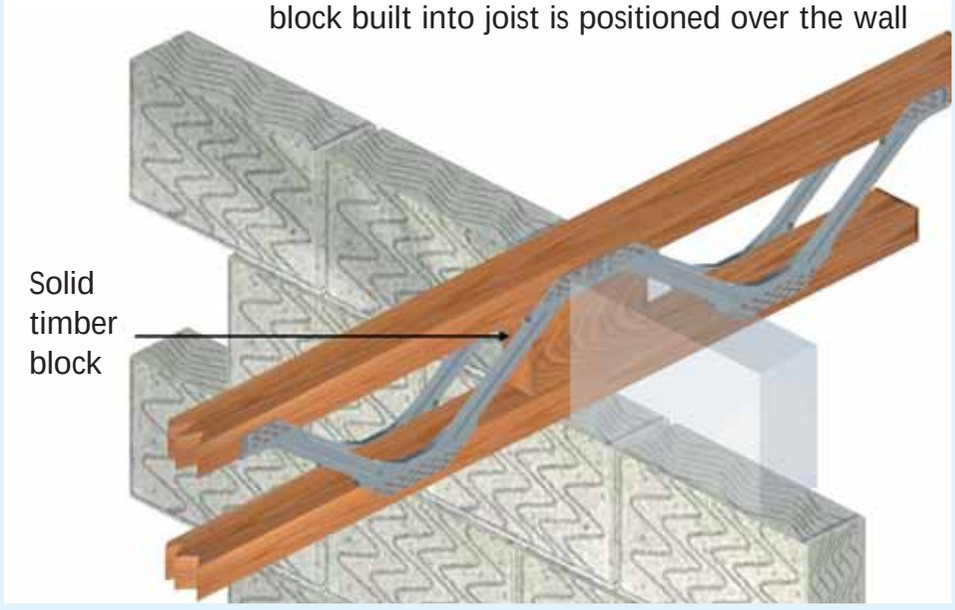
Detail H



Standard Details

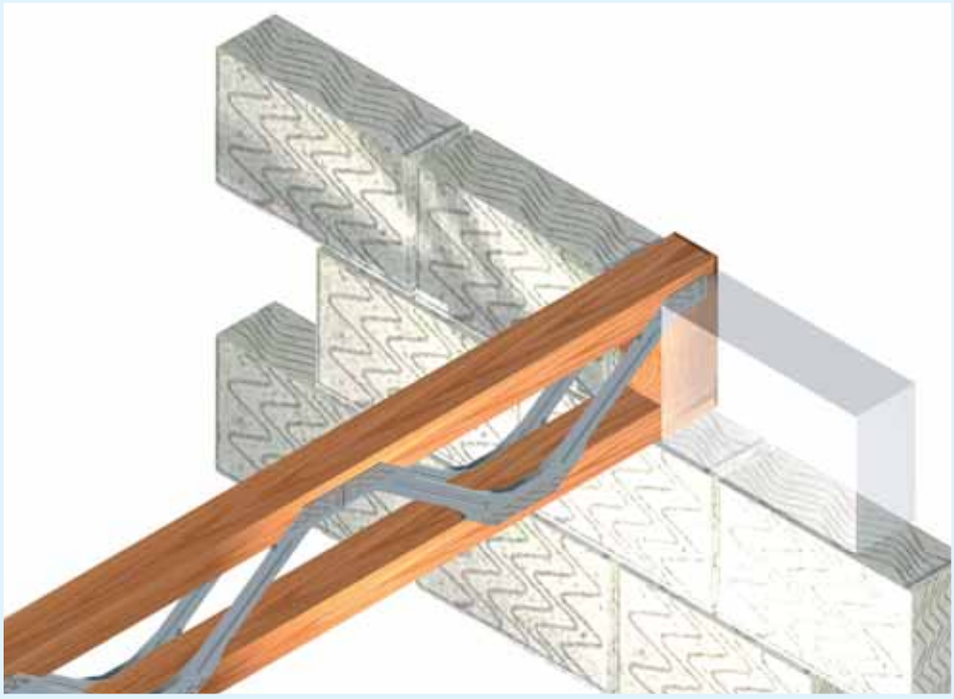
Continuous Joist

When joists are supported on internal loadbearing walls, ensure that the solid timber block built into joist is positioned over the wall



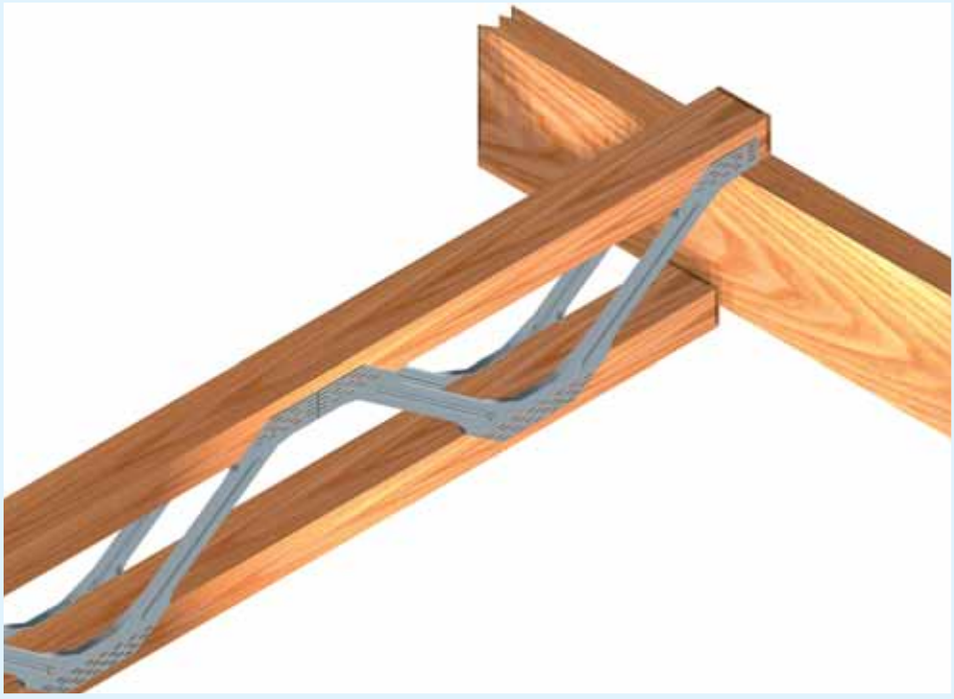
Standard Details

Joist Built into Wall

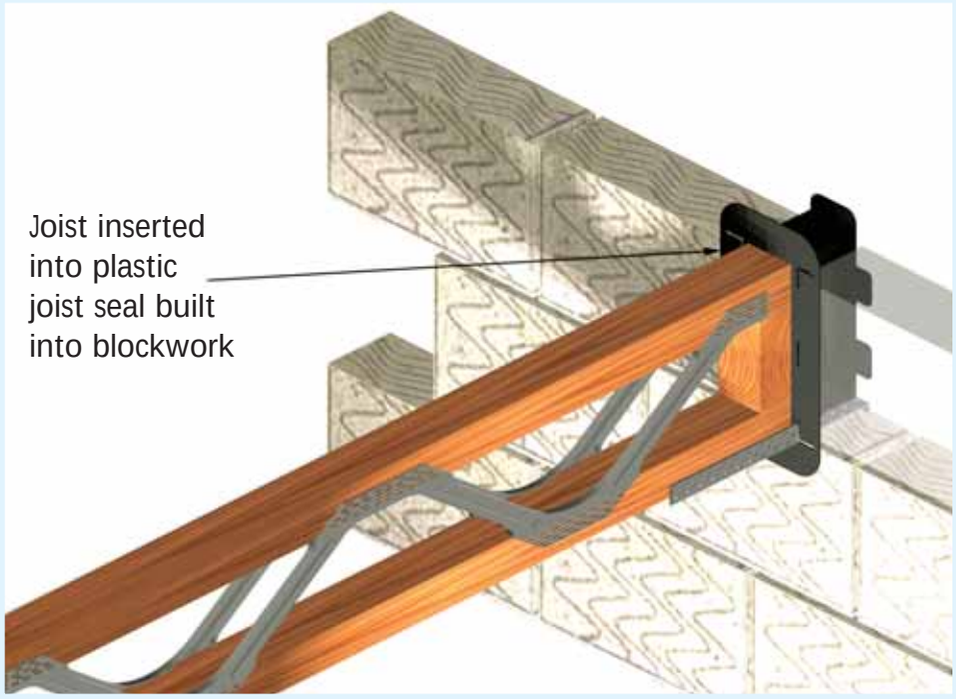


Standard Details

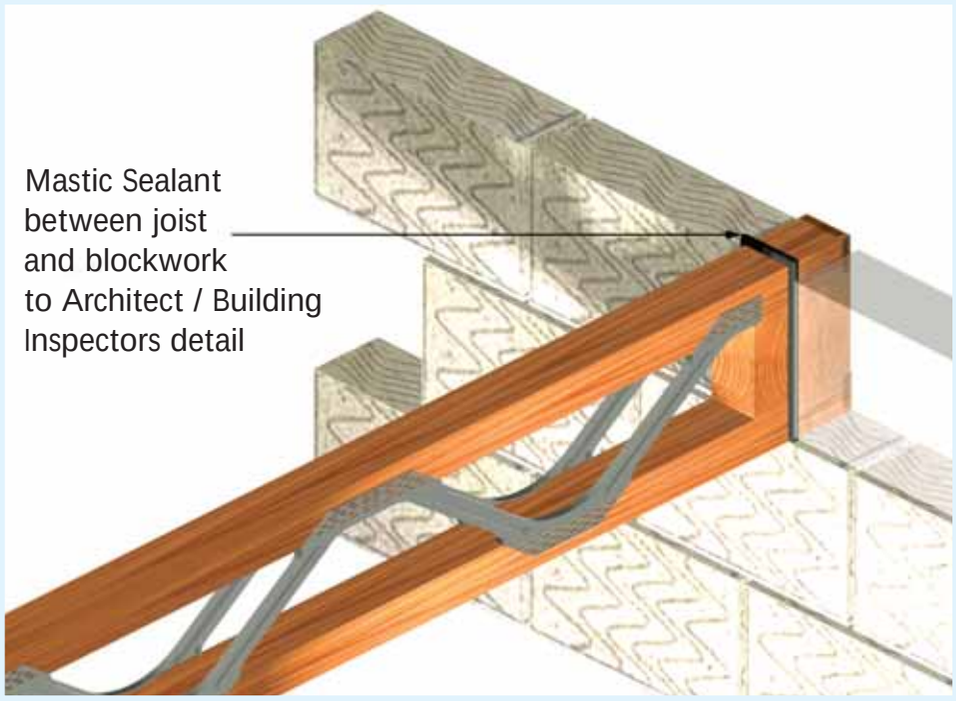
Typical Top Chord Detail: Supported Joist (On Trimmer)



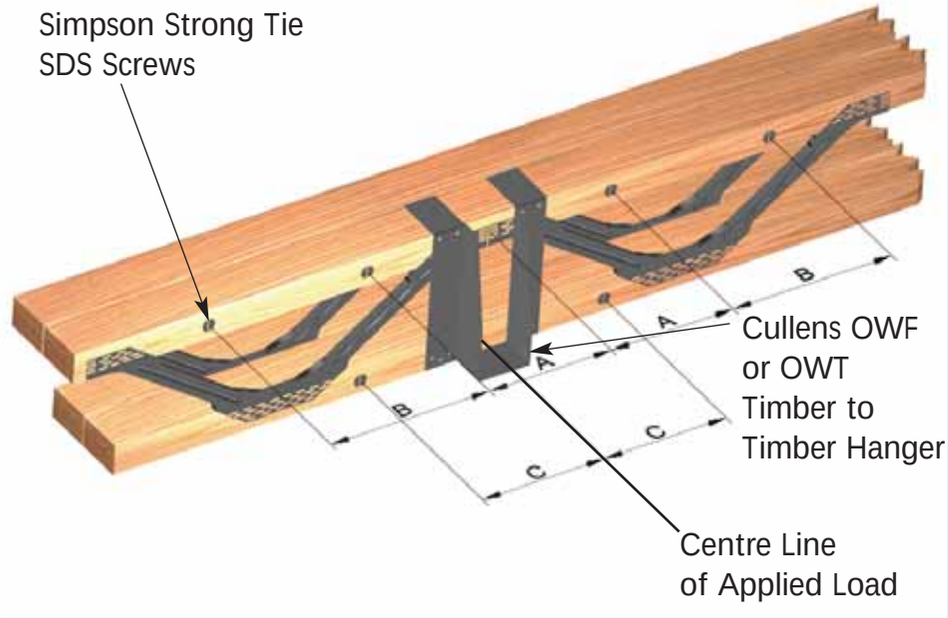
Use of Plastic Joist Seals:
to prevent air leakage into cavity



Use of Mastic Sealant:
to prevent air leakage into cavity



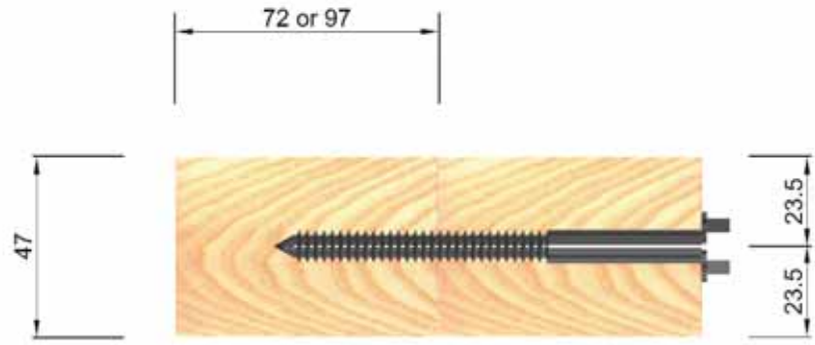
2 Ply Ecojoist Connection



LOAD APPLIED TO HANGER	NUMBER OF TOP CHORD SCREWS	NUMBER OF BOT. CHORD SCREWS	DIMENSION A IN MM	DIMENSION B IN MM	DIMENSION C IN MM
6600 N	2	2	not exceeding 150 mm	not applicable	not exceeding 150 mm
10000 N	4	2	not exceeding 150 mm	not exceeding 150 mm	not exceeding 150 mm

NB.
Check applied load against hanger safe working capacity.

2 Ply Ecojoist Connection



SDS screw position in chord

CHORD SIZE	SCREW LENGTH IN MM
2 ply 47 x 72	127
2 ply 47 x 97	152

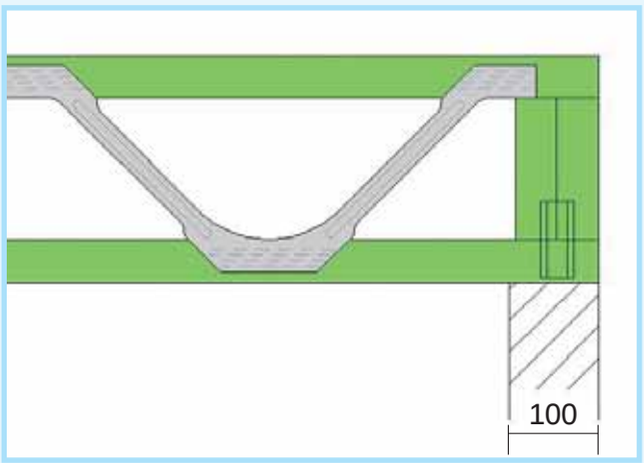
Important Notes

- Screws should be positioned at 600mm centres maximum along the chords of the joists. This is in addition to the screws shown in this detail.
- The floor decking should be screwed/nailed/glued to both of the top chords of the 2 ply joist.
- SDS screws should be installed such that the screw head is on the same side of the joist as the hanger.
- A minimum end distance of 75mm should be applied to both chords.
- SDS screws should be inserted along the centre line of the chords.

Section 2

Bearing onto Wall

Where joists are built into external walls, a bearing of 100mm is normal with a minimum of 90mm required by the NHBC in order to provide lateral restraint to the wall. If restraint is provided separately to the wall, a minimum bearing of 75mm is acceptable.



Restraining the wall can be achieved by the use of proprietary 'restraint type' joists hangers or by building in restraint straps and fixing them to the sides of the joist flanges.

Where joists are to be supported in masonry hangers, the hanger is required to bear onto the blockwork by 75mm. If the joists are supported on masonry hangers at each end care must be taken when cutting the joists to length to ensure a good fit. The NHBC have a tolerance of 6mm between the end of the joist and the face of the masonry hanger.

We would recommend the use of masonry hangers that have a return which extends in to the cavity. Care must be taken when ordering this type of hanger to match the hanger return dimension to the brick width.

Loads

Ecojoists® are precisely engineered structural components the design of which is dependent on the loads applied. The following serves to assist the specifier/designer in understanding and evaluating design loads.

Domestic floor loads

The design loads required for a domestic floor consist of both imposed and dead loads. The imposed or 'live' load represents people and furniture etc. and the dead loads represent the floor boarding, plasterboard ceiling, insulation within the floor and the joist selfweight.

Imposed	
Top chord	1500 N/m^2

Dead	
Top chord	250 N/m^2
Bottom chord	250 N/m^2

Should it be necessary to calculate the total load per *linear* metre, add the loads together and then multiply by the centres at which the joists are positioned (in metres).

Example
Calculate the load per metre for domestic floor joists spaced at 600mm centres.
Total of loads 1500 + 250 + 250 = 2000 N/m^2
Load per *linear* metre = 2000 x 0.6 = 1200 N/m

Separating or Compartment Floors

Compartment floors are those that separate one dwelling from another and are required to provide one hour fire resistance and resistance to the passage of sound from one dwelling to the one above or below.

The loads that have to be considered are greater than those of the floors of single occupancy dwellings. Below is a typical load description for a compartment floor having a 'floating floor' construction, to combat sound transfer, and two layers of 15mm Fireline plasterboard for fire and sound resistance.

Imposed	
Top chord	1500 N/m^2

Dead	
Top chord	470 N/m^2
Bottom chord	417 N/m^2

Loads

The imposed load will depend on the type of use and/or occupancy of the dwelling. The appropriate value can be found in BS 6399 part 1, an extract from which is shown in the table below.

Type of Occupancy	*Examples of Usage*	*Uniformly Distributed Load kN/m²*
Domestic and Residential	1. All usage within self-contained dwelling units and communal areas (including kitchens) in blocks of flats with limited use.*	1.5
	2. Bedrooms and dormitories except those in hotels and motels	1.5
	3. Bedrooms in hotels and motels Hospital wards Toilet areas	2.0
	4. Billiard and snooker rooms	2.0
	5. Communal kitchens except in flats covered by 1. above	3.0
Offices	6. General office use	2.5
	7. Kitchens, laundries and laboratories	3.0
Areas where people may congregate	8. Public, institutional and communal dining rooms, lounges, cafes and restaurants	2.0
	9. Classrooms	3.0

** Communal areas in blocks of flats with limited use refers to blocks consisting of not more than three storeys and with not more than four self contained dwelling units per storey accessible from one staircase.*

Partition Walls

Lightweight partition walls are often built on top of suspended floors. Consequently their weight must be included when designing the joists.

Timber studding faced with plasterboard each side is one method of forming partition walls but this has been superseded in popularity by the various types of proprietary partition systems available. Most systems use plasterboard either side of the framework, which should have a surface mass of 12.5kg/m² (if no mineral wool in between the studs is used) in order to satisfy the requirements of Part E of the Building Regulations.

Typically the load associated with partition wall construction is 267 N/m². So, assuming the partition is 2.4m high, a load of 2.4 x 267 = 640 N/m should be included. (note that this is a load per *linear* metre of partition).

An alternative way of accommodating partition loads is to apply a uniformly distributed load over the whole floor. The value of this load is equal to one third of the linear metre load of the partition. So using the example above, the UDL applied to the whole floor would be 640 ÷ 3 = 213 N/m². However the value most commonly used is 250 N/m².

Loads continued

Flat Roofs

Flat roofs are often made waterproof by applying several layers of asphalt roofing to the plywood or OSB decking. The imposed load applicable to a roof is 750 N/m^2 which allows for snow fall or access for maintenance work.

Assuming 15mm plywood decking, 3 layers of asphalt roofing, 12.5mm plasterboard ceiling, insulation and joist selfweight the loads would be as follows:

Imposed	
Top chord	750 N/m^2
Dead	
Top chord	760 N/m^2
Bottom chord	250 N/m^2

Weight of Building Materials

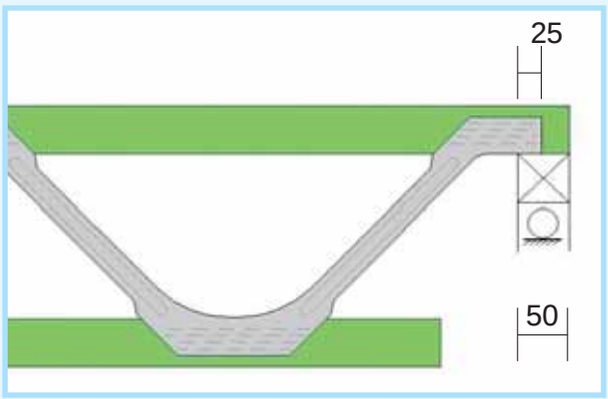
Listed below are the approximate weights of some commonly used building materials:

Asphalt Roofing	2 layers	42 kg/m^2
Asphalt Roofing	3 layers	63 kg/m^2
Chipboard flooring	18mm thick	14 kg/m^2
Chipboard flooring	22mm thick	18 kg/m^2
Plaster	1 skim coat	6.8 kg/m^2
Plasterboard	9.5mm thick	8.3 kg/m^2
Plasterboard	12.5mm thick	11.2 kg/m^2
Plasterboard	15 mm thick	13.4 kg/m^2
Plasterboard	19.1mm thick	17.1 kg/m^2
Plywood	12mm thick	8.4 kg/m^2
Plywood	15mm thick	10.5 kg/m^2
Plywood	18mm thick	12.6 kg/m^2
Screed	12.5mm thick	29.3 kg/m^2

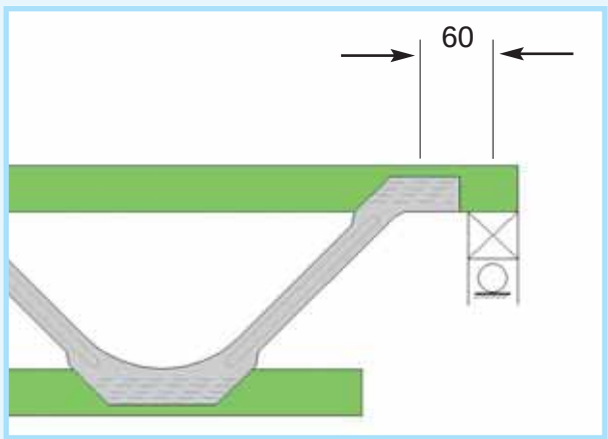
In order to convert kg/m^2 to N/m^2 multiply by 9.81

Top Chord Support Detail

It is possible to support Ecojoists® on their top chords allowing them to be 'hooked' onto the supporting structure. In order for the load from the joist to be efficiently transferred to the structure, the joist should be positioned such that the metal web is over the support.



If however, the support is not under the web, as shown below, a calculation can be made to see if the joist design is still acceptable.



Example

Joist span = 3,600m Chord sizes = 47 x 72 Joist centres = 0.6m Timber grade = TR26

Total Load = 2000N/m^2 (uniformly distributed domestic)

Load to be transferred from joist to support = $\frac{3.6 \times (2000 \times 0.6)}{2}$ = 2160N

Top Chord Support Detail continued

Two design checks must be made:

1. ***Shear check*** – as the load from the metal web has now passed into the timber before being transferred to the support, the timber shear capacity must be checked.

   Permissible shear capacity parallel to grain for TR26 timber = 1.1 N/mm^2

   Applied shear stress = $\frac{3 \times V}{2 \times A}$ where V is the load from the joist and A is the cross sectional area of the timber

   Applied shear stress = $\frac{3 \times 2160}{2 \times 47 \times 72}$ = 0.957 N/mm^2

2. ***Bending check*** – as the load is now being transferred to the support a distance of 60mm from the centre of the nailplated area of the metal web, a bending moment is introduced and the applied bending stress must be calculated.

   Permissible bending stress parallel to grain for TR26 timber = 10 N/mm^2

   Applied bending moment = Load x lever arm = 2160 x 60 = 129600 Nmm

   Applied bending stress = $\frac{m}{z}$ where m is the applied bending moment and z is the section modulus of the timber.

   $z = \frac{\text{breadth} \times \text{depth}^2}{6} = \frac{72 \times 47^2}{6}$ = 26508 mm^3

   Applied bending stress = $\frac{129600}{26508}$ = 4.89 N/mm^2

Summary

As the applied shear stress of 0.957 N/mm^2 is less than the permissible of 1.1 N/mm^2 and the applied bending stress of 4.89 N/mm^2 is less than the permissible of 10 N/mm^2 the joist design is still acceptable.

Top Chord Support Detail continued

Site Handling

Delivery is made to site on suitable transport provided by the Ecojoist® manufacturer. The manufacturer will usually bear responsibility for the joists until they are off-loaded at site whereupon they become the contractor's responsibility.

Site Storage

Site storage is intended to be temporary prior to erection. The fabrication and delivery of joists should, therefore, be arranged to minimise the storage time both at the manufacturer's premises and on site. Gang-Nail Systems recommend that the joists are delivered wrapped in protective plastic covering which will protect the joists from short term exposure to inclement weather. The joists should be stored horizontally, such that they are approximately 75mm clear of the ground and vegetation, and supported in such a way as to prevent the likelihood of distortion.

Erection

1. After studying the Ecojoist® layout drawing, decide which area of the floor is to be erected first and from which end of the building.
2. Place the required joists (A1, A2 etc.) next to the correct area of the building.
3. Check to see if the joists require internal support and/or have differing end details.If any of these conditions exist, attention should be paid as to the correct orientation of the joist before hoisting onto the scaffold.
4. Care should be taken not to damage the metal webs when hoisting onto the scaffold i.e. hoisting straps should be placed around timber chords and not around the metal webs.
5. The first joist is normally positioned a dimension of 50mm from the inside face of the brickwork measured to the edge of the joist. (see figure 1)
6. The remaining joists are positioned at the centres specified on the layout drawing (e.g. 600, 480 or 400mm) but set out from the inside face of the brickwork, thus making the distance from the 1st joist to the 2nd equal to the specified joist centres minus 50mm.
7. Joists may be required to support stair trimmers and partition walls which, in most cases, will be in addition to the joists occurring at the specified centres.
8. As an aid to setting the joists in their correct positions it is advisable to use a length of tiling batten positioned close to the external support brickwork and temporarily nailed to each joist. (see figure 1)
9. Once the joists have been positioned the strongback bridging, partition noggins (if required) and restraint straps can be installed.
10. If the joists are supported at 3 positions it is important to check that they are in contact with the supports at all locations. To achieve this it may be necessary to place packing (slate or similar) between the top of the brickwork and the underside of the joist.
11. Care should be taken to ensure that adjacent joists are level with each other and that joists are level along their length.

Site Handling

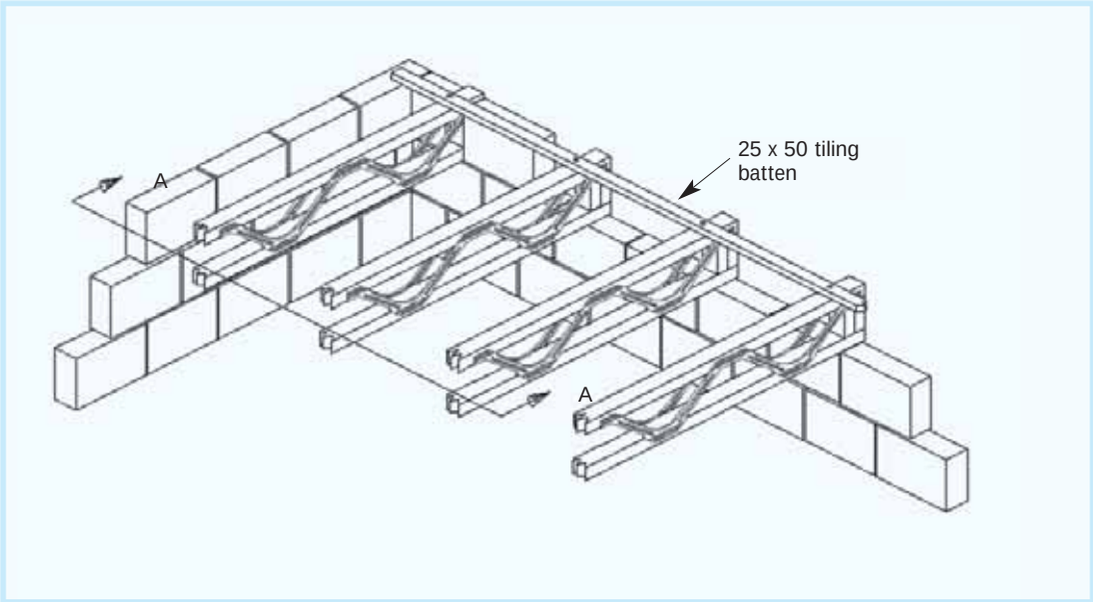
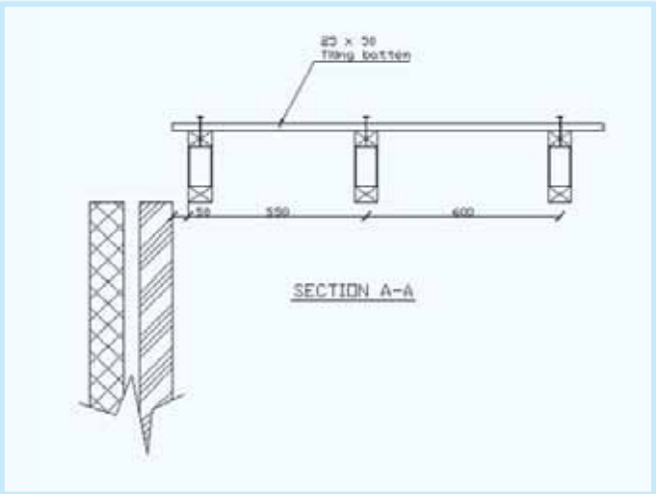


FIGURE 1



Floor Decking

There are a variety of sheet products available which can be used as floor decking with the most popular being chipboard. Readily available sheet sizes are 2400mm x 600mm with thicknesses of 18mm and 22mm. Attention should always be paid to the particular manufacturer's instructions but listed below are some good practice guidelines.

- Chipboard to be used in suspended domestic flooring applications should be marked P5 or P7. (conforming to BS EN 312-5 or BS EN312-7)
- Tongued and grooved boards should be laid with their long edges running perpendicular to the joists with the joint between the short edges occurring on the centreline of a joist.
- Square edged boards need to be supported continuously along all edges. This is best achieved by positioning the joint between the long edges on the centreline of a joist and the joint between the short edges on a noggin fixed between the joists.
- Joints along the short edges of boards should be staggered and the length of any board should generally not be less than 2 x joist centres.
- It is essential that boards are supported within 50mm of their edges at the perimeter of the floor by either joists or perimeter noggins.
- Fixings – 3mmø nails or screws with a minimum length equal to 2.5 x board thickness. Nails or screws should be positioned 8mm from the board edge and at 200mm c/c along all supports and edges. (see figure 2). Boards should be glued to the joists and the tongued and grooved joints should also be glued. A PVAC adhesive conforming to durability class D1 of BS EN 204 should be sufficient for these applications.
- Under domestic floor loads 18mm chipboard can be used on joist centres up to 450mm max. and 22mm chipboard can be used on joist centres up to 600mm max.
- Chipboard is similar to other timber products in that it will expand when exposed to moisture and high humidity. Consequently allowances must be made to accommodate potential expansion. It is recommended to leave a perimeter gap of 10–12mm between the edge of the board and the face of the brickwork. It is also recommended to leave a gap of 2mm between edges of abutting boards.

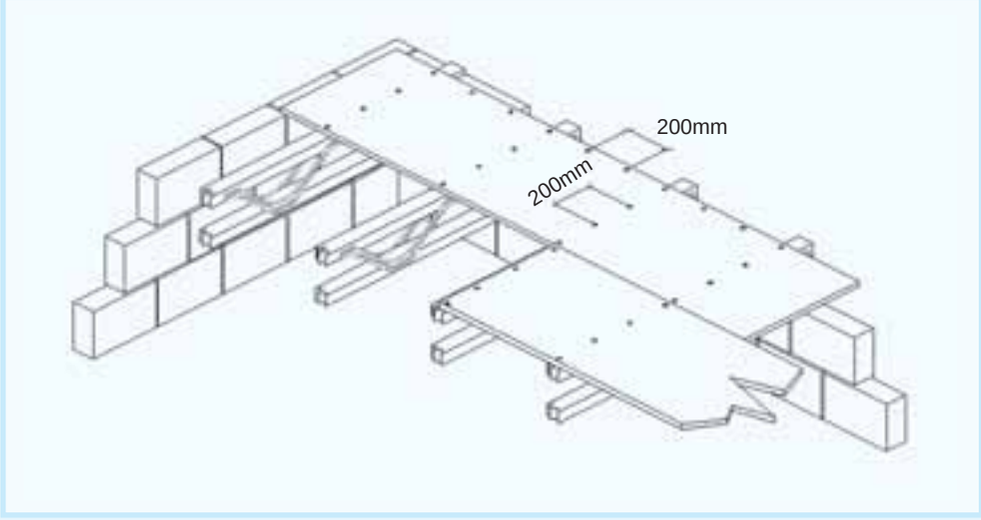


FIGURE 2

Nailing Requirements for Solid Timber 2 Ply Trimmers

In most floor layouts there is the requirement to frame around an opening in the floor, e.g. to allow access from the floor below via a staircase (stairwell).

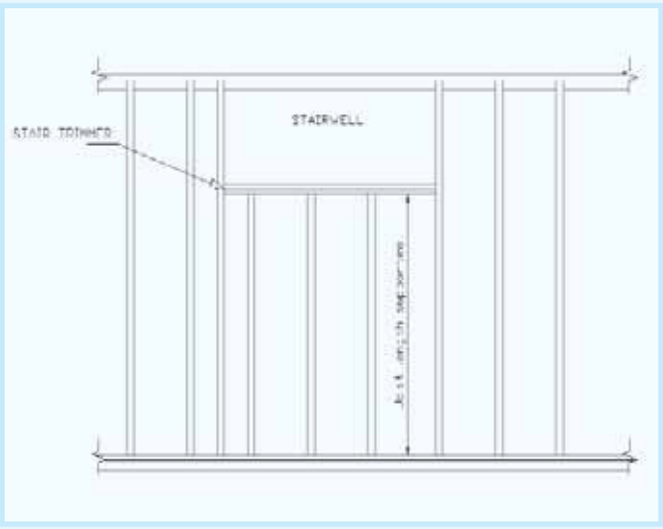
Stairwells can be many different shapes and sizes and located in various places within the floor layout. The timber member that supports the shortened joists is called a trimmer and may be a single or a double member. When a double member is specified it is necessary to join the two members together such that they each carry the same load. This can be achieved by nailing the members together.

The table below contains nailing requirements for double member trimmers (2 ply) based on domestic floor loads only.

TRIMMER THICKNESS IN MM	MAX. LENGTH OF JOIST SUPPORTED IN MM	NAIL DESCRIPTION	NAIL CENTRES (C) IN MM
35	3000	3.35 x 65	350
	3500	3.35 x 65	300
	4000	3.35 x 65	250
	4500	3.35 x 65	200

TRIMMER THICKNESS IN MM	MAX. LENGTH OF JOIST SUPPORTED IN MM	NAIL DESCRIPTION	NAIL CENTRES (C) IN MM
47	3000	3.35 x 90	350
	3500	3.35 x 90	300
	4000	3.35 x 90	250
	4500	3.35 x 90	200

For maximum length of joist supported, see figure 3 below.



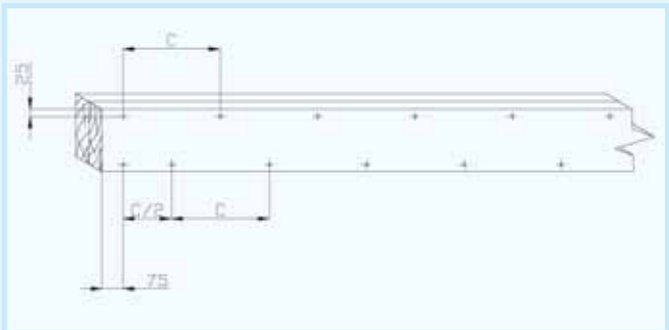


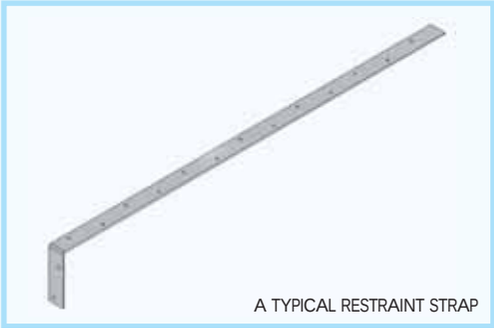
FIGURE 3

Metalwork

There are three types of metalwork that may be used within the construction of an Ecojoist® floor.

Restraint Strap

Where walls are to be laterally restrained by the floor diaphragm, the connection between the wall and the floor is made using galvanised steel restraint straps. These straps should be positioned at centres not exceeding 2000mm between points of restraint e.g. internal walls perpendicular to the one being restrained. They should also extend over 3 joists. For fixing, see Detail L (p.10-11).



A TYPICAL RESTRAINT STRAP

Hangers

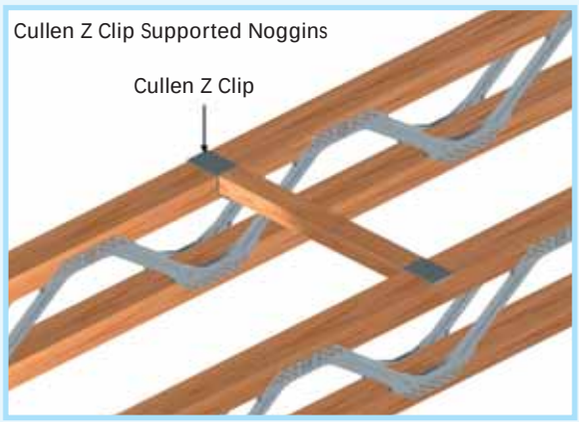
There are two types of hangers that may be used in an Ecojoist® floor – masonry hangers and timber to timber hangers. Masonry hangers are discussed under **Bearing onto Wall**. Timber to timber hangers are used to connect trimmers to Ecojoists® and Ecojoists® to timber beams. Where trimmers are connected to Ecojoists® the hanger is fixed to a plywood gusset that is factory fixed to the joist. As the nails in the plywood gusset don't have the same load carrying capacity as nails in a solid timber member, the safe working loads of the hangers must be altered from those published by the manufacturer. The table below gives safe working loads of hangers manufactured by a leading builders metalwork supplier. Face fix hangers are also available that remove the need for plywood.

HANGER TYPE	HANGER WIDTH, MM	DEPTH OF ECOJOIST, MM	SAFE WORKING LOAD, kN
KH50, 75,100	50,75,100	195	5.18
KH50, 75,100	50,75,100	219, 254,304	5.80
MHE 500	75	any	7.51
MHE 500	100	any	7.01

These figures are based on the hangers being fully nailed using 3.75ø x 30 long square twist nails.

Z Clips

Z clips can be used to fix noggins placed perpendicular to the joists where support is required for non-load bearing partitions which lie between joists. For fixing, see detail below.



Span Tables

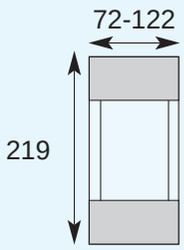
Domestic Load:

SPAN TABLE FOR ECOJOIST BEAMS

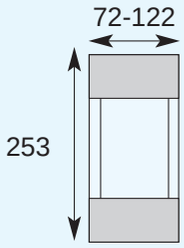
FLOOR LOADING:	Live load	1500 N/m^2
	Top chord dead load	450 N/m^2
	Bottom chord dead load	200 N/m^2

Includes an allowance of 250 N/m^2 for Partition Load.
Spans limited by max. deflection limit of 14mm where applicable.
Timber Strength Class = TR26
Self weight included. Spans include 100mm bearing at each end.

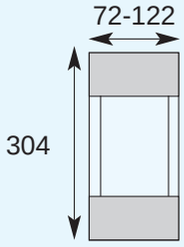
	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-8 219mm	400	47 x 72 47 x 97 47 x 122	4870 5170 5350
	600	47 x 72 47 x 97 47 x 122	4120 4480 4740



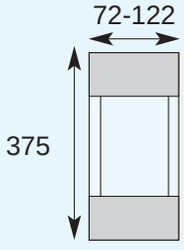
	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-10 253mm	400	47 x 72 47 x 97 47 x 122	5290 5620 5850
	600	47 x 72 47 x 97 47 x 122	4830 5120 5330



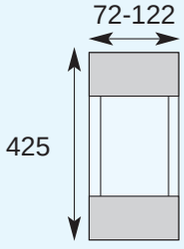
	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-12 304mm	400	47 x 72 47 x 97 47 x 122	5890 6250 6540
	600	47 x 72 47 x 97 47 x 122	5240 5540 5720



	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-14 375mm	400	47 x 72 47 x 97 47 x 122	6560 6920 7220
	600	47 x 72 47 x 97 47 x 122	5840 6150 6370



	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-16 425mm	400	47 x 72 47 x 97 47 x 122	6950 7350 7650
	600	47 x 72 47 x 97 47 x 122	6190 6530 6770



Span Tables continued

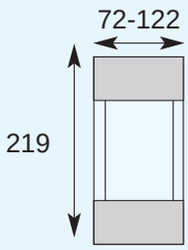
Office Load:

SPAN TABLE FOR ECOJOIST BEAMS

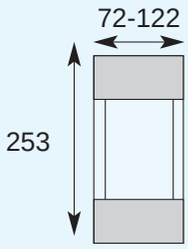
FLOOR LOADING:		
	Live Load	2500 N/m^2
	Top chord dead load	1200 N/m^2
	Bottom chord dead load	200 N/m^2

Includes an allowance of 1 kN/m^2 for Partition Load.
Spans limited by max. deflection limit of 14mm where applicable.
Timber Strength Class = TR26
Self weight included. Spans include 100mm bearing at each end.

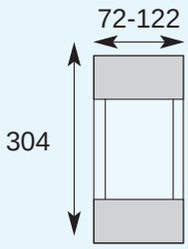
	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-8 219mm	400	47 x 72 47 x 97 47 x 122	3820 4120 4350
	600	47 x 72 47 x 97 47 x 122	3180 3420 3630



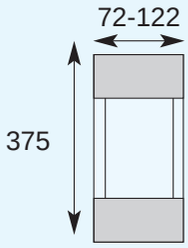
	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-10 253mm	400	47 x 72 47 x 97 47 x 122	4350 4700 4910
	600	47 x 72 47 x 97 47 x 122	3630 3910 4140



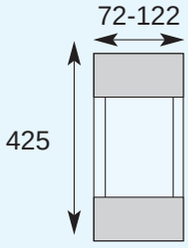
	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-12 304mm	400	47 x 72 47 x 97 47 x 122	4930 5190 5390
	600	47 x 72 47 x 97 47 x 122	4150 4480 4700



	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-14 375mm	400	47 x 72 47 x 97 47 x 122	5480 5800 6000
	600	47 x 72 47 x 97 47 x 122	4780 5050 5220



	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-16 425mm	400	47 x 72 47 x 97 47 x 122	5840 6130 6380
	600	47 x 72 47 x 97 47 x 122	4950 5400 5580



Span Tables continued

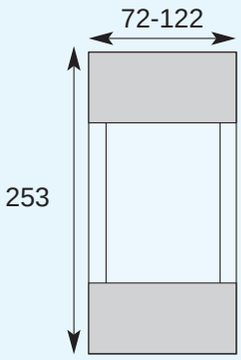
Robust Detail Load:

SPAN TABLE FOR ECOJOIST BEAMS

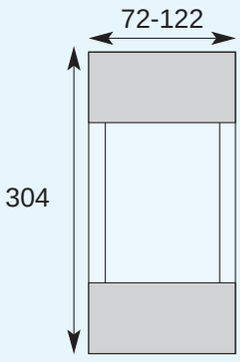
FLOOR LOADING:	Live Load	1500 N/m^2
	Top chord dead load	720 N/m^2
	Bottom chord dead load	420 N/m^2

Includes an allowance of 250 N/m^2 for Partition Load.
Spans limited by max. deflection limit of 14mm where applicable.
Timber Strength Class = TR26
Self weight included. Spans include 100mm bearing at each end.

	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-10 253mm	400	47 x 72 47 x 97 47 x 122	4990 5290 5520
	480	47 x 72 47 x 97 47 x 122	4740 5030 5250
	600	47 x 72 47 x 97 47 x 122	4330 4650 4890



	CENTRES mm	TIMBER SIZE mm	SPAN mm
V2-12 304mm	400	47 x 72 47 x 97 47 x 122	5540 5870 6130
	480	47 x 72 47 x 97 47 x 122	5270 5570 5750
	600	47 x 72 47 x 97 47 x 122	4910 4160 5370



Fire Resistance

All timber floors rely on a contribution from the ceiling towards the overall fire resistance of the floor structure. The required fire resistance for domestic floor structures is 30 minutes and for compartment floors is 60 minutes. Based on data from full scale testing and calculated assessment the following tables have been produced.

Table 1

30 minute fire resistance

JOIST DEPTH	WEB SIZE	JOIST CENTRES	BOARD THICKNESS AND TYPE°	SCREW FIXING	INTERMEDIATE NOGGINS REQUIRED	PERIMETER NOGGINS REQUIRED	FLOORBOARD THICKNESS
219mm or 253mm or 304mm or 375mm or 425mm	V2-8 or V2-10 or V2-12 or V2-14 or V2-16	400	12.5mm Fireline	150mm	No	Yes	18mm
		480	12.5mm Fireline	150mm	Yes	Yes	22mm
		600	12.5mm Fireline	150mm	Yes	Yes	22mm
		400	15mm Wallboard	150mm	No	Yes	18mm
		480	15mm Wallboard	150mm	No	Yes	22mm
		600	15mm Wallboard	150mm	No	Yes	22mm

60 minutes fire resistance

JOIST DEPTH	WEB SIZE	JOIST CENTRES	BOARD THICKNESS AND TYPE°	SCREW FIXING	INTERMEDIATE NOGGINS REQUIRED	PERIMETER NOGGINS REQUIRED	FLOORBOARD THICKNESS
219mm or 253mm or 304mm or 375mm or 425mm	V2-8 or V2-10 or V2-12 or V2-14 or V2-16	400	2 x 12.5mm Fireline	150mm	No	Yes	22mm
		480	2 x 12.5mm Fireline	150mm	No	Yes	22mm
		600	2 x 12.5mm Fireline	150mm	No	Yes	22mm

Fireline and Wallboard are products of Gypsum Industries Limited and may be contacted for further advice.

Fire Resistance

Notes:

1. Ceiling boards are positioned so that their long edges run perpendicular to the joists. Where a second layer is used, it must be set out such that the joints do not occur at the same location as the first layer of board.

2. The boards are fixed to the underside of the joist using diameter 3.2 x 42mm long black phosphated steel screws positioned at 150mm centres. Where two layers are used diameter 3.2 x 55mm long screws should be used for the second layer.

3. All joints in both layers of board should be taped with 50mm wide glass fibre tape and filled using gypsum joint filler.

4. Perimeter and intermediate noggins are required to support the boards at their edges. Perimeter noggins are required for all board thicknesses and joist centres, whereas intermediate noggins are only required for the thinner boards at larger centres. *See Table 1 (on the left).*

5. The fixing and noggin details given here are based on the use of Gypsum Industries Ltd products and are minimum requirements.

6. Where other products are used it should be established that their performance is equal to or better than those of Gypsum Industries Ltd.

7. Flooring to be tongue and grooved and fixed in accordance with good practice. If square edged boards are used, timber noggins are required under board edges that are not supported on joists.

Downlighters

Based on evidence from full-scale tests our recommendation is that all downlighters should either have a 30 or 60 minute fire rating or be equipped with a fire resistance sock.

Fire Resistance continued

FIGURE 1: 15MM PLASTERBOARD LAYOUT FOR ALL JOIST CENTRES

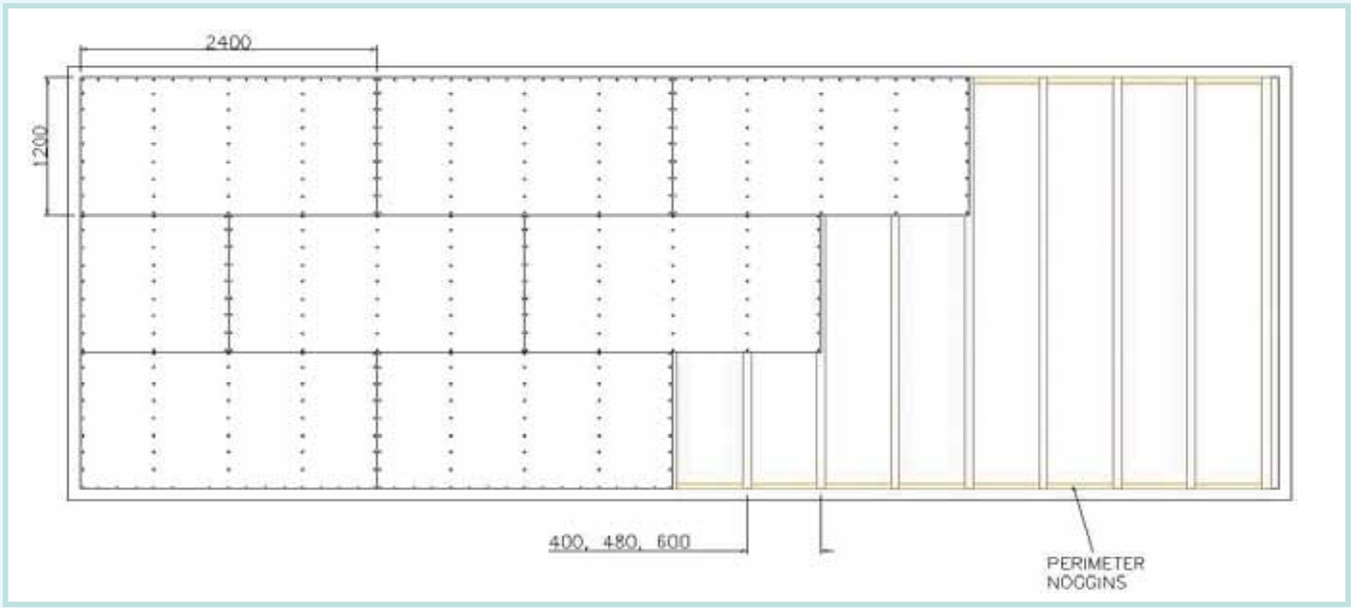
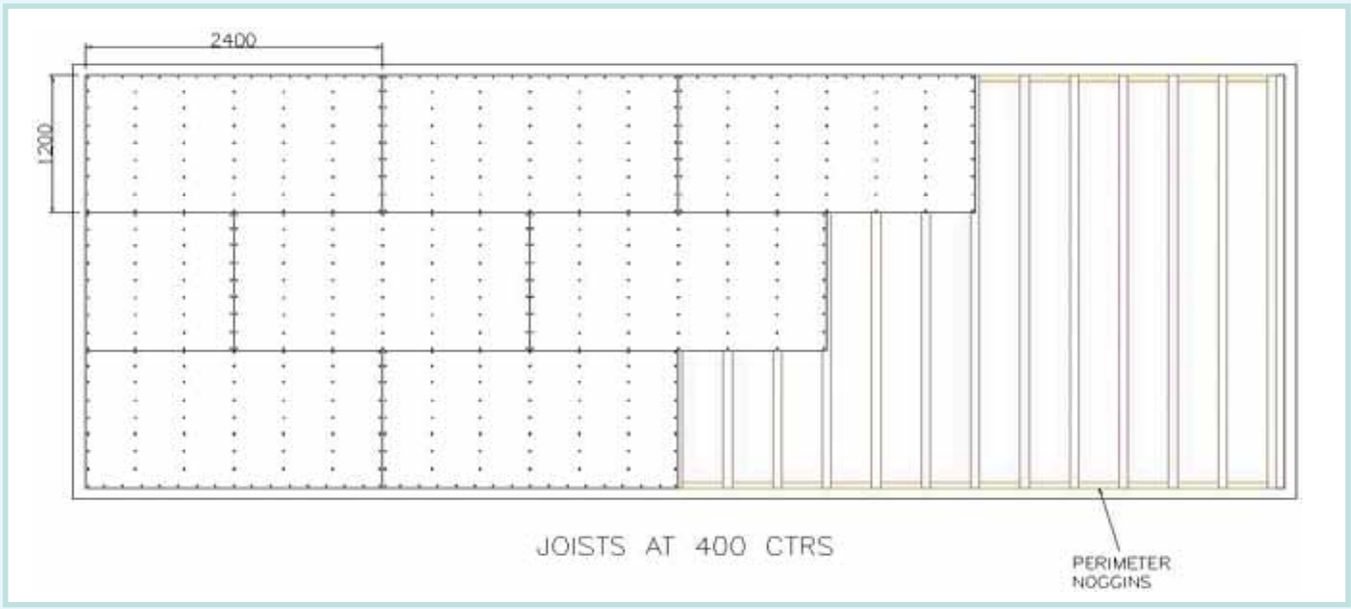
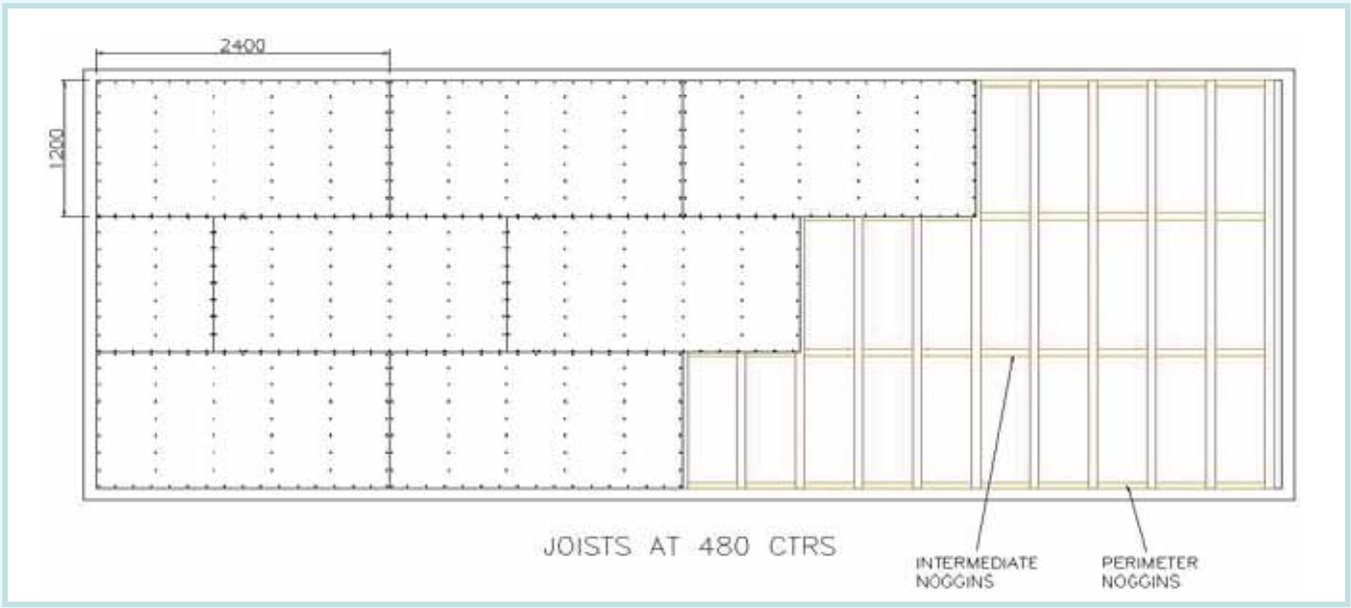


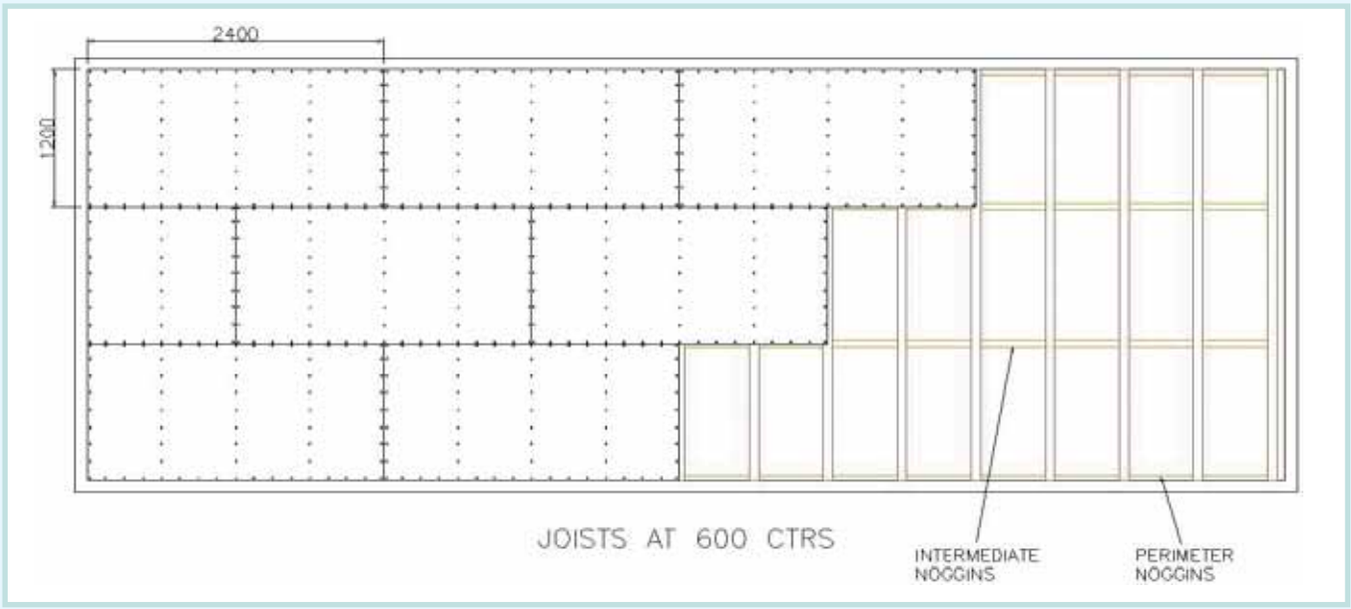
FIGURE 2: 12.5MM PLASTERBOARD LAYOUT FOR DIFFERENT JOIST CENTRES



Fire Resistance continued

FIGURE 2: 12.5MM PLASTERBOARD LAYOUT FOR DIFFERENT JOIST CENTRES (CONTINUED)





Sound

Changes to the requirements of Part E of Schedule 1 to the Building Regulations 2000 (as amended by SI 2002/2871) came into operation on 1st July 03. The purpose of these changes is to address the problem of noise in dwellings of which there have been complaints numbering 5000 per million of population. The total number of complaints has trebled in the ten years between 1986 and 1996.

The previous standards of sound insulation in dwellings have their roots in surveys carried out in the 1950s but since this time our standard of living has increased dramatically and with it the number of electrical appliances owned and used at home. Home entertainment systems (with increased power output at low frequencies) TVs, and the trend towards working from home all increase the amount of domestic noise generated. In general we have become less tolerant of noise related problems and public awareness has been heightened by the attention provided by the media to specific disputes.

The way the changes affect floors are two fold:

- **Single occupancy dwellings** – detached, semi detached, terraced houses and intermediate floors within flats. The new requirements aim to provide improved sound insulation and privacy between a room containing a WC and a living room, dining room, study or bedroom; and also between bedrooms and other bedrooms and other rooms. The requirement with regard to floors of new buildings is as follows:

Floor type	Airborne sound insulation Rw dB (min. value)
As above	40

For a suspended timber floor recommendations are that the floor boarding should have a mass per unit area of 15kg/m^2, the plasterboard should have a minimum mass per unit area of 10kg/m^2 and there should be a minimum of 100mm thick mineral wool in the floor void with a density of 10kg/m^3.

This recommendation is not prescriptive and other types of construction are acceptable if they are supported by laboratory test evidence. The testing laboratory should preferably be UKAS accredited. It is not intended that acoustic performance be verified by on site testing.

Sound

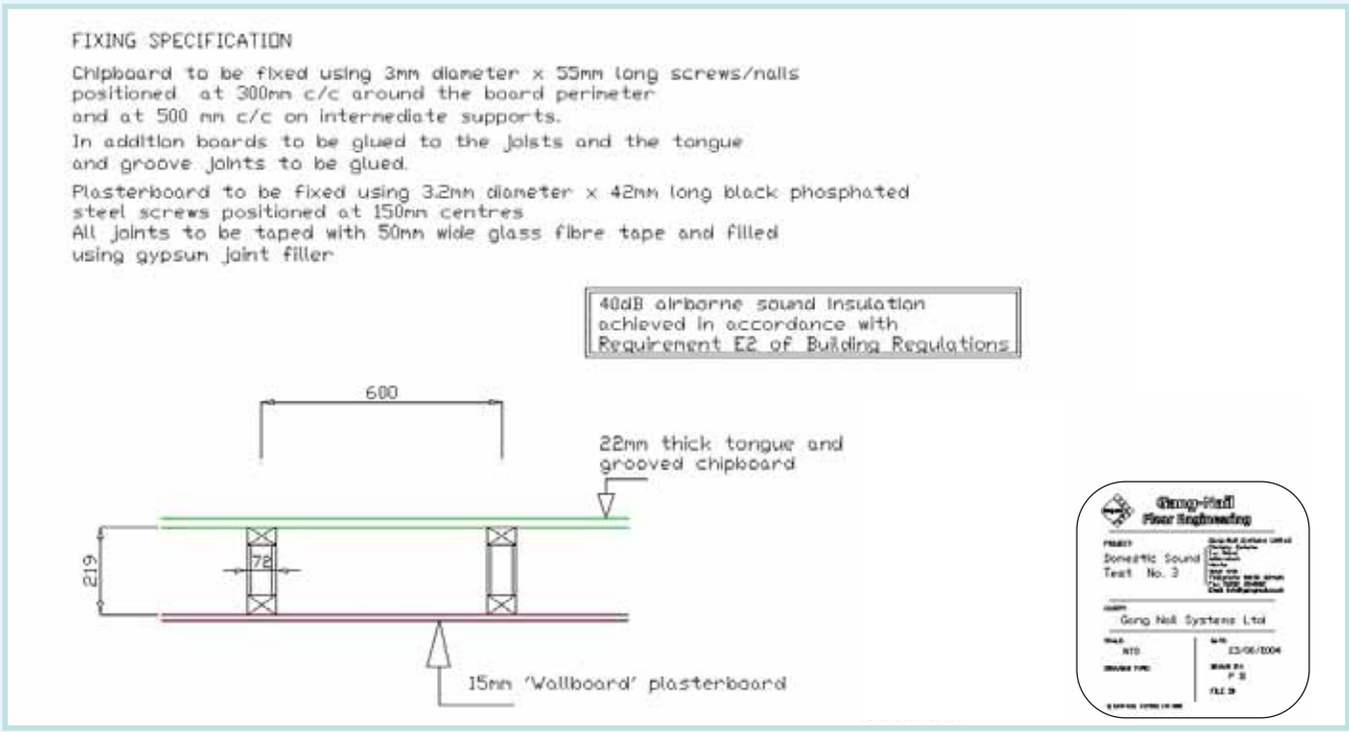
Acoustic Testing - Report Ref BTC 13560F

Ecojoist® has undergone acoustic testing in order to show compliance with Requirement E2, which refers to sound resistance within single occupancy residential dwellings.

The requirement is for a level of airborne sound insulation of 40dB, which Ecojoist® successfully achieved *without* the need for mineral wool insulation between the joists.

The test was carried out at the Building Test Centre in accordance with the requirements of BS EN ISO 140-3:1995. The tested floor construction comprised of 219mm deep Ecojoist® beams positioned at 600mm centres, 22mm thick T&G chipboard and 15mm Wallboard plasterboard. The test represented a practical solution which include both gluing of the chipboard to the joists and mechanical fixings (nails or screws).

In the controlled environment of a laboratory it is very easy to ensure that the tops of the joists are perfectly level thus ensuring that the good contact can be made between the two glued surfaces. However the realities on site are somewhat different and it is unlikely that the surface on which the joists bear is exactly level which will inevitably lead to discrepancies in level between joists. If gluing only is specified there is a danger that when the chipboard is laid it will adhere to the higher joists and miss those that are 2 or 3mm lower. However if mechanical fixings are included in the specification, the chipboard can be pulled down to the lower joists to ensure good contact is achieved and the glue can do its job.



Sound

Multi occupancy buildings – flats, hotels, nursing homes, hostels etc. The requirements with regard to floors of new buildings are as follows:

Floor Type	Airborne Sound Insulation DnT,w +Ctr dB (min. value)	Impact Sound Insulation L'nT,w dB (max. value)
Party floors in houses or flats	> 45	< 62
Party floors between rooms for residential purposes	> 45	< 62

You will see that the airborne sound insulation requirement is a minimum value. This is because airborne sound is measured as the difference in level between the source room and the receiving room, so the larger the number the better the sound insulation.

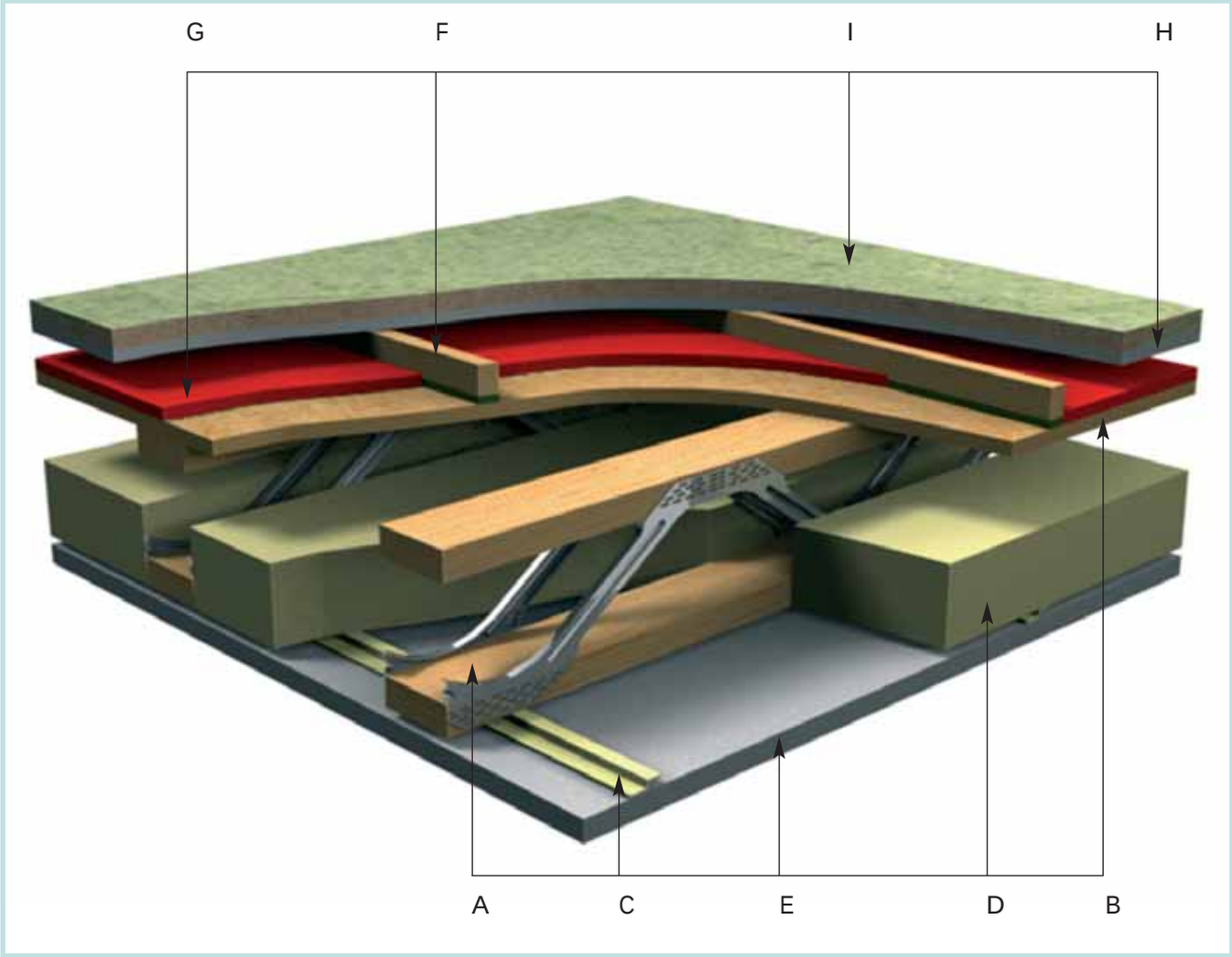
The impact sound insulation requirement is a maximum value because it is measured as the level of noise received, so the smaller the number the better the sound insulation. There are numerous proprietary products that can be incorporated in the floor construction to achieve these levels of insulation. Compliance with these requirements will have to be demonstrated by pre-completion testing or by the use of Robust Standard Details.

Robust Standard Details (RSD's)

RSD's were developed by the House Builders Federation as an alternative to pre completion testing, which was thought would be disruptive and difficult to manage on site. The premise behind RSD's is to provide a type of construction which can demonstrate, by on site testing, that its acoustic performance exceeds the requirements of Part E by 5dB in both airborne and impact sound insulation. This 5dB safety margin is designed to compensate for variances in workmanship and provides a factor of confidence that, with reasonable standards of workmanship, the RSD construction is unlikely to fall below the requirements of Part E if it were to be subject to pre completion testing.

Sound

Ecojoist® Robust Detail



- Use with timber frame walls only
- Joists can be supported on top or bottom chords

A. Ecojoist – minimum 253 mm deep.
B. Minimum 18mm thick sub deck with minimum density of 600kg/m^3.
C. Minimum 16mm resilient bars with laboratory performance of rd△w + Ctr = 17dB and rd△Lw = 16dB fixed at 400mm centres perpendicular to joists.
D. Minimum 100 mm thick mineral wool quilt insulation with density of 10 – 36 kg/m^3 laid between joists.
E. Two layers of 15mm thick plasterboard with nominal density of 11.7 kg/m^2 fixed with 32mm long screws (first layer) and 42mm long screws (second layer).
F. Minimum 70mm deep composite resilient battens fixed at 600mm centres perpendicular to joists.
G. Mineral wool quilt laid between battens, 25mm thick with density of 10 – 36kg/m^2.
H. 19mm thick plasterboard plank with nominal density of 13.5kg/m^2.
I. Minimum 18mm thick tongue and groove floor boards.

For full details refer to the Robust Details handbook.

Notes

Disclaimer
The specifications, calculations and information contained in the Manual are for guidance only and should only be used in conjunction with professional advice.

To the extent permitted by law, Gang-Nail Systems Limited disclaims all liability for any loss or damage, whether direct or indirect, arising as a result of the use of this Manual or the information contained in it.

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